Fox River cleanup & related issues

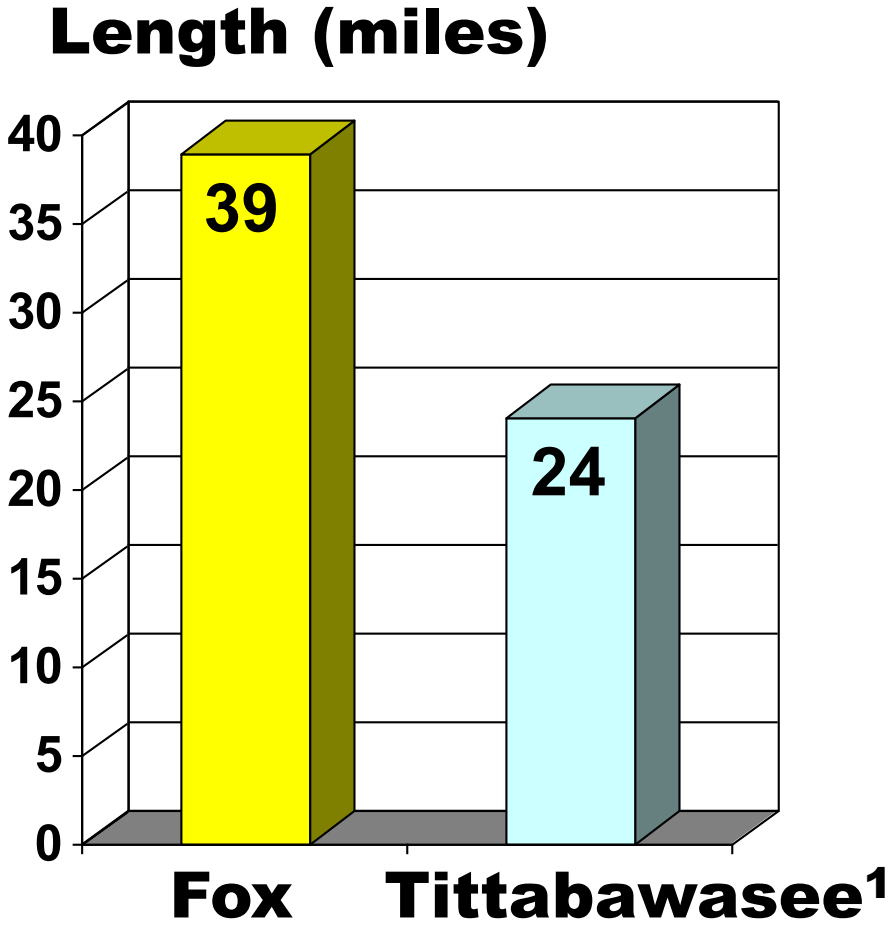
June 22, 2005

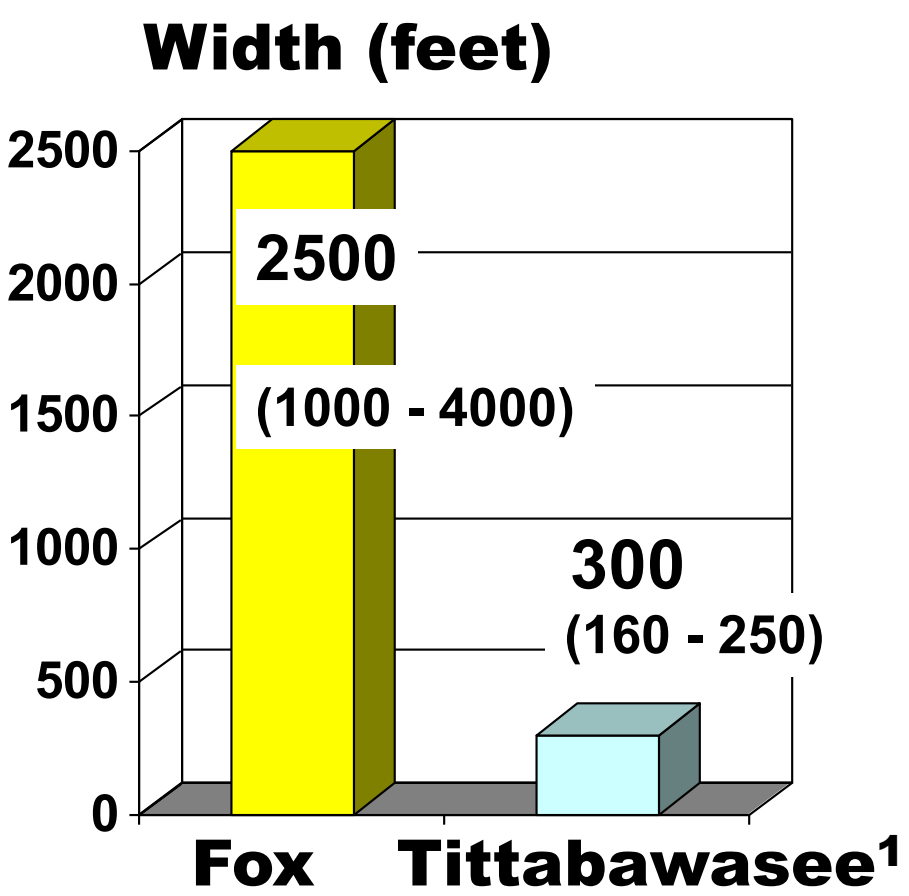
James Hahnenberg

Todays discussion

1. Tittabawassee & Fox rivers
2. Fox river cleanup activities (today: upriver focus)
3. Dredging issues and cleanup options
4. Cleanup economics

Fox and Tittabawassee

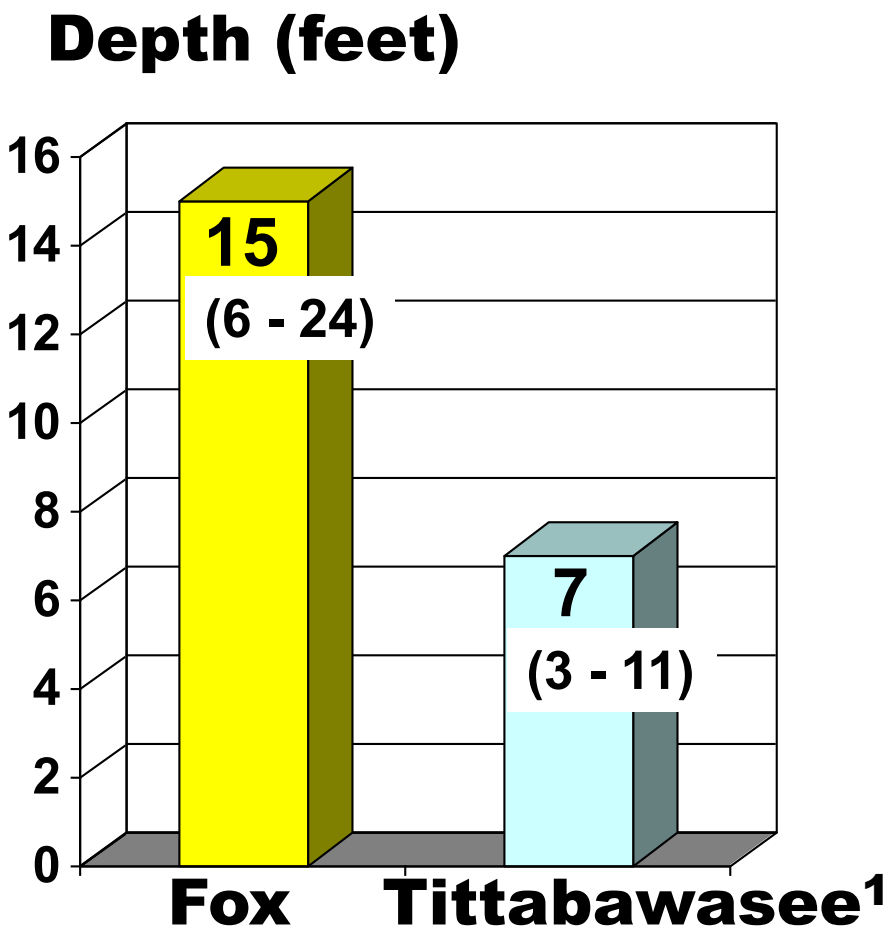


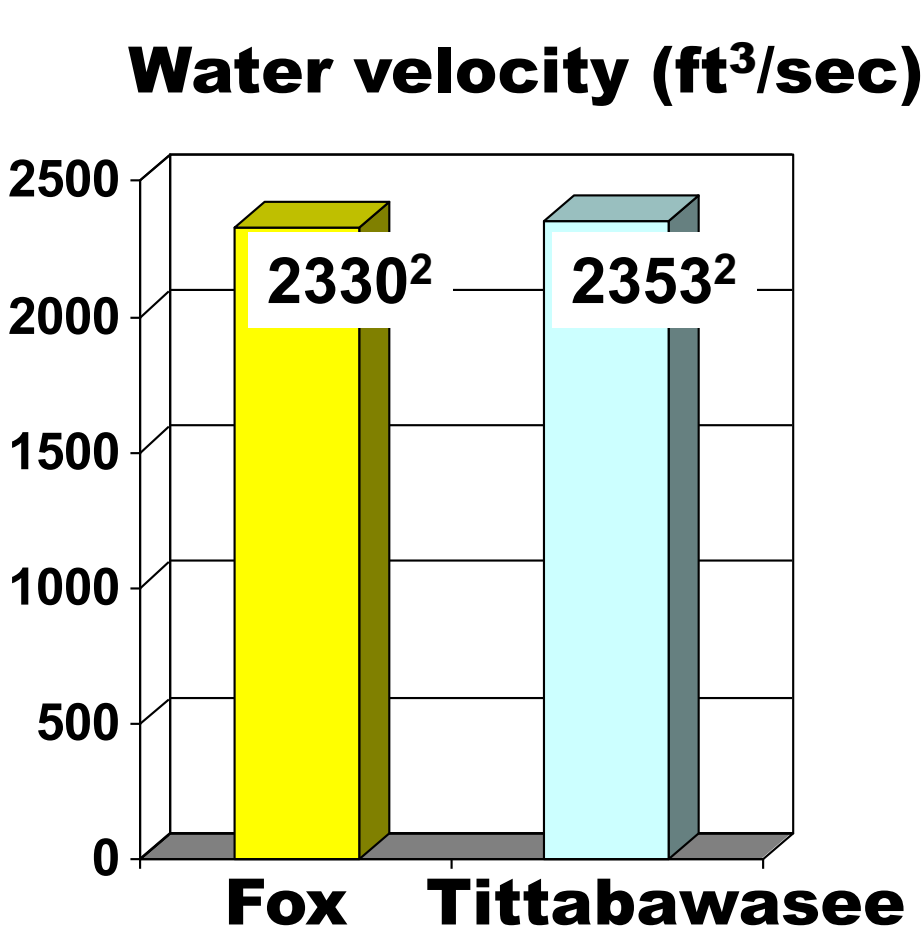


[1] From Midland to the Saginaw River

Note: Saginaw to Saginaw Bay is 22 miles:
Saginaw River width is up to 500 feet)

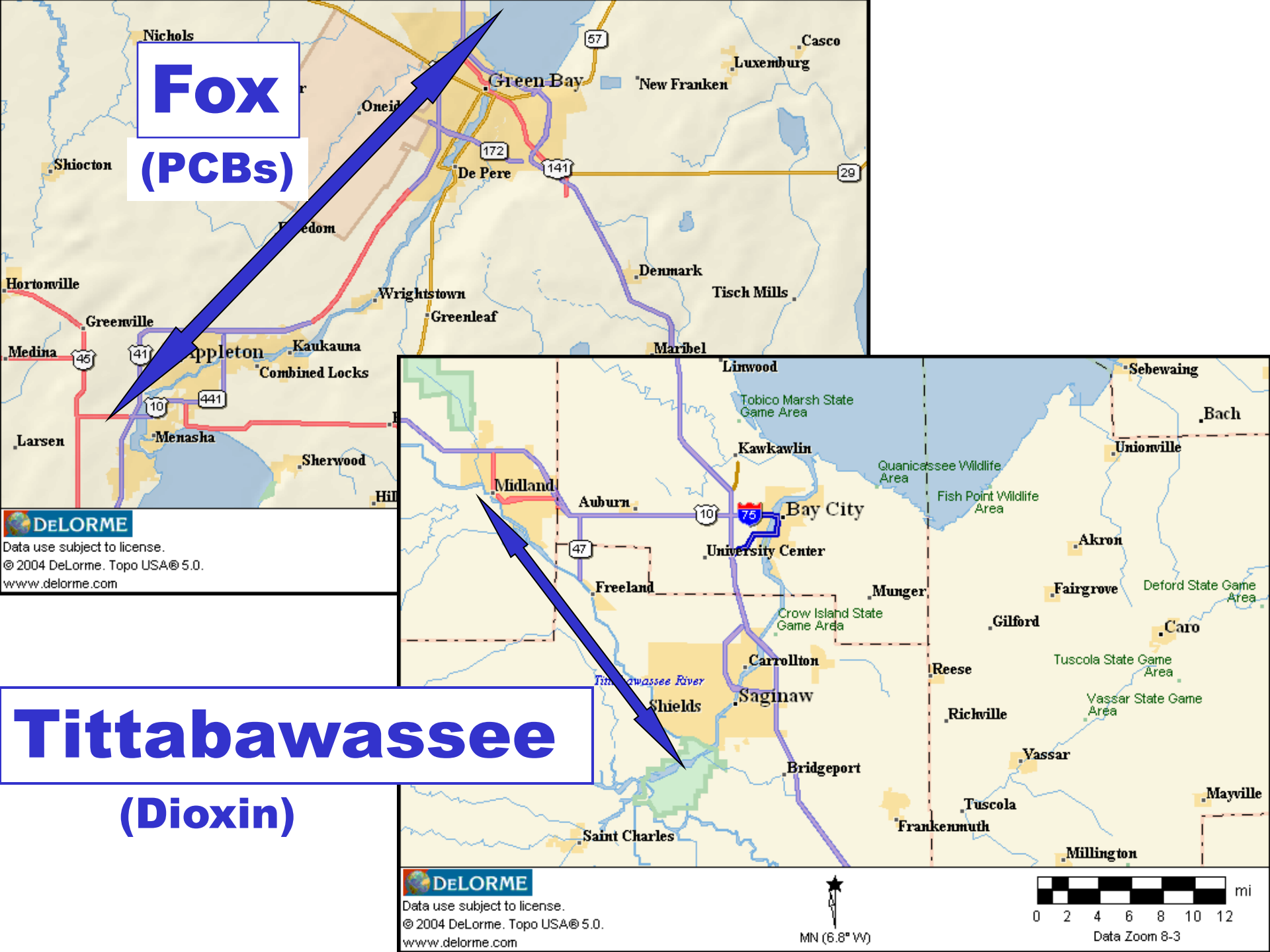
Fox and Tittabawassee





[1]Midland to the Saginaw River
(Saginaw River is up to 28 feet deep)

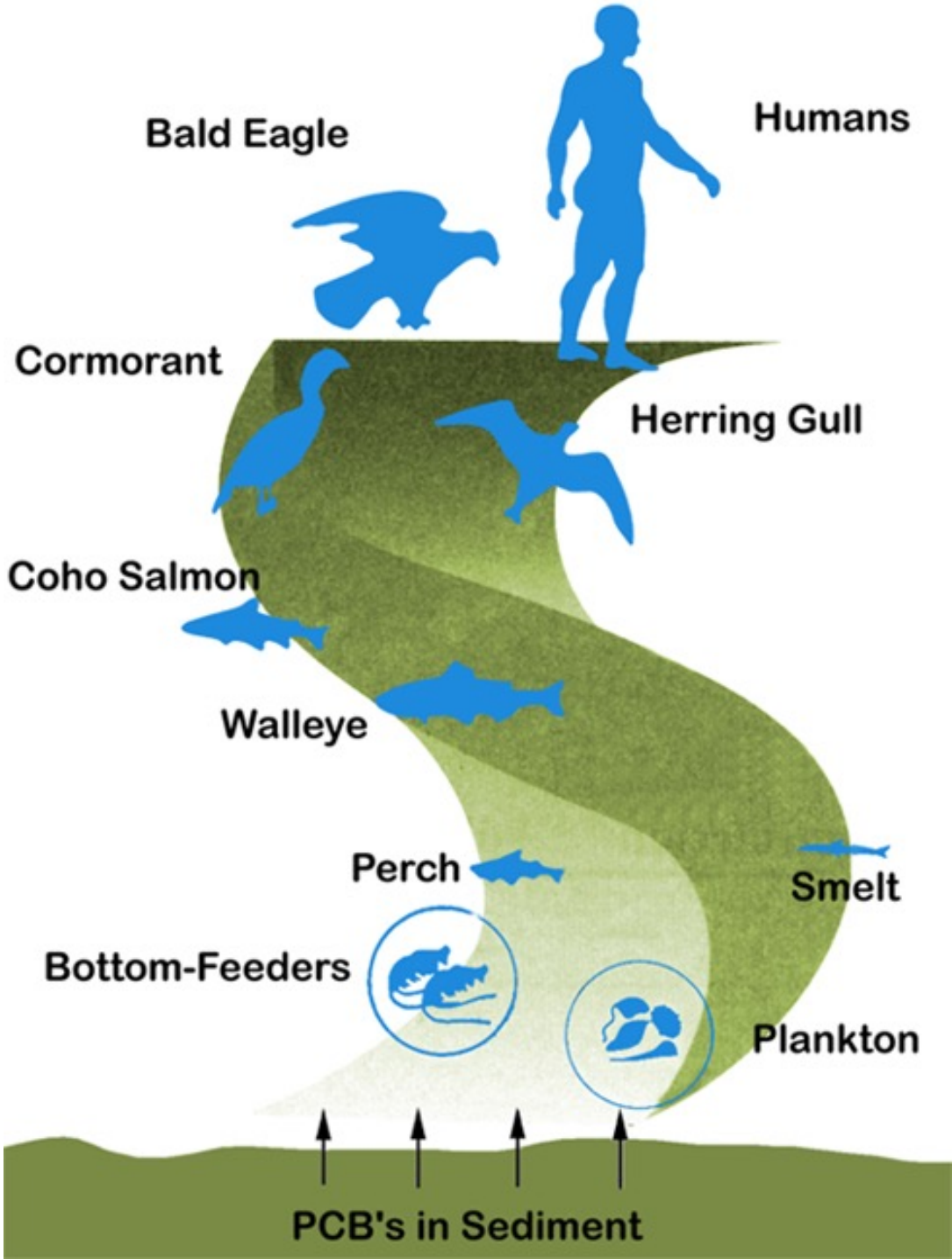
[2]Upstream


Fox
(PCBs)
Tittabawassee
(Dioxin)
Nichols
Shiocton
Green Bay
New Franken
Casco
Luxemburg
De Pere
Denmark
Tisch Mills
Wrightstown
Greenleaf
Hortonville
Greenville
Medina
Kaukauna
Combined Locks
Larsen
Menasha
Sherwood
Maribel
Linwood
Tobico Marsh State Game Area
Kawkawlin
Midland
Auburn
Bay City
University Center
Quanicassee Wildlife Area
Fish Point Wildlife Area
Sebewaing
Bach
Unionville
Akron
Freeland
Munger
Fairgrove
Deford State Game Area
Gilford
Caro
Crow Island State Game Area
Carrollton
Saginaw
Shields
Reese
Tuscola State Game Area
Vassar State Game Area
Richville
Vassar
Bridgeport
Tuscola
Mayville
Frankenmuth
Saint Charles
Millington
DeLORME
Data use subject to license.
© 2004 DeLorme. Topo USA® 5.0.
www.delorme.com
MN (6.8° W)
mi
0 2 4 6 8 10 12
Data Zoom 8-3

Fox River PCBs: from papermills

Modified from Green Bay Press Gazette

PCBs can get into your body



Fox fish advisories

NOTICE

Fish from these waters contain chemicals. Eating too much may be harmful, especially for women and children. Follow the safe fish eating guidelines below.

Los peces de estas aguas están contaminados. Su consumo puede ser mal para la salud, especialmente las mujeres y ninos. Para protejerse y protejer a su familia, siga las recomendaciones siguientes.

Ntses los ntawm cov dej no muaj yam tshuaj khesmis thiab yog noj ntau dlau lawm kuj yuav tsis zoo ib zaug, qhov tseem ntsiab lus yog tsis zoo rau cov poj niam thiab menyuam yaus noj. Ua ntej yuav noj ntses ua zoo saib lawv li cov xwm txeej lus qhia raw li nram qab no.

ONCE /MONTH HASTA UNA COMIDA AL MES TSHUA LUB HLI IB ZAUG	ONCE/EVERY TWO MONTHS HASTA UNA COMIDA CADA DOS MESES TSHUA OB LUB HLI IB ZAUG	DO NOT EAT NUNCA CONSUMIR COV NTSES NO NOJ TSIS TAU
BLUE GILL	SMALLMOUTH BASS	WHITE BASS
ROCK BASS	WHITE PERCH	CARP
BLACK CRAPPIE 0-9"	BLACK CRAPPIE 9"+	CHANNEL CATFISH
SHEEPSHEAD 0-10"	SHEEPSHEAD 10-13"	SHEEPSHEAD 13"+
WALLEYE 0-16"	WALLEYE 16-22"	WALLEYE 22"+
YELLOW PERCH	WHITE SUCKER	
NORTHERN PIKE 0-25"	NORTHERN PIKE 25"+	

FOR MORE INFORMATION, PLEASE CONTACT YOUR LOCAL HEALTH DEPARTMENT OR THE WISCONSIN DEPARTMENT OF HEALTH & FAMILY SERVICES
http://dhfs.wisconsin.gov

DEPERE DAM TO MOUTH OF FOX RIVER

Fox River progress

1. State & federal studies – 1990's
2. Superfund studies: 1998
3. Dredging demos: 1998-2001
4. Cleanup proposal: 2001

Fox River progress

5. Cleanup decisions: 2002 & 2003 by EPA and WDNR

6. Upriver dredging begins: 2004

---

7. Upriver completion: 2010

8. Downriver completion: 2018

Lower Fox River Dredging projects

Green Bay

SMU 56/57
(1999-2000)

Deposit N
(1998-1999)

N

Outagamie

Brown

Winnebago

Calumet

Manitowoc

Contaminated Sediments

Lake Winnebago

1 0 1 2 3 4

MILES

Fox River dredging demonstrations

	Deposit N (upriver)	SMU 56/57 (downriver)
Years	1998-1999	1999-2000
Volume removed (cubic yards)	8000*	80,000**
Material under contamination	Bedrock	Clay & silty sediment
Costs	$4,000,000 by WDNR	$17,000,000 by companies

*Football field – 5' high

**Football field – 5 stories high

Dredging projects Achievements

1. Removed 2200 pounds of PCBs

2. PCB concentrations reduced (where no bedrock)

3. Negligible PCB loss to air and water

Dredging projects Achievements

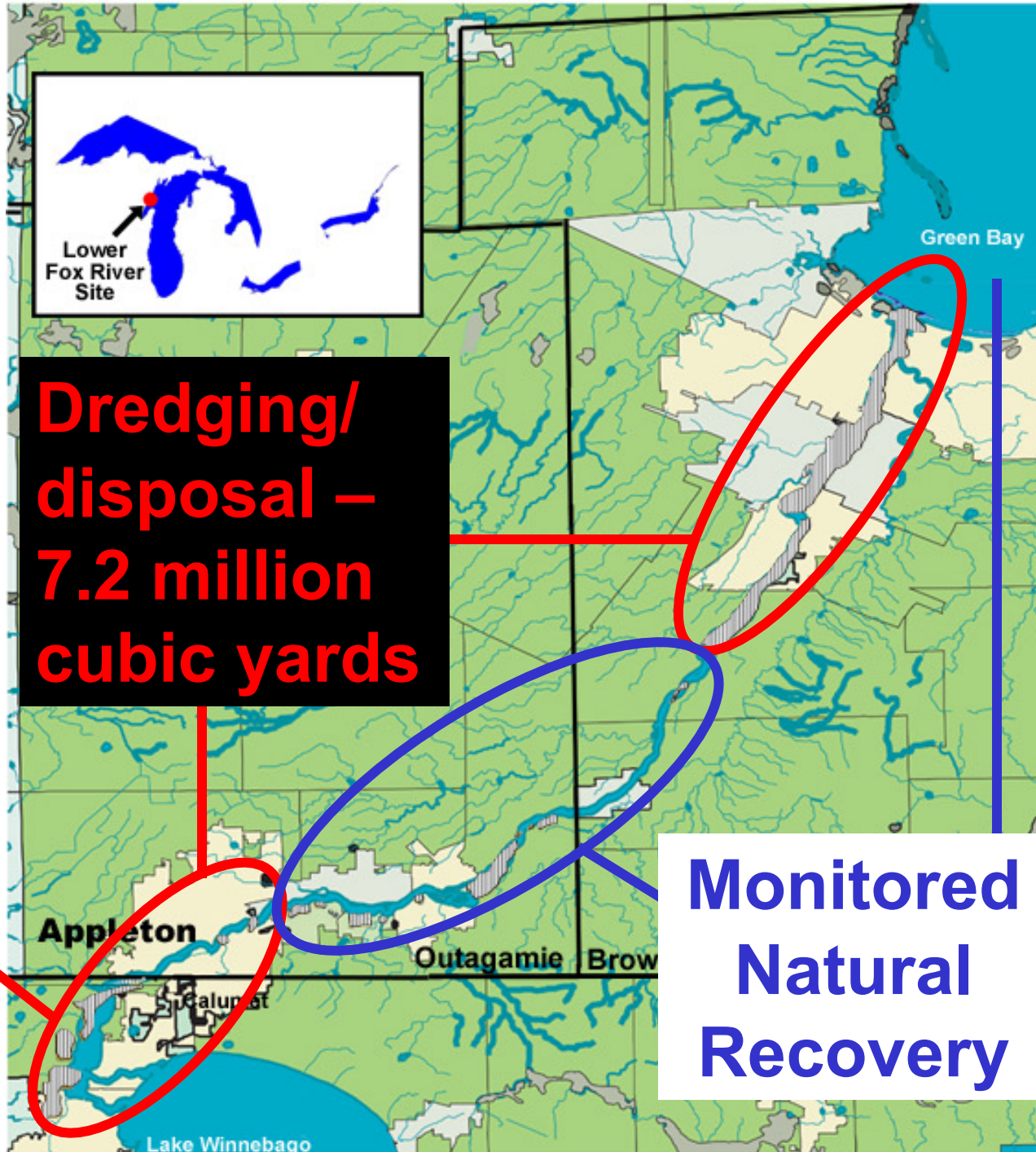
4. Minimal community disturbance (e.g., noise, odors, traffic, etc.)

5. Developed working relationship with companies and communities

6. Showed dredging works

Fox River cleanup decisions

Total cost: $400 million (dredging $350 million)



Upriver work started 2004

Fox Cleanup Decision

- **Reduce risks**
- **Mixture of cleanup options**
  1. **Dredging/disposal**
  2. **Capping**
  3. **Natural recovery**
- **Practical and flexible**

Upriver cleanup

OU 2:
Monitored
Natural
Recovery

Appleton

Winnebago

Calumet

Manitowoc

Contaminated Sediments

Lake
Winnebago

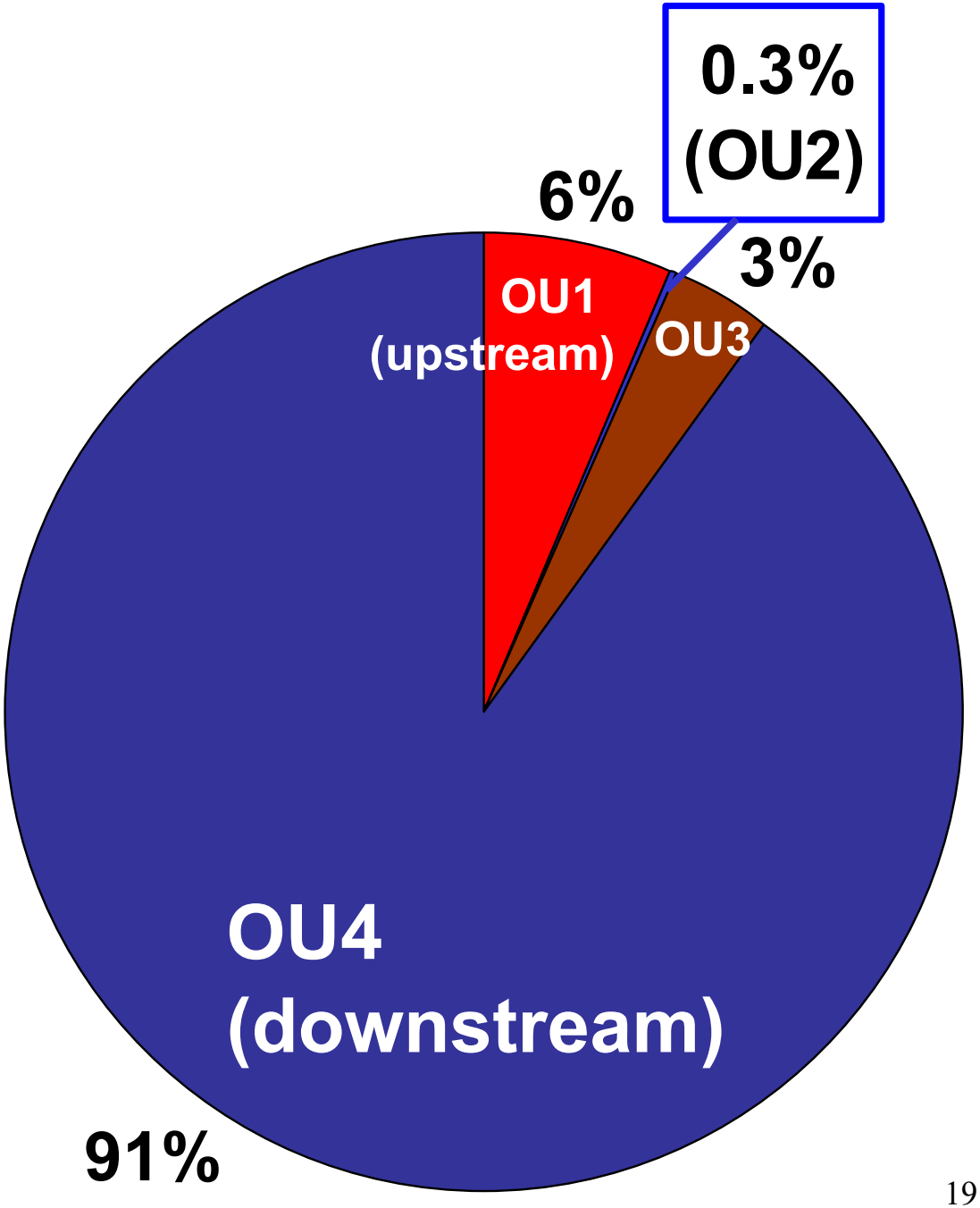
1 0 1 2 3 4

Monitored Natural Recovery (OU 2)

1. PCB burial, dilution, or breakdown from biological activity

2. Monitoring to track “recovery”

PCBs by river segment (pounds)



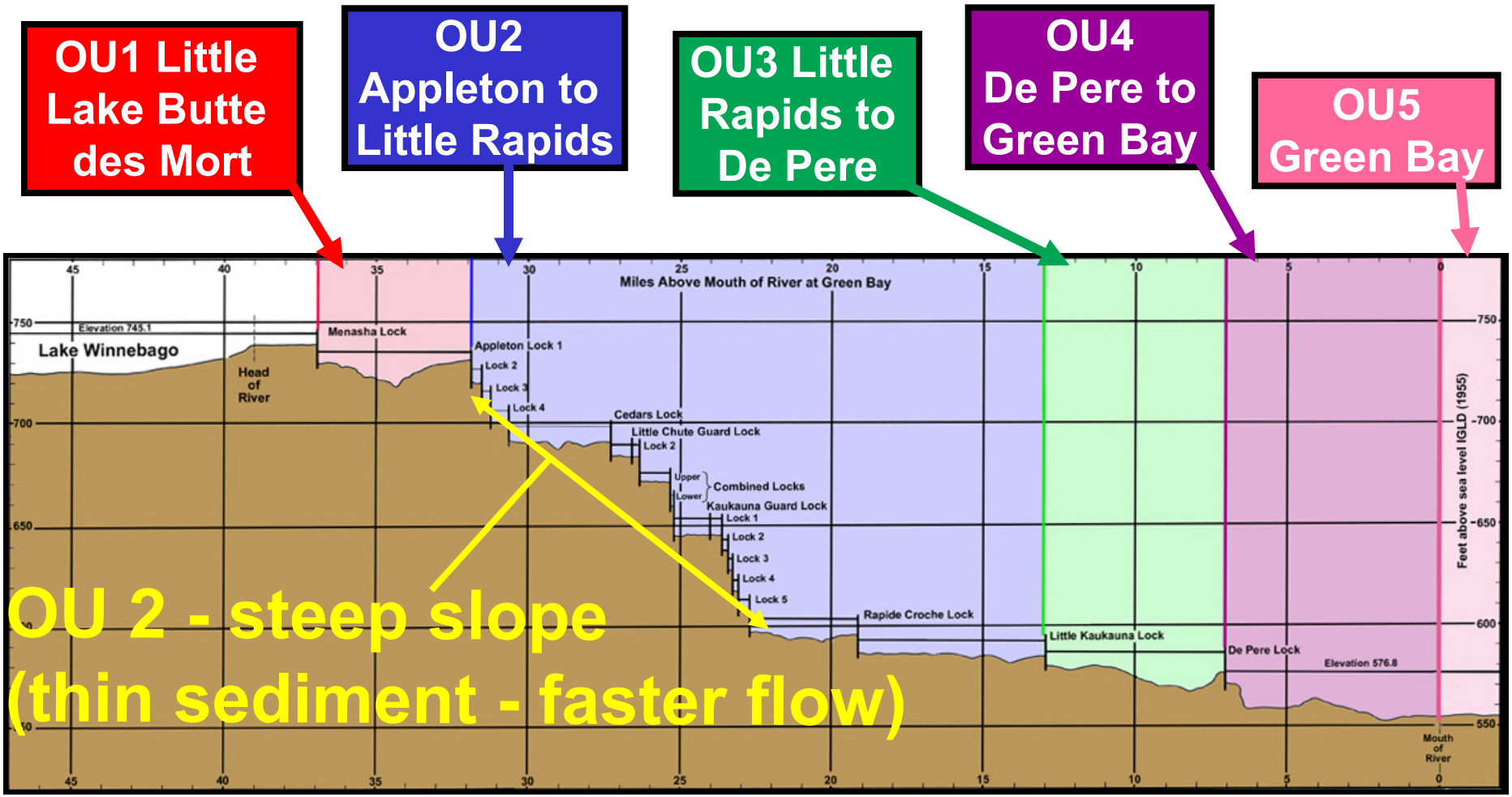
Fox River PCB concentrations

Media		Operable Unit			
		1	2	3	4
Sediments (ppm)	Average[1]	15	5	5	20
	Surface average	3.7	0.2	2.1	3.0
Water (ppt)	Average	28	17	41	61

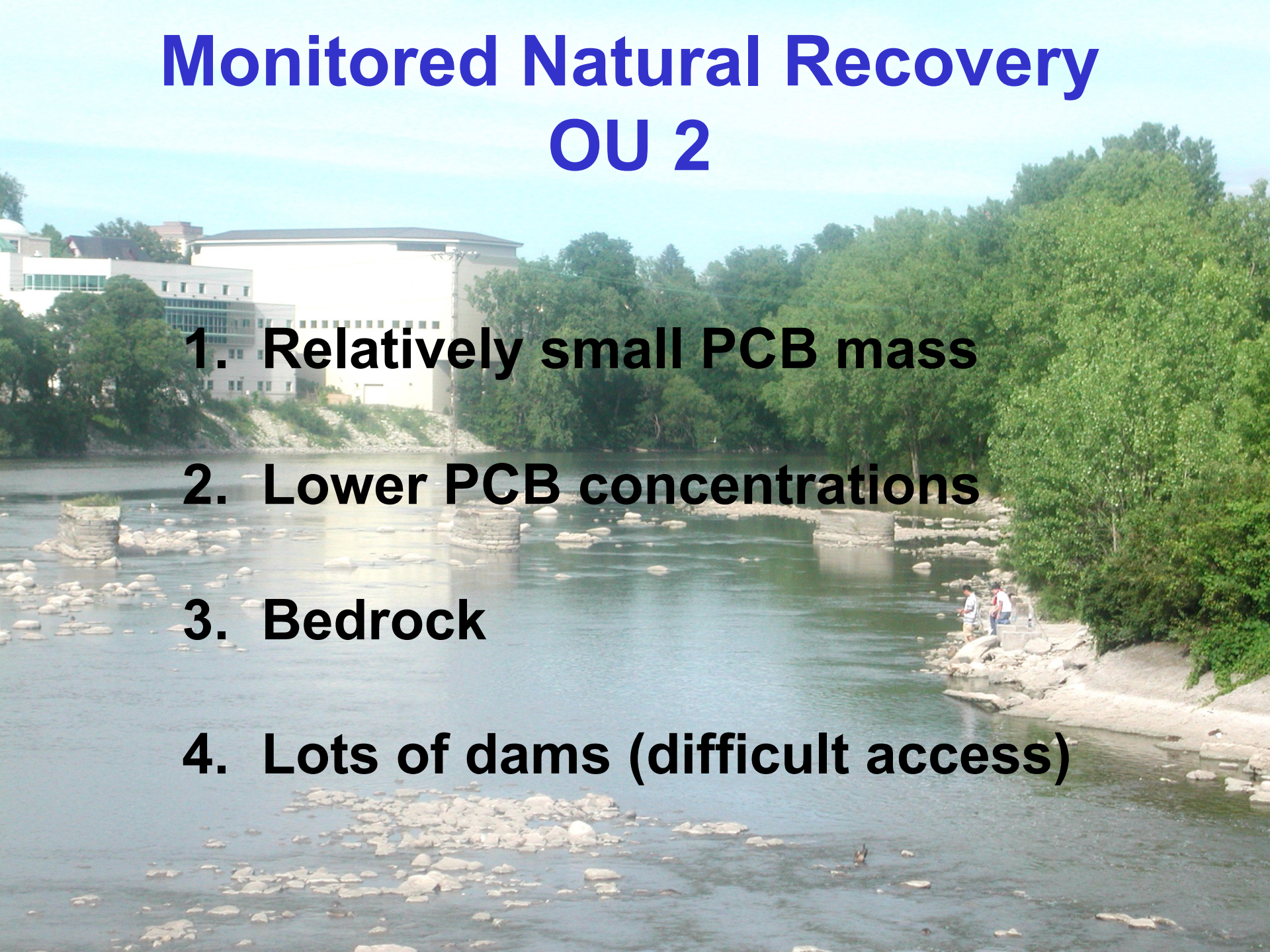
[1] All depths

Sediment goal: 0.25 ppm

Lower Fox River side view profile



Monitored Natural Recovery
OU 2



1. Relatively small PCB mass
2. Lower PCB concentrations
3. Bedrock
4. Lots of dams (difficult access)

Upriver dredging

Started September 2004

Appleton

Winnebago

Calumet

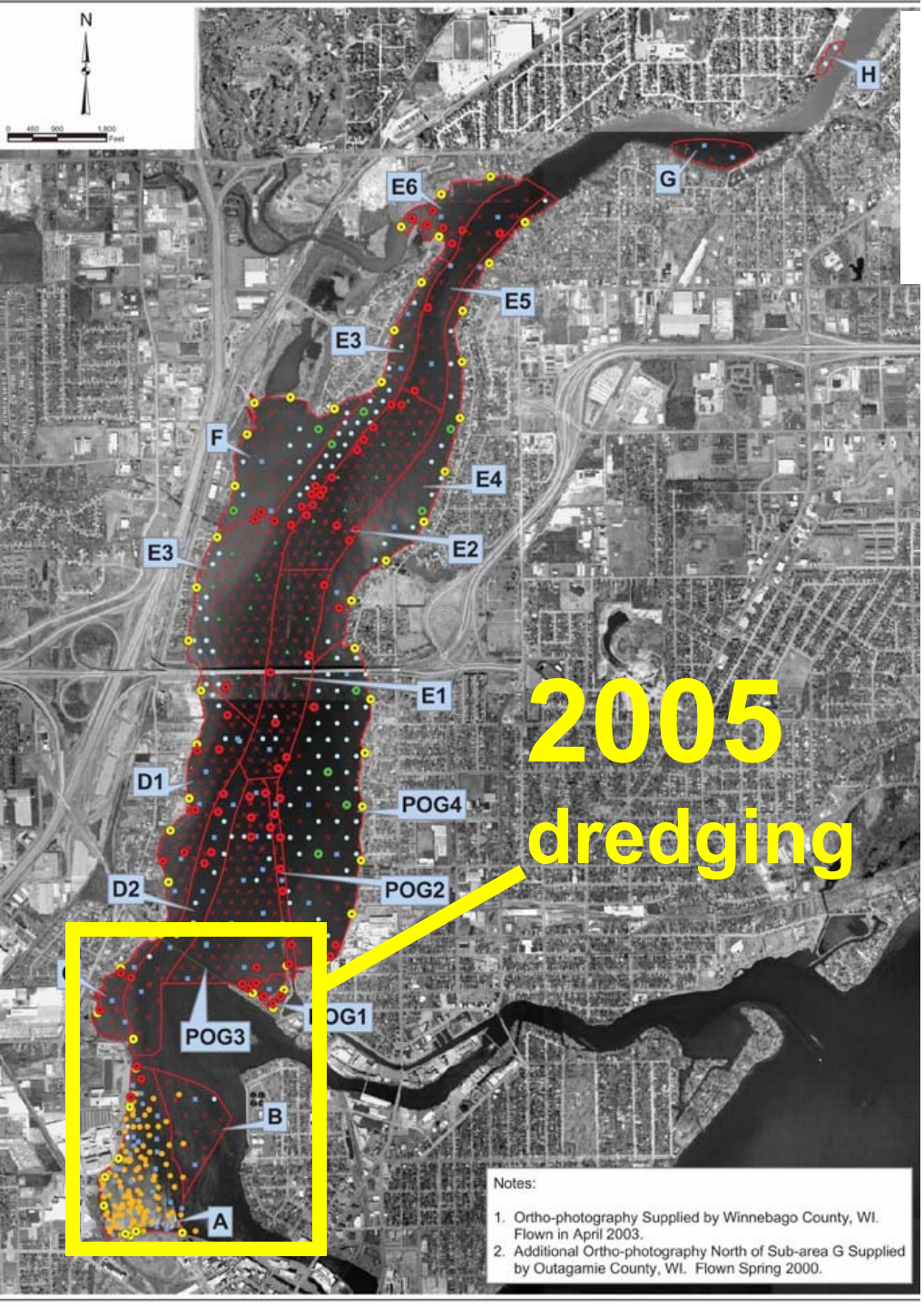
Manitowoc

Lake Winnebago

Contaminated Sediments

1 0 1 2 3 4

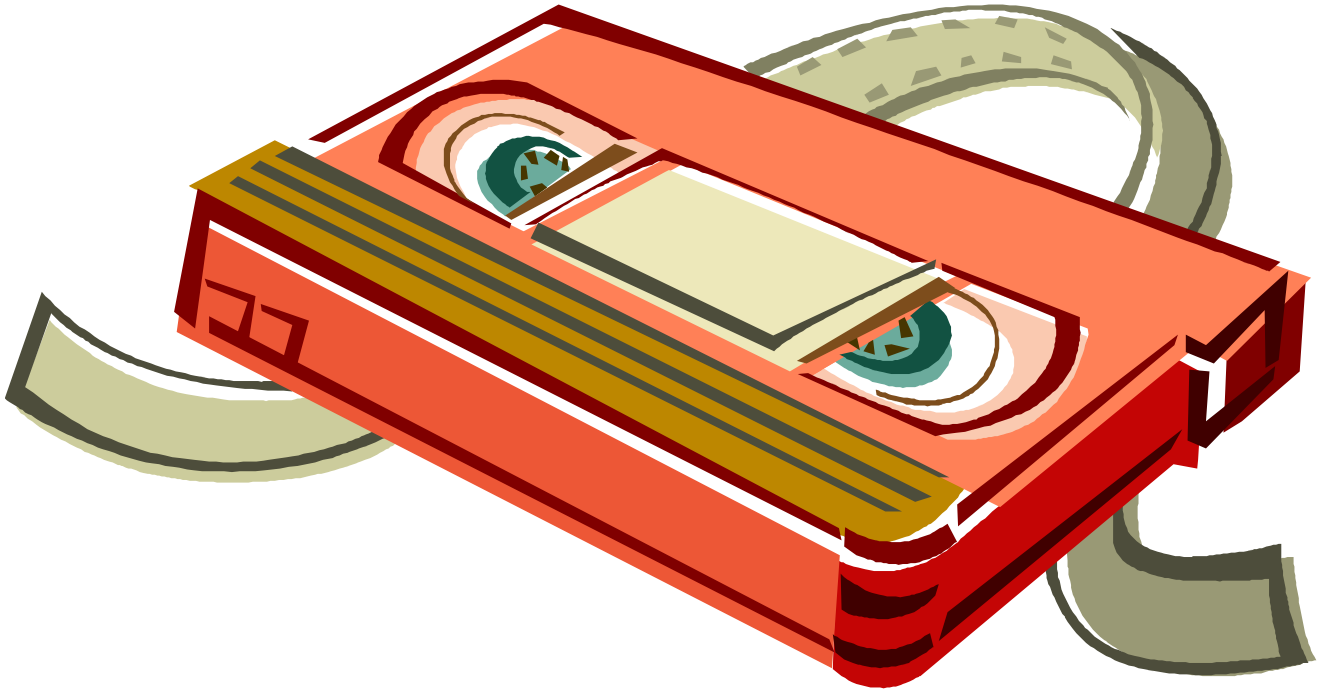
N



Upstream cleanup

1. **Dredge sediments (800,000 cubic yards*)**
2. **Separate water from dredge slurry**
3. **Treat dredge water**
4. **Dispose at landfill**

*Football field – 50 stories high



Sediment processing facility

Stacked geotubes

Geotubes need a lot of space

Water treatment

- Air flotation
- Sand/gravel filters
- Carbon filters

From: WDNR webpage

Loading

Landfill disposal*

*** Engineered for contaminant containment**

Good effort

1. Commitment to goals
2. Flexibility
3. Cooperation
4. Coordination & communication

THE POST-CRESCENT

LOCAL NEWS

Posted Sept. 24, 2004

PCB dredging a smooth operation

Little Lake Butte des Morts cleanup surpasses expectations

By Duke Behnke
Post-Crescent staff writer

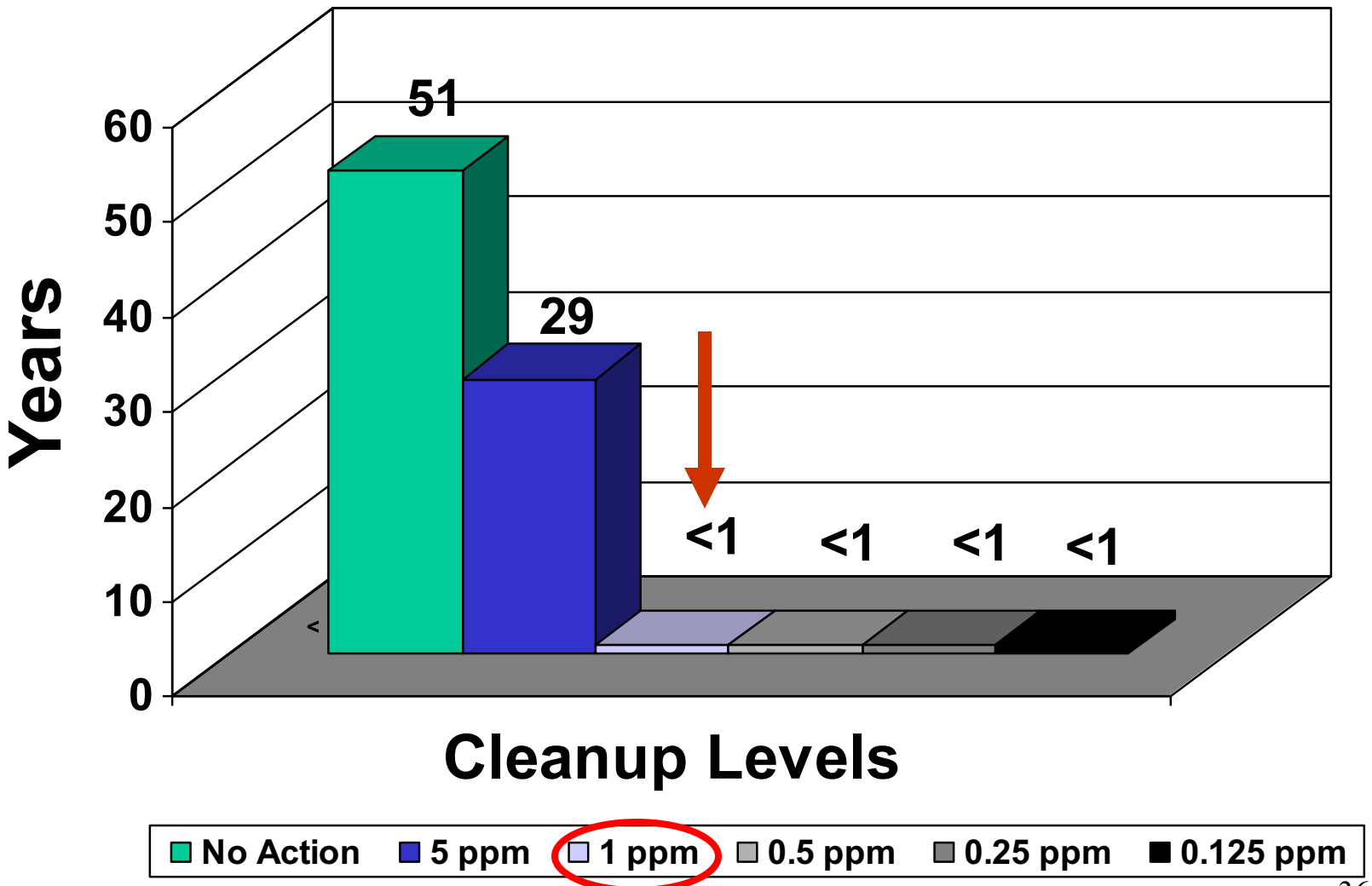
TOWN OF MENASHA — Engineers and contractors are all smiles three weeks into the six-year, $62 million cleanup of PCBs from Little Lake Butte des Morts.

A high-tech hydraulic dredge has

Clean up at a glance

Who: The Little Lake Cleanup Team consists of GW Partners and its contractors. Representatives can be reached at 920-912-5065 or by e-mail at littlelakecleanup@execpc.com.

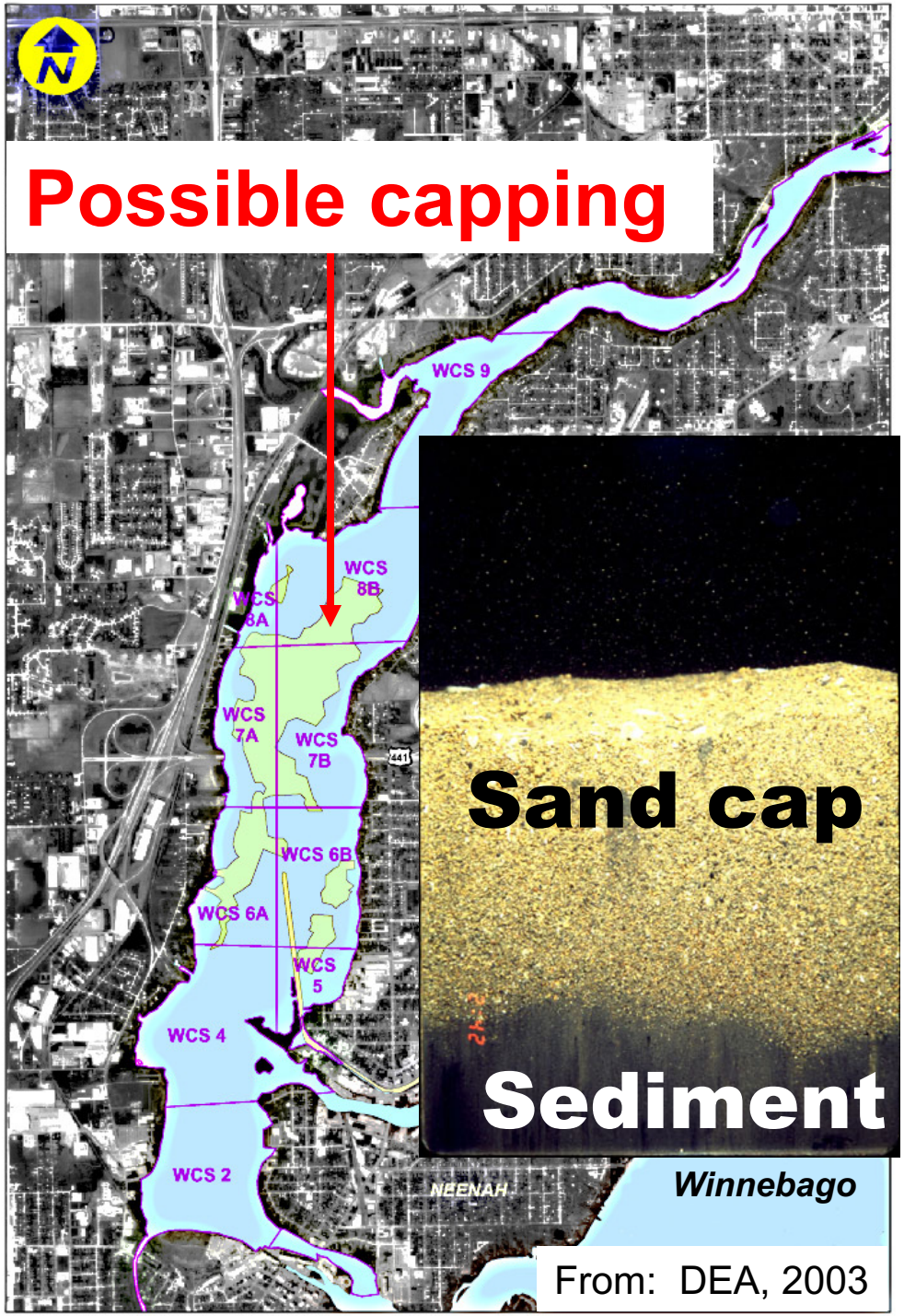
Why are we doing all this anyway? (time to fish recovery)



Project Objectives

- Clean water
- Edible fish
- Ecological improvements

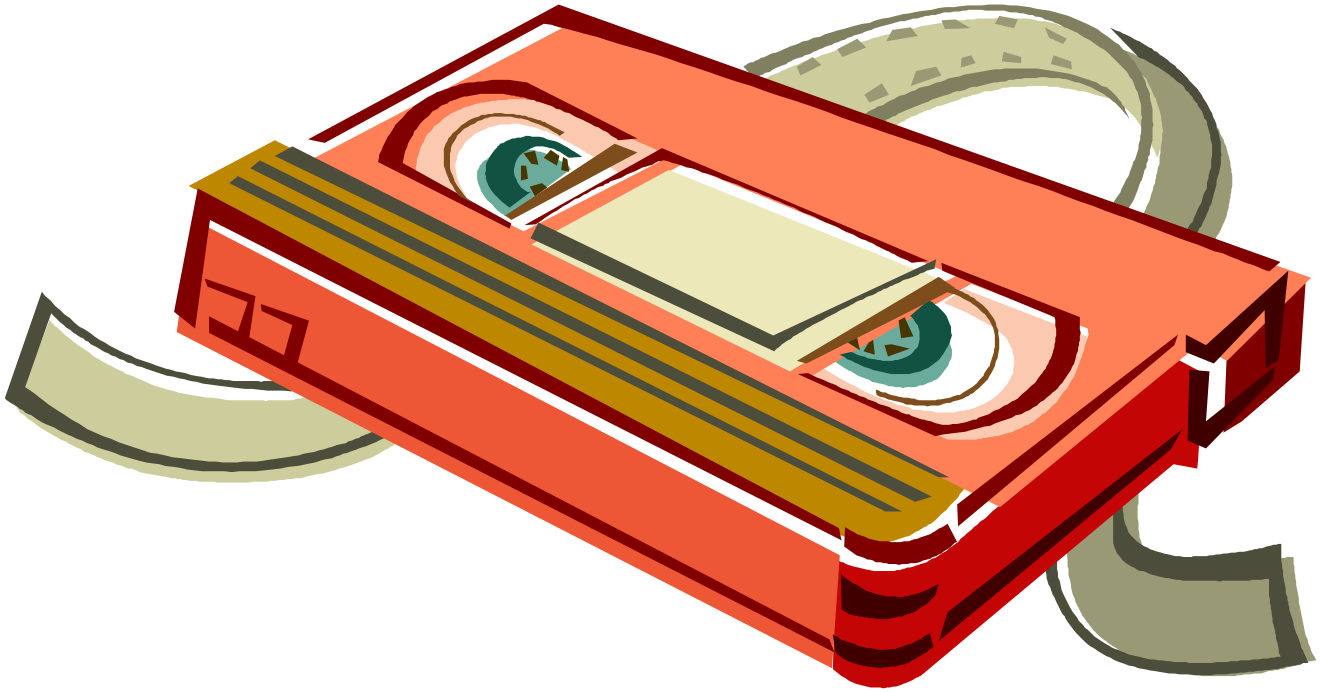
Capping: possible dredging supplement



1. **Post-capping water depth 3-feet+**
2. **Not in navigation channel**
3. **Avoid pipelines, utilities, etc.**
4. **PCBs less than 50 ppm**

Dredging
Issues

1. Stirring up (resuspension)
2. Leftover contamination ("residuals")
3. Habitat effects
4. Disposal



Contaminant losses during dredging

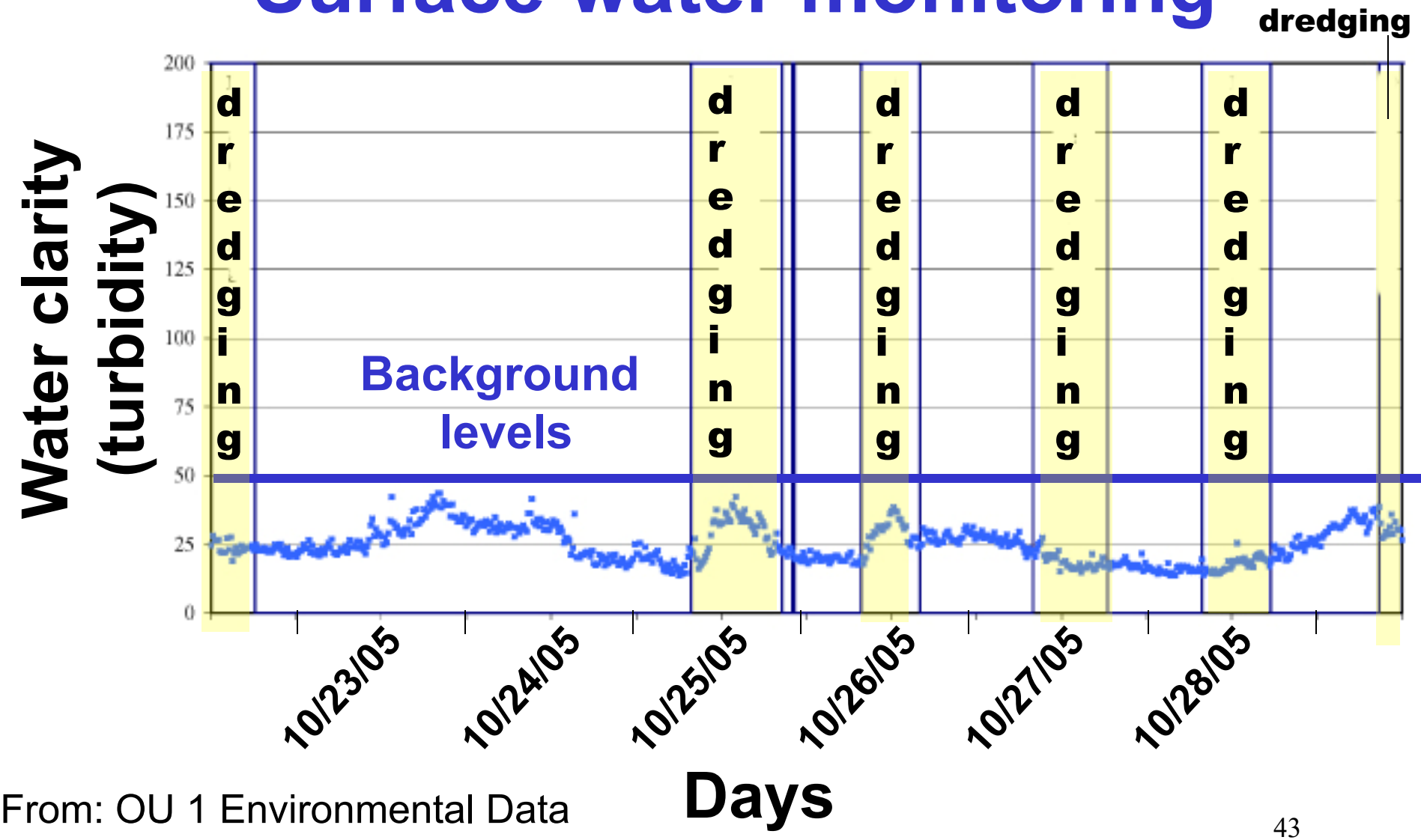
Hudson River White Paper
Resuspension of PCBs During Dredging

- **5 Projects**
- **388 observations**

Average loss: hydraulic dredge 0.1%

Average loss: mechanical dredge 0.3%

Dredging
Surface water monitoring



From: OU 1 Environmental Data Memorandum, November 2, 2004

Contamination left behind (dredging "failures")

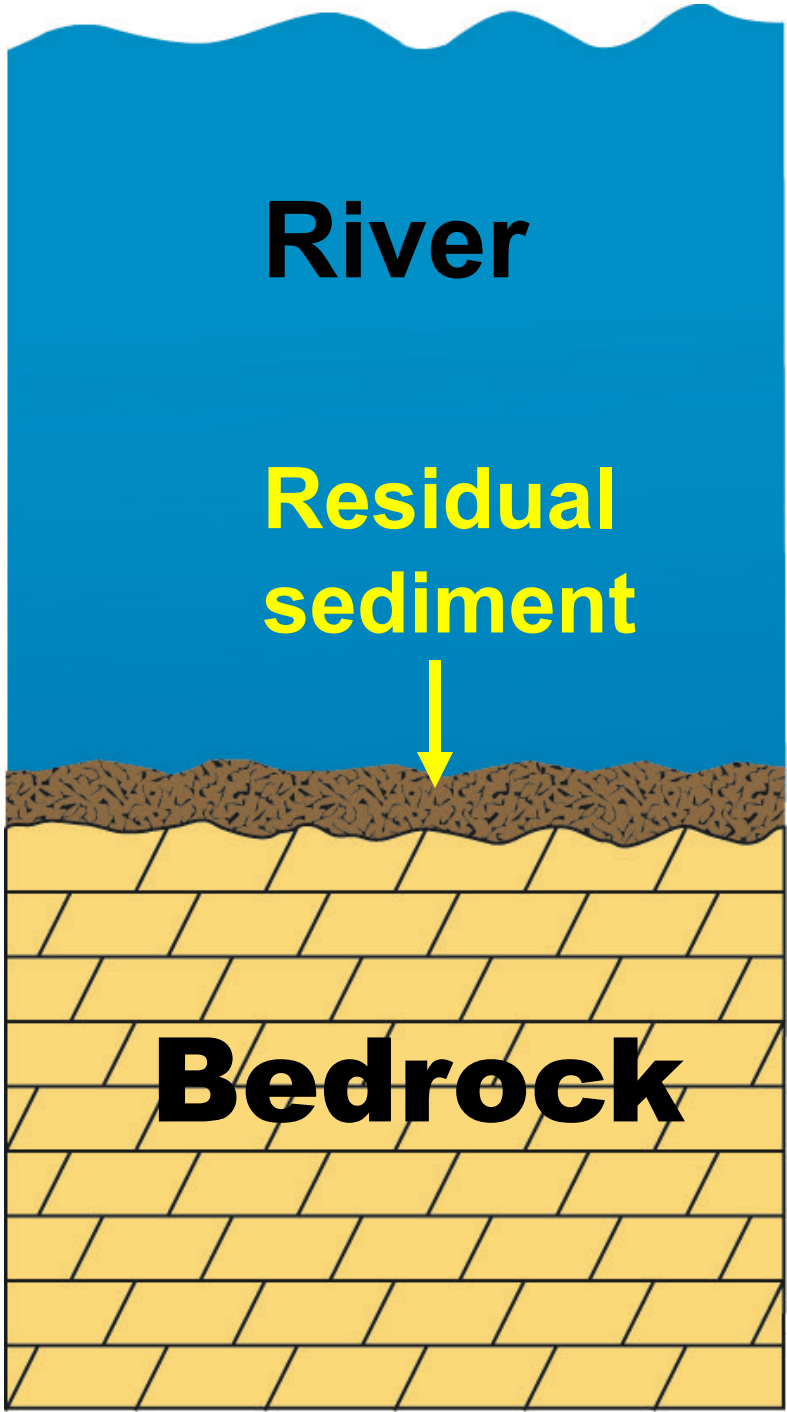
Critics view: "…no contaminant concentration reduction."

Reasons:

1. **Shallow bedrock**

2. **Debris (e.g., rock and wood)**

Shallow bedrock: “leftovers” are hard to remove




Wood debris
Manistique River, MI

Rock debris
Grasse River, NY

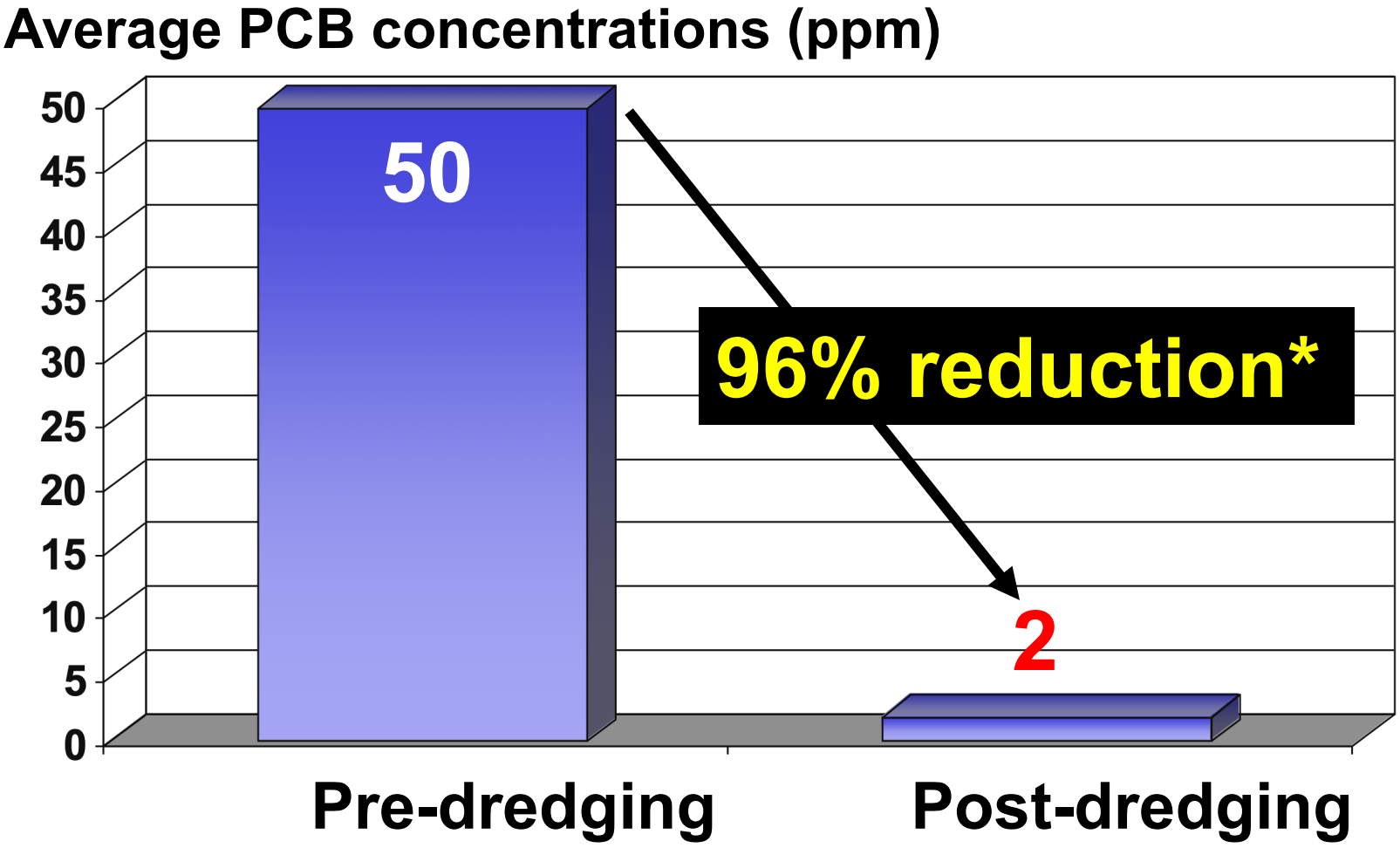
Concentrations after dredging

Project	Contaminant	Average % Reduction
Grasse River, NY	PCBs	79
GM Massena, NY	PCBs	99
Cumberland Bay, NY	PCBs	97
New Bedford, MA	PCBs	97
Marathon Battery, NY	Cadmium	92
Lake Jarnsjon, Sweden	PCBs	99
AVERAGE		94

From: Hudson River Responsiveness Summary White Paper (312663), Post-Dredging PCB Residuals

Fox River dredging project

Concentration reduction



*For all sediments

March 1999 (after excavation)

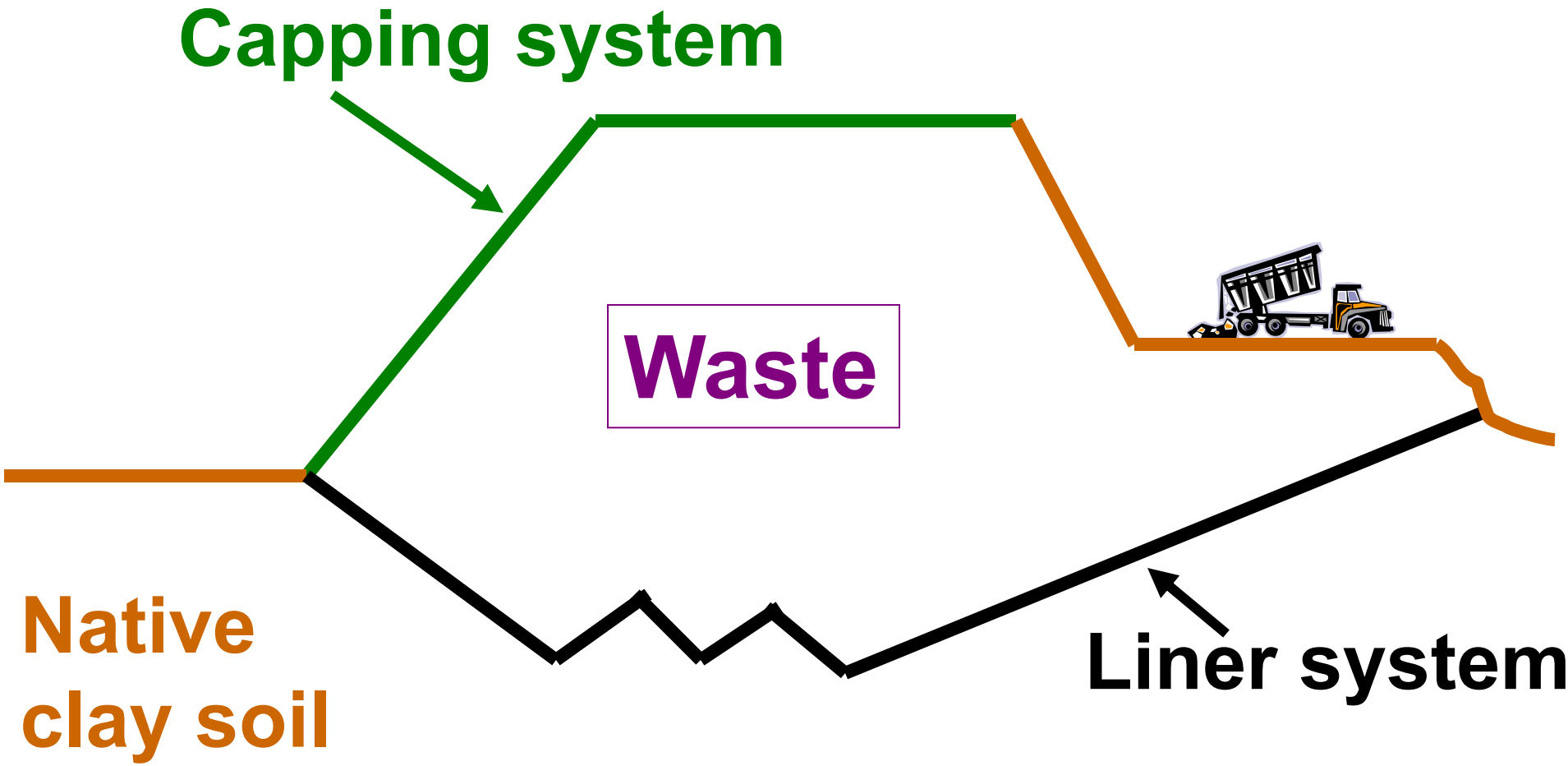
August 1999 (4-months after excavation)

Habitat recovery

Bryant Mill Pond

U.S. EPA and WDNR, 2002, Record of Decision, Operable Unit 1 and Operable Unit 2, Lower Fox River and Green Bay, White Paper 8 – Habitat and Ecological Considerations as a Remedy Component for the Lower Fox River

Disposal: engineered landfill



Treatment - sediment melting (vitrification)

Melting versus landfill disposal (Fox River upstream)

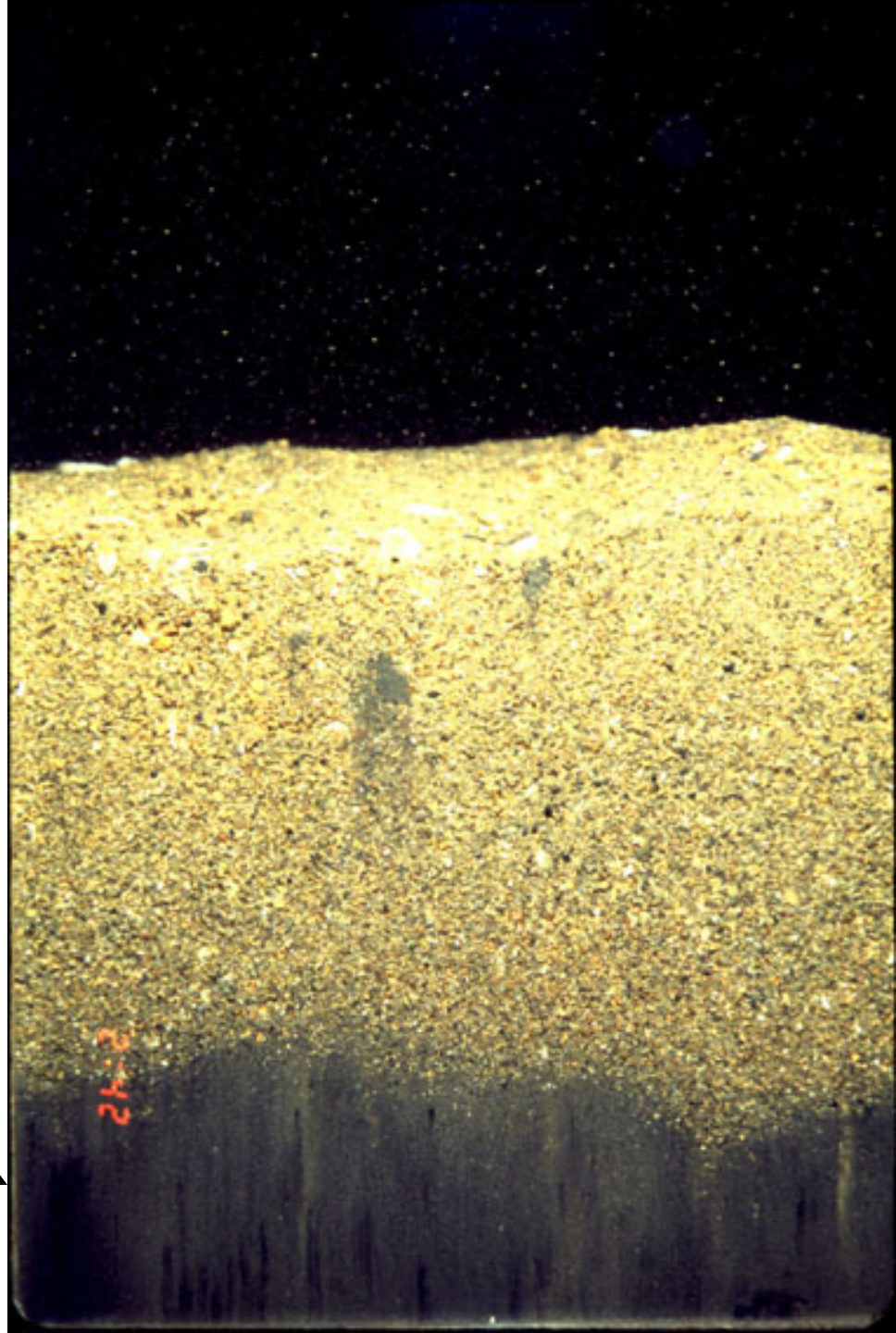
	Melting (i.e., vitrification)	Landfill disposal
Treatment	Yes (beneficial re-use)	No (landfill space used)
Technology development	Successful small scale test	Proven effective
Costs (upstream project)	$48 million	$21 million

Preferred

Capping

Sand cap

Contaminated sediment



Dredging versus Capping

	Dredging	Capping
Short-term releases	Small release	No releases
Contaminant disposition	Mostly removed	Contained*
	Landfill	Remains in river
Habitat	Altered/disrupted (eventual recovery)	Permanent change

Preferred

***Assumes long-term stability**

Dredging versus Capping

	Dredging	Capping
Construction impacts	Larger “footprint”	Smaller “footprint”
	Some noise, traffic, odors, etc.	Less noise, traffic, odors, etc.
Monitoring & maintenance	Limited followup monitoring	More monitoring & institutional controls
Cost	High	Moderate
Water depth	Increased	Decreased

Preferred

Capping

- Best in quiet waters
- Typically for low toxicity contamination

Photo courtesy of Bean Environmental, LLC.

Cleanup options summary

- “One size does not fit all”
- Unique site conditions should be considered

Economic benefits of cleanup

- Increase in property values (e.g., Waukegan Harbor: $53,000 increase per house following cleanup*)
- Cleanup-related jobs & business
- Health benefits

* Braden, J.B., et al, 2004, Contaminant Cleanup in the Waukegan Harbor Area of Concern: Homeowner Attitudes and Economic Benefits, Journal of Great Lakes Research.

Economic benefits of cleanup (continued)

- Recreation improvements & tourism (e.g., removal of fish advisories)

- Lower navigation dredging costs and/or increased commercial use

Big river sites cleanups

Site	Cleanup costs	Contaminated sediment (cubic yards)
Fox River, WI	$ 400 million	7.2 million
Kalamazoo, MI	?	1.0 million
Housatonic, MA	$ 600 million (?)	?
Hudson, NY	$ 460 million	2.7 million

More information:

http://www.epa.gov/region5/sites/foxriver

http://www.dnr.state.wi.us/org/water/wm/foxriver/index.html

http://www.littlelakecleanup.com/pages/1/index.htm

Photo from Ann Schell