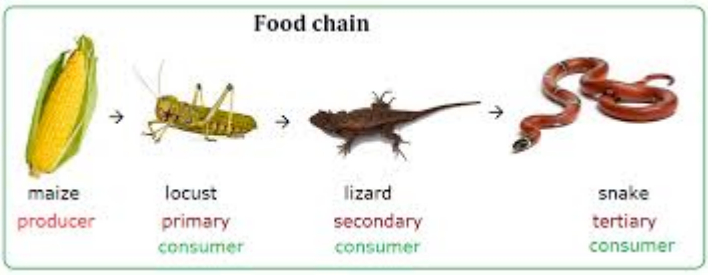
Event Supervisor Instructions for Ecology Regional Exam

1. Printing and copying
    a. The test
        i. If running as paper test make one copy for each team.
        ii. If run as stations make enough copies to place the relevant part (A, B, or C) at each respective station.
        iii. Make sure if you are using images that they print clearly in black or white. If not print in color. Also make sure they are big enough to read easily.
    b. The answer sheet - make one copy per team
    c. The key - print copies as needed to cover all graders
2. Options for running the event- give instructions to students prior to the start of the event, point out tie breaker questions are marked
    a. Run as 12 stations, 3.5 minutes each part A, B, and C- Divide the number of teams competing at once by 3, and set up that many replicates of each part
    b. Run as paper test
        i. Hand out test in its entirety
        ii. Tell them they have 50 minutes to finish.

Part A Station 1: Food Chains and Trophic Pyramids



1. How many trophic levels are in the food chain shown above?

2. What does the term trophic refer to?

3. Besides primary consumer, what other term could be used to describe the locust?
.
4. Which organism in the above food chain would be on the base of the trophic pyramid? Explain your answer.

5. If there are 10,000 kcal available for the maize, how many kcal are available for the snakes? Show your work.

6. Why are most food chains limited to 5 trophic levels?

Part A Station 2: Community Interactions

Match the following terms with the correct example

7. Commensalism	A. Giardia and humans
8. Mutualism	B. Yucca moth and the yucca plant
9. Interspecific competition	C. Birds and trees
10. Intraspecific competition	D. Two male lions and one female lion
11. Predation	E. Wolves and rabbits
12. Parasitism	F. Two paramecium species and one food source

Part A Station 3: Population Dynamics

13. Which of the following is FALSE when referring to the exponential growth model?
    a. The letter r represents the number of offspring per individual.
    b. If r > 0 the population will grow.
    c. If r < 0 the population will shrink.
    d. The larger the N the faster the population will grow.
    e. All of the above are TRUE.
14. The exponential growth model looks like this letter.
    a. L b. M c. N d. J e. S
15. The logistic growth model looks like this letter.
    a. b. M c. N d. J e. S
16. If N = 25, k = 1500, and rmax = 1, what is the population growth rate? Show your work.
17. If N = 250, k=1500, and rmax = 1, how much larger is the population growth rate than when N = 25? Show your work.
18. If k is 1500 and growth rate is 0, what is N? Show your work.

Part A Station 4: Terminology

19. Organisms leave a population by death and
    a. birth.
    b. immigration.
    c. emigration..
    d. migration
    e. selection.
20. The unit of evolution is
    a. individual.
    b. population.
    c. community.
    d. species.
    e. niche.
21. Migration is also sometimes called
    a. genetic drift.
    b. selection.
    c. extinction.
    d. gene flow.
    e. descent.
22. When no members of a species can be found in a local area, this is called
    a. extinction.
    b. coextinction.
    c. extirpation.
    d. reintroduction.
    e. none of the choices

For questions 23 through 25 name the type of selection. Your choices are:

a. stabilizing b. directional c. disruptive d. positive e. negative

The population starts out with a normal distribution of all black to grey to all white moths.

23. Over time all the moths become grey.

24. Over time all the moths become white.

25. Over time the grey moths disappear.

Part B Station 5: Forest Basics

1. Which of the following is false? Deciduous forests
   a. change significantly during four distinct seasons.
   b. are dominated by a few species of broadleaf trees.
   c. have trees that survive winter by dropping their leaves.
   d. have nutrient-poor soil.
   e. have a thick layer of slowly decaying leaf litter.
2. Which of the following are examples of deciduous plants?
   a. maples and oaks
   b. algae and seaweed
   c. bacteria
   d. pines and cedars
   e. fungi
3. Which of the following are examples of evergreen plants?
   a. maples and oaks
   b. algae and seaweed
   c. bacteria
   d. fungi
   e. pines and cedars
4. Trees with needlelike leaves that are kept year round are especially abundant in which biome?
   a. tundra forest
   b. tropical rain forest
   c. coniferous forest
   d. temperate deciduous forest
   e. desert forest
5. Which of the following is least descriptive of coniferous forest?
   a. carpet of needles on forest floor
   b. long, cold, dry winter
   c. short summer
   d. high species diversity
   e. south of the artic tundra
6. What forest biome am I?

7. What forest biome am I?

Part B Station 6: The Taiga

8. Coniferous trees are shaped the way they are because of
   a. snow b. light c. temperature d. wind

9. Taiga soil is
   a. thin b. acidic c. nutrient poor e. all of the choices

10. The taiga in North America is mostly being lost due to
    a. fires b. floods c. logging d. global warming

11. True or false, the taiga is the largest terrestrial biome.

12. True or false, taiga communities are dominated by relatively few species of trees.

13. The predominant form of precipitation in the taiga is _____.

Part B Station 7: The Forests of Illinois

14. Name the primary activity that has resulted in the loss of much of the forests of Illinois.

15. ____ % of Illinois' forests are hardwoods/
    a. 5 b. 10 c. 25 d. 75 e. 97

16. This is the Illinois State Tree.
    a. Slippery Elm
    b. White Oak
    c. Black Hickory
    d. Red Oak
    e. Green Ash

17. This is the most common tree in Illinois.
    a. Slippery Elm
    b. White Oak
    c. Black Hickory
    d. Red Oak
    e. Green Ash

18. In this type of forest the water easily runs or percolates through the soil.
    a. upland
    b. sand
    c. floodplains
    d. flatwoods
    e. swamps

19. This type of forest sits on top of a well-developed hardpan.
    a. upland
    b. sand
    c. floodplains
    d. flatwoods
    e. swamps

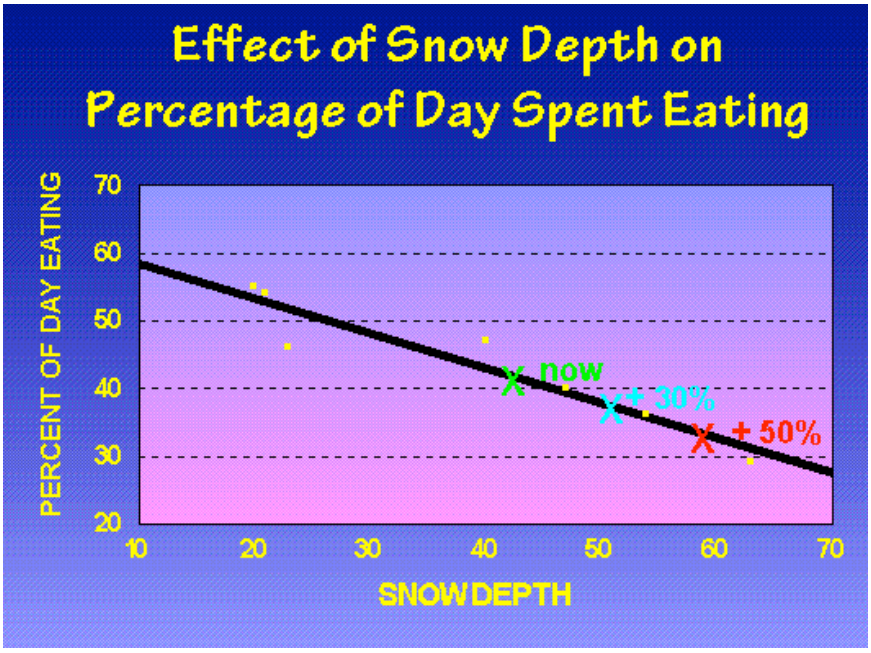
Part B Station 8: Biodiversity Basics

20. This level of biodiversity looks at allelic frequencies.
21. The total number of species in an ecosystem is referred to as species _____
22. This level of biodiversity builds over millions of years.
23. Building _____ an increase biodiversity lost due to habitat fragmentation.
24. Give one example of an essential service provided by diverse ecosystems.
25. The number one reason biodiversity is declining globally is
    a. loss of habitat.
    b. introduced species.
    c. global warming.
    d. pollution.
    e. habitat fragmentation.

Part C Station 9: Air Pollution

1. Ozone that contributes to the formation of smog is found in the
    a. troposphere.
    b. thermosphere.
    c. mesosphere.
    d. stratosphere
    e. mesopause
2. Photochemical smog is formed when primary pollutants interact with
    a. sunlight.
    b. water vapor.
    c. sulfur dioxide.
    d. oxygen
    e. carbon
3. A thermal inversion is the result of
    a. a lid of warm air on top of cooler, stagnant air.
    b. a cold blanket of air that prevents warm air from rising.
    c. mixing of cool and warm air.
    d. cold air drainage.
    e. precipitation.
4. Experts rate indoor air pollution as a
    a. high-risk health problem for humans.
    b. medium-risk health problem for humans.
    c. low-risk health problem for humans.
    d. high-risk ecological problem but no-risk health problem for humans.
    e. none of these answers.
5. Years of smoking and exposure to air pollutants can contribute to the incidence of
    a. emphysema.
    b. chronic bronchitis.
    c. lung cancer.
    d. asthma
    e. all of these answers
6. Sources of carbon monoxide include all of the following except
    a. cigarette smoking.
    b. anaerobic respiration.
    c. motor vehicles.
    d. faulty heating systems
    e. airplanes
7. Of the following strategies to reduce emissions of pollutants from stationary sources, the one that is least likely to help over the long run is
    a. burning low-sulfur coal.
    b. removing sulfur from coal.
    c. dispersing pollutants above the thermal inversion layer.
    d. shifting to less-polluting fuels.
    e. converting coal to a liquid or gaseous fuel.

Part C Station 10: Taiga and Climate Change



Porcupine caribou and climate change.
http://www.taiga.net/caribou/pch/slides/pch17.html

Referring to the figure above, answer the following questions.

1. Currently, how much time are caribou spending eating?

2. If snow depth increases by 30%, how much **<u>less time</u>** are the caribou hypothesized to spend eating? Show your calculations.

3. Give one example of an activity that may be impacted if caribou are spending more time eating

4. How does logging in the taiga impact the rate of climate change?
    a. Increases
    b. Decreases
    c. No affect

5. If an organism in the taiga cannot tolerate or adapt to an increase in temperature, what may happen?

6. If fragmentation occurs as a result of increased temperatures in the taiga, what impact will this have on population size?
    a. Increase
    b. Decrease
    c. No affect

Part C Station 11: Conservation Biology

Questions 14 to 16: List the Three important aspects of life that conservation biologists aim to maintain.

17. In the PAT model
  a. p stands for population
  b. per capita consumption is included.
  c. the impact of pollution can be assessed.
  d. technology is included.
  e. all of the above

18. If a population doubles and everything else remains constant, how will environmental impact change?
  a. increase by a factor of 1.5
  b. increase by a factor of 2
  c. increase by a factor of 4
  d. increase by a factor of 5
  e. decrease by a factor of 0.5

19. Areas of high interest to conservation biologists are termed _____ spots.

Part C Station 12: Land Reclamation

Questions 20 through 22- List three advantages of land reclamation

Questions 23-25- List three disadvantages of land reclaimation..

Division C Sample Biodiversity Question

Fill in the following table and calculate species diversity using the Shannon index, H.

Community A

Species	# of individ.	(pl)	|ln pl|	(pl) |ln pl|
A	59			
B	12			
C	11	.		
D	10			
E	5			
F	3	.		
Total				

Answer Key
Part A

1. Four
2. Feeding
3. Herbivore
4. Maize because it is the ultimate source of energy from the sun which supports the rest of the food chain.
5. 10,000 divided by 10 3 times (once for each level transition) = 10 kcal left for snakes
6. There is not enough energy to support more trophic levels.
7. C
8. B
9. E
10. D
11. E
12. A
13. E
14. D
15. E
16. Rmax x N (k-N)/k = 25
17. Growth is 208, take away 25, leaves 183
18. Then N= k, so N=1500
19. C
20. B
21. D
22. C
23. A
24. B
25. C

Part B

1. D
2. A
3. E
4. C
5. D
6. Tropical rain forest
7. Temperate deciduous forest
8. A
9. D
10. C
11. True
12. True
13. Snow
14. Agriculture
15. E
16. B
17. A
18. A
19. D
20. Genetic
21. Richness
22. Ecosystem
23. Corridors
24. One of the following or similar: resources such as food and water, construction materials, medicines, jobs, recycling of nutrients, mitigate floods, etc.
25. A

Part C

1. A
2. A
3. B
4. A
5. E
6. B
7. C
8. Approx. 40 to 42%
9. Approx. 42-38 = 4%
10. Examples may include: mating, sleeping, parenting, etc.
11. A
12. They will go exinct or migrate to a cooler climate.
13. B
14. Biological diversity (14-16 order doesn't matter)
15. Ecological integrity
16. Ecological health
17. E
18. B
19. Hot

Possible answers for 20-22 include provides habitat, more oxygen is produced, provides a reservoir of resources for future use.

Possible answers for 23-25 include it is expensive, it takes a long time to do, it takes space away from other activitites.

Sample Biodiversity Question for Division C

Community A

Species	# of individ.		(pl)	|ln pl|	(pl) |ln pl|
A	59	.59	0.528	.311	
B	12	.12	2.120	.254	
C	11	.11	2.207	.243	
D	10	.10	2.303	.230	
E	5	.05	2.996	.150	
F	3	.03	3.507	.105	
Total	100	1.00		1.293	

NOTE: At least **THREE** questions should be marked as TIE BREAKER questions.

Sample Ecology Regional Exam Division B

Student Name(s) _____
School Name and Number _____ JV? Yes or No _____

Part A- 25 points, 1 point each NOTE- mark tie breaker questions as well

1. _____

2. _____

3. _____

4. _____

5.

6. _____

7. ___

8. ___

9. ___

10. ___

11. ___

12. ___

13. ___

14. ___

15. ___

16.

17. Point total part A _____

18. Point total part B _____

19. ___ Point total part C _____

20. ___

21. ___ EXAM TOTAL SCORE _____

22. ___

23. ___ TIE BREAKER REQUIRED? ___

24. ___ MODIFIED SCORE ____

25. ___

Sample Ecology Regional Exam Division B

Part B- 25 points total, 1 point each

1. ____
2. ____
3. ____
4. ____
5. ____
6. _____
7. _____
8. ____
9. ____
10. ____
11. _____
12. _____
13. _____
14. _____
15. ____
16. ____
17. ____
18. ____
19. ____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____

TOTAL PART B _____

Part C- 25 points total, 1 point each

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8.
9.
10. _____
11. ____
12. _____
13. ____
14. _____
15. _____
16. _____
17. ____
18. ____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____

TOTAL PART C _____