

History and Status of the Chicago Aquatic Nuisance Species Dispersal Barrier

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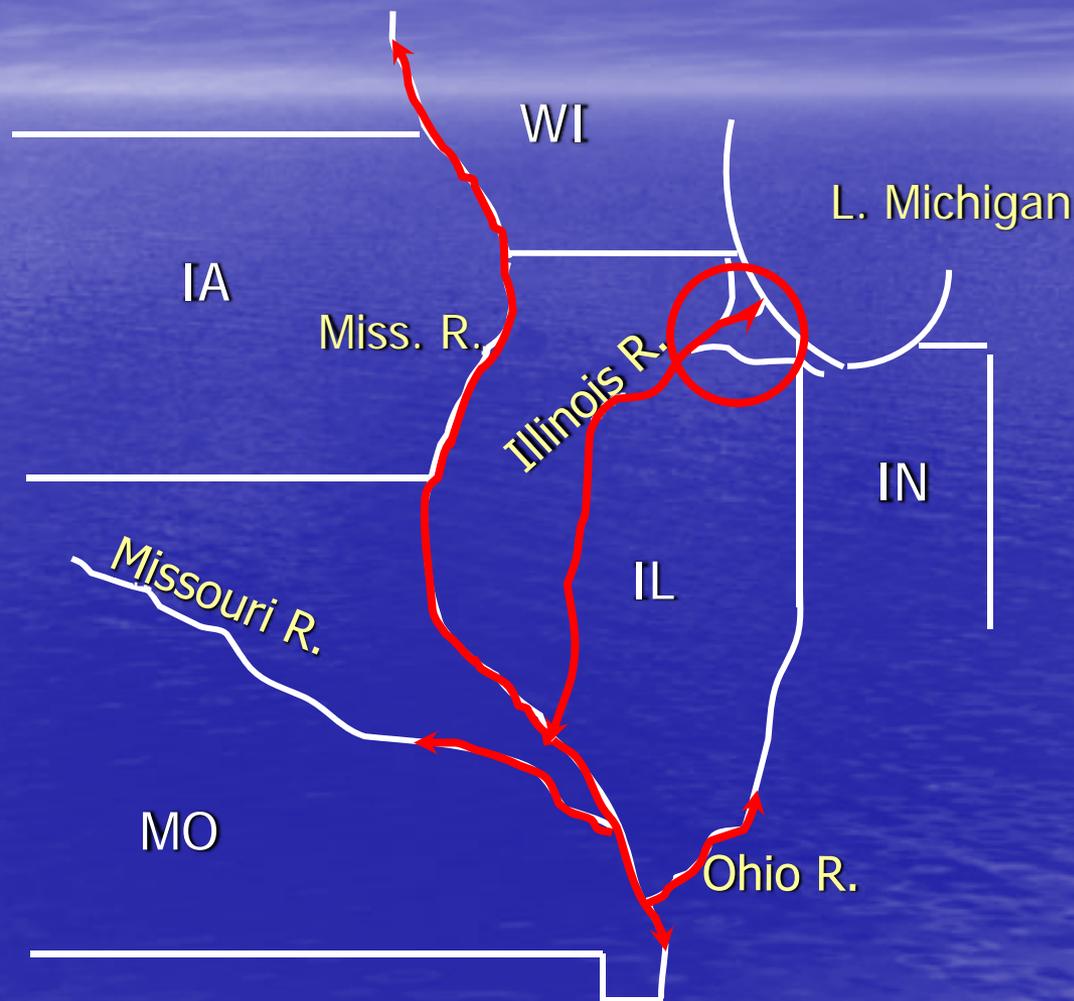
Sea Grant Institute

Dispersal Barrier Project

- Authorized by National Invasive Species Act (1996)
- Create a barrier to prevent dispersal of invasive species via the Chicago Sanitary and Ship Canal
- The Chicago Sanitary and Ship Canal is a cross-drainage link between the Great Lakes and Mississippi basins
- A two-way avenue for AIS dispersal

Dispersal Barrier Project

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- A two-way avenue for AIS dispersal



Chicago Canals

- First identified as a potential escape route from the Great Lakes for the Eurasian ruffe
- Targeted round goby until 1999
- Now bighead & silver carp



Chicago Waterways

Locks 



Chicago Sanitary and Ship Canal near Romeoville, IL



P. Moy

Regulatory and Use Interests

- **Federal**: Corps of Engineers, US Coast Guard, US Env. Protection Agency, USFWS
- **State**: DNR, EPA
- **Municipal**: MWRD of Greater Chicago, Chicago Dept. Of Environment
- **Power plants**, other industrial users
- **Navigation** - commercial and recreational
- **Historical** and **Environmental** interests

Species of Concern

2007

Mississippi Basin

Striped Bass
Hybrid Striped Bass

Black Carp

Bighead Carp
Silver Carp

Daphnia lumholtzi
Grass Carp



Zebra Mussel

Great Lakes Basin

Round Goby
Ruffe

Threespine Stickelback

Tubenose Goby

Quagga Mussel

Bythotrephes
cederstroemi

Cercopagis pengoi

White Perch

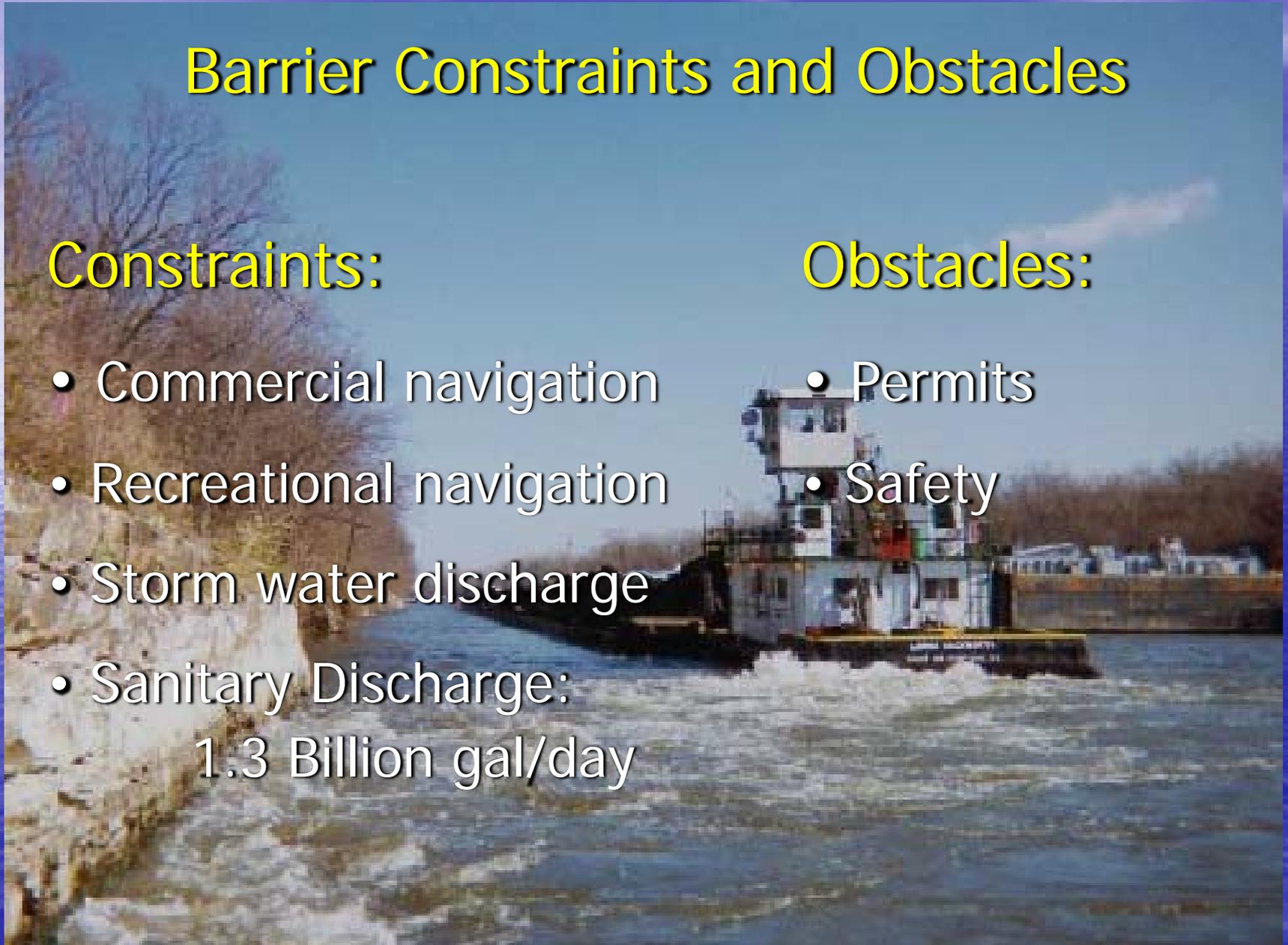
Barrier Constraints and Obstacles

Constraints:

- Commercial navigation
- Recreational navigation
- Storm water discharge
- Sanitary Discharge:
1.3 Billion gal/day

Obstacles:

- Permits
- Safety



Potential Barrier Approaches

~~Physical~~

~~Weirs~~

~~Screens~~

Visual

Bubble Screens

Lights

Chemical

Low/No DO

Nitrogen

Ozone

Toxicants *

Rotenone

Antimycin

TFM

Chloramine

Other

Electrical *

Acoustic

Hydraulic

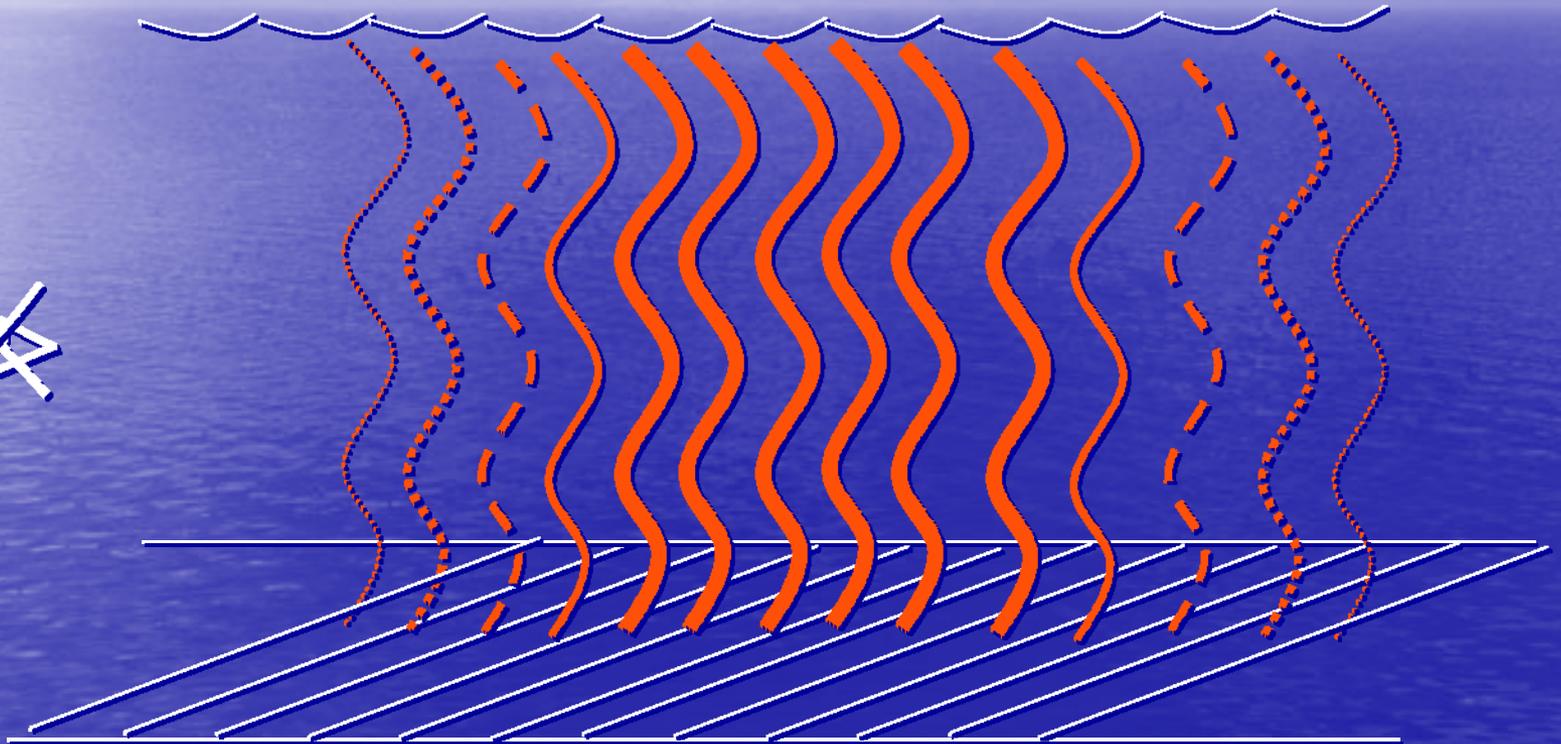
Biological

Thermal

Electric Barrier

- Micro-Pulsed DC; Graded field
- Few permitting issues
- Available technology - used in irrigation canals and for lamprey control
- High chance of success
- Electrodes on the bottom and recessed in the walls to avoid damage by barges

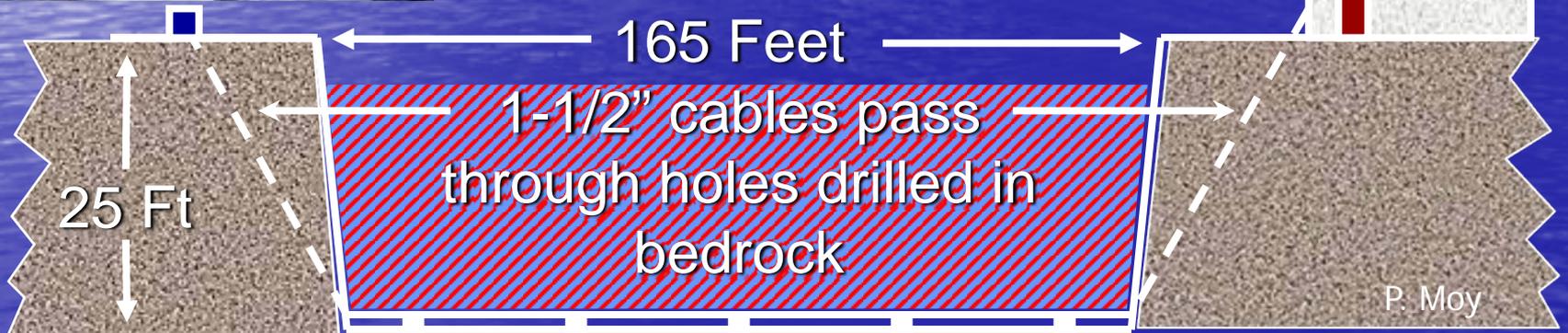
Barrier Effect



Barrier I



Control building



Canal cross section view

Barrier I



- \$1.8 million construction cost
 - Began operation April 2002
 - ~ \$2,000 / month to operate
 - 3 to 5 year service life – now at 5 ½ yrs
 - Will be used as back-up for Barrier II
 - Has been funded in 2007
 - Scheduled for rehab Fall 2007
- Barrier Site

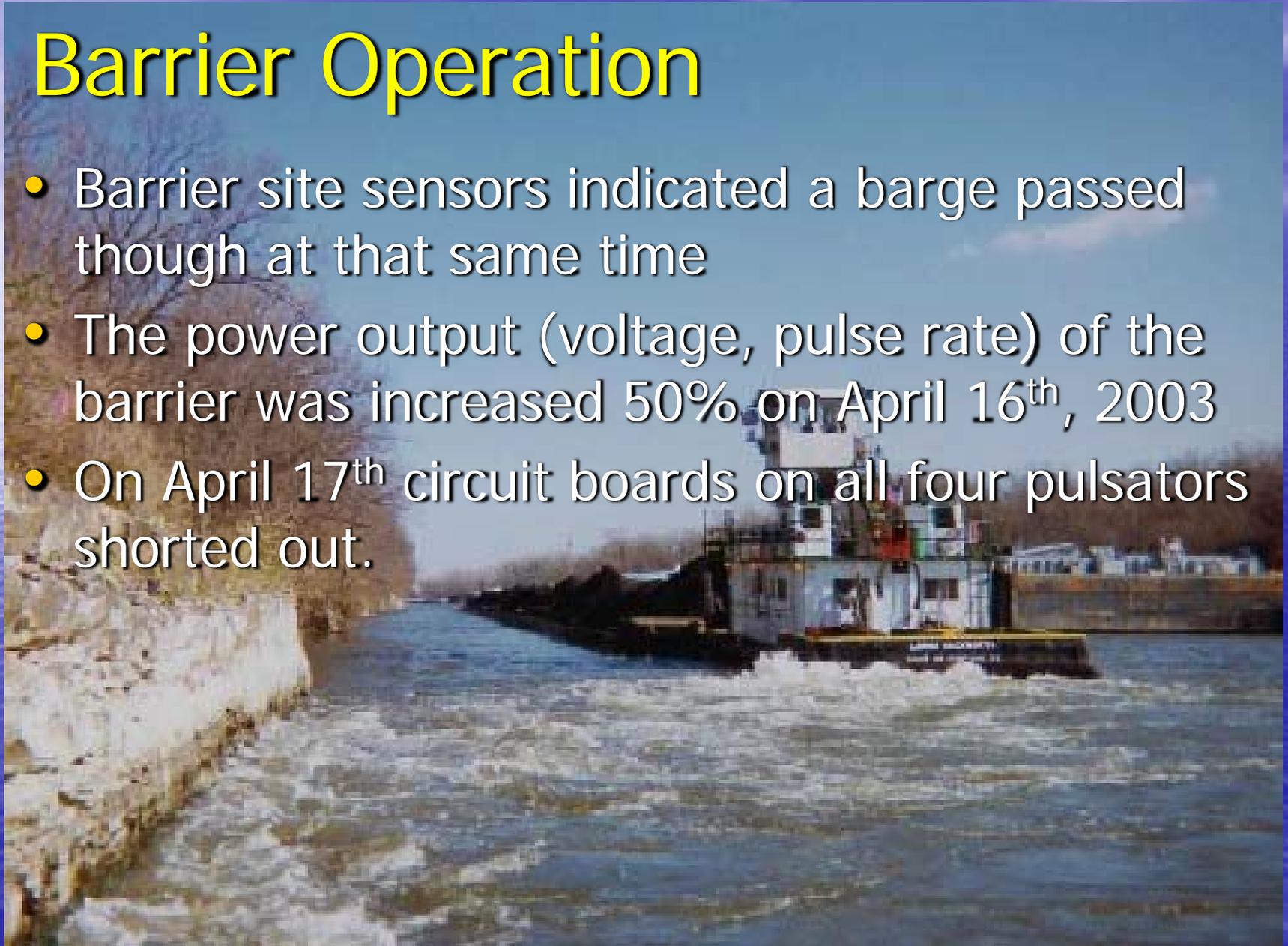
Barrier Monitoring

- Univ. of Illinois & Illinois Natural History Survey
- Uses radio-tagged common carp
- 132 fish tagged and released
- March 2003 found a tag upstream of the barrier
- Data from fixed antennas indicated the tag passed through the array between 2:30 and 2:35 PM on April 3rd



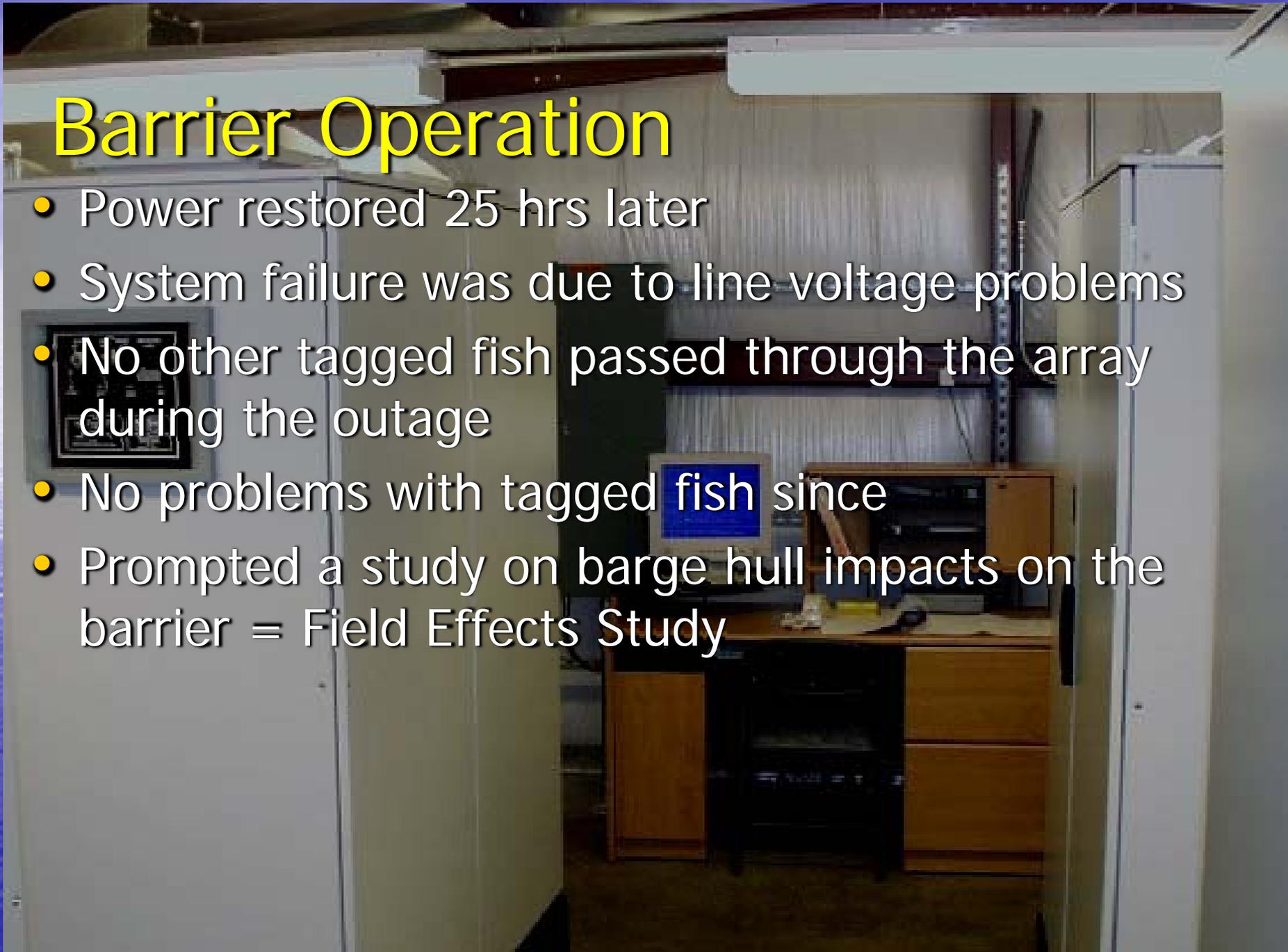
Barrier Operation

- Barrier site sensors indicated a barge passed through at that same time
- The power output (voltage, pulse rate) of the barrier was increased 50% on April 16th, 2003
- On April 17th circuit boards on all four pulsators shorted out.



Barrier Operation

- Power restored 25 hrs later
- System failure was due to line voltage problems
- No other tagged fish passed through the array during the outage
- No problems with tagged fish since
- Prompted a study on barge hull impacts on the barrier = Field Effects Study



Field Effects Study

- Barges create a weak area in the barrier field under the barge hull
- Could allow (or drag) a fish through the barrier field
- Barrier II double-array design addresses this problem

Chicago Sanitary and Ship Canal

Electric Fish Barrier

2A and 2B



Barrier IIA



Barrier II

- Two arrays
- 350 feet long (10X Barrier I)
- 6x6" Steel electrodes = 20-year service life
- Cost \$9.1 million; 75% Federal
- IL DNR provided \$1.8 million
- Other 7 Great Lakes States ~ \$70,000 each
- Need \$8.5 million more to complete



Barrier Safety



- Barge crew observed arcing at barrier site
- Arcing assess study completed March 2005
- Confirmed arcing could occur between barges
- USCG established a restricted activity zone:
 - No passing, mooring, single barge-wide tows
 - Special safety requirements – steel cables
 - All vessel occupants to wear PFDs

Danger

Electric Charge in Water

Do Not Stop, Anchor or Fish

No Mooring or Passing

Type 1 Lifejacket Must Be Worn

Notice

Leaving Electrical Shock
Hazard Area

NO MOORING

Barrier II Operation

- Safety testing completed in March 2007
- No sparks generated near coal dock
- Waiting for man overboard analysis
 - Due Friday Sept. 28
- Barrier IIA can operate if Barrier I fails
- But – Barrier II has problems
 - Leaking cooling system – needs repair
 - Not yet operated at full load

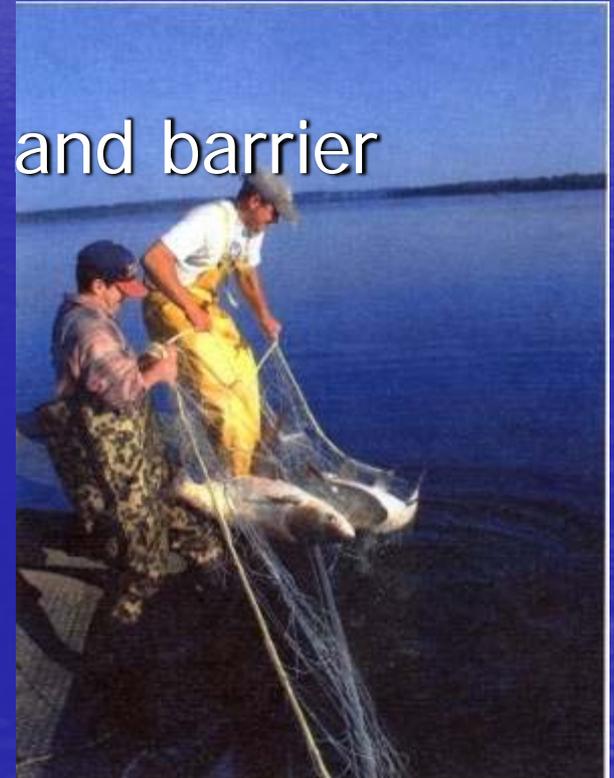
Asian Carp Monitoring

- 5 agency cooperative effort
- Electrofishing
- Mini Fyke nets
- Trammel nets
- Acoustic tags



Asian Carp Distribution

- June 2007, 13 Asian carp captured 13-15 miles below barrier in Des Plaines River
- 50+ miles from Lake Michigan
- Two locks between capture site and barrier



Asian Carp captures ★

Barrier Site: 296.5 ★

Lockport Lock ◆

Brandon Road Lock ◆

RM 284
2007

RM 274
2002

12.5 Mi



Barrier Legislation & Funding

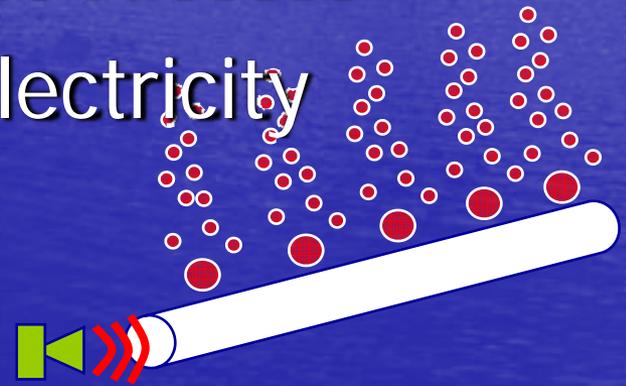
- President's Budget Proposal
 - Requires 25% non-federal match
 - Completion of Barrier II
 - Upgrade of Barrier I
 - Non-federal sponsor for O&M
- NAISA, WRDA and Asian Carp P & C Act
 - Provides full federal funding for Barriers
 - Federal O&M

Barrier status – bottom line

- Waiting for man overboard report
- Need federal appropriations
- Barrier I still operating
- Barrier II needs repair due to freezing
- Asian carp still ~12 miles away but more abundant

Ultimate Barrier

- A combination of barrier methodologies will likely be required for best success
- Acoustic-bubble barrier w/ electricity
- Safety a priority issue
- Funds requested for biological separation study



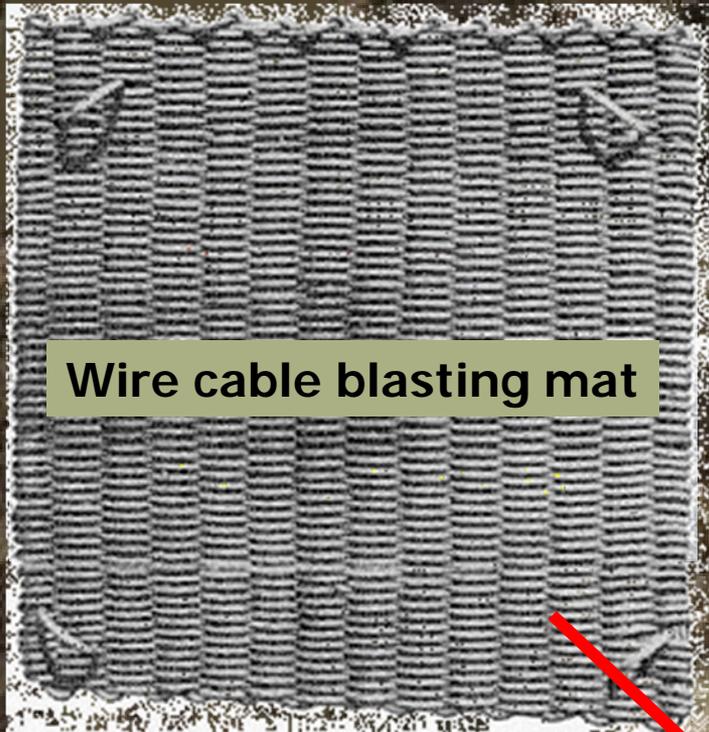
Danger

**Electric Charge in Water
Do Not Stop, Anchor or Fish
No Mooring or Passing
Type 1 Lifejacket Must Be Worn**

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Hazard Area**

NO MOORING



Wire cable blasting mat

Barrier I

Barrier II Site

Coal Dock



Barrier Safety

- Downstream voltage currently ~ 2 millivolts above background
- Barrier IIA can operate on an emergency basis at 1V/inch
- Need:
 - Further tests for arcing at coal dock
 - Install bumper to protect coal dock barges
 - Assess the effect on a person in the water

So where are the carps?

- Asian carp monitoring:
 - Corps of Engineers
 - Metropolitan Water Reclamation District
 - IL DNR
 - USFWS
 - IL Natural History Survey



Asian Carp Monitoring Area

Locks 

Barrier Site 

4 sites

Monthly samples

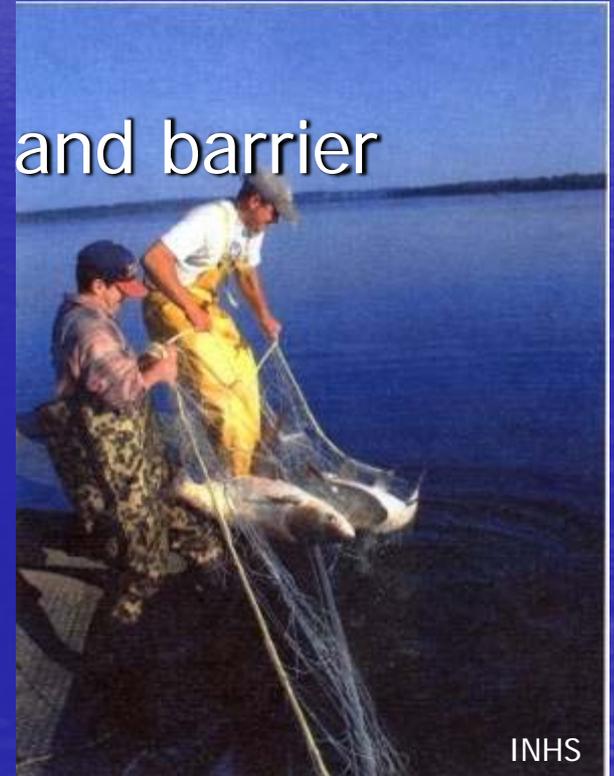
Fyke, trammel nets

Electrofishing



Asian Carp Distribution

- July 2002, 2 Live Asian carp found 22 miles below barrier in Des Plaines River
- 50+ miles from Lake Michigan
- Two locks between capture site and barrier
- No sightings upstream



Future of the Barrier

- Current cost estimates for completion of Barrier II exceed available funding
- Corps has requested \$8.5 million in additional funds



Barrier I

- Corps recently received authorization to spend \$400,000 on Barrier I
- Will operate Barrier I to about March 2007
- Barrier I will continue to operate until
 - It fails
 - Barrier IIA safety issues are worked out

Barrier II

- Senate and House passed versions of WRDA
- Both include provisions for the Barrier
 - Makes Barrier I permanent
 - Makes Barrier II a Federal project
 - Makes Barriers I and II a system
- Corps needs authorization *and* funding for long term O&M
- Without legislation, Illinois becomes barrier owner
- \$20,000/month operating cost