Aquatic Integrated Pest Management

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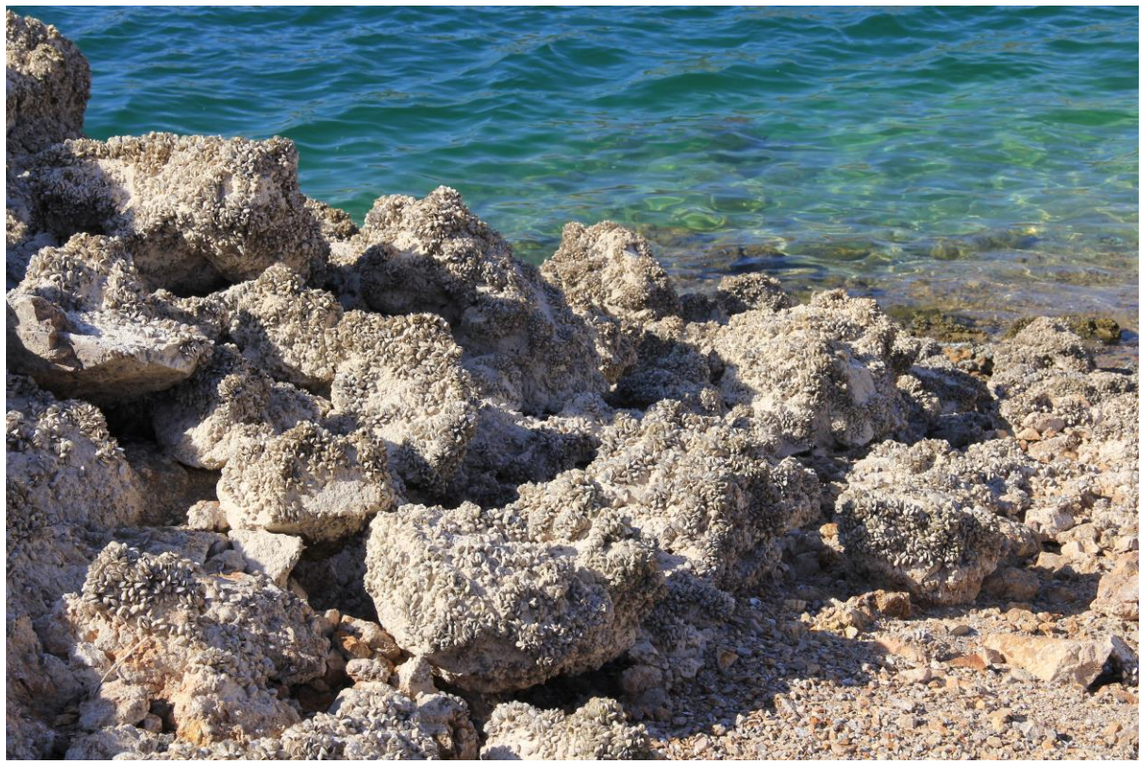
Presentation Outline

- Definitions
- Laws and Regulations
- ANS Plants / Weeds
- ANS Animals
- WID Station Network
- Statewide Monitoring Program
- Response and Management
- Questions and Answers



Noxious Weed

(16) "Noxious weed" means an alien plant or parts of an alien plant that have been designated by rule as being noxious or has been declared a noxious weed by a local advisory board, and meets one or more of the following criteria:

(a) Aggressively invades or is detrimental to economic crops or native plant communities;

(b) Is poisonous to livestock;

(c) Is a carrier of detrimental insects, diseases, or parasites;

(d) The direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

(21) "Weed" means any undesirable plant.

- State Weed Law Definitions

Aquatic Nuisance Species (ANS)

Aquatic Nuisance Species means exotic or nonnative aquatic **wildlife** or **plant** species that have been determined by the commission to pose a significant threat to the aquatic resources or water infrastructure of the state.

- State A.N.S. Act, SB08-226

State Weed Rules

List A – Eradication

- Giant Salvinia
- Hydrilla
- Parrotfeather

List B – Management Required

- Eurasian watermilfoil

List C – Manage as Directed by Local Agencies

- No ANS

Watchlist – No Management Required

- No ANS

State ANS Law and Regulations

Law

- Passed in May 2008
- Formalized State ANS Program
- **Illegal to possess**, import, export, ship, transport, release, plant, place, or cause an ANS to be released.
- Authority to “Agents” & Qualified Peace Officers to inspect, decontaminate and watercraft for ANS.
- Creates in the State Treasury an ANS Fund in CPW.

Regulations

- Sets ANS Prohibited Species List
- Rules related to watercraft inspection and decontamination certification, locations, protocols and mandatory requirements.
- Sets standards for sampling, monitoring, lab testing, listing, de-listing and reporting.
- Requires monitoring to be coordinated with CPW.
- Details Reporting Requirements.
- Requirement for **watercraft operator** to…
  - Clean, drain and dry the vessel
  - Remove water drain plugs upon exiting
  - Remove aquatic plants upon exiting
  - Prohibit the overland transport of a watercraft with water drain plugs in and aquatic plants attached.

Prohibited Aquatic Nuisance Species

Plants/Weeds

- African elodea
- Brazilian egeria
- Eurasian watermilfoil*
- Giant Salvinia*
- Water hyacinth
- Hydrilla*
- Parrotfeather*
- Yellow floating heart

Animals

- Zebra Mussels
- Quagga Mussels
- New Zealand Mudsnails
- Rusty Crayfish
- Spiny Waterflea
- Fishhook Waterflea
- Asian Carp

* On CDA State Weed List A or B

Negative Impacts from ANS Weeds

- Form dense monotypic stands which out-compete natives for light, nutrients and space.
  - Displaces native vegetation that is a valuable food source for fish, waterfowl and insects.
- Reduces water quality
  - Reduces water circulation
  - Lowers levels of dissolved oxygen
  - Increases water temperature
  - Increases pH
- Slows/stops the flow of water for municipal, agricultural and industrial supply
- Creates increased mosquito habitat

Bad for Recreation

Dense mats of aquatic weeds impede ALL forms of water-based recreation including…

The Lake George Association

Boating

Swimming

Scuba Diving

Standley Lake
Westminster, CO

LIVE LIFE OUTSIDE

Fisheries

Fish are typically smaller in weight and length in water bodies that have dense stands due to the alteration of the forage mechanism.

True Aquatic Plants

True aquatic plants are defined as plants that are normally, completely or mostly submerged in water and are unable to survive for long periods outside that medium. This definition includes floating, as well as rooted aquatic species.

MN DNR “A Guide to Aquatic Plants”

African elodea (*Lagarosiphon major*)

Invasive

GENERAL NOTES

- Native to southern Africa
- Noxious weed in New Zealand
- Not known to United States – threat to high elevation

IDENTIFICATION

- Perennial, rooted, and submerged
- Long stems up to 20 feet long
- Leaf color green- and leaves curl downward

African elodea (*Lagarosiphon major)*

Invasive

HABITAT

- Occurs in freshwater lakes, ponds, or flowing streams or rivers.
- Prefers cool water and can grow in high elevation lakes and reservoirs

PATHWAY OF SPREAD

- Only female plants have been found outside its native range
- Reproduce by fragmentation

Brazilian egeria *(Egeria densa)*

Invasive

GENERAL NOTES

- Native to Brazil and coastal areas of Argentina and Uruguay
- Introduced by aquarium and water garden industry
- Popular for oxygenation capabilities and attractive flowers
- Can establish in low light areas unlike native species

HABITAT

- Found in slow moving, shallow waters
- Lakes, ponds, and sluggish rivers or streams

Brazilian egeria *(Egeria densa)*

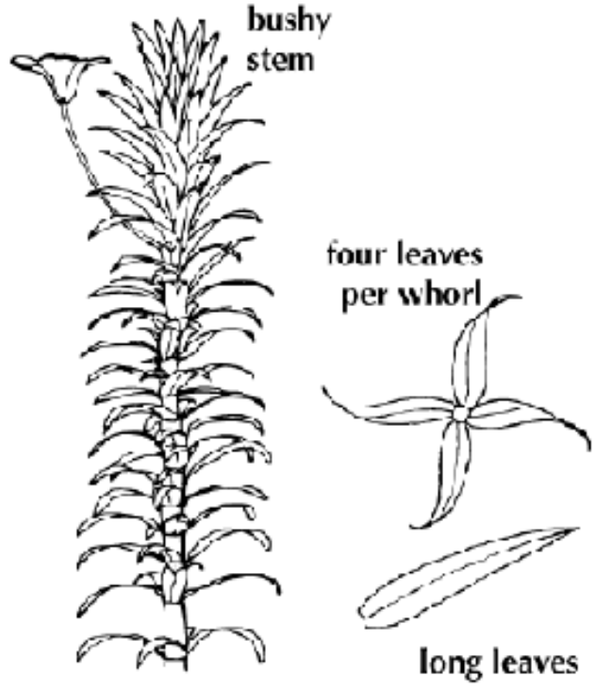
Invasive

IDENTIFICATION

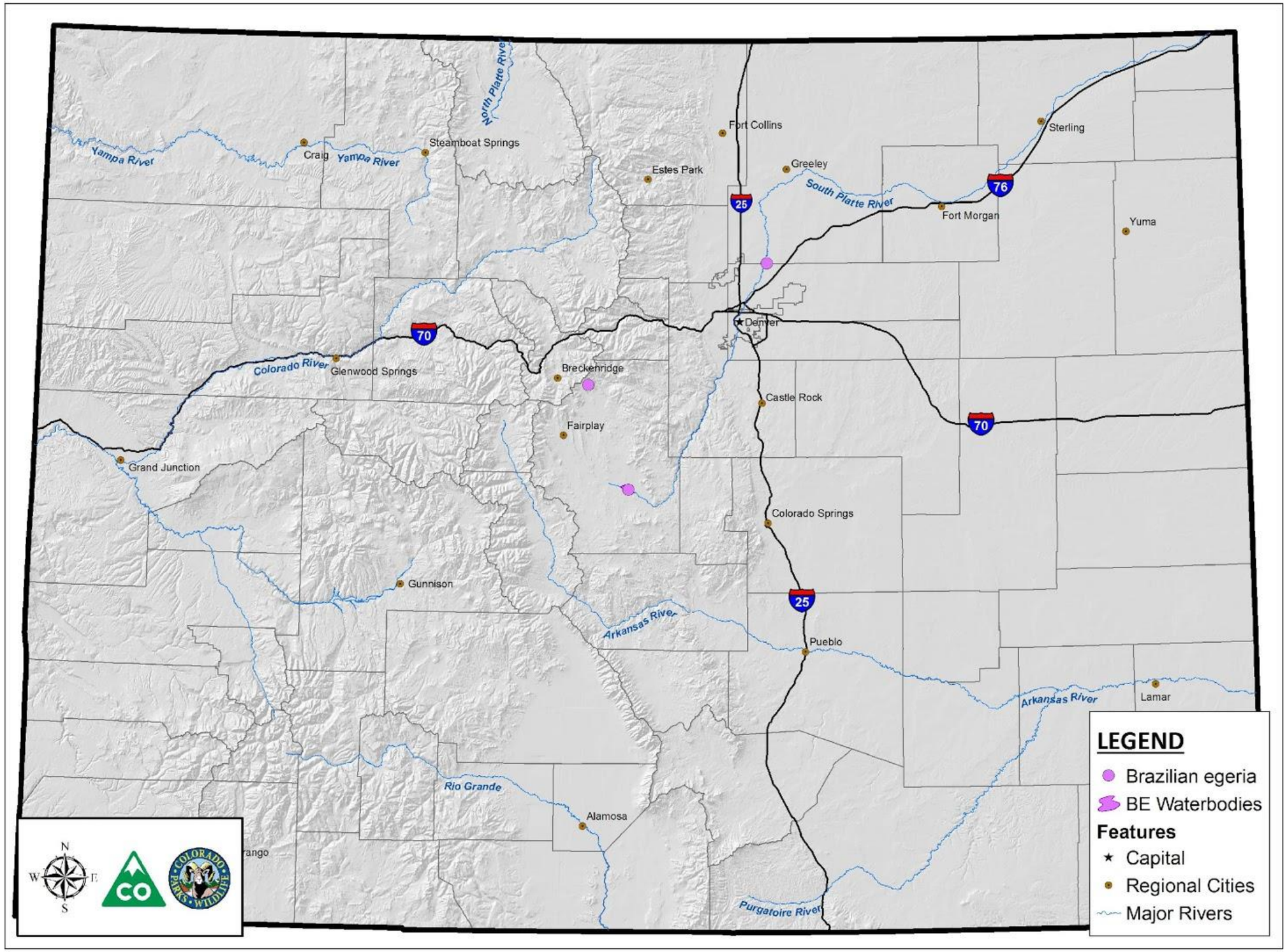
- Submerged and perennial
- Can live rooted or free floating
- Leaves are linear and oblong in shape
- Bright green leaves- in whorls of four

PATHWAY OF SPREAD

- Fragmentation



Brazilian Egeria Distribution for 2019



Map Produced by:
Colorado Parks and Wildlife Invasive Species Program, 1/4/2019

Miles
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Hydrilla (*Hydrilla verticillata*)

Invasive

GENERAL NOTES

- Native to Africa, Australia, and parts of Asia
- Introduced to FL in 1960 via aquarium trade
- Produces think mats and out-competes important native plants.

IDENTIFICATION

- Submerged, perennial and rooted
- Stems slender, branched and up to 25 feet long
- Leaves grow in whorls of 4-8 (number unreliable)

Hydrilla *(Hydrilla verticillata)*

Invasive

HABITAT

- In freshwater rivers, lakes, ponds
- Can grow and establish in low light (just 1% of full sunlight)

PATHWAY OF SPREAD

- It can be dumped from aquariums
- Fragmentation

Elodea- Hydrochartiaeae

Native

- *E. nuttallii* leaves less than 1.75mm in width
- *E. canadensis* leaves more than 1.75 mm in width
- In whorls of 3-4 leaves

Comparison

NATIVE- Elodea

INVASIVE- African elodea

INVASIVE- Brazilian egeria

INVASIVE- Hydrilla

LIVE LIFE OUTSIDE

Watermilfoils- Haloragaceae

- 3 native species
- Eurasian watermilfoil = invasive
  - Hybridizes with native milfoils
- Commonly mistaken with Coontail

Eurasian watermilfoil (*Myriophyllum spicatum*)

Invasive

GENERAL NOTES

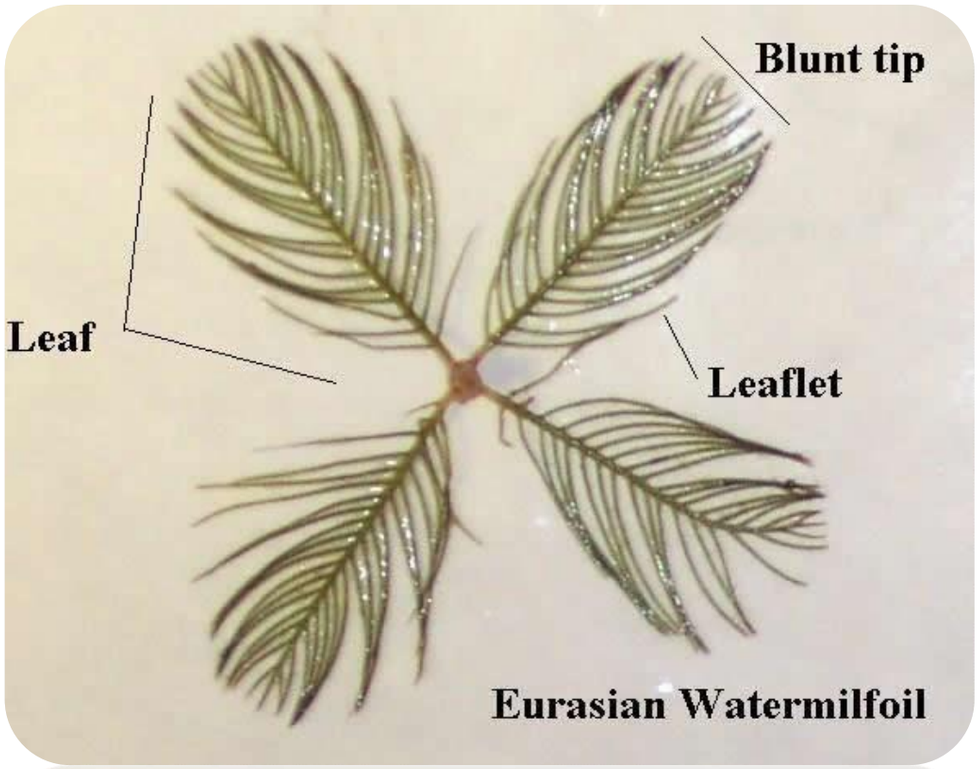
- Native to Europe, Asia and Northern Africa
- Introduced in the 1940s in eastern USA but possibly as early as the late 1880s
- A highly invasive aggressive species that colonizes a variety of habitats
- Forms extremely dense monotypic stands due to it's rapid growth rate (1 ft/wk)

Eurasian watermilfoil (*Myriophyllum spicatum)*

Invasive

IDENTIFICATION

- Submerged, rooted, perennial
- Long branching underwater stems
- Feathery leaves in whorls of 4-5
- Leaves have 11-21 pairs of leaflets
  - Closely spaced
  - ½ inch in length
  - Blunt or Flat Tip
- Collapses out of water



Eurasian watermilfoil (*Myriophyllum spicatum)*

Invasive

HABITAT

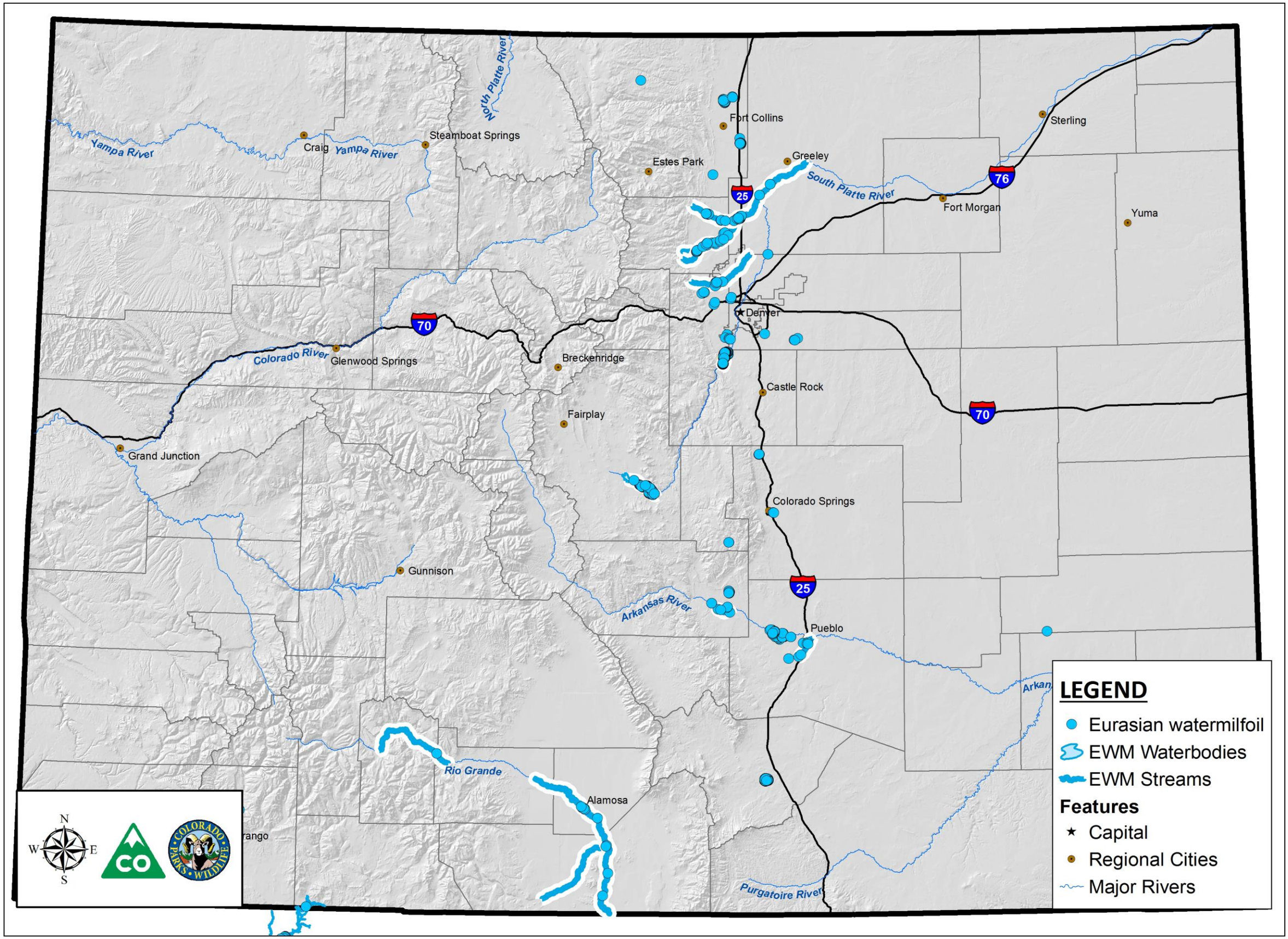
- Colonize a variety of systems
  - Rivers, streams, creeks, ditches, canals
  - Lakes, reservoirs, ponds
- Tolerates wide range of water conditions and depths
  - Will grow long in 2 inches of water
  - Will grow tall in 40 feet of water

PATHWAY OF SPREAD

- Reproduction
- Fragmentation
- Winter Buds

Eurasian watermilfoil

Eurasian Watermilfoil Distribution for 2019



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Colorado Parks and Wildlife Invasive Species Program, 1/4/2019

Miles
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Northern watermilfoil *(Myriophyllum sibiricum)*

Native

- 10 or less leaflet pairs
- Stiff out of water
- Rounded leaf apex
- Leaflets further apart

Comparison

NATIVE- Northern watermilfoil

INVASIVE- Eurasian watermilfoil

Parrotfeather (*Myriophyllum aquaticum*)

Invasive

GENERAL NOTES

- Native of the Amazon River in South America
- Introduced to U.S. in 1800s
- Form dense mats that alter the physical and chemical characteristics of the water

IDENTIFICATION

- Submerged and emergent leaves in whorls of 4-6
- Stems can grow up to a foot above the water

Parrotfeather (*Myriophyllum aquaticum)*

Invasive

HABITAT

- Slow moving or still lakes, ponds or streams
- Roots in shallow water and occurs as floating plants in deeper waters

PATHWAY OF SPREAD

- Fragmentation

Mare's Tail (*Hippuris vulgaris)*

Native

- Mistaken for Elodea in water (thin and limp)
- Mistaken for Parrotfeather when mature
- Fine, narrow leaves in whorls
- Resemble miniature spruce forest

Coontail
(*Ceratophyllum demersum)*

Native

- Leaves
  - -Firm, forked in whorls
  - -Margins fine toothed
  - -Dichotomously branched
  - -Free floating

Comparison

INVASIVE- Parrotfeather

NATIVE- Coontail

NATIVE- Mare's Tail

Water hyacinth
(Eichhornia crassipes)

Invasive

GENERAL NOTES

- Ornamental floating plant
- Brought from Central/ S. America to U.S. in 1884
- Cover the water's surface in a mat-like sheet

IDENTIFICATION

- Floating plant w/ thick, glossy, round leaves and lavender flower
- Each flower has 6 petals joined at the base to form a tube
- One petal has a yellow spot

Water hyacinth *(Eichhornia crassipes)*

Invasive

HABITAT

- Found in freshwater lakes, rivers, ponds and ditches

PATHWAY OF SPREAD

- Reproduce by seed
- Hundreds of daughter plants that form on rhizomes.

No native look-a-likes

Giant Salvinia *(Salvinia molesta)*

Invasive

GENERAL NOTES

- Small free floating fern
- Native to southeastern Brazil
- Distributed by the aquarium and landscaping trades
- Form thick layers of vegetation, replacing native plants and completely covering water’s surface

Giant Salvinia *(Salvinia molesta)*

Invasive

IDENTIFICATION

- Floating oblong leaves
- Have stiff leaf hairs on the upper surface of the leaves
- Root-like structures conceal stalks that can have egg-shaped spores attached

HABITAT

- Quiet water of lakes, ponds, ditches, slow flowing streams and rivers.

PATHWAY OF SPREAD

- Fragmentation

Duckweed
(Lemna spp., Wolffia spp.)

Native

- Small floating or submerged disk
- *Wolffia spp.* much smaller, often overlooked

Comparison

INVASIVE- Giant salvinia

NATIVE- Duckweed

Yellow floating heart (*Nymphoides peltata*)

Invasive

GENERAL NOTES

- Native of Eurasia and Mediterranean area
- Introduced as ornamental water plant to U.S.
- Grows in dense patches excluding native species

IDENTIFICATION

- Perennial, water lily-like plant
- Carpets the water surface with long stalked, heart-shaped leaves.
- 2-5 bright yellow flowers on each stalk

Yellow Floating Heart (*Nymphoides peltata*)

Invasive

HABITAT

- Slow moving rivers, lakes, or ponds

PATHWAY OF SPREAD

- Water dispersed seeds
- Fragmentation

Rocky Mountain pond-lily *(Nuphar lutea)*

Native

- Cup-like yellow flower

Management and Control Options for Weeds

IPM:

- Cultural
- Biological
- Physical
- Mechanical
- Chemical
- Monitoring

Visit www.aquatics.org for the Best Management Practices for Managing Aquatic Plants by the Aquatic Ecosystem Restoration Foundation.

Cultural Control

- Prevention
  - Boat inspections and vector management
  - Education and Outreach
  - Strong Regulations and Enforcement
- Early Detection
  - Survey and monitor for new infestations.
  - Report sightings immediately to CPW.
- Rapid Response
  - Have a plan in place for a new infestation.
  - Consider ESA and NPDES Compliance when evaluating control options.
  - Education of leadership and public in advance!

Physical Control

Management Method	Description	Advantages	Disadvantages
Benthic Barriers	Natural or synthetic material to cover plants	Direct & Effective, may last several seasons	Somewhat expensive, small-scale, nonselective
Draw down	“De-water” a lake or river for an extended period of time	Inexpensive, very effective, moderate-term	Can have severe environmental impacts
Dredging - Sediment Removal	Mechanical sediment dredge used to remove sediments	Creates deeper water, long-term results	Expensive – must deal with dredge sediment
Shading	Reduce sunlight with dyes or shade cloth	Generally inexpensive, effective	Nonselective, may not be aesthetically pleasing

Chart adapted from Aquatic Plant Management BMP by Aquatic Ecosystem Restoration Foundation

Mechanical Control

Hand Pulling / Digging

The whole plant, including the roots, should be removed.

Works best in softer sediments and smaller infestations.

Repeated hand pulling/digging is necessary to control re-growth.

All fragments must be collected!

Mechanical Control

Diver-operated dredging

Vacuum lift used to remove plant, stems, roots, leaves and sediment left in place.

Highly effective against relatively new infestations.

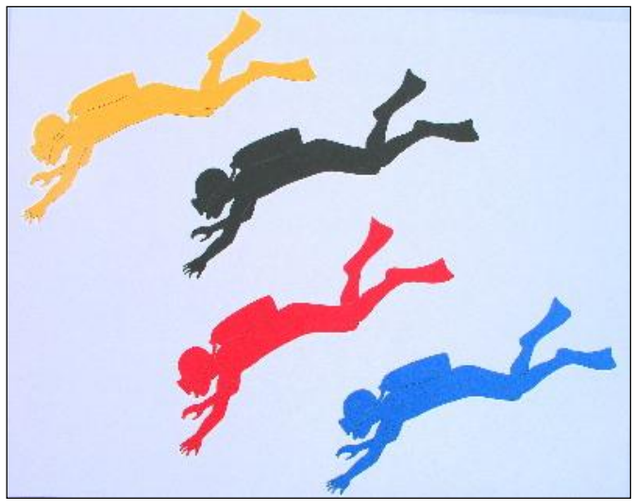
All fragments must be collected.

(+/-) Moderately selective

(+) Long term control

(+) Typically have minimal regrowth

(-) Slow and cost-intensive



Mechanical Control

Harvester

Mechanical cutting with plant removal

Limited to areas of sufficient size and depth

All fragments must be collected.

Aquarius Systems

(+) Removes plant biomass immediately

(+) Removes the shade producing portions of plant

(+) Widespread use of chronic problems

(-) Slow and expensive

(-) Resuspension of sediments

(-) Non-selective and Short-term

(-) Have to have upland area to put plants

Mechanical Control

Rotovator

Rototiller-like blades turn 7-9 inches below the bottom to dislodge roots. Plants and roots are removed manually or with a rake.

All fragments must be collected.

(+) Clears areas rapidly

(+) Effective in treating large stands of EWM

(-) Non-selective, intermediate-term

(-) Re-suspension of sediments

(-) Can have negative impacts to benthic organisms and fish spawning areas.

Chemical Control

Several approved aquatic herbicides will control aquatic plants.

Read the label for application rates, techniques, approved locations and safety information.

<u>The Label is the Law!</u>

Each site will need to have specific evaluation to determine best chemical control options.

See www.aquatics.org for plant specific chemical recommendation in the APMS BMP

Prohibited Aquatic Nuisance Species

Plants/Weeds

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- Brazilian egeria*
- Eurasian watermilfoil*
- Giant salvinia
- Water hyacinth
- Hydrilla
- Parrotfeather
- Yellow floating heart

Animals

- Zebra Mussels
- Quagga Mussels
- New Zealand Mudsnails*
- Rusty Crayfish*
- Spiny Waterflea
- Fishhook Waterflea
- Asian Carp

LIVE LIFE OUTSIDE

* Present in Colorado

New Zealand Mudsnail

GENERAL NOTES

- First found in CO in 2004.
- Native to New Zealand.
- Small aquatic freshwater snails
- First discovered in North America in the late 1980's in Snake River, Idaho and Madison River, Montana

More information in Mollusk Guide also! Page 68-71

New Zealand Mudsnail

GENERAL NOTES

- Asexual – all female clones
- Overwinter in riparian roots
- Easily hidden in mud on waders or gear

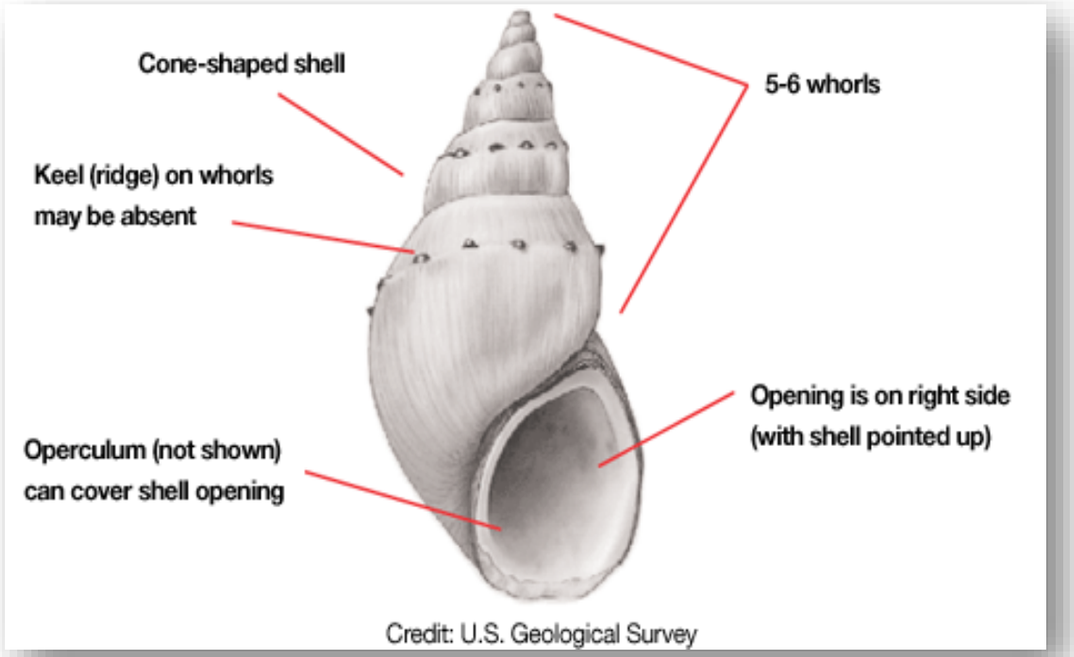
They are less than 1/8” in length and can hide in mud for weeks out of water. They hitchhike in mud on waders, boots and on boats.
Bottom Line = NO MUD!

- Loves to hitchhike down Boulder Creek on Eurasian watermilfoil

New Zealand Mudsnail

IDENTIFICATION

- Range from the size of a grain of sand to 1/8” in length
- Black or brown in color
- Shell has 5.5 spirals
- Shell tip pointed up, opening towards you, opens to the right.
- Attached operculum closes the opening



Credit: U.S. Geological Survey

They can survive up to 50 days on a damp surface or up to 30 days on a dry surface.

New Zealand Mudsnail

HABITAT

- Freshwater or Brackish or Saline waters
  - Less offspring and slower growth
- Prefers Rivers and Streams, but will colonize Lakes
- Tolerate wide temperature ranges (freezing – 82F)

PATHWAY OF INTRODUCTION

- Unintentional introduction from humans on waders, gear or on feet of dogs and wildlife
- Fish movement

New Zealand Mudsnail

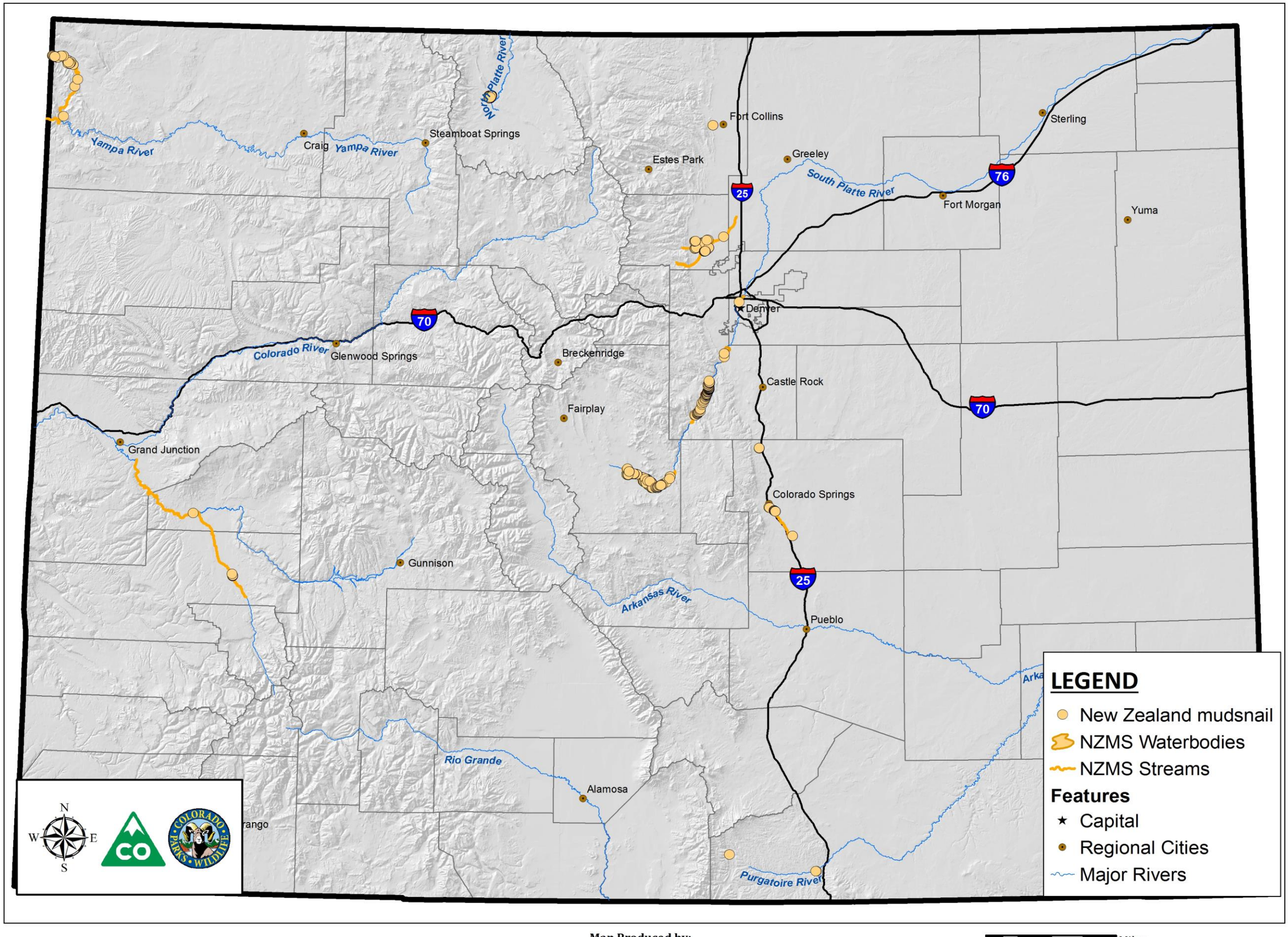
IMPACTS

- Outcompete native invertebrates for space and food
- Reduce the availability of native invertebrate prey for fish.
- Not viable food source themselves.

  • NZMS can close their operculum when eaten by a fish and then be excreted unharmed upstream or downstream. Fish think they are getting good food but really don’t get any food at all resulting in smaller fish in weight and length.

- Sheer biomass a problem – changing the benthic ecosystem

New Zealand Mudsnail Distribution for 2019



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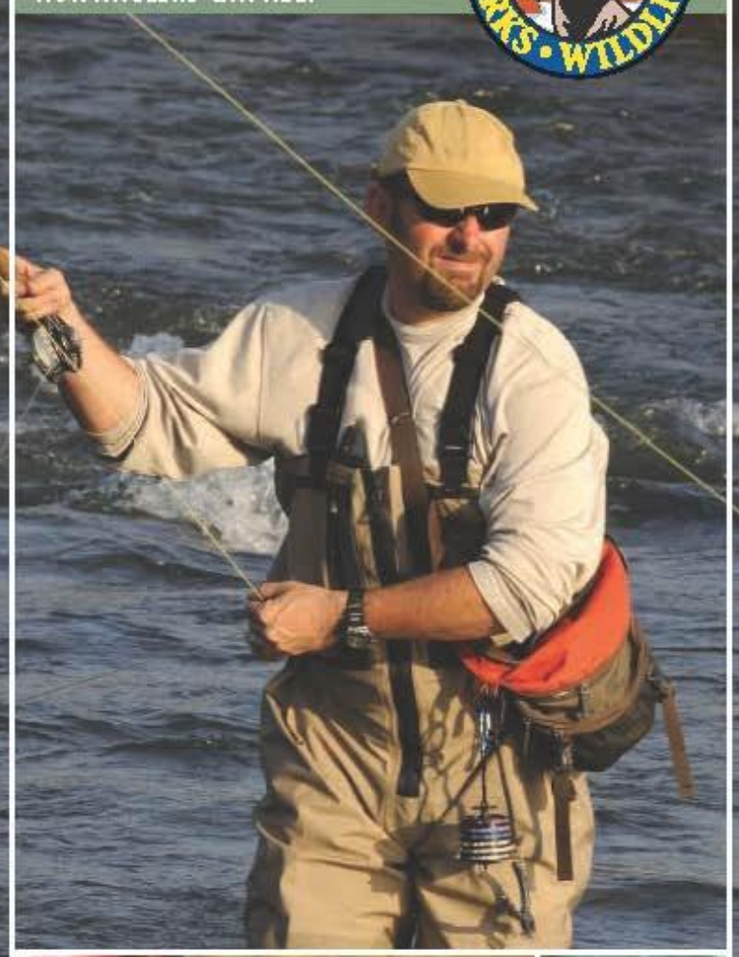
COLORADO PARKS & WILDLIFE

Protect our Rivers and Streams from Invasive Species

HOW ANGLERS CAN HELP



cpw.state.co.us

COLORADO PARKS & WILDLIFE

Angler Alert!

New Zealand Mudsnails have been found in this water body.

BOATERS:
Remove all mud, plants, and water from your vessel.
• CLEAN • DRAIN • DRY
between each and every use.

You can prevent the spread of invasive species by always:

1. CLEAN waders and gear with a brush and remove all mud, plants, and organic materials between each and every use.
2. In addition, anglers should then perform ONE of the following options before going into the next body of water:

OPTION 1
Submerge waders and gear in a large tub filled with a mixture of 6 ounces per gallon quaternary ammonia-based institutional cleaner (such as Super HDQ Neutral) and water for at least 10 minutes, scrubbing debris from the gear, and visually inspecting the gear for snails before rinsing. Follow all precautionary label instructions! Rinse water must be from a New Zealand mudsnail-free source (to avoid re-infection), and the chemical bath must be properly disposed of, away from the water body.

OPTION 2
Spray or soak waders and gear with 140° Fahrenheit water for at least 10 minutes.

OPTION 3
Dry your waders and equipment completely for a minimum of 10 days in between each use (remember that mudsnails can survive several days out of water).

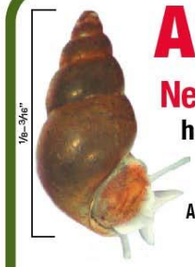
OPTION 4
Place waders and boots in a freezer overnight between use.

STOP AQUATIC HITCHHIKERS!™

www.cpw.state.co.us

Angler Alert!

New Zealand Mud Snails have been found in the South Delaney Buttes Reservoir.



Anglers who use waders in NZMS infested waters should CLEAN waders and gear with a wire brush and remove all mud, plants and organic materials between each and every use.

Anglers should then DISINFECT waders and gear using one of these options before going back into the water:

OPTION 1
- Mix 50% Water & 50% Formula 409®
- Submerge waders and gear for 10+ minutes.
- Scrub debris & inspect for snails before rinsing.
- Rinse water must be free from New Zealand mud snails (to avoid re-infection).
- Dispose away from any body of water.

OPTION 2
- Mix 1 part Sparquat 256 cleaner (3.1% concentration) to 15 parts water.
- Submerge waders and gear for 10+ minutes.
- Scrub debris & inspect for snails before rinsing.
- Rinse water must be free from New Zealand mud snails (to avoid re-infection).
- Dispose away from any body of water.

OPTION 3
- Spray or soak waders and gear for 10+ minutes.
- Make sure water is 140°f.

OPTION 4
- Let waders and gear completely dry for 10+ days between each use (mudsnails can survive several days out of water).

OPTION 5
- Place waders and gear in a freezer overnight between each use.

Boaters: Remove all mud, plants and water from your vessel.
CLEAN • DRAIN • DRY between each and every use.

You can prevent the spread of NZMS and other invasive species to other waters!

STOP AQUATIC HITCHHIKERS!™

www.wildlife.state.co.us

ANGLER ALERT!

Pictures Left: NZMS found on a rock with a penny for comparison

Photos by: D.L. Gustafson, MSU

If you find NZMS call ANS Coordinator: 303-291-7362 or 303-291-7355 or email: robin.knox@state.co.us

STOP AQUATIC HITCHHIKERS!™
Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

NEW ZEALAND MUD SNAILS (NZMS) have been found in the SOUTH PLATTE RIVER IN ELEVENMILE CANYON!

HELP Prevent the spread of New Zealand Mud Snails:

- Wash your waders, boots and soles with a stiff brush and a solution of 50% water and 50% FORMULA 409® Antibacterial Kitchen cleaner for 5 to 10 minutes to physically kill and remove snails, debris or other unwanted hitchhikers.
- Freezing overnight, or soaking in hot water above 130°F for 5 minutes has also been proven to be effective in killing snails.
- Be sure to wash and treat your boots and waders before you enter another stream.

How to Identify a New Zealand Mud Snail:

- New Zealand Mud Snails average 1/8 inch long, but young may be as small as a grain of sand. A plate covers the opening of the gray, brown or black cone-shaped shell with 5-6 whorls.
- They live in most types of waters, from silted river bottoms to clear mountain streams and brackish waters.
- Reproduce asexually - only takes ONE!

Why Control New Zealand Mud Snails?

NZMS disrupt the food chain by consuming algae in the stream and competing with native bottom-dwelling invertebrates. A population crash of invertebrates (small aquatic organisms) can follow the introduction of NZMS, which reduces fish forage. With a decrease in food availability, fish populations may decline as well.

Be A Clean Angler

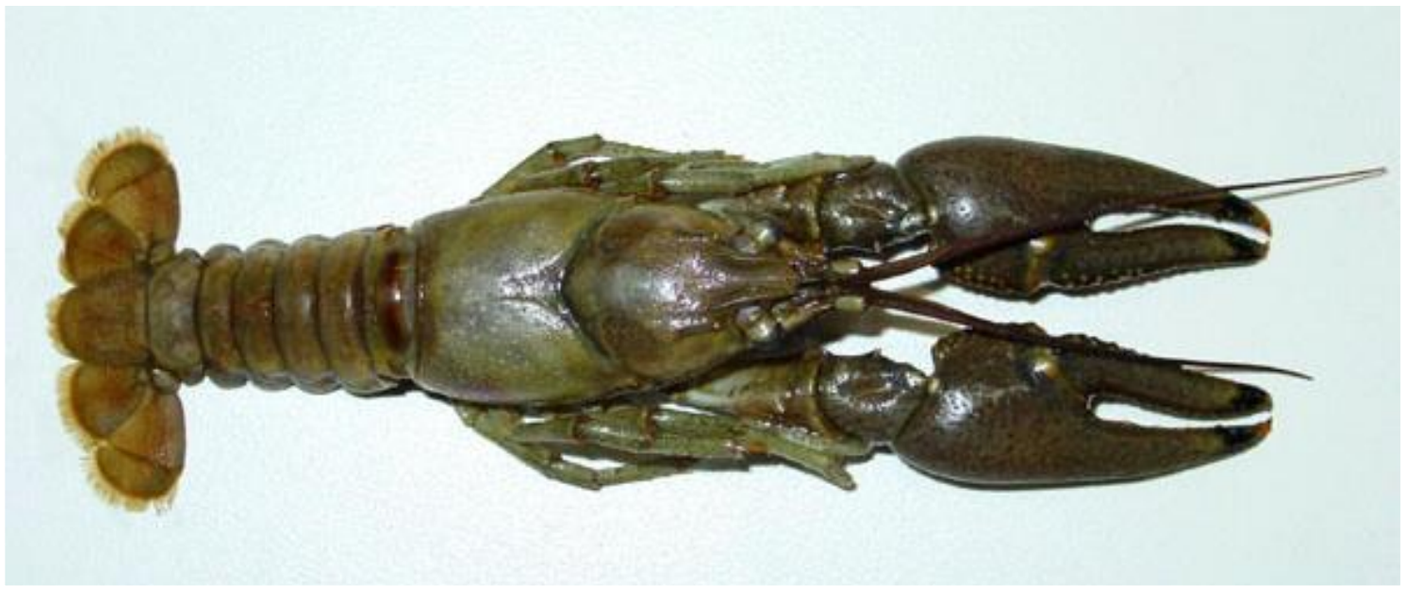
Inspect - Clean - Dry

www.wildlife.state.co.us

Rusty Crayfish

GENERAL NOTES

- Native to the Ohio River Basin.
- First discovered outside of their native range in the 1960's.
- Have had catastrophic ecological impacts in the Northeastern USA



Rusty Crayfish

IDENTIFICATION

- Grow up to 5” long
- Brown bodies
- Large grayish-green to reddish-brown claws with dark bands on the tips
- 2 Rusty patches on either side of body
- Closed claws have oval gap in middle
- Moveable claw is smooth and S-shaped

Rusty Crayfish

HABITAT

- Freshwater Lakes, Rivers, Streams
- Prefer deep pools and fast currents with cover from predators.

PATHWAY OF INTRODUCTION

- Illegal Bait Introductions
- Illegal Stocking

Rusty Crayfish

IMPACTS

- Eat small fish, insects and fish eggs – food web disruption
- Eat aquatic vegetation beds that is critical for fish spawning, prey fish cover and wildlife food
- Aggressive species
- Not good fish food
- *In the heavily-infested northern Wisconsin and Minnesota lakes, recreational swimming has been affected because large numbers of rusty crayfish now occupy favorite swimming holes and the fear of getting pinched by the large-clawed "rusties" is very real.*

Rusty Crayfish

RUSTY CRAYFISH SITES IN COLORADO	
Water Body	**Year Detected**
Catamount Reservoir (Routt County)	2009
Yampa River (Routt County south of Steamboat Springs)	2009
Sanchez Reservoir (Costilla County)	2010
Stagecoach Reservoir (Routt County)	2011

CRAYFISH: AGGRESSIVE, OPPORTUNISTIC FEEDERS

Learn how to help stop the spread of rusty crayfish at: **www.wildlife.state.co.us/Wildlife Species/Profiles/Invasive Species/Rusty Crayfish.htm.**

Crayfish are not native to parts of Colorado, yet they have become established in many waters throughout the state.

Non-native, invasive crayfish — like rusty crayfish — endanger aquatic native species and sport fish by:
» Preying on all life stages of fish, amphibians and invertebrates
» Aggressively competing for habitat and food
» Destroying productive habitat in our streams, ponds and lakes

Crayfish can be taken for personal consumption, but care should be taken with the use and disposal of crayfish.
» Even though crayfish can be taken live on the Eastern Slope, it is recommended that tails of all crayfish be removed immediately and packed in ice for transport.
» Do not throw unused bait crayfish, or bait of any kind, back in the water alive.

Rusty crayfish ©DOW

LIVE TRANSPORT PROHIBITED

FROM WATERS WEST OF THE CONTINENTAL DIVIDE

All crayfish caught west of the Continental Divide must now be immediately killed by removing the head from the thorax and taken into possession, or immediately returned to the water from which they were taken.

AT SANCHEZ RESERVOIR SWA

Rusty crayfish have been discovered at Sanchez Reservoir State Wildlife Area in Costilla County. To prevent the spread of rusty crayfish within and beyond this area, the DOW has issued an order that prevents the transport of any live crayfish from Sanchez Reservoir SWA.

Zebra & Quagga Mussels

- Freshwater bivalve mollusks
- Highly variable color patterns
- Triangular (Z) Rounded (Q)

- Invasive Characteristics
  - Rapid Reproduction
  - Attach with Byssal Threads
  - Filter Feeding

Driessena polymorpha

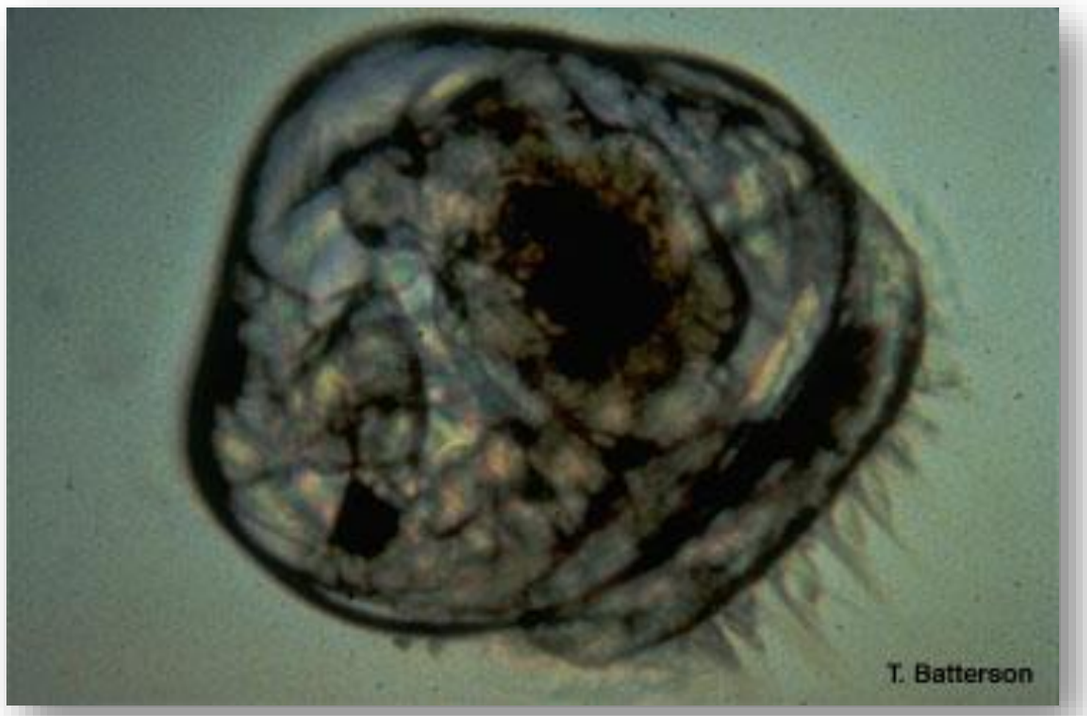
Driessena rostriformis bugensis

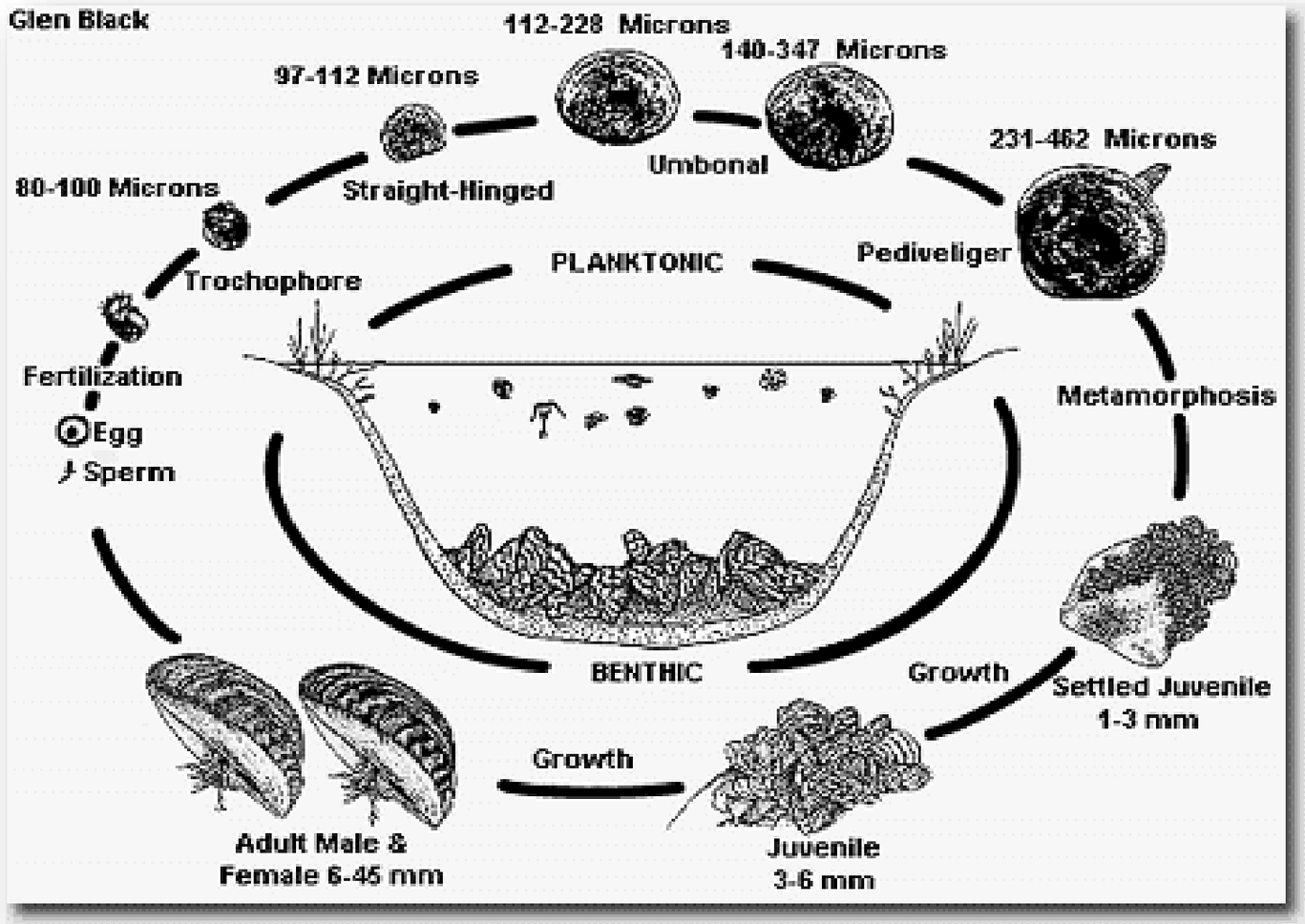
Life Cycle

- Planktonic Larval Stage (veliger)
- Settler Juvenile Stage
- Sessile as Adults

This is why standing water is such a HUGE concern.

This is what we are feeling boats for - “Bumps on Boats” that don’t rub off.





Adult Mussels

- Adults attach to any hard surface with byssal threads
- Adults about 1-2 inches long
- Typically forming dense clusters
- Light Sensitive – Can live in deep water (100-400’)
- Live 4-5 years

Why Be Concerned?
IMPACTS!

- Ecological Impacts
- Recreational Impacts
- Economic Impacts
- Spread Quickly!

Invasive Characteristic #1

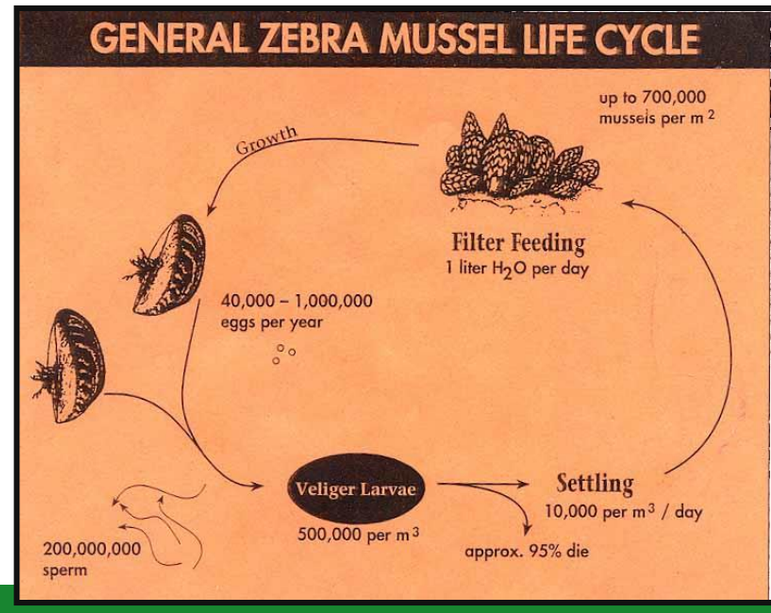
Extremely Prolific Reproduction

- Reproduce exponentially - can spawn year round if conditions are favorable.

- *A* single female mussel can produce up to 1,000,000 eggs per spawn!

- If only 10% survive, there would be 10 septillion mussels in the waterway at the end of 5 years!

- **(10,000,000,000,000,000,000,000,000)**



Invasive Characteristic #2

Byssal Threads - Attach to hard and semi-soft substrate

- Clog infrastructure and water distribution systems
  - *Counted as many as 700,000/m^2 in Lake Michigan*
- Smother benthic organisms
  - *10,000 attached to a single native mussel*
- Foul watercraft equipment
  - *Lake Mead Marina*

Invasive Characteristic #3

Filter feeders

- Filter up to 1 liter of water a day

- Remove plankton from water, base of food chain.

- Degrade water quality – taste and odor in drinking water

Management

- Eradication is almost impossible.
- There are no viable control methods for open water.
- Prevention is the best defense!
- Education is the most important task!

El Dorado, KS, Zebra Mussels 2003

El Dorado, KS, Zebra Mussels 2006

Why Inspect Boats?

- By inspecting boats, we are managing the single largest vector of introduction and spread.
- ZQM is transported overland on recreational boats.
- ZQM are the most costly invasive species in the USA.
- ZQM are ecological and financial threat to the West.
- Inspections are preventing introductions of ZQM and other ANS!

Mandatory Inspection Regulations

Resident Boats

The boat must pass a state-certified boat inspection if:

- The boat has launched in waters outside of Colorado.
- The boat has launched on any positive waters in Colorado. You must submit the boat to an inspection for ANS prior to leaving the containment body of water.
- Any reservoir where inspections are required (Prevention).

Out-of-State Boats

The boat must pass a state-certified ANS inspection if launching in any Colorado lake, reservoir or waterway.

Types of WIDS

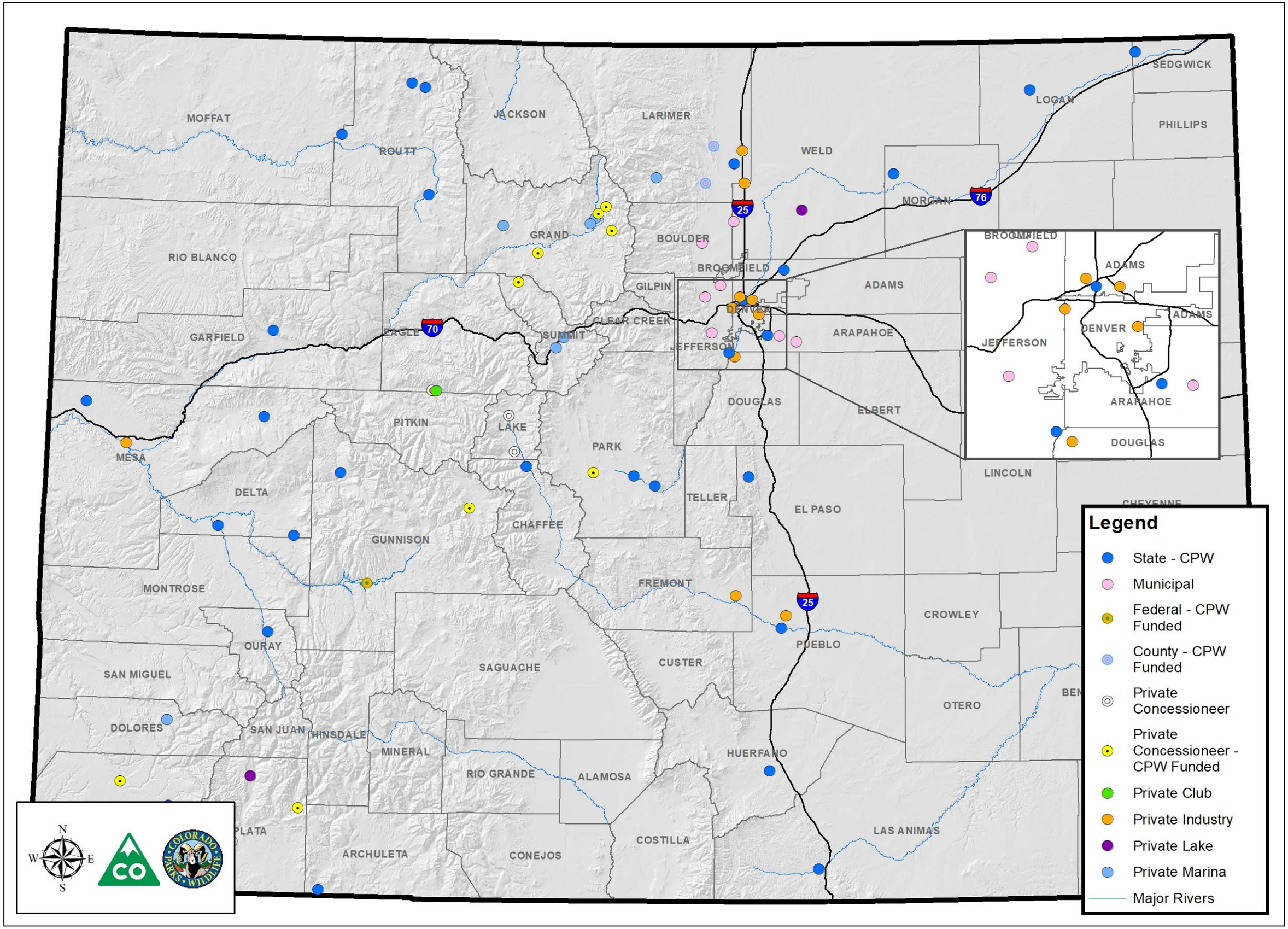
- **Negative Prevention Water -** Waters that have never had a verified detection of any ANS, or have been de-listed.
- **Other ANS Positive Water** – Waters that have a verified presence of an ANS listed in Chapter 8 regulations other than zebra or quagga mussels.

  Most ANS Positive waters are also prevention waters for mussels and some other ANS.
- **ZQM Containment Water** – Waters that have had a verified zebra or quagga mussel detection.
- **Off Water WIDS -** Authorized Locations that are not at a lake or reservoir (e.g. offices or marine dealers)

WID Authorized Locations

Number of Authorized Locations by Entity											
Entity Type	**‘08**	**‘09**	**‘10**	**‘11**	**‘12**	**‘13**	**‘14**	**‘15**	**‘16**	**‘17**	**’18**
Colorado Parks & Wildlife					38	37	37	32	32	30	29
State Parks	24	28	28	28							
Division of Wildlife	5	160	19	19							
Larimer County	0	2	2	2	2	2	2	2	2	3	2
Municipalities	3	7	11	9	8	8	8	8	8	7	8
National Park Service	0	1	1	1	1	1	1	1	1	1	1
Private Industry	3	11	51	30	24	27	27	28	28	31	32
Total:	**35**	**209**	**112**	**89**	**73**	**74**	**75**	**71**	**71**	72	72

Colorado Watercraft Inspection and Decontamination Stations for 2018

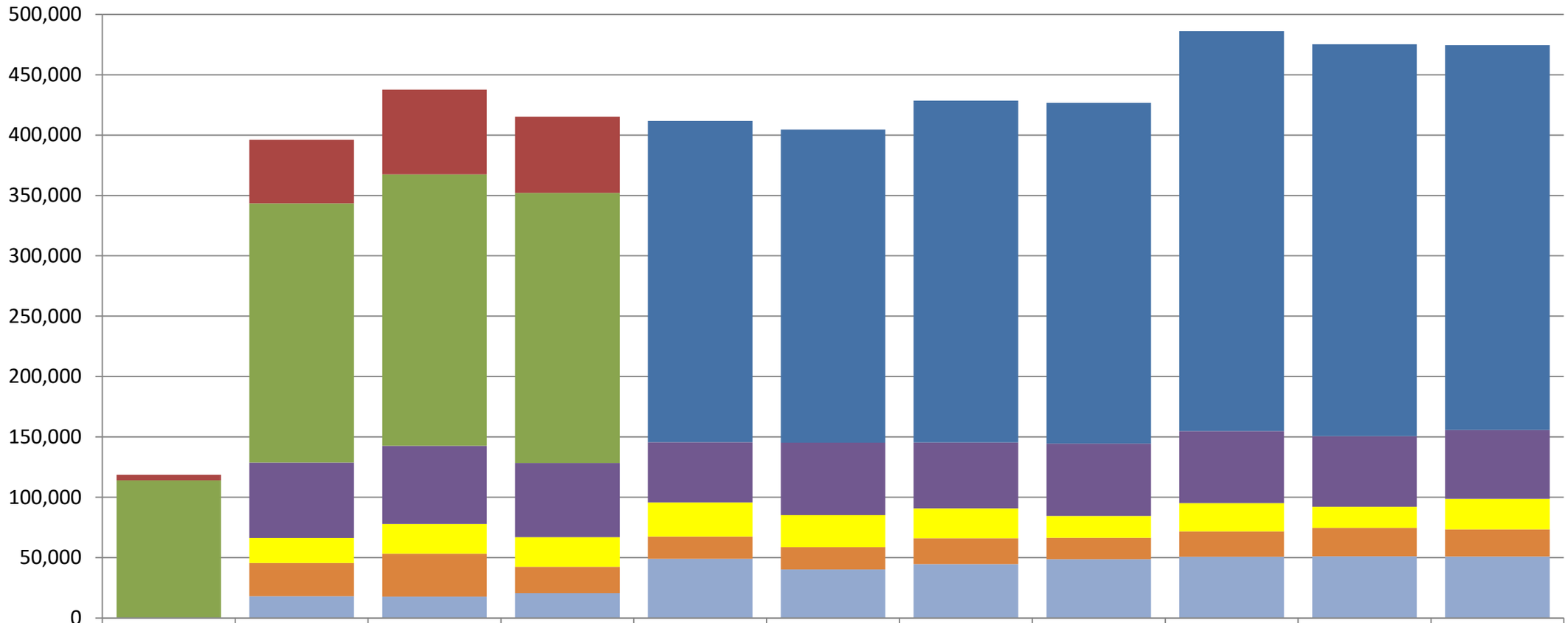


Q:\Invasive_Species\Mapping\Projects\WIDLocations_2017.mxd

Map Produced by:
Colorado Parks and Wildlife Invasive Species Program, December 2018

0 10 20 40 60 80 Miles

Statewide Inspection Numbers

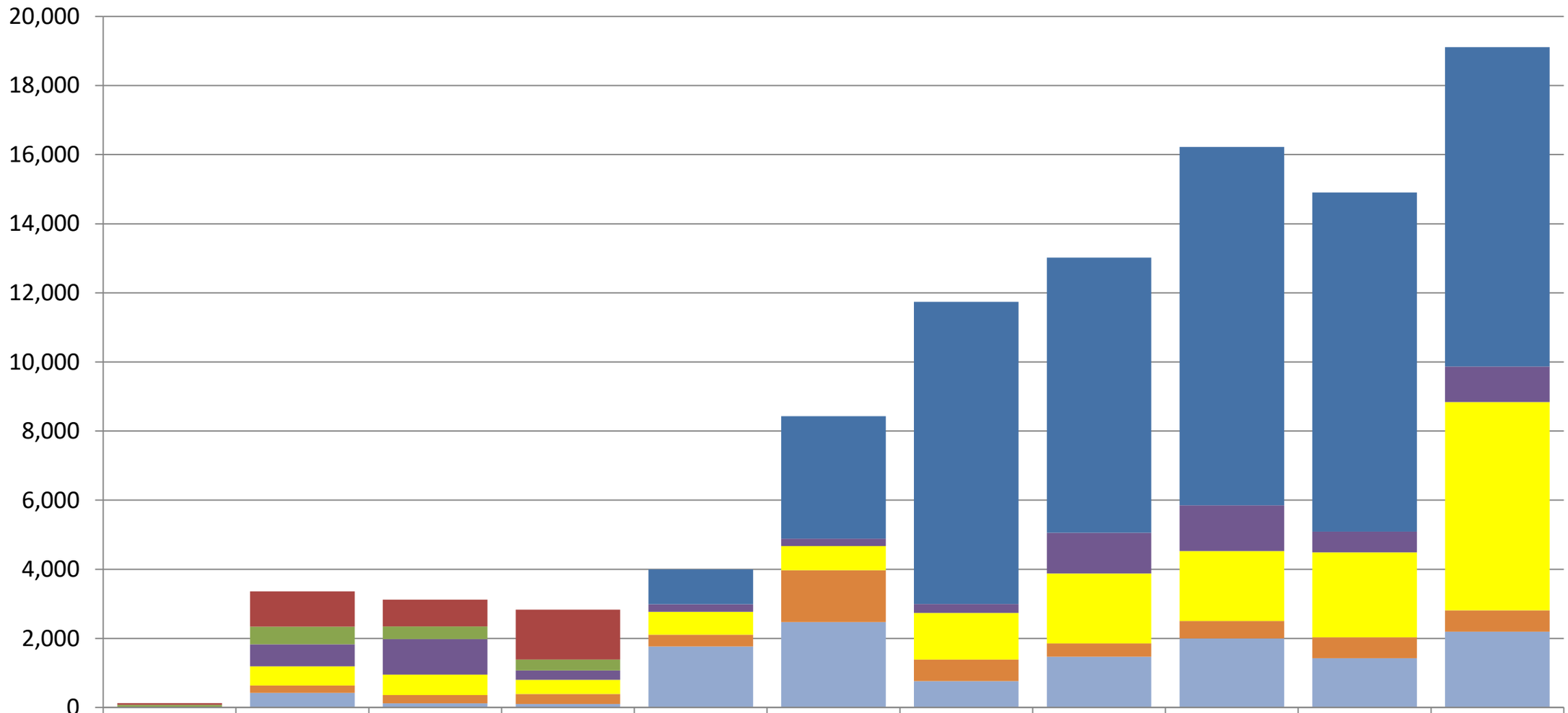


	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Colorado Parks & Wildlife	0	0	0	0	266,076	259,235	283,108	282,092	331,361	324,568	318,735
Division of Wildlife	4,587	52,608	70,165	63,155	0	0	0	0	0	0	0
State Parks	114,000	214,690	224,640	223,739	0	0	0	0	0	0	0
Larimer County	0	62,595	64,813	61,489	49,741	60,036	54,555	59,968	59,500	58,489	57,015
Municipalities	0	20,569	24,563	24,422	28,331	26,527	24,797	18,121	23,487	17,268	25,298
National Park Service	0	27,582	35,557	21,913	18,374	18,445	21,318	17,784	20,979	23,741	22,486
Private Industry	0	18,060	17,782	20,584	49,165	40,260	44,679	48,659	50,829	51,090	50,985

Over 4.4 Million Inspections!

LIVE LIFE OUTSIDE

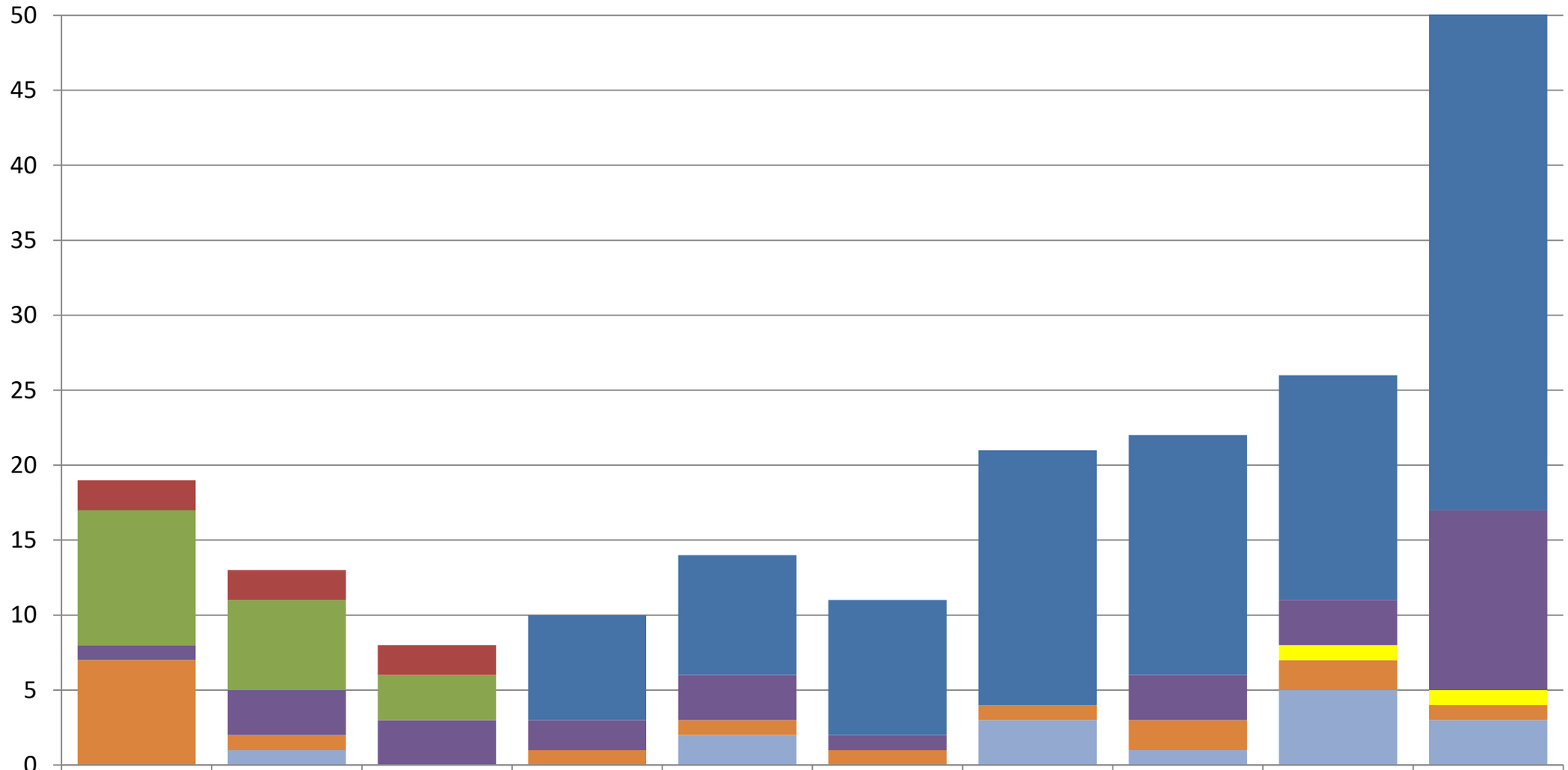
Statewide Decontamination Numbers



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Colorado Parks & Wildlife	0	0	0	0	1,009	3,543	8,746	7,965	10,373	9,816	9,246
Division of Wildlife	47	1,025	775	1,443	0	0	0	0	0	0	0
State Parks	79	511	365	315	0	0	0	0	0	0	0
Larimer County	0	635	1,029	271	217	212	258	1,178	1,325	601	1,027
Municipalities	0	554	590	415	664	703	1,348	2,025	2,024	2,455	6,026
National Park Service	0	219	239	290	338	1,501	627	380	501	606	618
Private Industry	0	420	122	99	1,769	2,469	761	1,472	2,001	1,426	2194

Mussel Boats Intercepted by Entity

Total Intercepted Vessels: 195

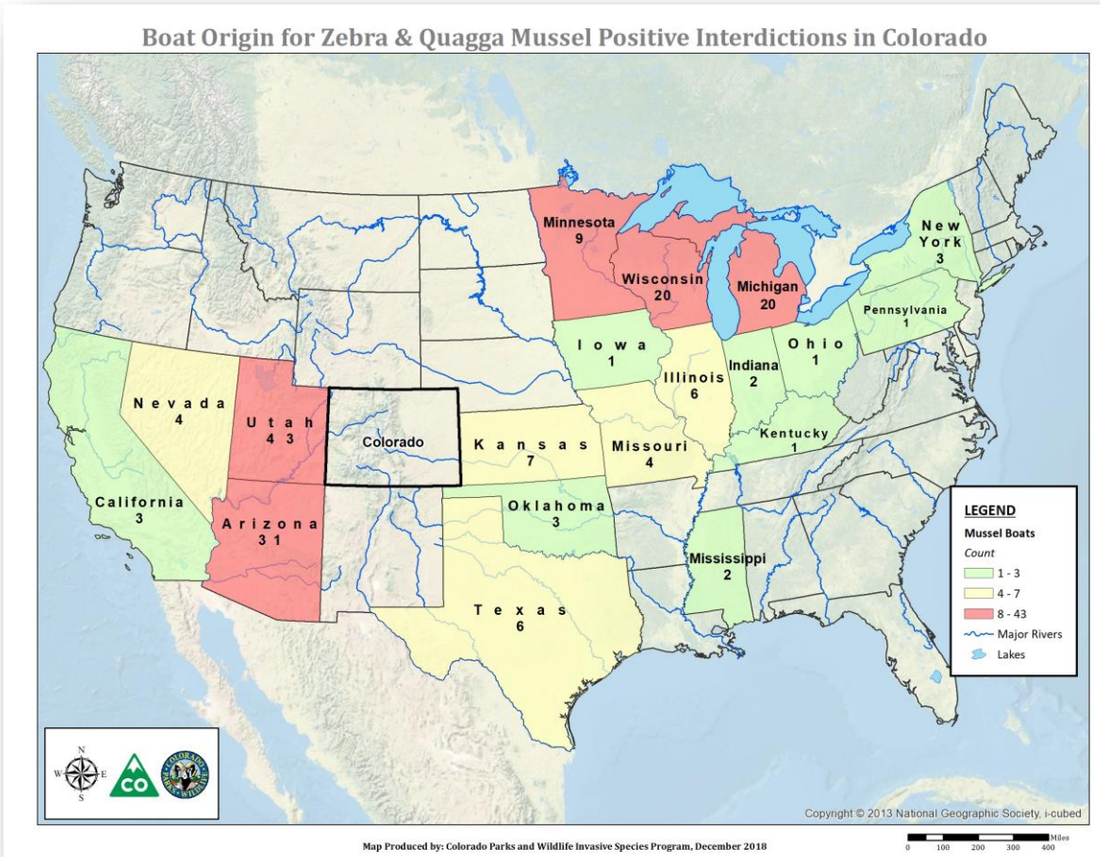


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Colorado Parks and Wildlife	0	0	0	7	8	9	17	16	15	34
Division of Wildlife	2	2	2	0	0	0	0	0	0	0
State Parks	9	6	3	0	0	0	0	0	0	0
Larimer County	1	3	3	2	3	1	0	3	3	12
Municipalities	0	0	0	0	0	0	0	0	1	1
National Park Service	7	1	0	1	1	1	1	2	2	1
Private Industry	0	1	0	0	2	0	3	1	5	3

LIVE LIFE OUTSIDE

Mussel Boat Origins 2009-2019

- Great Lakes
- Arizona
- California
- Illinois
- Indiana
- Kansas
- Kentucky
- Louisiana
- Michigan
- Minnesota
- Mississippi
- Missouri
- New York
- Nevada
- Oklahoma
- Ohio
- Pennsylvania
- Texas
- Wisconsin
- 14 are Unknown



State Monitoring Program

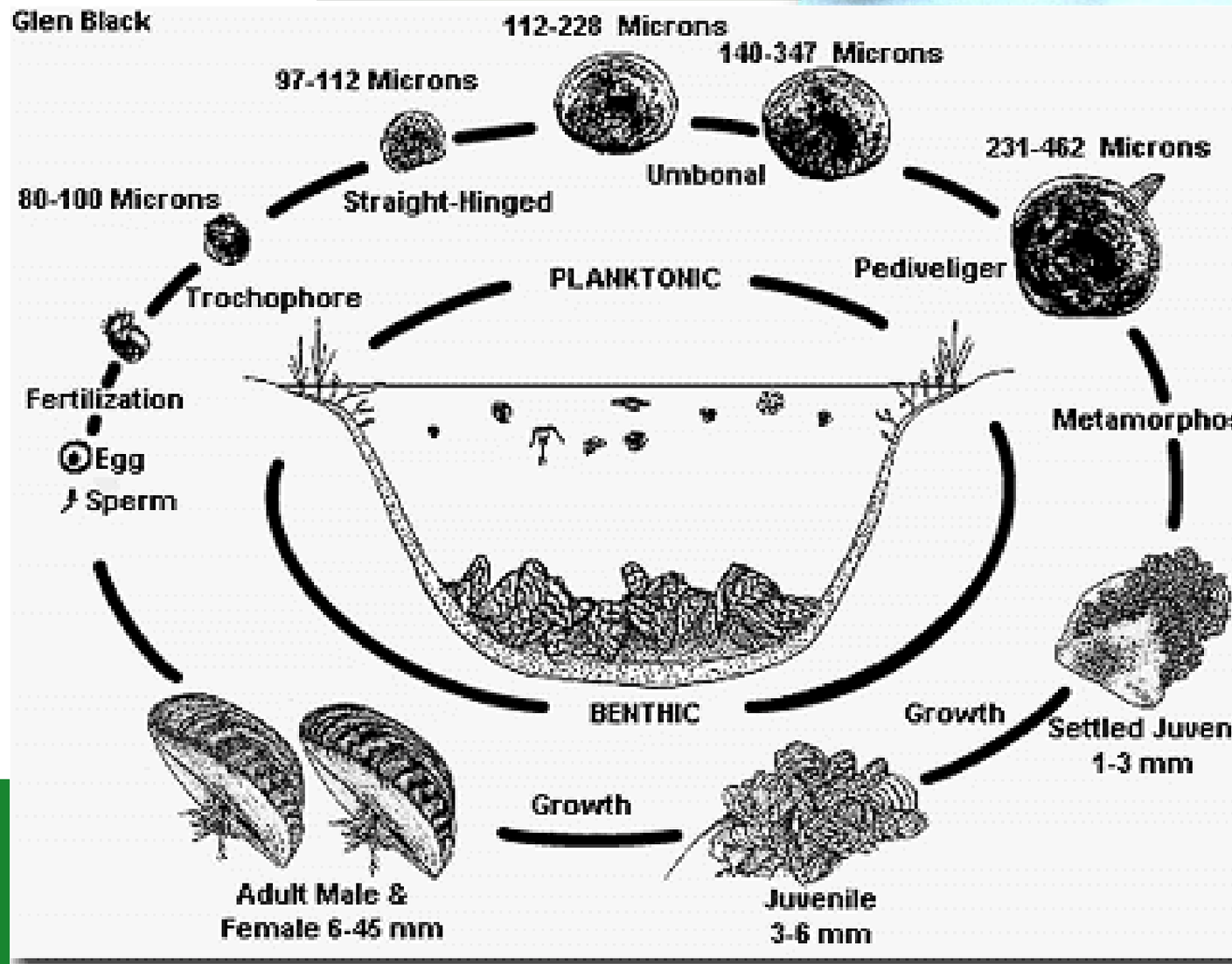
Early Detection Sampling & Monitoring

CPW Technicians

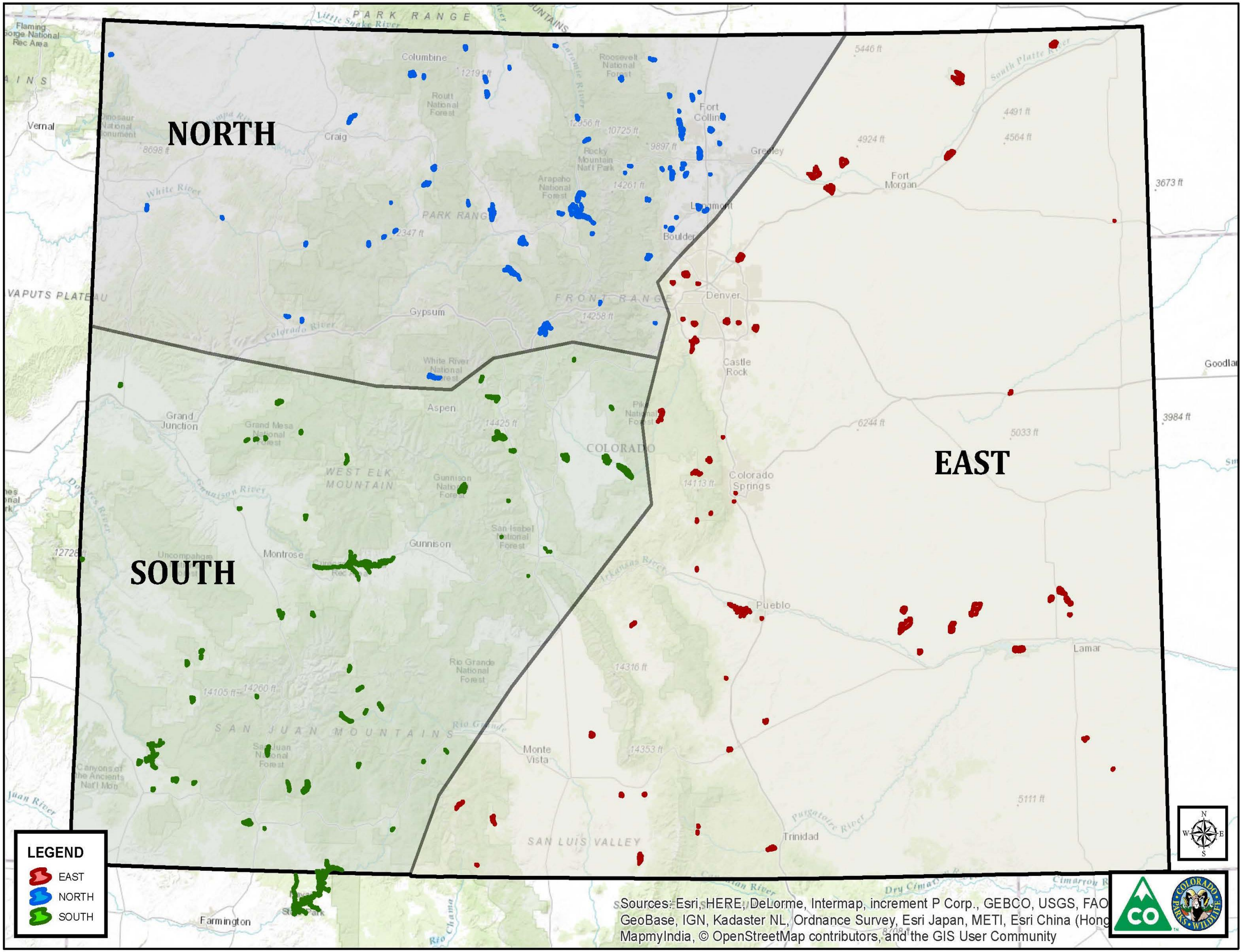
- Plankton tows
- Substrate checks
- Shoreline surveys
- Stream surveys
- Crayfish trapping
- **Plant inventories**

Frequency

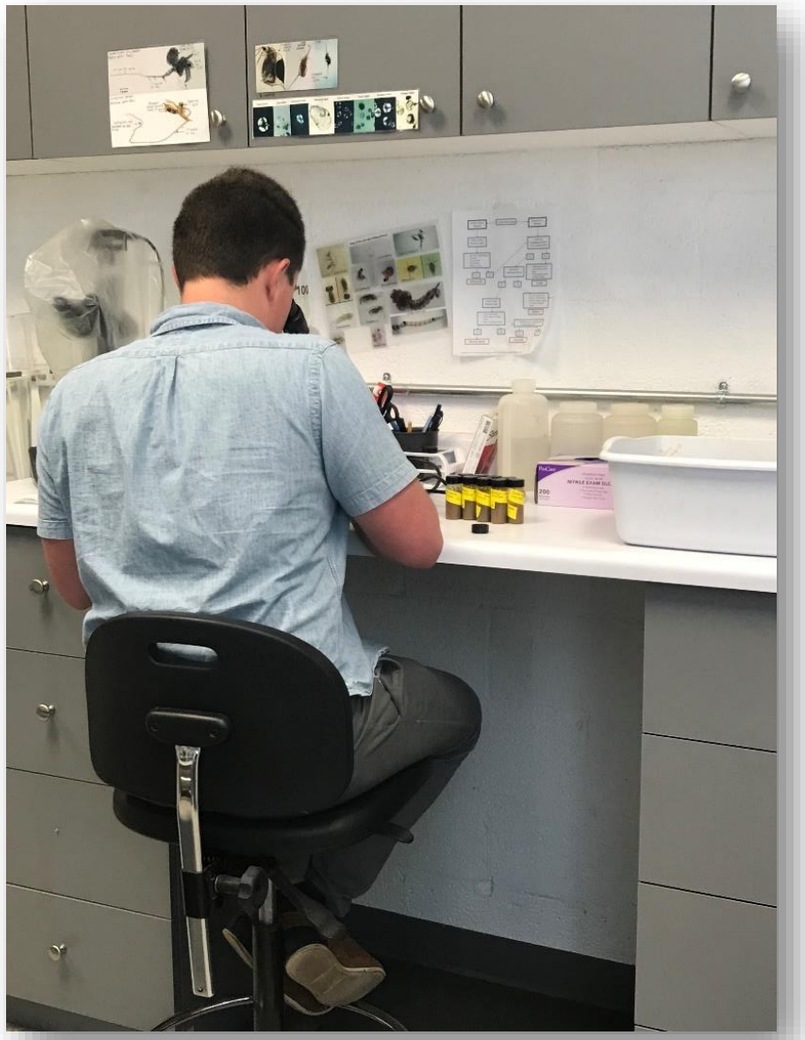
- Risk Dependent
- 1 time per year up to every 6 weeks



LIVE LIFE OUTSIDE


NORTH
EAST
SOUTH
LEGEND
EAST
NORTH
SOUTH
PARK RANGE
FRONT RANGE
WEST ELK MOUNTAIN
SAN JUAN MOUNTAINS
SAN LUIS VALLEY
COLORADO
Columbine
12191 ft
Routt National Forest
Roosevelt National Forest
Fort Collins
Craig
Vernal
Dinosaur National Monument
8698 ft
12956 ft
10725 ft
9897 ft
Rocky Mountain Nat'l Park
Arapaho National Forest
14261 ft
Greeley
Fort Morgan
Longmont
Boulder
Denver
Castle Rock
Gypsum
White River
Colorado River
14258 ft
White River National Forest
Aspen
14425 ft
Grand Junction
Grand Mesa National Forest
Gunnison National Forest
Gunnison
Montrose
Uncompahgre
San Isabel National Forest
Rio Grande National Forest
14105 ft
14260 ft
San Juan National Forest
Canyons of the Ancients Nat'l Mon
Monte Vista
14353 ft
14316 ft
Pueblo
Colorado Springs
14113 ft
Lamar
Trinidad
Purgatoire River
Arkansas River
Gunnison River
Dolores River
San Juan River
Rio Chama
Farmington
5446 ft
4491 ft
4564 ft
4924 ft
3673 ft
6244 ft
5033 ft
3984 ft
5111 ft
Flaming Gorge National Rec Area
VAPUTS PLATEAU
Goodland
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO
GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong
MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

CPW ANS Laboratory



- Provide free taxonomic identification:
  - Aquatic Plants
  - Aquatic Mollusks
  - Crustaceans
  - Zooplankton
- CPW utilizes private labs for DNA confirmation as needed (e.g. EWM)
- Currently building an aquatic plant herbarium focused on the natural history inventory of macrophytes in CO waters

Colorado ANS Law - Reporting

- The Law requires that any person who knows or suspects an ANS is present (weed, animal or pathogen) must immediately report the suspect to the ANS Program.

- There are three options for reporting:
  - Email: Invasive.Species@state.co.us
  - State Program Office: 303-291-7295
  - Web: https://cpw.state.co.us/aboutus/Pages/ISP-Report-Invader.aspx

Colorado ANS Regulations - Reporting

#807C – ANS Reports shall include the following minimum information:

- Date and Time of Detection
- Exact location of sighting (both water body specific location within the water body)
    - GPS Coordinates Preferred
- Suspected Species
- Name and Contact Information for Reporter

Confirmation of Report

- If possible, collect a sample of the plant, preserve in 70% ethanol and send the specimen to the CPW ANS Lab at 6060 Broadway, Denver, CO 80216 for confirmation.

- If no sample is submitted, CPW sampling crews will be deployed to survey the water body and collect specimen for identification.

- If positively identified as a prohibited aquatic invasive plant, CPW will notify CDA, the County Weed Supervisor, and the Reporter.
  - The occurrence record will be entered into the CDA noxious weed online reporting system.
  - The occurrence record will be submitted to the USGS NAS ANS Database.

- Depending on the species, CPW and CDA will consult with the County and/or water body manager/owner to determine the appropriate response and management activities for control depending.

Questions?

LIVE LIFE OUTSIDE

Thank you!