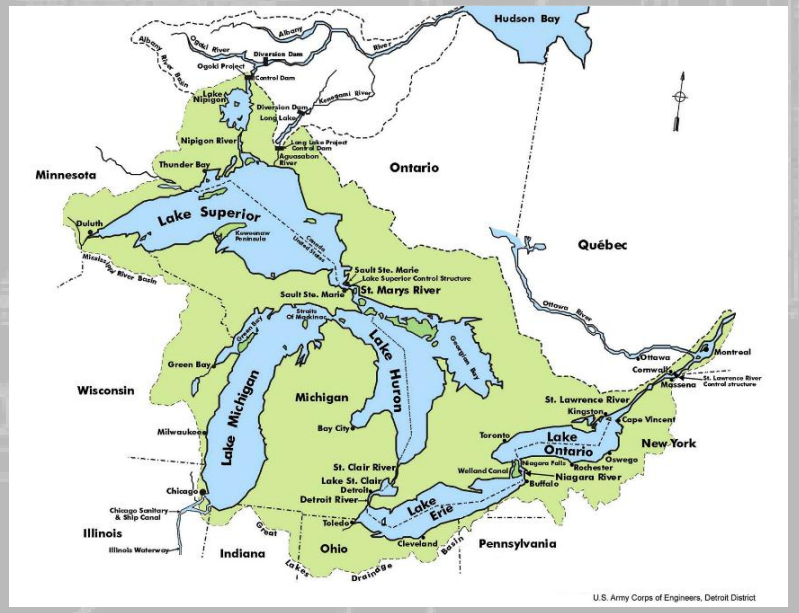
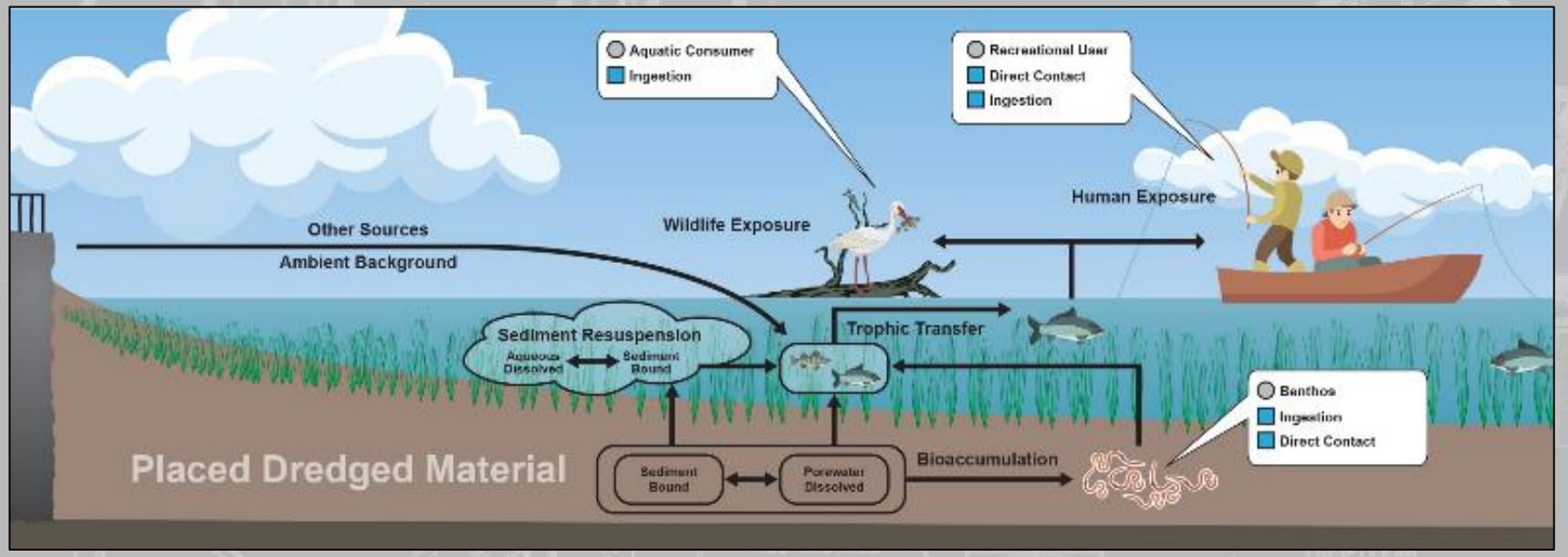
DEVELOPMENT OF A GUIDANCE MANUAL FOR DETERMINING THE ENVIRONMENTAL SUITABILITY OF DREDGED SEDIMENTS FOR BENEFICIAL USES IN THE GREAT LAKES





"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

Karen G. Keil, Ph.D.
U.S. Army Corps of Engineers Buffalo District

WEDA Webinar March 12, 2021

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Engineer Research and Development Center

Cynthia Banks
Dennis Brandon
Todd Bridges
Trudy Estes*
Alan Kennedy
Joe Kreitinger*
Guilherme Lotufo*
David Moore
Richard Price*
Paul Schroeder*
Burton Suedel*
Chuck Theiling

Buffalo District

Mike Habberfield*
Victoria Harms
Bryan Hinterberger
Karen Keil*
Andrew Lenox*
Scott Pickard*
Martin Wargo*

Chicago District

Jen Miller*

Detroit District

Pam Horner
Jason Miller*
Marie Strum

Great Lakes and Ohio River Division

Tony Friona
Carl Platz

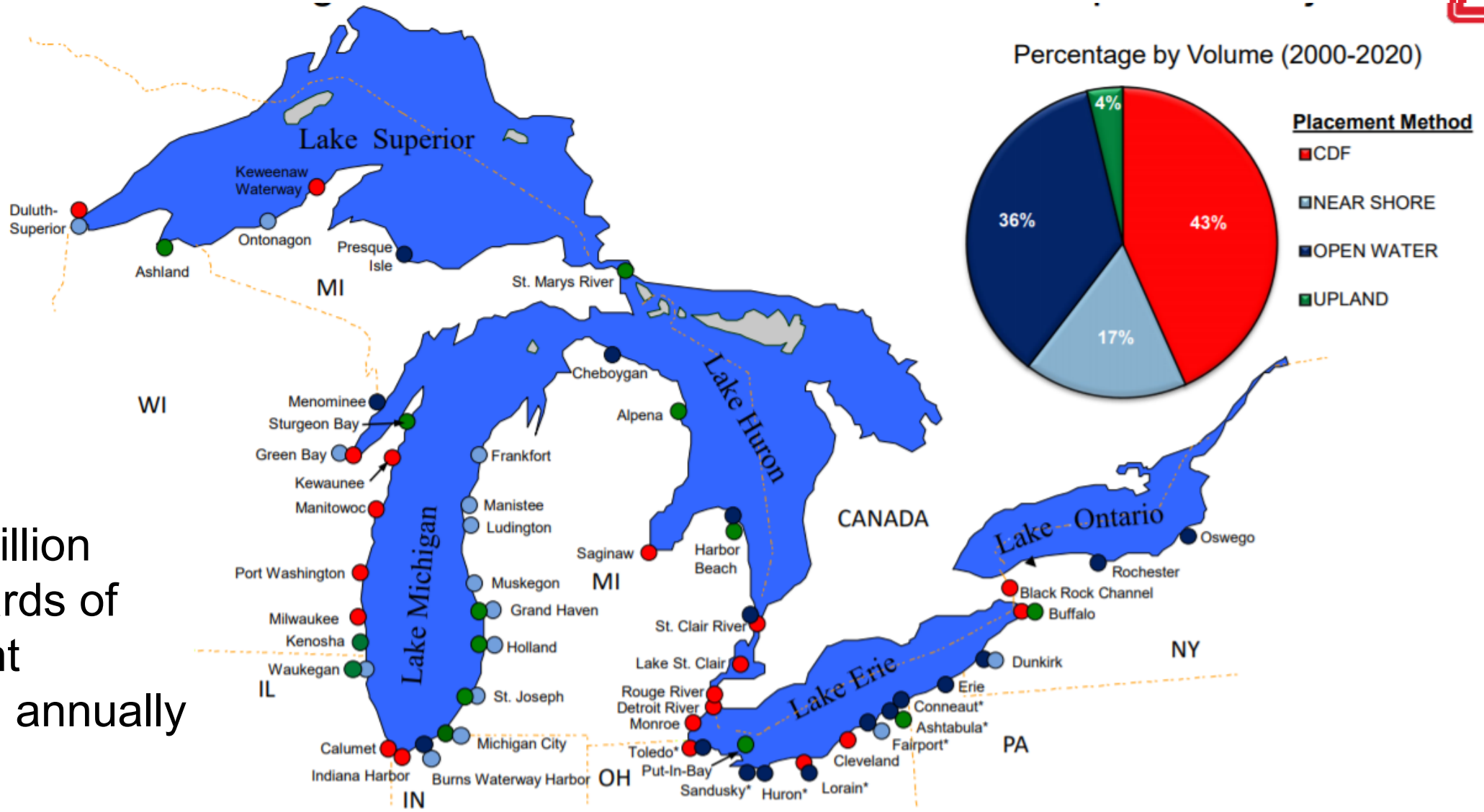
* *Primary author*

ENTITIES WHICH PROVIDED INPUT

COMPANION DOCUMENT TO THE TESTING MANUAL

https://greatlakesdredging.net/publications/guide-policies-projects-related-beneficial-use-dredged-material-great-lakes/

THE GREAT LAKES NAVIGATION SYSTEM

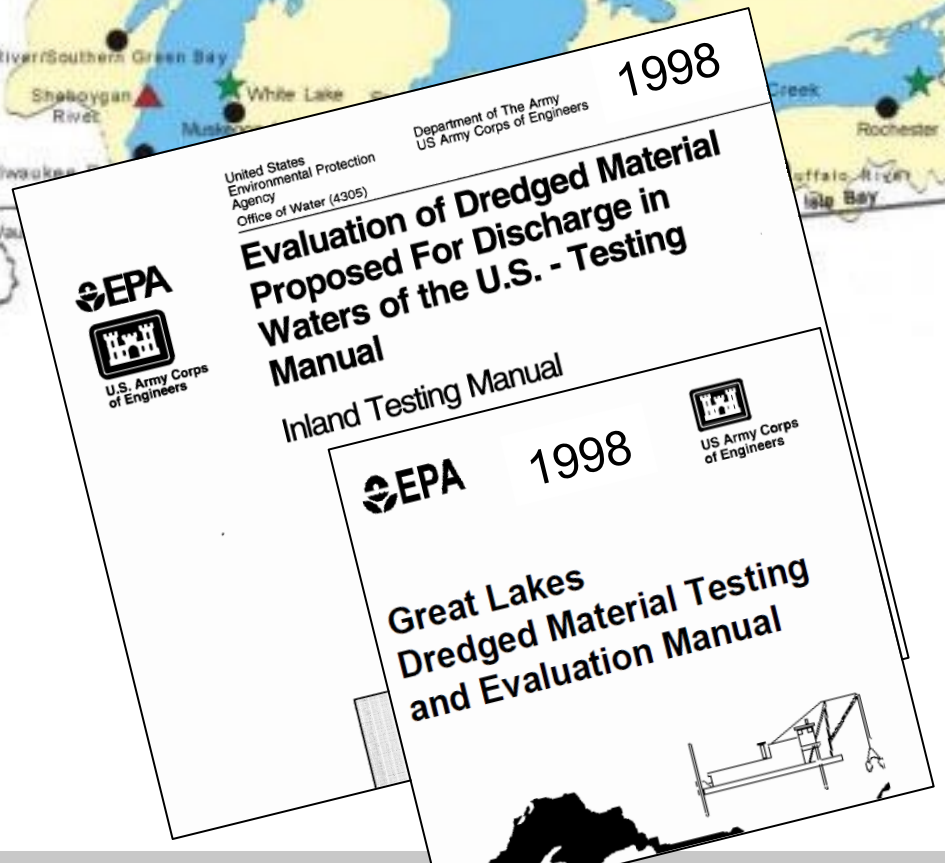


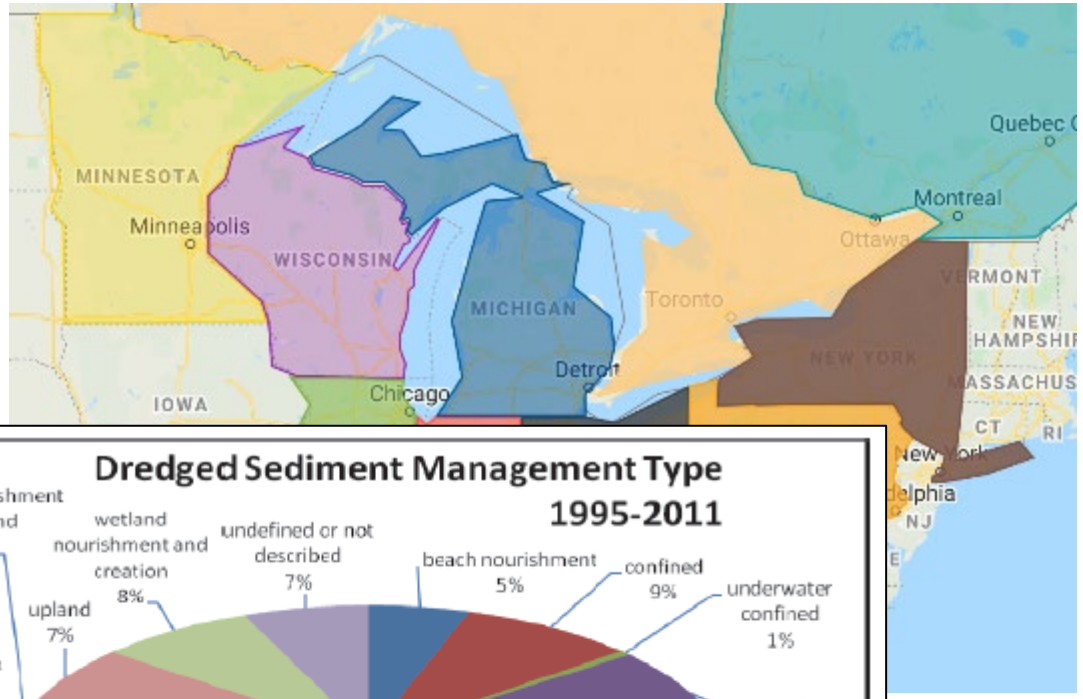
Percentage by Volume (2000-2020)

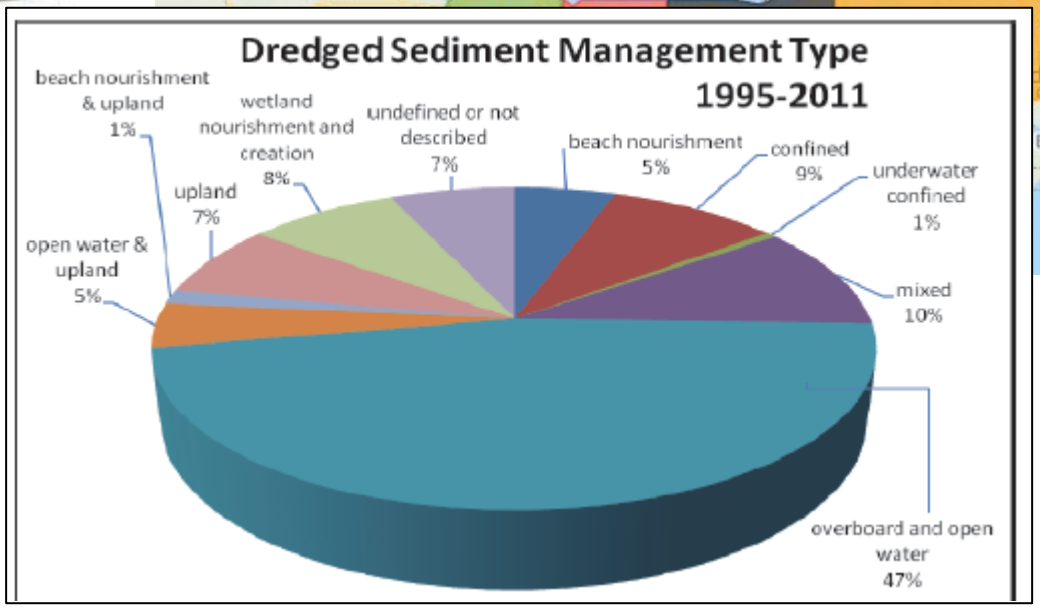
3 to 5 million cubic yards of sediment dredged annually

*Placement method likely to change due to restrictions on open water placement in Ohio beginning July 2020.

CHALLENGES TO IDENTIFYING DREDGED MATERIAL THAT IS ENVIRONMENTALLY SUITABLE FOR BENEFICIAL USES IN THE GREAT LAKES







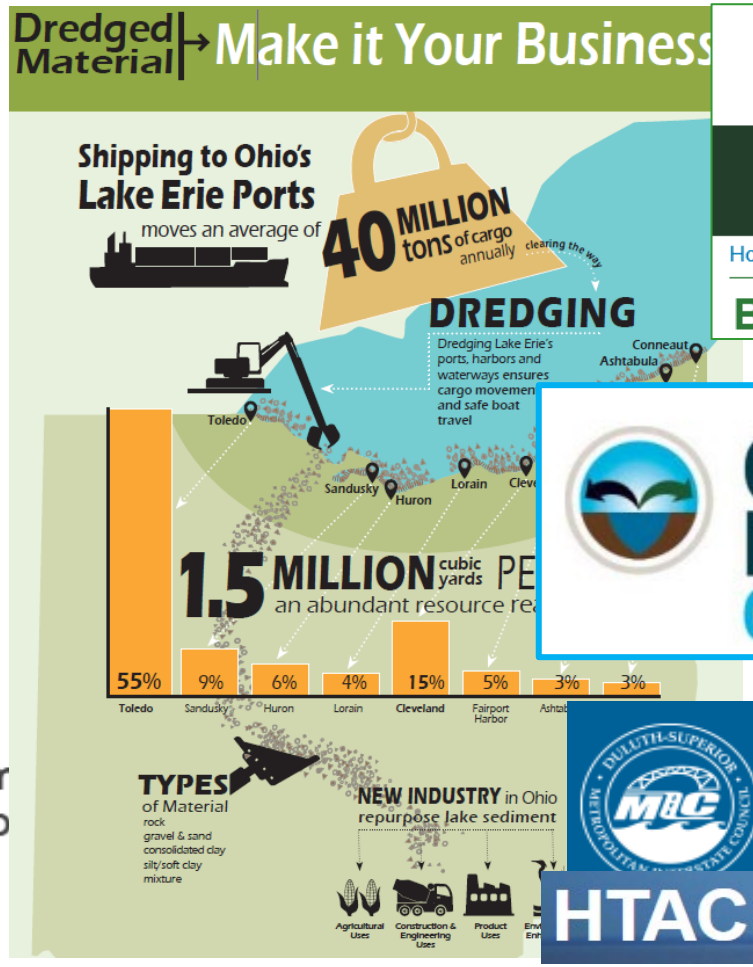
SUPPORT FOR IDENTIFYING ENVIRONMENTALLY SUITABLE DREDGED MATERIAL FOR BENEFICIAL USES IN THE GREAT LAKES

EWN Engineering With Nature

GREAT LAKES DREDGING TEAM

Great Lakes RESTORATION

U.S. Army Corps of Engineers
Engineer Research and Developm
Dredging Operations Technical Supp



GREAT LAKES DREDGED MATERIAL CENTER FOR INNOVATION

DULUTH - SUPERIOR Metropolitan Interstate Council

HTAC Harbor Technical Advisory Committee

ENVIRONMENTAL EVALUATION AND MANAGEMENT OF DREDGED MATERIAL FOR BENEFICIAL USE: *A REGIONAL BENEFICIAL USE TESTING MANUAL FOR THE GREAT LAKES*

- Objective is to support beneficial use of dredged material by **developing a standard approach to evaluating the environmental suitability** of dredged material for beneficial uses.

- Recognize that **beneficial use of dredged material projects can support regional remediation and restoration efforts** throughout the Great Lakes.

- Uses a **risk-based approach** and incorporates federal and state assessment paradigms

GREAT LAKES BENEFICIAL USE TESTING MANUAL PROVIDES:

- A risk-based approach which frames the evaluations.

- **Evaluations are broken into 2 main sections**, depending on whether the placement occurs in an **aquatic** or **upland** environment

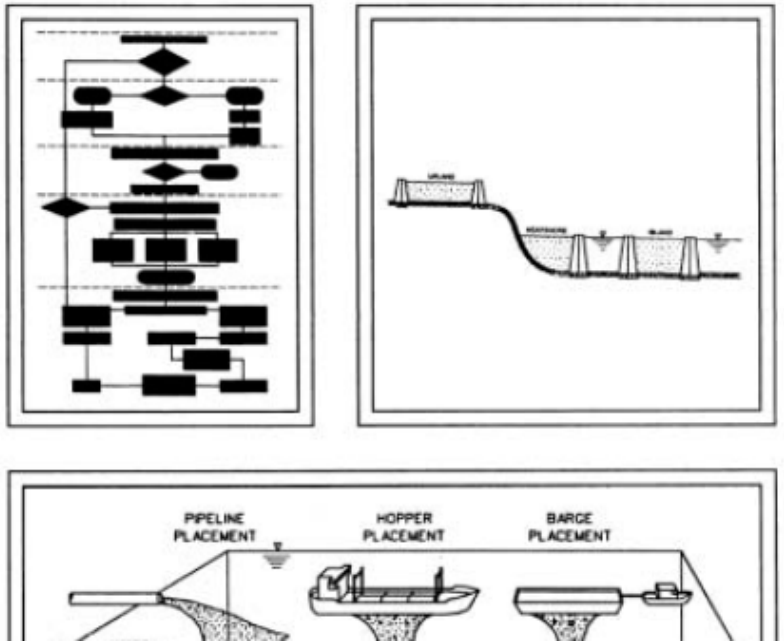
SECTION 1: INTRODUCTION

EPA

US Army Corps of Engineers

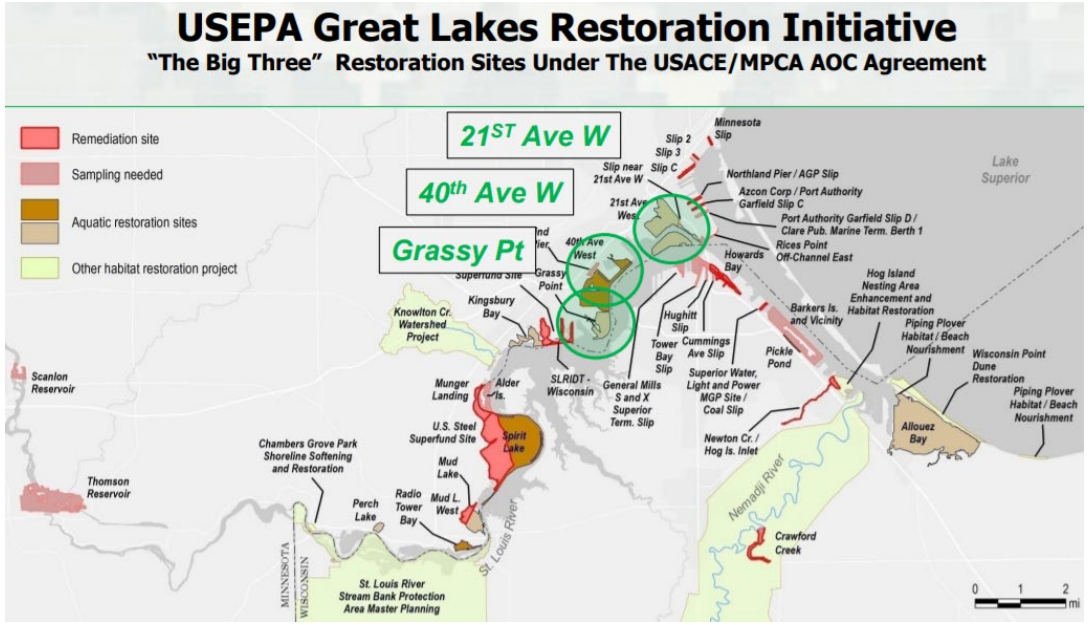
Evaluating Environmental Effects of Dredged Material Management Alternatives—A Technical Framework

1992 / 2004



Dredged material evaluation frameworks

Great Lakes-specific issues



SECTION 2: STATUTORY / REGULATORY OVERVIEW

National Environmental Policy Act (NEPA)

Aquatic placement

Clean Water Act

Endangered **S**pecies **A**ct

Coastal **Z**one **M**anagement

Upland placement

New York B.U.D.

Ohio H.S.A.

Solid waste (RCRA, TSCA)

ESA

CZMA

Other

National Historic Preservation Act

Clean Air Act

Federal Surface Mining Control and Reclamation Act

National Flood Insurance Program

Natural Resources Damage Assessment and Restoration

Disclaimer!

The Manual is not intended to direct the public, but rather to **provide a framework for a recommended approach** and evaluations.

It is not binding, nor does it regulate or change any authority in determining environmental suitability for the management of dredged material.

SECTION 3: BENEFICIAL USE CATEGORIES

Aquatic placement

Habitat creation

Shore protection

Capping / remediation

Upland placement

Habitat development

General fill

Manufactured soils

Agricultural field amendment

SECTION 4: PRINCIPLES FOR BENEFICIAL USE EVALUATIONS

Risk-based approach

Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials

USEPA 2016

- ✓ Project Goal
- ✓ Conceptual Site Model
- ✓ Evaluate ambient conditions

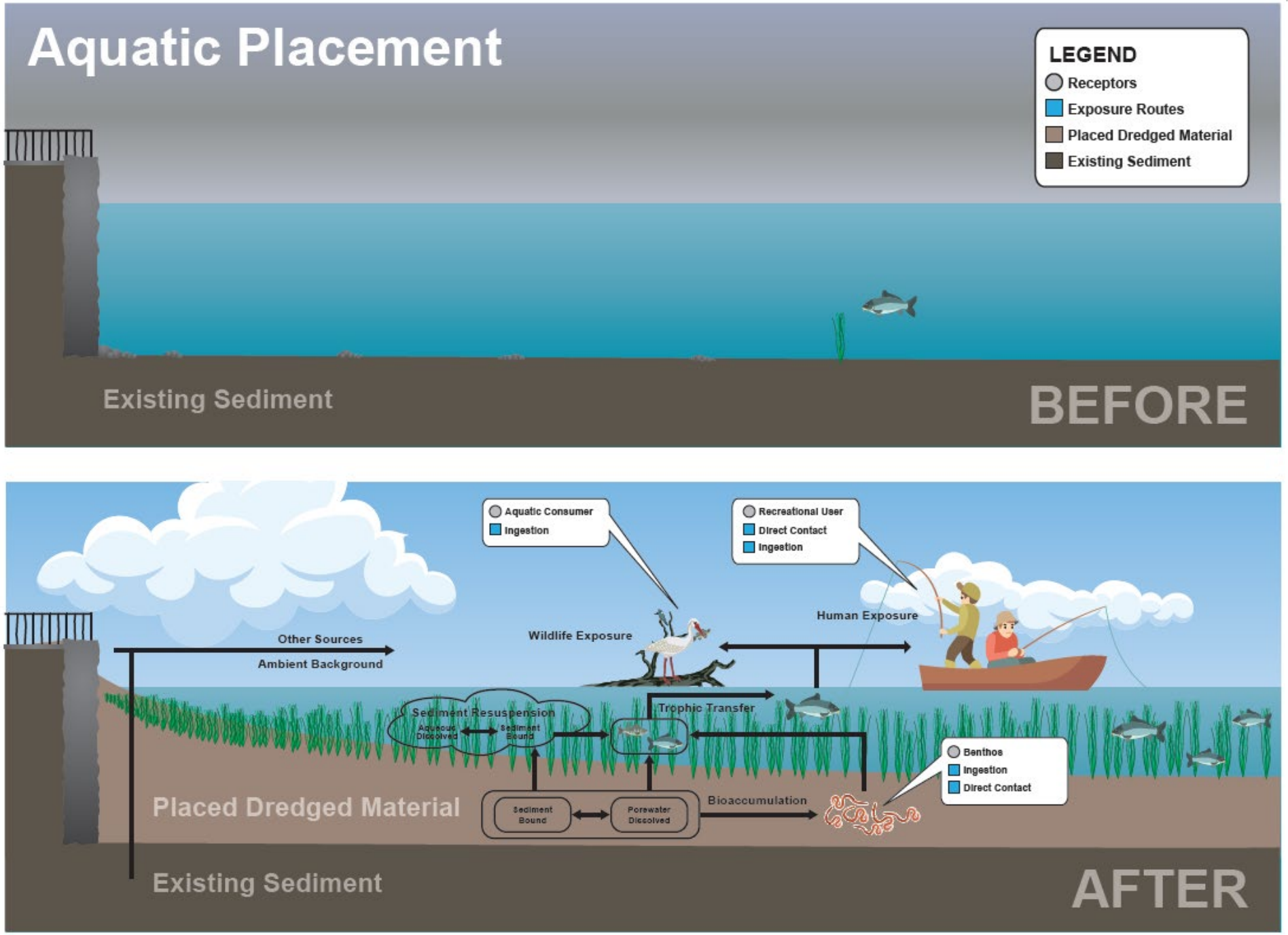


Figure 4-2. Generalized Conceptual Model for Dredging Operations at Beneficial Use Aquatic Placement Sites.

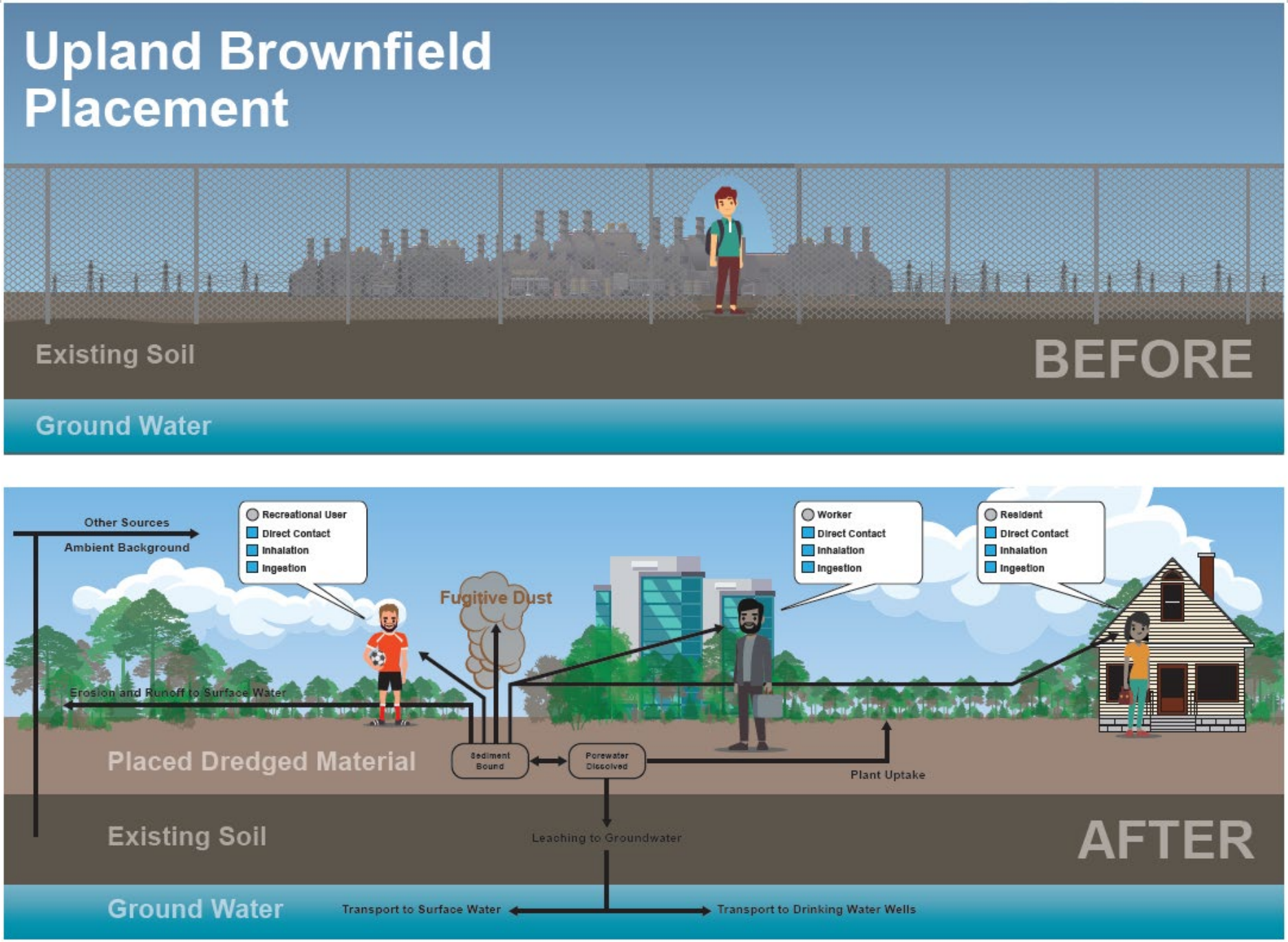


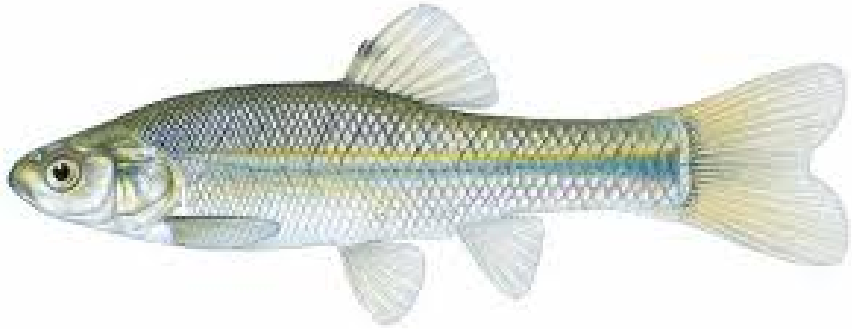
Figure 4-5. Generalized Conceptual Model for Dredging Operations at Beneficial Use Aquatic Placement Commercial, Residential, or Athletic Field Sites.

CROSS WALK BETWEEN AQUATIC AND UPLAND EVALUATION TIERS AND RELEVANT RISK-BASED PROCESSES

TIER	RISK-BASED PROCESS	AQUATIC PATHWAYS		UPLAND PATHWAYS	
		Water column	Benthic	Human Health	Environmental Health
Tier I	Development of project goals and conceptual site model to focus pathways being evaluated	Comparison to placement / reference site sediment concentrations		Comparison to placement / reference site soil concentrations	
Tier II	Reliance on chemical analysis of samples, and modeling	Elutriate chemistry and dispersion/dilution modeling	Theoretical bioaccumulation potential	Comparison to generic soil screening levels	Modeling and/or further chemical analysis
Tier III	Incorporation of laboratory bioassays and/or additional site-specific exposure assumptions	Elutriate toxicity tests	Sediment toxicity & bioaccumulation tests	Site-specific risk-based screening levels and/or modeling or extractions	Bioaccumulation tests
Tier IV	Site-specific evaluation	Site-specific sampling, analysis, and/or evaluations		Site-specific sampling, analysis, and/or evaluations	

SECTION 5: AQUATIC PLACEMENT EVALUATIONS

- ✓ Mirrors existing guidance for inland (Great Lakes) aquatic placement of dredged material (USEPA / USACE 1998).



- ✓ Additional detailed guidance provided for interpreting the results of laboratory bioaccumulation assays (Appendix F).

SECTION 6: UPLAND PLACEMENT EVALUATIONS

Upland Testing Manual (USACE 2003)

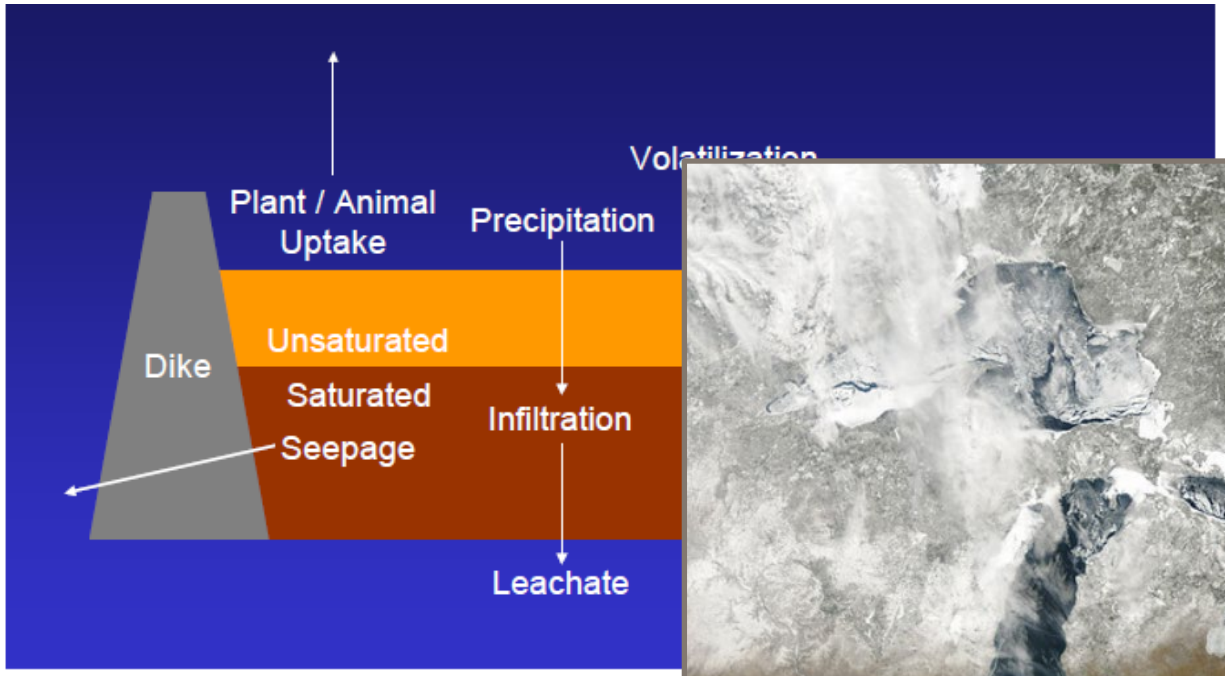
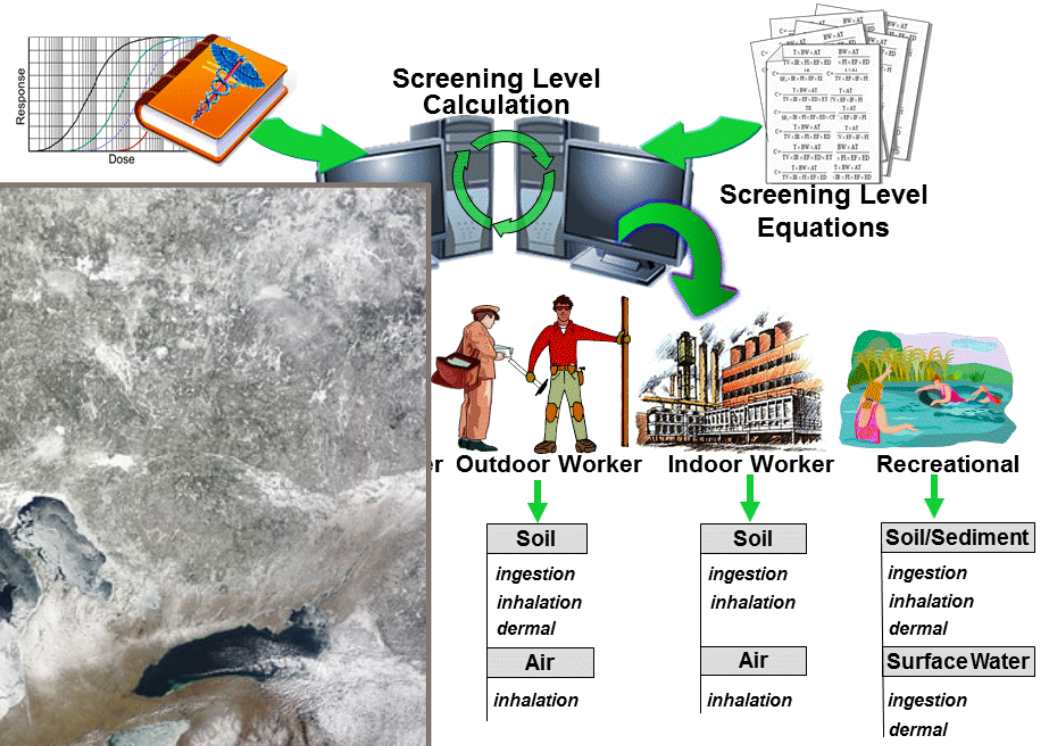


Figure 1-2. Schematic of contaminant migratio

Risk based screening levels (USEPA)



Great Lakes specific considerations

SECTION 7: RISK MANAGEMENT

- Risk versus uncertainty
  - Complex systems cannot be completely understood / characterized
  - Conditions may be unpredictable during project implementation
  - Projects may involve interdependent systems
- Controls
- Adaptive management

SECTION 8 REFERENCES

APPENDICES

A. Sources of Regional Soil and Sediment Background Concentrations

B. State-Specific Regulations / Guidance

C. Ecological Biota Screening Levels for Upland Beneficial Use Determination – Plant Pathway

D. Treatment Options for Impaired Sediments

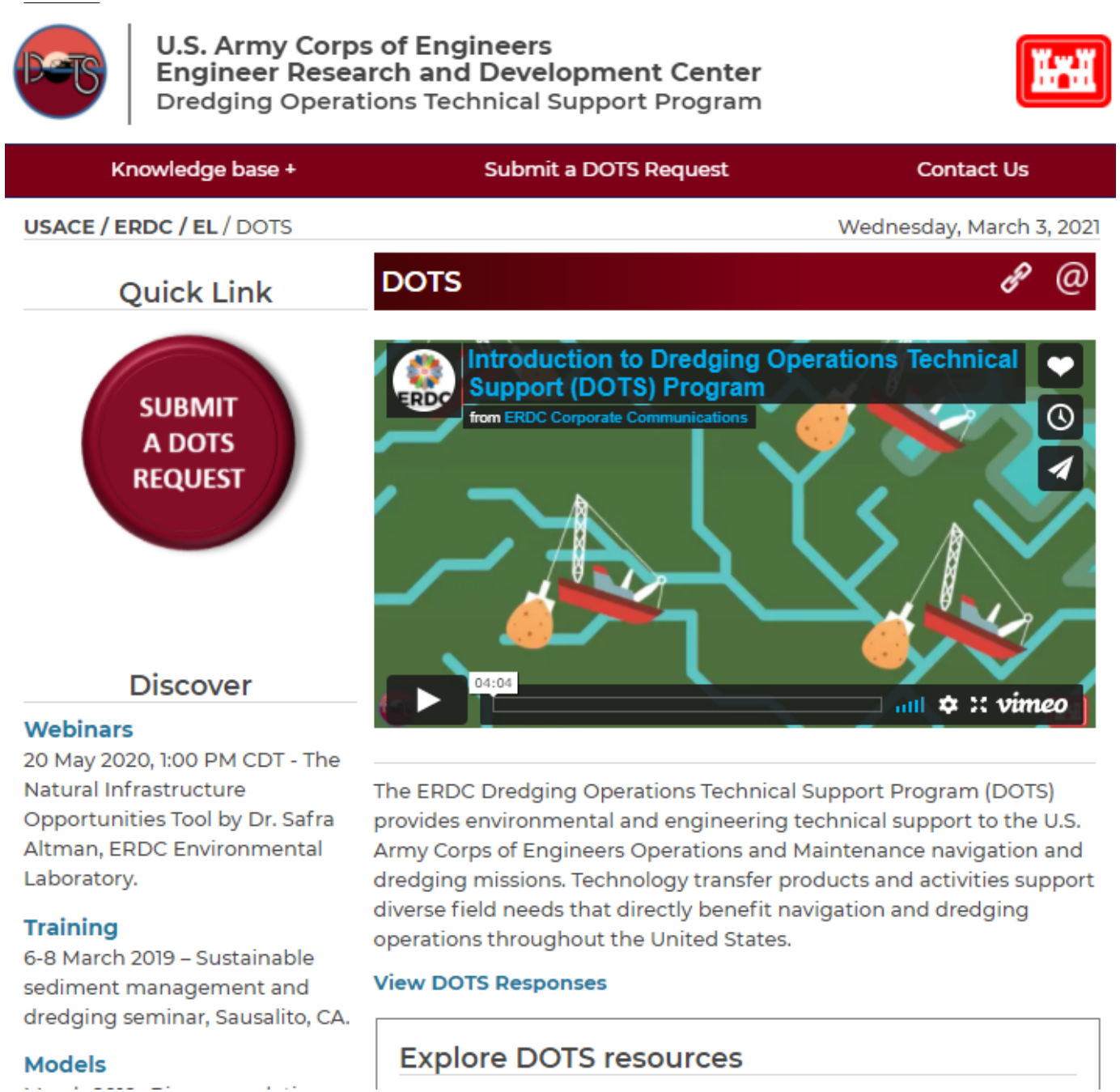
E. Practical Considerations for Dredged Material Management

F. Interpreting Bioaccumulation Assays

USE OF THE GREAT LAKES BENEFICIAL USE TESTING MANUAL

- Refer to this manual when your beneficial use **project** is developing a **Quality Assurance Project Plan** for sampling and evaluations.

- **Harmonize** the recommendations in this Manual with your agency's perspectives on environmental evaluations.



FUTURE PUBLICATION OF THE FINAL MANUAL

https://dots.el.erdc.dren.mil/

CURRENT LOCATION OF DRAFT FINAL VERSION OF MANUAL

https://greatlakesdredging.net/priorities/dredged-material-management/

RESOURCES ON BENEFICIAL USE OF DREDGED MATERIAL IN THE GREAT LAKES

https://www.lre.usace.army.mil/Missions/Great-Lakes-Navigation

https://greatlakesdredging.net/

https://dots.el.erdc.dren.mil/

ADDITIONAL DETAILS:

APPENDICES

A. SOURCES OF BACKGROUND (REFERENCE) CONCENTRATIONS IN THE REGION

Soil surveys have been conducted in

New York

Ohio (several counties adjacent to Lake Erie)

Michigan

Illinois (metropolitan and non-metropolitan areas)

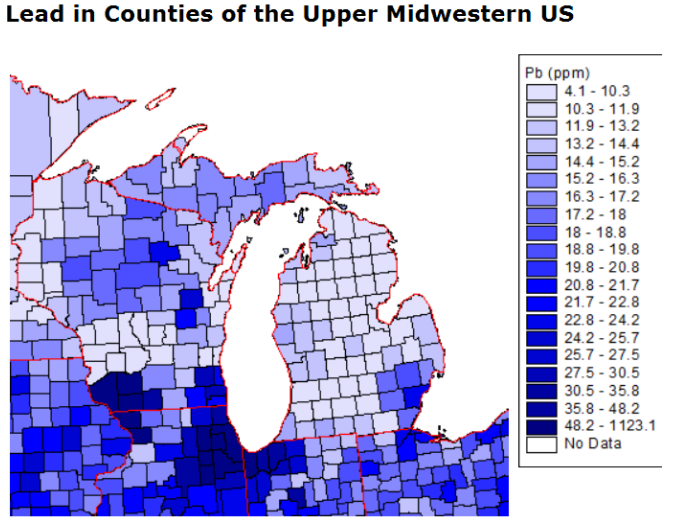
Wisconsin

Minnesota

Sediment surveys have been conducted in

Ohio (statewide)

Nationwide (US Geological Survey)



B. STATE-SPECIFIC ENVIRONMENTAL REGULATIONS AND GUIDANCE

Appendix B-1 focuses on human health (upland evaluations)

Reflects state responses to questionnaires sent out in 2015 & 2019

Table B.1-1 compares basis of state brownfield risk-based soil concentrations

Table B.1-2 compares state-specific residential (non-industrial) risk-based soil concentrations with proposed regional approach following regionally-modified U.S.EPA risk-based screening levels

Table B.1-3 compares state-specific industrial (non-residential) risk-based soil concentrations with proposed regional approach following regionally-modified U.S.EPA risk-based screening levels

B. STATE-SPECIFIC ENVIRONMENTAL REGULATIONS AND GUIDANCE

Appendix B-2 focuses on environmental health (aquatic evaluations)

Minnesota guidance regarding aquatic placement of dredged sediments for ecosystem restoration

– St. Louis River Area of Concern, Duluth-Superior Harbor

C. ECOLOGICAL BIOTA SCREENING LEVELS FOR UPLAND PLACEMENT – PLANT PATHWAY

Focuses on soil-to-plant pathway exposures for ecological receptors

U.S.EPA Ecological Soil Screening Levels were not developed for the unique chemical/physical attributes associated with upland placement of dredged material

Plant uptake of metals from 3 Lake Erie CDFs in Ohio (and reference locations) were measured to calculate bioaccumulation factors.

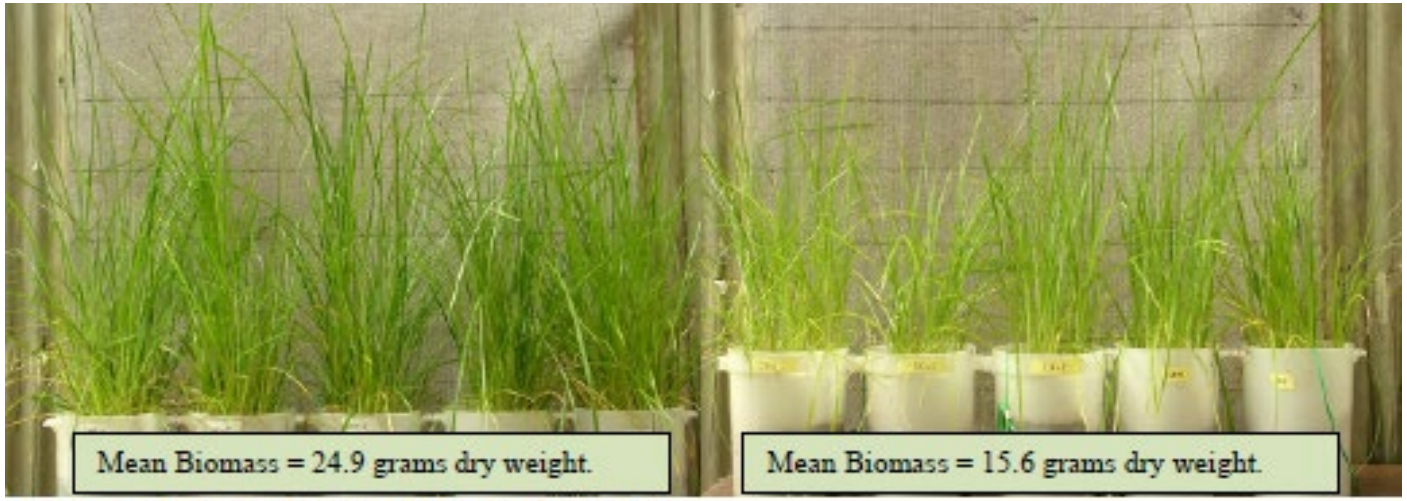


Figure 1. Plant growth in Cleveland CDF (l) and REF soils (r).

Biota screening levels for herbivores were developed using the site specific plant bioaccumulation factors combined with toxicity reference values (U.S.EPA eco-SSL based)

D. TREATMENT OPTIONS FOR IMPAIRED SEDIMENTS

Impaired sediments may not be suitable for beneficial use without treatment, but, treatment may be cost prohibitive.

Figure 1.2 Photograph of Boskalis-Dolman physical separation system, Miami River, FL (Courtesy Bastiaan Lammers, Boskalis Dolman).

Synopsis of available sediment treatment technology alternatives

History of development of treatment alternatives

Key operational characteristics of alternatives

Many examples in the Great Lakes and around the nation where treatment is being or has been used

E. PRACTICAL CONSIDERATIONS FOR DREDGED MATERIAL MANAGEMENT

Water management for upland placement of dredged material

Upland placement of dredged material can involve direct, indirect, or no discharge of water.

This appendix offers water management approaches for the different water discharge configurations, and considers

- Clean Water Act requirements
- Timeframes for water discharges
- Water quality conditions
- Dredging operation options (hydraulic vs. mechanical)
- Land requirements

F. INTERPRETING LABORATORY BIOACCUMULATION TESTS FOR WATER PLACEMENT

Further evaluation recommended when the mean worm tissue concentration exposed to dredged sediment is statistically greater than the worm tissue concentrations exposed to placement (reference) sediments.

FIGURE 1. Laboratory total PCB *L. variegatus* bioaccumulation data on all Lake Erie background sediments offshore of Ashtabula, Ohio