INVASIVE SPECIES

Pembroke Hill In-House Tournament • December 5, 2015

ANSWER KEY

NOTES ON RUNNING THE EXAM

- When you're running the exam, it's pretty easy: Start the PowerPoint and sit back. The slides will automatically progress, keeping time on every section (the images will appear/disappear at a pre-decided rate, and the slides are set up to time the short answer section as well). Read a book, sit back, and relax while they are taking the exam!

- It's very important that you do NOT click the mouse, press the space bar, or change slides while the exam is in progress. Everything is timed and will go on its own!

NOTES FOR GRADING

- I would suggest grading based on the following assumption: Assume everything is wrong unless proven otherwise. Yes, this is harsh, but I think it is fairer. Also, a bad grade on this exam won't affect anybody's real grades, so don't be afraid to take off points!

- Be lenient on spelling for common and scientific names so long as the answer is identifiable.

- For the questions on Part 2, there is NO partial credit. Either the answer is right or its wrong.

- For Part 3, if somebody gives an answer that is not listed as a possible response, assume it is wrong. If you think it may be right, check the Internet to see for sure.

ANSWER KEY: PART 1: SPECIES IDENTIFICATION

SCORING: *Each blank is worth 1 point. Be lenient on spelling. No partial credit on any of the blanks (either they got the right species or they did not).*

1. **Hydrilla**
2. **European Green Crab**
3. **Canada Thistle**
4. **Curly Pondweed**
5. **Downy Brome**
6. **Scotch Thistle**
7. **Round Goby**
8. **Garlic Mustard**
9. **Glassy-Winged Sharpshooter**
10. **Common Buckthorn**
11. **Emerald Ash Borer**
12. **Kudzu**
13. **Saltcedar**
14. **Princess Tree**
15. **Leafy Spurge**
16. **Scotch Broom**
17. **European Spruce Bark Beetle**
18. **Autumn Olive**

• When Part 1 is complete, continue on to Part 2 on the next page. •

ANSWER KEY: PART 2: SPECIES KNOWLEDGE

SCORING: *Each blank is worth 1 point. Be lenient on spelling. Partial credit can be given at the grader's discretion, though I would advise just keeping it simple and not giving partial credit.*

Species 1:

1. Scientific Name: ***Dreissena bugensis***

2. How was this species introduced to the United States? **Ballast water discharge**

Species 2:

3. Scientific Name: ***Alliaria petiolata***

4. Why was this species introduced to the United States? **Culinary herb (cooking uses)**

Species 3:

5. Scientific Name: ***Hemigrapsus sanguineus***

6. What is the diet of this species? **Omnivore (algae, grasses, small fish, small invertebrates)**

Species 4:

7. Scientific Name: ***Potamopyrgus antipodarum***

8. Which of the words below apply to this species? **C**

   (a) Parthenogenesis (b) Ovoviviparous (c) Parthenogenesis and Ovoviviparous (d) None of the words

Species 5:

9. Scientific Name: ***Myocastor coypus***

10. What is the habitat of this species? **Swamps, marshes, and/or wetlands**

Species 6:

11. Scientific Name: ***Anoplophora glabripennis***

12. What is the life cycle of this organism? **Egg-Larva-Pupa-Adult *(must give all four stages to get the point)***

Species 7:

13. Scientific Name: ***Lythrum salicaria***

14. How is this species spreading across the United States? **Seeds for gardening**

15. How does this species affect native plant species? **Forms dense growths that outcompete natives**

• Part 2 is continued on the next page with Species 8-12. •

Species 8:

16. Scientific Name: ***Adeleges tsugae***

17. Is this species found in Kansas City? **No**

18. Where is this species from? **Japan (and China) – do NOT accept "Asia"**

Species 9:

19. Scientific Name: ***Dreissena polymorpha***

20. How does this species affect the turbidity of a water body? **Decrease the turbidity (by filter feeding)**

21. What life cycle difference distinguishes this species from native equivalents?

    Zebra mussels do NOT require fish hosts for their larvae, unlike native mussels.

Species 10:

22. Scientific Name: ***Rosa multiflora***

23. Why would a sheep farmer in the 1930s plant this species? **As a living fence**

24. What is one mechanical control method for this species? **Cutting/mowing [OR] Digging/uprooting [OR] Fire**

Species 11: Japanese Knotweed

25. Scientific Name: ***Fallopia japonica***

26. Why does cutting off the stems of a plant not kill this species? **It has rhizomes, underground root growth network.**

27. What is the habitat of this species? **Open areas (such as roadsides, stream banks, etc.)**

Species 12: Rock Snot

28. Scientific Name: ***Didymosphenia geminata***

29. To prevent the spread of this species, you should: "Clean, Check and **Dry**."

30. What part of this species creates the nuisance seen in the image? **(Extracellular) stalks (produced by the cells)**

Species 13: White-Nose Syndrome

31. Scientific Name: ***Pseudogymnoascus destructans***

32. How will this invasive species affect U.S. insect populations? **Increase in insect populations (no bats to eat them)**

33. How is host species hibernation affected by this species?

    Hibernating bats awaken and leave cave in winter searching for food, burning calories and dying

• When Part 2 is complete, continue on to Part 3 on the next page. •

ANSWER KEY: PART 3: SPECIES MANAGEMENT

SCORING: *Grade each of the following questions according to the rubric provided. For many of the questions, there are multiple accepted answers that are listed.*

1. You are a forester managing a forest of butternut, elm, and chestnut trees in Pennsylvania. Recently, you have noticed signs of butternut cankers on your butternut trees, but luckily, you have not yet seen any signs of Dutch elm disease.

   a. Propose one way you could minimize the spread of butternut canker in your forest. *(1 point)*

   1 point for one of the following:
   - **Water and fertilize your butternut trees because healthy trees are better able to avoid getting the canker.**
   - **Don't move wood/seeds from diseased trees around once they die. Minimize spread by minimizing movement.**

   b. You find a fairly healthy tree in the corner of your property that shows signs of Dutch elm disease in some branches. This is the only tree on your property with the disease. Describe a treatment plan to save this tree and prevent the spread of the disease. *(1 point)*

   Prune the branches that have signs of DED, going far enough down (following the staining) to remove any infected areas (0.5 points)

   Inject the tree with fungicide to protect the tree from infect (0.5 points)

   c. Chestnut blight is an invasive species very similar to butternut canker. When chestnut blight enters your forest, what will it do the trees? *(1 point)*

   0.5 points for the following (required):
   - **Fungus will grow between the bark, cutting the cambium, killing the tree**
     must use the word "cambium" – if not, no points

   0.5 points for one of the following:
   - **Fungus enters the trees through wounds**
   - **Infected stems/branches will die quickly**
   - **Yellow tendrils can be seen in wet weather**

• Part 3, Question 2 is on the next page. •

2. You are a sheep farmer in central Missouri. You have 100 sheep on your farm, and recently 20 of your sheep have shown signs of blue tongue virus. You do not have any spare funds to purchase treatments (e.g., vaccines), so you must prevent the spread of the disease using what you have on your farm or by changing your farming practices. Devise a plan with three distinct parts (approaches) to prevent the spread of blue tongue virus to the other sheep. *(3 points)*

1 point for each of the following — must give 3 for full credit:

- **House livestock during times of maximum midge activity**
- **Protect livestock shelters with fine mesh netting**
- **Fix leaks and dry up puddles to get rid of midge breeding grounds**
- **Cover dung heaps or slurry pits**
- **Clean or dispose of any needles or medical equipment that could be contaminated with blue tongue virus**

3. You are a conservationist in charge of a prairie in central Kansas. Threats of invasive species have been high this year, so you are keeping a close eye on the prairie. What is one invasive plant species you should look for? *(1 point)* Explain one way this species would negatively affect the local flora and fauna in your prairie. *(1 point)*

This question should be 2 easy points.

1 point for any one of the following:

- **(Common) Brome**
- **Johnsongrass**
- **Any thistle**
- **Multiflora rose**
- **Any grasses**
- **Other plants are possible too (if unsure, look up the plant's habitat online)**

1 point for any of the following:

- **Reduces biodiversity, create monocultures**
- **Less nutritious than native plants**
- **Change habitat availability for fauna**
- **Other possible species-specific responses (again, use Internet to fact-check responses)**

• Part 3, Question 4 is on the next page. •

4. You are an environmental consultant and have been hired by a small local fish farmer outside of Jefferson City, Missouri. This fish farmer owns two medium-sized (~2 acres each) ponds where he grows smallmouth and largemouth bass. In Ponds 1 and 2, the farmer invites tourists from around the country to come and have an "authentic Missouri fishing experience," where they spend either an afternoon or a full-day fishing for smallmouth and largemouth bass.

   This summer, the farmer noticed a decline in the bass populations in Ponds 1 and 2. The farmer has hired you to investigate why bass populations are declining in Ponds 1 and 2.

   Below you will find all of the information you have collected from Ponds 1 and 2. Review your evidence and then create your report on Ponds 1 and 2 by answering the questions on the next page.

Source #1: *The images on the screen in front of you are of four invasive species you found in Ponds 1 and 2.*

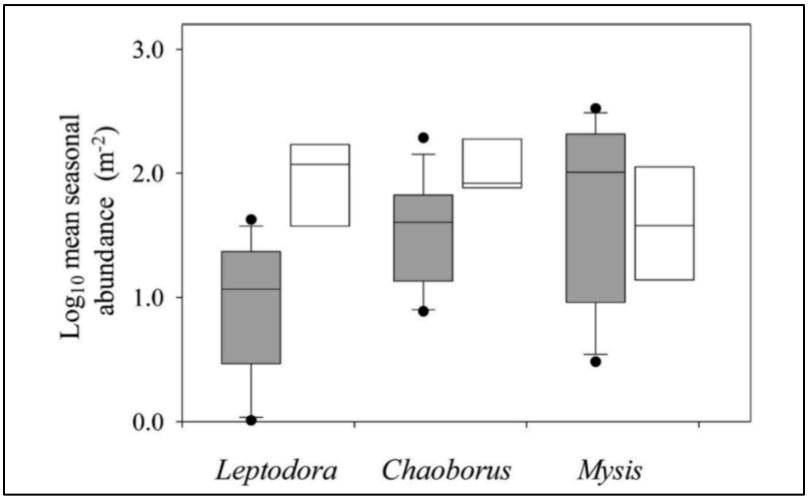
Source #2: *Below is a chart showing which species were found in which of the two ponds.*

POND 1	POND 2
Grass Carp	**Species A**
Species B	**Species B**
Species C	**Species C**

Source #3: *Below is a quote from the fish farmer about why he introduced the grass carp (a species of Asian carp) after he saw a rise in Species B in Pond 1.*

> "I read online about what I could do to fight the rise of a submerged aquatic plant like [Species B], and a social networking website for fish farmers suggested using grass carp as a biological control method."

Source #4: *The figure below is from a paper published in 2009 by Foster and Sprules in* Limnology and Oceanography. *This figure shows the abundance of three different native small invertebrate predators (Leptodora, Chaoborus, Mysis) in ponds with or without Species A (shaded boxes are with species A; white boxes are without species A).*



• Part 3, Question 4 continued on the next page. •

Question 4, continued:

a. How could Species A, B, and C have made it into Ponds 1 and 2? *(1 point)*

Likely from hitchhiking on clothes or gear or boots from the tourists that came in from around the country (1 point, no partial credit)

b. Was introducing the grass carp to Pond 1 a good or bad idea? Why or why not? *(1.5 points)*

Good idea (0.5 points)

Compared to chemical/physical management methods for milfoil (Species B), grass carp are cheap and relatively easy to use (1 point)

c. Should the farmer be concerned about the grass carp overpopulating Pond 1? Why or why not? *(1.5 points)*

No, shouldn't be concerned (0.5 points)

Grass carp only breed in flowing water, not in still water like ponds (1 point)

d. Using the information provided in Source 4 and your knowledge of Species A, explain how the introduction of Species A could contribute to the decline of the bass in Pond 2. *(1 point)*

Something about: **Species A (spiny water flea) will outcompete and also eat native small invertebrates the bass rely on for food. The bass avoid eating the spiny water flea because of its barbed tail. Thus, the bass won't have any food, and their population will decline.**

KEY IDEAS: - outcompete/eat native invertebrates (0.5 points)
- bass won't eat flea because of spiny tail (0.5 points)

e. The farmer plans to dig a third pond near the first two sometime next spring. What is one method the farmer could employ to prevent the spread of invasive species from other water bodies to the new pond? *(1 point)*

1 point for any of the following: Something about cleaning gear before going to the pond
- **Make people clean clothes/boots/gear before going to the pond**
- **Clean gear with hot water, give it time to dry**

• Part 3, Question 4 continued on the next page. •

f. Explain how Species B and C will affect the bass populations in Ponds 1 and 2. Consider food sources (for both species) and shelters (for Species B) and dissolved oxygen (for Species C) in the pond. *(3 points)*

FOOD: **- Species B (milfoil): less nutritious than natives, outcompetes nutritious plants (0.5 points)**
- Species C (hyacinth): blocks out sunlight from reaching submerged plants that the bass can eat, kills native plants (0.5 points)

SHELTER: **- Species B: forms dense mats that bass cannot swim through (1 point)**

D.O.: **- Species C: covers the pond, blocks out sunlight, stops photosynthesis of submerged plants, decreasing dissolved oxygen (1 point)**

g. Devise a treatment plan for Pond 2 to remove the invasive species from the pond. First, should the farmer try and remove Species A from Pond 2? Why or why not? Second, propose one method to eradicate Species C. *(2 points)*

Species A (spiny water flea):
- **No, the farmer shouldn't try. (0.5 points)**
- **Reproductive traits and resting eggs make them nearly impossible to eradicate (0.5 points)**

Species C (hyacinth): Any of the following (1 point)
- **Moth/weevil as biological control**
- **Drain the entire pond and manual removal of hyacinth**
- **Mechanical removal from boats or with cranes, etc.**
- **Use of chemical herbicides to kill it**
- **Weevil or moth as biological controls**

• Congratulations! You have finished the exam! •