CAWS Advisory Committee – Background and ANS Control Evaluation

Great Lakes Commission 2015 Annual Meeting

HDR

September 28, 2015

ADVISORY COMMITTEE WORKING CRITERIA

- Prevent 2-way Aquatic Nuisance Species (ANS) transfer
- Maintain/Enhance efficient waterway transportation
- Reduce flood risk in IL and IN
- Reduce impact of CSOs in IL and IN
- Protect/improve water quality and meet environmental regulations
- Reduce discretionary diversions from Lake MI
- Create local benefits and facilitate cost sharing

TECHNICAL WORK ACTIVITIES

- ANS Control Measure Evaluation
- Commercial Cargo Navigation Assessment
- Marine Transportation Operations Assessment
- Contaminated Sediment Consultation with U.S. EPA
- Water Quality and Environmental Regulation Investigation with IL EPA and IDEM
- Flood Risk Management – Description of Potential System Components and Implications

CAWS Discussion Framework

This framework should not be characterized as an option being considered but rather as a tool for analyzing options and impacts

LONG TERM STRATEGY SYSTEM COMPONENTS USED FOR EVALUATION

- ANS Control Measures
  - Non-structural (monitoring, removal, inspection, education, etc.)
  - 2-way ANS Buffer Zone
- Water Quality and Flows
  - CSO Tunnel for Chicago River System
  - Pump Station w/ Disinfection at McCook
  - O'Brien & Calumet WRP Conduits
  - WRP & stormwater facility modifications related to anti-deg and GLI standards
  - Flow augmentation/circulation
  - Contaminated Sediment Remediation
- Flood Risk Management
  - Local flood mitigation measures
  - McCook/Thornton reconfiguration
- Transportation
  - Commercial cargo transportation infrastructure
  - Recreational navigation infrastructure
  - Management of extreme Lake MI levels

ANS CONTROL MEASURE EVALUATION

CAWS Advisory Committee

HDR

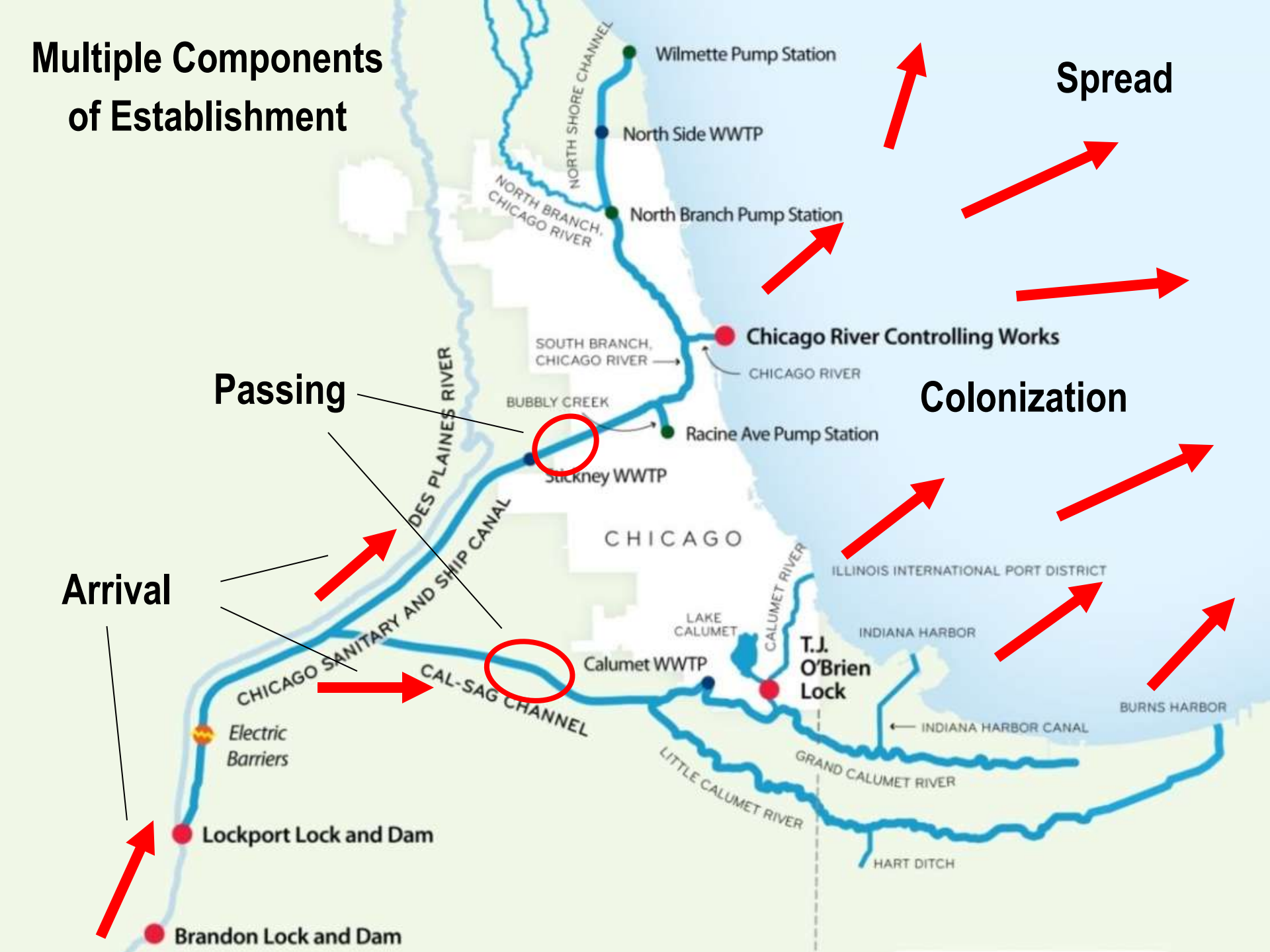
ANS CONTROL MEASURE EVALUATION

- ANS control measure evaluation by species
- Identify ANS lock system concepts for maximizing risk reduction
- Frame in context of GLMRIS Risk Assessment
- Risk reduction comparison for long term scenarios

ANS BUFFER ZONE

- 2-way species control
- Minimize impacts to users/uses
- Upstream/downstream control
- Combination of 1-way and 2-way control points
- Various technologies
- Miss River and Lake MI species
- Phased implementation

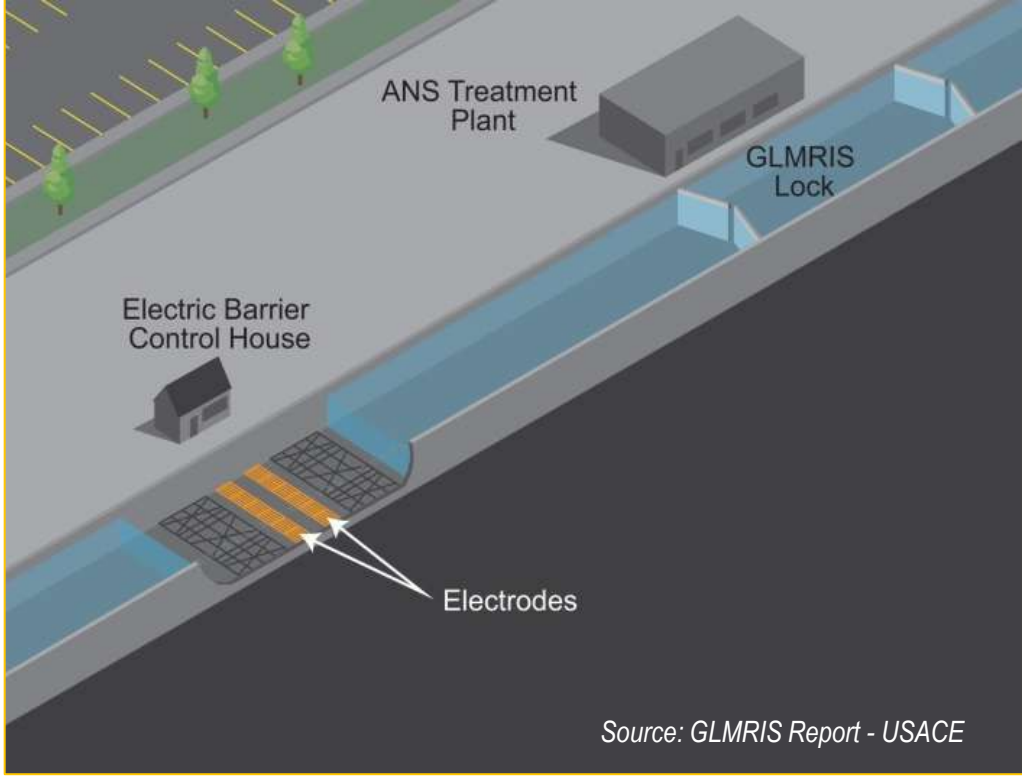
Buffer Zone Concept
(example for illustrative purposes only)


Multiple Components of Establishment
Spread
Passing
Colonization
Arrival
Wilmette Pump Station
North Side WWTP
North Branch Pump Station
NORTH SHORE CHANNEL
NORTH BRANCH, CHICAGO RIVER
Chicago River Controlling Works
SOUTH BRANCH, CHICAGO RIVER
CHICAGO RIVER
BUBBLY CREEK
Racine Ave Pump Station
Stickney WWTP
DES PLAINES RIVER
CHICAGO SANITARY AND SHIP CANAL
CHICAGO
CAL-SAG CHANNEL
Calumet WWTP
LAKE CALUMET
CALUMET RIVER
T.J. O'Brien Lock
ILLINOIS INTERNATIONAL PORT DISTRICT
INDIANA HARBOR
INDIANA HARBOR CANAL
BURNS HARBOR
GRAND CALUMET RIVER
LITTLE CALUMET RIVER
HART DITCH
Electric Barriers
Lockport Lock and Dam
Brandon Lock and Dam

ANS LOCK SYSTEM

- Control Technologies
  - Flushing lock
  - Electric barrier
  - Water treatment
    (CO2, UV, Chlorine, Temperature, etc.)
- Species
  - Varies w/ controls
  - Active and passive movements
- Maritime transportation
  - Implications vary w/ controls
    - Fill/travel times
    - Stray currents
    - Operator/vessel safety
  - Additional investigations needed

System has Numerous Controls - Varies by Location



Sample ANS Lock System Configuration

PASSAGE REDUCTION FINDINGS

- ANS control measure evaluation by species
  - Efficiency varies by species and technology
    - Higher for fish species w/ chemicals than most plant species
    - Higher for lethal temperature for plant species than chemical
  - Current information suggests lethal temperature provides highest efficiency across all species
  - Uncertainty and/or ongoing development basis for range in efficiencies
- ANS Lock System Efficiency/Risk Reduction Estimates
  - Potential for > 85% efficiency or RRF ~ 7 for GLMRIS species
  - Potential for > 95% efficiency or RRF ~ 20 for Mississippi to Great Lakes species – based on cumulative effects
  - Combination with Brandon Road drives cumulative effects

FINDINGS

- Frame more fully in context of GLMRIS Risk Assessment
  - Probability of passage ➔ Probability of Establishment ➔ Risk Reduction
  - Several species may establish at any time (T0)
- Enhance risk reduction comparison for long term strategy
  - Weakest pathway link drives overall assessment
  - Further R&D and adaptive management is expected to improve efficiencies and reduce uncertainty

LONG TERM STRATEGY CONSIDERATIONS

CONSIDERATIONS FOR ADDITIONAL EVALUATION

- ANS Lock System Evaluations
  - Risk reduction validation – investigations for water treatment, lock flushing/mixing, lab & field testing
  - Feasibility/safety/operational assessments of selected ANS control measures
- Water Quality
  - Water quality modeling – update related to anti-degradation, GLI standards, and stormwater
  - Contaminated sediment – assess threshold levels and model sediment movement
- Flood Risk Management
  - Update assessment related to current framework reservoir concepts
- Transportation
  - Economic evaluations related to water compelled rates and potential business impacts/closures
  - Identification of additional infrastructure for potentially impacted industries/users

CONSIDERATIONS FOR ADDITIONAL EVALUATION

- Local/Regional Cost Sharing & Benefits
  - Identify local/regional cost & benefit elements of long term strategy components
  - Investigate potential cost-sharing and financial models
  - Cost/benefit analysis of all system elements

DISCUSSION

Water flow in the Chicago Area, circa 1900

Current water flow in the Chicago Area Waterway System

Graphics courtesy of the Great Lakes Commission

EXAMPLE OF PASSING PROBABILITY IMPACTS FOR *LONG TERM SCENARIOS*

Long Term Scenario	Example Species	Probability Element					Cumulative Change in Passage Probability	Risk Reduction Factor
		Pathway	Arrival	Passage	Colonization	Spread		
No control	N/A	100%	80%	100%	50%	50%	N/A	N/A
Scenario 1	Great Lakes	100%	80%	<5%	50%	50%	100% to <5%	>20 (100% vs <5%)
Scenario 1	Mississippi	100%	80%	15%	50%	50%	100% to 15%	7 (100% vs 15%)
Scenario 2	Great Lakes	100%	80%	<5%	50%	50%	100% to <5%	>20 (100% vs <5%)
Scenario 2	Mississippi	100%	80%	15%	50%	50%	100% to 15%	7 (100% vs 15%)

$$P_{path} \times P_{arrival} \times P_{passage} \times P_{colonize} \times P_{spread}$$

Notes:

1. Assumes all other probability elements are held constant
2. Arrival and Passage are only elements GLMRIS alternatives are expected to impact (pathway, colonization, and spread are all independent)
3. Assumes ANS Lock controls applied at multiple control points – Brandon Road and Stickney/Alsip

COMPARISON OF RISK REDUCTION BY SPECIES

Movement Type	Classification	Species	Time Period (years)	Basin at Risk	Estimated Risk Reduction of ANS Controls						
					GLMRIS Alts w/ ANS Lock Controls	Scenario 1: 2 ANS Locks			Scenario 2: 1 ANS Lock & 1 Physical Barrier		
					Risk Reduction[1]	Estimated Passage Reduction Efficiency	Cumulative Change in Passage Probability	Risk Reduction Factor[2]	Estimated Passage Reduction Efficiency	Cumulative Change in Passage Probability	Risk Reduction Factor[2]
Active Dispersal	Fish	Silver Carp	25	Great Lakes	Yes	95%	100% to <5%	>20	95%	100% to <5%	>20
		Bighead Carp	25	Great Lakes	Yes	95%	100% to <5%	>20	95%	100% to <5%	>20
		Ruffe	50	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
		Threespine Stickleback	0	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
		Tubenose Goby	10	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
Active/ Passive	Crustaceans	Scud	0	Great Lakes	No	95%	100% to <5%	>20	95%	100% to <5%	>20
		Bloody Red Shrimp	0	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
		Fishhook Waterflea	25	Mississippi	No	85%	100% to 15%	7	85%	100% to 15%	7
Passive Dispersal	Plants	Reed Sweetgrass	50	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
	Algae	Red Algae	0	Mississippi	No	85%	100% to 15%	7	85%	100% to 15%	7
		Diatom	0	Mississippi	No	85%	100% to 15%	7	85%	100% to 15%	7
		Grass Kelp	10	Mississippi	Yes	85%	100% to 15%	7	85%	100% to 15%	7
	Disease	VHSv	0	Mississippi	No	85%	100% to 15%	7	85%	100% to 15%	7

Notes:

1. Risk is reduced provided no establishment occurs before plan implementation
2. Assumes all other probability elements are held constant and baseline passing probability is 100%.