

Aquatic Invasive Species

Threatening the

Crown of the Continent





**AQUATIC INVASIVE
SPECIES THREATENING
THE CROWN OF THE CONTINENT**

ACKNOWLEDGMENTS

AUTHOR

Jennifer McBride, MS candidate in Environmental Studies, University of Montana

DESIGN & LAYOUT

Melissa Sladek, Science Communication Specialist, Glacier National Park

EDITOR

Alice Wondrak Biel, Writer-Editor, National Park Service

PROJECT ADVISOR

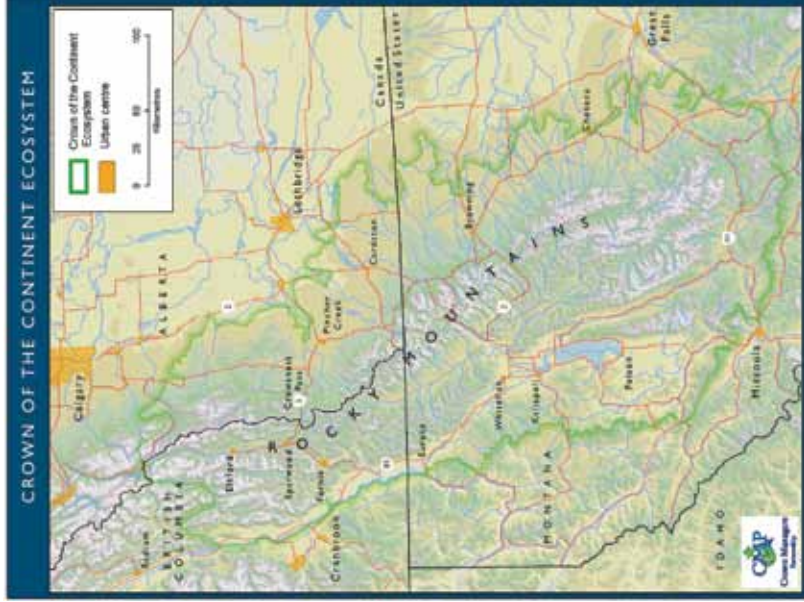
Mary Riddle, Chief of Planning and Compliance, Glacier National Park

This publication was made possible by funding from the National Park Service-Intermountain Regional Office, through an agreement administered by the National Park Service's Rocky Mountains Cooperative Ecosystem Studies Unit. Glacier National Park, the University of Montana, and the Crown Managers Partnership (CMP) collaborated to produce this field guide. We thank the CMP working group for this field guide (see p. 117); their input, knowledge, and dedication made this publication possible. Thanks also to Joe Giersch for the use of his underwater photography.

CONTENTS

Acknowledgements	ii
Crown of the Continent Map	iv
Introduction	1
What You Can Do.....	6
Species Descriptions	
Mollusks	8
Crustaceans	22
Vertebrates.....	38
Plants and Algae.....	92
Pathogens and Parasites.....	110
Glossary	114
List of Contributors.....	117





The Crown of the Continent Ecosystem encompasses 28,000 square miles of the northern Rocky Mountains and adjoining plains. It includes Glacier National Park in Montana, and Waterton Lakes National Park in Alberta, and is considered one of the world's premier mountain ecoregions.

INTRODUCTION

The Crown of the Continent Ecosystem, with Glacier National Park, Montana, and Waterton Lakes National Park, Alberta, at its center, is one of North America's most remarkable landscapes. Here, where open prairies meet the Rocky Mountains, some of the world's most pristine freshwater ecosystems remain intact. Many North American watersheds originate in the Crown's 28,000 square miles (72,000 km²), contributing to life-sustaining resources throughout much of North America.



Ian Dyson

Access to cold, clean water supports ranching, farming, recreation, and wildlife in the Crown. Without this resource, quality of life in the region would drastically decrease. Unfortunately, the spread of aquatic invasive species poses great risk to the Crown of the Continent's watersheds.

ABOUT AQUATIC INVASIVE SPECIES

Aquatic Invasive Species (AIS) are species whose introduction into aquatic ecosystems where they are not native causes economic or environmental damage and/or harm to human health. Separated from the pathogens, chemical defenses, predators, and usual factors that limit populations within their native ranges, AIS populations tend to quickly proliferate and, once introduced, are extremely difficult to eradicate.

Once they take hold, these species lead to food-web depletion and diminished water quality as they consume resources required by native species. Native species populations may be diminished or even eradicated as the invasive population booms, leading to a cascade of negative ecological effects. If keystone native species are replaced by invasive species, the effects can be ecologically devastating.



Beach invaded by zebra mussels

U.S. Environmental Protection Agency, Great Lakes National Program
Office, Bugwood.org

RECREATIONAL AND ECONOMIC IMPACTS

The negative impacts of AIS on humans are also substantial. Opportunities for fishing, hunting, and sightseeing are reduced or lost when AIS outcompete native plants, plankton, and fish, in turn affecting the waterfowl and other wildlife that consume them. Some invasive species have shells sharp enough to cut skin, ultimately preventing access to swimming and beaches.

Reduced recreational opportunities result in negative economic impacts to local communities as revenue from fishing, boating, and tourism is lost. Direct costs arise from the labor-intensive efforts required to manage and mitigate the effects of AIS, which can severely damage industrial and agricultural infrastructure, such as water storage, irrigation, and hydroelectric power systems. Mechanical, biological, and chemical controls are expensive, time-consuming, and can result in unintended consequences.

In the U.S., invasive species management costs have been reported in excess of \$25 million annually, with ongoing demand for more funds. The most cost-effective option is to prevent the transport and introduction of AIS. When and where an invasive species is introduced, it must be immediately isolated and eliminated if infestation is to be prevented.



Zebra mussels clog pipe

Craig Czarnecki, Michigan Sea Grant,
Bugwood.org

TRANSPORTING AQUATIC INVASIVE SPECIES

Many aquatic invasive species first become established in and around major ports, as ships take up ballast water in one port and then drain it in another. In the absence of appropriate treatment and precautions, plants and animals can survive in ballast water for weeks or even months.

Inland AIS transport follows the same pattern, as boats and fishing equipment used in one water body are then submerged in another. AIS can disperse and spread between watersheds by hitching rides on practically anything that comes into contact with water: fishing poles, lines, waders, boots, buckets, trailers, and recreational boats. They can survive for days or weeks as people move from one water body to another. The introduction of just a single asexual reproducing species can be enough to establish an entire population.



Kari Hamilton

A NOTE TO USERS

This guide is a tool to assist in prevention and identification of aquatic invasive species within the Crown of the Continent Ecosystem (the Crown). Species included in this guide were carefully selected by agency professionals within the Crown based on potential impacts of invasion and likelihood of introduction.

Locations are provided for each species already known to exist in the Crown of the Continent Ecosystem. Information in this guide may change rapidly if new aquatic invasive species move and/or are transported into the Crown. New locations or new species may have occurred within the region since this guide was written. For additional information, questions, or concerns regarding aquatic invasive species in the Crown, contact a local agency. For information on invasive riparian plant species, please consult the *Invasive Plants of the Crown of the Continent* field guide, available at www.crownmanagers.org.

WHAT YOU CAN DO!

Perhaps the most important thing to note about the spread of AIS is that it can't be prevented with a "top-down approach" that relies solely on government agencies and other organizations. **PREVENTION CAN ONLY SUCCEED WITH THE ASSISTANCE OF PEOPLE LIKE YOU.**



STOP AQUATIC HITCHHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

BEFORE MOVING BETWEEN WATER BODIES:

- CLEAN** and inspect boats as well as fishing, hiking, and any other equipment that has been in contact with water before transporting it. Thoroughly wash and remove all mud, plants, fish, and animals. Be sure to check seams and hidden areas.
- DRAIN** and eliminate all water from equipment before leaving a water body. This includes water in wells, ballast, and other containers.
- DRY** your boat and equipment for as long as possible. Five days is optimal. Some AIS are microscopic and can survive in dirt, sand, and on plant fragments outside of water for many days or even weeks.

PREVENTION AND EARLY DETECTION IS OUR BEST DEFENSE:

NEVER release live or dead plants, fish, or animals into a body of water unless they came out of that same body of water.

ALWAYS report any AIS you discover. Photos, estimated population size, location (GPS or landmarks), and species samples are helpful.

FOUND AN AQUATIC INVASIVE SPECIES?

Canada: Call the Canadian Aquatic Invasive Species Network (CAISN) at 1-519-253-3000 x3751.

To report online visit: <http://www.caisn.ca/contact.aspx>

United States: Call the Aquatic Invasive Species Hotline at 1-877-786-7267 (1-877-STOP-ANS)

To report online visit: www.fws.gov/fisheries/ans/ANSContacts.cfm

FOR ADDITIONAL INFORMATION VISIT:

Stop Aquatic Hitchhikers — www.protectyourwaters.net

MOLLUSKS

Need to Know

Mollusks are small organisms capable of creating enormous economic and ecological damage in the regions they invade. Most larvae are microscopic; immature organisms may be as small as a grain of sand. They hitchhike on recreational boats, field equipment, and anything that travels with humans from one body of water to another. Mollusks may survive outside water for multiple days or weeks. Rapid reproducers, they form large colonies that overwhelm beaches, devastate the food chain, and clog water intake and transport systems. Some mollusks act as vectors for parasites and disease. Once introduced, there is no known way to eradicate these organisms.

If Introduced

Bivalves consume zooplankton, destroying the base of the food web that supports fish and waterfowl. Snails also disrupt the base of the food chain, competing with macroinvertebrates and reducing food for fish. Invasive mollusk colonies overrun breeding habitat for fish and wildlife. Costs of invasion are enormous; the U.S. Fish and Wildlife Service estimated the potential economic impact of quagga and zebra mussels to water users in the Great Lakes region to be \$5 billion from 2000 to 2010.



New Zealand mudsnails on a wading boot

Dennis McKinney

What You Can Do

- Clean, drain, and dry all equipment, including fishing lines, poles, reels, boots, and boats.
- Do not transport fish or other aquatic species.
- Contain and dispose of all unused bait in the trash. Do not use live fish or fish parts as bait.
- Keep live aquatic food and/or pets securely contained indoors.
- Keep an eye out and report invasive species. Report unclean watercraft, trailers, and other equipment on the roadway.

Size: Adults are generally less than 3 cm long, but may be up to 5 cm. Larvae are free-floating and less than 1 mm long.

Color: Varies. Light yellow to dark brown.

Shape: Triangular shell, with a rounded outer margin and repetitive grooved arcs along the surface. When open, very small, finely serrated lateral teeth may be visible.

Found in: Mature individuals are found on the surface of sediment or slightly buried in silt and sand.

Native to: Southern and eastern Asia, eastern Australia, and Africa.



U.S. Geological Survey, Noel M. Burkhead



Stop the Spread: Asian clams are easily spread by people. They are more tolerant of water pollution than most native clam species. Asian clam establishment has the potential to collapse fish populations, close recreational areas, and disrupt municipal water and irrigation systems.



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Chinese mysterysnail (*Cipangopaludina chinensis*)

12

Size: May reach lengths of 6 cm, but is generally smaller.

Color: Adults range from a deep green-brown to a brown-red. Color is often uniform with no banding. Juveniles are light in color.

Shape: Shell has 6–7 strongly convex whorls and an operculum at its foot.

Found in: Prefers lakes, ponds, reservoirs, or slow-moving streams. Settles in muddy substrates where there is minimal vegetation.

Native to: Eastern Russia, Japan, and southeast Asia.



U.S. Fish and Wildlife Service, Dave Britton



Stop the Spread: A single snail will live 3–5 years and may host parasites and diseases. Invasive populations significantly alter food webs and overrun habitat. Economic costs arise due to impacts on native fish and wildlife populations.



Oregon Department of Fish & Wildlife

Size: Mature snails are less than 1 cm long, averaging 0.5 cm. Width is about half of height.

Color: Varies. Ivory to dark brown.

Shape: A spiraled, cone-shaped shell with 5–6 whorls, occasionally up to 8. The operculum is thin with an off-center nucleus.

Found in: Capable of thriving in a wide range of conditions, from clean and clear waters to eutrophic and brackish waters. Most often found in slow-moving or disturbed water bodies.

Native to: New Zealand.



National Park Service, Tom Cawley



Stop the Spread: Because New Zealand mudsnails are asexual reproducers, one tiny snail can result in prolific populations. They are known in the Snake River drainage in Idaho, and the Missouri, Madison, and other rivers in southwest Montana. Invasive populations alter food webs, reducing native fish and wildlife populations.



U.S. Fish and Wildlife Service

Size: Adults are up to 4 cm long. Young mussels may be as small as a grain of sand; larvae are microscopic.

Color: Varies. Bands range from black to brown to cream with few to no zigzag patterns. Colors fade near the hinge.

Shape: Shell is curved at the outer margin and tapered near the hinge. The ventral surface is convex and the mid-ventral line is uneven.

Found in: Lakes and reservoirs. Attaches via byssal threads to any hard surface (native mussels do not attach). May also partially bury in sediment.

Native to: Eurasian steppe.



NOAA, Great Lakes Environmental Research Laboratory



Stop the Spread: Quagga mussels are easily spread by people and are prolific reproducers. Invasive populations cost millions per year to manage, deplete fish populations, close recreational areas, and disrupt municipal and irrigation systems.



U.S. Bureau of Reclamation. Inset: Michigan Sea Grant

Red-rim melania (*Melanoides tuberculatus*)

18

Size: Average shell length is 4 cm, but may grow up to twice that size.

Color: Light brown with dark red-brown spots.

Shape: Long, cone-like shell, with up to 10 whorls and an operculum at the foot.

Found in: Commonly prefers areas of slow, shallow, and turbid water. May settle in rocky substrates in deeper pools.

Native to: Northern Africa to southern Asia.



Idaho Department of Agriculture



Stop the Spread: Because red-rim melania are asexual reproducers, one tiny snail can result in prolific populations. They are known to host parasites that can infect humans, birds, and fish. Food and habitat competition can result in the decline of native species. A population now exists in the Big Hole River drainage of Montana.



Dr. Lyubov Burtakova, Buffalo State College

Zebra mussel (*Dreissena polymorpha*)

Size: Adults are approximately 2.5 cm long. Young mussels can be as small as a grain of sand; larvae are microscopic.

Color: Varies. Black-brown to white-yellow, with zigzagged patterns.

Shape: Triangular with a curved outer margin. Small striped ridges cross the shell. The ventral surface is flat and the mid-ventral line is straight.

Found in: Lakes, reservoirs, and slow-moving rivers. Attaches to rocks, wood, cement, watercraft, or any other hard surfaces with its byssal threads (native mussels do not attach to surfaces).

Native to: Europe and Asia.



Top: U.S. Geological Survey. Bottom: Amy Benson, USGS, Bugwood.org



Stop the Spread: Zebra mussels travel easily undetected—on people, in plants, in mud, and on equipment. Invasive populations cost millions per year to manage, deplete fish populations, close recreational areas, and disrupt municipal and irrigation systems.



Whitney Cranshaw, Colorado State University, Bugwood.org

CRUSTACEANS

Need to Know

Crustaceans are capable of altering ecosystems and devastating fisheries, resulting in economic losses and increased management costs. Crustaceans are prolific reproducers that consume food and occupy and alter habitat essential for native species. They are known hosts for pathogens and parasites that can infest and kill native species, including fish. Crayfish travel easily across land and are generalized predators. Some crayfish burrow and cause stream bank erosion. Freshwater shrimp and water fleas feed on plankton, disrupting the food web; some compete with native fish.

If Introduced

Crustaceans undermine the food web, resulting in smaller populations or local extirpations of native species. Documented fishery declines have occurred in Flathead Lake since intentional introduction of *Mysis diluviana* (see pages 30–31). Humans transport crayfish intentionally for use in aquaculture, ponds, bait buckets, and aquariums, from which crayfish frequently escape. Freshwater shrimp and water fleas are very small and travel easily undetected on field equipment, such as boats, boots, and fishing lines.



Rusty crayfish in an aggressive position

Minnesota Seagrant

What You Can Do

- Clean, drain, and dry all equipment, including fishing lines, poles, reels, boots, and boats.
- Do not transport fish or other aquatic species.
- Contain and dispose of all unused bait in the trash. Do not use live fish or fish parts as bait.
- Keep live aquatic food and/or pets securely contained indoors.
- Keep an eye out and report invasive species. Report unclean watercraft, trailers, and other equipment on the roadway.

Size: Adults may be 18–30 cm long, excluding limbs. Young juveniles are approximately 1.5 cm long.

Color: Body ranges from blue-brown to dark gray. There is a distinctive red patch on the outside edge of each claw.

Shape: Most easily identified by color. Generally large for a crayfish.

Found in: Freshwater streams, lakes, and reservoirs.

Native to: Northern Australia and southern Papua New Guinea.



Kell Nielsen, Gold Coast



Stop the Spread: Commonly used in aquaculture and aquariums, Australian redclaw crayfish are tolerant of large variations in acidity and oxygen and capable of altering ecosystems. Do not store, dispose of, or release pets or aquarium contents outdoors.



Kell Nielsen, Gold Coast

Size: No longer than 1.5 cm.

Color: Most easily distinguished by red markings. May appear pale yellow to transparent with red pigments near the head and tail.

Shape: Visually resembles a tiny shrimp (though it is not technically a shrimp). May be confused with *Mysis diluviana*, but is distinguished by its red markings.

Found in: Generally found in lakes and slow-moving waters with rocky substrate but can live in flowing water with alternative substrates.

Native to: Various watersheds leading to the Black Sea, Azov Sea, and eastern



NOAA, Great Lakes Environmental Research Laboratory

portions of the Ponto-Caspian Sea.



Stop the Spread: Introduced populations have established in the Great Lakes region. The bloody red shrimp is a brackish water species that has adapted to freshwater, can tolerate warm temperatures, and alters the food webs of non-native ecosystems.



Both: J.L. Corteau/J.Marty, St. Lawrence River Institute

Size: When mature, may reach lengths of 1.5 cm.

Color: The body is white or transparent with black eyes.

Shape: Body is laterally compressed and supports large, kidney shaped eyes. First antenna is generally longer than the second.

Found in: Prefers well oxygenated, shallow areas of rivers and lakes. Tolerates brackish water.

Native to: North America, including the Mississippi drainage and east coast rivers.

Undetermined if this species will remain in the field guide. Currently no photos.

Top photo: credit information. Bottom photo: credit information



Stop the Spread: Displaces other macroinvertebrates and alters food webs, creating negative impacts on fish and other native species.

Photo: credit information

Size: No longer than 3 cm.

Color: Nearly transparent with large dark eyes.

Shape: Visually resembles a tiny shrimp (though it is not technically a shrimp).

Found in: Prefers cold, deep waters with high levels of dissolved oxygen. Spends the day near the bottom and migrates to the surface at night.

Native to: Native only to Waterton Lake, Alberta, within the Crown, with widespread dispersal throughout the northern hemisphere.



NOAA, Great Lakes Environmental Research Laboratory



Stop the Spread: Once widely stocked to increase forage for sport fish, opossum shrimp are now known to significantly alter ecosystems, harming native species. Stocking in Flathead Lake resulted in population dominance, food-web disruption, and smaller sizes and numbers of native fish in the fishery.



Joe Giersch

Red swamp crayfish (*Procambarus clarkii*)

Size: When mature, the body may be 12 cm, excluding limbs.

Color: Deep red body with long narrow claws that are covered with red, white, or black tubercles.

Shape: Easily identified by tubercles on the claws.

Found in: Slow-moving waters or ditches with muddy substrates and debris. May create shallow burrows for breeding.

Native to: Various drainages in the southeastern United States near the Gulf of Mexico.





Stop the Spread: An aggressive competitor and predator, the red swamp crayfish is capable of altering ecosystems. Do not store, dispose of, or release pets or aquarium contents outdoors.



Wikimedia Commons, Mike Murphy

Rusty crayfish (*Orconectes rusticus*)

Size: At maturity, body may reach lengths of 12 cm (excluding limbs).

Color: Dark rust-colored spots visible on each side of the carapace, black tips on claws. Dominant body color varies between individuals, though commonly green-grey to red-brown.

Shape: Claws are large and robust.

Found in: Lakes, ponds, and streams. Generally prefers substrates lined with debris, such as rocks, logs, or leaves for cover.

Native to: The Ohio, Tennessee, and Cumberland river basins.



Top: U.S. Geological Survey. Bottom: Jeff Gunderson, Minnesota Sea Grant



Stop the Spread: An invader since the 1930s, the rusty crayfish has been spread widely by people using it as game fish bait, in aquariums, and for scientific education and research. Known to aggressively compete with native crayfish and fish, and alter ecosystems.



U.S. Geological Survey

Size: Individuals reach lengths of 1.5 cm, including tail spines that are approximately twice the length of the body.

Color: Translucent with one large, black eye.

Shape: Colonies resemble gobs of gelatin with black spots and bristles. Each individual has 1–3 pairs of barbs on its tail spine and four sets of legs, the most obvious being closest to the head.

Found in: All depths of freshwater. Often congregate in masses, attaching to many surfaces, including fishing lines.

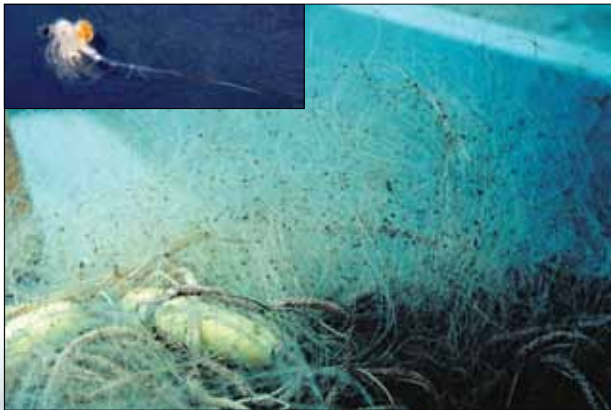
Native to: Northern Europe and Asia.



Michigan Sea Grant



Stop the Spread: Introduction to the Great Lakes caused significant food-web alterations due to zooplankton consumption and competition with juvenile fishes. Spiny water fleas are capable of parthenogenic reproduction and reproduce rapidly. Small fish cannot digest the spines.



Steve Geving, Minnesota Department of Natural Resources, Minnesota Sea Grant. Inset: Michigan Sea Grant

VERTEBRATES

Need to Know

Invasive vertebrates damage ecosystems, deplete fisheries, and reduce recreation opportunities, therefore increasing management costs. Introduced aquatic vertebrates push out native species through direct predation and excessive consumption of food sources, greatly altering food webs in aquatic ecosystems. Some species hybridize with native fish or carry parasites and pathogens that infect native species.

If Introduced

We continue to learn the impacts of introducing vertebrate species and altering natural fish migration routes through dams and diversions. Non-native populations in the Crown of the Continent have led to revenue losses due to depleted fisheries, reduced recreational opportunities, and increased management costs. Introduced species compete with and prey upon native species, including westslope cutthroat trout and threatened bull trout.



Northern pike are voracious predators

Wikimedia Commons, Vineyard. Photo by uk user, Shao

What You Can Do

- Clean, drain, and dry all equipment, including fishing lines, poles, reels, boots, and boats.
- Do not transport fish or other vertebrates.
- Contain and dispose of all unused bait in the trash. Do not use live fish or fish parts as bait.
- Keep live aquatic food and/or pets securely contained indoors.
- Keep an eye out and report invasive species. Report unclean watercraft, trailers, and other equipment on the roadway.

Size: Adults generally 30–60 cm (12–24 in) long.

Color: Variable. Often a deep green, bronze, or silver, fading to a pale hue on the belly. Ornamental varieties are much more colorful.

Shape: Elongated, oval bodies, often with large, thick scales and small eyes. Subterminal mouths with a barbel in each corner and thick lips. Tail fins forked with rounded lobes. Serrated spines on the dorsal fin.

Found in: Lakes, ponds, and slow-moving streams. Capable of thriving in degraded areas.



Michigan Sea Grant

Native to: Europe and Asia.



Stop the Spread: Carp have been widely introduced in North America for vegetation control and food. Unfortunately, they alter food webs, displace native fish, degrade habitat, and eat eggs of other species. Do not use live bait or dump live bait or aquariums into water bodies.



U.S. Geological Survey. Inset: U.S. Geological Survey,
Noel M. Burkhead

Asian swamp eel (*Monopterus albus*)

Size: Adults may be as long as 1 m (40 in).

Color: Varies from olive-green to brown with lighter, often yellow-orange bellies.

Shape: Snake-like body and no fins. Individuals appear slimy, with a rounded nose and one gill located below the mouth.

Found in: Freshwater lakes and streams. They thrive in anoxic water conditions.

Native to: Asia.





Stop the Spread: A generalized predator, adapted to breathe in and out of water and capable of travel across land. All individuals are born female; some transform into males later in life. May burrow up to 1.5 m (60 in) deep and accelerate drying of shallow water bodies. Do not use live bait or dump unused bait or aquariums into water bodies.



U.S. Geological Survey. Inset: Florida Fish and Wildlife, Conservation Commission Archive, Bugwood.org

Size: Adults are typically 15–25 cm (6–10 in) long.

Color: The body may appear green, light brown-yellow with a nearly black or a deep brown-grey back.

Shape: Scale-less body with a depressed head that supports eight barbels. The anterior dorsal fin is short and usually has just one spine with six rays. An adipose fin is present and not connected to the rounded, slightly notched tail fin.

Found in: Up to 12 meter depths in vegetated water bodies with silt or sand substrates.

Native to: Portions of North America



Dave Giordano, © 2012 Regents of the University of California

west of the Appalachians and east of the Rockies.



Stop the Spread: Exists in multiple watersheds in the Crown. Black bullhead catfish are tolerant of polluted or damaged environments and compete with native species for food. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Brian Zimmerman

Size: Adults are generally 15–30 cm (6–12 in) long.

Color: Olive-brown or grey with yellow or red spots surrounded by blue halos. Ventral fins are mostly orange-red with a dark line next to white leading edges.

Shape: Oblong body and a large mouth reaching beyond the eye. Dorsal fin is triangular and marked by black, wavy lines. The tail fin is only slightly forked.

Found in: Cold water, especially headwaters and spring-fed streams.

Native to: Northern regions of the midwestern and eastern states, as well as eastern Canada.



Steve Geving, Minnesota Department of Natural Resources, Minnesota Seagrant



Stop the Spread: Brook trout were introduced across the Crown for sport fishing. They compete with native fish, such as westslope cutthroat trout, for food and space, and hybridize with bull trout.



U.S. Fish and Wildlife Service, Eric Engbretson

Brown bullhead catfish (*Ameiurus nebulosus*)

Size: Adults are typically 15–25 cm (6–10 in) long.

Color: Mostly brown, but fades to a yellow-brown or white on the underside.

Shape: Scale-less body with a depressed head that supports eight barbels. The anterior dorsal fin is short and usually has just one spine with six rays. An adipose fin is present and not connected to the rounded, slightly notched tail fin.

Found in: Depths of up to 12 meters in vegetated water bodies with silt or sand substrates.



U.S. Geological Survey, Noel M. Burkhead

Native to: North-central and eastern North America.



Stop the Spread: Exists in multiple watersheds in the Crown. Brown bullhead catfish are tolerant of polluted or damaged environments, competing with native species for food. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Brian Zimmerman

Brown trout (*Salmo trutta*)

Size: Adults are typically 25–40 cm (10–16 in) long.

Color: Mostly brown with some hints of olive and a belly that is more silver. Spots are both red and black, haloed by white. The dorsal fin often has dark markings. Spots tend to fade on belly.

Shape: Oblong body and triangular dorsal fin, often with dark markings. An adipose fin is present.

Found in: Alpine streams and lakes, throughout the water column. Seeks cover in debris and vegetation.

Native to: Asia, Africa, and Europe.



U.S. Fish and Wildlife, Eric Engbretson



Stop the Spread: Present in multiple watersheds throughout the Crown. Brown trout are territorial and chase other fish from cover, eat other fish, and compete for food. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



David Jude, Center For Great Lakes and Aquatic Sciences,
Minnesota SeaGrant

Size: Currently the largest frog found in North America. Adults are typically 8–16 cm (3–6 in) long. Tadpoles are usually no longer than 12 cm (4 in).

Color: The body is dull green or deep grey with darker patches on the back and a white-yellow belly. Tadpoles are green with darker spots across their bodies and tails, often white-yellow below.

Shape: Most easily identified by their size and tympanic membranes, or obvious folds of skin that run from the eye around the ears.

Found in: Ponds, wetlands, and slow-moving waters.



Gary Nafis, www.californiaherps.com

Native to: Central and eastern portions of North America.



Stop the Spread: Present in the Flathead and Blackfoot drainages in the Crown. Bullfrogs can lay up to 20,000 eggs on water surfaces and tadpoles can overwinter for 2–3 years. Mature bullfrogs eat anything that moves and can be swallowed, including native frogs. Do not transport or sell bullfrogs. Do not release non-native pets outdoors.



Gary M. Stolz, U.S. Fish and Wildlife Service, Bugwood.org.
Inset: Gary Nafis, www.californiaherps.com

Size: Adults are generally 30–50 cm (12–20 in) long.

Color: Usually deep olive-brown with a yellow-grey belly and brown-bronze fins.

Shape: Oval, robust body with a high, rounded back. Dorsal fin, with 17–21 fused rays, runs along the spine from the high point on the back almost to the tail. Forked tail fin with rounded lobes. Terminal or subterminal mouth. Barbels are present.

Found in: Still-to-moderately flowing streams. A bottom feeder that thrives in eutrophic and brackish water.



Wikimedia Commons, Public Domain

Native to: Europe and Asia.



Stop the Spread: Used for food and ornamental purposes. Common carp alter food webs in non-native environments. Populations exist in Montana, within the Crown. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Wikimedia Commons, George Chernilevsky

Size: Adults are typically 10–15 cm (4–6 in) long.

Color: Golden-brown to olive. May have dark specks on the body and fins. The belly is usually white or yellow.

Shape: Body tapers at both ends; dorsal fins are attached. Most easily distinguished by the broadly fused anterior dorsal fin with 11–18 spines. The posterior dorsal fin is softer, with one spine and 11–16 soft rays. The tail fin has 16–17 rays and the mouth is terminal.

Found in: Freshwater at variable depths and conditions.



Wikimedia Commons, Tiit Hunt

Native to: Northern Europe and Asia.



Stop the Spread: Capable of swift propagation and will have significant impacts on native species. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Gary Cholwek, U.S. Geological Survey, Bugwood.org

Goldfish (*Carassius auratus*)

Size: Adults are typically 12–25 cm (5–10 in) long.

Color: Wild populations vary in colors from brown-green to ivory.

Shape: Stocky body with a small mouth and no barbels. Dorsal fin has 13 or more fused rays and a long base. The tail fin is forked. The lateral line has 25–31 scales. Goldfish also have a firm serrate spine near the dorsal and anal fins. The mouth is terminal.

Found in: Slow-moving water bodies with submerged vegetation. Tolerant of turbid waters, temperature changes, and low levels of dissolved oxygen.



Government of Alberta, Jason Cooper

Native to: Eastern and central Asia.



Stop the Spread: Commonly used in aquariums and ponds. Collected in the Crown east of the divide in the Marias River drainage, but no established populations have been reported. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Government of Alberta, Jason Cooper

Size: Adults are generally 40–80 cm (15–30 in) long.

Color: Deep grey to green with pale white spots on its sides and fins. Some markings may show a bit of red, especially on the fins.

Shape: Oblong body with a triangular dorsal fin and deeply forked tail.

Found in: Cold lakes throughout the water column, up to 200 feet deep.

Native to: Native to a wide range of North America, including the Hudson Bay drainages east of the Continental Divide within the Crown. Non-native west of the Divide within the Crown.



Steve Geving, Minnesota Department of Natural Resources, Minnesota Seagrant



Stop the Spread: Introduced to the western portion of the Crown, including Flathead Lake. Lake trout threaten the persistence of native species, such as bull trout and cutthroat trout. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Michigan Seagrant

Size: Adults are typically 30–40 cm (12–16 in) long.

Color: Green-brown on back with lighter sides. Dark markings form a horizontal stripe along the side of the fish.

Shape: Flat, oval body. The anterior dorsal fin has fused spines and is connected to the posterior dorsal fin, which has multiple soft rays. The tail is indented and mouth reaches just beyond the position of the eye.

Found in: Lakes, ponds, and rivers, rarely deeper than 20 feet. Prefers heavily vegetated, warmer waters.

Native to: Widespread range from central

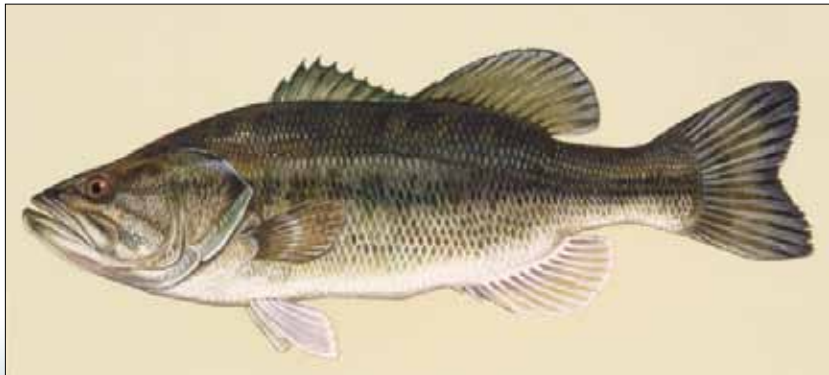


U.S. Fish and Wildlife Service, Eric Engbretson

to eastern North America.



Stop the Spread: Populations exist within the Crown. Largemouth bass prey on native fish, frogs, and crayfish. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



U.S. Fish and Wildlife Service, Duane Raver

Size: Adults are typically 40–60 cm (16–24) long.

Color: Generally a greenish-brown with yellow to white spots on the body. Color fades to a creamy white on the belly. Most fins have dark spots or wavy lines.

Shape: A slender fish with an elongated pointed mouth that holds many sharp teeth. It has one dorsal fin near the forked, lobed tail fin. The anal fin is nearly symmetrical with the dorsal fin.

Found in: Lakes, reservoirs, ponds, and slow-moving rivers.



Brian Zimmerman

Native to: North America, but within the Crown, only the Hudson Bay drainage east of the Continental Divide.



Stop the Spread: Northern pike are superior predators. Where introduced, they eat native fish. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Michigan Seagrant

Size: May grow to be 75 cm (30 in) or longer.

Color: Adults range in shades of brown, with black markings in camouflage patterns, much like a snake. Juveniles may be lighter in color or have a green hue.

Shape: A long, thin body with a rectangular dorsal fin running the length of the back. The anal fin is similar but shorter. All fins only have rays.

Found in: Usually found in slow-moving, vegetated waters less than 10 meters deep.

Native to: Russia, China, and Korea.



U.S. Geological Survey, Bugwood.org



Stop the Spread: Northern snakehead eat a broad diet, including other fish, eggs of fish, crustaceans, and small rodents. Not yet reported in the Crown. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



U.S. Fish and Wildlife Service, Brett Billings.
Inset: U.S. Geological Survey, Bugwood.org

Pumpkinseed sunfish (*Lepomis gibbosus*)

Size: Adults are typically 7–15 cm (3–6 in) long.

Color: Yellowish or orange belly. Many brown to orange spots on the body as well as on the dorsal and tail fins. There is a bright red-orange spot near the ear.

Shape: A robust, deep-bodied fish. The dorsal fin has obvious fused spines and is connected to the posterior dorsal fin, consisting only of soft rays.

Found in: Lakes, ponds, and clean, slow-moving water with dense vegetation.

Native to: Freshwater margins of the Great Lakes and eastern portions of North America.



Brian Zimmerman



Stop the Spread: Exists in drainages throughout the Crown. Pumpkinseed sunfish alter native ecosystems by feeding on insects, crustaceans, and other fish. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Brian Zimmerman

Size: Typical adult length is 30–40 cm (12–16 in).

Color: Bluish to olive-green on back and silver on sides. Red-pink midline horizontal band. Numerous black spots on sides and head, as well as on dorsal and tail fins. Gill covers may appear pink, not to be confused with the red slits on the underside of the jaws of cutthroat trout.

Shape: A long, oval body with a triangular dorsal fin and slightly forked tail.

Found in: Lakes, reservoirs, ponds, rivers, and streams.

Native to: Freshwater margins along the



Idaho Department of Fish and Game, Joe DuPont

Pacific and other parts of the Northwest.
Native within the Crown only to the
Kootenai River drainage.



Stop the Spread: Stocked for sport in many North American watersheds, including the Crown. Native cutthroat trout populations are subject to competition and hybridization from rainbow trout. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Brian Zimmerman

Size: Adults are typically 5–10 cm (2–4 in) long.

Color: Back is greenish-brown. Sides are mostly silver with a reddish hue. Belly is silvery. A darker horizontal band runs along the side of the fish from head to tail.

Shape: Flat, oval body with a deep belly and forked tail.

Found in: Lakes and slow-moving waters, usually with some vegetation.

Native to: The Crown in British Columbia and west of the Continental Divide in the U.S. Invasive in Alberta within the Crown.



Todd Pearsons



Stop the Spread: Redside shiners feed on plankton, aquatic insects, and some snails, and alter ecosystems where introduced. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Joseph Tomelleri

Size: Adults are generally 5–20 cm (2–8 in) long.

Color: Mostly green-grey or pale brown with dark blotches and a cream belly. The dorsal fin often has just one dark spot, larger than the eye. Males turn black with yellow spots when spawning.

Shape: Rounded body with bulging eyes, a terminal mouth, and large lips. The anterior dorsal fin has 5–7 fused spines. The posterior dorsal fin has one spine with 13–16 rays. The tail fin is round.

Found in: Found at various depths in fresh or brackish water. Tolerates low levels of dissolved oxygen.



Center for Great Lakes and Aquatic Sciences Archive, University of Michigan, Bugwood.org

Native to: Freshwater margins of the Ponto-Caspian Sea, Black Sea, and Azov Sea.



Stop the Spread: The round goby alters food webs, negatively impacting native species. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Eric Engbretson, U.S. Fish and Wildlife Service, Bugwood.org

Size: Typical adult size is 25–40 cm (10–16 in).

Color: Light grey-green to brown back with lighter sides. Multiple dark vertical bars on the sides of body.

Shape: A flat, oval body. The anterior dorsal fin has fused spines and is connected to the posterior dorsal fin, which has multiple soft rays. The tail is indented and the mouth reaches just below the position of the eye.

Found in: Lakes, reservoirs, ponds, rivers, and streams. Prefers cold, clear water with rocky substrates.

Native to: Mid to eastern portions of the



U.S. Fish and Wildlife Service, Eric Engbretson

Mississippi drainage.



Stop the Spread: Once stocked in multiple water bodies in the Crown. Preys on macroinvertebrates, fish, frogs, and crayfish. Their presence may result in decline or elimination of native fish species. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Brian Zimmerman

Snapping turtle (*Chelydra serpentine*)

Size: The upper carapace may be 20–50 cm (8–20 in) long.

Color: Variations of deep green-brown throughout the shell and body.

Shape: The posterior edge of the upper carapace is serrated. The large tail is as long or longer than the upper carapace. Tail has protruding scales that appear saw-toothed.

Found in: Prefers shallow and muddy substrates. Hibernates in winter, burying in soft mud in areas protected by rocks or debris.

Native to: Central and eastern portions of North America.



Wendy VanDyk Evans, Bugwood.org



Stop the Spread: Competes with native turtles for habitat and food. Snapping turtles can eat young ducks and turtles, transmit diseases and parasites, and bite people. May lay 20–40 eggs in shallow, excavated holes on land. Do not transport, sell, or release snapping turtles outdoors.



National Park Service, Minnesota Sea Grant. Inset: Arnold T. Drooz, USDA Forest Service, Bugwood.org

Size: Adults are typically 15–25 cm (6–10 in) long.

Color: Dark olive-colored back with a bronze-yellow color on the belly and bright, reddish-orange eyes.

Shape: Stalky body that is deep with moderate lateral compression. The mouth is terminal with a short barbel in each corner. Fins do not have spines and are rounded.

Found in: Lakes, reservoirs, and slow-moving waters with muddy substrates and vegetation. Tolerant of low levels of dissolved oxygen and variations in temperature.



Wikimedia Commons, Public Domain

Native to: Most of Europe and western Asia.



Stop the Spread: Non-native populations known in the Crown, both in Alberta and Montana. Introduced in some regions for sport and food. Tench alter food webs, impacting native species. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Wikimedia Commons, Public Domain

Threespine stickleback (*Gasterosteus aculeatus*)

Size: Adult length is 3–10 cm (1–4 in).

Color: Varies from green-brown to pale blue-silver. Usually a darker back and lighter belly. Breeding males are red on the lower sides and belly.

Shape: A tapered body at the tail and head, with a terminal mouth. Lacks scales and has up to 30 small firm plates on the sides. Two to four separate dorsal spines, the first two larger than the last. Dorsal fin has 9–11 fused rays.

Found in: Shallow vegetated water, but adapted to live in deep, brackish water. Not reported in the Crown but present in other portions of British Columbia.



U.S. Environmental Protection Agency, Great Lakes National Program Office

Native to: Marine and freshwater regions near the Atlantic and Pacific oceans.



Stop the Spread: Negatively impacts native species by preying on eggs or hybridizing with native fish. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



U.S. Fish and Wildlife Service, Paul Barrett

Size: Average adult length of 15 cm (6 in).

Color: Varies from yellow-brown to a light grey.

Shape: Robust body with the greatest body depth just behind the head. A small fish with large scales, forked tail, and triangular dorsal fin.

Found in: Lakes, reservoirs, ponds, rivers, and streams. Generally prefers warmer waters with debris and vegetation for cover.

Native to: Portions of the Klamath, Pit, and Mohave river drainages. Also native to part of the Columbia River drainage in Washington.



Dave Giordano, © 2012 Regents of the University of California



Stop the Spread: Bait bucket releases have introduced this species outside its native range. It is currently unknown in the Crown. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Dave Giordano, © 2012 Regents of the University of California

Size: Adults typically 35–50 cm (14–20 in) long.

Color: Variable. Often appears green-brown with gold flecks and white underbelly with a white spot on the lower tip of the tail.

Shape: Oval body and large bulging eyes. Rounded, anterior dorsal fin with spines and a triangular, posterior dorsal fin with soft rays. Slightly forked tail. Large mouth with many teeth.

Found in: Lakes, reservoirs, and large, slow-moving streams or rivers. Favors deeper waters during the day but comes up to feed at night.



Eric Engbretson, U.S. Fish and Wildlife Service, Bugwood.org

Native to: Still debated, but known in the midwestern and eastern areas of the Mississippi drainage.



Stop the Spread: Present throughout the Crown. The walleye's main diet is other fish, thereby negatively impacting native fish populations and ecosystems. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Rodger Klindt, New York State Department of Environmental Conservation, Minnesota Seagrant

Size: Adults are typically 15–25 cm (6–10 in) long.

Color: Yellow-green with dark blotches that form vertical lines on the body.

Shape: The anterior dorsal fin is spiny and the posterior dorsal fin is made up of soft rays. The tail is forked with rounded lobes. There are 6–8 soft rays and 2 spines on the anal fin. The gill covering has a sharp edge. The mouth holds many sharp teeth.

Found in: Lakes, reservoirs, ponds, and slow-moving rivers. Prefers shallow, slow-moving waters with debris or emergent vegetation.



Michigan Seagrant

Native to: Atlantic, Arctic, Great Lakes, and northern portions of the Mississippi River Basin.



Stop the Spread: Yellow perch compete with others for food and may prey on young fish. They are present throughout the Crown. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



NOAA, Great Lakes Ecological Research Center

Size: Adults can grow to be as long as 1 m (40 in).

Color: Dark grey fading to light colors on its belly. Back, dorsal, and tail fins marked with black splotches.

Shape: An elongated fish. The forward dorsal fin has 13–17 fused spines and the rear dorsal fin has two spines with 19–24 soft rays. The anal fin has 2–3 thin spines and 11–12 rays. The lateral line has 80–90 scales. The head is small and comes to a point at the mouth, holding sharp teeth.

Found in: Prefers deep lakes or low, light-flowing water bodies.



Wikimedia Commons, Piet Spans

Native to: Mainland of Europe and western Siberia.



Stop the Spread: Zander are currently not known in the Crown, but will compete with and prey on native fish. May hybridize with walleye and sauger. Do not move live fish to new waters, use live bait, or dump live bait or aquariums into water bodies.



Wikimedia Commons, Public Domain

PLANTS AND ALGAE

Need to Know

Aquatic plants are those that live entirely or partially submerged in a water body. Invasive populations have detrimental impacts on economy, recreation, ecologic health, and aesthetics. Thick monocultures form mats that deplete fish habitat, impede boating and swimming access, and disrupt irrigation and municipal systems. Plant fragments become tangled in motors and fishing gear and attach to trailers and other equipment, making them easily transported to other waters.

If Introduced

Populations of invasive aquatic plants replace native plants that are essential sources of food, cover, and breeding habitat for fish and wildlife. Invasive plants alter available nutrients and change water quality. Dense stands of plants impede water flow in rivers and streams. Altered flow patterns negatively affect agricultural and forestry practices. Consequently, species invasions result in diminished resource availability and decreased revenue from tourism. The cost of prevention is miniscule compared to the cost of management.



Both: Karl Hamilton

What You Can Do

- Clean, drain, and dry all equipment, including fishing lines, poles, reels, boots, and boats.
- Do not transport fish or other aquatic species.
- Contain and dispose of all unused bait in the trash. Do not use live fish or fish parts as bait.
- Keep live aquatic food and/or pets securely contained indoors.
- Keep an eye out and report invasive species. Report unclean watercraft, trailers, and other equipment on the roadway.

Size: Rooted in substrates, it grows to the water surface, where it forms dense, monotypic stands. Individual leaves may reach 3 cm long and 0.5 cm wide. When in bloom, flower petals are approximately 2 cm long.

Color: White flowers bloom in the summer and fall. When not in bloom, the plant's leaves are a bright green color.

Shape: Leaves are whorled, increasing from 3 to 4 leaves per whorl near the stem base and 5 or 6 leaves at the top of the stem. Leaf margins are finely toothed, needing magnification to view. Primary stems stand upright and may or may not branch.



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Found in: Submerged, usually no deeper than 6 meters. Prefers warmer conditions but capable of surviving cold winters.

Native to: Brazil, Argentina, and Uruguay.



Stop the Spread: Brazilian waterweed is a popular aquarium plant that disperses easily through stem fragmentation. Dispose of aquarium contents in a sealed container. Populations alter habitat and disrupt recreation, water intake, and transport systems.



Left: Richard Old, XID Services, Inc., Bugwood.org. Right: William T. Haller, University of Florida, Bugwood.org

Size: Whole plant is generally less than 3 meters tall. Leaves are approximately 8 cm long and 1.5 cm wide.

Color: Deep green or green-red leaves. Flower spikes are similar in color.

Shape: Rooted and submerged plant that may form dense mats. Leaves are alternate, oblong, finely toothed, and have distinct, wavy margins. Flower spikes frequently emerge from the water surface in the spring.

Found in: Water less than 3 meters deep and no more than 12 meters deep. Highly tolerant of low light and low water temperatures.



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Native to: Eurasia, Australia, and Africa.



Stop the Spread: Reproduces with turions (burr-like winter buds). New plants can grow under winter ice and may emerge early in spring. Populations alter habitat and disrupt recreation, water intake, and transport systems. Now present in Montana, but unknown in the Crown.



Left: Chris Evans, River to River CWMA, Bugwood.org, Right: Richard Old, XID Services, Inc., Bugwood.org

Size: Microscopic, single-celled diatoms form colonies visible to the naked eye. Mats often accumulate to a thickness of 3 cm or more and may grow in long strands.

Color: Colonies generally appear light yellow to light brown, and are often mistaken for raw sewage.

Shape: Forms mats that look and feel like wet wool or toilet paper strands. May appear slimy, but is not.

Found in: Shallow, sun-exposed waterways. Attaches to rocks, plants, or hard surfaces, such as boots and boats.

Native to: Some places in the Crown.

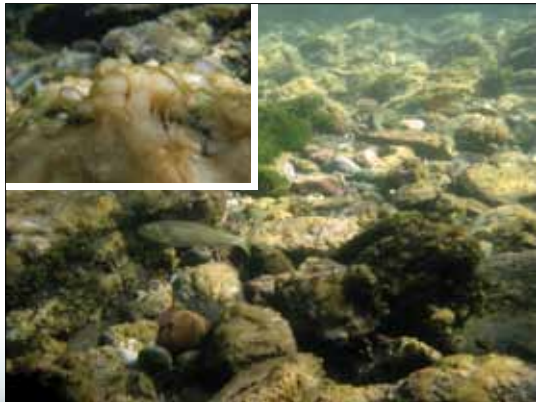


National Park Service

Where native, explosive colonies are considered nuisance blooms. Spread exacerbated by human transport.



Stop the Spread: Didymo is currently the only algae of concern in the Crown. It takes just one living cell to produce a breeding colony. In some environments, these diatoms can survive outside streams for 40 days or more. Blooms alter habitat for fish and other native species.



Both: U.S. Geological Survey/Northern Rocky Mountain Science Center, Joe Giersh

Size: The whole plant is generally less than 4 meters tall. Flower spikes are 5–20 cm long.

Color: Light brown, green, or red stem, with green leaves. Leaves occasionally dark red at the stem tips. Flowers are pink.

Shape: Stem supports leaves in whorls of 4 with 12–28 pairs of thin, pinnately divided, feathery leaflets. Leaflets are often square at the tips and there are typically more than 14 per leaf. Flowers grow in 3–10 whorls and have 4 petals, often emerging from the end of stems as spikes in July and August.



Alison Fox, University of Florida, Bugwood.org

Found in: Water depths up to 4 meters but can occur up to 10 meters deep. Often found in highly disturbed, heavily used lakes and reservoirs.

Native to: Asia, Europe, and North Africa.



Stop the Spread: Has more leaflets than closely related native species. Rapidly grows and reproduces. Spreads with fragments and stolons. Disrupts habitat, recreation, and water intake and transport systems. Present in Montana and B.C., but unknown in the Crown.



Richard Old, XID Services, Inc., Bugwood.org

Size: Grows up to 3 meters tall, emerging from the water surface up to 1.5 meters.

Color: Flowers range in color from white to pink. Leaves and stem are green.

Shape: Flowers, with three petals, grow in umbrella-shaped clusters that are supported by a leafless, cylindrical stem. Leaves grow in opposite rows along the thick rhizomes. Emerged leaves are stiff, long, and triangular, with sharply pointed ends.

Found in: Found in slow-moving water with depths up to 2 meters. Also settles in wetlands and riparian areas.

Native to: Europe, Asia, and Africa.



John M. Randall, The Nature Conservancy, Bugwood.org



Stop the Spread: Originally an ornamental plant that has spread through rhizomes and seed. Populations alter habitat and disrupt recreational opportunities. It is well established in the Flathead watershed, but unidentified in other areas of the Crown.



Left: John M. Randall, The Nature Conservancy, Bugwood.org. Right: Lestle J. Mehrhoff, University of Connecticut, Bugwood.org

Size: May grow up to 10 meters. Largest leaves are 2 cm long, 0.5 cm wide.

Flower stalk is less than 10 cm. Petals and sepals are less than 0.5 cm.

Color: Leaves are usually green, but may appear yellow-brown. Flowers are white, red, or light green, and may have red streaks during the summer and fall.

Shape: Submerged and rooted, branching near the water surface to form dense mats. Leaves are pointed with sharply toothed edges, arranged in whorls of 4–8, and commonly 5 leaves per whorl.

Found in: Slow streams or lakes at depths ranging from 20 cm to 7 meters.



Robert Videki, Bugwood.org

Native to: Sri Lanka, southern India (mainland), and Korea.



Stop the Spread: A popular aquarium plant that disperses easily, reproducing through rhizomes, tubers, turions, or seeds. Capable of growing in low light conditions, it alters habitat and disrupts recreation, water intake, and transport systems. Do not dump aquariums.



Chris Evans, River to River CWMA, Bugwood.org.
Inset: Robert Videki, Bugwood.org

Size: Mature plants are 2–5 meters tall. Emergent stems may grow up to 30 cm above the water surface with stiff leaves, 2–5 cm long. Submersed leaves are often decayed, but are shorter if present, at approximately 1–3 cm in length.

Color: Stems and leaves above the surface are bright green. Submersed leaves are yellow-red or green.

Shape: A heterophyllous plant with leaves that grow in whorls of 4–6 around the stem. Emergent leaves are divided into 12–36 leaflet pairs, so the emergent stems resemble miniature fir trees. Submersed leaves are limp and divided into 10–15 leaflet pairs per leaf.



Jake Jarvis, www.rawutah.com

Found in: Grows best in shallow flow areas, but may also establish in deeper waters that are nutrient rich.

Native to: The Amazon.



Stop the Spread: Spreads through fragmentation. Rhizomes form dense mats in the water. Populations alter habitat and disrupt recreational opportunities. Use in aquariums has assisted in widespread invasions. Unknown in the Crown.



Left: Nancy Loewenstein, Auburn University, Bugwood.org.
Right: Alison Fox, University of Florida, Bugwood.org

Yellow flag iris (*Iris pseudacorus*)

Size: Emerging plants reach heights above one meter. A mature plant's leaves range from 40–100 cm with widths of 2–3 cm.

Color: Stems and leaves are green. When in bloom, flowers are yellow and may be adorned with brown or blue spots or veins. Rhizomes are pink.

Shape: Leaves are shaped like long, sharp swords. They are erect or bend outward and are thicker near the middle. Blooms in the spring or summer with flowers of 6 petals, 3 pointing upward and 3 pointing downward.

Found in: Prefers shallow, calm waters and wetlands.



U.S. Fish and Wildlife Service, Jenny Beuerman. Inset: John M. Randall, The Nature Conservancy, Bugwood.org

Native to: Eurasia.



Stop the Spread: Poisonous to animals. Contact with skin can cause blistering. Likely introduced for ornamental purposes. Do not use in ponds or gardens. Known to exist in portions of the Crown, including the Kootenai, Flathead, and Clark Fork/Blackfoot watersheds.



Left: Barry Rice, sarracenia.com, Bugwood.org. Right: Jessica Sprajcar, PA DCNR/Office of Conservation Science, Bugwood.org

PATHOGENS AND PARASITES

Need to Know

Pathogens and parasites are microscopic organisms that are highly difficult to detect. These invisible invasive species are capable of inflicting enormous ecological and economic damage. Pathogens and parasites cause illness that often leads to death in the species they infect. Such viruses and organisms can easily spread undetected in just small amounts of contaminated water and/or through the introduction of an infected species, such as an infected baitfish.

If Introduced

Pathogens and parasites will infect and likely kill native predators, such as fish and amphibians. A decline in fish population will lead to loss of revenue for fisheries and recreation and damage ecological balances that maintain water quality. Efforts to diagnose, contain, treat, manage, or eradicate infected species will be costly.



VHS-infected fish

Dr. Paul Bowser, College of Veterinary Medicine, Cornell University

What You Can Do

- Clean, drain, and dry all equipment, including fishing lines, poles, reels, boots, and boats.
- Do not transport fish or other aquatic species.
- Contain and dispose of all unused bait in the trash. Do not use live fish or fish parts as bait.
- Keep live aquatic food and/or pets securely contained indoors.
- Keep an eye out and report invasive species. Report unclean watercraft, trailers, and other aquatic equipment on the roadway.

Asian tapeworm (*BOTHRIOCEPHALUS ACHEILOGNATHI*)

Asian tapeworm is a parasite temporarily hosted by small crustaceans until consumed by fish. The tapeworm matures in fish intestines and uses the fish as its primary host. Internal competition for nutrients can be fatal to fish and lead to fish population decline.

Chytridiomycosis (*BATRACHOCHYTRIUM DENDROBATIDIS*)

Chytridiomycosis is an amphibian skin disease also known as chytrid fungus or Bd. It has contributed to global-scale amphibian population decline. An infected individual may

have reddened or discolored skin, shed with more frequency than normal, and behave lethargically. Laboratory tests are required for diagnosis. This disease has been documented in amphibians within the Crown in the Flathead drainage.

Heterosporis

Heterosporis is caused by the microscopic parasite *Heterosporis*, which degrades muscle tissue in its fish host. The fillet of an infected fish may display pale markings and a granular texture. This parasite is known to infect multiple fish species, though it was originally detected in yellow perch. North American cases are known in Ontario, Wisconsin, and Minnesota.

IHN (*INFECTIOUS HEMATOPOIETIC NECROSIS*)

IHN is a fatal virus known to infect salmon and trout. Infected fish may display symptoms such as lethargy, pop-eye, pale gills, anorexia, darker skin tones, and distention of the abdomen. Some infected fish will swim high in the water column. IHN is not known in the Crown, though it has infected fish in U.S. states west of Montana.

VHS (*VIRAL HEMORRHAGIC SEPTICEMIA*)

VHS is an infection that affects multiple fish species. It can cause moderate to severe internal and external bleeding throughout the body of a fish, including eyes and fins. Infected fish may rise to the surface of the water and/or swim in circles. VHS requires laboratory testing for diagnosis. It has infected fish in the

Great Lakes region and some eastern states.

Whirling disease

Whirling disease is caused by the parasite *Myxobolus cerebralis*, which consumes the cartilage of trout. It generally affects young fish. Signs of infection are deformities that cause reduced swimming and feeding ability. The parasite is native to Europe. Known occurrences exist in more than 20 U.S. states, including multiple Montana watersheds and the Blackfoot River (southern boundary of the Crown). The parasite is temporarily hosted by aquatic worms until consumed by fish, where it matures and produces infective spores that assist in its spread.

GLOSSARY

adipose fin—a small, fatty, fin-shaped projection behind the dorsal fin of certain fishes, such as trout and salmon, that lacks supporting rays.

anoxic—relating to, or marked by a severe deficiency of oxygen.

anterior—situated at or toward the front.

asexual reproduction—reproduces independent of sexual processes.

barbel—a long, thin, fleshy growth on the mouth or nostrils of some fish.

brackish—slightly briny or salty.

byssal threads—a tuft of strong, silky filaments by which various mussels attach themselves to rocks and other objects.

carapace—a shell or bony covering on the back of animals, such as turtles.

dorsal—of, on, or near the back or upper surface of an organ, part, or organism.

eutrophic—having waters rich in minerals and organic nutrients that promote a

proliferation of plant life, especially algae, which reduces dissolved oxygen content and often causes the extirpation of other organisms.

heterophyllous—having leaves of different types upon the same plant.

hydrologic apex—the highest point, especially the vertex of a peak, that determines the direction of flow and geographic distribution of water.

lateral—of, at, or from the side; in the direction of or toward the side.

operculum—a lid-like part or organ; any flap covering an opening, as the plate of some gastropods that closes the opening of the shell or the gill cover of a fish.

parthenogenic—reproduces without any male element, as the eggs in certain species develop from virgin females without fertilization from a male.

plankton—small organisms that float or drift in water, especially at or near the surface.

posterior—situated behind or farther back.

rays—the parts that support and extend the fin of a fish.

rhizome—a rootlike, creeping, underground stem of some plants, which usually sends out roots below and leafy shoots above.

riparian—of, on, or relating to the banks of a natural course of water.

spines—a sharp, rigid fin ray of a fish.

sub-terminal mouth—located on the underside of the head of a fish, typical of bottom feeders.

terminal mouth—located at the end of a head, typical of fish that chase and capture things.

tuber—a solid, thickened portion or outgrowth of an underground stem, of a more or less rounded form, with buds from which new plants may arise; a potato is a tuber.

tubercles—a small, rounded projection or protuberance, as on a bone or on the surface of the body in various animals.

turion—a thick, fleshy, young shoot or sucker, such as an emerging stem of asparagus.

tympanic membranes—the membrane separating the ear from the middle ear; the eardrum.

ventral—of, having to do with, or situated on or near the surface or part opposite the back.

SPECIAL THANKS TO OUR WORKING GROUP

Tom Bansak *University of Montana, Flathead Lake Biological Station, Research Scientist*

Sue Crowley *British Columbia Ministry of Environment, Ecosystem Biologist*

Chris Downs *Glacier National Park, Fisheries Biologist*

Clint Folden *Confederated Salish Kootenai Tribes, Fisheries Biologist*

Erik Hanson *State of Montana, Invasive Species Coordinator*

Kari Hamilton *Alberta Sustainable Resources and Development, Biologist (former)*

Tris Hoffman *Flathead National Forest, Weed Specialist*

Barb Johnston *Waterton Lakes National Park, Ecosystem Scientist*

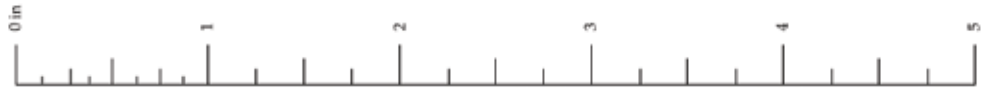
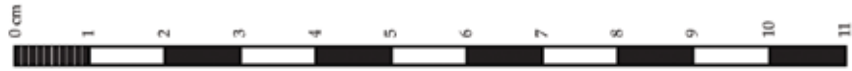
Terry Kosinski *Province of Alberta, Fish and Wildlife Division, Head of Resource and
Division Planning*

Beth Raboin *University of Montana, M.S. Environmental Studies Candidate*

Pat Van Eimeren *Flathead National Forest, Fisheries Biologist*

John Wachsmuth *Montana Fish Wildlife and Parks, Aquatic Invasive Species
Coordinator (former)*

Dr. Vicki Watson *University of Montana, Professor*





The Crown Managers Partnership (CMP) seeks to address environmental management challenges in the Crown by adopting transboundary collaborative approaches. Since 2001, the CMP has brought U.S. and Canadian land managers together to facilitate cross-border resolutions and management strategies to shared resource issues.