Ecology

2010 SAMPLE EVENT (BASED ON 2010 RULES, NOT 2011)

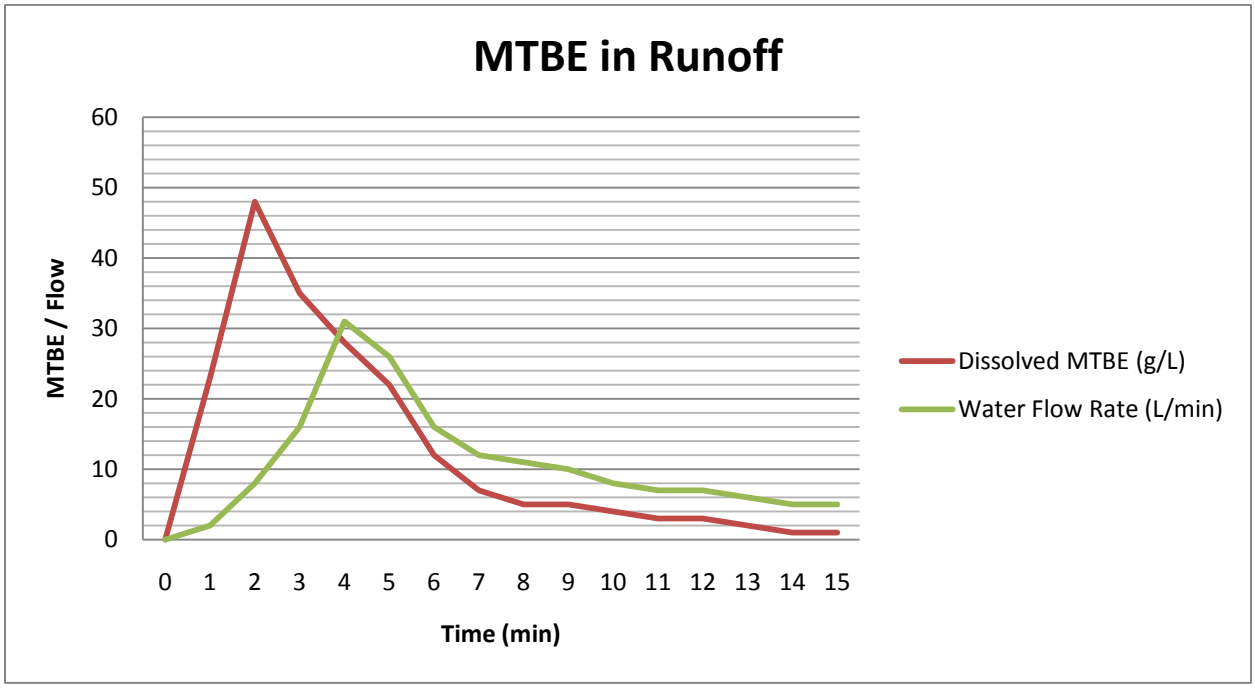
Highest score wins. Ties are broken in favor of teams that turn in their test earlier. You are given a maximum of 40 minutes to complete the test.

1) What is the term for the scientific study of how organisms interact with each other and with their environment?
2) Which is not a term for a non-native species?
   A. introduced species
   B. invasive species
   C. alien species
   D. exotic species
3) Approximately what percentage of exotic species introduced to North America become invasive species?
   A. 1%
   B. 14%
   C. 28%
   D. 53%
4) What theory states that, within a species, populations in colder climates have larger body masses?
   A. Darwin's Law
   B. Bergmann's Rule of Ecogeography
   C. Theory of Succession
   D. Leopold's Law of Distribution
5) Top predators significantly affect populations of lower trophic levels, including herbivores and plants. The term for this phenomenon is:
   A. dynamic biomass forcing
   B. community shock
   C. ecological efficiency
   D. trophic cascade
6) Which is not a method developed by milkweed to survive herbivory?
   A. growing quickly at the expense of producing fewer toxins
   B. producing toxins or other defensive mechanisms
   C. out-competing ironweed, dogbane, foxglove, and switchgrass
   D. attracting predators of herbivores
7) In the taiga, there is a large range of temperatures that inhabiting organisms must tolerate. An organism that can only tolerate a small range of temperatures is called:
   A. eurythermal
   B. poikilothermic
   C. stenothermal
   D. t-selected species
8) A new theory developed in 2009 provides a method of determining species diversity over large areas. It states that the number of species is proportional to the ¼ power of the area. Arbitrarily assuming that the proportionality

constant is 67.3 species*km^2 for the Colorado prairie, how many species occupy 38.000 square kilometers of this ecosystem? Use significant figures. <http://www.sciencedaily.com/releases/2009/07/090709174751.htm>

9) According to research by a professor at the University of Zurich, fertilization of grasslands has led to _____ in productivity and _____ in species biodiversity.
   A. an increase; a decrease
   B. a decrease; a decrease
   C. a decrease; an increase
   D. an increase; an increase
10) Research from Oregon State University in 2009 shows that an increase in the abundance of grassland herbivorous species (mule deer, rabbits, and feral pigs) indirectly leads to a higher _____.
   A. chance of climax community establishment
   B. predator death rate
   C. prevalence of viral plant disease
   D. local carrying capacity
11) While forests sequester carbon dioxide, mitigating the greenhouse effect, some also _____, causing short-term local warming effects, according to Yakir and Rotenberg.
   A. reduce albedo
   B. have net positive greenhouse gas emissions
   C. increase infrared diffraction
   D. prevent the spread of more productive wetlands
12) What is another common name for a taiga or coniferous forest?
13) "During the 2003 fire season, blazes in the taiga forests of Eastern Siberia were part of a vast network of fires across Siberia and the Russian Far East, northeast China and northern Mongolia. Fires in Eastern Siberia have been increasing in recent years, and the 2003 spring and summer seasons are the most extensive recorded in over 100 years." These fires have caused changes in the plants and wildlife present. Such changes are generally termed:
14) Bryophyte succession in taigas starts with feathermoss, which is then replaced by hummock *Sphagna*, and is finally dominated by hollow *Sphagna*. As this succession occurs, more light became available and the water table rose, making it easier for incoming species to survive. This type of succesion is termed:
15) Taiga on inorganic soil may shift to a peatland as a thick forest floor accumulates and the water table rises. What is the *specific* term for this process?
16) Grasslands are turning into deserts by the process of desertification. Factors causing this shift are climate change, rain infiltration, overgrazing, fire suppression, fertile soil accumulation, and wind shielding by plants. Which of these factors are allogenic as opposed to autogenic?
17) What is the most widely-used grass in producing ethanol in the United States?
18) "Known for its hardiness and rapid growth, this perennial grows during the warm months to heights of 2–6 feet. [It] can be grown in most parts of the United States, including swamplands, plains, streams, and along the shores & interstate highways. It is self-seeding (no tractor for sowing, only for mowing), resistant to many diseases and pests, & can produce high yields with low applications of fertilizer and other chemicals. It is also tolerant to poor soils, flooding, & drought; improves soil quality and prevents erosion due its type of root system. [It is an] approved cover crop for land protected under the federal Conservation Reserve Program (CRP). CRP is a government program that pays producers a fee for not growing crops on land on which crops recently grew." The grass described above is an attractive feedstock for cellulosic ethanol production. What is its common name?

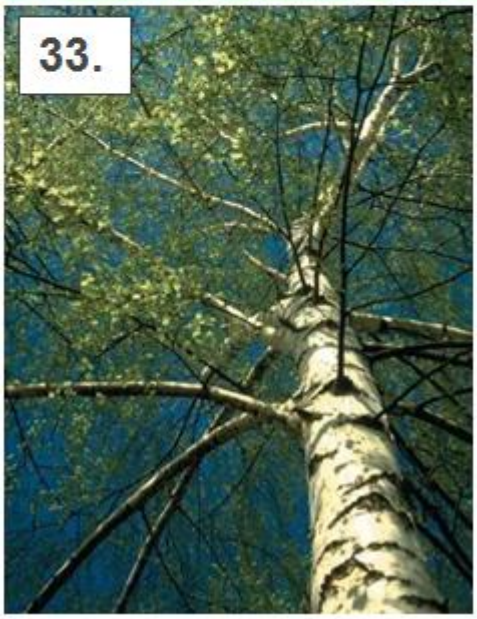
Methyl tert-butyl ether (MTBE) is a water-soluble compound added to gasoline to decrease engine knock, but it contaminates groundwater. There is a spill of gasoline with MTBE additive in a village at the top of a mountain above a taiga. Shortly after, the runoff from a storm carries the MTBE into the ecosystem at a lower elevation. The hydrograph below shows the flow rate of runoff water in a gully, and the pollutograph shows the concentration of MTBE in the runoff.



19) What is the peak water flow rate in liters per minute?
20) What is the peak concentration of MTBE in grams per liter?
21) When does the peak flow of MTBE occur? Consider only time increments of 1 minute (e.g. 13 minutes is acceptable, but 13.2 is not).
22) What is the peak flow of the pollutant, MTBE, at this time?

23) What is the name for a species whose existence affects the well-being of several other species?
24) What is the term for the "ecological role of an organism in a community especially in regard to food consumption?"
25) What type of biodiversity describes the variety of different species in a community?
26) What is the process by which competing species are naturally selected to occupy different niches as they evolve?
27) Taiga fragmentation occurs when roads are built through the forest, breaking the ecosystems' species up into smaller metapopulations. These are more likely to go extinct because of chance extinction. Describe this effect.
28) The creation of small taiga patches through fragmentation limits bird populations that can only survive in the central areas of a forest because they cannot tolerate dry conditions on the edges of the forest. This is due to the basic geometry of patches compared to large habitats. Habitat fragmentation causes a decrease in the _____ ratio (generic description of ratio).
29) What is the term for the loss of local genetic variation that occurs when a new population is established from a small number of individuals from a much larger population?
30) An ecotone exists between the taiga and a colder biome to the north. What is the biome to the north?

Identify the following organisms of the taiga by their common names:

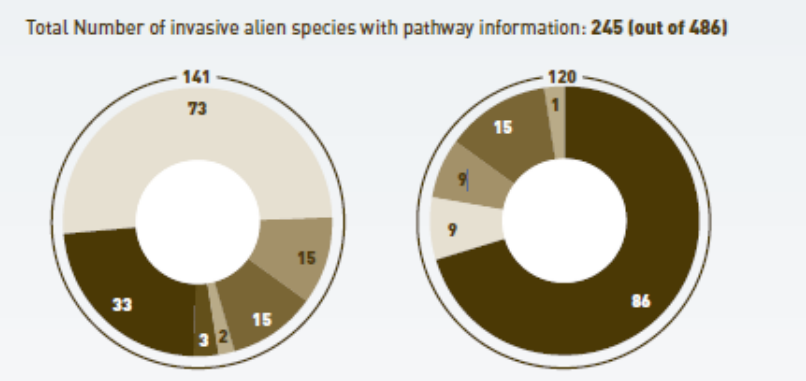


31) see photo above
32) see photo above
33) see photo above
34) see photo above

Identify the following organisms of grasslands and savannas by their common names:

35) see photo above
36) see photo above
37) see photo above

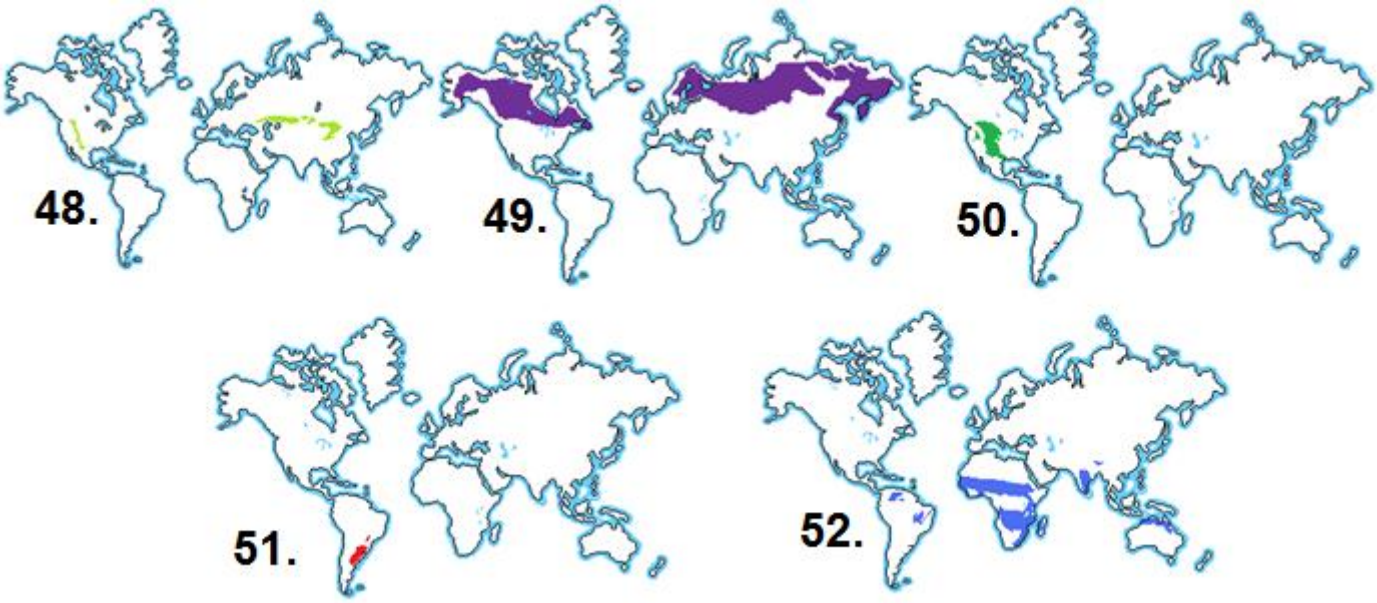
There are many pathways for introduction of invasive species in Canada's ecosystems, both intentional and unintentional. Match the following pathways with the number of invasive alien species they have been associated with:



38) intentional introduction for research
39) unintentional introduction with freight, packing materials, machinery, equipment, etc.
40) intentional introduction as agricultural crop
41) unintentional introduction through recreation/tourism (baggage, camping equipment, boats, etc.)
42) intentional introduction as ornamental or landscaping plant
43) unintentional introduction with plant products (contaminants in seed, forage, produce, wood products, garden supplies)

44) Of the following limiting factors affecting a population of prairie dogs on a prairie in Nebraska, which is/are density-independent rather than density-dependent? [you may select multiple answer choices]
    A. depth of the local drinking pond
    B. heat wave
    C. bacterial pneumonia
    D. population of coyotes
    E. all are density-dependent
45) Which of the following is not an example of a grassland biome?
    A. pampas
    B. tundra
    C. steppe
    D. prairie
46) Which of the following is often considered a transition region between desert and tropical rainforest?
    A. savanna
    B. prairie
    C. steppe
    D. pompas
47) According to an ecologist of the mid-20th century, "a population will grow (or decline) exponentially as long as the environment experienced by all individuals in the population remains constant." Who is the ecologist that stated this law?
    A. Aldo Leopold
    B. Thomas Malthus
    C. Leonhard Euler
    D. Charles Darwin

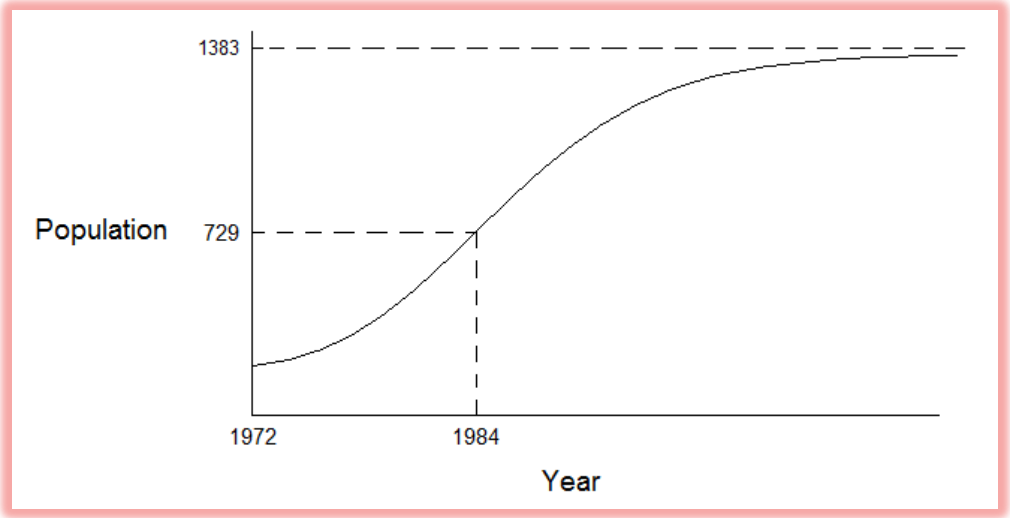
Identify the biomes shown in the map of distribution using these choices: steppe, prairie, savanna, pampas, taiga.



48) see map above
49) see map above
50) see map above
51) see map above
52) see map above

53) The plains zebra of the African savanna is an herbivore that feeds primarily on grass. Its habitat is being occupied by farms, and livestock are eating the same grass that the zebras feed on. The plains zebra is unable to feed on a few different grass species available to it. In terms of the information given, what is the difference between its realized niche and its fundamental niche?
    A. the realized niche is limited by farms, competing livestock, and its inability to eat certain grasses
    B. the realized niche is limited by farms and competing livestock
    C. the realized niche is limited by competing livestock
    D. the realized niche is broader than the fundamental niche
54) When fires occur in the pampas, most of the trees die, but the grasses are able to survive. Of the choices given, what is the most important factor for the grasses' survival?
    A. fire resistance of lower stalks
    B. fire shielding from nearby bryophyte patches
    C. high water flow in xylem
    D. deeper roots

Below is the graph of a long-eared owl population in an Alaskan taiga.



55) What is the carrying capacity for this population?

56) Classify the curve above:

A. exponential s-curve
B. exponential j-curve
C. logistic s-curve
D. logistic j-curve

57) A population of Canadian lynx (*Lynx canadensis*) lives in a taiga region of western Canada. The fake life table below shows how many survive at each age. Draw a survivorship curve given the following data.

58) What type (Type I, II, or III) of survivorship does the graph that you just drew display?

Age (x)	Individuals Surviving to Age x
0	184
1	165
2	162
3	160
4	156
5	147
6	142
7	140
8	135
9	130
10	121
11	105
12	87
13	65
14	43
15	16
16	3
17	0

Ecology C 2010 North Carolina State Tournament Answer Sheet

Team Name: _____
Team Number: _____
Participant Names: _____

1.		33.	
2.		34.	
3.		35.	
4.		36.	
5.		37.	
6.		38.	
7.		39.	
8.		40.	
9.		41.	
10.		42.	
11.		43.	
12.		44.	
13.		45.	
14.		46.	
15.		47.	
16.		48.	
17.		49.	
18.		50.	
19.		51.	
20.		52.	
21.		53.	
22.		54.	
23.		55.	
24.		56.	
25.		57.	
26.			
27.			
28.			
29.			
30.			
31.			
32.		58.	

Ecology 2010 SAMPLE EVENT
Answer Key

1. ecology
2. B. invasive species
3. A. 1%
4. B. Bergmann's Rule of Ecogeography
5. D. trophic cascade
6. C. out-competing ironweed, dogbane, foxglove, and switchgrass
7. C. stenothermal
8. 167 species OR 167
9. A. an increase; a decrease
10. C. prevalence of viral plant disease
11. A. reduce albedo
12. boreal forest
13. succession OR anything containing "succession"
14. facilitative succession OR facilitative
15. paludification
16. climate change, fire suppression, overgrazing
17. corn OR maize
18. switchgrass
19. 31 L/min
20. 48 g/L
21. 4 min
22. 868 g/min
23. keystone species
24. niche
25. species biodiversity
26. niche differentiation
27. A smaller population has a greater chance of having all males or females die without any others to replace them or re-colonize the patch.
28. interior to edge OR core to edge OR anything synonymous
29. founder effect
30. tundra
31. spruce tree OR anything with "spruce"
32. wolf OR anything with "wolf"
33. birch tree OR anything with "birch"
34. cedar tree OR anything with "cedar"
35. milkweed OR anything with "milkweed" OR bloodflower OR bloodroot
36. coyote OR anything with "coyote" OR "prairie wolf" OR "American Jackal"
37. acacia tree OR anything with "acacia"
38. 2
39. 15
40. 33
41. 1
42. 73
43. 86
44. B. heat wave
45. B. tundra
46. A. savanna
47. B. Thomas Malthus
48. steppe
49. taiga
50. prairie
51. pampas OR pampa
52. savanna
53. B. the realized niche is limited by farms and competing livestock
54. D. deeper roots
55. 1383
56. C. logistic s-curve
57. See graph below. No partial credit. Curve must have: 1) shape, 2) correct axis labels, 3) correct starting & ending points
58. Type I