

UPSETTING THE PYRAMID

CARD PUZZLE
MODERATE TO DIFFICULT
1 - 4 PLAYERS

OBJECT

Turn an aquatic food pyramid upside down by removing three native species and adding three invasive species.

WILDCARDS

See sample list below: 1 fish-eating bird, 2 small fish, 3 aquatic carnivores, 4 aquatic herbivores, 3 aquatic invasives (Note: Substitute other cards or build a terrestrial food pyramid.)

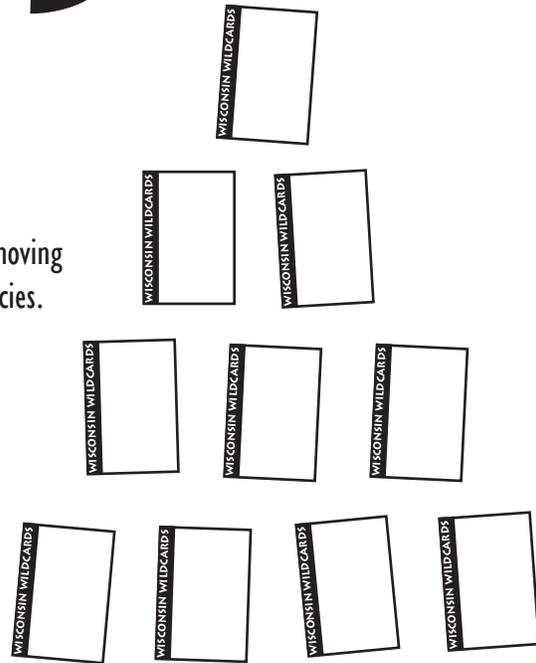
DEAL

Working alone or in small groups, read the information on the native **Wildcards** and build a pyramid:

- 1st row – animal that eats fish (Common Loon)
- 2nd row – fish that eats small invertebrates (Bluegill, Yellow Perch)
- 3rd row – invertebrates that eat other invertebrates (Alderfly Larva, Dragonfly Larva, Damselfly Larva)
- 4th row – plant-eating invertebrates (Mayfly Larva, Caddisfly Larva, Stonefly Larva, Riffle Beetle)

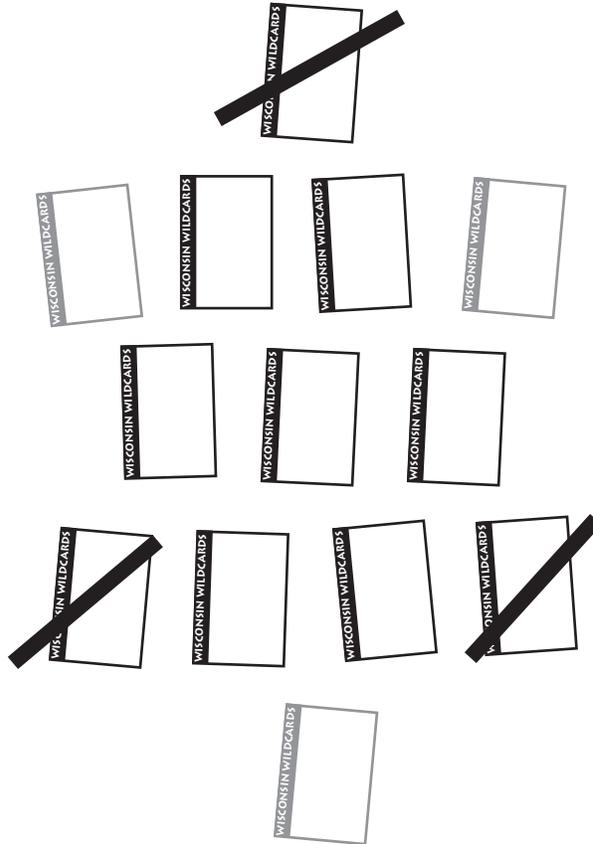
PLAY

Now, without moving any other cards, turn the pyramid upside down by removing three native species cards and adding three invasive species cards (e.g., Zebra Mussel, Rainbow Smelt, and Rusty Crayfish). See solution on the next page.



SOLUTION

Remove the crossed-out cards. Add the shaded cards.



THINK ABOUT IT!

Check out the aquatic food pyramid now! While invasives don't completely turn food pyramids upside down, they do compete with native species for limited food, cover, and space. They often upset the whole ecosystem that they invade. Look at the backs of the **Wisconsin Wildcards: Alien Invaders** to discover some of the adaptations that allow invasive species to outcompete native species and upset aquatic ecosystems:

- Invasives are free from the predators, parasites, and diseases that control populations of native species.
- Invasives have great dispersal ability or migratory tendencies.
- Invasives have a high reproductive potential.
- Invasives mature early.
- Invasives are often able to reproduce both sexually and asexually.

WISCONSIN WILDCARDS



NATIVE SPECIES **W**

WISCONSIN WILDCARDS



MATCH YOUR CATCH! **W**

WISCONSIN WILDCARDS



MATCH YOUR CATCH! **W**

WISCONSIN WILDCARDS



13-68 mm

NATIVE SPECIES **W**

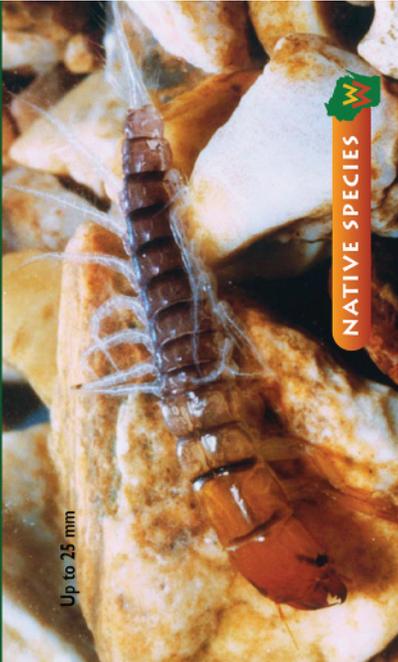
WISCONSIN WILDCARDS



13-68 mm

NATIVE SPECIES **W**

WISCONSIN WILDCARDS



Up to 25 mm

NATIVE SPECIES **W**

WISCONSIN WILDCARDS



2-32 mm

NATIVE SPECIES **W**

WISCONSIN WILDCARDS



2-43 mm

NATIVE SPECIES **W**

PUMPKINSEED

Lepomis gibbosus

IDENTIFICATION

Look for a bright red spot, just behind a black spot on their "earflap" – an extension of the gill cover. Belonging to the sunfish family, most anglers know pumpkinseed as just "sunfish".

HABITAT

Pumpkinseeds prefer cool to warm, shallow waters with plenty of weed cover. Like other sunfish, the males use their tails to fan out a nest in the sand or gravel of lake bottoms during the spawning season.

TACKLE TIPS

An easy catch! You can fish from shore using light tackle or worms to catch these tasty little fish.

COMMON CATCH SIZE 4-5", up to 8 oz.

For more information, visit:
dnr.wi.gov

Painting: Virgil Beck
Recycled paper



FH-930f 2009

YELLOW PERCH

Perca flavescens

IDENTIFICATION

Yellow perch are found in most Wisconsin lakes. These tasty fish can be identified by the prominent vertical bars along their yellow sides.

HABITAT

Yellow perch prefer the cool, open waters of Wisconsin's deep lakes. They move about in large schools, sometimes numbering in the hundreds. They are not active at night but lie still near the bottom.

TACKLE TIPS

Keep on the move! If you don't get a bite in one area, move to another until you find a school. Yellow perch will bite on almost any bait, but tend to nibble lightly. Use light tackle and set your hook quickly!

COMMON CATCH SIZE 7-10", 4 oz.

For more information, visit:
dnr.wi.gov

Painting: Virgil Beck
Recycled paper



FH-930m 2009

COMMON LOON

Gavia immer

IDENTIFICATION

The common loon measures nearly 3 feet and has a 5-foot wingspan. It is gray and white until four years of age, when it grows the elegant black and white breeding plumage for which it is famous.

VOCALIZATION

Loons have four calls. The laugh-like tremolo is an alarm call, while the hoot reassures. The males' high-pitched yodel is territorial; the mournful wail is a call to other loons.

HABITS

Loons are expert divers, feeding on fish and aquatic invertebrates. They nest along the water's edge and rear one or two chicks each summer.

CONSERVATION Protect natural shorelines, essential for suitable nesting habitat, and use lead-free fishing tackle like bismuth sinkers to reduce fatal lead poisoning.

For information about Loonwatch:

<http://www.northland.edu/soei/loonwatch.asp>

Photo: Ginger Gumm/Daniel
Paletchok, Jr.
<http://www.dnr.state.wi.us/org/water/fhp/fish/kidsparents/anglereducation/workshopschedule.shtml>
Recycled paper



ER-1086-2005

ALDERFLY LARVA

Order Megaloptera (meaning "large wings")
Family Sialidae

These larval predators live in soft substrates in highly-oxygenated waters, such as streams, but can live in temporary waters. Eggs, pupae and adults are terrestrial. There are 7 species in Wisconsin. Avoid confusing them with caddisfly, dobsonfly, or beetle larvae.

Check for these characteristics:

- Two claws on each leg
- Seven pairs of segmented projections along their sides
- One "tail"



WILD! Alderfly larvae obtain oxygen through their skin. The projections along their sides are not legs but respiratory tubes that give them lots of surface area for absorbing oxygen.

clean-water.uwex.edu/wav

Photo: Missouri Department of Conservation
Art: UWEX
Partial funding provided by US EPA S. 319
Water Quality Act



WT-786 2004

DAMSELFLY LARVA

Order Odonata (meaning "toothed")
Suborder Zygoptera

These predators may be eaten by birds and other critters as they leave their larval homes in aquatic vegetation, sediments, or rocky riffles to emerge as adults. As larvae, they swim by moving their abdomen and gills ("tails") side to side. Avoid confusing them with dragonfly or mayfly larvae.

Check for these characteristics:

- Head is wider than thorax and abdomen
- Long, thin abdomen
- Three plate-like gills ("tails") on the end of abdomen



WILD! Damselflies hunt by sight and actively stalk their prey, while some other predatory larvae simply lie in wait for their prey to approach.

clean-water.uwex.edu/wav

Photo: Dr. Stanley Szczytko,
Professor of Limnology, UWSP
Art: Illinois Natural History Survey
Partial funding provided by US EPA S. 319
Water Quality Act



WT-788 2004

DRAGONFLY LARVA

Order Odonata (meaning "toothed")
Suborder Anisoptera

These voracious predators crawl about in vegetation, sediments, and riffles in many aquatic environments. They swim by forcing a jet of water out of their rectum. Both eggs and larvae of the 154 species of dragonflies and damselflies in Wisconsin are aquatic. Dragonfly larvae might be confused with damselfly larvae.

Check for these characteristics:

- Head is nearly equal or narrower than thorax and abdomen
- No "tail"



WILD! Dragonfly larvae have an extendable lip that helps them be successful predators. They're considered the lions of the invertebrate world.

clean-water.uwex.edu/wav

Photo: Dr. Stanley Szczytko,
Professor of Limnology, UWSP
Art: UWEX
Partial funding provided by US EPA S. 319
Water Quality Act



WT-787 2004

CADDISFLY LARVA

Order Trichoptera (meaning "hairy wing" – which describes the wings of adult caddisflies)

Caddisfly larvae live on rocks, vegetation and woody debris in many aquatic environments. Adults are terrestrial. There are 245 caddisfly species in Wisconsin, most of which eat plants, animals, or decaying material. Avoid confusing them with dobsonfly, alderfly, or midge larvae.



Check for these characteristics:

- Houses or "cases" made of sand grains, vegetation, or pieces of wood (some are free-living)
- Head and/or thorax have dark, thick, hardened skin
- Caseless net-spinners have two brush-like tails

WILD! A caddisfly uses silk glands in its mouth to build a case or spin a net.

clean-water.uwex.edu/wav
Photo: Dr. Stanley Szczytko, Professor of Limnology, UWSP
Art: Jens von Sivers
Partial funding provided by US EPA S. 319
Water Quality Act



WT-791 2004

MAYFLY LARVA

Order Ephemeroptera
(meaning "short-lived on the wing")

These "cows" (they graze on plants!) of aquatic environments live in or on rocks, plants, or other large woody debris. They crawl or swim by moving their abdomen up and down. Wisconsin has 115 mayfly species. Avoid confusing them with stonefly or damselfly larvae.

Check for these characteristics:

- Gills on abdomen are feathery and often flutter
- One claw on each leg
- Usually three tails (sometimes two)



WILD! Terrestrial adults emerge from their aquatic larval stage in great numbers (all at once), do not eat, and may live for only a few hours.

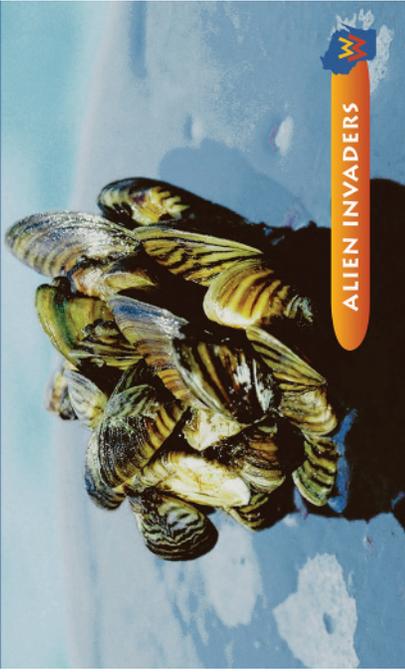
clean-water.uwex.edu/wav

Photo: Dr. Stanley Szczytko, Professor of Limnology, UWSP
Art: Illinois Natural History Survey
Partial funding provided by US EPA S. 319
Water Quality Act



WT-790 2004

WISCONSIN WILDCARDS



ALIEN INVADERS



WISCONSIN WILDCARDS

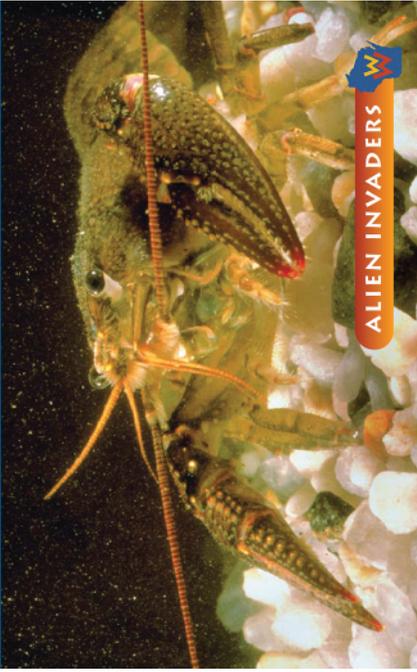


5-70 mm

NATIVE SPECIES



WISCONSIN WILDCARDS



ALIEN INVADERS



WISCONSIN WILDCARDS



larva

less than 4 mm

NATIVE SPECIES



WISCONSIN WILDCARDS



ALIEN INVADERS



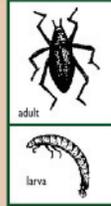
RIFFLE BEETLE

Order Coleoptera (meaning "sheathed wings")
Family Elmidae

These beetles live their entire lives primarily in faster moving water on gravel, wood, and vegetation. There are 24 species in Wisconsin. Both adults and larvae eat plants and scrape algae from rocks.

Check for these characteristics:

- Adults and larvae dark, with thick, leathery skin
- Larvae cylindrical
- Adults and larvae with long claws to hold onto the bottom in fast water
- Adults with thread-like antennae



WILD! After flying to disperse, adults return to the water and go to the surface only once in a lifetime to obtain oxygen. They hold oxygen in a flattened bubble on many tiny hairs on their body, refilling it with oxygen from the water as it is depleted.

clean-water.uwex.edu/wav

Photos: Missouri Department of Conservation
Art: UWEX
Partial funding provided by US EPA S. 319
Water Quality Act



WT-794 2004



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STONEFLY LARVA

Order Plecoptera (meaning "braided wings" – adults position back wings in folds under front wings)

These pollution-intolerant insects eat plants, dead material, and other insects. The eggs and larvae of Wisconsin's 58 stonefly species live in cool, flowing water in gravel, rocks, wood, or leaf packs. The larvae crawl or swim by moving their abdomen side to side. Avoid confusing them with mayfly larvae.

Check for these characteristics:

- Long antennae
- Two claws on each leg
- No gills located along middle of abdomen
- Two tails



WILD! Stonefly larvae have few gills, so they need highly-oxygenated water to survive. To increase oxygen supply to their gills, they do "push-ups" to move oxygen-rich water across them, making it easier to absorb the oxygen.

clean-water.uwex.edu/wav

Photo: Dr. Stanley Szczytko, Professor of Limnology, UWSP
Art: UWEX
Partial funding provided by US EPA S. 319
Water Quality Act



WT-789 2004



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RAINBOW SMELT

WHAT IS IT?

These slender fish are typically 6 to 8 inches long, with obvious teeth and a small fleshy fin on top of their body near the tail. They escaped into the Great Lakes from an inland lake in Michigan.

WHAT'S THE PROBLEM?

These fish cause problems in our inland lakes, where they were probably used as bait and released. Adult smelt eat young walleye, and the young of both fish compete for the same food.

WHAT CAN I DO?

- Learn how to identify rainbow smelt
- If you catch a rainbow smelt in an inland lake, kill it, and dispose of it in the trash
- Don't use live smelt as bait

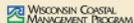
WILD!

Fried smelt are tasty, but they smell like cucumbers when freshly caught!

www.dnr.state.wi.us/org/caer/ce/invasives

Photo: John Lyons,
WI DNR

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WT-757 2003

RUSTY CRAYFISH

Orconectes rusticus

WHAT IS IT?

Rusty crayfish have larger claws than most other native crayfish species with dark, rusty spots on each side of their carapace (middle part of their outer body.)

WHAT'S THE PROBLEM?

Rusty crayfish feed very aggressively on aquatic plants reducing the abundance of vegetation in many northern Wisconsin lakes. They also are very prolific and reduce native crayfish populations.

WHAT CAN I DO?

- Learn how to identify rusty crayfish.
- Don't transport them from lake to lake by using them as fishing bait.

WILD!

Female rusty crayfish can lay from 80-575 eggs!

<http://dnr.wi.gov/invasives>

Photo: WI DNR

Recycled paper



WT-739 2005



ZEBRA MUSSEL

WHAT IS IT?

These yellowish-brown clams—up to 2 inches long—have light and dark stripes on their "D" shaped shells. Native to the Baltic and Caspian Sea region of Europe, they came here in water carried in the bottom of sea-going ships.

WHAT'S THE PROBLEM?

They attach to all hard surfaces, including boats and docks, and clog water intake pipes. They are filter feeders, taking plankton out of the water that young fish rely on for food. They produce tens of thousands of young mussels each summer, and can cover lake and river bottoms.

WHAT CAN I DO?

- Learn how to identify zebra mussels
- If you find zebra mussels, dispose of them in the trash
- Drain all water (livewell, bilge) before going to another waterbody

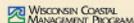
WILD!

They are one of the ONLY freshwater mussels that can attach themselves to solid objects!

www.dnr.state.wi.us/org/caer/ce/invasives

Photo: Great Lakes Sea Grant Network

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WT-738 2003