WILDLIFE MANAGEMENT

Fall 2005

FW/ZO 353

FINAL EXAM

Here is your final exam for FW/ZO 353, Wildlife Management. The base for your final grade will be determined by this exam (30%), and your 4 best quizzes (70%) modified by your pop-quizzes.

INFORMATION

Please read the questions carefully. Think about each question and do not answer questions too quickly. Relax, you have more than enough time for this exam, so take that time. Feel free to ask me questions. Before turning in your answer sheet, sit and relax for a few minutes and think about your answers, or just sit and relax. If you wish to explain your answers for certain questions more fully, feel free to turn in with your answer sheet a piece of paper with those explanations. Remember to put your name on that piece of paper. If you do not have a piece of paper, ask me for one.

NAME

On the computer answer sheet, please be certain to fill in your name circles, **LAST NAME FIRST**, so that the computer can generate an answer sheet for you.

HONOR CODE

North Carolina State University has an Honor Code that applies to this exam. If you acknowledge that you "have neither given nor received unauthorized aid on this" exam, sign your name in the NAME space on the backside of your answer sheet.

POSTING FINAL GRADE

I shall submit grades electronically, with luck tonight. I am going to Saskatoon for 3 days for a small conference aimed at finding more bear-friendly ways to live-trap grizzly bears. Consequently, if the computer grading facility has not graded your exams by 17:00 tonight, I will not be able to submit grades till Friday. That means your grade will be listed as LA (= late). I shall get grades posted absolutely as quickly as I can when I return.

And, have

HAPPY AND REWARDING HOLIDAYS.

For those questions with multiple options (i, ii, iii, etc.), list all that apply.

1 How and why do the diets of many young birds differ from the diets of their parents?

i. Adults need food that is higher in protein than do youngsters because adults fly.
ii. The diets do not differ.
iii. Young birds eat more seeds.
iv. Young birds eat more insects and other invertebrates.

a. all of them, i-iv b. i and iii only c. iii only d. iv only e. not a, b, c or d

2. How can v_x be used?

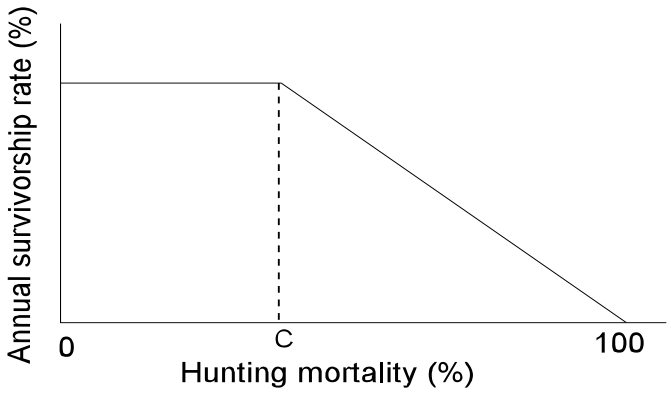
i. to know which females in a population will produce the most offspring in their lives
ii. to target females that should be harvested or culled to reduce a population or to keep it from growing
iii. to target females to be protected so that a population can grow
iv. to target females to be live-trapped and used to re-establish a population.

a. all of them, i-iv b. i, ii and iii only c. ii and iii only d. ii, iii and iv only e. not a, b, c or d

3. (3 pts) Which of the following wildlife are neotenous?
   i. domestic dogs
   ii. many salamanders, such as spotted salamanders
   iii. white-tailed deer
   iv. wolves

   a. all of them, i-iv b. i only c. i and ii only d. i and iii only e. not a, b, c or d

4. Here is a graph showing how hunting affects the annual survival of an hypothetical wildlife species. Annual survival of a species is usually measured over a 'demographic year', which usually starts at the beginning of a critical season (*eg.*, at the beginning of the breeding season after winter). What can you deduce from this graph?



   i. When mortality of this species from hunting is > c%, hunting mortality is compensatory with natural causes.
   ii. For hunting mortality up to c%, hunting has no effect on mean annual survival of animals in this wildlife population.
   iii. For hunting mortality up to c%, hunting has no effect at all on this wildlife population.
   iv. For hunting mortality up to c%, hunting this species has no effect on any other wildlife population.

   a. all of them, i-iv b. i and ii only c. i, ii and iv only d. iv only e. not a, b, c or d

5. (3 pts) One can use the age distribution of a population to estimate the survival schedule when one knows what about the population?
   i. $J_x = \ell_x$ ii. $N \approx K/2$ iii. $r = 0$ iv. $R_0 > 1$

   a. all of them, i-iv b. i and iii only c. iii only d. iv only e. not a, b, c or d

6. Which guideline for managing wildlife in wilderness areas is most likely to conflict with other guidelines?
   a. the guideline to favor endangered species
   b. the guideline to minimize human impact
   c. the guideline to use natural phenomena to manage habitats
   d. the guideline to have hunting and other interactions of humans with wildlife to mimic natural phenomena
   e. not a, b, c or d

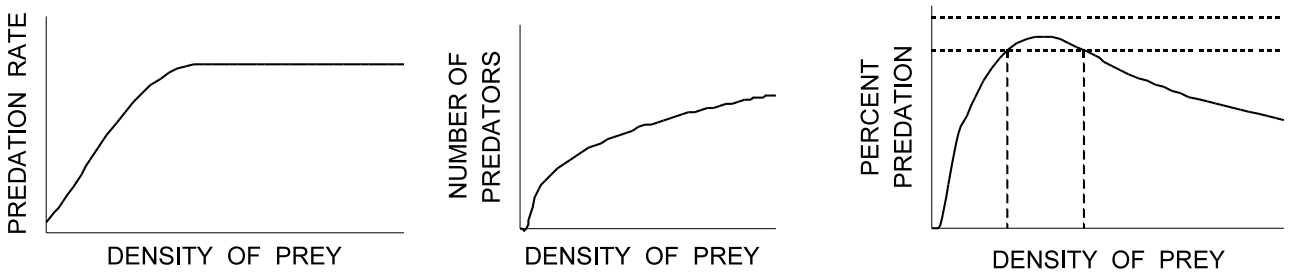
7. (3 pts) Wild pigs in Great Smoky Mountains National Park are examples of what characteristics that are often exhibited by exotic species?
   i. Expenses to control them are born by the general public through taxes and not by the people or groups that introduced them.
   ii. They disrupt natural ecological communities.
   iii. They are expensive to control.
   iv. They relieve management problems with native species.

   a. all of them, i-iv b. i only c. i, ii and iii only d. ii, iii and iv only e. not a, b, c or d

8. Large brood sizes and litter sizes tend to be associated with
   i. high mortality of young
   ii. high survival of young
   iii. rapid population increases and decreases
   iv. stable population sizes

   a. all of them, i-iv b. i and iii only c. iv only d .ii and iv only e. not a, b, c or d

Here are 3 figures that show how different aspects of predation by an (hypothetical) mammalian predator can change with the density of its prey. The left-hand figure shows how rate of predation (number of prey eaten per predator per unit of time) varies with density of prey. The center figure shows how the number of predators varies with density of prey. And the right-hand figure shows how the percent of the prey population eaten by the predators changes with density of prey. In the right-hand figure, the horizontal lines represent 2 possible predation thresholds for the prey; when percent predation exceeds the predation threshold for a prey species, predation will limit the prey population. Real populations of mammalian predators interact with their prey much as shown in these figures.



9. What do these figures tell you about this population of mammalian predators and its prey?
   i. This predator population is limited by the number of available prey.
   ii. The predators become satiated when the prey population is high, and reach a limit to how many prey each kills.
   iii. The predator population increases with the prey population, but at a decreasing rate.
   iv. The prey population has $r > 0$.

   a. all of them, i-iv b. i, ii, and iii only c. ii and iii only d. ii, iii and iv only e. not a, b, c or d

10. Consider again the figures associated with the previous question. What can you deduce from the figures regarding whether the predator population limits the size of the prey population?
   i. No predator population can ever limit the size of the populations of its prey.
   ii. If the higher 'predation threshold' line is correct, then this predator population is unable to limit the size of the prey population.
   iii. If the lower 'predation threshold' line is correct, then this predator population can limit the size of this prey population when the prey population size lies between the 2 vertical lines on the right-hand figure.
   iv. If the lower 'predation threshold' line is correct, then this predator population is unable to limit the size of the prey population.

   a. all of them, i-iv b. i only c. ii and iii only d. ii and iv only e. not a, b, c or d

11. In the 'Almanac' section of *A Sand County Almanac*, Aldo Leopold showed his love of the land, showed his perceptive way of looking at the world around him, showed his ability to gain personal peace from the world around him, and showed that humans have abused the natural world in many ways. In his essay 'A Land Ethic', Leopold explained how human abuses of the land can be reduced if we, humans, adopt a land ethic that treats all living organisms as part of one, big ecological system. What is true of another essay by Leopold, 'Wilderness'?
   i. Leopold explained the importance of having wild areas left wild
   ii. Although we have much work yet to do, we may take heart that many problems Leopold noted have been solved, at least in part.
   iii. 'Wilderness' is particularly pertinent today because it provides a check list of steps we need to take in the US to meet Leopold's goals for wild areas and to reach his Land Ethic.

   a. all of them, i-iii b. i and ii only c. ii and iii only d. i and iii only e. not a, b, c or d

12. (3 pts) After which of the following events does secondary succession occur?
   i. a large fire that kills most of the vegetation on the surface of the ground
   ii. volcanic eruption that covers a wide area with lava
   iii. volcanic explosion that covers a wide area with large amounts of volcanic ash (such as Mt St Helens in 1980)
   iv. clearcutting that removes all the trees in an area and disturbs much of the ground vegetation
   v. the cessation of farming

   a. all of them, i-v b. i and ii only c. ii and iii only d. i, ii, iv and v only e. not a, b, c or d

13. What is true about exotic species?.
   i. Exotic species sometimes out-compete native species, causing decreases in population sizes of the native species.
   ii. Exotic species usually fill important vacant niches in their new homes and complement the native biota.
   iii. Most populations of exotic species that have grown large provide good hunting opportunities.
   iv. When populations of exotic species grow large, they sometimes cause considerable economic hardship for people.

   a. all of them, i-iv b. i and iii only c. i, ii and iv only d. i and iv only e. not a, b, c or d

14. All black bears (*Ursus americanus*) in North Carolina have black as their dominant color. Some black bears have white patches on their chests and most have tan points (tan colored muzzles, tan inside their ears, sometimes tan around their anuses) but all black bears in North Carolina have black body color. In the southern Sierra Nevada Mountains along the California-Nevada border, more than 50% of the black bears have brown body color. Black or brown body colors in black bears appear to be controlled at a single genetic locus with a dominant black allele (B) and a recessive brown allele (b). (Tan points and white chest patches are controlled at other loci.) "BB" and "Bb" bears are black, while "bb" bears are brown. The climate in the southern Sierra Nevadas is a hot, dry, desert climate with long summers and short winters. Brown mammals in general absorb roughly 50% less heat when in direct sunlight than do black mammals. What is true about color of black bears?
   i. Black bears in North Carolina and in the Sierra Nevadas have evolved different distributions of colors (different proportions of black and brown individuals).
   ii. Black bears in North Carolina and in the Sierra Nevadas have evolved different distributions of colors but this is not an example of natural selection at work.
   iii. The evidence indicates that color is a characteristic of black bears that responds to natural selection.
   iv. Natural selection clearly is involved in the color of black bears but this is not an example of evolution.

   a. all of them, i-iv b. i and iii only c. i, iii and iv only d. iii and iv only e. not a, b, c or d

15. (3 pts) Most birds that lay clutches of eggs spread the egg-laying out over several days. When a female bird lays a clutch, she has several alternatives for incubating them, ranging from starting incubation as soon as the 1st egg is laid through postponing incubation until the last egg had been laid. Red-cockaded woodpeckers start incubation as soon as the 1st egg is laid. What do they gain from this strategy?
   i. In years with abundant food, the 1st nestling to hatch can grow to be extremely large and become dominant rather than being a helper at the nest.
   ii. In years with food shortage, the largest nestling will eat its smallest sibling, increasing its chance of survival.
   iii. In years with food shortage, the chances of raising at least 1 youngster are better than if incubation were delayed.
   iv. The birds are able to adjust clutch size to the number of young the food supply can support.

   a. all of them, i-iv b. i only c. ii only d. ii, iiii and iv only e. not a, b, c or d

16. (3 pts) Imagine that you decide to do research on Centennial Campus to learn how chipmunks (*Tamias striatus*) are affected by dense growths of blackberry bushes. You get all the permits, get live-traps, and start your research by setting traps in an undeveloped section of Centennial Campus that has a luxurious growth of blackberry bushes. You get the results shown in Table 1 at right. To the nearest whole chipmunk, what is the Lincoln-Petersen estimate for your chipmunk population size after traps are checked on day 4?

a. 21 b. 24 c. 32 d. 43 e. not a, b, c or d

17. (3 pts) What is the Minimum Number Alive estimate for your chipmunk population on day 4?

a. 21 b. 24 c. 32 d. 43 e. not a, b, c or d

18. (3 pts) If you continued to live-trap chipmunks for a month or more, which single assumption of the Lincoln-Peterson estimator have your data most probably violated but that probably had not been violated during the 4 days listed in Table 1?
a. capture is representative
b. initial capture does not affect future capture
c. marking the animals has no effect on behavior
d. population closure
e. not a, b, c or d

19. (3 pts) Imagine that you study chipmunks for a couple years and you obtain data allowing you to construct the life table shown in Table 2. What is R_0 for this chipmunk population?

a. 0.9 b. 1.3 c. 1.9 d. 7.3 e. not a, b, c or d

Table 1. Hypothetical results from live trapping chipmunks on Centennial Campus. All chipmunks captured were marked before release. Number of chipmunks trapped and number of recaptures each day are shown.

Day	Total Number Trapped	Number Recaptures
1	Set traps on Day 1	
2	15	
3	8	5
4	9	6

Table 2. Life table information derived for an hypothetical population of eastern chipmunks on Centennial Campus.

Age	l_x	m_x
0	1.00	0
1	0.25	3
2	0.05	3
3	0	

20. Functional and Numerical Responses of consumers appear in many mathematical models of wildlife populations because these concepts are critical to understanding how wildlife populations respond to changing conditions. What is a Functional Response?
a. A Functional Response is the theoretical change in population size that is the response to a change in habitat.
b. A Functional Response is the change in population structure (demographic change) that is the response to a change in food supply.
c. A Functional Response is the change in population size that is the response to a change in food supply.
d .A Functional Response is the change in the number of perferred food items eaten that is the response to a change in the abundance of that food when other foods do not change in abundance.
e. Not a, b, c or d

21. What is the single (broad) factor that has the greatest effect on the nutritional content of plants for wildlife?

a. fats b. grazing pressure c. protein d. soil quality e. not a, b, c or d

22. Which act(s) has (have) the potential to benefit species threatened with extinction?
i. Endangered Species Act ii. Lacey Act iii. National Forest Management Act iv. Pittman-Robertson Act

a. all of them, i-iv b. i only c. i and iii only d. i, iii and iv only e. not a, b, c or d

23. (3 pts) Under what conditions can rumination be superior to cecal digestion?
i. When the animal is small (< 2 kg).
ii. When the anima l is large (> 50 kg).
iii When the animal can be coprophagous.
iv. When food is high in fiber.

a. all of them, i-iv b. i only c. ii only d. i, iii and iv only e. not a, b, c or d

24. Angle Island lies in San Francisco Bay and is a state park. Decades ago, black-tailed deer (*Odocoileus hemionus*)were released on the 300-ha island and their population grew. In the 1980s, the deer population was so high that vegetation on the island was severely over-browsed, compromising the goal of the Park administration to restore the original vegetation to the Park. The Park worked closely with the California Department of Fish & Game and developed, over time, several proposals to reduce the deer population. First, they proposed to release coyotes (*Canis latrans*) on the island as natural predators to reduce the deer population, estimated then to be about 275 deer. Animal rights and animal welfare groups filed suit to stop such a release, however, arguing 1) that the deer would be unprepared for an introduced predator, 2) that killing by coyotes is an inhumane way for people to reduce the high deer population, and 3) that if coyotes killed all the deer, they would end up starving. Rather than enter a protracted law suit and upset many state residents, the Park administration withdrew the proposal. Next, the Park proposed to allow hunting on the island to reduce the deer population. Animal rights, animal welfare and anti-hunting groups filed suit to stop such hunting, arguing that hunting was inhumane and that hunting was not allowed in state parks. Again, the Park withdrew the proposal. Next, the Park proposed to employ sharp-shooters to reduce the deer population. Animal rights and anti-hunting groups filed suit to stop such sharp-shooters, arguing again that hunting was inhumane and that hunting was not allowed in state parks. The animal rights and anti-hunting groups proposed that the Park should sterilize the deer, either surgically or chemically, or remove deer from the island and release them on the mainland. The Park considered this proposal seriously but decided against it because surgical sterilization would be prohibitively expensive, might kill deer (thereby contradicting the purpose of sterilizing rather than killing), and can never be a long-term solution. Chemical sterilization was not feasible. Finally, the Park funded a study to move deer to the mainland. At considerable cost, about 80% of the deer were captured. Several deer died during capture and transport to the mainland. Many deer moved to the mainland were outfitted with transmitter collars and followed. Of the collared deer, many died soon after release on the mainland, having been hit by cars. Others starved because they could not find a place to settle. Most were dead within a year. What does this story illustrate?
i. Although they may represent a minority of US citizens, animal rights, animal welfare and anti-hunting groups can affect public policy and management of wildlife.
ii. An argument that must now be considered is that using sharp-shooters to kill deer could be more humane than trapping and moving deer to the mainland.
iii. Sometimes the solution to a wildlife management problem is dictated not by biology but by politics, sociology or economics.
iv. The animal rights, animal welfare and anti-hunting groups directed the Park administration, ultimately, to the most economical solution to the problem.

a. all of them, i-iv b. i and ii only c. i, ii and iii only d. i, iii and iv only e. not a, b, c or d

25. If $K = 500$ for a herd of deer in a management unit at Fort Bragg, what does this mean?
i. If the population is below 500, then the deer are not healthy.
ii. If the population goes above 500, then the population size is expected to decrease.
iii. If the population = 500, then the population is stable.
iv. If the population is below 500, then the population is not healthy.

a. all are true, i-iv b. i and ii only c. ii and iii only d. ii and iv only e. not a, b, c or d

26. Why are more species around the world found in metapopulations today than 100 years ago?
i. because habitats are more fragmented today than they were 100 years ago.
ii. because man has altered habitats, reducing the amount of late-successional habitat available for wildlife.
iii. because medium-sized carnivores (meta-carnivores) are more common today that they were 100 years ago.
iv. because man has connected with roadways and other corridors many habitats that used to be separate.

a. all of them, i-iv b. i and ii only c. iii only d. iii and iv only e. not a, b, c or d

27. Several years ago Dr Gary SanJulian, who was then the Wildlife Extension Specialist for North Carolina and a member of our Zoology Department and our Fish & Wildlife Program, told Dr Powell about a North Carolina farmer who reported a 'weasel problem'. The farmer was losing chickens and figured that a weasel or weasels 'must' be causing the problem, since weasels are bloodthirsty critters that love to kill chickens and suck blood. While talking to the fellow, Dr SanJulian figured that the problem was probably not caused by weasels (*Mustela frenata*) at all but by rats (probably brown rats, *Rattus norvegicus*) instead. The farmer kept chicken feed in a shed near his coop, the shed was not secure, and the farmer reported that critters were getting into his chicken feed. To top it all off, the farmer kept his dog tied to its dog house near the coop and usually kept food in the dog's bowl. This all added up to rat heaven and rats were, indeed, the problem.

Suppose Dr SanJulian wished to learn how many rats were living off this farmer's generosity. Suppose further that the farmer was willing to let Dr SanJulian trap around his chicken coop, his shed and his dog house. (We have here a truly cooperative person, obviously dedicated to the advancement of science. Everything must be done to sustain this fellow's support.) A general rule of thumb is that for every rat you see (or know is there), there are 10 you don't see. That does not help us much here but gives us the idea that we are not dealing with a single rat. Besides making certain that his trapping causes no harm to chickens, dog, feed supply and other property, what approach should Dr SanJulian take to estimate the rat population?

a. Use a mark-recapture method, such as Lincoln-Petersen, because these provide the best population estimates available.
b. Use a population index of some sort because it will involve the least disturbance of the farmer's property.
c. Use a removal method, such as the DeLury method.
d. Use a complete count method.
e. Use a method other than a, b, c or d.

28. (3 pts) Which of the following are characteristics of early successional plant species?
i. early reproduction iii. large seeds v. shade tolerance
ii. high reproductive rate iv. long-distance dispersal of seeds

a. all of them, i-v b. i and ii only c. i, ii and iv only d. iii, iv and v only e. not a, b, c or d

29. (3 pts) Coyotes are extremely adaptable critters. Since wolves were extirpated across the Great Plains in the late 1800s and early 1900s, coyotes have expanded their range eastward and now have populations in every eastern state of the US. Coyotes can find themselves at cross-currents with farmers and ranchers because they sometimes kill chickens, lambs or other livestock and sometimes eat crops, such as corn, watermelons and tomatoes. Consequently, farmers, ranchers and wildlife managers sometimes trap, hunt and otherwise kill coyotes to control their populations. When many coyotes are killed, reproductive output of the remaining coyotes predictably increases. This is an example of a
i. density dependent response in reproduction
ii. density dependent response in survival
iii. functional response
iv. numerical response

a. all of them, i-iv b. i only c. ii only d. iv only e. not a, b, c or d

30. The long-leaf pine/wire grass ecological community
   i. is a typical early successional community because it burns every few years, resetting succession for the whole community.
   ii. requires frequent fire (every year or few years) to be maintained.
   iii. supports a number of species that are not found elsewhere or are rare elsewhere.
   iv. can, in many ways, be considered a late successional community because with frequent fires the species composition within the community remains stable, as in a typical late successional community.
   v. highlights the differences between stand-replacing fires and stand-maintaining fires.

   a. all are true, i-v b. i and iii only c. ii and iii only d. iii and iv only e. not a, b, c or d

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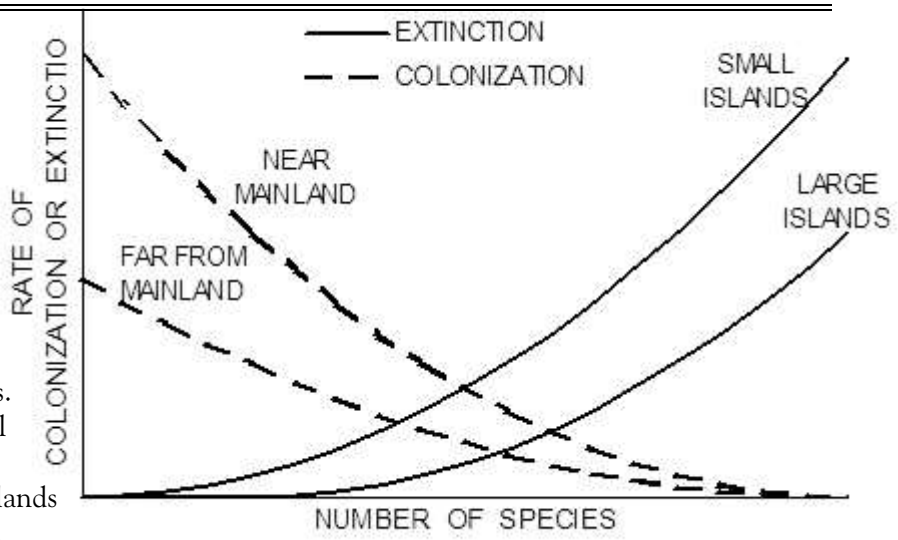
31. To the right is a figure that predicts how the rates of colonization and extinction on an island will change with size of the island and its distance from the mainland. These graphical predictions have been tested many times and are remarkably robust (the predictions are usually confirmed). What does this figure predict?
   i. Small islands far from the mainland will have, at equilibrium, the fewest species.
   ii. Large islands far from the mainland will have, at equilibrium, the most species.
   iii. Extinction rates for species on small islands are greater than those on large islands.
   iv. Islands near the mainland will receive more colonizers than will islands far from the mainland.



   a. all of them, i-iv b. i and iii only c. i, iii and iv only d. iii and iv only e. not a, b, c or d

32. Consider again the figure introduced in the previous question. Islands often have endemic species (species that are found in one place only) that have evolved from closely related species on the nearest mainland. Many endemic, island species have become endangered due to Man's introduction of diseases, competitors and predators. What type of island is most likely to have the greatest number of endemic species?

   a. small islands near the mainland
   b. small islands far from the mainland
   c. large islands near the mainland
   d. large islands far from the mainland
   e. not a, b, c or d

For the following 2 questions, consider these North American species.

i. bison	iv. key deer	vii. passenger pigeon
ii. black-footed ferret	v. great auk	viii. pronghorn
iii. Carolina parakeet	vi. Labrador duck	ix. wood duck

33. Which of the species has/have become extinct since European settlement?

   a. all of them, i-ix b. i, ii, viii, ix only c. ii, iii, v and viii only d. iii, v, vi and vii only e. not a, b, c or d

34. Which of the species has/have rebounded from very low populations sometime in the 20th Century?

   a. all of them, i-ix b. i, ii, viii, ix only c. ii, iii, v and viii only d. iii, v, vi and vii only e. not a, b, c or d

35. (3 pts) Which of the following can help a farmer or rancher reduce damage caused by wildlife to crops or wildlife?
i. Confine crops of livestock with fences or within buildings.
ii. Hire shepherd or use guard dogs, llamas or other guard animals.
iii. Use electric fences.
iv. Use frightening devices

a. all of them, i-iv b. i only c. i and ii only d. i, ii and iii only e. not a, b, c or d

36. Imagine that you are head of the Animal Control Division for the city of Chicago. Mayor Weekly has chosen you for this position based on your experience, in contrast to many of his other appointments. He knows that when you were younger, you showed dogs in American Kennel Club dog shows and, therefore, you should be able to deal with the numerous dog and cat problems that the city has.

One of your pet peeves is rats. You really do not like rats and one of your personal goals for your term as head of the Animal Control Division is to reduce the numbers of rats (mostly *Rattus norvegicus*) in the city. One day, in the waiting room of your dentist's office, you find an old issue of *National Geographic* with an article about quitcits (*Misforstaaelse lamentica*) and settle in to read it. You do not mind having the time to read this long article because you prefer to wait as long as possible before seeing your dentist. You learn that quitcits are small, mammalian predators that live in the forests of Siberia. Some of these predators have colonized large cities in western Siberia recently and have seriously dented the rat populations in those cities. Not only that, in one city in Karelia the quitcits also reduced the numbers of starlings (*Sturnus vulgaris*) and pigeons (*Columba livia*), thereby reducing a significant problem of bird droppings around overpasses on city roads and in parks.

You decide that quitcits are the perfect answer to your rat problem in Chicago, so you start doing some homework. You spend time in the city library and document as much as you can about quitcits. Then you take a proposal to the city council that the city introduce quitcits to control the rats, and maybe even starlings and pigeons. The city council is ecstatic and boldly endorses your proposal. In addition, several aldermen meet with your privately, each to say that he is certain that he can get some of the people in his ward to "donate" some extra funds for you to do "research" on quitcits if only his ward gets the first quitcits.

Before you can release any quitcits, you need to get some quitcits to release, and to do this you need to obtain permits to import these cute little critters. With the backing of the city council, you contact the US Fish & Wildlife Service regarding a permit. The first biologist you contact at the USF&WS
i. thinks that you have a great idea with no potential problems; you have proposed to use a good wildlife management tool (biological control) to solve a major problem.
ii. agrees that the city has a problem with rats but states that introducing a new species will probably not solve that problem. The city's money would be spent better by tackling the conditions that favor rats, rather than by introducing quitcits.
iii. notes that in Siberia, most quitcits live outside of cities. Quitcits introduced to Chicago might very likely leave the city and colonize rural areas of the Midwest, potentially causing all sorts of problems.
iv. points out that quitcits might start eating native songbirds, such as cardinals (*Cardinalis cardinalsi)* and robins (*Turdus migratorius*), which people in Chicago appreciate.
v. points out that introducing quitcits might introduce unknown diseases that could spread to other wildlife or to livestock.

a. all of them, i-v b. i only c. ii, iv and v only d. iv and v only e. not a, b, c or d

37. Aldo Leopold wrote in "Thinking Like a Mountain" that he reached a dying wolf and watched the fierce green fire in her eyes die. What is true about this essay?
i. Leopold explained in the essay that he had to move the wolf out of a small forest fire.
ii. Leopold argued in the essay that predators have important ecological roles.
iii. This essay describes accurately an experience Leopold had and how it shaped his thinking as a young man.

a. all of them, i-iii b. i only c. ii only d. ii and iii only e. not a, b, c or d

38. Consider edges.
i. Edges occur where 2 different habitats meet.
ii. Particular edges are important for wildlife that use both habitats creating the edge but will not be important for wildlife that do not use those habitats.
iii. Early successional edges often support high populations of wildlife because many wildlife in North America today are adapted to early successional habitat.
iv. Edges between 2 habitats with complementary resources are particularly beneficial for members of a particular species that uses both those habitats.

a. all, i-iv, are true b. i only is true. c. i and ii only are true d. i and iii only are true e. not a, b, c or d

39. Elk (*Cervus elaphus*) browse cottonwood trees (*Populus deltoides*) and willows (*Salix* spp.) along the Lamar River in the Lamar Valley in Yellowstone National Park. Just about wherever elk live, they prefer to browse cottonwoods (or closely related trees) and willows because these plants are relatively high in nutrition and low in secondary compounds. Since wolves (*Canis lupus*) were extirpated from the Park some 7 decades ago, no young cottonwoods escaped browsing and joined the population of adult trees. Similarly, recruitment of willows was severely restrained. During most of those 7 decades, the elk population was regulated predominantly by food shortage, except for a decade in the 1960s and 1970s when elk were culled by the National Park Service to half the size of their unregulated population. Even when the elk population was halved by culling, they browsed cottonwoods and willows enough to limit recruitment. Wolves were reintroduced to the Park in the early 1990s. Wolf predation has not decreased the elk population as much as did culling. Nonetheless, since wolves have been reintroduced into Yellowstone, elk spend much less time along the Lamar River to avoid wolves. In consequence, cottonwood recruitment has begun for the first time in 7 decades and willow recruitment has increased significantly. What is going on here?
i. Wolves kill more elk than did the sharp-shooters who did the culling.
ii. Elk no longer prefer to eat cottonwoods and willows.
iii. Wolves affect organisms in their ecological communities through their effects on the behavior of their prey.

a. all of them, i-iii b. i and ii only c. i and iii only d. iii only e. not a, b, c or d

40. The prairie potholes are especially important breeding habitat for what wildlife?
i. bison ii. cottontail rabbits iii. ducks iv. geese v. pheasants vi. quail

a. all of them, i-vi b. i only c. iii only d. No such habitat as "prairie potholes" exists. e. not a, b, c or d

41. Aldo Leopold wrote: "The wild things that live on my farm are reluctant to tell me, in so many words, how much of my township is included within their daily or nightly beats. I am curious about this, for it gives me the ratio between the size of their universe and the size of mine, and it conveniently begs the much more important question, who is the more thoroughly acquainted with the world in which he lives?" Where did Leopold's thinking take him from here?
i. Leopold continued by writing that animals, like people, frequently disclose by their actions what they can not or do not to say in words.
ii. As an early ecologist, Leopold understood the power of controlled experiments and wrote that only through controlled experiments can we learn about animals.
iii. Leopold showed that one could learn much from watching animals and looking at their sign.

a. all of them, i-iii b. i and ii only c. i and iii only d. ii and iii only e. not a, b, c or d

42. Almost all species that have colonized the US in the past 100 years were brought here by man. One successful species is an exception. That species is

a. cattle egret b. Labrador duck c. ring-necked pheasant d. starling e. not a, b, c or d

43. (3 pts) Rafiniesquii's big-eared bat (*Corynorhinus rafininesquii*) is listed as a "priority species" in North Carolina (a couple steps below "endangered") but "endangered" in Virginia. These bats are a specialist predators on moths, do not migrate, and in North Carolina and Virginia hibernates singly or in small groups. Like many bats, female Rafiniesquii's big-eared bats bear only 1 young per year. These bats are selective about their roosts and prefer to roost in hollow cypress trees with triangularly shaped bases in swamps. Swamp habitats are more extensive in coastal North Carolina than in Virginia. Why might Rafiniesquii's big-eared bat be listed differently in North Carolina and Virginia?
    i. More research may have been done in Virginia than in North Carolina, providing a better understanding of the bats' real status.
    ii. North Carolina has more habitat for Rafiniesquii's big-eared bat than does Virginia.
    iii. State laws affecting swamp habitats might differ between the 2 states.
    iv. The people who made the decision to list Rafiniesquii's big-eared bat at "endangered" in Virginia might have been more bat-friendly than the Wildlife Commissioners in North Carolina, who make such decisions.

    a. all of them, i-iv b. i only c. ii only d. i, ii and iii only e. not a, b, c or d

44. In Australia, the small, insectivorous marsupials in the genus *Antechinus* resemble mice in their general appearance but have very different diets and reproductive strategies. All *Antechinus* are insectivorous and many species in the genus are adapted to environments that have a single, very productive flush of insects each year. During this flush of insects, these *Antechinus* reproduce. Members of the species *Antechinus stuartii* may be the only species of mammal that is completely semelparous (semelparous animals produce all of their offspring in one shot and then die; iteroparous animals spread their reproduction out over several reproductive periods). *A. stuartii* males and females reach reproductive maturity at about 11 months of age, right as the annual flush of insects occurs. After mating, all males die. Females live long enough to raise a litter of offspring but almost none of them can live to the next reproductive period (that is, basically none of them ever reach 2 years of age and reproduce a second time). Some species of *Antechinus* are seriously endangered with extinction. If you were in charge of management of one of these endangered species what would you try to do?

    a. try to decrease generation time, *T*, because *T* is in the exponent of the equation for □ and, therefore, has the potential to have tremendous effects on rate of population growth for a population.
    b. try to increase the number of animals that reach age 1.
    c. try to increase the number of 1-yr-olds that reach age 2.
    d. do nothing; with a reproductive strategy like they have, *Antechinus* species are more like insects than mammals and are unlikely to be able to survive.
    e. not a, b, c or d

45. Imagine that you have responsibility for managing the deer harvest at Camp LeJeune, the Marine Base down near the coast. Camp LeJeune is divided into several units, each of which is hunted separately. Now, imagine that you decide to allow 100 hunters to hunt in Unit A for 4 hours each day. Because hunters can harvest more than 1 deer per day, hunters that kill a deer keep hunting for the rest of their 4 hours. On the 1st day of the deer season, the 100 hunters kill 100 deer. The hunters on the 2nd day kill 80 deer, those on the 3rd day 60 deer, those on the 4th 50, and on the 5th 40. To (approximately) the nearest 25 deer, what is your estimate for the deer population in Unit A after 5 days of hunting?

    a. 150 b. 325 c. 475 d. 575 e. The population can not be estimated.

46. (3 pts) Which of the following are reasons for us (people in general) to try to save endangered species?
    i. Some have aesthetic value.
    ii. Some have commercial value.
    iii. Some have medicinal value.
    iv. Some have educational value.

    a. all of them, i-iv b. i only c. i and iii only d. i, iii and iv only e. not a, b, c or d

For the following 3 questions, consider these types of natural wetlands.

i. bog ii. estuary iii. lake or pond iv. marsh v. pocosin vi. river vii. swamp

47. What wetland type(s) has (have) low primary productivity due to high acidity?

a. i only b. i and iv only c. ii and iii only d. v only e. not a, b, c or d

48. What wetland type has the highest productivity?

a. i b. ii c. iii d. v e. not a, b, c or d

49. What wetland type is found almost exclusively in North Carolina and no where else in the world (except for a few wetlands in Virginia and South Carolina)?

a. i b. ii c. v d. vii e. not a, b, c or d

50. (3 pts) What is true about rabies?
i. The most common vectors for rabies in every state in the US are foxes.
ii. The survival rate for people who contract rabies is relatively high for a viral disease.
iii. The virus breaks down under UV light.
iv. The virus is usually transmitted through a bite.

a. all of them, i-iv b. i only c. i, iii and iv only d. i and iv only e. not a, b, c or d

51. Functional and Numerical Responses of consumers appear in many mathematical models of wildlife populations because these concepts are critical to understanding how wildlife populations respond to changing conditions. What is a Numerical Response?
a. A Numerical Response is the actual change in population size that is the response to a change in habitat.
b. A Numerical Response is the change in population structure (demographic change) that is the response to a change in food supply.
c. A Numerical Response is the change in population size that is the response to a change in food supply.
d. A Numerical Response is the change in the number of perferred food items eaten that is the response to a change in the abundance of that food when other foods do not change in abundance.
e. Not a, b, c or d

52. White-tailed deer (*Odocoileus virginianus*) were nearly extinct in North Carolina in the early 1930s, so deer were introduced from New York and Minnesota to augment the population here. The native deer here in North Carolina were relatively small as white-tailed deer go (before the release of deer from up North), while those that came from New York and Minnesota were about twice as big (in weight). The introduced deer became established and bred, both with other introduced deer and with native deer. After the introduction of northern deer the 1930s, deer were at first quite, like northern deer, but have since come to be the same size as the original, native deer. What is true about deer in North Carolina?
i. Clearly, low food abundance in North Carolina leads to small deer.
ii. Deer in North Carolina have evolved small size again, since the 1930s, but natural selection was not involved.
iii. If body size is at least partially heritable in deer, then natural selection may well have led to the evolution of small size of deer in North Carolina since the 1930s.
iv. To know whether natural selection has acted on deer in North Carolina since the 1930s, we need at least to know if body size has a genetic component.

a. all of them, i-iv b. i and ii only c. i and iii only d. iii and iv only e. not a, b, c or d

53. You study a population of bobcats (*Lynx rufus*) on a study site in central North Carolina that is divided by highways into 4 sections (Sections A, B, C and D) of different areas. Each section of the study area is split as best as possible into a grid of 0.1 x 0.1 km cells. To gain an understanding of how your bobcat population may be changing over time, you place scented sponges (sponges soaked with bobcat urine) in each section for 5 dys at the same time in each of three years. Each cell gets one scented sponge. You get the results in the table to the right.

Scent Station Results
(% stations visited)

Section (area)	Year 1	Year 2	Year 3
A (10 km^2)	50	45	55
B (15 km^2)	45	40	50
C (12 km^2)	40	35	45
D (8 km^2)	55	50	60

What can you say about your results?
i. Section D probably has the most bobcats living in it.
ii. Section C appears to have the lowest density of bobcats.
iii. Sections B and C may have similar numbers of bobcats in them.
iv. Either the bobcat population dropped during the 2nd year and increased again in the 3rd year, or something (such as weather) affected the abilities of bobcats to detect the scents differently in each year.

a. all are true, i-iv b. i and ii only c. ii and iii only d. ii and iv only e. not a, b, c or d

54. Foregut digestion using a rumen is tremendously efficient at extracting nutrients and energy from plant materials, yet this method of digestion has an imperfection that is not found in the system of foregut digestion that kangaroos evolved. What is that imperfection?
i. Rumination has no imperfection.
ii. The rumen of a newborn ruminant is inoculated with bacteria species that are dominant in its mother's rumen at the time and those bacteria remain the dominant bacteria in the youngster's rumen for the rest of its life.
iii. The rumen is located behind the small intestine, limiting absorption of nutrients.
iv. The rumen is part of the esophagus and, therefore, can not excrete digestive enzymes.

a. all of them, i-iv b. i and ii only c. ii and iii only d. iii and v only e. not a, b, c or d

55. (3 pts) Hunters that Stephen Kellert categorized at "Sport Hunters" were characterized by what?
i. An interest in learning more about animals
ii. Extensive knowledge about wildlife
iii. Participation in many outdoor activities
iv. The ability to state clearly why they hunt

a. all of them, i-iv b. i only c. i and ii only d. iv only e. not a, b, c or d

56. Given that predators prey disproportionately on old and sick prey animals, why is it that predators can also kill apparently healthy, prime prey animals?
i. When predators have killed all the old and sick prey, healthy ones are the only ones left so predators can always kill them.
ii. Healthy prey are sometimes in the wrong place at the wrong time (from their point of view; right place at the right time from a predator's point of view) and are vulnerable to predation at those times.
iii. Animals that appear to researchers to have been healthy when they were killed may actually have suffered from a disease or problem that the researchers could not detect.

a. all of them, i-iii b. i and ii only c. i and iii only d. ii and iii only e. not a, b, c or d

57. (3 pts) Which of the following makes management of Wilderness areas difficult?
i. Endangered species that live in wilderness areas may require active management to prevent extinction.
ii. Native predators that are locally extinct may not return to wilderness areas on their own.
iii. Native species that are locally extinct may require active habitat management or other human intervention to get them to return.

a. all of them, i-iii b. i only c. i and ii only d. i and iiii only e. not a, b, c or d

58. Hunters enjoy hunting and benefit from eating the meat they harvest, from spending time outside in nature, and from learning about wildlife. What else is true about hunting?
i. These benefits are clearly accepted as adequate justification for hunting by all people in the US.
ii. If hunters wish to maintain the tradition of hunting, they must argue for hunting by emphasizing clear truths about hunting.
iii. Even though hunting (not counting hired sharp-shooters) is usually unable to control high, problematic game populations, hunters should emphasize population control as a strong argument in favor of hunting.
iv. Because large predators have been extirpated from much of the US, hunters have a clear, uncontroversial argument in their favor, because hunting by humans mimics closely the hunting by large predators.

a. all of them, i-iv b. i and ii only c. ii only d. iii and iv only e. not a, b, c or d

59. (3 pts) What is a major reason that Red-cockaded Woodpeckers are endangered?
i. habitat loss ii. introduced disease iii. introduced predator iv. loss of major food species

a. all of them, i-iv b. i only c. ii only d. iv only e. not a, b, c or d

60. What is true about trapping mammals for fur?
i. Trapping mammals for fur has a long history in North America, going back to the 1600s.
ii. Trapping mammals for fur was integral to the exploration of North America by Europeans.
iii. Trapping mammals for fur is now illegal in most states.
iv. Trapping regulations have become more and more restrictive this century, both with respect to behavior of trappers and with respect to traps themselves, predominantly to reduce suffering by animals trapped.

a. all of them, i-iv b. i and ii only c. i and iii only d. i, ii and iv only e. not a, b, c or d

61. (3 pts) Under what conditions is cecal digestion superior to rumination?
i. When the animal is small (< 2 kg).
ii. When the anima l is large (> 50 kg).
iii When the animal can be coprophagous.
iv. When food is high in fiber.

a. all of them, i-iv b. i only c. ii only d. i, iii and iv only e. not a, b, c or d

62. What is true about the diets of black bears (*Ursus americanus*)?
i. Black bears are omnivorous and, therefore, eat both plant and animal matter as food.
ii. Because black bears are omnivorous, they have an easy time balancing their diets.
iii. Because black bears have long digestive tracts with adaptations for eating plant matter, they can eat and gain nutrition from eating most plants that are important foods for many herbivores.
iv. Because black bears have short digestive tracts with no adaptations for eating plant matter, they must be very picky about the plant matter that they eat, choosing plant matter that is easy to digest.
v. Year round, black bears meet their protein demands through active predation on other vertebrates.

a. all of them, i-v b. i and ii only c. i and iv only d. i, iv and v only e. not a, b, c or d

63. (3 pts) Which of the following have foregut digestion?
i. all kangaroos
ii. all rabbits and hares
iii. some birds that eat a lot of vegetative matter, like quail and grouse
iv. some odd-toed hooved mammals, like horses and rhinoceroses
v. some even-toed hooved mammals, like deer and antelopes

a. all of them, i-v b. i only c. i and ii only d. i, iiii and v only e. not a, b, c or d

64. In the 1800s and early 1900s, longleaf pine (*Pinus palustris*)were tapped to get sap, which was refined into terpentine. Although tapping the trees did increase tree mortality somewhat over natural levels, terpentining was potentially a sustainable use of longleaf pines. During the same period, longleaf pines were logged for lumber. When done right, logging can also be a sustainable use of longleaf pines. Longleaf pines now cover <5% of their original acreage. What 2 human actions have led longleaf pine forests to become extremely restricted in distribution and rare?
i. fire prevention
ii. increase in incidence of forest fires
iii. logging
iv. management for endangered species
v. terpentining
vi. urban sprawl

a. i and ii b. i and iii c. iii and iv d. iii and vi e. not a, b, c or d

65. Why is simply dividing the number of animals in a study area by the area of the study area not always a good measure for density of wildlife?
i. Even if you have a really good estimate of the number of animals, you can not trust that it is good enough to use in management decisions.
ii. Knowing the density of animals in a population is not important.
iii. This is a stupid question, because "the number of animals divided by area" is the definition of density.

a. all of them, i-iii b. i only c. ii only d. iii only e. not a, b, c or d

66. (3 pts) The importance of a habitat edge to an animal may depend on what?
i. ecological flow
ii. the importance to the animal of each habitat making the edge
iii. the species' mapping ability
iv. the species' mobility

a. all of them, i-iv b. i only c. ii and iii only d. ii, iii and iv only e. not a, b, c or d

67. Which of the following species are exotic to North America yet maintain healthy, wild populations here (populations not purposefully maintained by people)?
i. bison (*Bison bison*)
ii. black and brown rats (*Rattus rattus* and *R. norvegicus*)
iii. Carolina parakeet (*Conuropsis carolinensis*)
iv. house mice (*Mus musculus*)
v. Indian mongoose (*Herpestes havanica*)
vi. passenger pigeons (*Ectopistes migratorius*)
vii. pig (*Sus scrofa*)
viii. turkey (*Meleagra gallopava*)
ix. wood duck (*Aix sponsa*)

a. all of them, i-ix b. ii and vii only c. ii, iv and vii only d. ii, v and vii only e. not a, b, c or d

68. What is Ecological Succession?
i. a natural process by which plant communities change in a predictable manner over time
ii. an important process manipulated by wildlife managers to affect wildlife populations
iii. a change in dominance within a wildlife social group resulting from natural mortality
iv. a change in dominance within a wildlife social group caused by interactions with humans

a. all of them, i-iv b. i and ii only c. ii and iv only d. i, ii and iii only e. not a, b, c or d

69. What sources of error might affect the results of the breeding bird surveys?
i. New technologies have made the old data obsolete.
ii. Noise levels have changed on some of the census routes, making at least some species of birds harder to hear.
iii. People differ in their abilities to hear and to identify songs of birds, even well trained birders differ.
iv. Urban sprawl has changed habitat on some of the census routes since they were established, which changes the species most likely to be counted on those routes.

a. all of them, i-v b. i and ii only c. ii and iii only d. ii, iii and iv only e. not a, b, c or d

70. (3 pts) Mammals do not stay with their mothers forever. At some time, youngsters strike off on their own. What can cause a young mammal to disperse from its mother's home range?
i. Adult males can be intolerant of youngsters, so a youngster might leave to try to find a place without adult males.
ii. Its mother becomes reproductively active and intolerant of her maturing offspring.
iii. Older siblings on a nearby territory entice the youngster to leave its mother and settle with them.
iv. Young mammals disperse to find their own home ranges where they can settle.

a. all of them, i-iv b. i only c. i and ii only d. i, ii and iv only e. not a, b, c or d

71. (3 pts) Which of the following might be considered a problem with the Wilderness Act?
i. The word "Man" in the Act really refers only to European Man.
ii. Well-educated, well-off, urban people visit Wilderness areas and, thereby, gain benefit from Wilderness areas, while less well-off, rural people who live close to Wilderness areas may gain little benefit.
iii. "Wilderness" (capital "W") is well defined in the act yet "wilderness" means different things to different people.

a. all of them, i-iii b. i only c. i and iii only d. ii and iiii only e. not a, b, c or d

72. West Nile virus was introduced to birds in North America during the past decade and has spread rapidly across the continent. In fact, the disease spread from New York to California in only 3 years. Why has the virus been able to spread so easily?
i. The virus moves through a number of vectors.
ii. The major organisms that contract disease from the virus can travel long distances.
iii. The virus is abundant in ticks and deer, thereby making it transmissible to humans.

a. all of them, i-iii b. i and ii only c. i and iii only d. ii and iii only e. not a, b, c or d

73. What is true about future of hunting?
i. Over the past several decades, the proportion of the people in the US that hunt has decreased. In the future, we expect that even smaller proportions yet of people will hunt.
ii. Hunters who break laws and vandalize property jeopardize the future of hunting.
iii. Because hunting has a long history in the United States and, therefore, will always be allowed.
iv. Anti-hunting sentiments are growing in the US and have the potential to jeopardize hunting in the future.

a. all of them, i-iv b. i and ii only c. i, ii and iv only d. and iii only e. not a, b, c or d

EXTRA CREDIT (*Note the change in numbering*)

101. What wildlife biologist of historical importance was crippled with polio as a child and recovered after a considerable struggle?

a. Charles Elton b. Paul Errington c. Fran Hamerstrom d. Aldo Leopold e. Henry David Thoreau

102. (2 pts) What wildlife biologist is of historical importance because she was the only woman to be awarded a graduate degree under Alsd Leopold?

a. Susan Flader
b. Fran Hamerstrom
c. Estella Leopold
d. Melissa Sparrow
e. None of them. Leopold never had a woman student

103. In February of *A Sand County Almanac*, Leopold ended his discussion of each decade with the line "Rest! cries the chief sawyer, and we pause for breath." Who was the chief sawyer?

a. Aldo Leopold
b. Estella Leopold, his wife
c. A. Starker Leopold, his oldest son
d. Charles Schwartz, the illustrator of *A Sand County Almanac*
e. not a, b, c or d

104. Aldo Leopold was years ahead of his time and understood and predicted things that are only now being fully understood. What can you surmise that he did not know?
i. Oil slicks are extremely hazardous for wildlife.
ii. Habitat development and maintenance is an important aspect of wildlife management.
iii. Predators do not have the extremely deleterious effect on game populations as generally believed when Leopold lived.
iv. Smoking is bad for one's health.

a. all of them, i-iv b. i and iii only c. i and iv only d. iv only e. not a, b, c or d

105. Which of the following living biologists have been instrumental in promoting conservation?

i. David Ehrenfeld ii. Daniel Janzen iii. Reed Noss iv. Daniel Rather v. Michael Soulé

a. all of them, i-v b. i only c. i and ii only d. not iv only e. not a, b, c or d

106. *A Sand County Almanac* was published after Aldo Leopold's death. Who did the final editing and chose the title?

i. Estella Leopold, his wife
ii. A Starker Leopold, his oldest son
iii. Luna Leopold, another son
iv. Charles Schwartz, the illustrator of *A Sand County Almanac*
v. the managing editor at Oxford University Press

a. all of them, i-v b. i only c. ii only d. iii only e. not a, b, c or d

107. Which of the following has (have) made *major* contributions in 2 very different fields of science?

i. Jared Diamond
ii. Charles Elton
iii. Paul Errington
iv. R. A. Fisher
v. Ernst Mayr
vi. Sewall Wright

a. all of them, i-vi b. i and iv only c. ii and iii only d. iii only e. not a, b, c or d

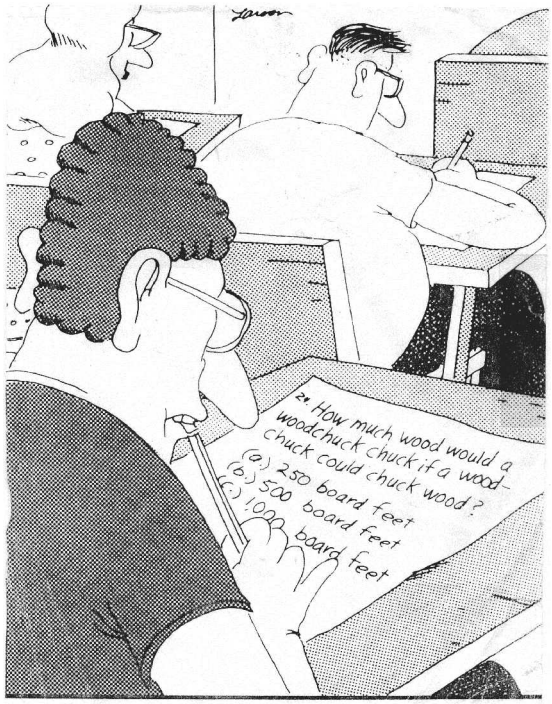
108. The Bush Administration has been the most environmentally unfriendly administration since at least the Reagan Administration. Which of the following has/have President Bush and his administration done during the past 5 years?
i. Arrogantly failed to join the rest of the world to try to reduce greenhouse gasses, even though the US produces more greenhouses gasses than any other country.
ii. Agreed to try to preserve salmon stocks in the Columbia River drainage but not to restore the 80% of the stock that has been decimated due to dams.
iii. Tried to ease regulations to maintain viable populations of native vertebrates on national forests, as mandated by the National Forest Management Act..
iv. Approved changes in regulations for the Clean Air Act that will allow significant increases in Mercury pollution.
v. Reopened logging on that last great tracts of Old Growth temperate rain forest left in the US.

a. all of them, i-v b. i, ii and iii only c. i, ii, iii and v only d. iii and v only e. not a, b, c or d

109. Last year after George Bush was re-elected, I made the following 4 predictions. On which of these predictions was I correct?
The Bush administration and the Republican Congress will
i. introduce legislation to open the Arctic National Wildlife Refuge for oil drilling.
ii. attempt to invoke regulations that favor energy generated from fossil fuels and minimize energy generated from renewable sources.
iii. attempt to ease regulations to maintain viable populations of native vertebrates on national forests.
iv. introduce legislation that relaxes protection of endangered species.

a. all of them, i-iv b. i and ii only c. i, ii and iii only d. iii only e. not a, b, c or d

110.



The Wildlife Management finals

TA Evaluation (*Note the change in numbering*)

Please answer the following questions about your Joy Osborn, who was the Honors Teaching Assistant for the course this year.

Fill in as many circles as appropriate. These will be hand-graded and the computer will not be confused. For questions requiring you to write an evaluation or to write other information, please use the back of the opscan sheet as best you can.

Thank you.

120 . Which of Joy's lectures did you attend?
- a. Salamanders
- b. Predators and predation
- c. Endangered species

121. Which lecture did you like best? Why?
- a. Salamanders
- b. Predators and predation
- c. Endangered species

122. From which lecture did you learn the most?
- a. Salamanders
- b. Predators and predation
- c. Endangered species

123. What did Joy do particularly well?

124. Did Joy do anything bad that she might have avoided?

125. What is your sex?
- a. Female
- b. Male

126. What is your major?

127. Please write other comments or suggestions.