HURON-ERIE CORRIDOR SYSTEM HABITAT ASSESSMENT – CHANGING WATER LEVELS AND EFFECTS OF GLOBAL CLIMATE CHANGE

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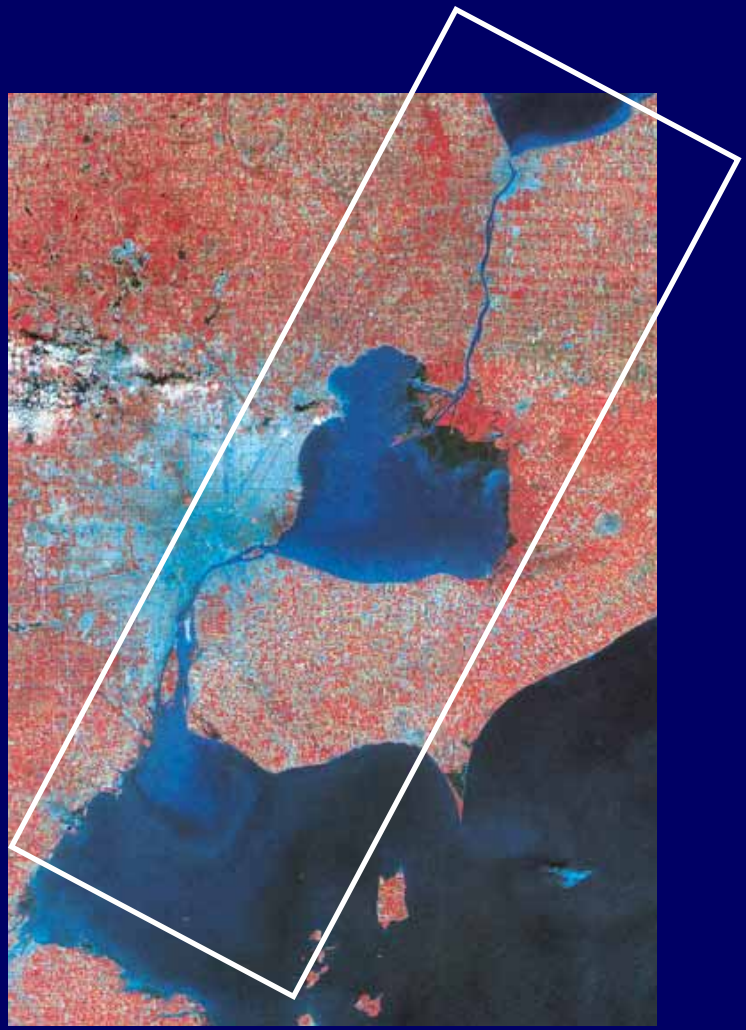
Huron-Erie Corridor System



The “System”:

- St. Clair River
- St. Clair Delta
- Lake St. Clair
- Detroit River
- Western Basin, Lake Erie

HEC Project

(GLFC Shotgun Wedding)

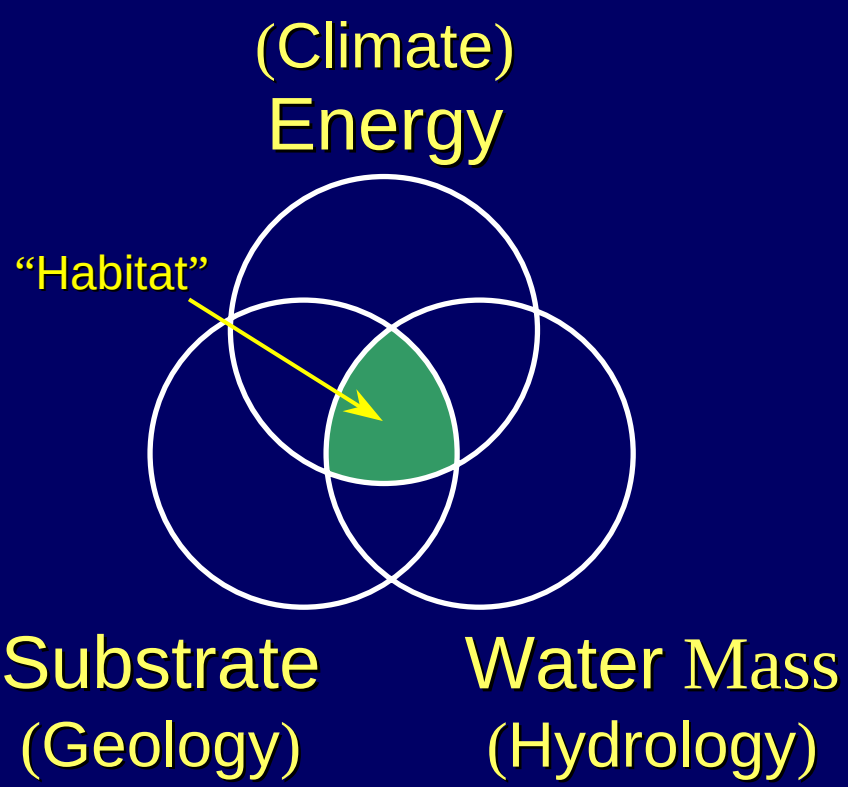
- This project will create a framework and design a process to systematically identify, coordinate, and implement binational aquatic and fish habitat restoration opportunities in the Lake Huron to Lake Erie Corridor (HEC)
  - Methodology? Workshops, and more workshops!
  - Finding willing partners and building project teams
  - Identifying research needs and developing long-term protection and restoration strategies

Fundamentals - Aquatic Habitat

- Combination of a range of physical characteristics and energy conditions that can be delineated geographically that meet the needs of a specific species and/or biological community for a specific life stage.

- Created and maintained by physical processes acting along hydrogeomorphic pathways that convey energy, water, and materials to, and through, the lakes.

Abiotic (Physical) Characteristics

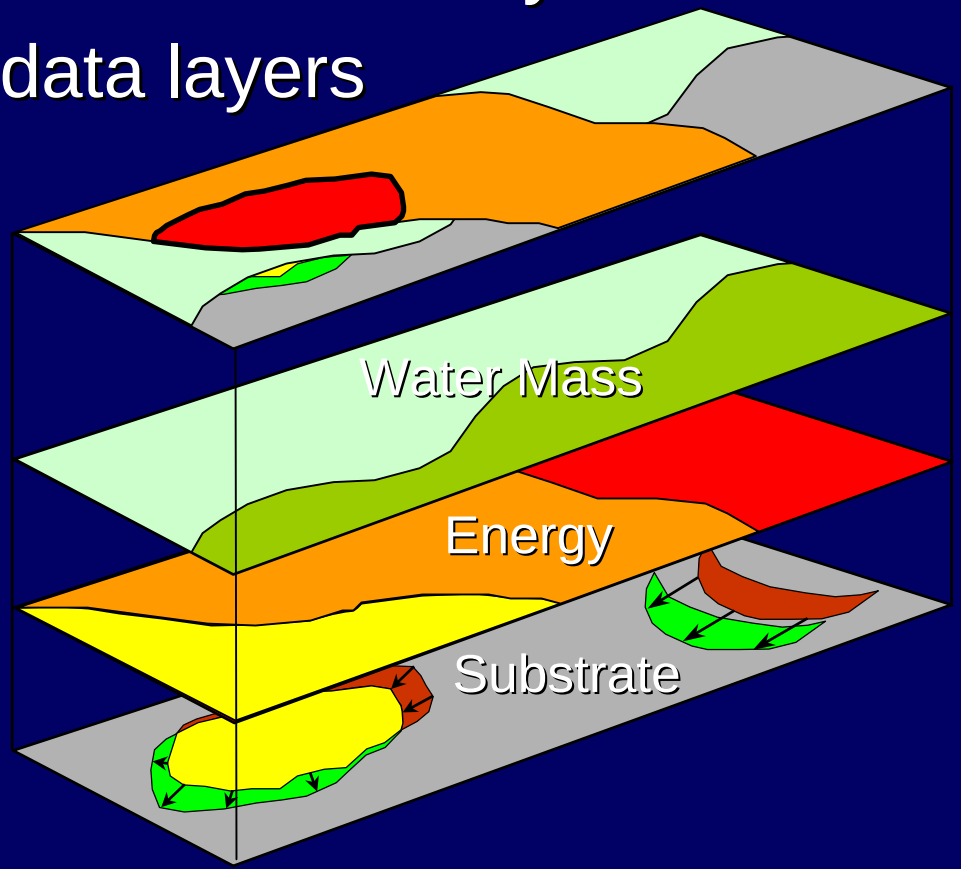


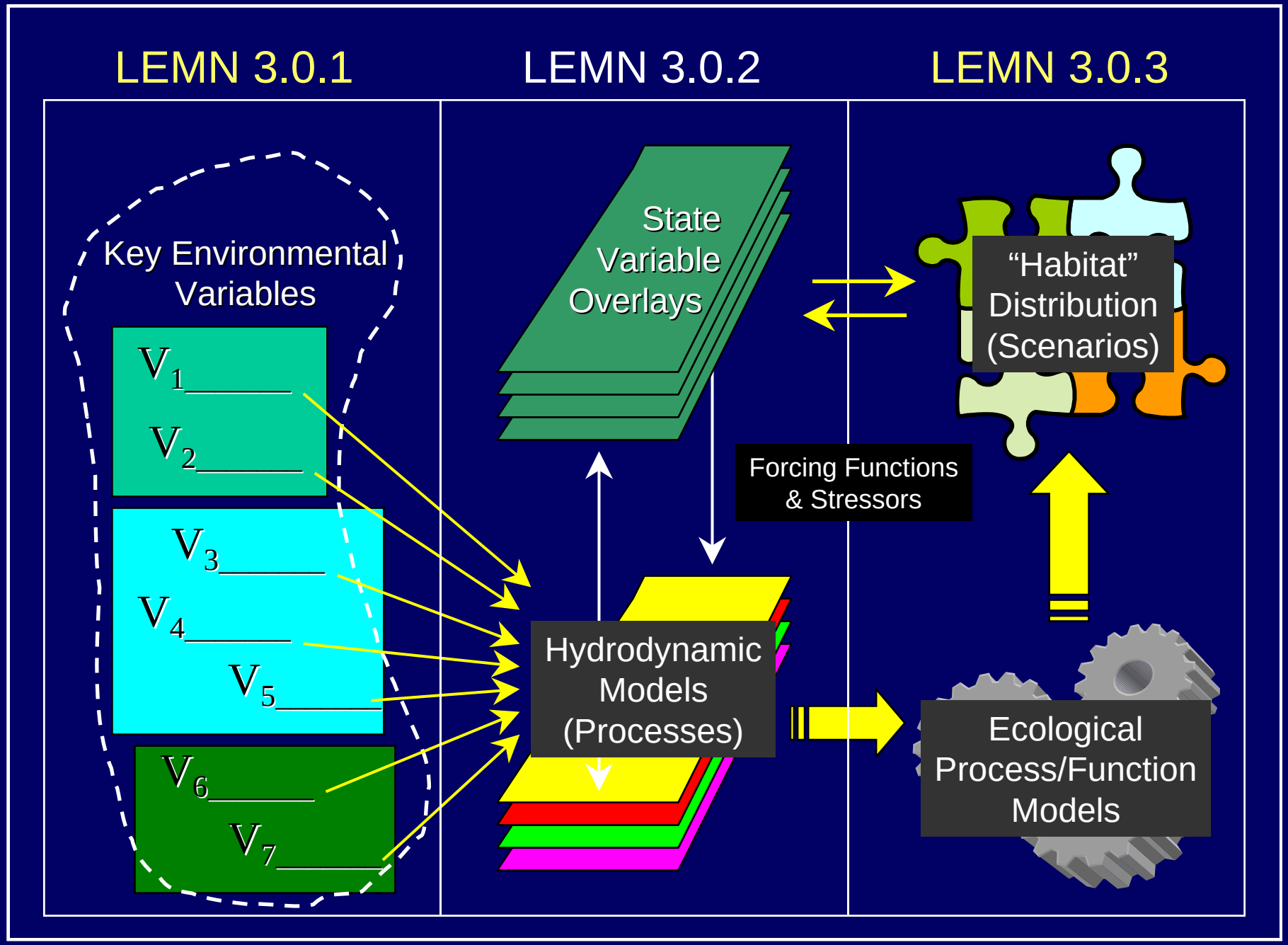
- Energy – oscillatory and unidirectional flows, shear stress, turbulence.
- Substrate – bedrock, composition, texture, hardness, stability, porosity, permeability, roughness.
- Water Mass – depth, temperature, turbidity, nutrients, contaminants, and dissolved oxygen.
- Habitat – when physical characteristics meet the needs of a specific species or biological community

Environmental Template

- Requires a dynamic classification system
- Multiple geospatial data layers
- 3-Dimensional

What are the characteristics or variables that define high-quality habitat? (habitat suitability analyses)



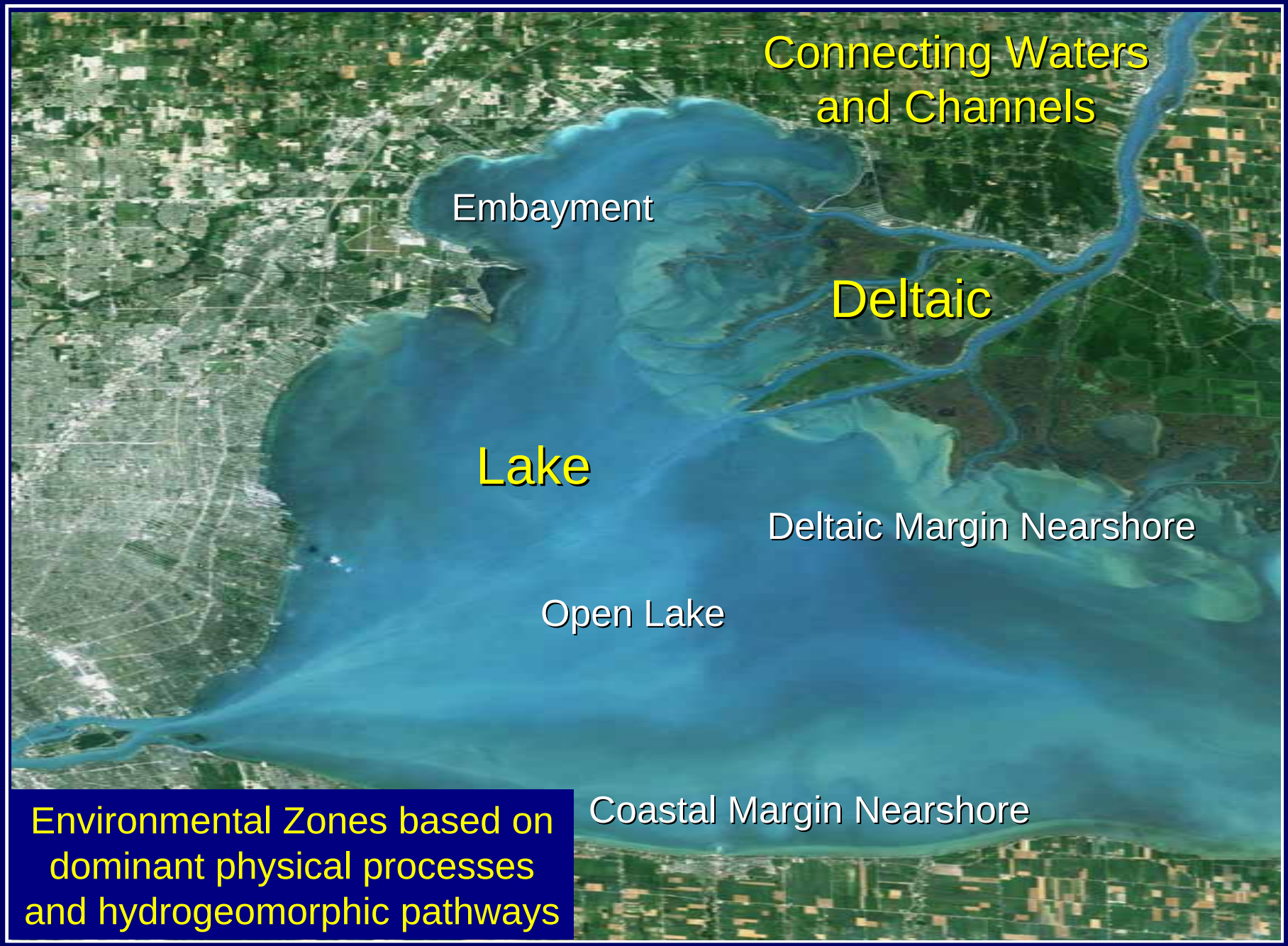

LEMN 3.0.1
LEMN 3.0.2
LEMN 3.0.3
Key Environmental Variables
V1
V2
V3
V4
V5
V6
V7
State Variable Overlays
Forcing Functions & Stressors
Hydrodynamic Models (Processes)
"Habitat" Distribution (Scenarios)
Ecological Process/Function Models

LEMN Workshop 3.0.1

- Identification, characterization, distribution, and inventory of aquatic habitats with the objective of integrating physical and biological datasets within the HEC system (geospatial data).
  - Assess existing physical and biological habitat datasets
  - Identify and prioritize gaps and additional habitat research/data collection needs
  - Identify key agencies, organizations, methods, and approaches
  - Develop a process/plan that would ensure research gaps/data needs are filled/met

LEMN 3.0.1 Workshop

- 28 Participants from a range of agencies and disciplines
- Datasets
  - Compiled, identified, and catalogued 86+ datasets, information sources
  - Miscellaneous reports
  - “Working up results” – summary report/presentations
- Data Gaps
  - Bathymetry
  - Substrate
  - Habitat Utilization (USGS)



Environmental Zones based on dominant physical processes and hydrogeomorphic pathways

HEC Environmental Zones

Environmental Zone	Low Energy Area	High Energy Area
Connecting Waters and Channels	Shallow water (bank) and backwater areas, riparian wetland habitat	Deep water (thalweg) and main channel areas
Deltaic	Interdistributary bays, delta plain, deltaic wetland habitat	Distributary channels, Delta margin nearshore
Lake	Embayments, coastal wetland habitat, open lake	Coastal margin nearshore, open lake

LEMN Workshop 3.0.2

- Explore issues associated with developing and validating models to characterize and predict existing high-quality aquatic and fish habitats and to predict future locations of such habitats within the HEC.
  - Need for conceptual and quantitative models that link dynamic abiotic processes to high-quality habitat structure and biological communities
  - These models will be designed to integrate abiotic and biotic geospatial data needed to characterize nearshore and coastal habitats as a function of community and life-stage under existing and future water-level regimes.

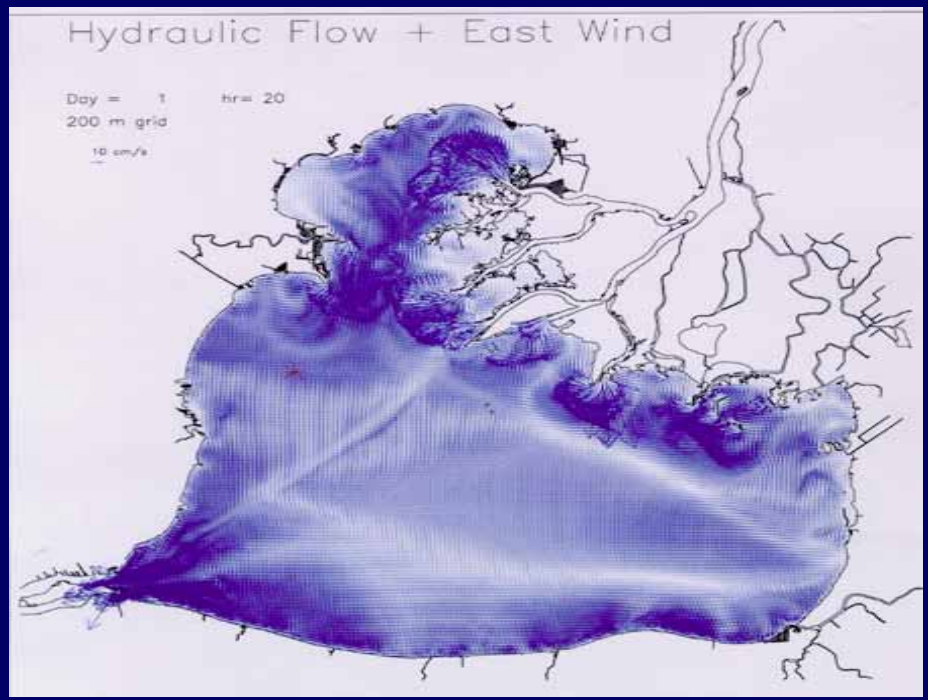
Why are you here?

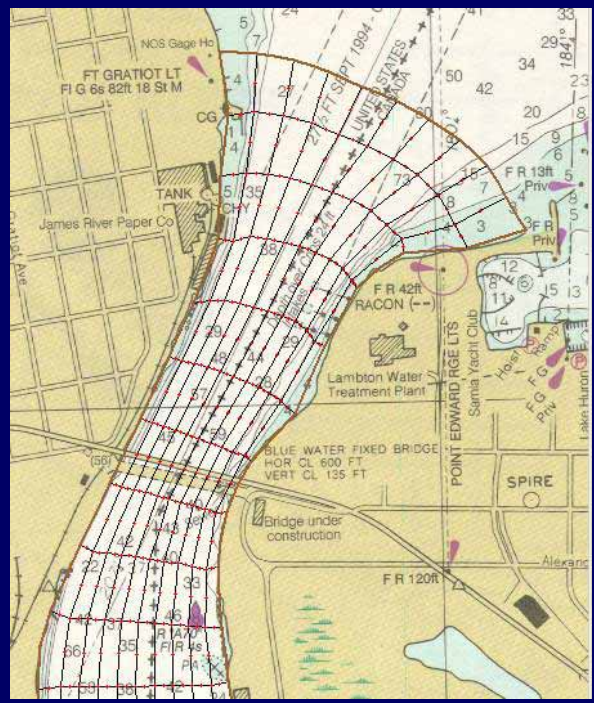
- Participants will be asked how best to apply these dynamic models to describe and predict the current and future distribution and quality of aquatic habitats within the HEC system, including ways to integrate modelling results in a geospatial context and present modelling results in ways that are most useful to resource managers and conservation planners.

There are no “free” lunches!

Integration of Existing Models

- Explore the potential of using existing physical and biological models to better understand the dynamic linkages between the processes that create, maintain, and regulate habitat structure within the Huron-Erie Corridor (HEC) system.





Breakout/Roundtable Discussions

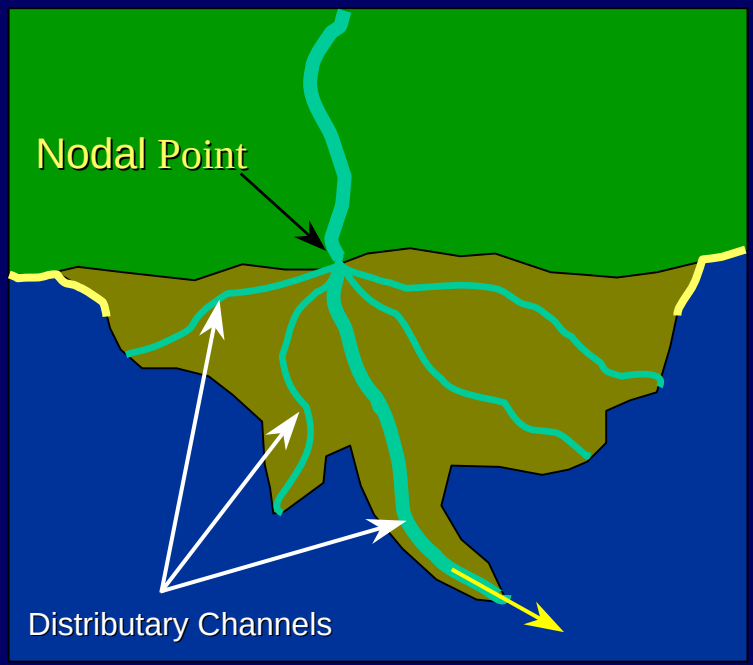
1. Participants will be asked to evaluate data input needs and the potential of each of these models to capture and identify the attributes of high-quality fish habitat for each of the four major hydrogeomorphic zones identified within the HEC system, including an assessment of data and/or modelling "gaps"

Breakout/Roundtable Discussions

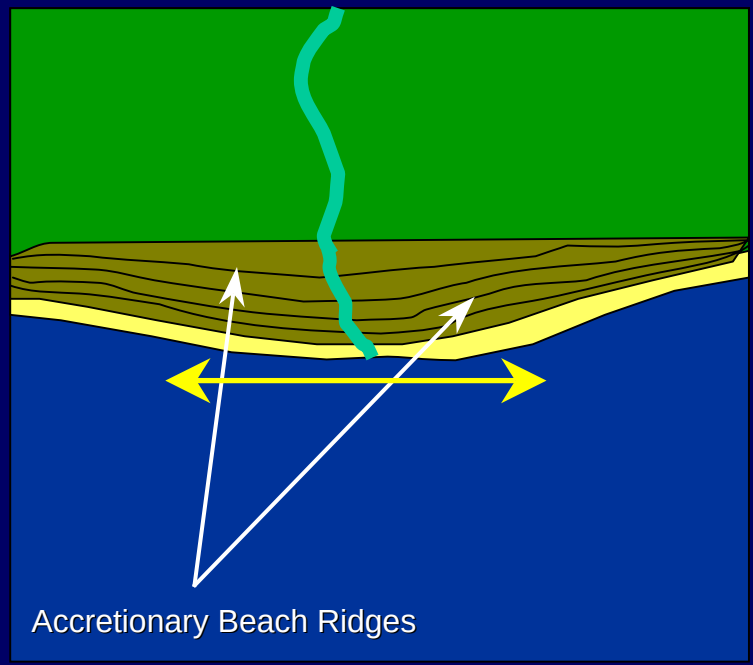
2. Participants will also be asked to provide additional guidance and expertise as to how these tools might be used to guide development of long-term research and management strategies that will predict the distribution of future critical aquatic habitats and assess the effects of long-term stressors, such as climate-driven water level change on aquatic habitats.

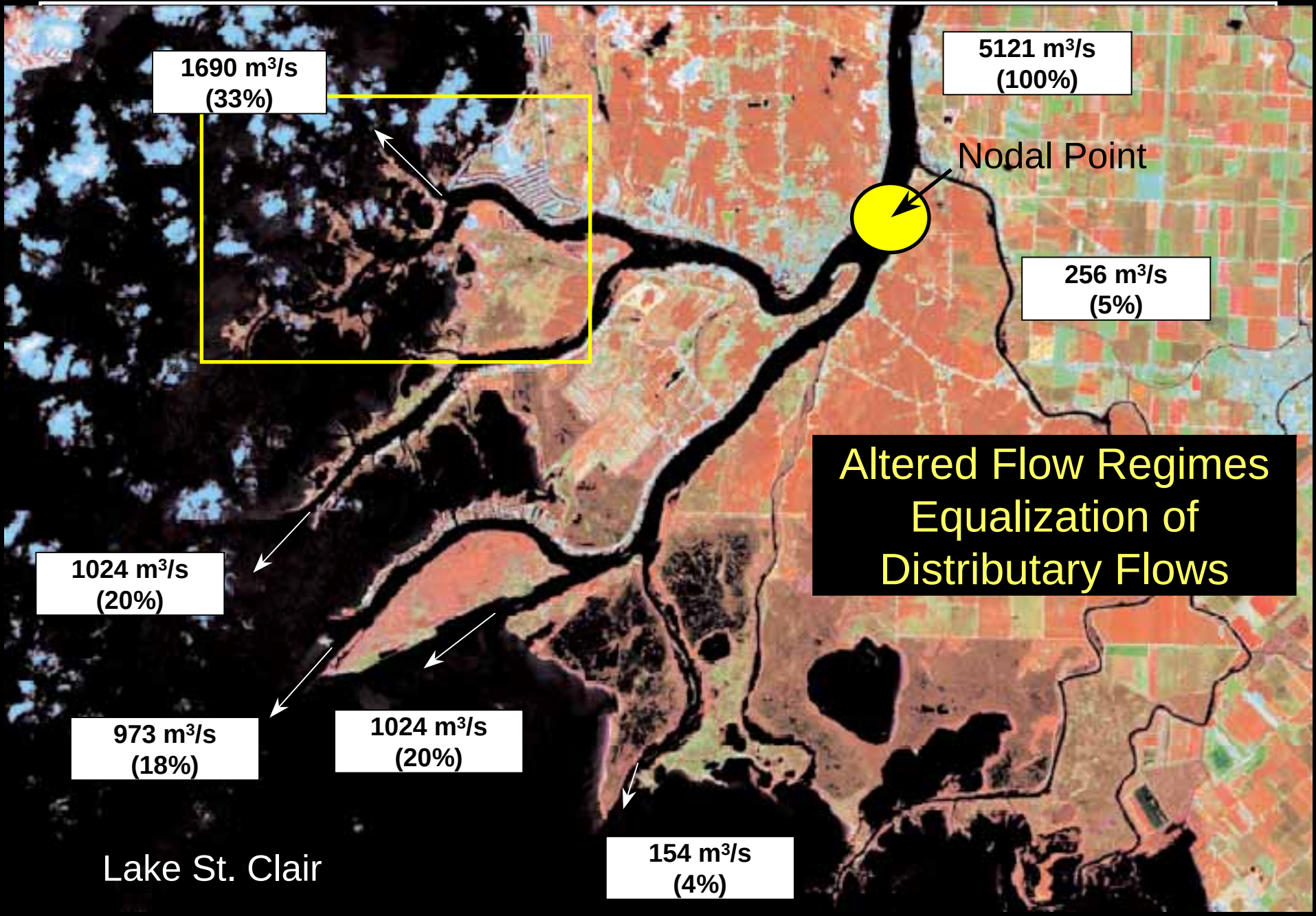
Types of Deltas

River-Dominated

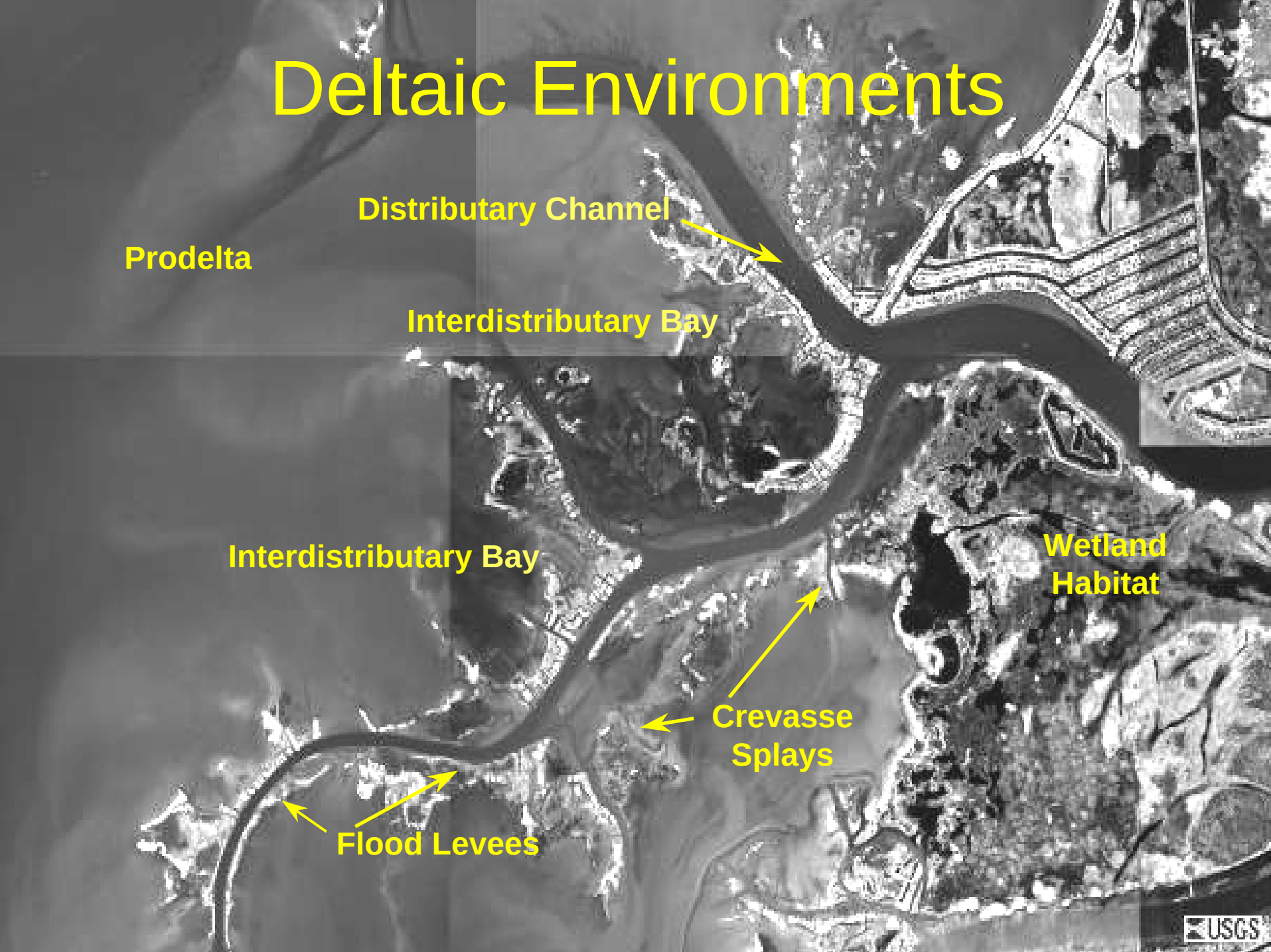


Wave-Dominated



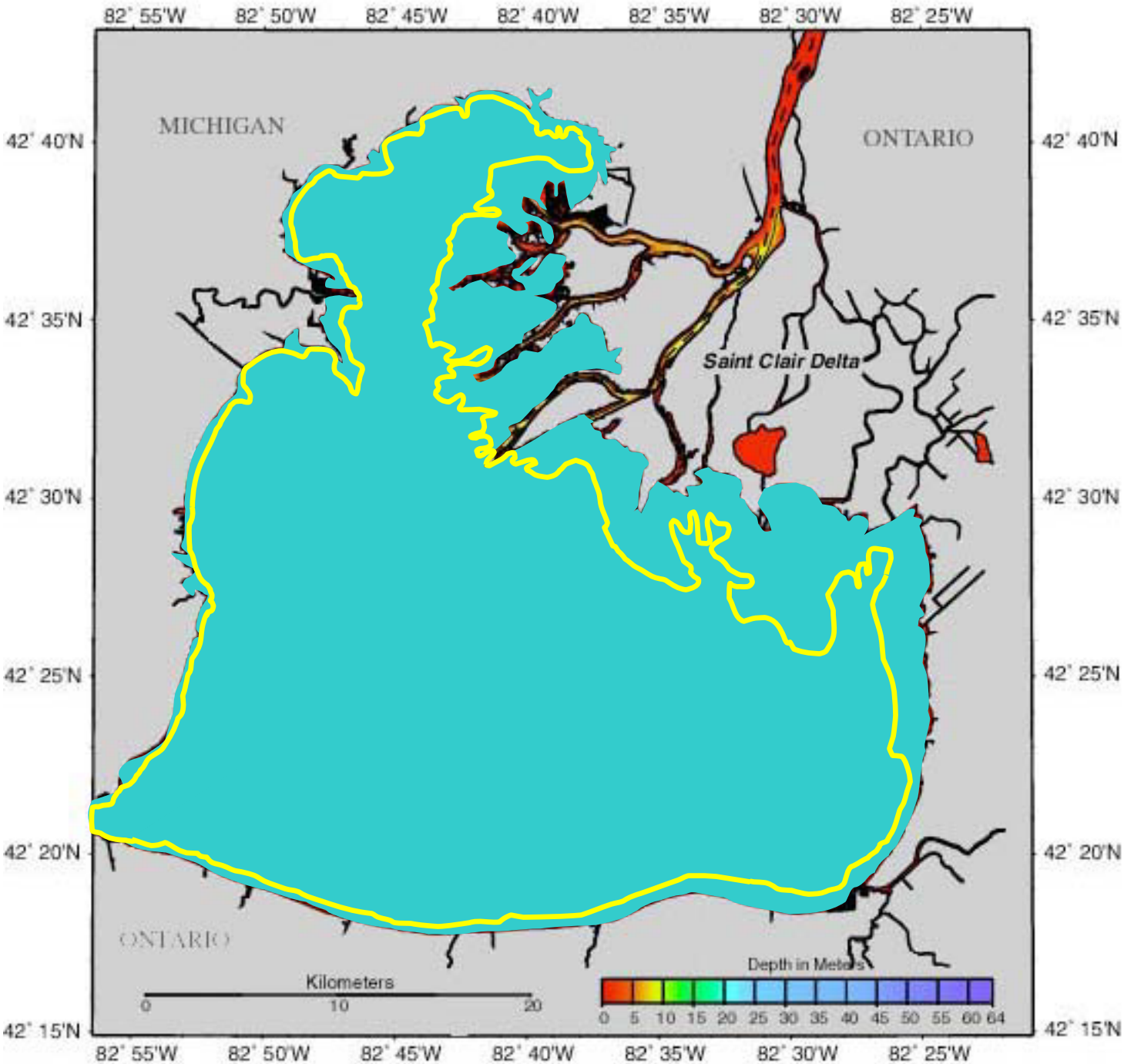

1690 m³/s
(33%)
5121 m³/s
(100%)
Nodal Point
256 m³/s
(5%)
Altered Flow Regimes
Equalization of
Distributary Flows
1024 m³/s
(20%)
973 m³/s
(18%)
1024 m³/s
(20%)
154 m³/s
(4%)
Lake St. Clair

Deltaic Environments



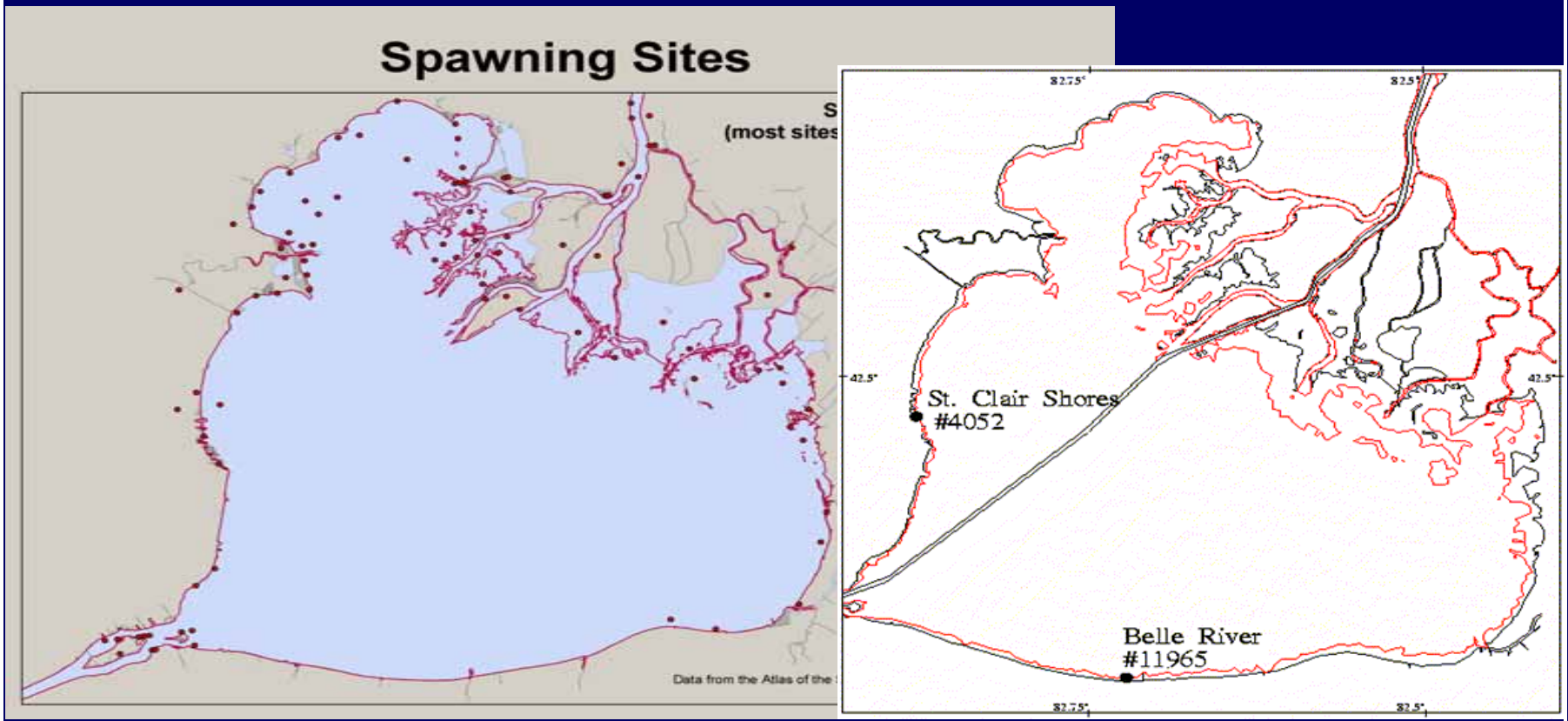
Lake St. Clair - Water Level Scenarios

	BASE CASE	WARM & DRY	NOT-AS Warm & Dry	WARM & WET	NOT-AS Warm & Wet
LAKE STATISTICS					
Mean	175.38	174.40	174.75	174.57	175.18
Maximum	176.11	175.12	175.43	175.36	175.95
Minimum	174.38	173.37	173.72	173.46	174.05
Annual Range	1.73	1.75	1.71	1.90	1.90
CHANGE FROM BASE CASE					
Annual		-0.98	-0.63	-0.81	-0.20
Winter		-0.95	-0.62	-0.81	-0.21
Spring		-0.98	-0.61	-0.77	-0.16
Summer		-1.01	-0.64	-0.80	-0.20
Autumn		-1.01	-0.65	-0.87	-0.26
Growing Season		-1.00	-0.63	-0.78	-0.18


82° 55'W
82° 50'W
82° 45'W
82° 40'W
82° 35'W
82° 30'W
82° 25'W
42° 40'N
42° 35'N
42° 30'N
42° 25'N
42° 20'N
42° 15'N
MICHIGAN
ONTARIO
Saint Clair Delta
ONTARIO
Kilometers
0
10
20
Depth in Meters
0 5 10 15 20 25 30 35 40 45 50 55 60 64

Lake St. Clair
Spawning Sites and Water Level Change

Gregory et al. 1982



LEMN Workshop 3.0.3

- Explore a range of “transitional habitat” issues associated with anticipated changing water-level and flow regimes and develop long-term strategies to identify potential aquatic and fish habitat restoration opportunities within the HEC.
  - Interactive guidance from LEC Habitat Task Group
  - Binational multidisciplinary project team
  - Designed to anticipate long-term resource management needs

Restoration Opportunities

- Where possible, restore natural connecting channel morphologies, use flow regimes/natural processes to create and maintain habitat structure
- Restore natural habitat pattern, distribution, and function
- Find beneficial uses for dredge material (habitat restoration, creation)
- Soften shoreline/distributary channel banks
- Reconnect distributaries with wetlands, delta plain, interdistributary bays
- Proactive and anticipatory long-term resource management

Summary

- “Work in progress”
- Focus on developing tools to identify high-quality fish habitat in HEC system and the environmental factors and dynamic processes that create and maintain them.
- Assess system responses to potential long-term changes in climate/water-level regime.
- Work with project partners to identify fish habitat protection and restoration opportunities within the HEC system, both short and long term.