USGS
science for a changing world

Columbia
Research

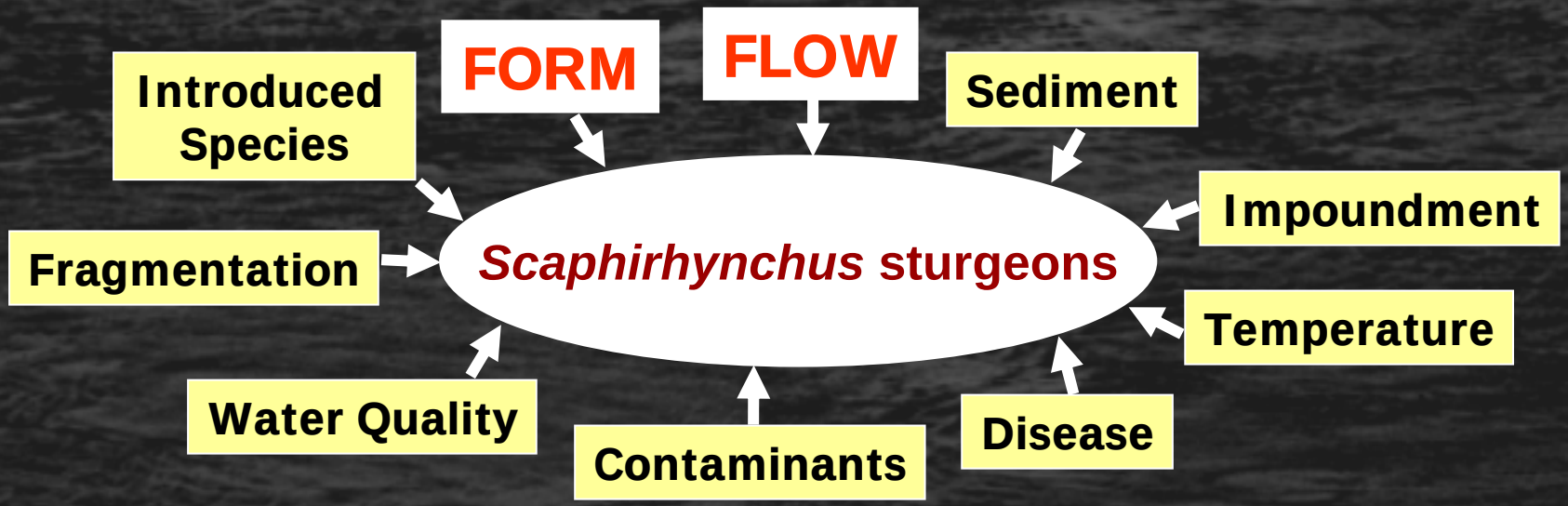
Sturgeon Research

Progress Update and Vision, September 2005

Sturgeon Research Team
U.S. Geological Survey
University of Missouri
Columbia, Missouri

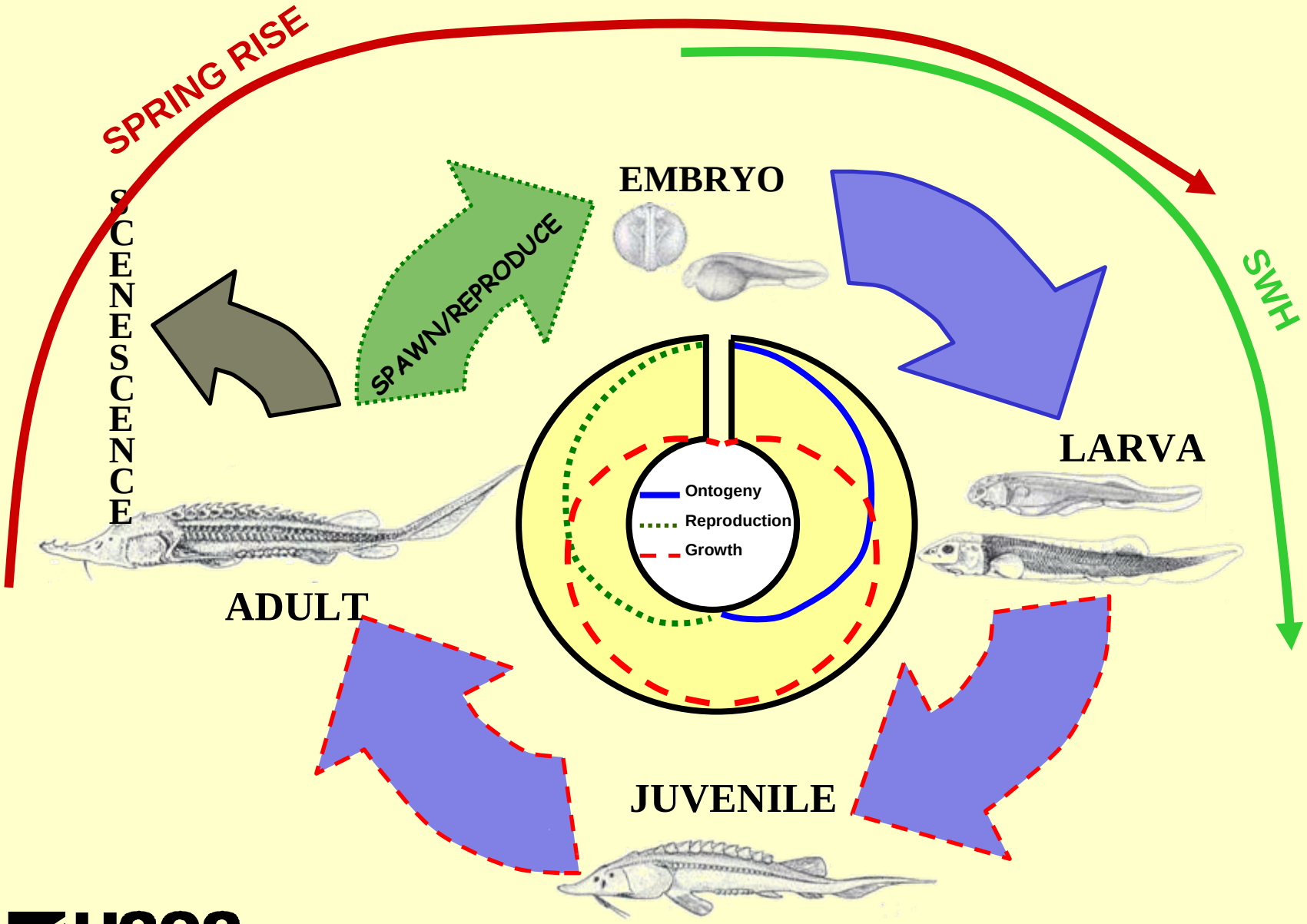
U.S. Department of Interior
U.S. Geological Survey

Environmental Stressors Affecting Missouri River *Scaphirhynchus* sturgeons



USGS

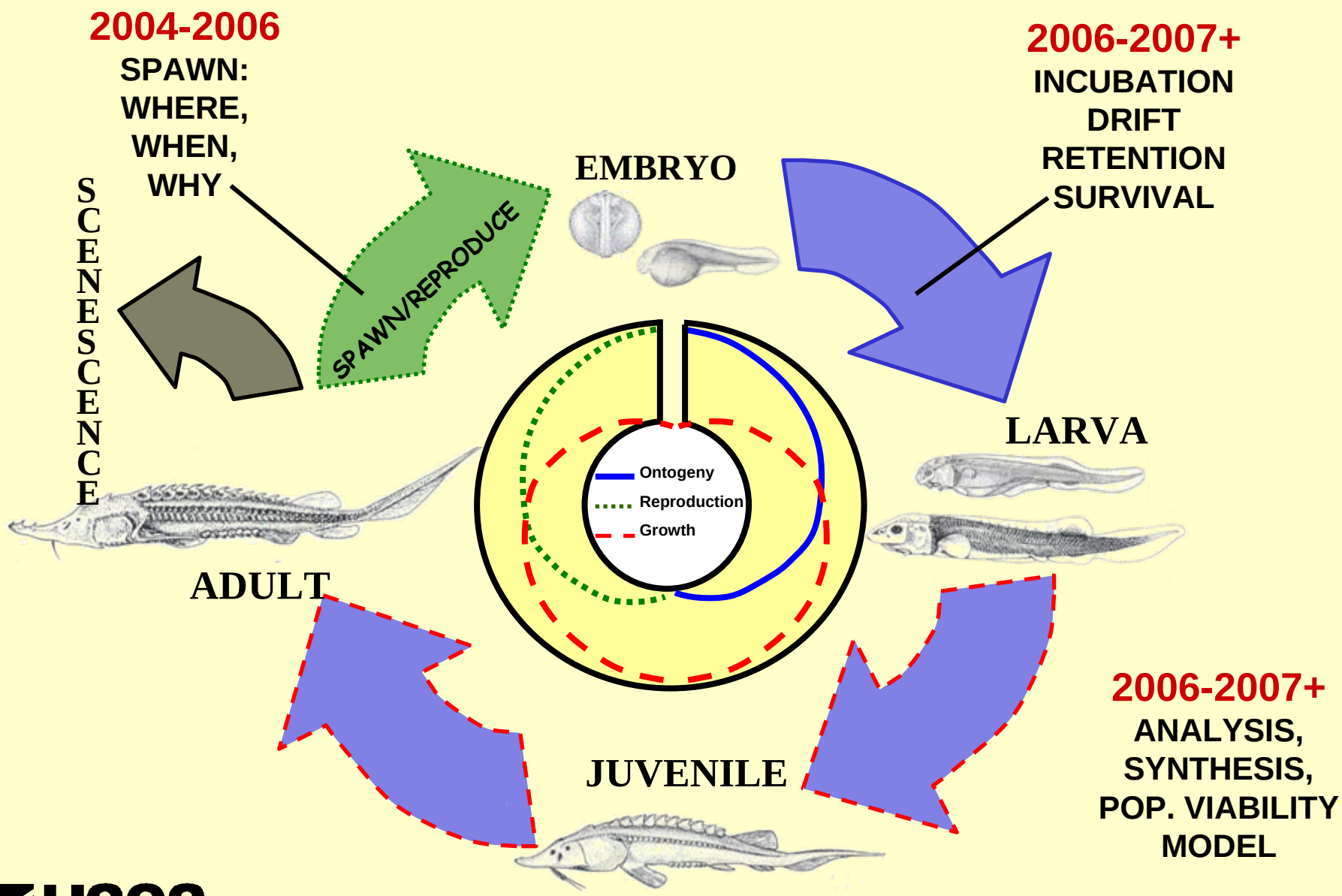
GENERALIZED *SCAPHIRHYNCHUS* LIFE STAGES



USGS

Adapted from Fuiman & Werner 2002

GENERALIZED *SCAPHIRHYNCHUS* LIFE STAGES



USGS

Adapted from Fuiman & Werner 2002

Sturgeon Research Scope 2005

Evaluation Of Reproduction, Spawning Movement And Habitat Of Missouri River Sturgeon

- Multiple Reach Comparison
- Opportunistic
- Flow as the Primary Variable
- Anticipation of Management Action
- Behavior, Physiology, and Habitat

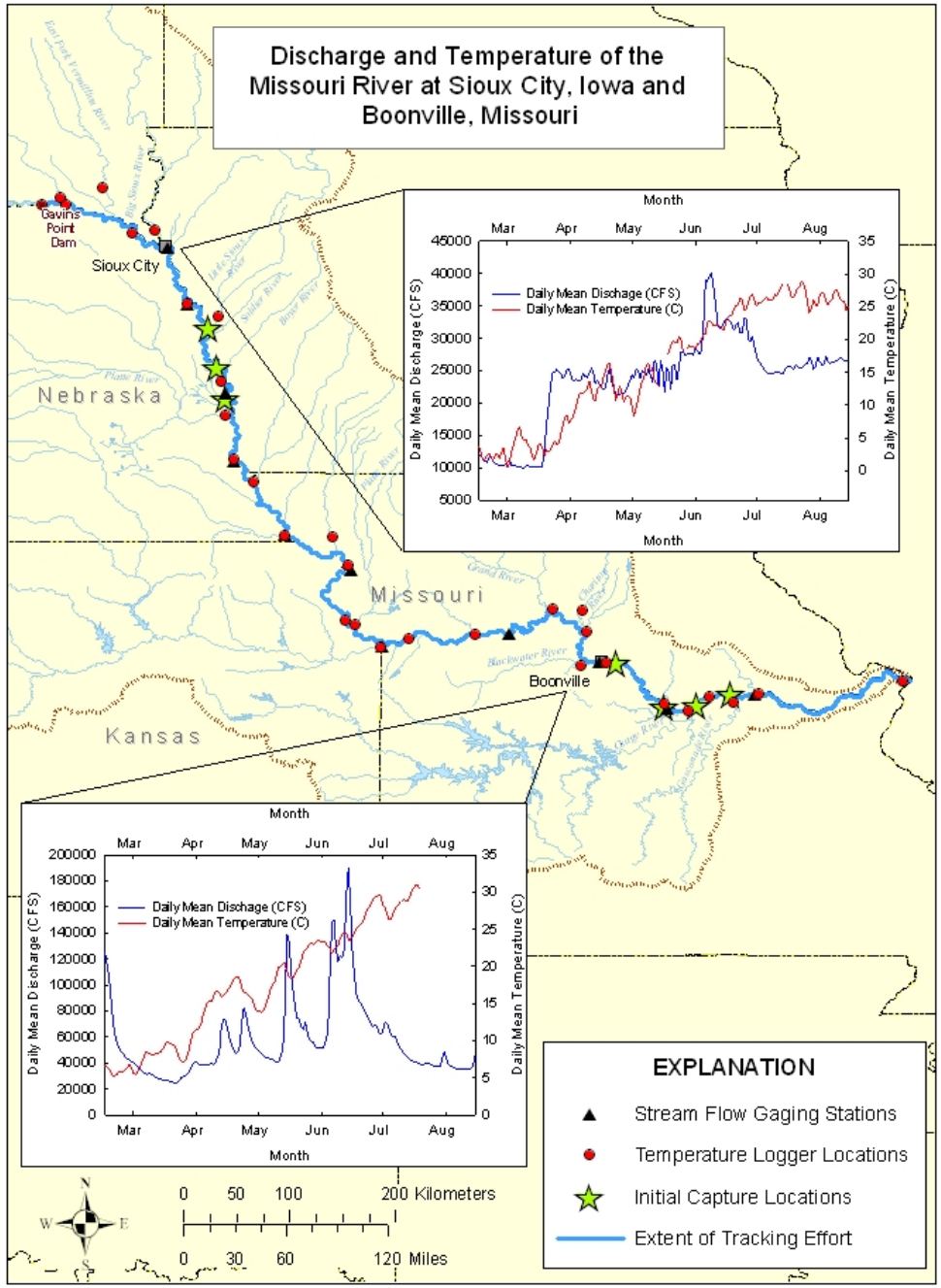
USGS

EXPERIMENTAL RIVER SEGMENTS

USGS

ENVIRONMENTAL CONDITIONS

Flow
Temperature



USGS

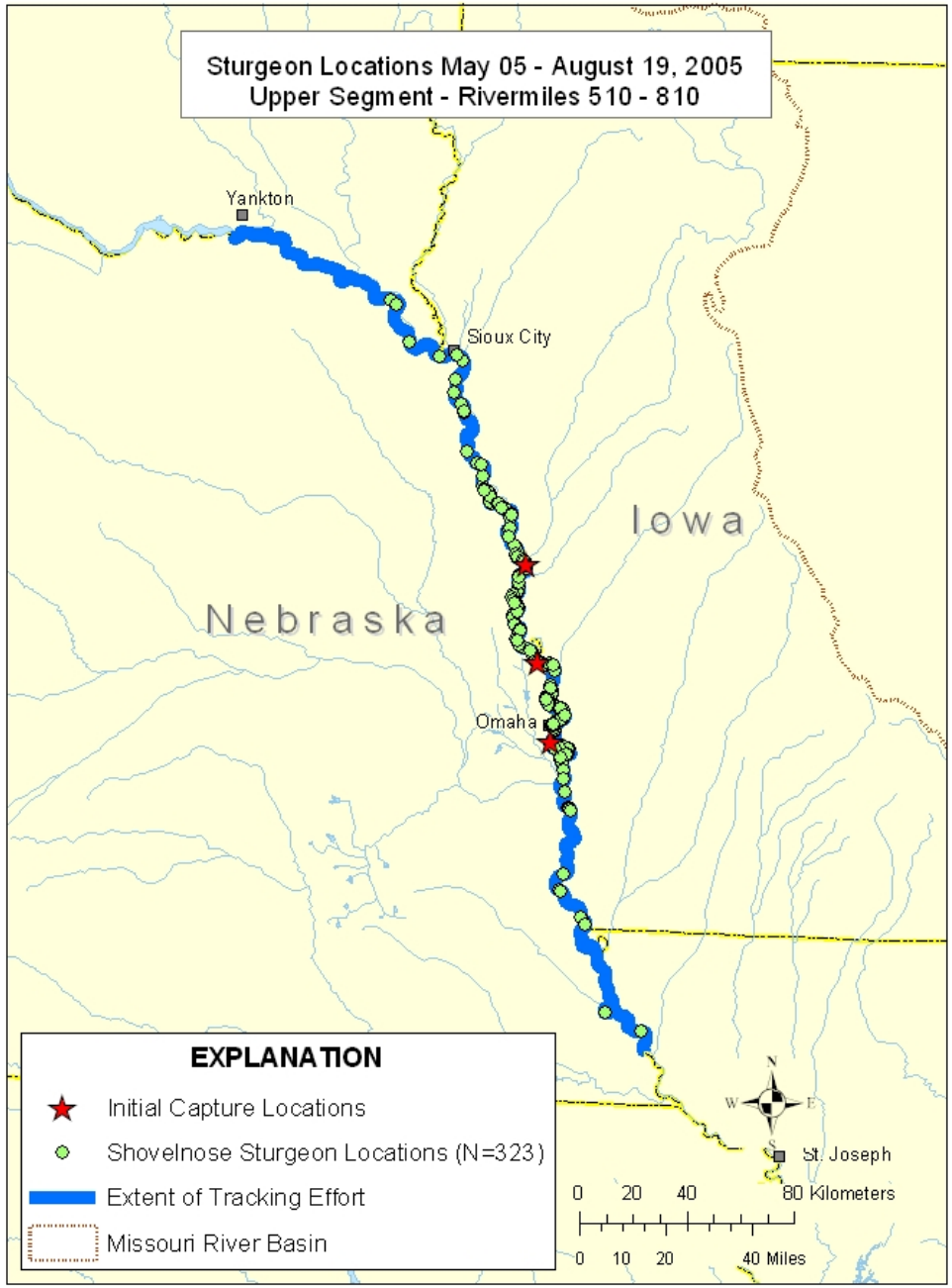
STURGEON REPRODUCTION

USGS

DOWNSTREAM STURGEON RELOCATIONS

USGS

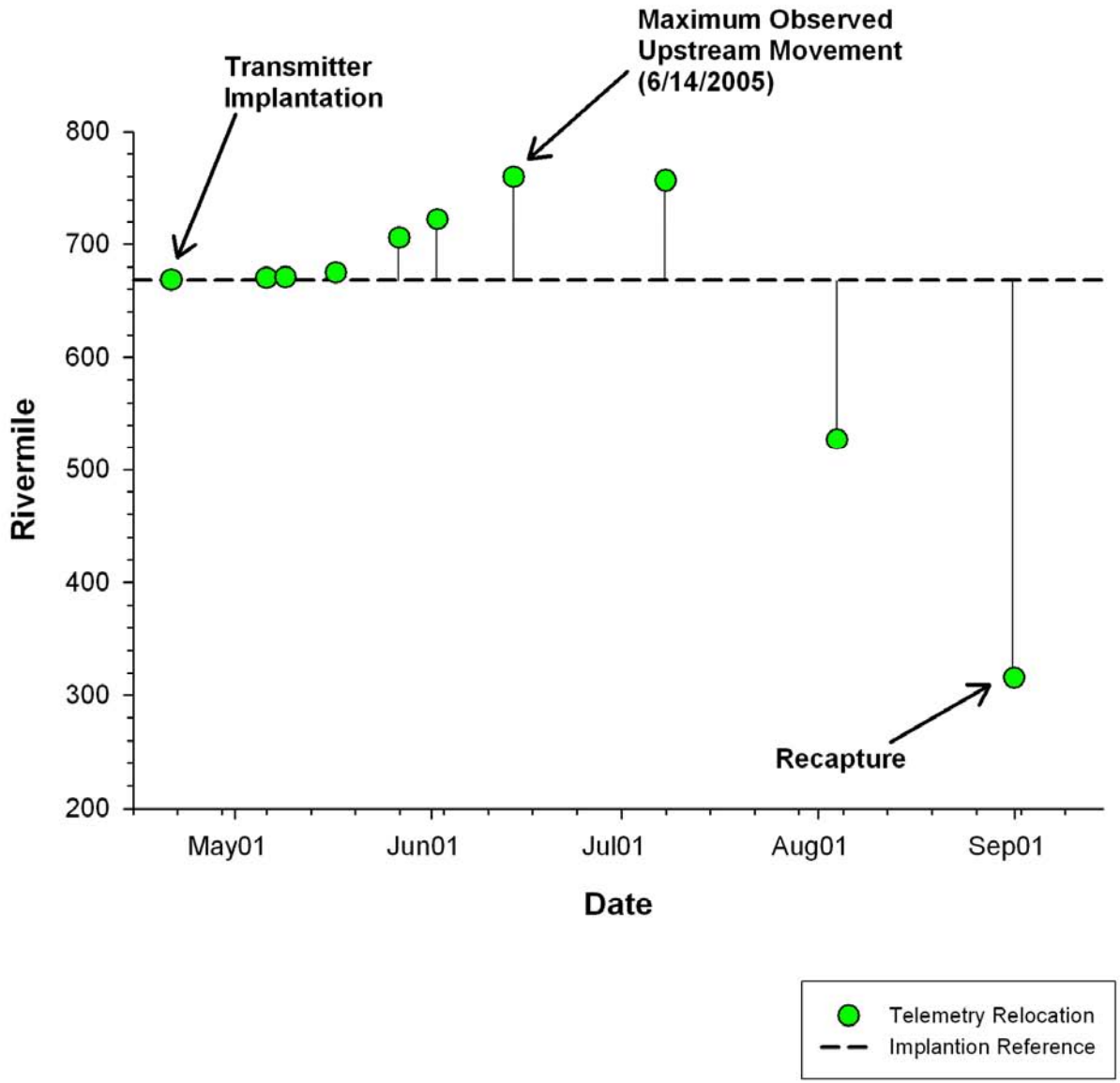
UPSTREAM STURGEON RELOCATIONS



USGS

•STURGEON MOVEMENT

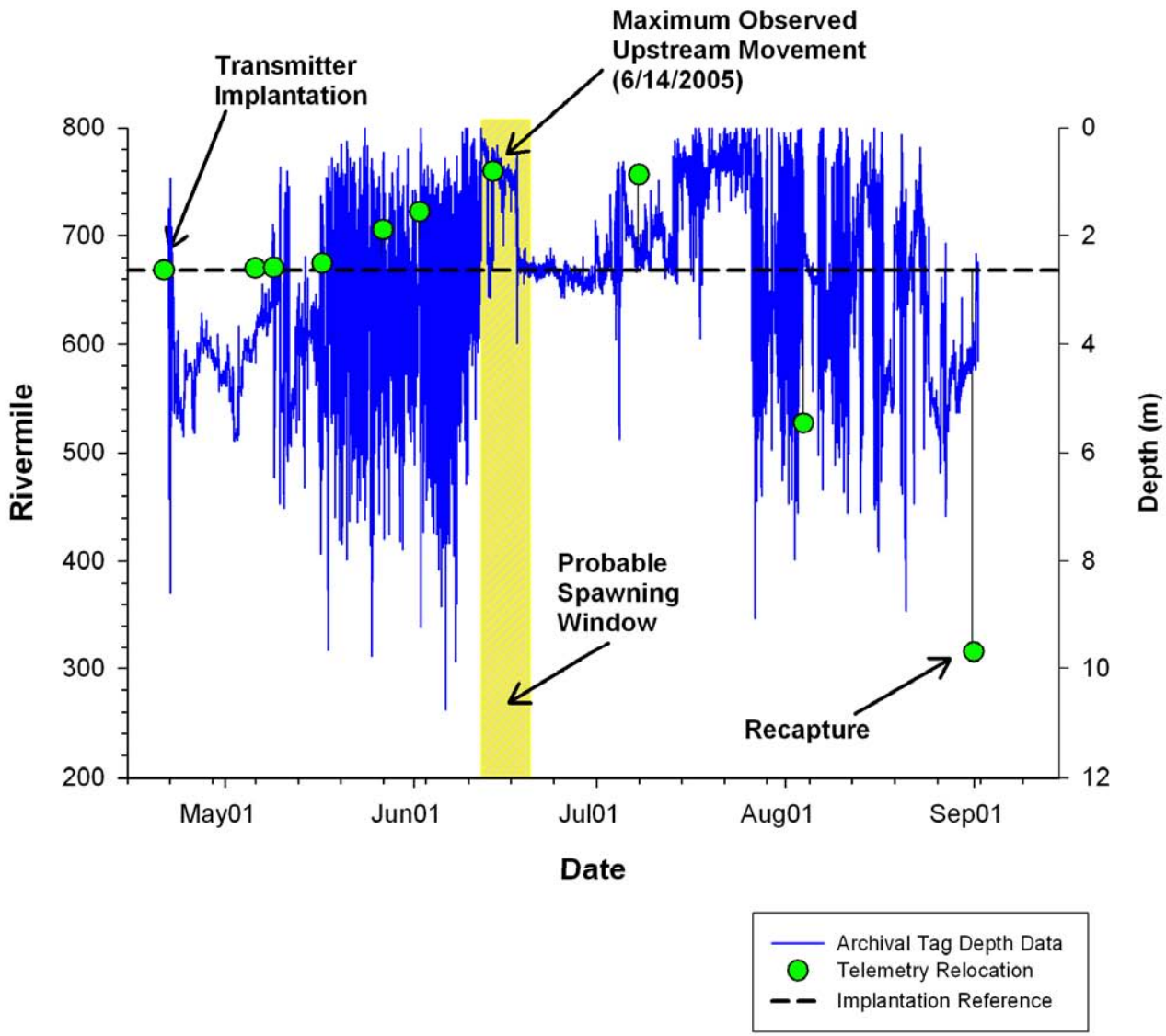
Fish# 131



USGS

•STURGEON HABITAT USE (DEPTH)

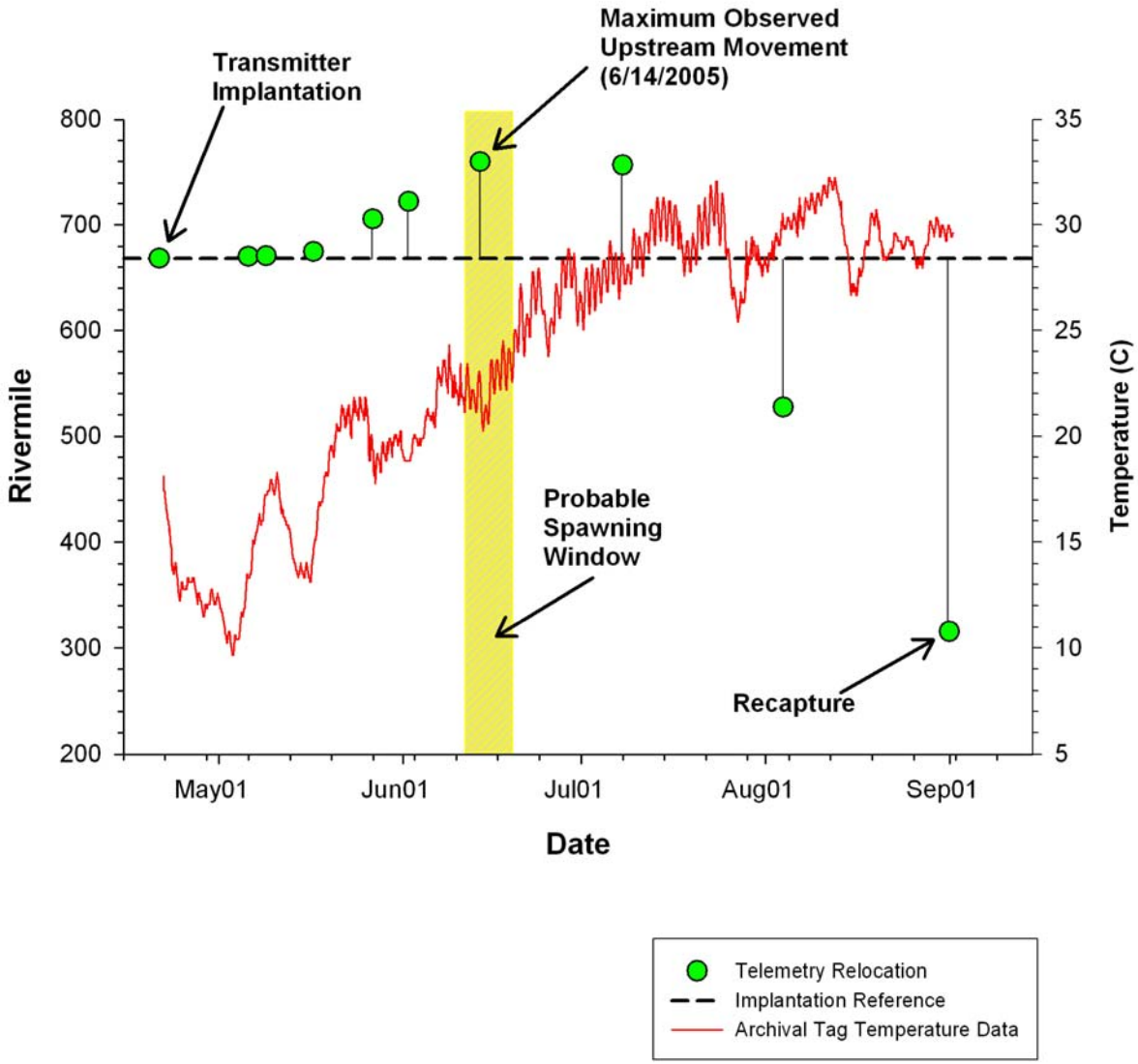
Fish# 131



USGS

•STURGEON HABITAT USE (TEMPERATURE)

Fish# 131



USGS

Physiological Condition

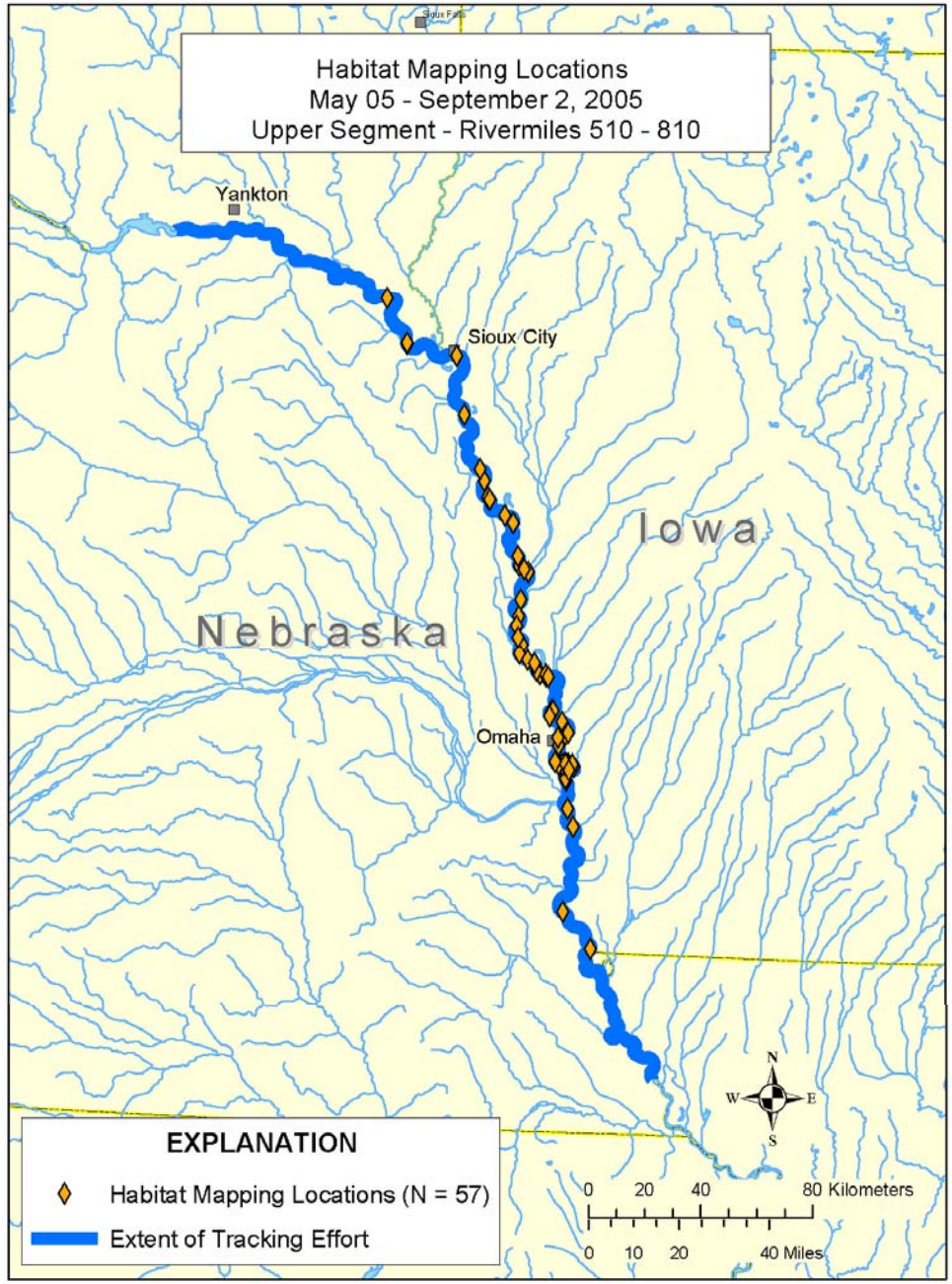
- PI: 0.17
- Activation Assay: negative
- E/T: 1.0
- Cortisol: 26.5 ng/mL
- Full Spawn

USGS

HYDROACOUSTIC HABITAT ASSESSMENT

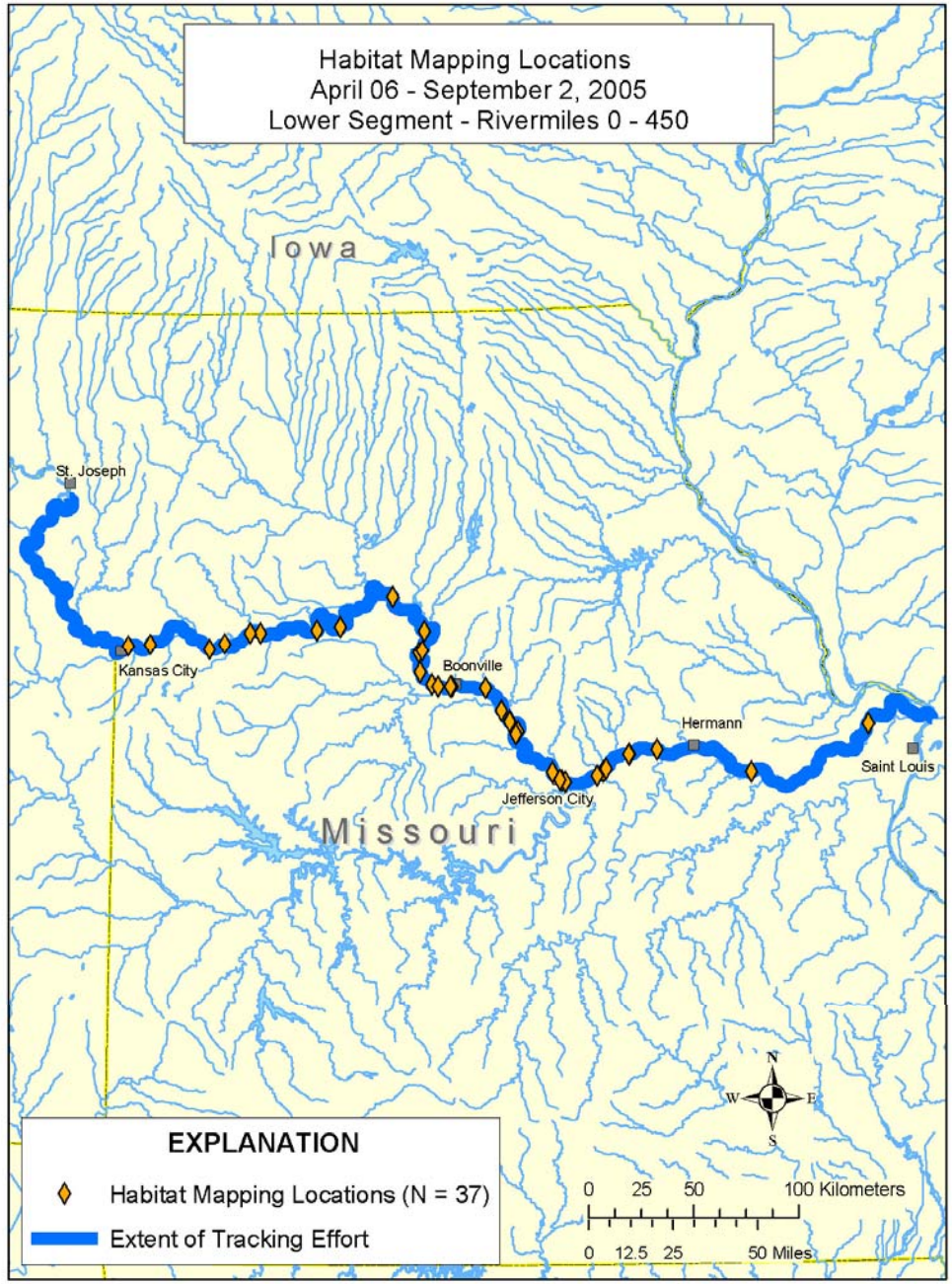
USGS

Upstream Segment Habitat Mapping Reaches

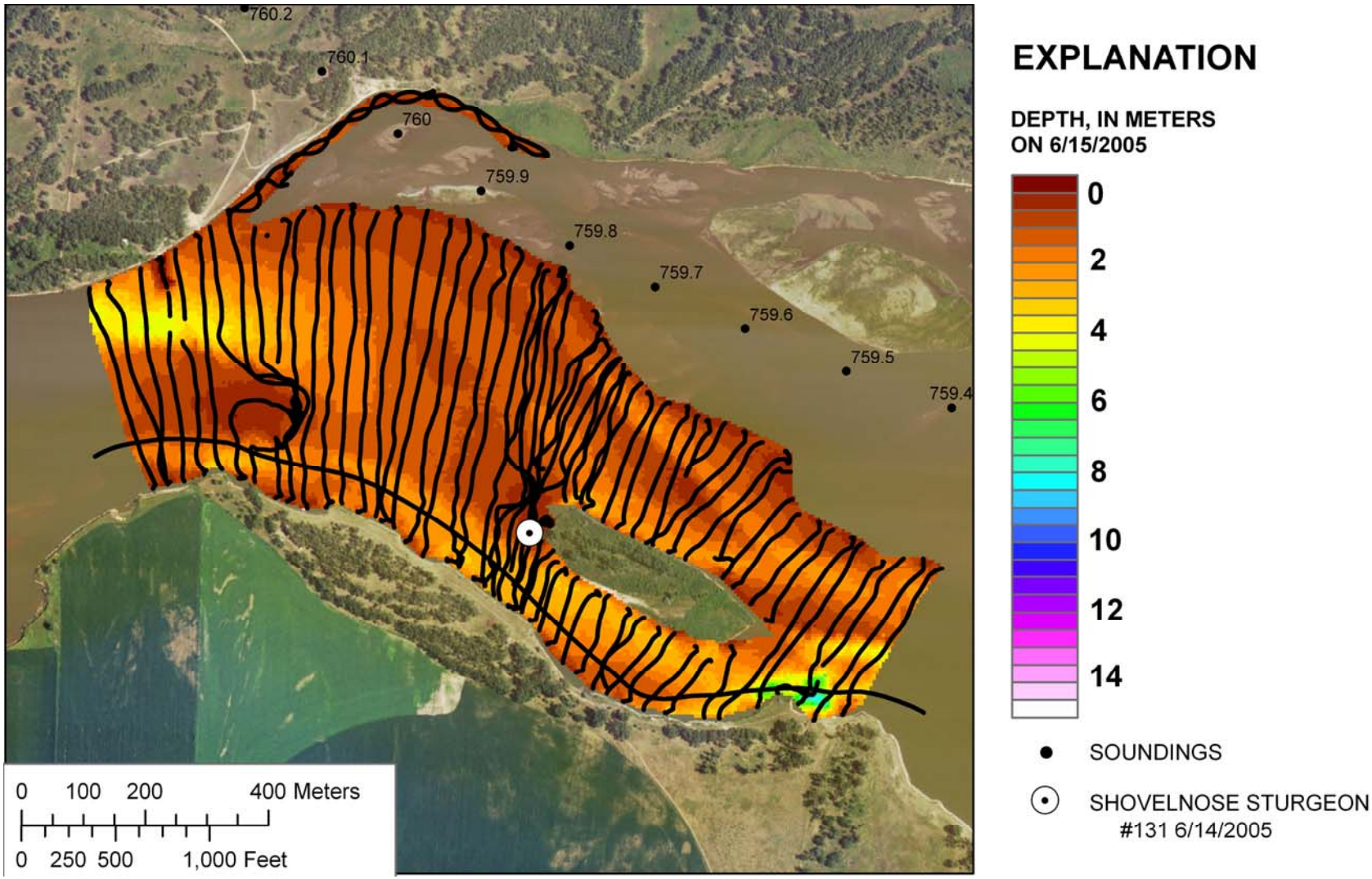


USGS

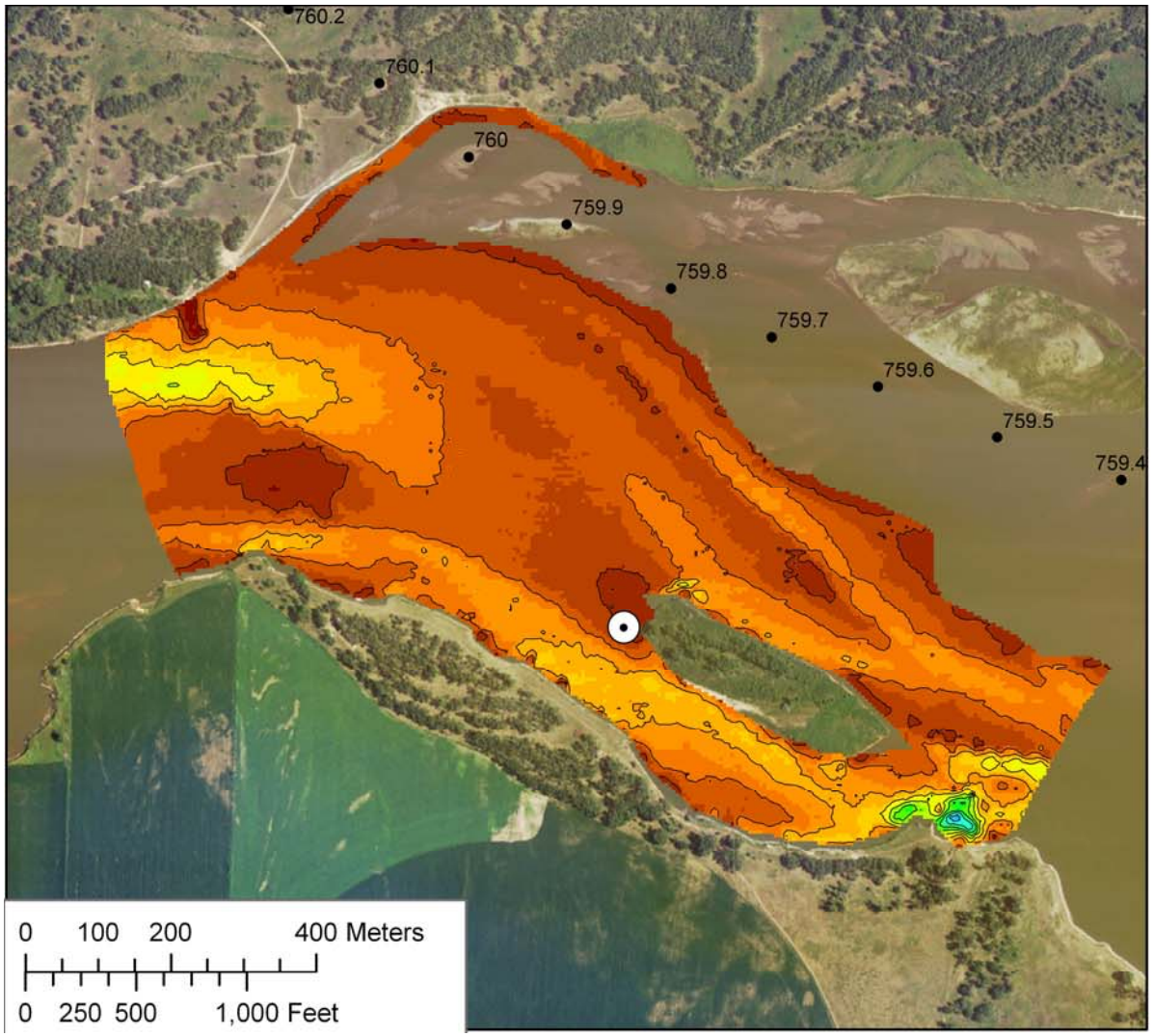
Downstream Segment Habitat Mapping Reaches



USGS


760.2
760.1
760
759.9
759.8
759.7
759.6
759.5
759.4
0 100 200 400 Meters
0 250 500 1,000 Feet
EXPLANATION
DEPTH, IN METERS
ON 6/15/2005
0
2
4
6
8
10
12
14
SOUNDINGS
SHOVELNOSE STURGEON
#131 6/14/2005

USGS



EXPLANATION

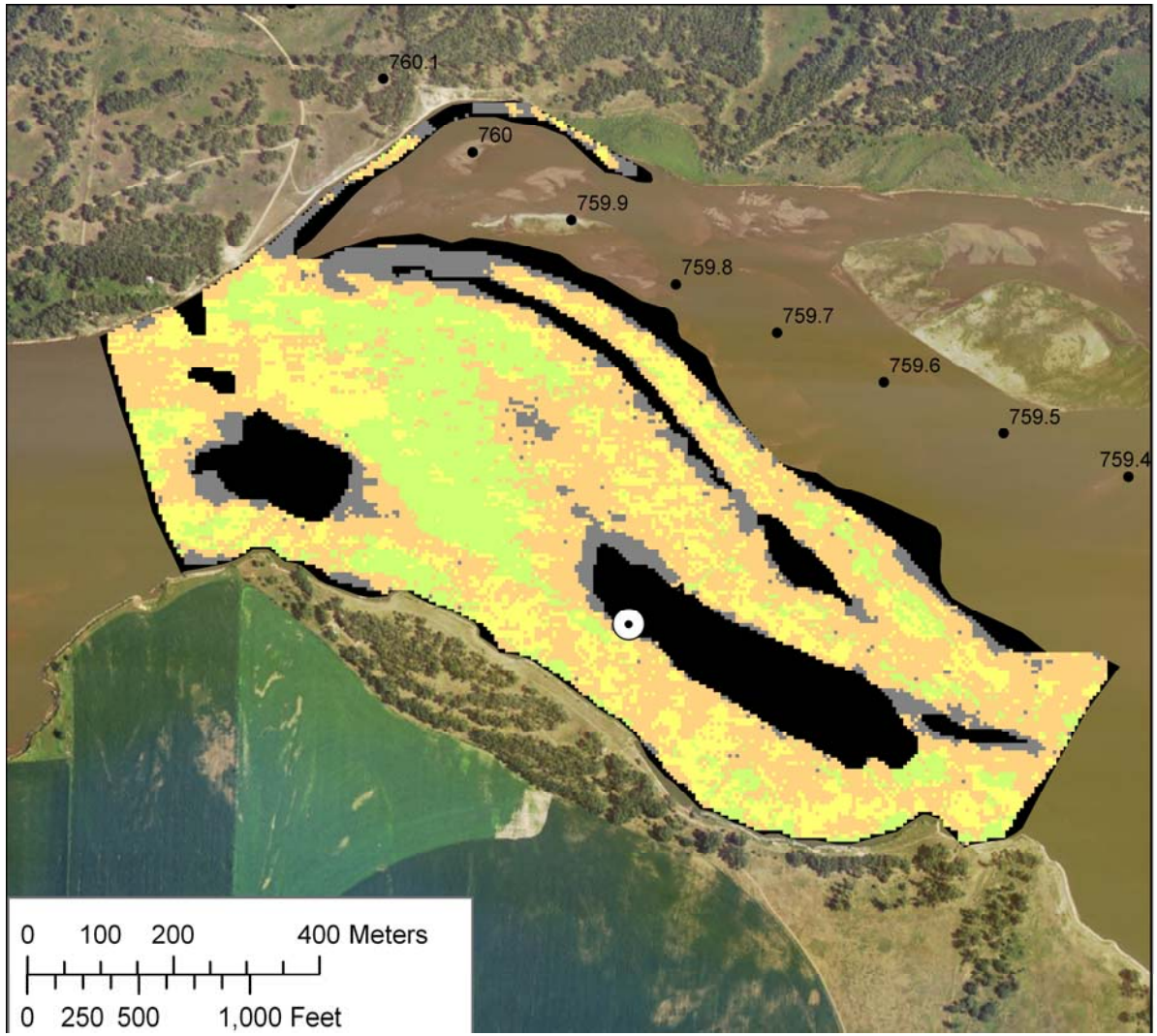
DEPTH, IN METERS
ON 6/15/2005

0
2
4
6
8
10
12
14

1 METER DEPTH CONTOURS

SHOVELNOSE STURGEON
#131 6/14/2005

USGS



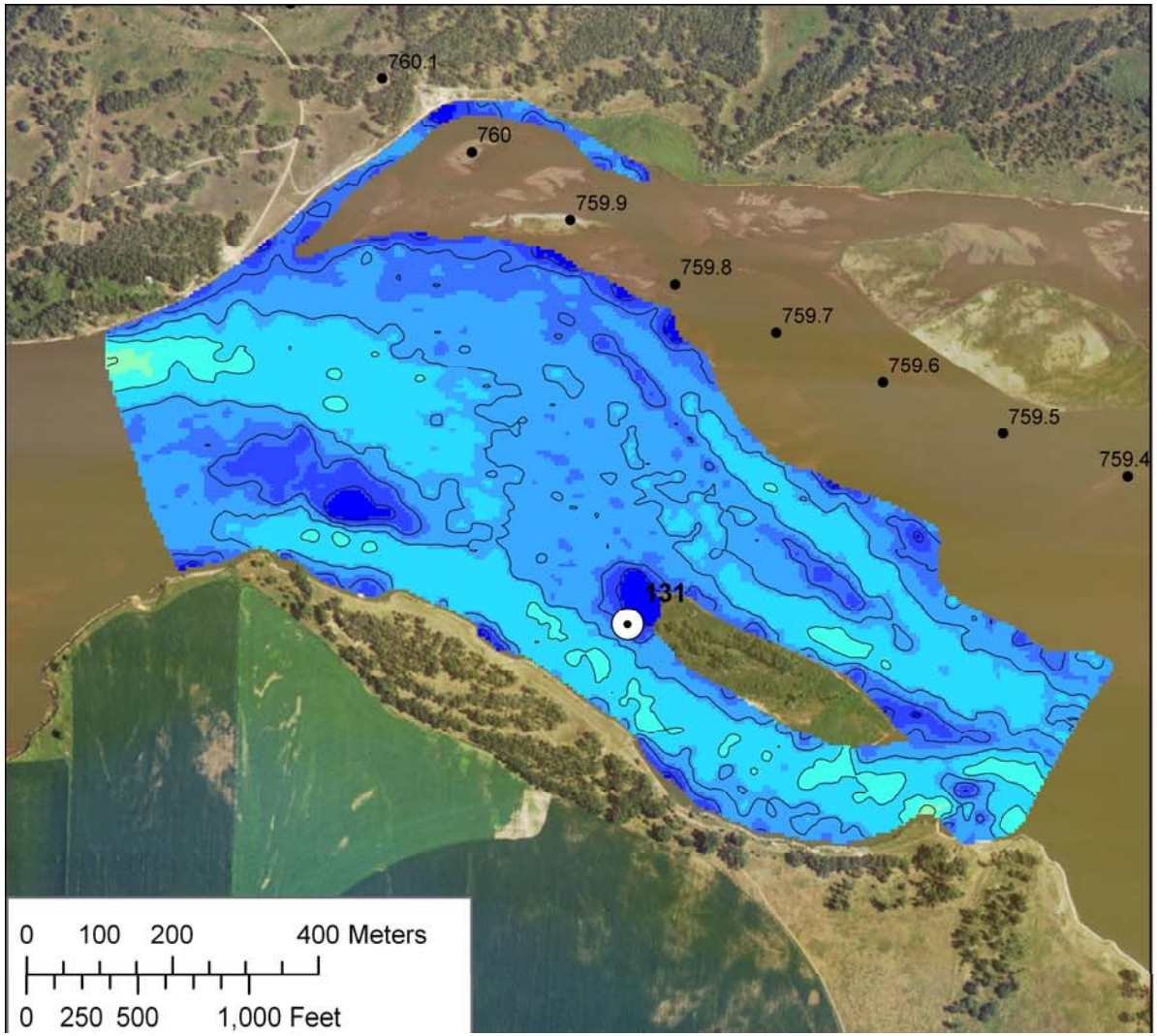
EXPLANATION

SUBSTRATE

- MUD
- SAND AND MUD
- SAND
- SAND DUNES
- NO DATA

⊙ SHOVELNOSE STURGEON #131 6/14/2005

USGS



EXPLANATION

AVERAGE WATER COLUMN VELOCITY, IN METERS PER SECOND

0

1.0

2.0

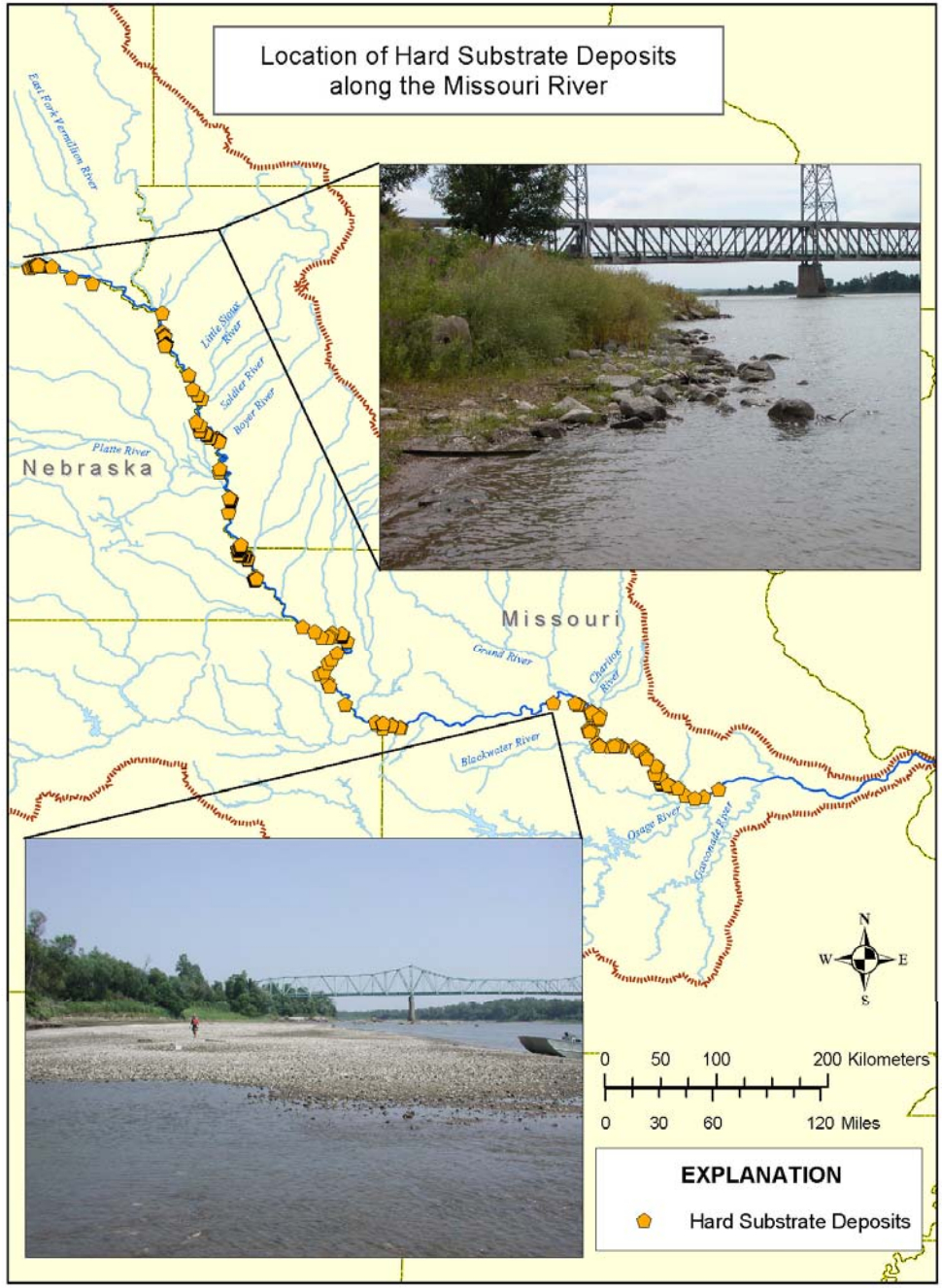
3.0

0.25 M/S CONTOUR LINE

SHOVELNOSE STURGEON #131 6/14/2005

USGS

Hard Substrate Mapping



USGS

Spawning Substrate Inventory

- 9/15/2005: 70% of LMOR has been surveyed with preliminary protocol.
- 274 deposit locations mapped.
- 35 significant bedrock exposures mapped.
- Natural hard substrates exist in patches throughout, including Gavins Point Reach.

USGS

Sturgeon Research Scope 2006 - 2007

With or without spring rise
Upstream/downstream comparison

- Spawning
  - Ecology
  - Physiology
  - Habitat
- Early life stage
- Synthesis and Modeling

USGS

Reproductive Ecology Research Scope 2006 - 2007

- Intensification of Effort
- Environmental & Physiological Linkages
- Geographic Focus
- Coordination
- Validation and Verification
- Event Characterization
- Population-level Inference

USGS

Early Life Stage Research 2006 - 2007

- Field
  - Verification of spawning: where, when (eggs and larvae)
  - Dispersal and post-dispersal
    - Methods development
    - Habitat availability and ‘use’

USGS

Early Life Stage Research 2006 - 2007

- Lab
  - Discrimination between PS and SNS
  - Temperature-specific time-to-hatch, and growth

USGS

Habitat Research Scope 2006 - 2007

- Spawning Habitat
  - Continue, refine inventory: stake out spawning locations
  - 3-dimensional hydraulic modeling habitat availability at high-potential sites in GP reach: spawning habitat availability during SR
  - Monitor erosion/deposition at modeling sites, GP reach: spawning habitat conditioning.
- Early life stage
  - Begin modeling/verifying hydrodynamics of larval drift and retention

USGS

SYNTHESIS AND MODELLING

	Population Forecasting						
Program	N_i	S_i	F_i	R_1	R_i	F/M	G
Population	C	C	E	E	E	E	C
Habitat	C	C					C
Mitigation	C	C					C
Propagation	C	C	C	C	C	C, E	C
MDC	C	C					C
USGS Research	E	E	C, E	C, E	E	C, E	E

Critical Environmental Factors for Reproduction, Egg and Larval Survival, Larval Growth

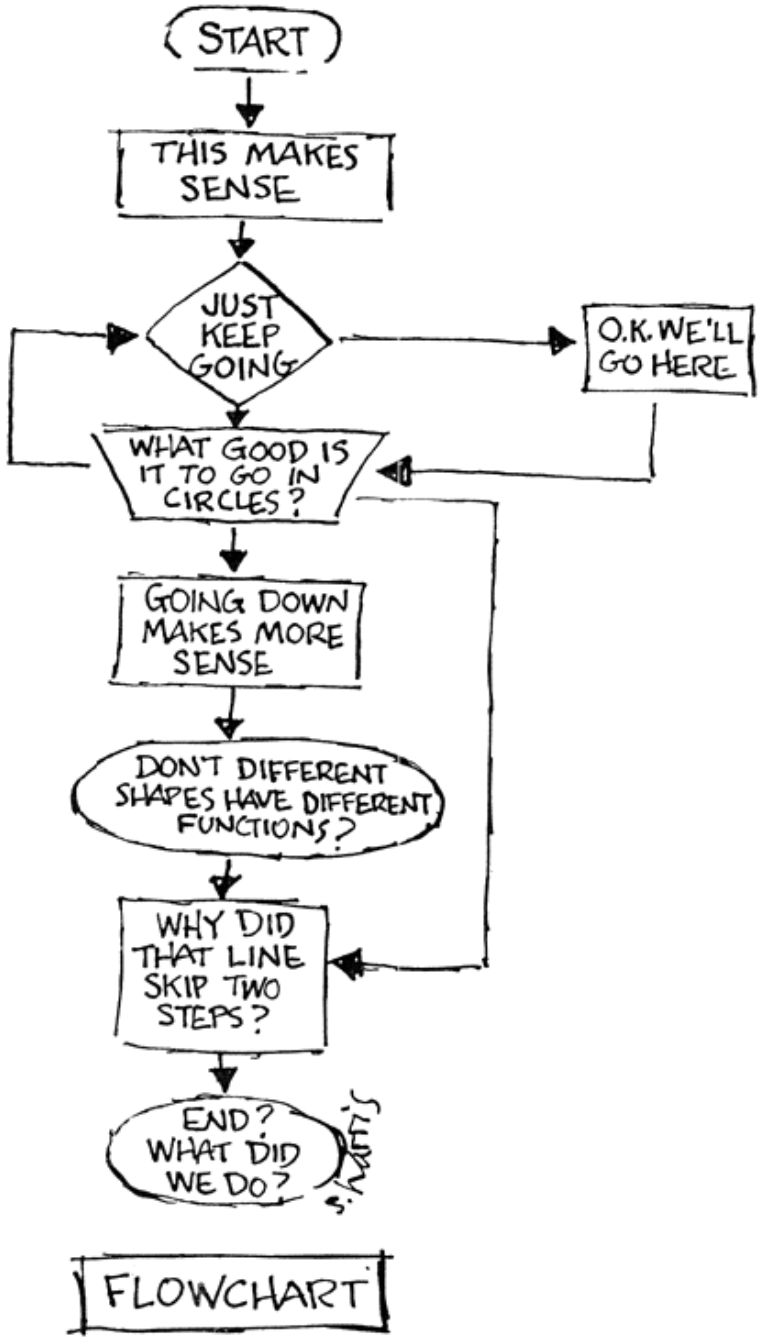
+

Habitat Assessment: Spatial and Temporal Patterns

USGS

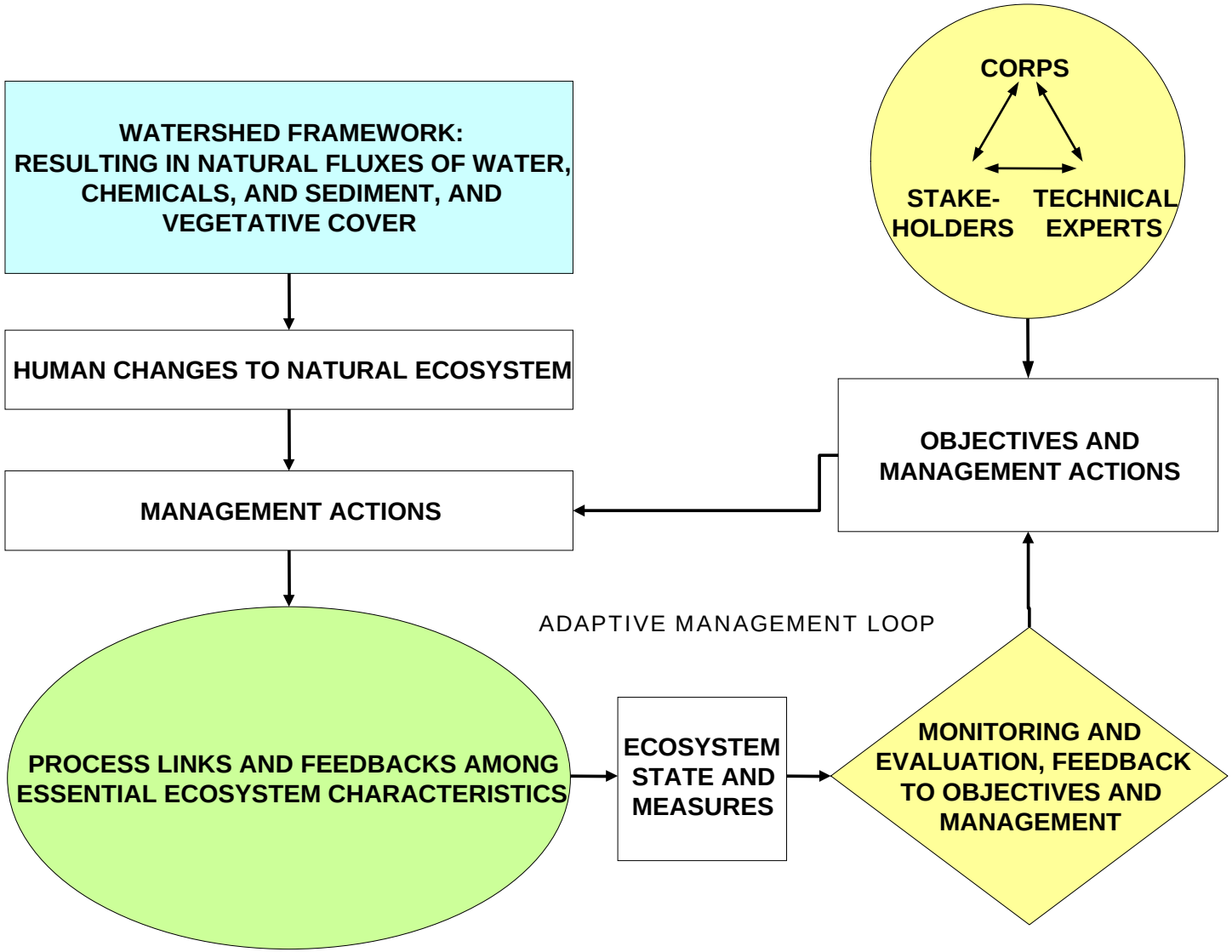
Conceptual Models:

- Illustrate structure
- Formulate hypotheses
- Precursor to simulation

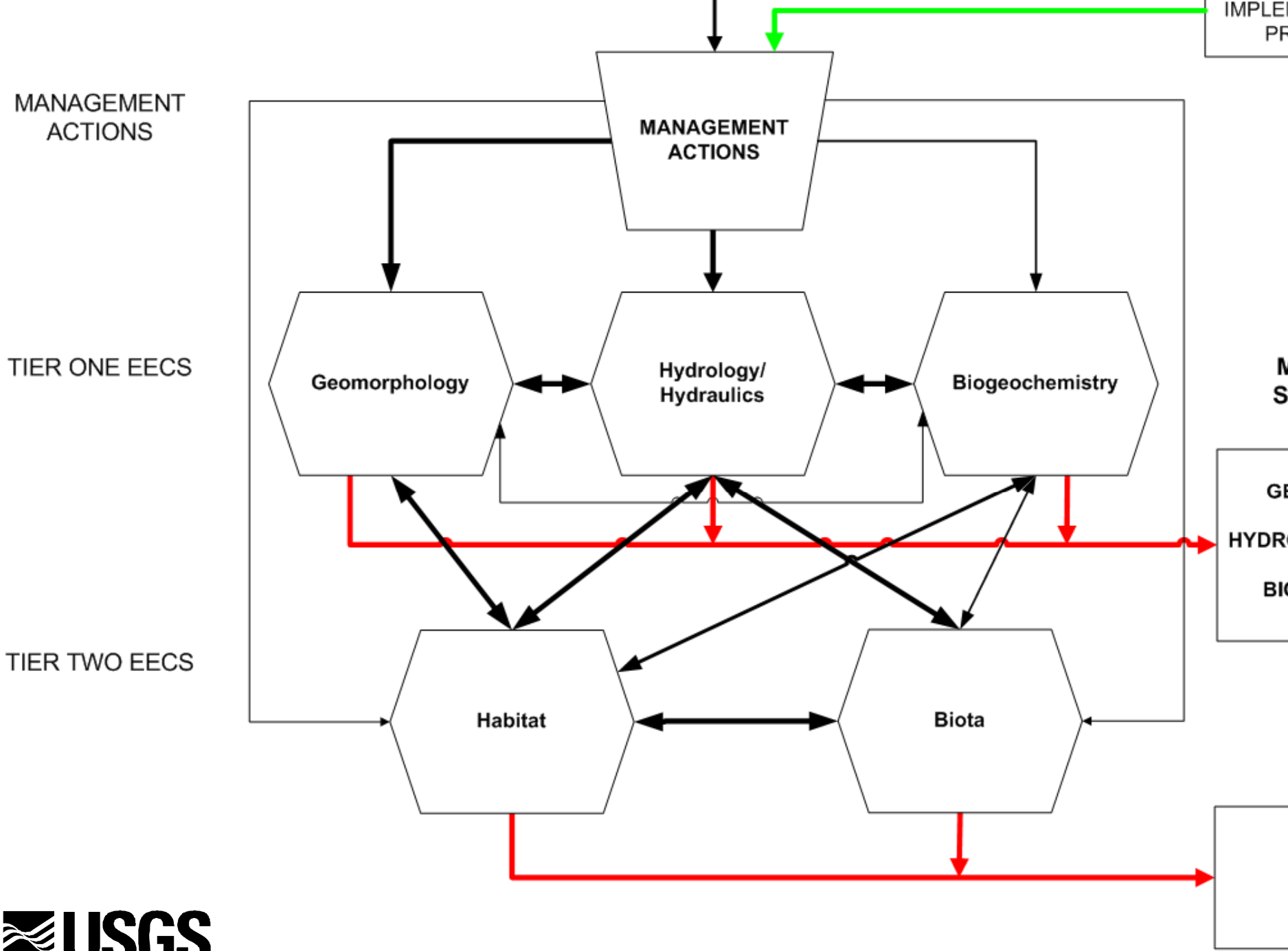


USGS

Simplified Conceptual Model



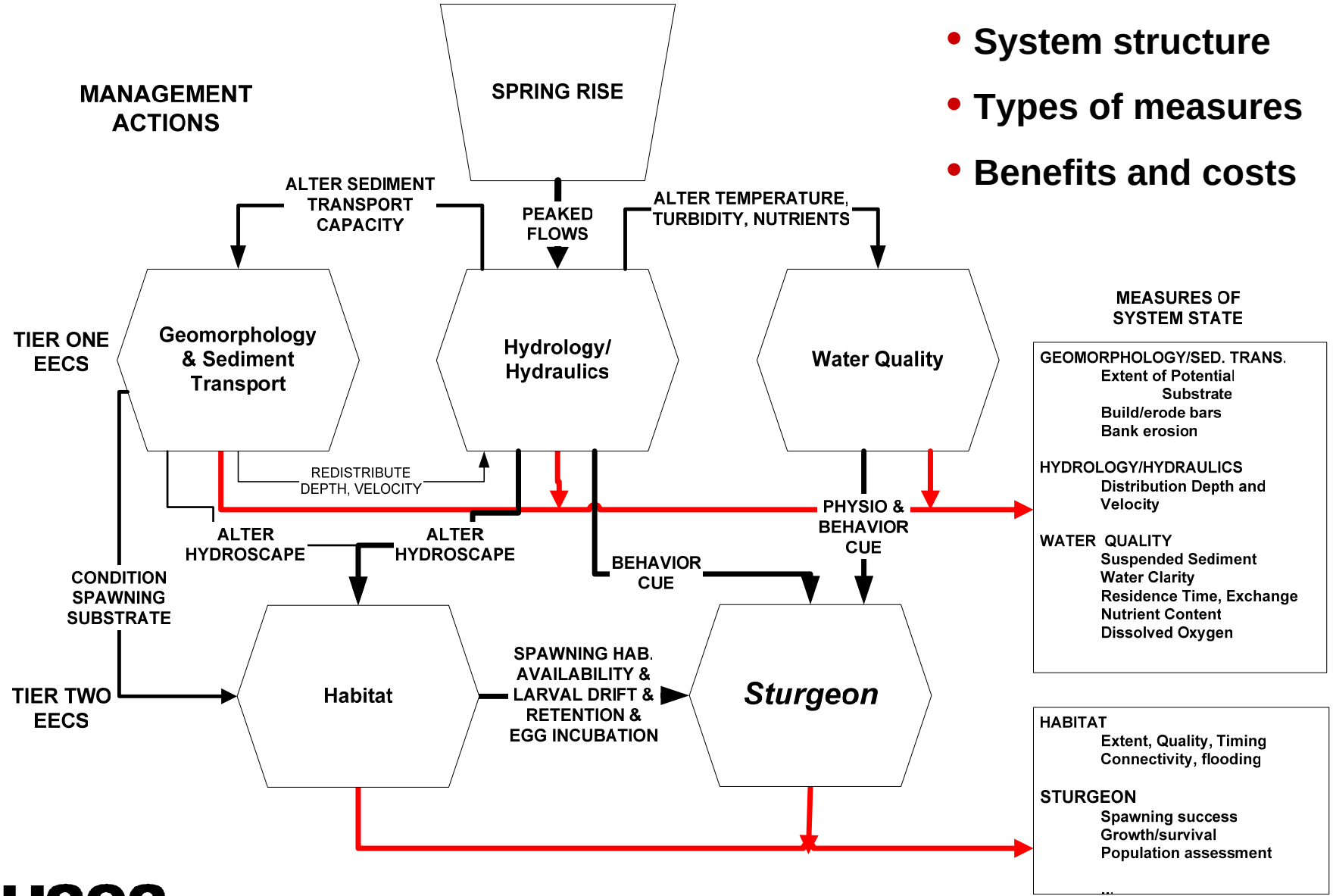
USGS


IMPLE
PR
MANAGEMENT ACTIONS
MANAGEMENT ACTIONS
TIER ONE EECS
Geomorphology
Hydrology/ Hydraulics
Biogeochemistry
M
S
GE
HYDR
BI
TIER TWO EECS
Habitat
Biota

USGS

SPRING RISE EFFECTS – CONCEPTUAL MODEL

- System structure
- Types of measures
- Benefits and costs



USGS