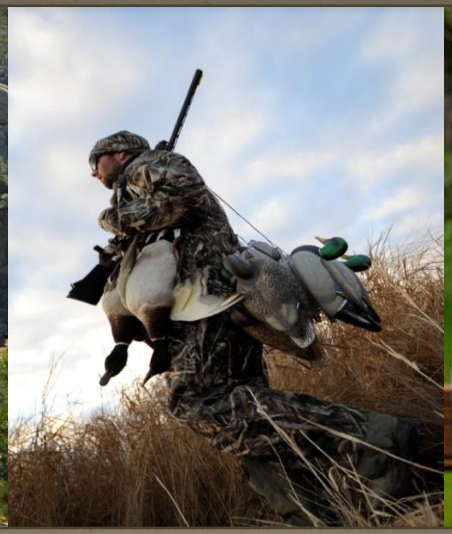





Aquatic Invasive Species in South Dakota & Watercraft Inspection and Decontamination

Serving People, Managing Wildlife

Mission Statement

Our mission is to provide sustainable outdoor recreational opportunities through responsible management of our state's parks, fisheries and wildlife by fostering partnerships, cultivating stewardship and safely connecting people with the outdoors.

Vision Statement

Our vision is to conserve our state's outdoor heritage to enhance the quality of life for current and future generations.

What are AIS?

Aquatic Invasive Species

- Not native to South Dakota
- Negative impact to the ecosystem
  - Foodweb alterations
  - Competition with native species

OR

- Negative impact to human use
  - Prevent fishing and recreation
  - Reduced efficiency of water intakes
  - Financial cost to control

South Dakota AIS List

Fish	Plants	Invertebrates
Bighead Carp	Brittle naiad	Asian clam
Common Carp	Common reed (Phragmites)	New Zealand mudsnail
European Rudd	Curly pondweed	Red rimmed melania
Grass Carp	Didymo (rock snot)	Red swamp crayfish
Silver Carp	Eurasian water-milfoil	Rusty crayfish
Western Mosquitofish	Flowering rush	Zebra mussel
Black carp	Purple loosestrife	Quagga mussel
Blotched Snakehead	Starry stonewort	Spiny waterflea
Bull's-eye Snakehead		
Giant Snakehead		
Northern Snakehead		
Round Goby		
White Perch		

Invasive Fish

Bigheaded Carp

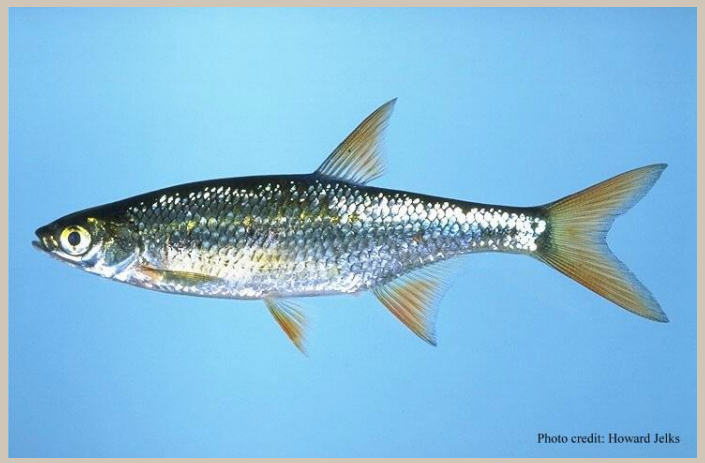
Silver Carp

- Maximum Size
  - 40 in
  - 60 lbs.
- Sexual maturity in 2 years
- Up to 3.7 million eggs
- Multiple spawns/year
- Consume 40% bodyweight daily, primarily phytoplankton

Bighead Carp

- Maximum Size
  - 55 in
  - 90 lbs.
- Sexual maturity in 2 years
- Up to 1.9 million eggs
- Multiple spawns/year
- Consume 40% bodyweight daily, primarily phytoplankton

Which is a bigheaded carp?



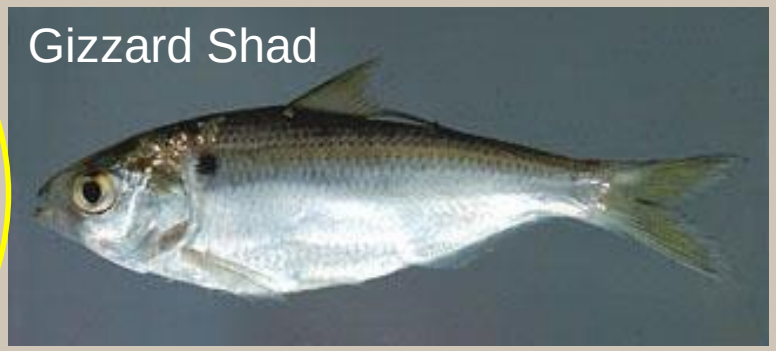
Which is an bigheaded carp?

Golden Shiner

Goldeye

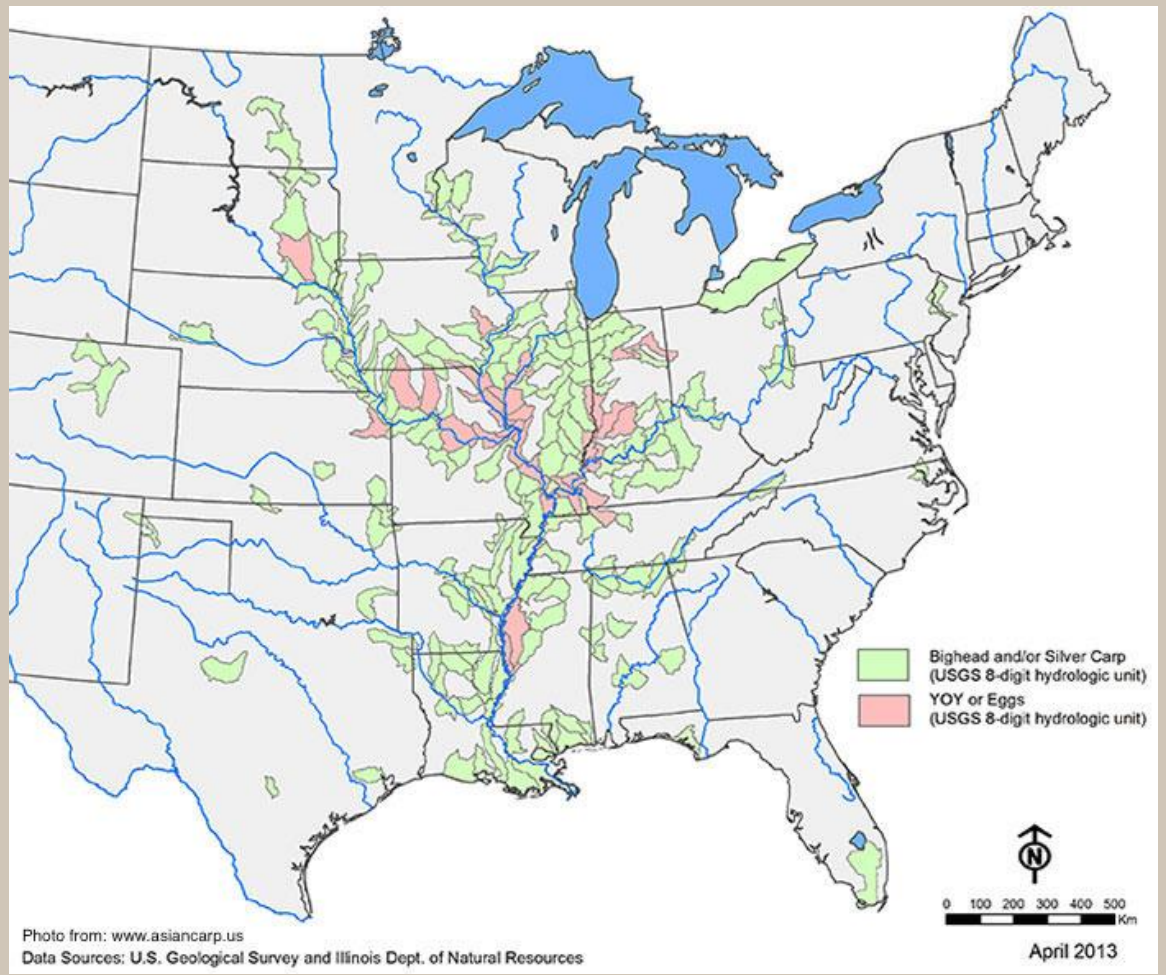
Bighead Carp

Gizzard Shad



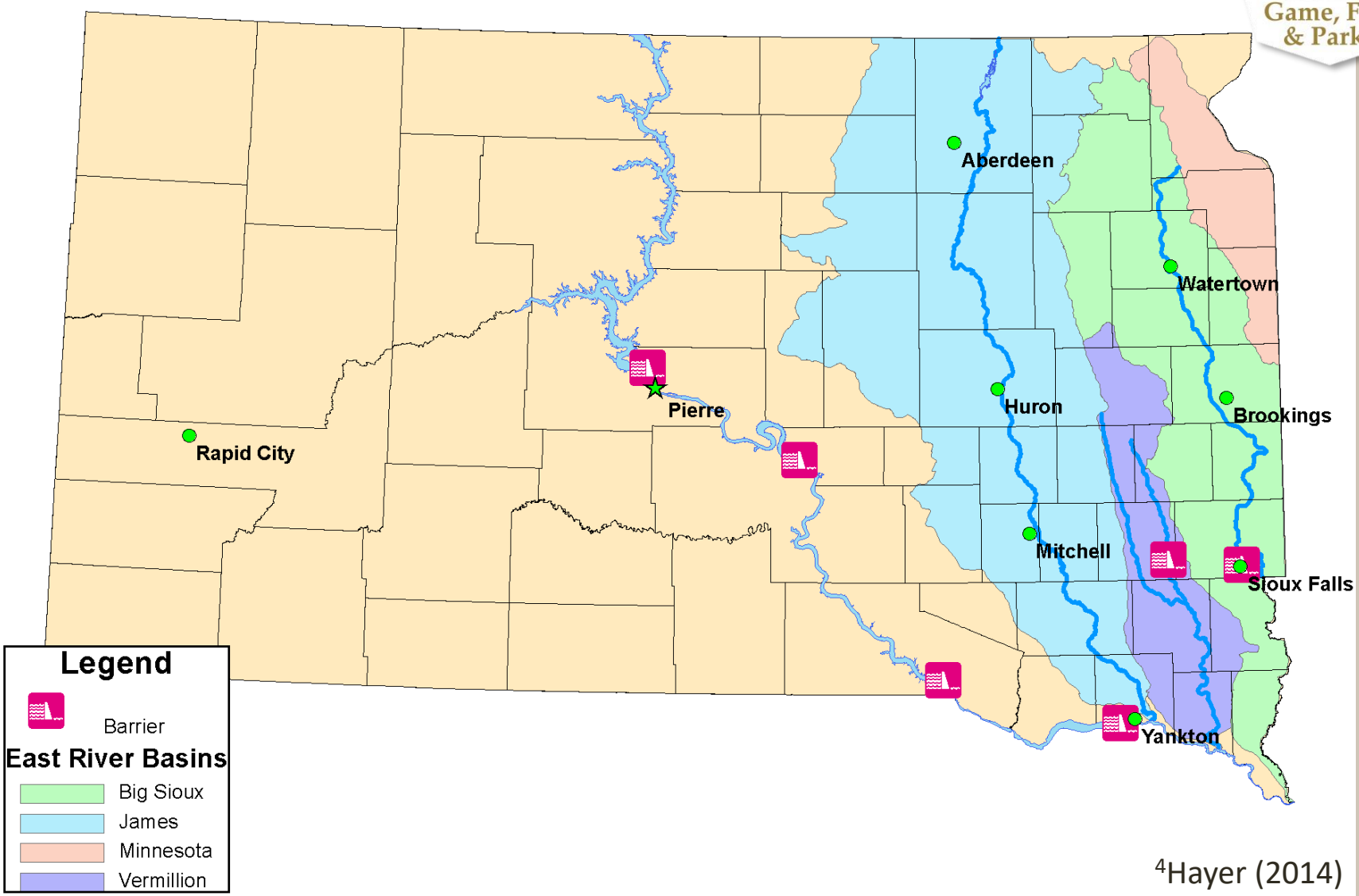
Silver and Bighead Carp

- Introduced in Arkansas in 1973
  - For water quality improvement in aquaculture ponds
  - Escaped into natural waters by 1980[3]



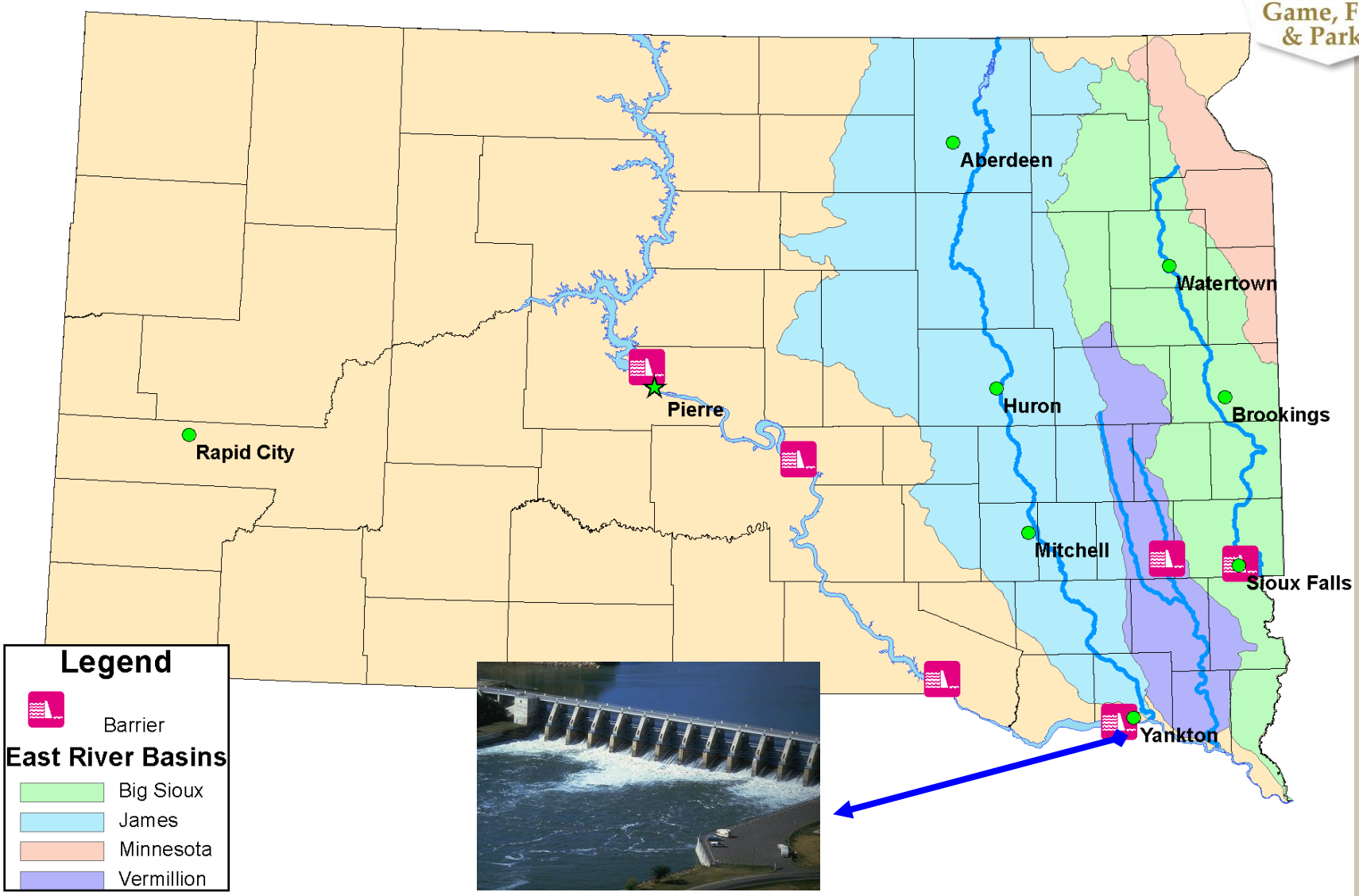
[3]Freeze and Henderson (1982)

Bigheaded Carp Range[4]



[4]Hayer (2014)

Bigheaded Carp Range[4]



Bigheaded Carp Range[4]

Aberdeen
Watertown
Huron
Brookings
Pierre
Rapid City
Mitchell
Sioux Falls
Yankton

Legend

Barrier

East River Basins

- Big Sioux
- James
- Minnesota
- Vermillion

Bigheaded Carp Range[4]

Aberdeen
Pierre
Rapid City
Huron
Brookings
Mitchell
Sioux Falls
Yankton

Legend

Barrier

East River Basins

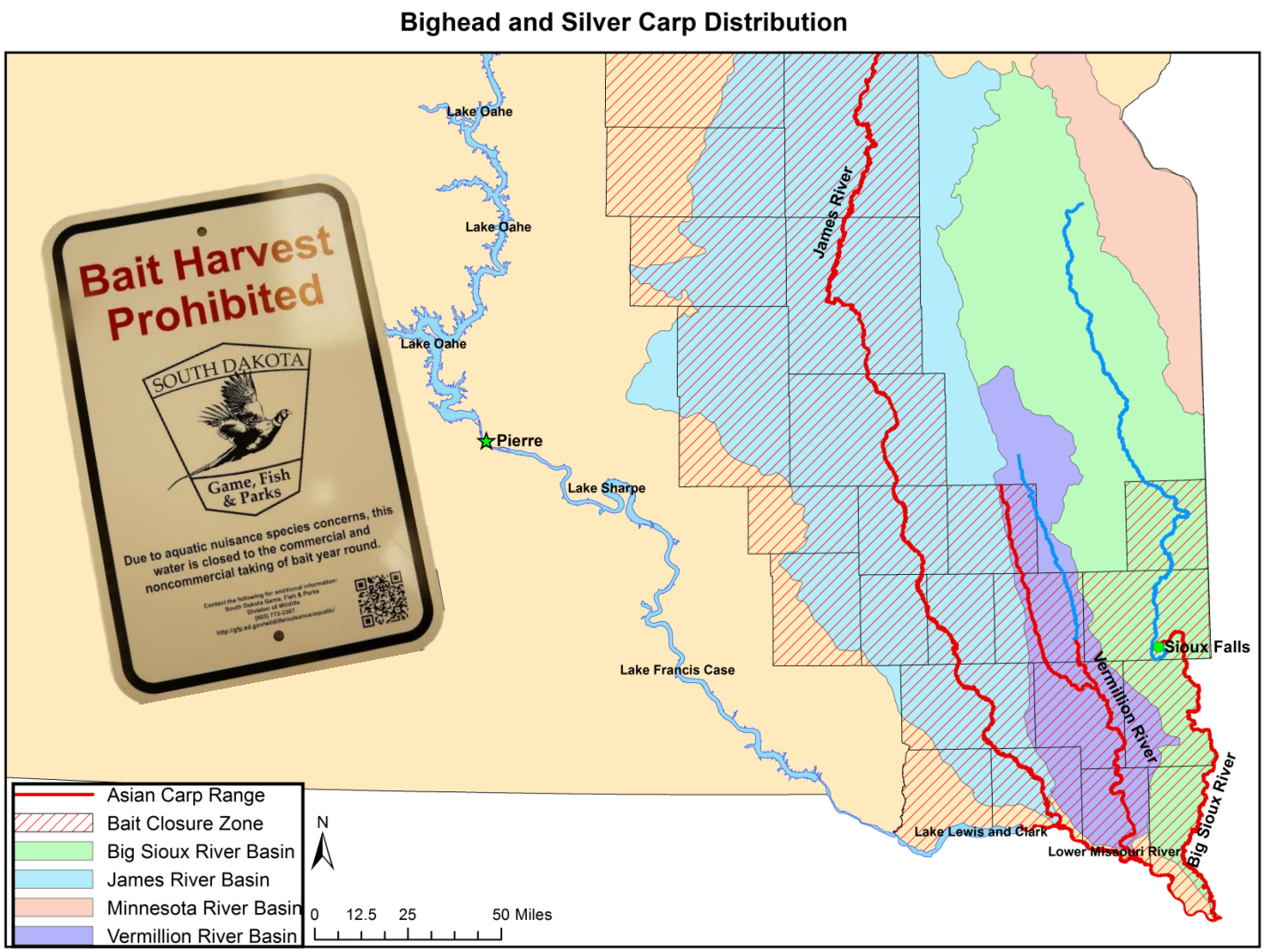
- Big Sioux
- James
- Minnesota
- Vermillion

Potential Impacts

- Potential to cause a decline in plankton populations[5]
- Compete with native fish for plankton
  - Force changes in trophic position[4,6]
- Shift production to benthic pathway[7]
- Collision with boaters
  - Silver Carp can jump vertically 5 ft.

[5]Laird and Page (1996)
[6]Freedman et al. (2012)
[7]Collins and Wahl (2017)

Bait Closure Zone



Common Carp

- Uproot vegetation
- Increases turbidity by stirring up sediments
- Change water quality and waterbody state
- Can shift community composition of fish and invertebrates

Grass Carp

- Alter macrophyte abundance and composition similar to Common Carp
- Consume 61 lbs of macrophytes/lb of body weight annually
- 61 X 62.5= **3,812.5 lbs/yr!**

European Rudd

- Hybridize with Golden Shiner
  - Could alter spawning behavior and recruitment success
- Omnivorous
- Can alter macrophyte communities similar to invasive carp species

Western Mosquitofish

- Aggressive competitors negatively affect native species
  - Competition
  - Predation
- Have locally extirpated federally listed T&E species
- Widely stocked to control mosquitoes, not particularly effective
- Established statewide

Invasive Plants

Invasive Plants

- Grow extremely fast
- Form dense mats
  - Out-compete native plants
  - Canopy decreases light penetration
  - Inhibit growth of phytoplankton
- Reduce local diversity
- Tangle in propellers
- Makes water recreation difficult
- Decrease dissolved oxygen during decay
- Easily spread by hitchhiking on boat trailers

Curly-leaf pondweed

- Spread by fragmentation and turions
  - Multiple infested waters in SD
  - Angostura, Big Stone, Canyon Lake, Herrick Lake, Lake Alice, Lake Mitchell, Lake Roosevelt, Lake Traverse, McCook Lake, MO River, Nelson Slough, Rapid Creek, Roy Lake, Sheridan, Stockade, Yankton

Eurasian watermilfoil

- Can spread by seeds or stem fragmentation
  - Lake Oahe
  - Lake Sharpe
  - Lewis and Clark Lake

Brittle naiad (waternymph)

- Spreads by seeds or stem fragmentation
  - McCook Lake
  - Lewis and Clark

Didymo (Rock snot)

- A species of diatom (algae)
  - Castle Creek
  - Rapid Creek
- May reduce or alter macroinvertebrates
- May spread on equipment (felt-soled boots, waders, bags)

Wetland Ornamentals

- Outcompete native plants
- Grow extremely dense and tall
- Displace wildlife
- Prevent access
- Distributions not well-documented in SD

Purple Loosestrife

- Widespread
- Missouri River and Rapid Creek

Phragmites (Common Reed)

- Widespread
- Similar to native variant; more aggressive
- Missouri River

Flowering Rush

- Limited distribution
- Lakes Faulkton and Louise

Invasive Invertebrates

Physical Characteristics

Zebra Mussel

- Shape:
  - Triangular or “D” shaped
  - Sharply pointed hinge
- Color
  - Alternating dark (green to brown) and light (white to yellow) bands
- Size
  - 3-5 cm

Quagga Mussel

- Shape:
  - Fan-Shaped
  - Rounded hinge
- Color:
  - Brown to white, stripes may or may not be present
- Size:
  - 3-5 cm

Zebra Mussel Introduction

- Introduction to the United States in 1980's
  - First found in Lake St. Clair near Detroit, MI
- Spread throughout Mississippi River drainage
  - Missouri, Arkansas, Tennessee, and Ohio Rivers

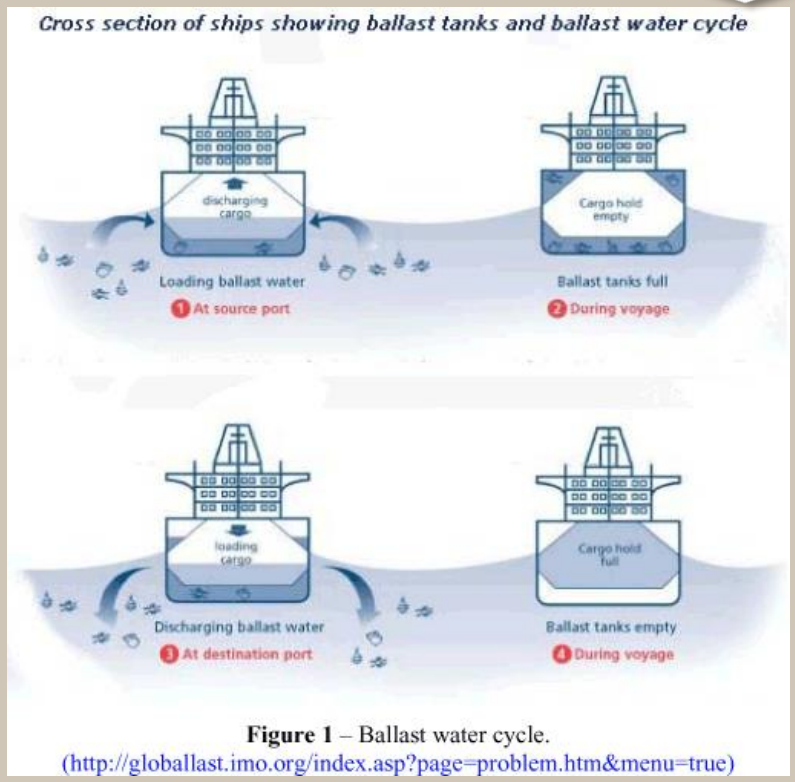
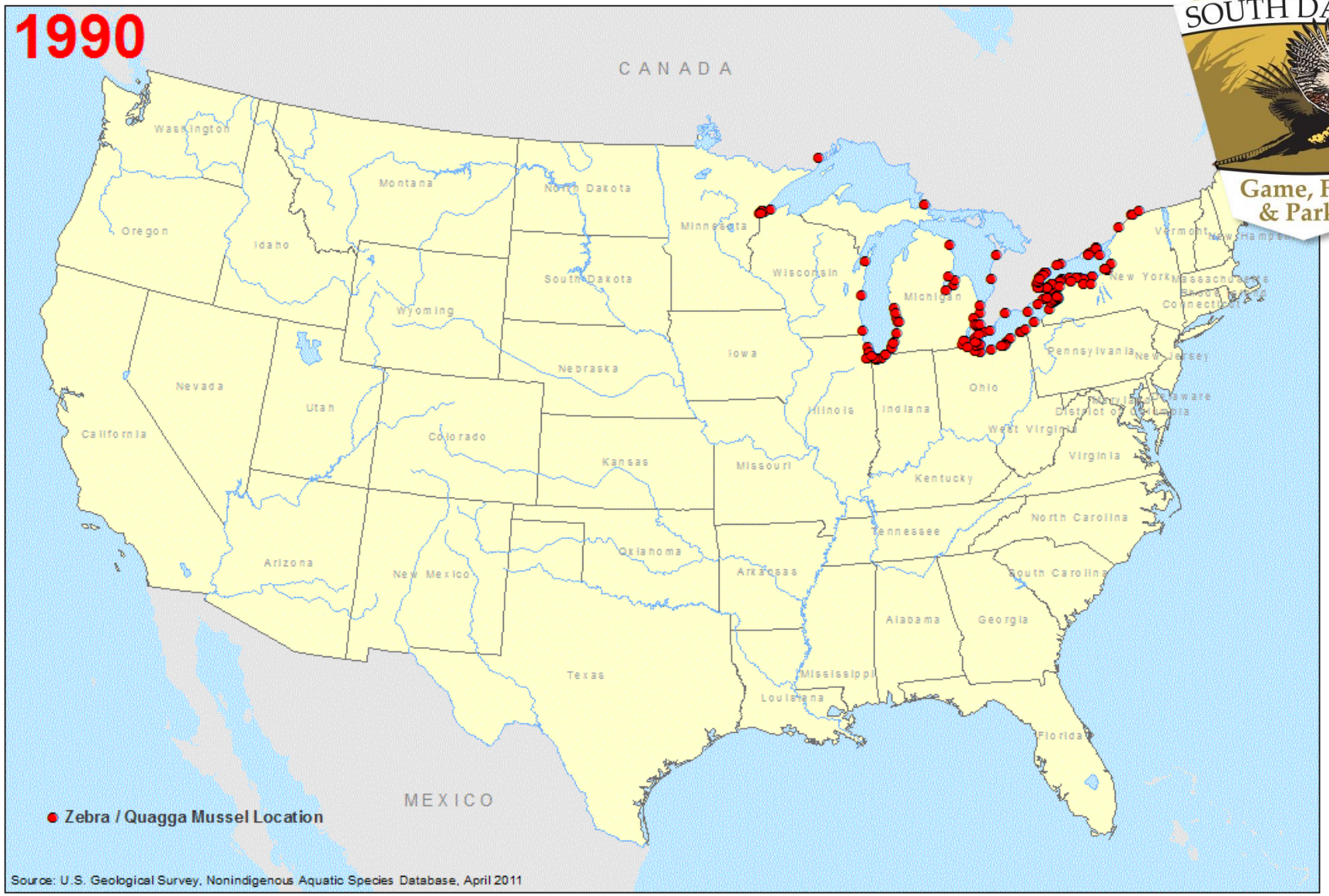


Figure 1 – Ballast water cycle.
(http://globallast.imo.org/index.asp?page=problem.htm&menu=true)

http://mdc.mo.gov

SOUTH DAKOTA
Game, Fish & Parks



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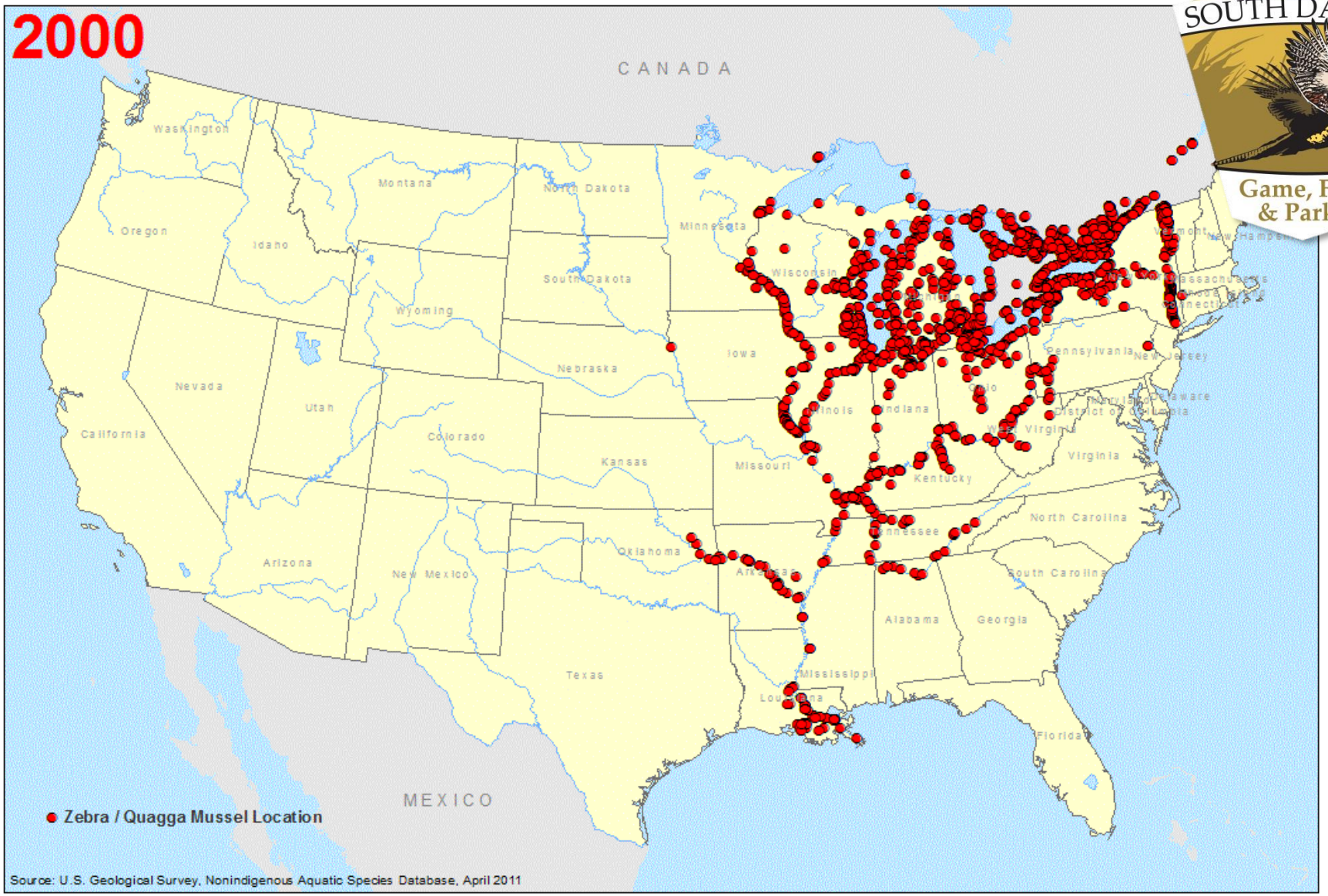

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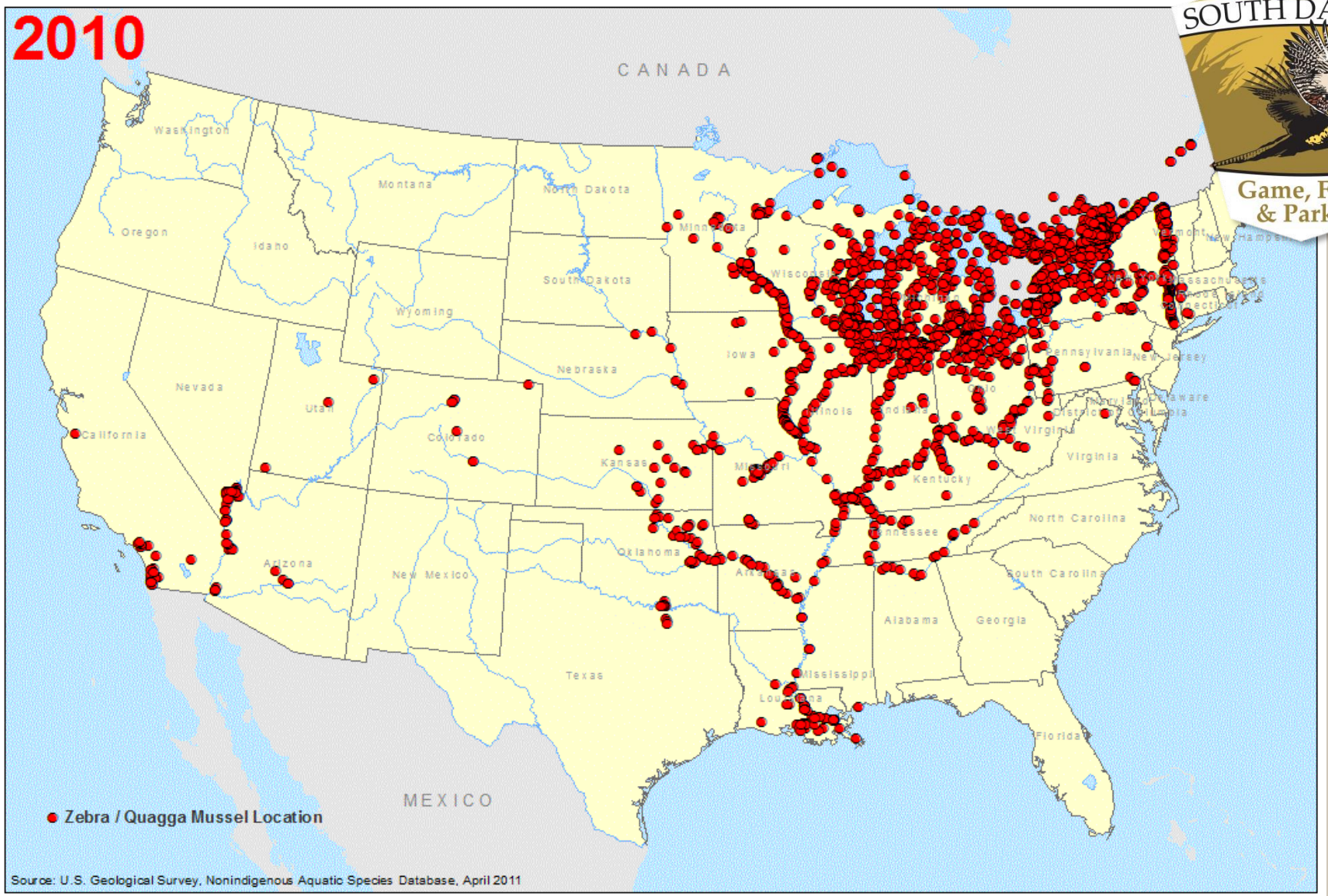

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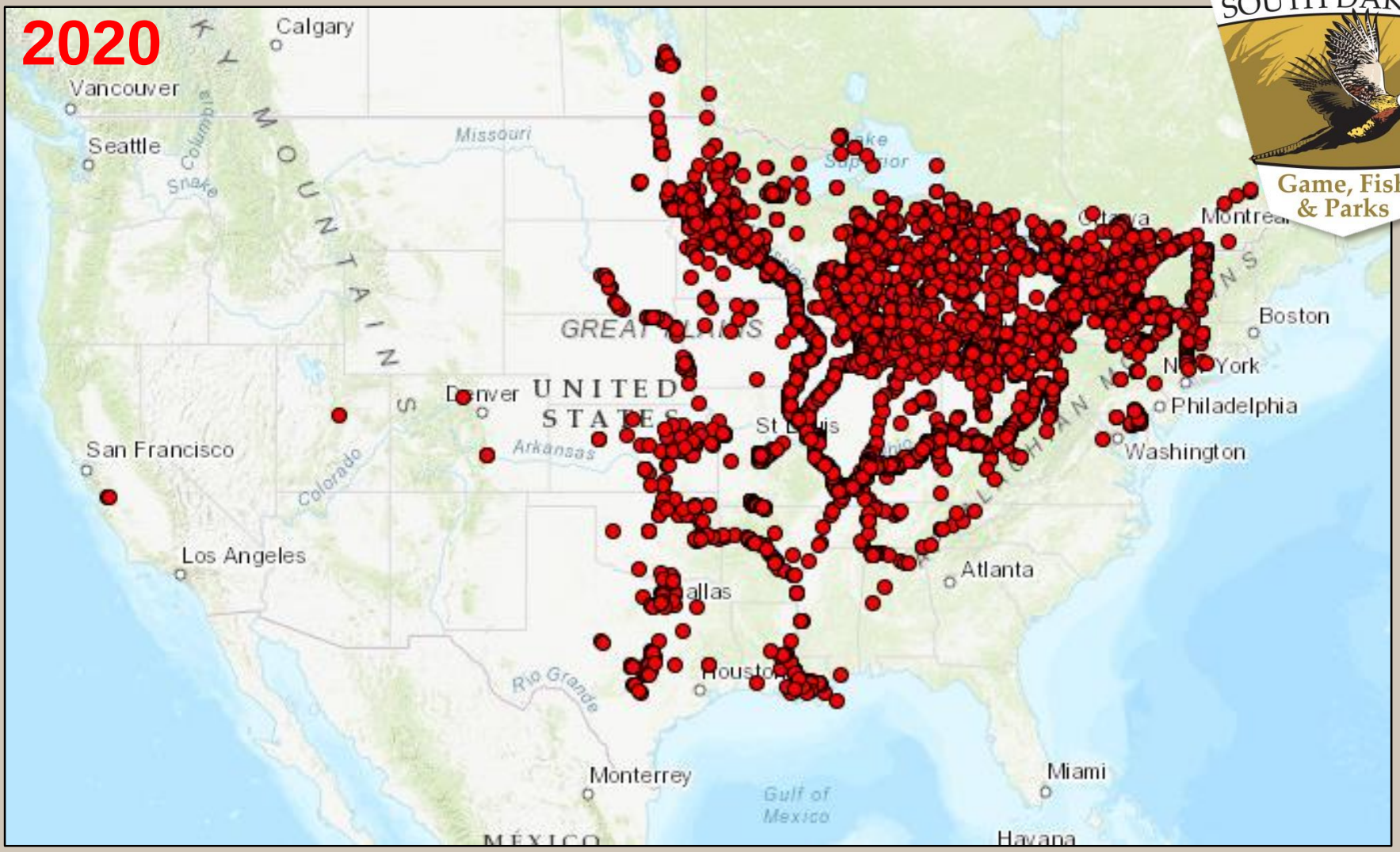
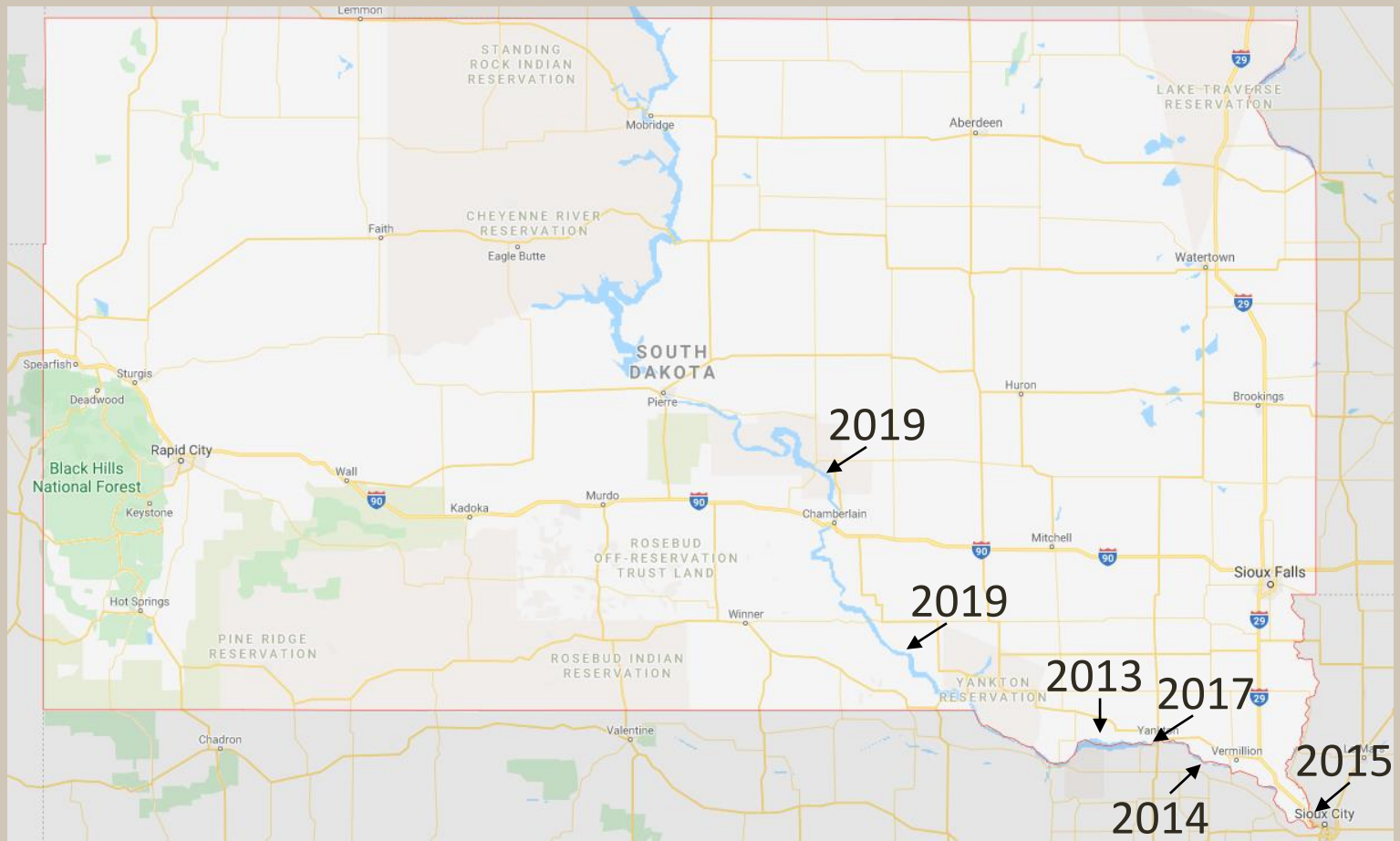

2020
Calgary
Vancouver
Seattle
Columbia
Snake
Missouri
ROCKY MOUNTAINS
Ottawa
Montreal
Boston
New York
Philadelphia
Washington
Atlanta
Denver
UNITED STATES
St Louis
Arkansas
Colorado
San Francisco
Los Angeles
Dallas
Houston
Rio Grande
Monterrey
Gulf of Mexico
Miami
Havana
SOUTH DAKOTA
Game, Fish & Parks

Timeline of Zebra Mussels in SD

- 2014 – Lewis and Clark Lake
- 2015 – Missouri River below Gavins Point Dam
- 2015 – McCook Lake
- 2018 – Lake Yankton
- 2019 – Lakes Sharpe and Francis Case

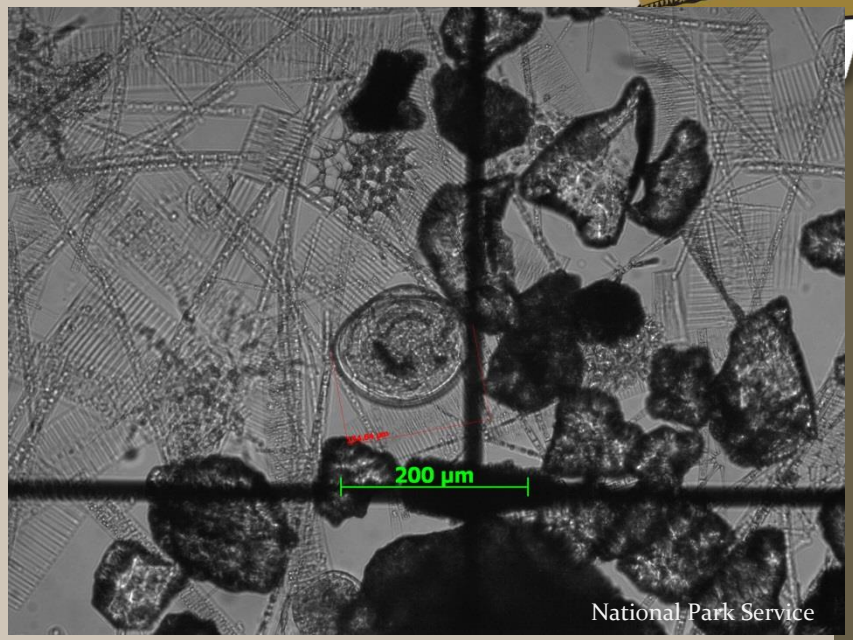


Physical Characteristics

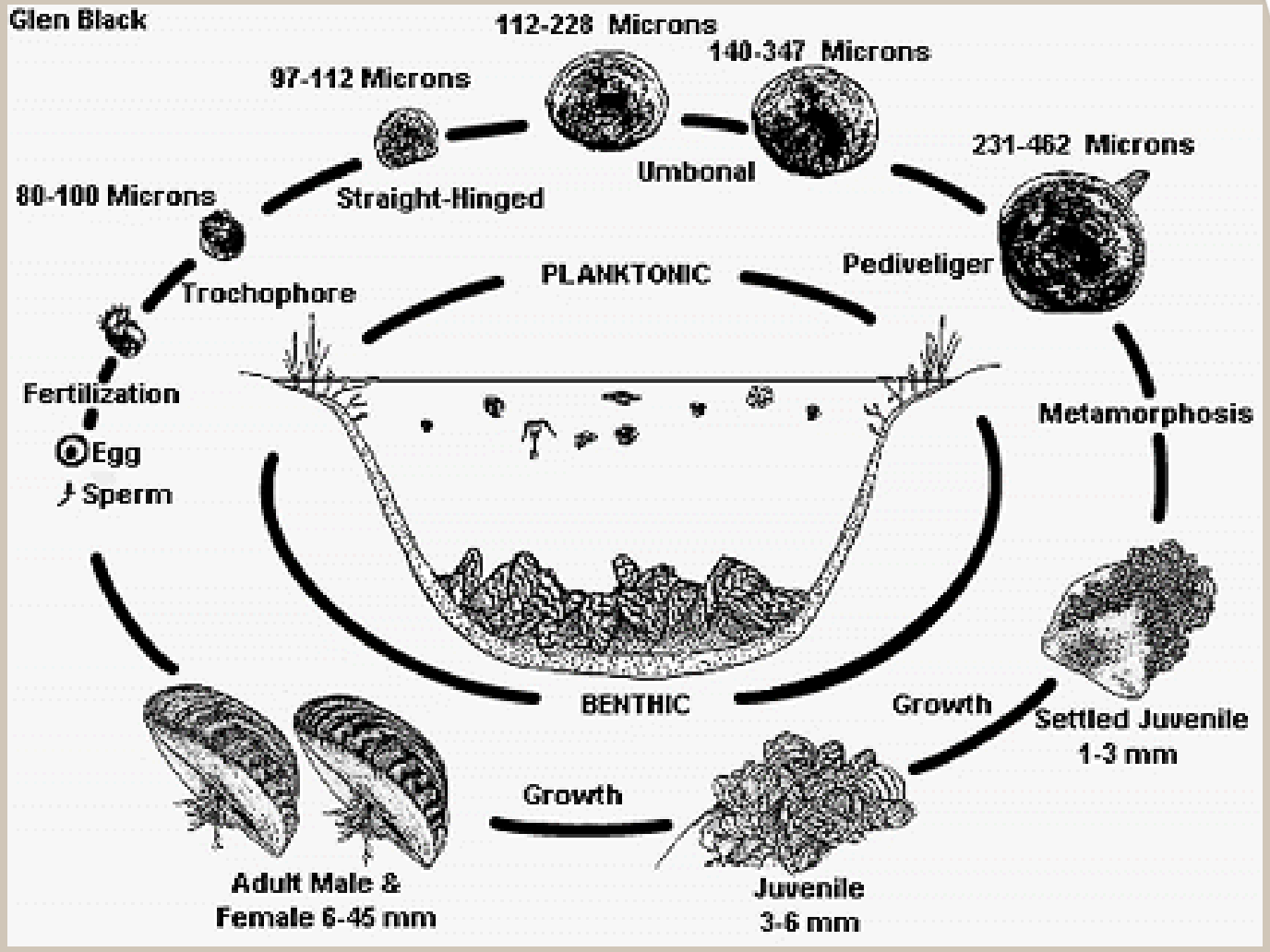
- Byssal threads
  - Allow Dreissenid mussels to attach to hard surfaces
  - Quagga mussels can also attach to soft surfaces such as mud
  - No native mussel species have byssal threads

How do they spread?

- Larval stage called veligers
  - Microscopic
  - Transported in boats holding water
    - Ballast tanks (wakeboard boats)
    - Livewells
    - Bait buckets
  - Can survive 2 weeks without food



Dreissenid Life Cycle



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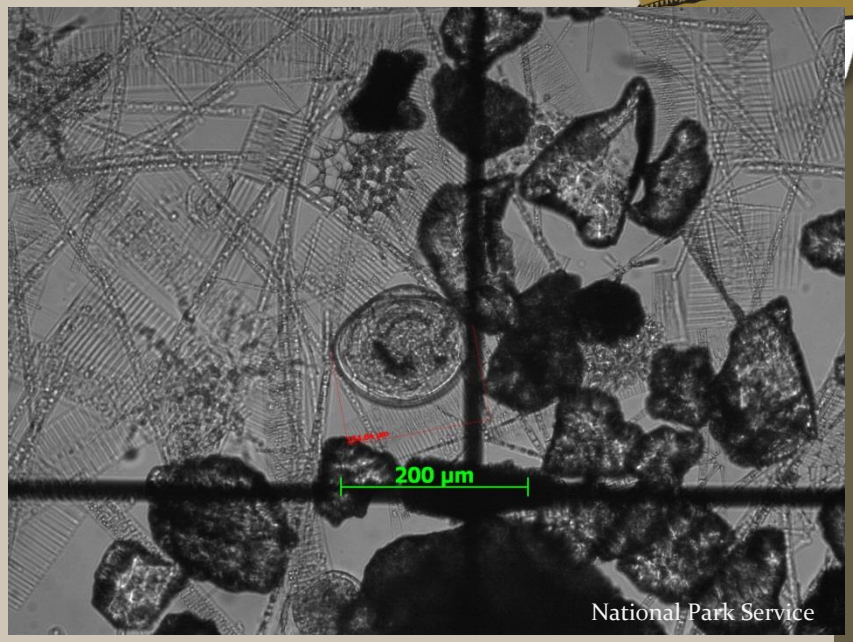
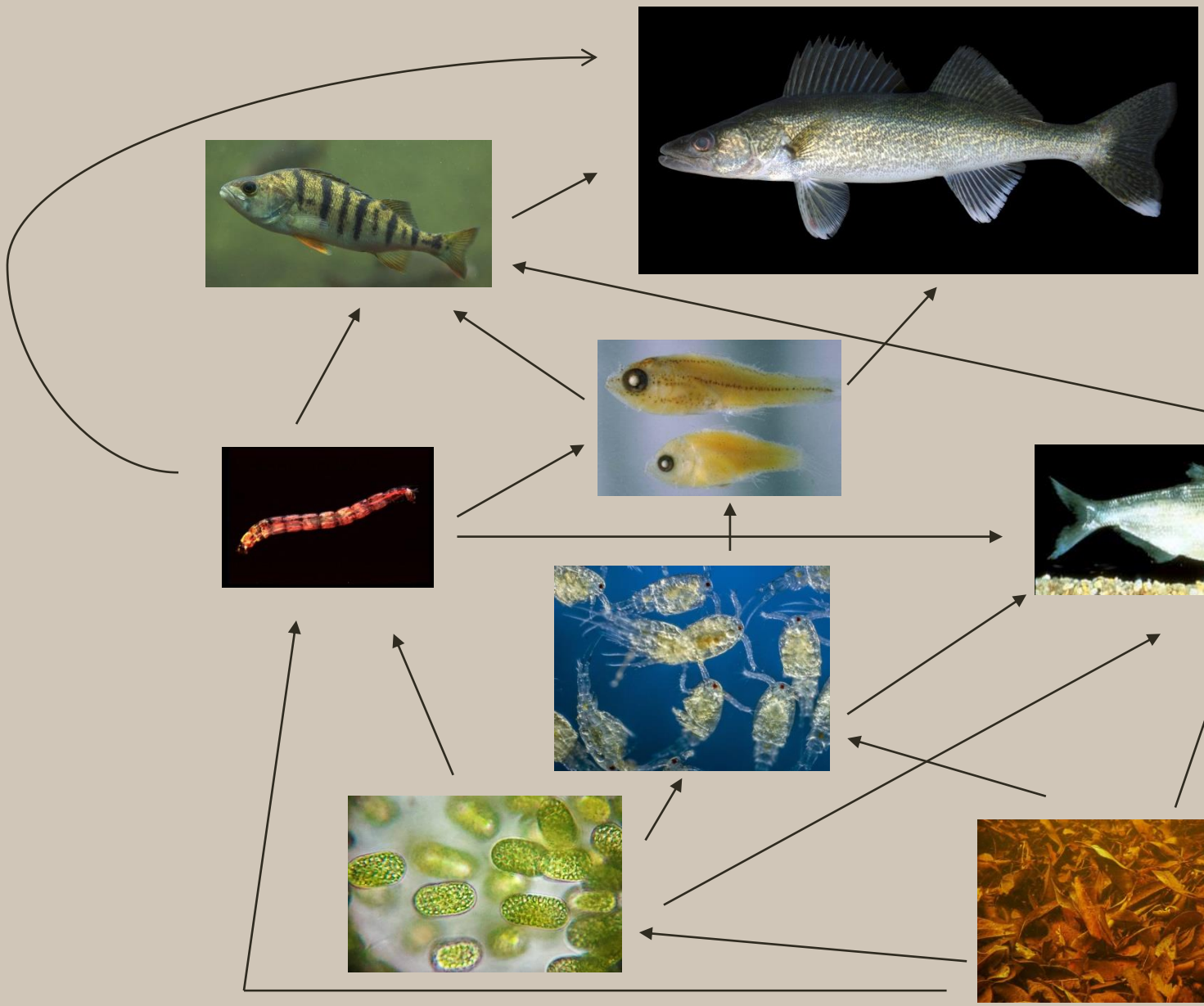


- Adults attach to hard surfaces
  - Boats, pontoon, etc.
  - Aquatic vegetation

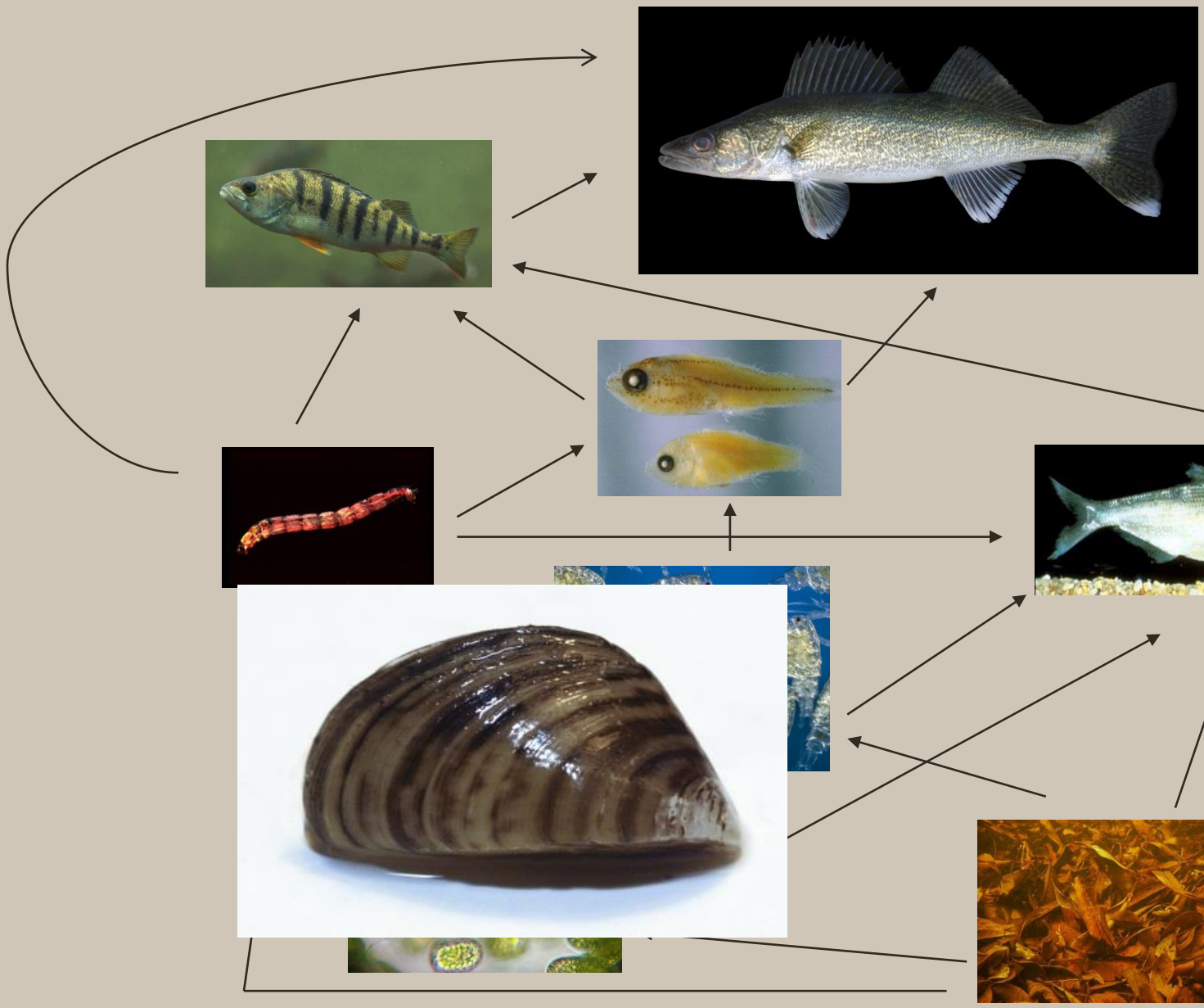
Dreissenid Biology

- Females produce up to 1 million egg/year
  - Spawning begins at 50-55°F and maxes at 62.6°F
  - Adult densities can reach ≈700k/m^2
- Adults can filter ≈1L of water/day
  - Mille Lacs Lake = filtered every 1-3 days
  - Lake Erie = 100% increase in water clarity
- Resilient to environmental stress
  - Temperature: < 0˚C to 32°C
  - Avoid chemical treatment by closing shells
  - Veligers can survive up to 30 days in damp environments

Foodweb Alteration



Foodweb Alteration



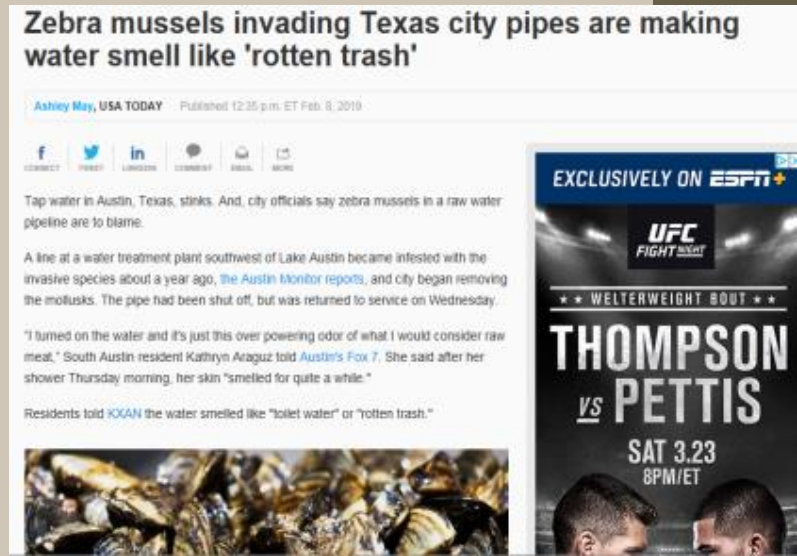
Effects on Aquatic Community

- Decline in native mussels[14]
- Competition for zooplankton
  - Larval (Bluegill)[15]
  - Juvenile (Striped Bass)[16]
  - Pelagic species (herrings)[16]
- Shift nutrients to the bottom
  - Lower plankton/zooplankton[17]
  - More benthic invertebrates (i.e. leeches, freshwater shrimp)
- Increased clarity = more vegetation, higher temperature[18]
  - Changes fish distribution and feeding habits
  - Can make angling more challenging
- Conflicting effects on fish populations
  - Increased juvenile Yellow Perch growth[19]

[14]Hart et al. (2001) [15]Raikow (2004) [16]Strayer et al. (2004)
[17]MacIsaac et al. (1995) [18]Skubinna et al. (1995) [19]Mayer et al. (2000)

Human Impact of Zebra Mussels

- Costly Mitigation
  - >$1 billion annually in United States
    - Water treatment plants, irrigation, boat/dock maintenance, etc.
- Eradication is generally infeasible
  - Infestations are not typically discovered until the population is well-established
  - MN DNR Zequanox® study at Christmas Lake
    - $6800 to treat 7500 ft^3 (unsuccessful)
    - Extrapolated to Lewis & Clark Lake-$23.6 Billion
- Prefer green algae, increasing blue-green algae blooms
- Foul taste and smell of drinking water
- Concentrate heavy metals
- Sharp shells are dangerous to swimmers



Zebra mussels invading Texas city pipes are making water smell like 'rotten trash'

Ashley May, USA TODAY Published 12:35 p.m. ET Feb. 8, 2019

Tap water in Austin, Texas, stinks. And, city officials say zebra mussels in a raw water pipeline are to blame.

A line at a water treatment plant southwest of Lake Austin became infested with the invasive species about a year ago, the Austin Monitor reports, and city began removing the mollusks. The pipe had been shut off, but was returned to service on Wednesday.

"I turned on the water and it's just this over powering odor of what I would consider raw meat," South Austin resident Kathryn Araguz told Austin's Fox 7. She said after her shower Thursday morning, her skin "smelled for quite a while."

Residents told KXAN the water smelled like "toilet water" or "rotten trash."

Crayfish

Tennessee Wildlife Resources Agency

Michigan.gov

- Rusty Crayfish
  - Maximum length of 11 cm
  - Large claws with black banded tip
  - Dark “rust-colored” spot on side
  - Compete with native crayfish
  - Can reduce macrophytes and increase turbidity
- Red Swamp Crayfish
  - Maximum length of 12 cm
  - Dark red body with bright red bumps on body, claws, and first leg
  - Compete with native crayfish

Additional AIS Invertebrates

- Asian Clam
  - Biofouling
  - Compete with natives

- Red-Rimmed Melania
  - Host for several parasites
  - Compete with natives
  - Consume fish eggs

New Zealand Mudsnail

- Densities up to 300k/m²
- Potential to outcompete native species
- Alter productivity and become a biofouler

Potential Threats to South Dakota

Photo Credit Jean-Francios Helias/ Michael Hoff Productions, Inc.

Snakeheads

- Size Variability
  - Blotched = 13 inches
  - Bullseye = 4 feet
- Native to East and Southeast Asia
- Introduced as food fish and aquarium pets
- Capable of breathing atmospheric oxygen
- Voracious predators
  - Some species are known to attack humans

Snakeheads

Giant Snakehead

Blotched Snakehead

Northern Snakehead

Bullseye Snakehead

Black Carp

- Max Size = 7.2 ft; >150 lbs[1]
- Prodigious, large river spawner
- Molluscivore[20]
  - Prey on native snails and mussels
- Imported as food fish and biocontrol in aquaculture ponds (snails)

[20]Nico et al. (2005)

Round Goby

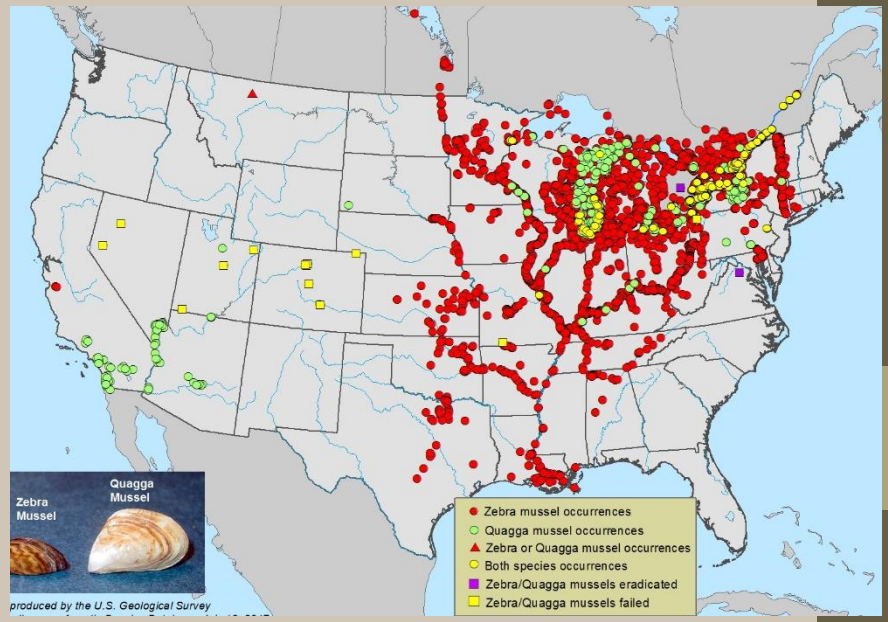
- Large declines in native fish
- High predation on SMB eggs= seasonal closures of Lake Erie
- Concerns with intentional stocking

White Perch

- Spread to neighboring states (Nebraska, Iowa)
- Prey heavily on WAE, WHB eggs
- Competition
- Hybridization
- May be responsible for WAE collapse in Bay of Quinte

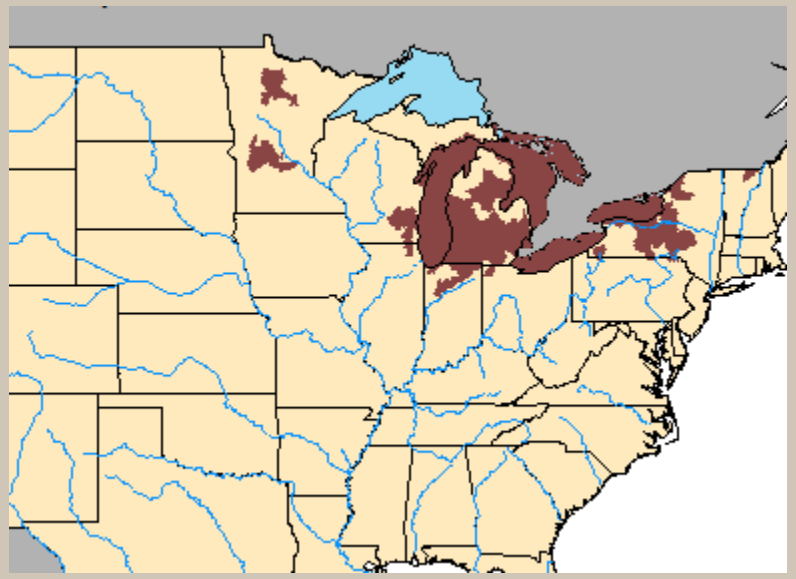
Quagga Mussel

- Established throughout the Great Lakes but hasn't expanded as rapidly as Zebra Mussels
  - Introduced via ballast water discharge in late 1980s
- Similar economic and ecological impacts to zebra mussels
  - Can inhabit deeper water than zebra mussels



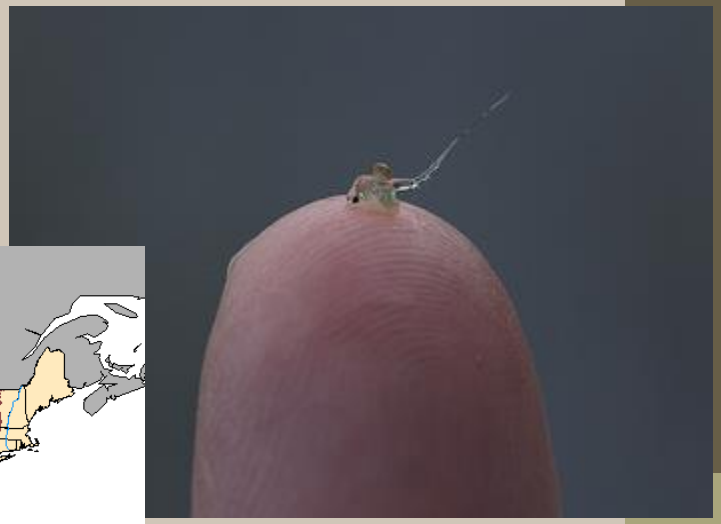
Starry Stonewort

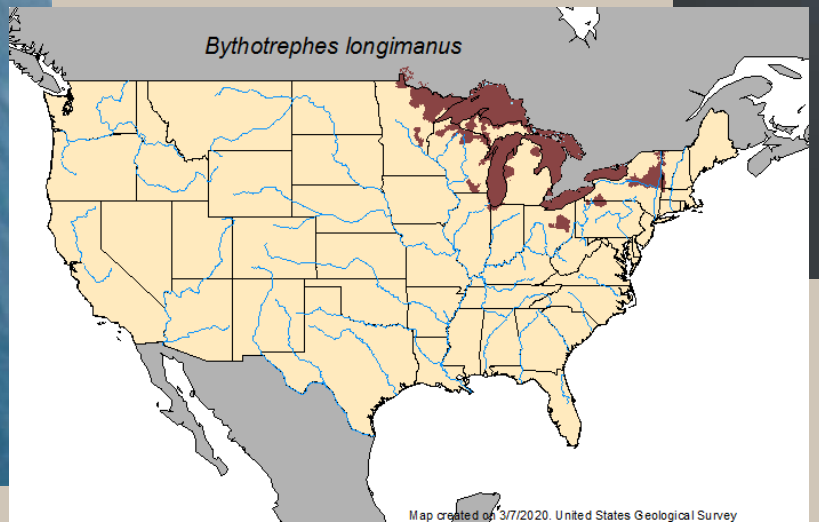
- Spread through fragmentation and by mammals and bird transport
- Dense mats inhibit growth of other plants, impacting fish habitat preferences



Spiny Waterflea

- Predatory zooplankton that consumes native zooplankton
  - Reduce prey for larval fish, declines in WAE and YEP in MN lakes
- Clog fishing equipment
- Long spines and tails make them poor prey items





Actions by the Game, Fish and Parks

2020 Authorities

- Legislative bill (HB 1033) gives GFP the authority to:
  - Prohibit movement/possession of AIS
  - Require boaters to complete the following before launching:
    - Clean watercraft of all AIS, plants, or mud
    - Drain all water by removing plugs, running pumps, and expunging water
    - Dry watercraft when possible
  - Require watercraft to stop at inspection stations
  - Require decontaminations, when necessary
    - Can detain a watercraft until decontamination is complete

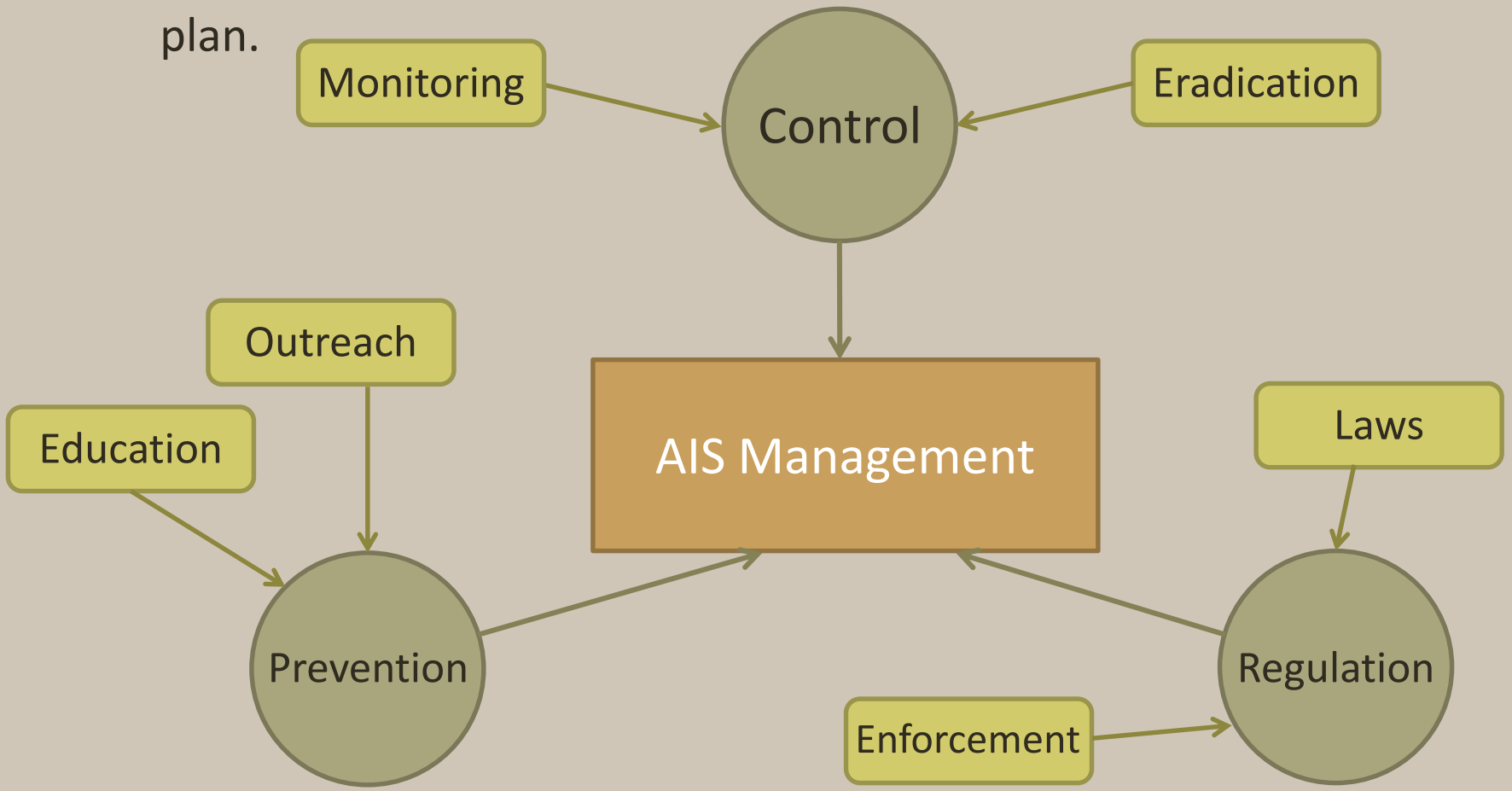
- Violations are primarily Class 2 misdemeanors
  - Second violation within a year is a Class 1 misdemeanor

Other AIS Regulations

- 41:10:04:05 - A person may not transport fish or aquatic bait in water obtained from a lake, river or stream except while in a boat ramp parking area.
- 41:10:04:06 – Lists containment waters
  - Lewis and Clark, Francis Case, Sharpe, McCook, Yankton, Missouri River from Sioux City to Oahe Dam, and ZM/QM infested waters outside SD
- 41:10:04:07 – Power to create Local Boat Registries
- 41:10:04:08 – Watercraft retaining a gallon or more after plugs have been pulled must undergo a decontamination
- 41:10:04:08 – Watercraft moored in a containment water for 3 or more consecutive days must undergo a decontamination

State AIS Management Plan

- Statewide Strategic Plan to Guide AIS activities in SD
- Coordinated by SD Game, Fish & Parks, but not only a GFP plan.



AIS Control

- Zebra Mussel Monitoring:
  - Hester-Dendy Plate Samplers
  - Dock/Structure inspection
  - Citizen PVC Dock Samplers
  - Veliger sampling
- Bigheaded Carp Monitoring:
  - Detection and population dynamics monitoring
  - Potential movement study in the James River - 2021
- Plant Monitoring:
  - Curlyleaf Pondweed surveys
  - Select chemical treatments

AIS Prevention & Regulation

- Boat ramp signs
- Education events
- SD Least Wanted Campaign
  - Started 2012, re-launched 2015
  - “One-stop-shop” for AIS in SD
    - Media Gallery
    - Species Info
    - Maps
    - Citizen Monitoring
  - #sdleastwanted
- Fishing Handbook

SOUTH DAKOTA
Game, Fish & Parks

SD LEAST WANTED .COM

South Dakota WID Program

- Inspection Stations Statewide
  - May through August
  - Two-person teams equipped with decontamination units
    - Multiple locations in each fisheries management area
- Goal is to increase compliance with existing regulations

WID Process

- Risk assessment (1-2 min)
- High risk inspection (5 min)
- Decontamination
  - Time is variable
  - Depends on type
    - Standing water vs. Full

Initial Inspection

- Risk assessment
  - Out of state/infested in past 30 days
  - Dirty/crusty/slimy
  - Standing water/ballast tanks
  - Complex (multiple motors, interior compartments)

- If 2 or more risks occur, then conduct a more thorough, high-risk inspection

https://www.threeriversparks.org/page/aquatic-invasive-species

When is a Decontamination Required?

- Watercraft was in contact with an infested water for 3 or more continuous days
- If water cannot be completely drained (ballast tanks) after leaving a containment water
- If there is standing water in the watercraft
- Observed AIS onboard

Types of Decontamination

1. Plant Decontamination
   - Simple – Manually remove all vegetation from trailer

Types of Decontamination

1. Plant Decontamination
2. Standing Water Decontamination
   - Soak up water with sponge, chamois, or towel
   - Low-pressure rinse with 120°F water for 2 minutes

Types of Decontamination

1. Plant Decontamination
2. Standing Water Decontamination
3. Ballast Tank Decontamination
   - Only needed if they come from an infested source
   - Low pressure flush with 120°F water for 5 min

Types of Decontamination

1. Plant Decontamination
2. Standing Water Decontamination
3. Ballast Tank Decontamination
4. Full Decontamination
   - If zebra mussels are observed on the boat or trailer
     - 140°F water for 10 seconds on exterior surfaces, motor flush
     - 120°F water for 2+ minutes on internal compartments

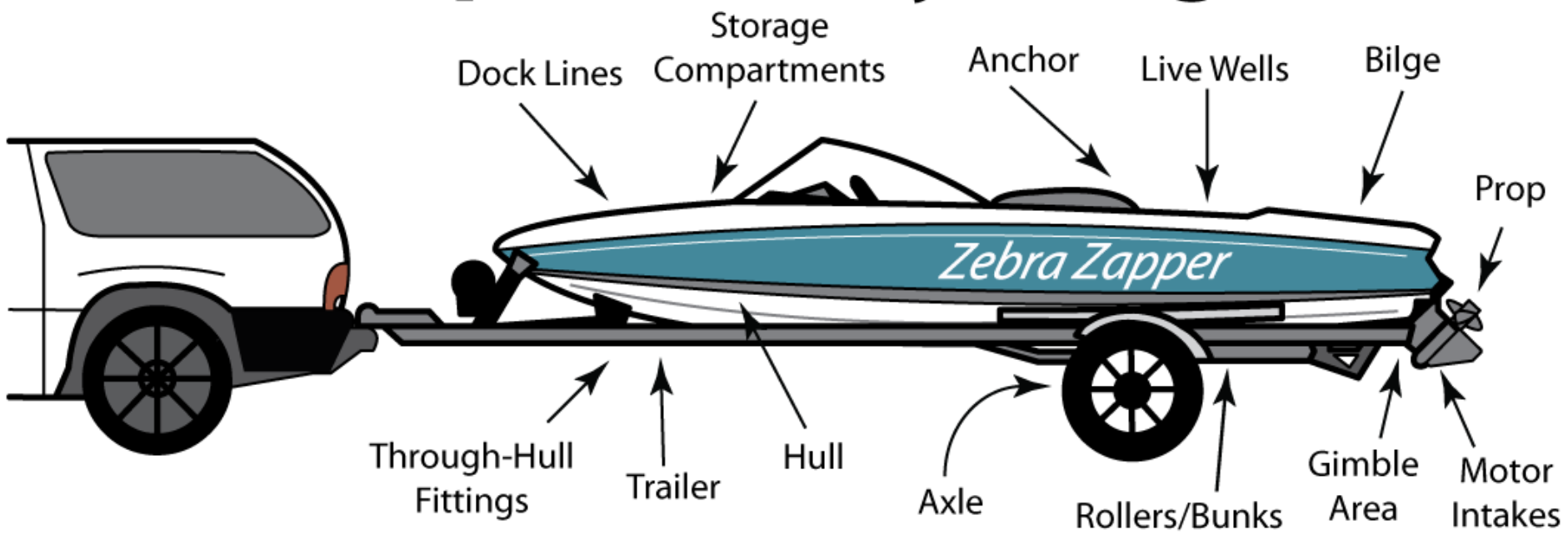
What's the message?

- CLEAN. DRAIN. DRY. Every time.
  - No mud, plants, or water moved among waterbodies

Watercraft 101

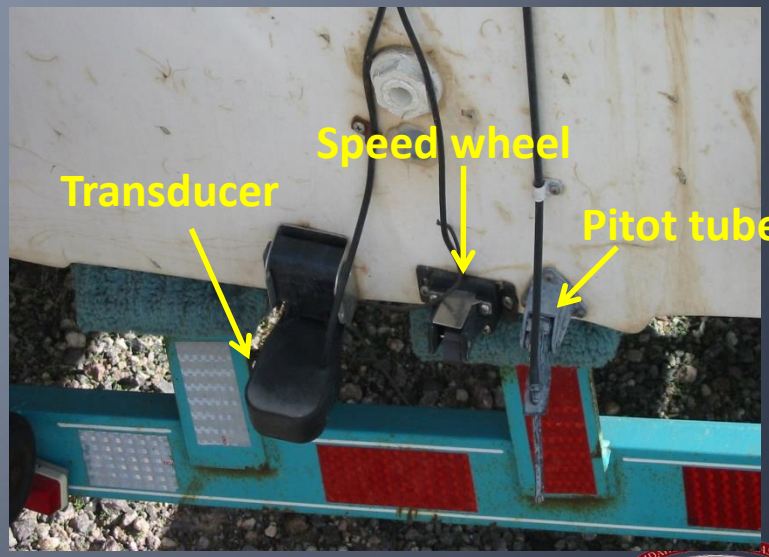
Before Leaving & Before Launching...

Inspect Everything!



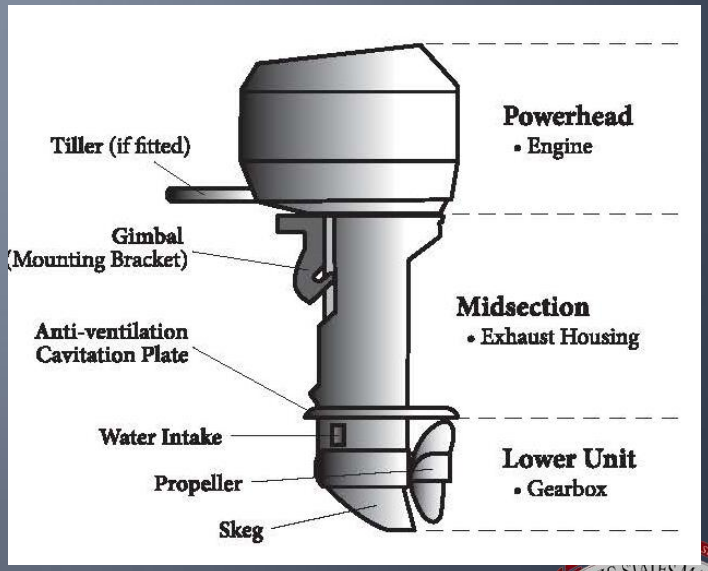
Boat Terminology

- Bait Well
- Ballast and Ballast Tank
- Bilge, Bilge Plug, & Pump
- Gimbal
- Live Well
- Pitot Tubes
- Transom
- Trim Tabs

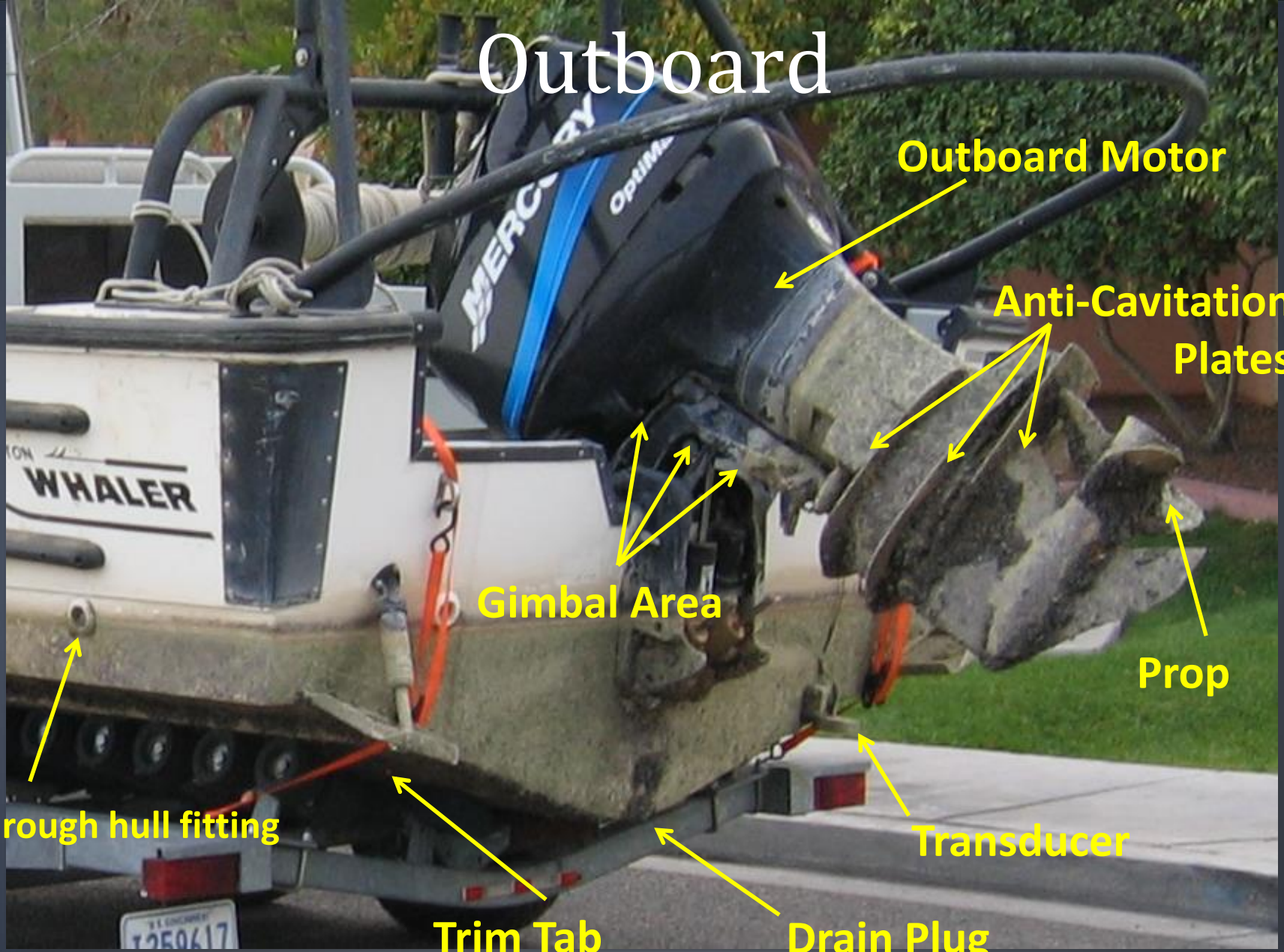


Marine Propulsion Systems

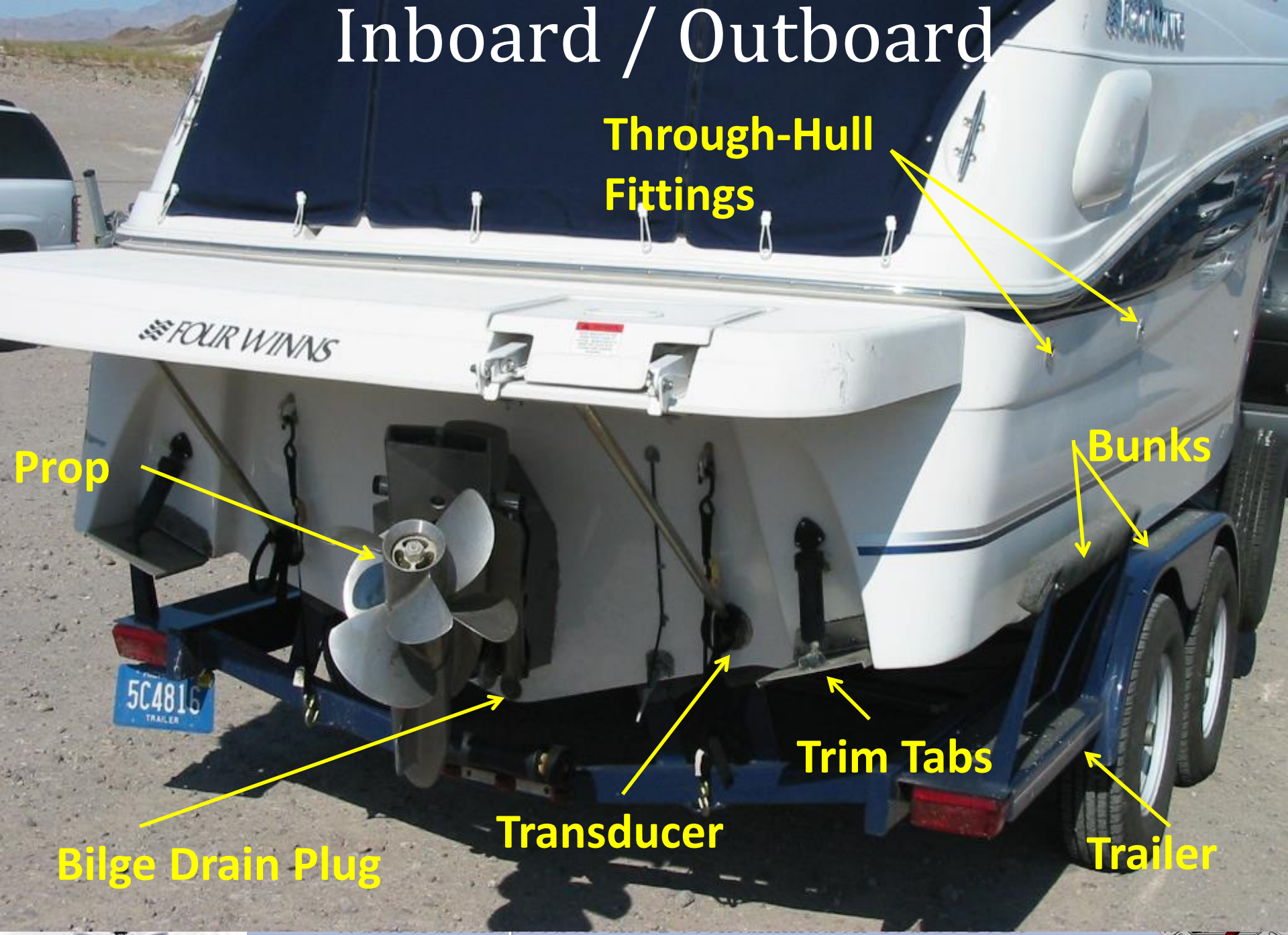
1. Trolling Motors
   - Electric
   - Gasoline
2. Inboard/Outboard Engines (I/O)
3. Outboard Motors
4. Inboard Engines
5. Jet Engines



Outboard


Outboard Motor
Anti-Cavitation Plates
Gimbal Area
Prop
Through hull fitting
Transducer
Trim Tab
Drain Plug

Inboard / Outboard



Watercraft Risk Assessment

Categories of Boats

- Hand-launched, non-motorized watercraft
  - Inspections may, or may not, be required pending state or local laws and regulations
- Simple Boats
  - Need to inspect
- Complex Boats
  - Need to inspect

➢**VERY COMPLEX**

Hand Launched

Kayak
Canoe
Raft
Windsurfer and
Paddle Boards
Sailboard
Float Tubes
Inner Tubes

Hand-Launched:

- No Trailer
- No Compartments
- No Motors or Engines
- Typically Cleaned, Drained & Dried

A Simple Boat

- Open Hull
  AND
- No Containers or Compartments
  AND
- Single Outboard or Motor

A Complex Boat

- Closed Hull

  OR
- One or More Interior Compartments

  OR
- More Than One Motor or Engine

VERY Complex

- Multiple Intakes
- Multiple Devices
- Multiple Engines

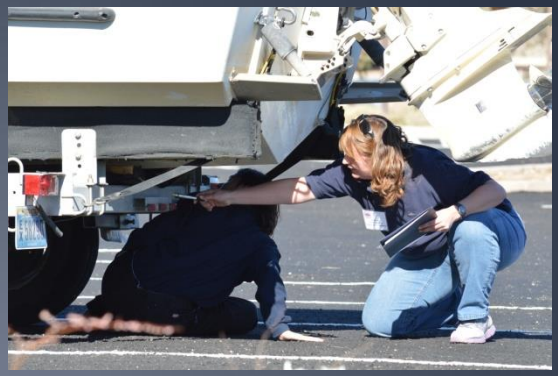
Watercraft Risk

Watercraft Type	Risk Level
House Boats, Cabin Cruisers Ski Boats and Wakeboard Boats with Ballast Tanks	Very High Biological Risk
Large Open Boats, Sailboats, Ski Boats and Wakeboard Boats with no ballast tanks, Personal Watercraft (PWC)	Medium to High Biological Risk
Simple Boats - Open Hull, Single Motors, No Interior Containers or Compartments	Low Biological Risk
Hand-launched, Non-Motorized Watercraft: Canoe, Kayak, Windsurfer Board, Paddle Board, Sail Board, Belly Boats, Rafts, Float Tubes and Inner Tubes	Very Low Biological Risk

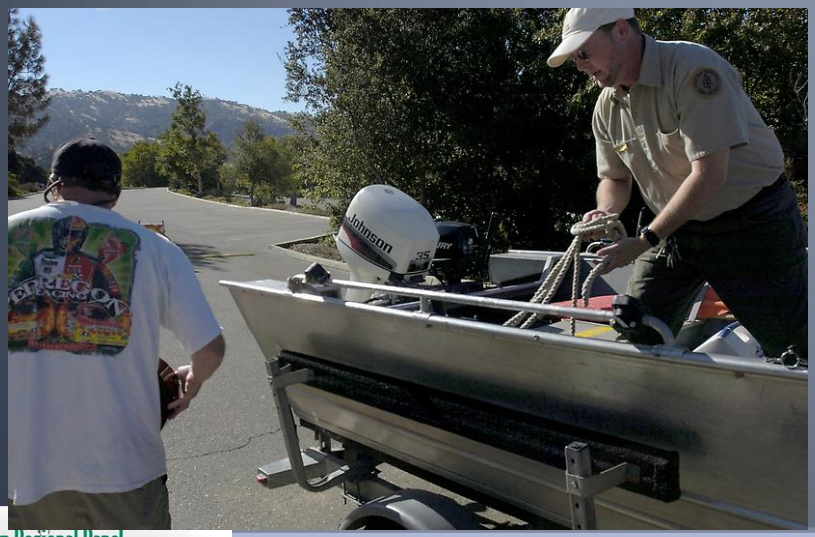
Boat Anatomy

Where Do We Look?

H.E.A.D.



- H – Hull and Trailer – Exterior
- E – Engine or Motor – Transom
- A – Anchor, Anchor Rope and Equipment
- D – Drain Interior Compartments

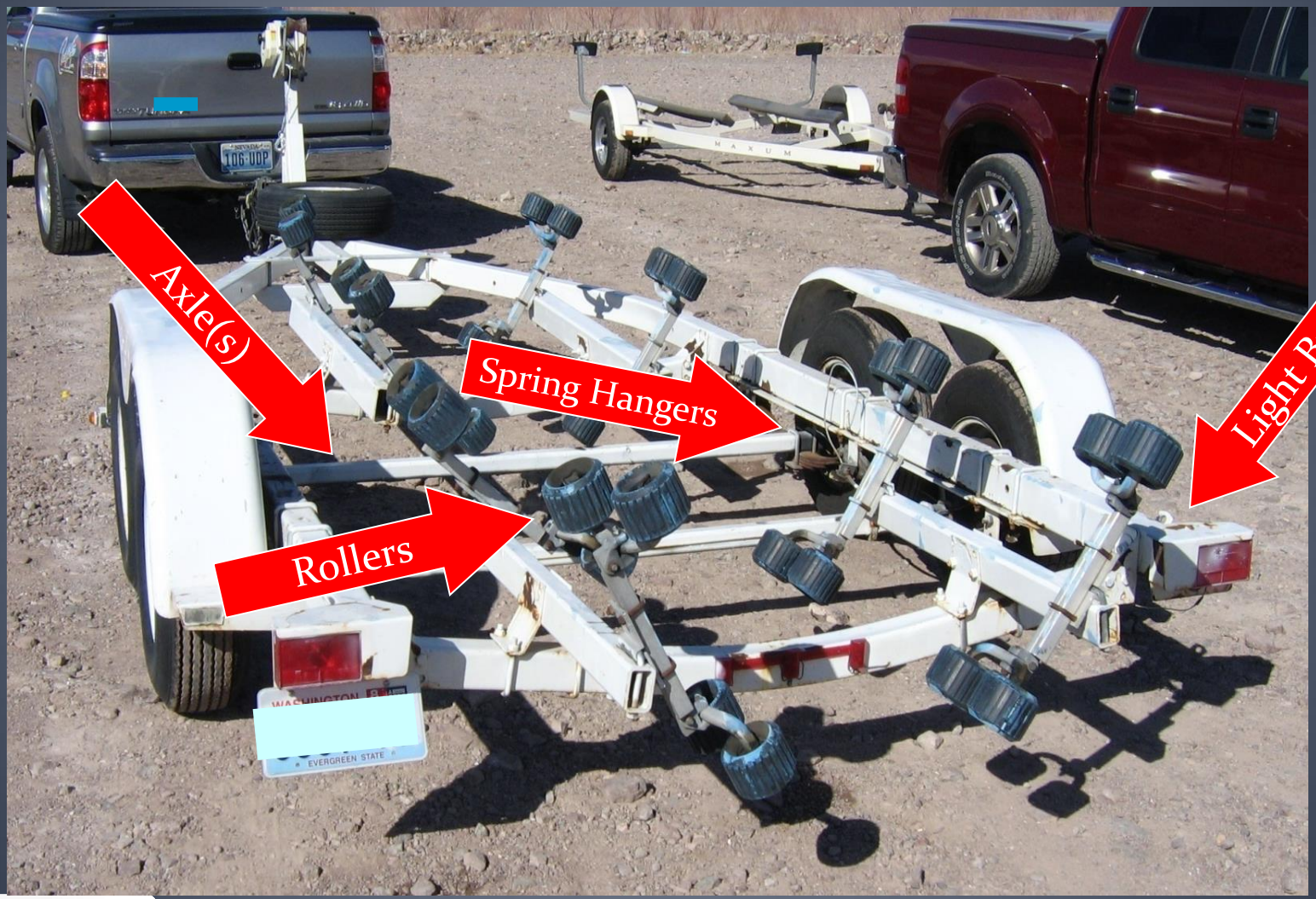


The Hull!

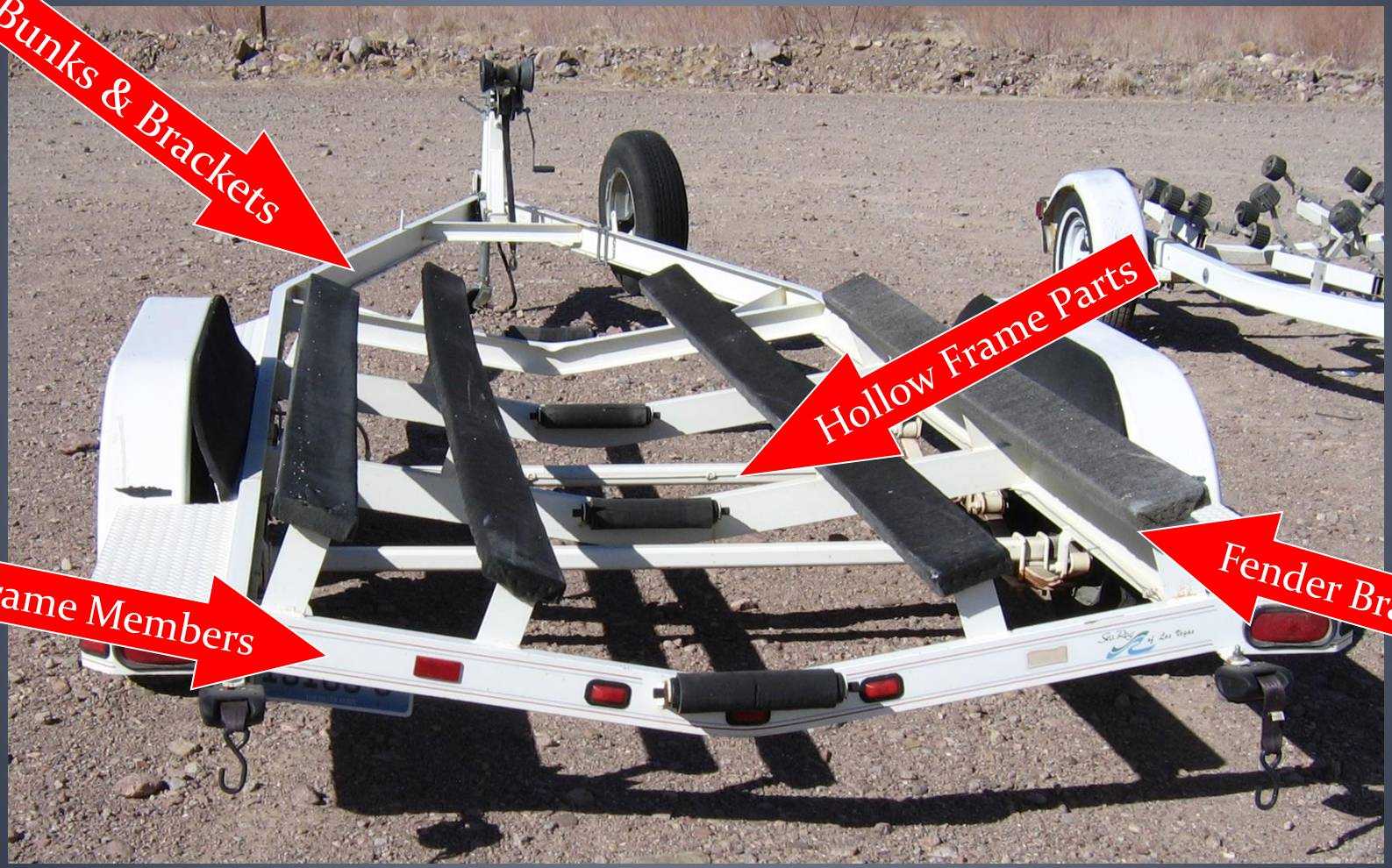
Through Hull Fittings

Use a flashlight!

Trailers - Rollers



Trailers – Carpeted Bunks



Intakes

Gimbal Unit

Anti-Cavitation Plates

Fasteners – Nuts & Bolts

Prop Shaft

Prop Shaft Support

Trim Tabs, Hinges, Top & Bottom

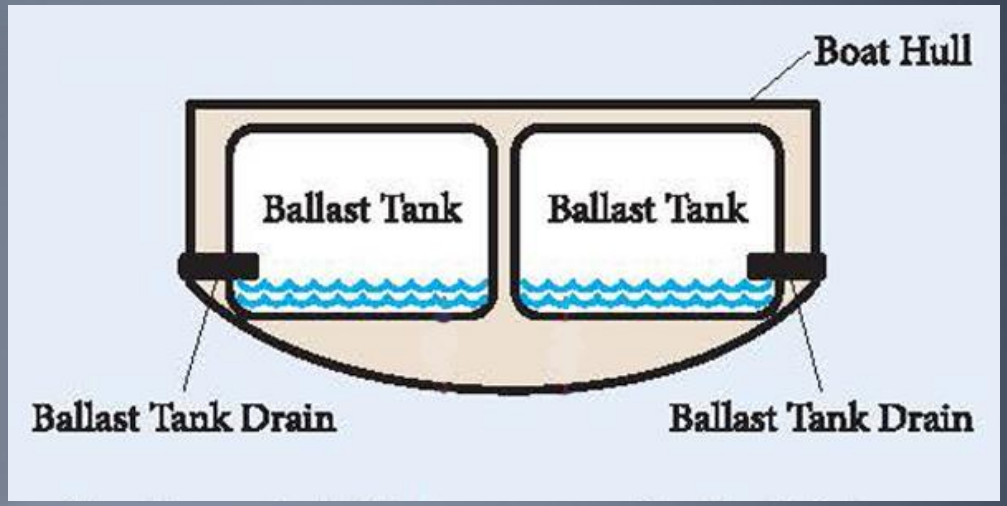
Transducers & Pitot Tubes

Anchors and Rope/Chain

Anchors get checked on every inspection in & out!

Equipment and Storage Lockers

Tanks or Bladders



Sailboats

- Hull and Trailer
- Centerboard Box
- Motors
- Fittings
- Rudder
- Keel

What Does Decon Consist Of?

- Hot Water to Kill
  - No bleaches, soaps or chemicals
- Low pressure to flush
- High pressure to remove from the exterior
- Based on Scientific Research
  - 140°F rinse for 10 seconds kills adult mussels
    - *Morse, 2009*
  - 95°F kills veligers
    - *Craft and Myrick, 2011*

SOP's for Decon Unit

- Check Fluid levels
  - Gas, Diesel, Oil
  - Water if resource tank on MDU
- Roll out the hose – the whole way!
- Connect the water supply
- Pull the choke, and turn the key
  - Squeeze Trigger

Operating Instructions

- Operation
  - Start with squeezing the trigger on the gun
  - Stop by squeezing trigger on the gun after cool down
- Burner
  - Turn on, squeeze trigger
  - Ck Temperature at the gun
  - Bypass Mode
  - Cool down before shutting off

High Pressure – Hot Water!!

- 3,000 psi from the trigger back to the machine – backpressure
- Trigger activates the backpressure through orifice of the nozzle.
- 40 degree tip on nozzle – White Tip
- Water travels thru at speed of 400 miles p/hour
  - Atomized to small droplets
  - 12” standoff, white nozzle = 1lb p/sq. inch
    - 6” INCREASES TO 4 lbs. force

For Example

Standard Decontamination Protocols

- Interior Compartments = 120 F, low pressure
- Ballast Tanks = 120 F, low pressure
- Engines/Motors = 140 F, low pressure

- Constantly checking temperatures of water
  - Also watch temperature gauge for engines at the helm

Standing Water Decontamination

- Most common
- Kill veligers and other AIS in standing water
- Targeted procedure
- Remove or force standing water out of the watercraft and replace it with sterile hot water
- Veligers can live in standing water for 24 days

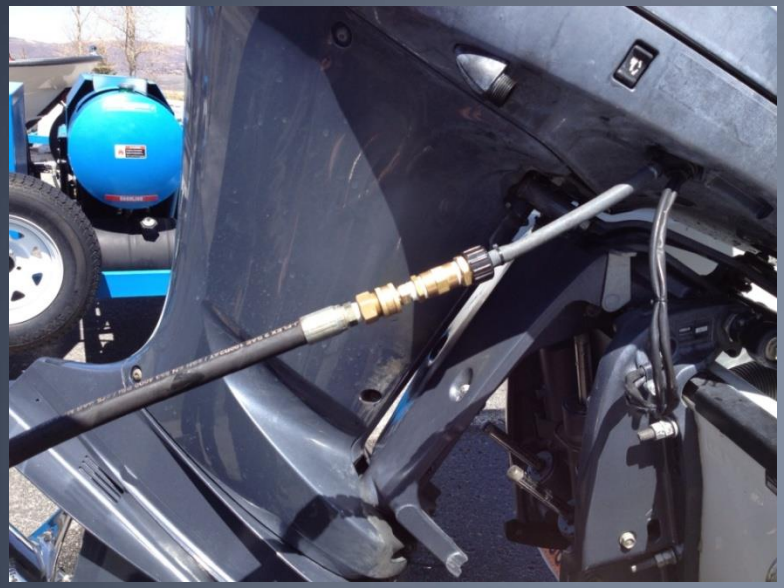
Triggers for Standing Water Decontamination

- Watercraft has been in positive or infested water in last 30 days, was not decontaminated upon exit, and has ANY standing water present
  - Should be done for ballast tanks, I/O and Inboards leaving containment waters intended for another location next.
- Watercraft is unable to be fully drained and cannot be sponged, toweled, or pumped out

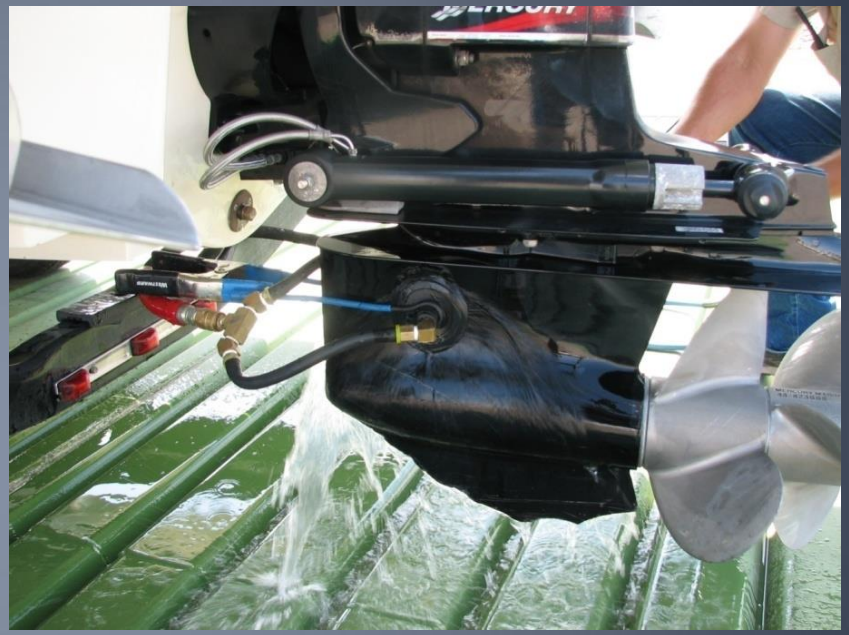
Standing Water Decontamination

- Engine Flushes
- Ballast Tanks
- Motor, Live or Bait Wells

Standing Water Decontamination



Make Sure engine is completely lowered



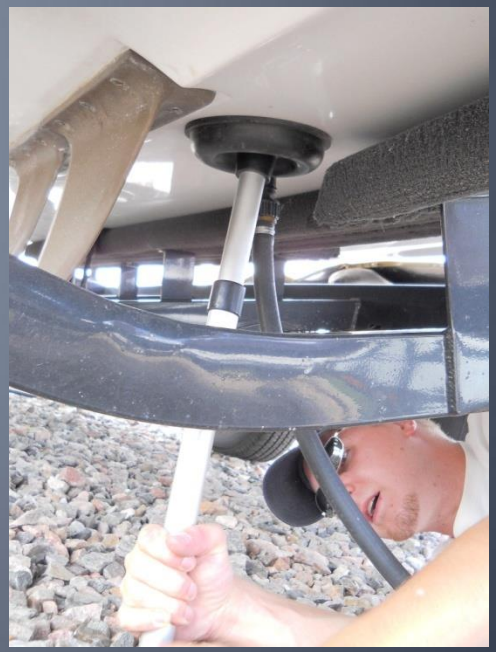
Different Types of Muffs and Attachments Recommended

Engine Flush

- Place muffs on intake openings completely
- Start MDU (Mobile Decon Unit)
- Start Water by engaging Trigger
  - Ck that muffs still secure
- Have eye contact with Watercraft Operator
  - Stand Clear of the propeller
  - Ask Operator to start engine in NEUTRAL
    - Watch to make sure engine is uptaking water!
    - Allow Engine to warm up, then Fire the Burner
    - Exit Temperature measured at Discharge 140 Degrees

Inboard Engine Flush

- Locate Intake on the bottom of hull
- Attach hose to fake-a-lake attachment
- Start MDU
  - Start Water
  - Ck attachment
  - Eye contact
    - Stand Clear of Prop
    - Start Engine
    - Ck Exit Temp at discharge – 140F



Bilge Flush

Flushing the bilge –

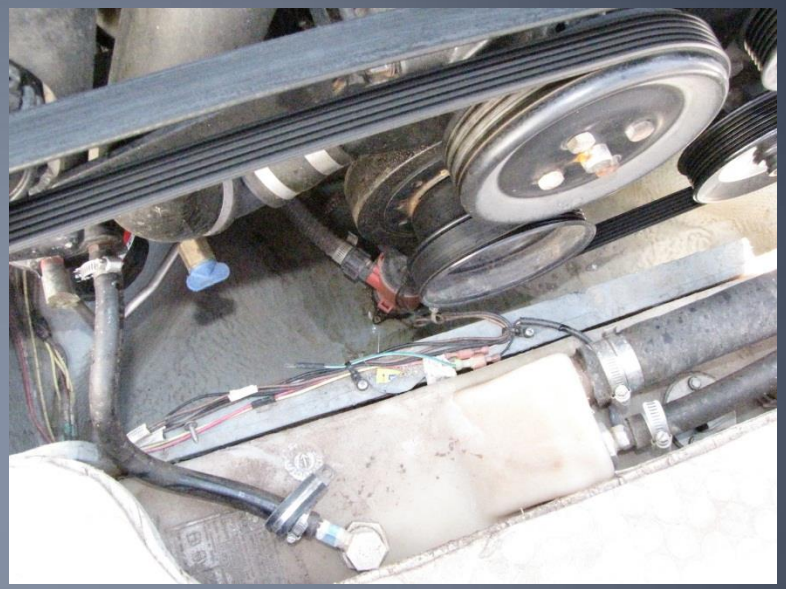
Soak up Contaminants

LOW Pressure

– 4-5 gallons of 120F water,

- have owner remove plug

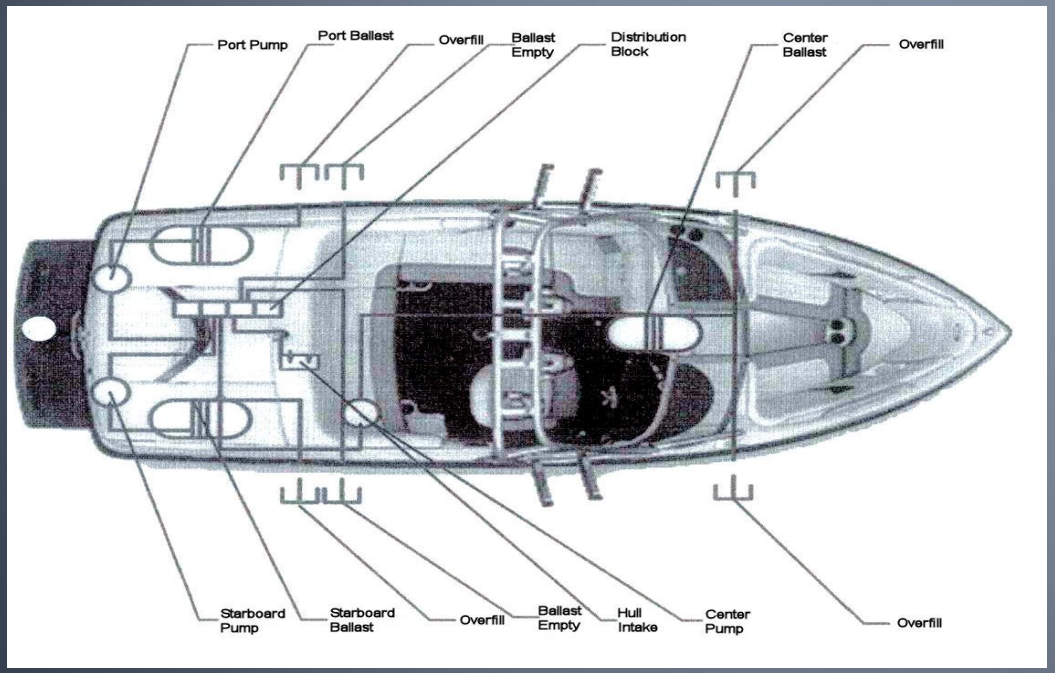
- flush until exit water reaches 120F



Bilge pump can/will come on when water reaches float – Hot water discharged – careful of temperatures for pump motor

Ballast Tanks

- Pumps - multiple
  - high temperatures
- Fill & Drain repeatedly



Ballast Tanks

- Options for Flushing Ballast Tanks

  Back Flush by going thru Overflow or Discharge through hull port

  - Identify Outlet
  - Be Aware of one way Valve
    - Water will splash back

- Tow Boat Ballast intakes can reach 7-9 GPM
  - Pumps will be rated for this amount of Flow
  - Your MDU may be rated for only 5 GPM

Questions?