Nyanza Chemical Superfund Site
Sudbury River (OU4)

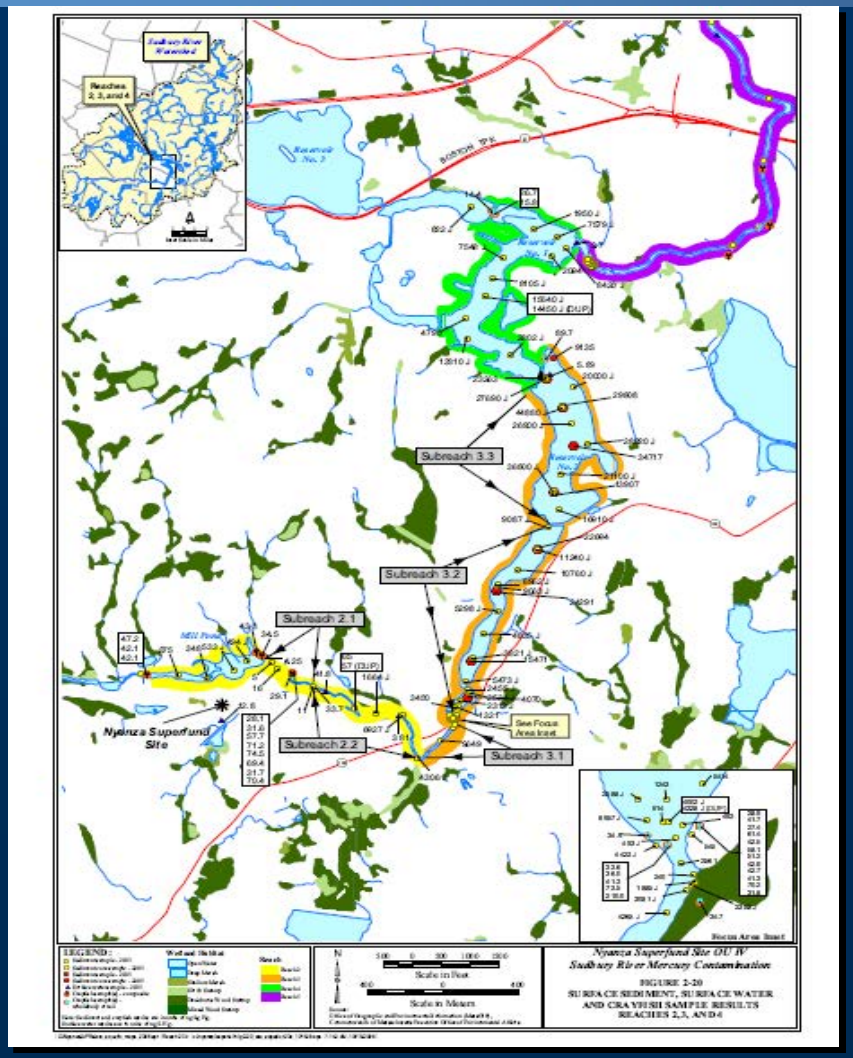
May 2013

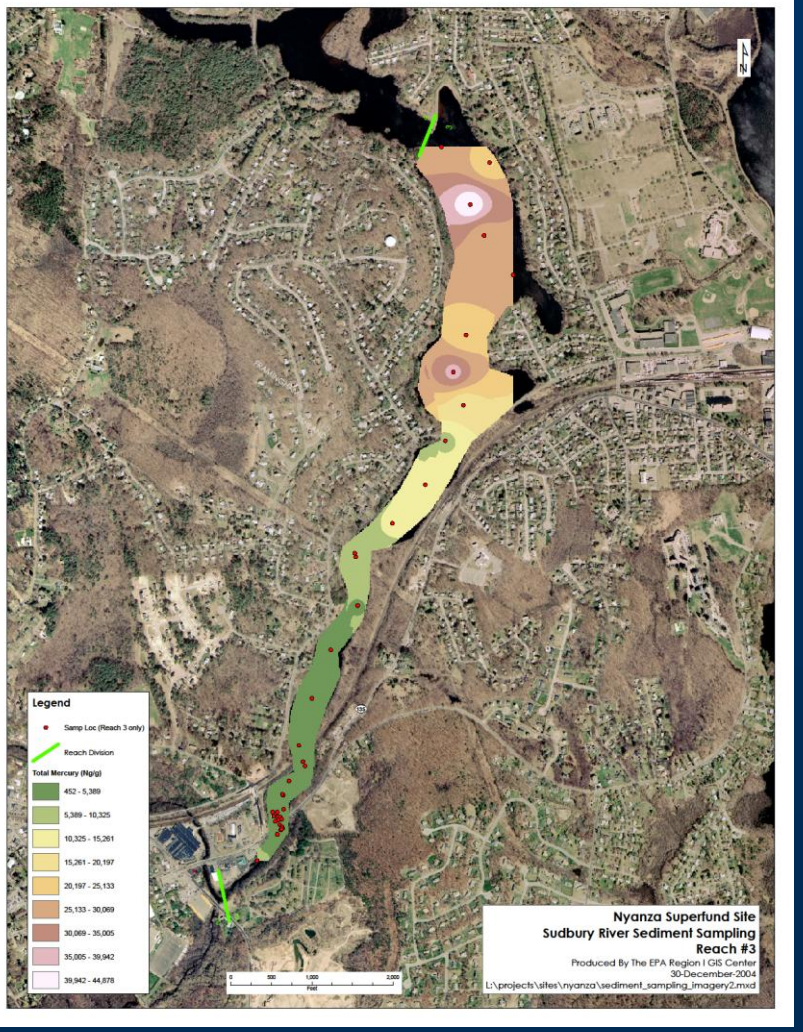
SDMS Doc ID 546339

Nyanza (Sudbury River) Investigations

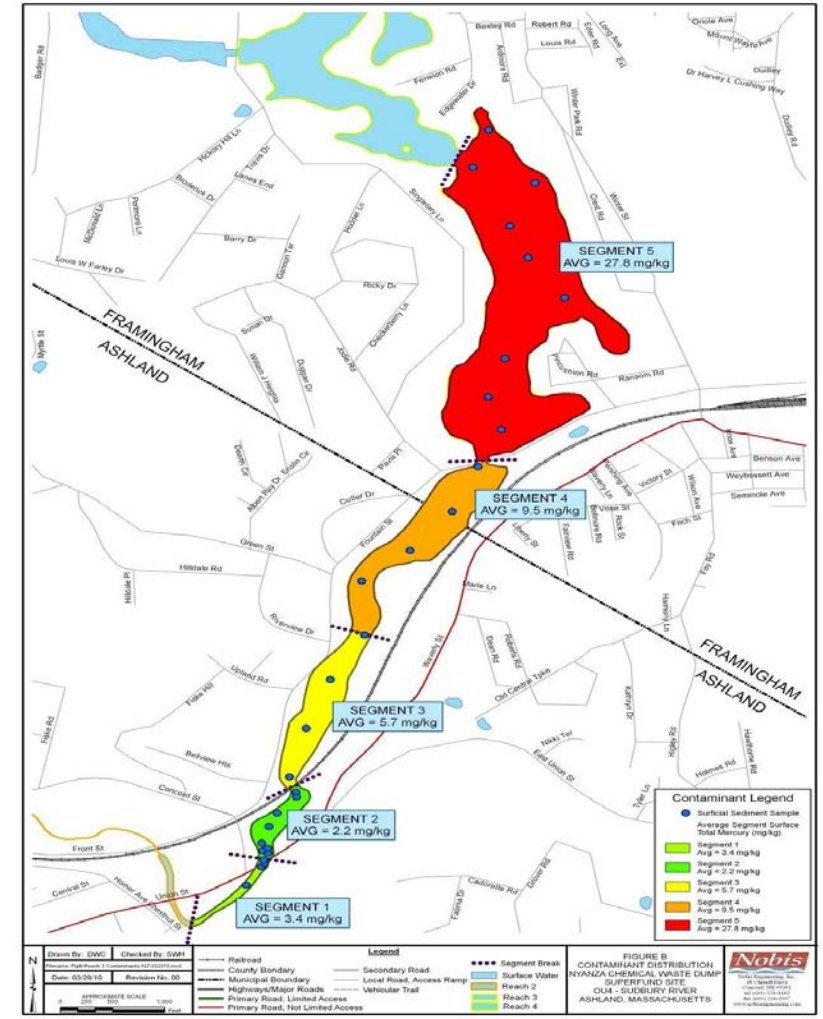
- Numerous investigations since the creation of OU4 in 1993:
  - 1995 - 1997 Nyanza Task Force Studies
  - 1999 Human Health Risk Assessment
  - 1999 Baseline Ecological Risk Assessment
  - 2003-2005 Site-wide comprehensive sampling
  - 2006 Supplemental Human Health Assessment
  - 2008 Supplemental Ecological Risk Assessment
  - 2010 Feasibility Study, Remedy Selection
  - **2013 Remedial Design Complete**

Mercury Distribution

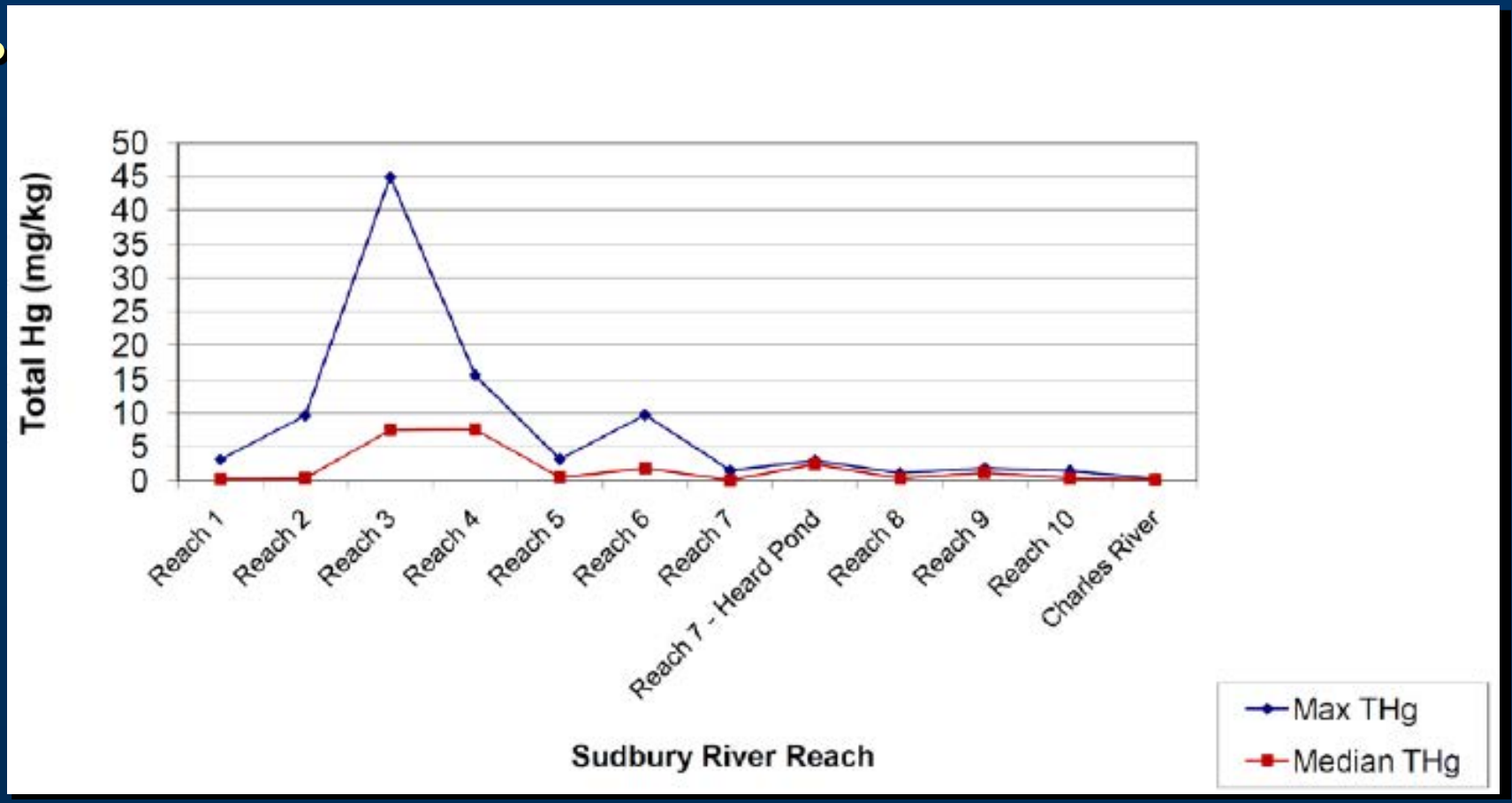




Mercury Distribution



Mercury Distribution - Sediment



Two Types of Risk

- Human Health
  - Routes of possible exposure
    - Direct Contact (Surface water and Sediment)
    - Ingestion (Surface water, Sediment, **Fish**)

- Environment
  - No Population level effects*

  * Many species sampled were above the “No Effects Level”

Human Health Risks

Reach	Recreational Angler		Subsistence Angler	Ethnic Angler	
	Child	Adult	Adult	Child	Adult
Reach 2 -	1.8		√	√	√
Reach 3 – Res 2	2.1	1.2	√	√	√
Reach 4 – Res 1	1.3		√	√	√
Reach 5			√	√	√
Reach 6 - Saxonville	1.3		√	√	√
Reach 7			√	√	√
Reach 7 – Heard Pond			√	√	
Reach 8 – Great Meadows	1.3		√	√	√
Reach 9	1.5		√	√	√
Reach 10	1.4		√	√	√
Reference Areas			√	√	√

Human Health Risks -Who is eating Fish?

Study conducted by MWGMC ("Fish 4 Fun, Not 4 Food")

QUESTIONS	Michel	Cléber / Tânia	Romildo / Sônia	Benny	Clécio	Marco	Fernando
Area of the River You Fish In	- Framingham/ Sudbury Line	Route 20	- Off of Central St/N. Framingham; - Rte 128; - Natick/Ashland Line	- North Framingham	- Ashland - Rte 135	Rte 126	Rte 126
Fish Alone or With Friends?	Friends	With My Wife	With My Son	Alone	Friends	Friends	Friends
Time of Year You Usually Fish?	Year Round	Year Round	Year Round	Summer	Year Round	August-Sept/Summer	August-Sept./Summer
How Many Fish Do You Typically Catch?	Varies	Varies	Varies	Varies	Varies	Varies	Varies
What Kind of Fish?	n/a	Peacock Snakefish	Sunfish Bluegill Small-Mouth	Cat Fish (Bagre)	n/a	Trout Carp	Bass Yellow perch Large Yellow Perch
Do you Catch & Release or Eat the Fish?	Eat	Eat	Eat (his wife does not eat the fish)	Used to eat, does not eat now	Eat	Eat	Eat
What Part of the Fish Do You Eat?	Everything but the head	Everything but the head	Everything but the head	Everything but the head	Everything but the head	Everything but the head	Everything but the head
How Do You Prepare the Fish?	Fried	Fried	Fried & Baked	Baked	Fried & Baked	Depends on the fish, but normally fried	Depends on the fish, but normally fried
What Do You Think of the Signs at the River?	Ignore them	Ignore them	Ignore them	Ignore them	Ignore them	Ignore them	Ignore them
Do You Know about the Health Risks?	No	No	Yes	Yes	Yes	Yes	Yes
Would you Accept the Idea of Fishing for Fun?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Would You Be Willing to Educate Your Children About this Issue?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Where Do You Get Your Health Info?	Newspapers	Internet, radio and Newspaper	Books, Magazines, Newspapers	TV, Newspapers	Newspapers	Brazilian Newspapers, Internet	Brazilian Newspapers, Internet

Environmental Justice

- Although not directly within an EJ area, Town of Framingham identified the close proximity of EJ communities to the River (2010)

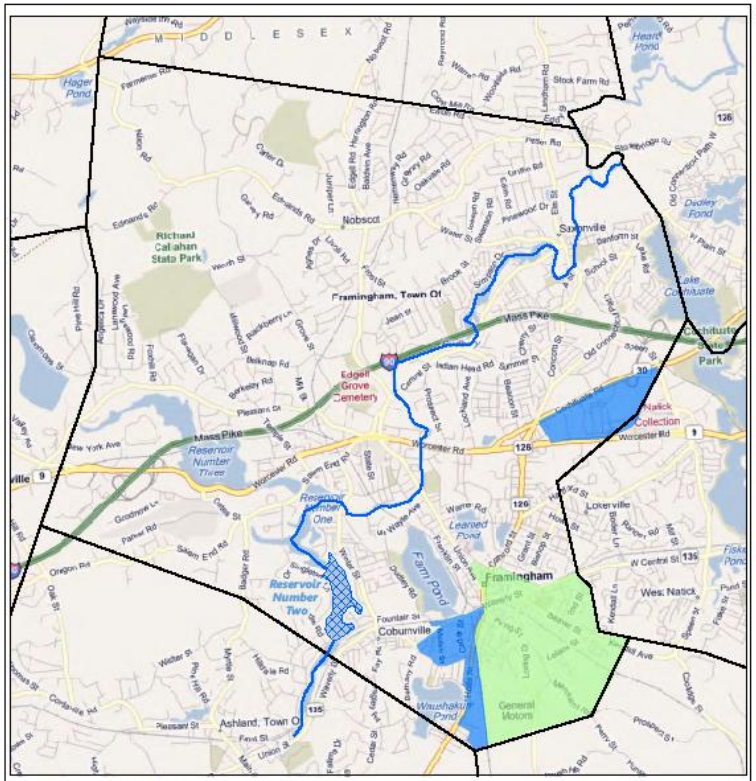
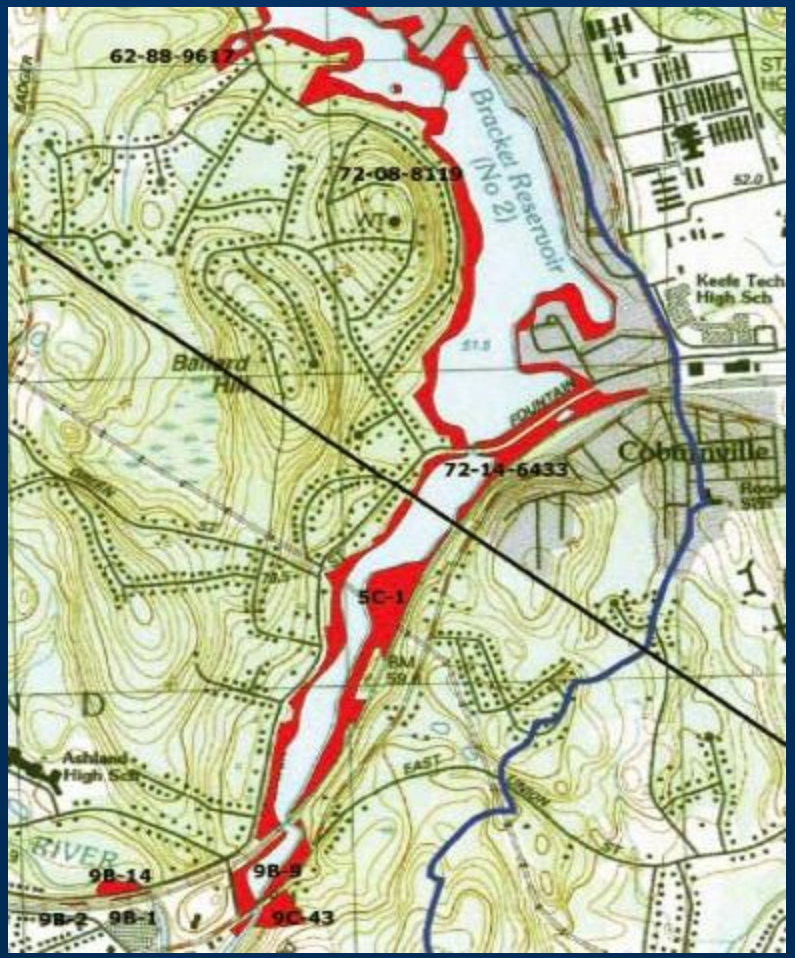


Figure 3 - Environmental Justice Areas along the Sudbury River

Natural Resource Damages

- $3.9 Million
- Not Clean-up Funding
- DCR proposal was selected to create the Stearns & Bracket Wildlife Refuge.
- ~180 acres
- Supported by Rep. Walsh and Town of Framingham
- Increase opportunities for fishing and potentially consuming fish.



Ecological Assessment

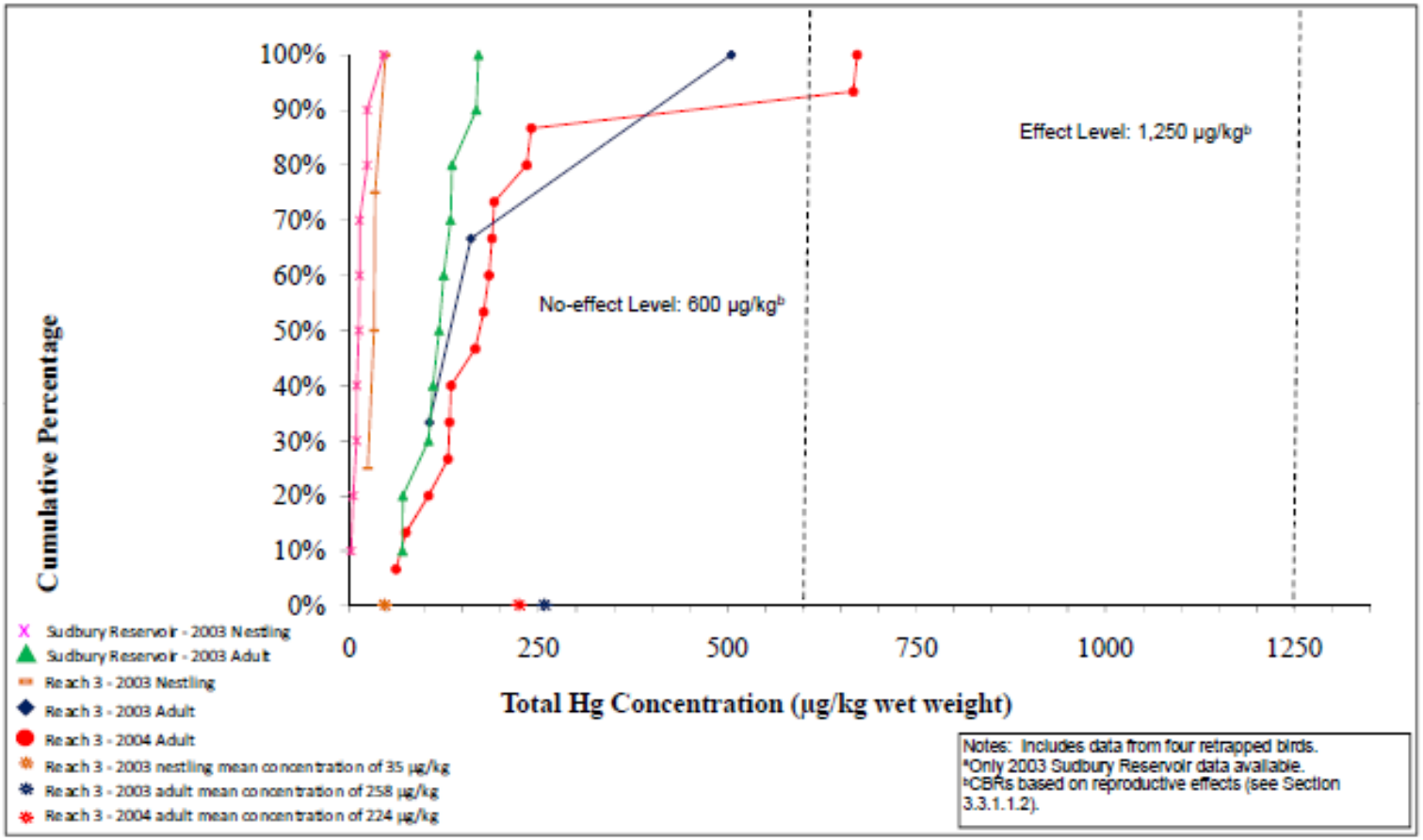
- *229 Measurement Endpoints* –
  - food chain modeling results
  - site-specific/species-specific measurements
  - Measurement endpoint = species x media (e.g., blood, egg, feather, fur)
  - More weight given to site-specific measurements over modeling

Ecological Risk

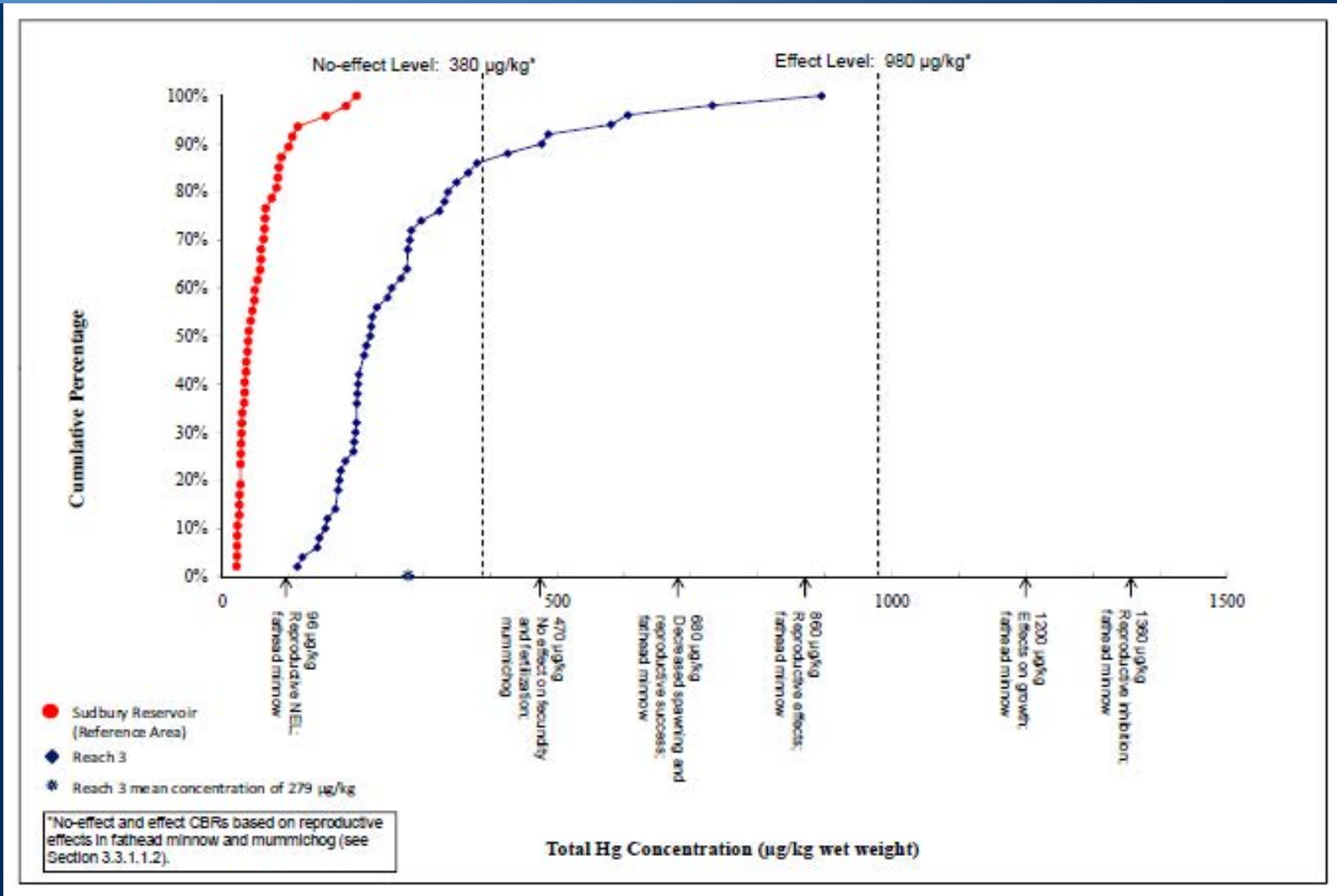
- The 2008 BERA found that although there was evidence of elevated exposure, the concentrations do not cause “population-level” effects. However, adverse effects below this threshold level are likely occurring.
- Population-level risk is a “high bar”
- Other adverse effects, short of mortality:
  - Slow growth rate
  - Decreased life span
  - Lack of diversity

Tree Swallows

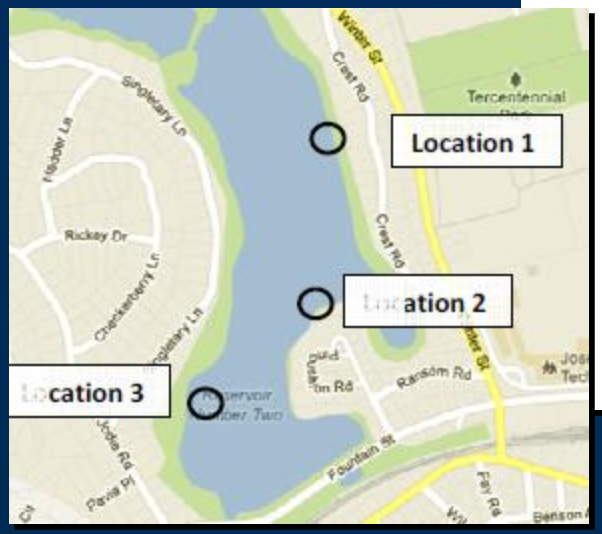
Figure 4-27
Cumulative Frequency Distribution of Total Mercury Concentrations in 2003 and 2004 Nestling and Adult Tree Swallow Blood from Reach 3 and Sudbury Reservoir Reference Area[a]
Nyanza Superfund Site OU IV Sudbury River Mercury Contamination

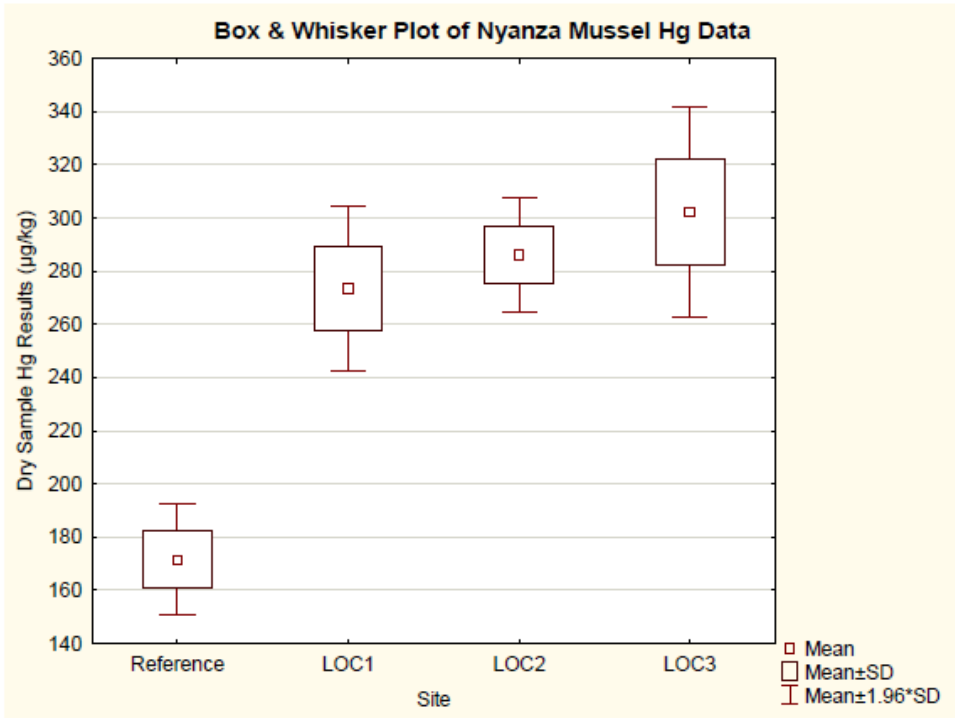


Fish (LMB)


No-effect Level: 380 µg/kg*
Effect Level: 980 µg/kg*
Cumulative Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
500
1000
1500
96 µg/kg Reproductive NEL: fathead minnow
470 µg/kg No effect on fecundity and fertilization: mummichog
680 µg/kg Decreased spawning and reproductive success: fathead minnow
860 µg/kg Reproductive effects: fathead minnow
1200 µg/kg Effects on growth: fathead minnow
1360 µg/kg Reproductive inhibition: fathead minnow
Sudbury Reservoir (Reference Area)
Reach 3
Reach 3 mean concentration of 279 µg/kg
*No-effect and effect CBRs based on reproductive effects in fathead minnow and mummichog (see Section 3.3.1.1.2).
Total Hg Concentration (µg/kg wet weight)

Mussel Study 2012





Options

- Basically, at most sediment sites, have three (3) “options” *
  - Dredge/Removal
  - Cap (Isolation caps/sand caps)
  - Monitoring only

* A component of all typically includes posting warning signs and advisories

What we heard - Public Comment

- Dredge it (Town of Framingham, some residents)
- Cap it (F&WS, NOAA, supported by DEP)
- Monitor only (abutter/some residents)

Selected Remedy
Thin Layer Capping

- Is being implemented more frequently
  - Centerdale Manor Wetlands (RI)
  - GE/Silver Lake (MA)
  - Onandaga Lake(NY)
- It is a proven remedial solution

Thin Layer Caps of Varying Grain Size

Photos courtesy of Germano & Associates, Inc.

Thin Layer Capping

- The impacts from capping have already been evaluated (i.e., short-term impacts).
- We are required to select the ***Least-damaging practical alternative*** to reduce a risk (implicit is that some injury/damage is associated with any construction project).
- EPA wants to work with the Town and Community to mitigate these impacts to the maximum extent practicable.

Scope and Impacts

- Duration 2 constructions seasons*
- Operating from 100% State-owned lands
- Consists of clearing 2 – 3 acres from 2 parcels
- Comply with all local noise and dust ordinances

Scope and Impacts

- Sand layer not dissimilar to native sediment
- Other projects have shown re-colonization in as little as 5 years.
- "Sediment Remedy Effectiveness Case Studies" (ASTSWMO, 2013):

> Overall, the cap and the ENR layer are both functioning to isolate contaminants and both remain stable after ten years. There is no sign of upward migration of contaminants from underlying sediments into the cap or ENR layer. The ENR layer functioned similarly to the cap and benthic community recolonization occurred from external recruitment. There is no evidence that bioturbation in the ENR layer has mixed the underlying sediments into the surface layer above. The benthic community in both areas shows characteristics of a more robust, species rich community compared to the pre-capping state. By these criteria, remediation of the Pier 53-55 Site was concluded to be successful.
>
> The various lines of evidence indicate that the 2002 benthic community at Pier 53-55 is healthier and more species are present than prior to cap placement. The community may still be changing with time as more sediment fines are deposited. However, the project goal appears to have been met.

Hydraulic Placement

Restoration

- 98% of the Shoreline/bank will not be disturbed.
- Cap only extends to 3 foot water depth
- Most of the shoreline habitat is preserved
- Staging areas will be surveyed prior to construction to document existing vegetation for replacement .