INVASIVE SPECIES

Pembroke Hill In-House Tournament • December 5, 2015

For competitor to complete:

Name: _____ _____
First Name *Last Name*

For event supervisor to complete:

Individual Part Scores	**Overall Score**
Part 1 Score: _____ / 18	
Part 2 Score: _____ / 33	
Part 3 Score: _____ / 19	out of 70 possible points

In the event of a tie, ties are broken by the highest score on Part 2, then the highest score on Part 3, then the highest score on Part 1.

EXAM FORMAT

- Part 1: Species Identification. You will be shown 18 images of invasive species and have to identify each by common name. You will have 30 seconds to view each image. This section will take 9 minutes.
- Part 2: Species Knowledge. You will be shown 13 images of invasive species. For each species, you will have to identify it and then answer specific questions. You will have one and a half minutes to view each image and answer the accompanying questions, each worth 1 point. This section will take 19.5 minutes.
- Part 3: Species Management. You will have four short answer questions to answer. The four questions are worth 19 points total, with three short questions and one longer one. You will have 20 minutes to complete this section.

EXAM INSTRUCTIONS

- You are allowed only to use the information contained within one three-ringed binder during the course of the exam. All electronic devices are prohibited. Use a pencil or a dark-colored pen to complete the exam.
- Mark your answers on the appropriate blanks in this packet. Any illegible response will be counted as an incorrect response.
- Parts 1 and 2 do *not* require complete sentences. In Part 3, please use complete sentences and write succinctly.
- The exam supervisor will *not* answer any questions regarding the content of the exam, and you will *not* be able to view any images a second time. The event supervisor can deduct points for poor behavior.
- Have fun, and keep studying invasive species!

Exam by Jeffrey Rubel: Pembroke Hill '13, Williams College '17 • Written November 25-30, 2015

PART 1: SPECIES IDENTIFICATION

DIRECTIONS: *For each of the images shown on the screen, identify the species by its **COMMON NAME** only. There are eighteen images, and you will have thirty seconds to view each image. Note each image corresponds to one species, and no species is repeated in this part of the exam.* ***(1 point per question; 18 points total)***

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____

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

PART 2: SPECIES KNOWLEDGE

DIRECTIONS: *For each of the images shown, identify the species by its **SCIENTIFIC NAME** and answer one or two questions about that species. You will have one and a half minutes for each species/image. A species that appeared in Part 1 may reappear in Part 2 of the exam.* ***(1 point per question; 33 points total)***

Species 1:

1. Scientific Name: _____

2. How was this species introduced to the United States? _____

Species 2:

3. Scientific Name: _____

4. Why was this species introduced to the United States? _____

Species 3:

5. Scientific Name: _____

6. What is the diet of this species? _____

Species 4:

7. Scientific Name: _____

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

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

Species 5:

9. Scientific Name: _____

10. What is the habitat of this species? _____

Species 6:

11. Scientific Name: _____

12. What is the life cycle of this organism? _____

Species 7:

13. Scientific Name: _____

14. How is this species spreading across the United States? _____

15. How does this species affect native plant species? _____

• Part 2 is continued on the next page with Species 8-13. •

Species 8:

16. Scientific Name: _____

17. Is this species found in Kansas City? _____

18. Where is this species from? _____

Species 9:

19. Scientific Name: _____

20. How does this species affect the turbidity of a water body? _____

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

_____

Species 10:

22. Scientific Name: _____

23. Why would a sheep farmer in the 1930s plant this species? _____

24. What is one mechanical control method for this species? _____

Species 11:

25. Scientific Name: _____

26. Why does cutting off the stems of a plant not kill this species? _____

27. What is the habitat of this species? _____

Species 12:

28. Scientific Name: _____

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

30. What part of this species creates the nuisance seen in the image? _____

Species 13:

31. Scientific Name: _____

32. How will this invasive species affect U.S. insect populations? _____

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

_____

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

PART 3: SPECIES MANAGEMENT

DIRECTIONS: *Write your answers in the space provided, and use complete sentences. The images on the screen apply only to question 4. You have 20 minutes.* ***(19 points total)***

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, assuming removing the infected trees is not an option. *(1 point)*

    b. You find a fairly young 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)*

    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)*

• 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)*

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 (beyond outcompeting native plants). *(1 point)*

• 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. 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 are of four invasive species found in Ponds 1 and 2. (Hint: It's a good idea to identify them before continuing!)*

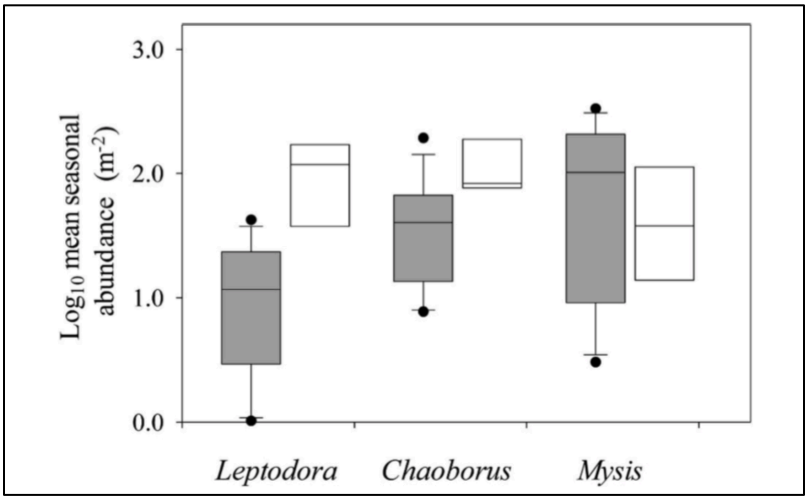
Source #2: *Below is a chart showing which species were found in which of the two ponds.*

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

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)*

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

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

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

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)*

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

Question 4, continued:

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)*

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)*

• Congratulations! You have finished the exam! •