INVASIVE SPECIES - MAKING A BINDER AND PREPARING FOR COMPETITION

Game Plan for Learning the Invasive Species Information

1. Use the ***POWERPOINT*** for an overview
2. Study the ***TWO HANDOUTS*** – for background information and as a guide to making a binder and learning the competition
3. Use the ***INTERNET RESOURCES*** and ***CD'S*** for more help – see the Science Olympiad National website at **www.soinc.org** under **B/C Events** and the **Science Olympiad store**
4. Prepare a ***BINDER*** and use ***OTHER TOOLS*** to **LEARN THE INVASIVE SPECIES** and then ***MODIFY THE BINDER*** for effective use in competition
5. Do the ***SAMPLE TOURNAMENT*** under timed conditions to experience being timed in competition.
6. Prepare and do ***PRACTICE STATIONS***, ***OLD TESTS*****,** and ***INVITATIONALS*** –to master knowledge, teamwork, and using your binder effectively under timed conditions.

Organization of Organisms on the National Invasive Species List

- Organized by groups of organisms
- Organized alphabetically by common name within the group to match USDA National Invasive Species List of Profiles
- http://www.invasivespeciesinfo.gov/unitedstates/main.shtml **(National List – use Browse by Subject on left for Aquatic Species, Plants, Animals, Microbes etc. and Resource Library on right for other resources)**
- Browse in Animals for Insects/other Invertebrates, Aquatic Species for Animals & Plants, Plants, and Microbes for Fungi and Viruses
- USDA profiles also have other resource links

State Invasive Species List

(Note: Your state may have a State Invasive Species List for regional and state competitions so check your state website - http://www.soinc.org/state_websites*)*

- Individual states may make a State Invasive Species list for regional and state competitions
- It may be organized differently than the National Invasive Species List-by Scientific Name rather than Common Name
- State Agencies for Information on Invasive Species in your state and state regulations
  http://www.invasivespeciesinfo.gov/resources/lists4states.shtml
  http://www.invasivespeciesinfo.gov/resources/orgstate.shtml
  www.naisn.org/documents/compendium%20for%20website_links.pdf
  http://www.fws.gov/offices/statelinks.html

Things you need to know for each of the Invasive Species

- Common name and Scientific Name
- Pictures of the species with unique identification tips, damage it causes and live cycle
- Region or Origin and Year of introduction
- State or Body of Water where first discovered
- How was it introduced
- Transport – How is it spread and history of its spread throughout the country
- Distribution Map
- Identification Tips and how to distinguish it from similar species
- Life Cycle and Mode of Reproduction
- Adaptive Anatomy and special adaptions to the environment
- Habitat Characteristics as diet, behavior, niche, species displacement, trophic level
- Damage it does and how it effects the environment and natural food web of the environment- ecological, biological, human health and economic damage
- Preventive Measures
- Control Methods and Effectiveness of each methods
- Laws or Regulations about collecting or distributing this specie.

Note: See page 5 for a Sample Factsheet on Zebra Mussels

Study Binder - Use the Binder as a Field Guide to Help Learn the Invasive Species

- The most effective resources are the ones produced by the students.
- The process of producing the resources is a major learning tool.
- Have a **copy of the rules** in your binder
- Have a copy of the lists (**National and State Invasive Species Lists**) in your binder
- Prepare a fact sheet or profile for each Invasive Species List
- Prepare and organize materials by major topic divisions – as groups of organisms.
- Organize your fact sheet according to the organization of your National or state Invasive Species List – **National List is alphabetically by common name within each group.**
- States may use Scientific Names or Family names to organize the list.
- Place materials from many different sources into your topic divisions
- Reduce the size of pictures where possible to get more information on a page.
- Color code information to help you locate or emphasize key items.
- Put pages in sheet protectors – two per protector to save space.
- Use tabs to separate sections.
- Label tabs so items can be located with ease.

Other Possible Study Methods: to help learn the Invasive Species

- **SO Electronic Binder** – See power point by Mark VanHecke, National Earth Science Committee Chair on the National Website under "Who Are You" then "Students"
- **Electronic Quizlets** – See sample by Amy Gillette on Invasive Species – https://quizlet.com/20206144/science-olympiad-invasives-flash-cards/original

- **Power Point Slides -** make power point slides for species and use them so you can use them to study
- **Flash Cards –** make a set of flashcards with pictures on the front and information on the back
- **Timer –** prepare practice stations and use the timer to improve efficiency of your teamwork skills

Station Topics - FOR SAMPLE TOURNAMENTS, PRACTICE, AND COMPETITION

BACKGROUND

- Terminology – matching
- Mode of Introduction – intentional vs unintentional & why – matching
- Region of Origin for invasives – matching
- Where most invasives originate and why
- Distribution Across the US
- Methods of Control – advantages and disadvantages of each
- Prevention Techniques
- Federal laws and Initiatives
- State laws and guidelines

INDIVIDUAL INVASIVE SPECIES – questions about

- Pictures and/or specimens of an Invasive Specie with questions about the species from your fact sheet or profile
- Identify species by scientific name and/or "common name"
- Region of origin and year of introduction with where first introduced
- Mode of Invasion
- Distribution
- Damage caused – ecological, biological, human health and economic
- Life cycle, ecology and special adaptions
- Mode of control and its success
- Special regulations to prevent spread

GROUPS OF INVASIVE SPECIES – questions about several species – may be by group or environmental region or biome

- Distinguish between several species or identify each specie
- Mode of invasion with selected species – matching
- Transport mechanism for selected species – matching
- Types of damage to environment and/or humans
- Insect responsible for damage in pictures – matching
- Special adaptions of groups of organisms – matching
- Methods of Control for selected species
- Match invasive species to its distribution map

Practice Competitions – use them to improve knowledge and team work skills

- Do the Sample Tournament – under timed conditions
- Make up sample stations – refer to the Station topic list on this handout
- Do previous Competitions for Science Olympiad CD's or Internet resources
- Go to Invitational Competitions

COMPETITION BINDER - make it functional in a 50 minute competition

- **Learn the invasive species** so resources will be used as little as possible.
- The most successful teams use very limited resources in competition.
- Remember that most stations in competition have only 1.5 to 2 minutes – large binders with hundreds of pages are not effective
- **The best solution is to know the Invasive Species**
- As you learn the Invasive Species, reduce the size of the resources that you need
- Make your binder for competition as time effective as possible and practice using it under timed conditions before your competition
- Since the events are timed, organization of materials is essential for the most effective use of the materials during the competition.
- Remember that you will only have 1.5 to 2 minutes per station and huge binders are not efficient under these timed conditions.
- Organize materials on each page to maximize available space
- Organize the materials within groups to match the setup of the National or State Invasive Species list.
- Cut and paste items to organize materials more effectively on a page.
- Color code information to help you locate or emphasize key items.
- Use front and back of the page.
- Place the page in a protective sleeve or laminate it so it won't get wet or damaged.

DOING THE COMPETION – relax and let it show you how much you have learned

General Tips

- Use common sense when answering non- identification questions
- Be careful to spell Scientific Name and Common Names correctly
- Work as a team and use your teamwork skills to finish the requested tasks

Answer Sheet

- Be sure to put your team name, team number, and individual team member names.
- Print information so it can be easily read and understood.
- Place answers in the appropriate place on the answer sheet.
- Be sure to put units after any measurements or calculations.
- Be sure answers to essay questions are organized and easy to read.

Team work skills

- Use time effectively! Assign tasks and trust your partner's skills.
- Keep on task and be sure to finish each part of the assigned question.

Answering questions

- Carefully read all questions to determine exactly what is being asked.
- Take a moment to determine if your answer makes sense.
- Be certain that you have completely answered each question.
- Pay attention to details in the questions and in your answers.

GOOD LUCK! Have fun and do your best.

INVASIVE SPECIES SAMPLE FACT SHEET

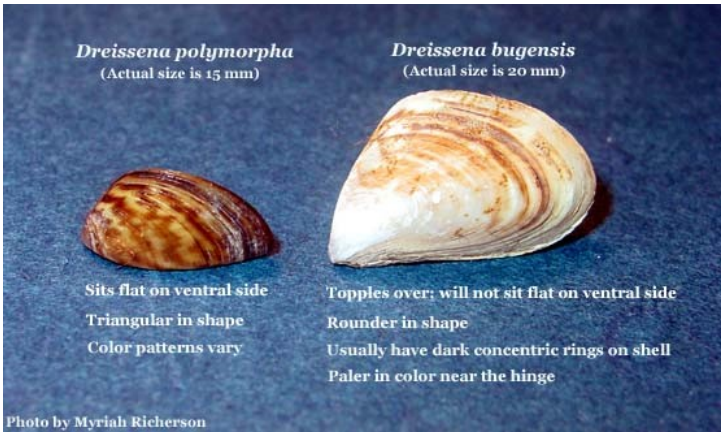
Common name: Zebra mussel
Scientific Name: *Dreissena polymorpha*

Region or Origin and Year of introduction: Eastern Europe (Eurasia) 1988
State or Body of Water where first discovered: one or more transoceanic ships discharged ballast water into Lake St. Clair on Michigan/Canada border

Transport – How is it spread: Discharged ballast water, hitchhiking on boats, floating matter, fishing equipment

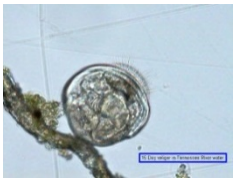
Identification: Stripped pattern on their shell- pattern varies greatly – some have no stripes – max length of about 50 mm (5-10 mm in 1st year. Live 4-5 yrs.

Similar Species: Quagga Mussel *(Dreissena bugensis)* - also an invasive species



Pictures of the species with unique identification tips, damage it causes and live cycle:

Zebra mussel



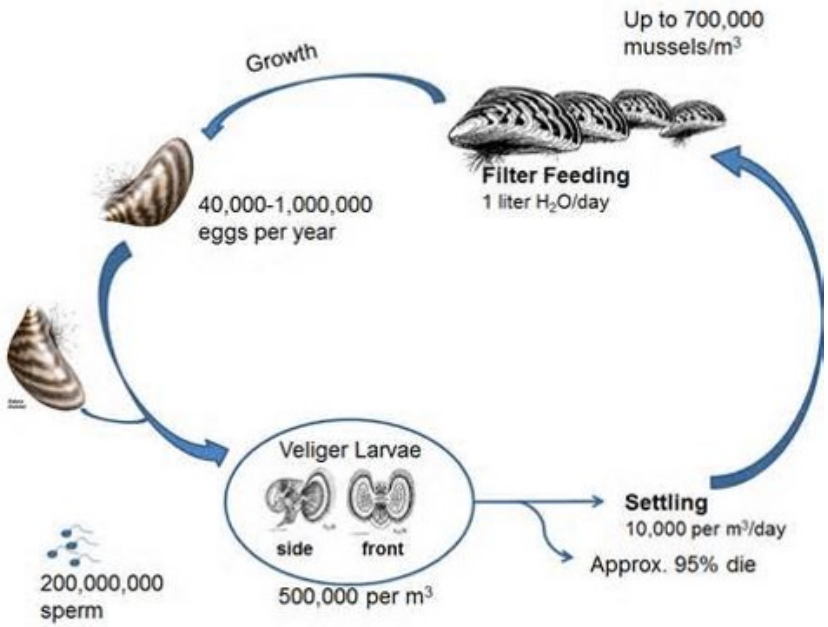
Veligar larva

on native clam

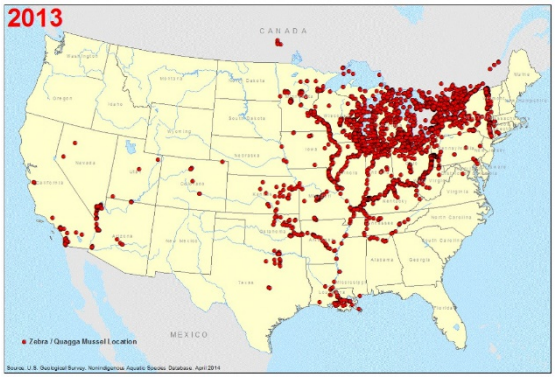
clogging drainage pipe

Life Cycle

They are spread as larva and adult to new waterways.



Distribution Map:



1986 **2013**

Habitat Characteristics as diet, behavior, niche, species displacement, trophic level: They are filter feeders and can filter 1 liter of water per day removing vital plankton

Ecological Impacts - Zebra mussels have disrupted the traditional aquatic food chains of many inland lakes. Regardless of their size, inland lakes represent unique ecological systems. When zebra mussels enter into these fragile systems, their voracious filter feeding depletes the availability of microscopic organisms that play a critical part in each lake's ecological food web. As a result, valued sportfish are impacted. Zebra mussels consume considerable amounts of these beneficial microscopic organisms and this creates less food for larval and juvenile fishes that support sport and commercial fisheries.

Biological Impacts - Zebra mussels are similar to other mussel species because they attach themselves to hard surfaces. However, unlike other species, zebra mussels will readily attach themselves to native mussels. This behavior is known as **bio-fouling** and with the spread of zebra mussels, native mussel populations have been severely reduced. Some native mussels are more tolerant than others, but even for these resistant species, becoming covered by zebra mussels makes them more vulnerable to environmental stressors, such as extreme water temperatures, lack of food, or parasites and disease. As zebra mussels spread, biologists are concerned that populations of native mussels will decline, and perhaps some of the rarer species may be completely eliminated.

Economic Impacts - The zebra mussel attaches to hard surfaces located at moderate depths. This affinity for hard surfaces has made water intake structures, like those used for power and municipal water treatment plants, susceptible to colonization. Since 1989, some plants located in areas of extensive zebra mussel colonization have reported significant reductions in pumping capabilities and occasional shutdowns.

Human Health Impacts – As significant filter feeders, zebra mussels may increase human and wildlife exposure to organic pollutants (PCBs and PAHs). Early research shows that zebra mussels can rapidly accumulate organic pollutants within their tissues to levels more than 300,000 times greater than concentrations in the environment. They also deposit these pollutants in their **pseudofeces**. These contaminants can be passed up the food chain so that any fish or waterfowl

consuming zebra mussels will also accumulate these organic pollutants. Likewise, human consumption of these same fish and waterfowl could result in further risk of exposure.

Control Methods: Prevent transport, physical removal – public awareness is essential

- Remove any visible vegetation from items that were in the water, including the boat, trailer, and all equipment.
- Flush engine cooling system, live wells, and bilge with tap water. If possible, use hot water.
- Do not re-use bait if exposed to infested waters.
- Dry boat and other equipment for at least 48 hours before using in uninfested waters.
- Examine boat exterior for mussels if it has been docked in infested waters; if mussels are found or exterior is heavily fouled by algae, either clean fouled surfaces or leave boat out of the water for at least 5 days before entering uninfested waters

Laws or Regulations: Federal Initiatives and Plans

- Listed as injurious wildlife under the Federal Lacey Act, which makes it illegal in the U.S. to import, export, or transport between States without a permit *DOI. FWS. Fish and Aquatic Conservation.*
- Many states have regulations prohibiting the import, transport, or possession of this species in order to limit the spread
- 100^{th} Meridian Incentive
- Quagga-Zebra Mussel Action Plan for Western U.S. Waters