

Grade Level Middle School

#### Subject Areas Life Science, Environmental Science, Ecology, and Human Impacts

## Key Topics

Aquatic invasive species, native, non-native, adaptations

**Duration** Preparation Time: 20 min Activity Time: 50 min. (2x)

Setting Classroom (Individual or in pairs)

Skills Researching; Communicating

## Standards

### NGSS & MT Science Stds:

LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.C: Adaptation CROSSCUTTING CONCEPTS: Stability and Change Cause and Effect SCIENTIFIC & ENGINEERING PRACTICES: Obtaining, Evaluating, and **Communicating Information** 

## **COMMON CORE:**

WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

# **Most Unwanted AIS Poster**

Do you ever wonder which aquatic invasive species are a threat to your area?

## **Overview**

Students will create an informational poster about aquatic invasive species (AIS) that are a threat to their local environment and economy. The poster may be completed as either an electronic document or as a hard-copy poster. To educate the school community, the finished posters can be posted in the school and/or compiled into a document that can be shared electronically.

## **Objectives**

Students will be able to:

- research an AIS that is a threat to the region.
- identify local habitats that the AIS could potentially invade.
- determine traits that make the non-native species invasive.
- describe ways AIS may disturb local lakes, streams, or rivers and impact the local economy.
- explain how an AIS invasion can be prevented and detected.

## Materials

### Warm Up/Activity

- Student worksheets #1-5 and teacher resource worksheet #1
- Laminated teacher resource worksheets #2-3
- Computer and projector for the instructor
- Computer/chromebook and printer access for each student
- Electronic poster: Individual access to presentation software (ex. PowerPoint, Keynote, Google Slides, Prezi, etc.)
- Hardcopy poster: 8 ½" x 11" assorted colored paper or construction paper, scissors, rulers, glue, and colored pencils

## **Advanced Preparation**

- Copy the student worksheets #1-4 (double-sided).
- Copy the student worksheet #5 and teacher resource worksheet #1 (single-sided).
- Pull out the laminated teacher resource worksheets #2-3.
- Acquire student access to a computer/chromebook and printer.
- For the hard-copy poster: Gather the poster paper, scissors, rulers, glue, and colored pencils for the students to use in class.
- Prior to class, pre-load the Most Unwanted AIS Poster example from the thumb drive or on our website: https://flbs.umt.edu/newflbs/k12teachingmaterial



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## Background

Northwest Montana is home to aquatic habitats rich in diverse aquatic plants, insects, crustaceans, amphibians, fish, mammals, and birds. The streams, rivers, wetlands, lakes, and ponds in the region support a tremendous variety of **native** wildlife, and create a sense of place unlike any other in the country. Imagine the Flathead Valley without the Flathead River, Flathead Lake, or the surrounding wetlands. The clear, clean water that we rely upon for our recreation, drinking water, tourism, agriculture, and ultimately our way of life is under siege from **non-native**, **aquatic invasive species (AIS)** that have the potential to alter this beautiful landscape permanently.

Eurasian watermilfoil, curly-leaf pondweed, and flowering rush are just some of the many aquatic invasive species that are already found within our watershed. Being able to identify the AIS threats and to understand the **adaptations** that make them invasive, along with the ways that we can prevent the spread of these species, is knowledge that everyone in the community should have.

The headwaters of the Columbia River Watershed flow through our valleys as they make their way towards the Pacific Ocean. As they pass through this region, they can pick up and transport invasive species downstream. The Columbia River Watershed is the last major watershed in the country that has not been invaded by zebra and quagga mussels. These mussels spread easily through microscopic, planktonic veligers (larvae) that can drift with the water currents. Once these mussels enter a water body, it is very difficult to contain them and virtually impossible to effectively eradicate them. As a result, it will take a community-wide effort to prevent the spread of these harmful mussels throughout Montana, Idaho, Washington, and Oregon.



Photo credit: California Department of Fish and Wildlife (public domain)

Zebra and quagga mussel veligers look alike when viewed from a light microscope. Polymerase Chain Reaction (PCR) and genetic sequencing was used to confirm the identity of the zebra mussel larvae in the photo above.

Now more than ever, it is critical to be AIS aware, and to promote that awareness throughout our community. Creating public AIS awareness can begin in the classroom and stretch beyond the school walls by sharing the products of this lesson to the school and surrounding community.

#### Vocabulary

Adaptations – Physical, chemical, or behavioral characteristics of organisms, which allows them to live in particular environments.

Aquatic invasive species (AIS) – Aquatic, non-native species that cause economic or environmental harm. Native species – An indigenous species historically found in an ecosystem.

Non-native species – A species that has been moved outside of its natural geographic range.

### Procedure

### Warm Up (5 minutes)

- Pass out the student warm up worksheets (#1-2).
- Prompt: Examine the provided photographs, maps, and life cycle diagram. Identify and describe the problem and where it is occurring in the United States and Montana.
- Ask 1-2 students to share what they think the problem is.
- Ask 1-2 students to share where this problem is occurring.
- Explain that this warm up activity is an introduction to one AIS threat to Montana and that they will be taking a more in-depth look at one specific species for this AIS poster project.





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## **Procedure**

## The Activity (90 minutes)

- Pass out the AIS Mini-Poster worksheets (#3-4) and the AIS Poster Research Guide worksheets (#5-6). •
- Describe the poster project and requirements to the students.
- Have each student select one aquatic invasive species from the provided list. Record the students' names on the AIS Poster Sign Up Sheet.
- Ask the students to first complete the AIS Poster Research Guide as they conduct their research.
- Next, have the students sketch out a rough draft of their poster layout on the back of their worksheet.
- Lastly, have the students create either an electronic or hardcopy poster to share with the class.

## Warm Down (5 minutes)

- Prompt: What makes your aquatic invasive species harmful?
- Students may share their response verbally, electronically, or on paper (ex. post-it note, index card, etc.).

## OPTIONAL Poster Gallery (30 minutes)

- Arrange the mini-posters around the classroom so that students can freely move and make observations.
- Pass out the Poster Gallery worksheet (#7).
- Direct the students to select 5 posters, to complete the provided table, and to answer the three summary questions at the bottom of the worksheet.

Note – The poster gallery can be conducted after school for parents and community members to learn about local AIS threats. These posters can also be posted in the school common areas to promote AIS awareness. Alternatively, the posters can be scanned into a document that could be distributed to the school community electronically.

## **Teacher Resources**

### **Assessment Options**

Have students:

- create the project poster as described.
- complete a 3-minute poster presentation to educate their peers.
- conduct a poster gallery for students (and community members) to learn about local AIS threats.

## **Modifications**

- ٠ Either remove or add poster elements to adjust the difficulty level of the project.
- The worksheets can be enlarged for students in need of larger text.
- If desired, share the following Google Slides template with your students: ٠ https://docs.google.com/presentation/d/1uHnS CpWdsTCLqHR 14Wp3mPUae VV6uoz0SoDGXIYE

## **Extensions**

Students can:

design a bumper sticker or create a movie trailer to promote AIS prevention and awareness.

## **Online Resources**

Montana Field Guide: http://fieldguide.mt.gov/

Montana Fish, Wildlife and Parks Aquatic Invasive Species website: http://fwp.mt.gov/fishAndWildlife/species/ais/ Yellowstone Coordinating Committee Aquatic Invasive Species Pocket Guide: https://docs.wixstatic.com/ugd/a0f00b\_398521b0c8fc42acbc1226ea9c7a3110.pdf

## Acknowledgements

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Name

## **AIS Mini-Poster Project**

**PROJECT CHALLENGE:** Design your own "MOST UNWANTED AIS" poster for an aquatic invasive species that is a threat to Montana lakes, rivers, ponds, and streams.

**FIRST**: Select ONE of the following to research. Check the box for the topic you selected.

- □ Asiatic clam (*Corbicula fluminea*)
- □ Chinese mysterysnail (*Cipangopaludina chinensis*)
- □ New Zealand Mudsnail (*Potamopyrgus antipodarum*)
- □ Quagga Mussel (*Dreissena rostiformis bugensis*)
- □ Red-rim melania (*Melanoides tuberculatus*)
- □ Zebra mussel (*Dreissena polymorpha*)
- □ Virile crayfish (*Orconectes virilis*)
- □ Bloody red shrimp (*Hemimysis anomala*)
- □ Red swamp crayfish (*Procambarus clarkii*)
- □ Rusty crayfish (*Orconectes rusticus*)
- □ Spiny waterflea (*Bythotrephes longimanus*)
- □ Bighead carp (*Hypophthalmichthys nobilis*)
- □ Asian swamp eel (*Monopterus albus*)
- □ American Bullfrog (*Lithobates catesbeianus*)

- □ Northern pike (*Esox lucius*)
- □ Northern snakehead (*Channa argus*)
- □ Snapping turtle (*Chelydra serpentina*)
- □ Brazilian waterweed (*Egeria densa*)
- □ Curly-leaf pondweed (*Potamogeton crispus*)
- □ Didymo (*Didymosphenia germinata*)
- □ Eurasian watermilfoil (*Myriophyllum spicatum*)
- □ Flowering rush (*Butomus umbellatus*)
- □ Hydrilla (*Hydrilla verticillata*)
- □ Parrot Feather Water-milfoil (*Myriophyllum* aquaticum)
- □ Yellowflag iris (*Iris pseudacorus*)
- □ Starry stonewort (*Nitellopsis obtusa*)

**SECOND**: Research your AIS topic, complete the AIS Poster Research Guide worksheet, and create a mini-poster on an 8.5" x 11" paper or Google Slide. Please include the following:

- **Common name** of the organism (and scientific name if it has one).
  - Mug shot A photo, which must be properly cited (see example below), or draw a sketch.
  - What to Look For Physical appearance and any other distinguishing characteristics.
  - □ **Modus operandi** Police jargon for "mode of operation." What physical, chemical, and/or behavioral traits make it an invasive species.
  - □ Last Known Location Last know locations? Where could it be found in Montana?
  - □ **Hide out** What is its preferred habitat?
  - □ Armed and dangerous? How so? How does it harm the environment and/or economy?
  - **Tips for capture** Suggest weapons that can be used against it, as well as, ways to detect and П prevent it.
  - □ **Contact** An agency or appropriate authority to contact if organism is found.
  - □ **Miscellaneous** At least two other unique facts that could help lead to its capture.



Photograph of American bullfrog. (Alan D. Wils, 2006)

## THIRD: Create a Poster Reference List

- □ At least two sources (ex. a website, book, or encyclopedia, etc.).
- Source material MUST have an author's name or be from a reliable organization (.gov, .org, or .edu), otherwise do NOT use it.
  - □ A.P.A. formatted. See provided formatting guide.
  - □ Alphabetized.
  - □ You must submit it separately from your poster.





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Student Worksheet (1 of 5)

**LAST**: Review your poster to make sure the following criteria are met:

- □ Typed OR neatly hand written.
- □ Limit the number of words. Not too wordy, nor too sparse!
- □ 'Wow' factor that engages the viewer and helps them to learn about your AIS topic!
- □ 'Mug shot' is sketched, or copied and pasted from the web source (but make sure you cite the source directly beneath the image and include the source in your Reference List).

## **Poster Grading Rubric**

Use the following rubric as a guide as you complete your poster.

	Exceeds	Meets	Does Not Meet
Content	Common and scientific name	Common name included	Organism name not
	included	Mugshot is included but	included
	Mugshot clearly depicts the	the organism is difficult	Mugshot was either
	organism	to see	inaccurate or not
	Physical appearance and	Physical appearance	included
	distinguishing traits are clearly	described	Physical appearance
	identified in detail	Briefly explains why the	vague or inaccurate
	Explains in detail why the	species is invasive	Invasive traits unclear
	species is invasive	Hide out identified	Hide out not
	Hide out clearly identified	Provides potential	identified
	Impacts to the environment and	impacts	Impacts unclear
	economy described in detail	Minimal tips for	Detection and/or
	Accurate tips for detection	detection and/or	prevention tips not
	and/or prevention provided	prevention provided	included
	Contact listed	Contact listed	Contact not listed
	Three or more unique facts	Two unique facts	Unique facts not
	included	included	included
Format	Typed or artistically hand-	Neatly hand-written	Writing messy or
	written	Basic poster design	unclear
	Poster design elicits a 'WOW'	Text is too wordy	Text is too sparse
	Text is not too wordy or sparse		
Reference	Three or more reliable sources	Two sources provided in	Less than two sources
List	provided in correct A.P.A format	A.P.A. format	provided or not in
	Mugshot properly cited and	Mugshot cited and	A.P.A format
	included in reference list	included in reference list	Mugshot not cited

## **Comments:**





#### Most Unwanted AIS Poster Name\_\_\_\_\_

## **AIS Poster Research Guide**

Student Worksheet (3 of 5)

Online resources that you may use to find information about your AIS topic:						
Montana Field Guide: <u>http://fieldguide.mt.gov/</u>						
Montana Fish, Wildlife and Parks Aquatic Invasive Species website: <a href="http://fwp.mt.gov/fishAndWildlife/species/ais">http://fwp.mt.gov/fishAndWildlife/species/ais</a>						
Yellowstone Coordinating Committee Aquatic Invasive Species Pocket Guide: https://docs.wixstatic.com/ugd/a0f00b_398521b0c8fc42acbc1226ea9c7a3110.pdf						
Common name: Scientific name:						
Mug shot (Find a photo or create a sketch) Source/website:						
Physical Description:						
Other distinguishing (unique) characteristics:						
Modus operandi (what makes it invasive):						
Who/what it associates with:						
Armed and dangerous?						
How it harms the environment:						
How it harms the economy:						
Where it is found in Montana:						
Hide out (preferred habitat):						
<b>Tips for capture:</b> Weapons that can be used against it, as well as, ways to detect and prevent it:						
Contact if found:						
Miscellaneous (At least two other unique facts that could help lead to its capture): 1						
2						
<b>References</b> (record the websites that you get information from):						





#### Student Worksheet (4 of 5)

Use this space to plan your poster design and layout:

## A.P.A Referencing Guide

What follows is how to cite the most commonly used sources in APA format and how to make an in-text citation for each example.

### Website:

Author last name, first initial OR organization's name. (Year of publication). Title of document. Retrieved from: URL

#### Example of a person as author:

Campellone, J. (2007). Huntington's disease. Retrieved from: http://www.nlm.nih.gov/medlineplus/en.htm

#### Example of organization as author:

University of California Museum of Paleontology, Understanding evolution (2005). "Superweed" discovered in Britain? Retrieved from http://evolution.Berkeley.edu/evolibrary

### Article in a magazine or journal:

Author last name, first initial. (Year, month, day). Title of article. Name of periodical, issue number, pages. Retrieved from [database name].

#### Example:

Decaestecker, E., et al. (2007, Dec 6). Host-parasite 'Red Queen' dynamics archived in pond sediment. Nature, 7171, 870-873. Retrieved from Science Reference Center.

### Book:

Author last name, first initial. (Year of publication). Title of work: Capital letter also for subtitle. Location: Publisher.

#### Example:

Percival, M. (1965). Floral biology. Oxford: Pergamon Press.

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How to in-text cite: (Campellone, 2007)

How to in-text cite: (Decaestecker, 2007)

How to in-text cite: (Percival, 1965)

# How to in-text cite: (UCMP, 2005)



**Poster Gallery** 

Student Worksheet (5 of 5)

Name

Complete the following as you examine 5 of your classmates' posters.

#	Common Name	What adaptations make this species invasive?	How is it harmful?	Where is this species found in Montana?
1				
2				
3				
4				
5				

What do all of the aquatic invasive species that you looked at have in common?

In what ways can these species impact the local economy?

How can the spread of the species be prevented or controlled?





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## **AIS Poster Sign Up Sheet**

#### Teacher Resource (1 of 3)

AIS Poster Topic	Student Name(s)
Asiatic clam (Corbicula fluminea)	
Chinese mysterysnail (Cipangopaludina chinensis)	
New Zealand Mudsnail (Potamopyrgus antipodarum)	
Quagga Mussel (Dreissena rostiformis bugensis)	
Red-rim melania (Melanoides tuberculatus)	
Zebra mussel (Dreissena polymorpha)	
Virile crayfish (Orconectes virilis)	
Bloody red shrimp (Hemimysis anomala)	
Red swamp crayfish (Procambarus clarkii)	
Rusty crayfish (Orconectes rusticus)	
Spiny waterflea (Bythotrephes longimanus)	
Bighead carp (Hypophthalmichthys nobilis)	
Asian swamp eel (Monopterus albus)	
American Bullfrog (Lithobates catesbeianus)	
Northern pike ( <i>Esox lucius</i> )	
Northern snakehead (Channa argus)	
Snapping turtle (Chelydra serpentina)	
Brazilian waterweed (Egeria densa)	
Curly-leaf pondweed (Potamogeton crispus)	
Didymo (Didymosphenia germinata)	
Eurasian watermilfoil ( <i>Myriophyllum spicatum</i> )	
Flowering rush (Butomus umbellatus)	
Hydrilla (Hydrilla verticillata)	
Parrot Feather Water-milfoil ( <i>Myriophyllum aquaticum</i> )	
Yellowflag iris (Iris pseudacorus)	
Starry stonewort (Nitellopsis obtusa)	
Other:	
Other:	





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## Warm Up

Teacher Resource (2 of 3)

## Examine the items below and be prepared to respond to the two questions below:

1. What is the problem?

2. Where is it occurring?











