

Human Impact on Ecosystems and Population Dynamics

English Language Arts		Content Area		Grade Level	
	Science	U.S. History	Middle School	High School	

Approximate Time Needed: Two to three weeks

UNIT OVERVIEW		KEY STANDARDS	
<p>How does human activity impact ecosystems and what evidence-based solutions may help mitigate the human impact? In this unit, students address this question by engaging in three common assignments. First, they conduct a lab simulation that demonstrates the various ways human activities impact organisms within an ecosystem. Second, students complete an LDC research paper in the form of a <i>National Geographic</i> article. They are required to research the human impact on biodiversity in regards to either keystone species or invasive species. They analyze and interpret data in order to provide a solution to mitigate the human impact on the given ecosystem. In the article, they provide evidence, clarify their choice, and then draw conclusions/implications. Lastly, the unit culminates with students presenting this information orally to the class using visual aids. It is expected that teachers will scaffold these assignments with additional tasks and resources.</p>		<p>Common Core</p> <ul style="list-style-type: none"> R.CCR.1 R.CCR.2 R.CCR.4 R.CCR.6 R.CCR.10 W.CCR.2 W.CCR.4 W.CCR.5 W.CCR.9 W.CCR.10 	<p>Colorado</p> <p>Life Sciences— Evidence Outcomes</p> <p>2a 2d</p> <p>Kentucky</p> <p>LS2-2 LS2-7</p>
COMMON ASSIGNMENTS		LDC TEACHING TASK	
<ul style="list-style-type: none"> • Population Dynamics Lab Report • LDC Informational Essay • National Geographic Conference Presentation 		<p>Informational analysis: After researching the human impact on biodiversity in regard to either keystone species or invasive species, write a magazine article (in <i>National Geographic</i> style) that analyzes and interprets data, in order to propose a solution to mitigate the impact of removing keystone species from an ecosystem or introducing invasive species into an ecosystem of your choice, providing evidence to clarify your analysis. What conclusion or implications can you draw? A bibliography is required.</p>	
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About the Common Assignment Study

The Common Assignment Study (CAS) represents an effort to strengthen instruction through the integrated development of curriculum, instructional supports, and embedded assessments. Led by teachers in Colorado and Kentucky, CAS produced multiple high-quality instructional units in science, history, and English language arts. As new academic standards and assessments are being adopted across the states, CAS showcases teachers' pivotal role in translating these larger initiatives into rigorous and relevant classroom experiences for their students.

The CAS instructional units—which include classroom activities, assessments, and rubrics for scoring student work—were developed using the Understanding by Design framework. Each unit was strengthened by integrating a Literacy Design Collaborative (LDC) module to help scaffold and support the development of students' content literacy. Over a two-year period, the teachers developed, taught, and revised the units with the support and leadership of The Colorado Education Initiative and The Fund for Transforming Education in Kentucky; the subject matter expertise provided by the Stanford Center for Assessment, Learning and Equity; and the research support of the Center for Assessment. Throughout the study, which was funded by the Bill & Melinda Gates Foundation, Westat provided technical assistance and support and collected student work samples and scores from each unit.

The units contain shared elements (“common assignments”) that were collaboratively developed and used by teachers in both states. However, teachers maintained flexibility and autonomy to tailor the units to meet local needs and make contextualized instructional choices. Teacher-leaders have taken active roles in facilitating the collaborative design process. Teachers have reported that newly developed tools and strategies have better engaged their students and provided them with richer opportunities to demonstrate their understanding of the material. Research for Action has studied the implementation of the CAS units and gathered feedback to improve how districts and schools can use CAS resources to support the integrated use of teacher-developed curricula, instructional supports, and embedded assessments.



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Human Impact on Ecosystems and Population Dynamics Unit Overview

Unit of Study: Human Impact on Ecosystems and Population Dynamics

Content Area	Science	Grade/Course	Biology, Ecology, General Science		
Unit of Study	Human Impact on Ecosystems and Population Dynamics	Semester	Spring		
Calendar Dates Pacing	Two to three weeks	Unit Type	Topical	Skills-based	Thematic

Desired Outcomes

Priority Standards	<p>Common Core State Standards</p> <p>Reading</p> <p>R.CCR.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</p> <p>R.CCR.2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.</p> <p>R.CCR.4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.</p> <p>R.CCR.6: Assess how point of view or purpose shapes the content and style of a text.</p> <p>R.CCR.10: Read and comprehend complex literary and informational texts independently and proficiently.</p> <p>Writing</p> <p>W.CCR.2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>W.CCR.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>W.CCR.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.</p> <p>W.CCR.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.</p> <p>W.CCR.10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p> <hr/> <p>Colorado</p> <p>Life Sciences — Evidence Outcomes</p> <p>2a. Analyze and interpret data about the impact of removing keystone species from an ecosystem or introducing non-native species into an ecosystem (DOK 1-3).</p> <p>2d. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate ecosystem interactions (DOK 1-2).</p>
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Human Impact on Ecosystems and Population Dynamics Unit Overview

	<p>Kentucky (from NGSS)</p> <p>HS Interdependent Relationships in Ecosystems:</p> <p>LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p>			
<p>Transfer</p>	<p><i>Students will be able to independently use their learning to ...</i></p> <ul style="list-style-type: none"> Understand how they fit into their ecosystem (human impact). <p>Cross-Curriculum Transfer</p> <p><i>Students will engage in ...</i></p> <ul style="list-style-type: none"> Mathematics: creating, analyzing, and interpreting various data sources, as well as density calculations. ELA: creating an authentic writing piece that requires research, pre-writing, and editing. Social Studies: analyzing population dynamics. 			
<p>Meaning</p>	<p>Understandings/Big Ideas</p> <p><i>Students will understand ...</i></p> <ul style="list-style-type: none"> How to analyze and interpret data regarding the impact of removing a keystone species from an ecosystem and/or introducing an invasive species into an ecosystem. The importance of population dynamics. How to utilize data to make inferences. 	<p>Essential Questions</p> <p><i>Students will keep considering ...</i></p> <ul style="list-style-type: none"> How can human activity impact ecosystems and population dynamics? What are the impacts of removing species from or introducing species into an ecosystem? 		
<p>Acquisition</p>	<p>Know (Content)</p> <p><i>Students will know ...</i></p> <ul style="list-style-type: none"> About the impacts of keystone and invasive species. About food webs and communities changing over time. About population dynamics. About the impacts of human activities (mining, farming, pollution, deforestation, drilling, resource extraction, population expansion, recreation, climate change). How energy flows through trophic levels. <p>Do (Skills)</p> <p><i>Students will be skilled at ...</i></p> <table border="0" data-bbox="423 1501 1492 1843"> <tr> <td data-bbox="423 1501 971 1843"> <p>Science Practices</p> <ul style="list-style-type: none"> Making predictions based on data and historical evidence. Finding relevant and appropriate data/evidence through various sources (using technology to support this process). Organizing, representing, and analyzing data graphically. Synthesizing information to create conclusions. </td> <td data-bbox="971 1501 1492 1843"> <p>Literacy Skills</p> <ul style="list-style-type: none"> LDC Informative Essay: focusing paper on a particular species, the impact(s) of human activity on that species and solutions for mitigating those effects. <p>Technology</p> <ul style="list-style-type: none"> About the ethical use for technology for research purposes. </td> </tr> </table>		<p>Science Practices</p> <ul style="list-style-type: none"> Making predictions based on data and historical evidence. Finding relevant and appropriate data/evidence through various sources (using technology to support this process). Organizing, representing, and analyzing data graphically. Synthesizing information to create conclusions. 	<p>Literacy Skills</p> <ul style="list-style-type: none"> LDC Informative Essay: focusing paper on a particular species, the impact(s) of human activity on that species and solutions for mitigating those effects. <p>Technology</p> <ul style="list-style-type: none"> About the ethical use for technology for research purposes.
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Human Impact on Ecosystems and Population Dynamics Unit Overview

Acceptable Evidence of Results

Key performance tasks, tests, etc., including LDC task	Evaluative Criteria
<ol style="list-style-type: none">1. Lab Simulation: Human impact on population dynamics.2. LDC Module: After researching human impact on biodiversity in regard to either keystone species or invasive species, write a magazine article (in <i>National Geographic</i> style) that analyzes and interprets data, in order to propose a solution to mitigate the impact of removing keystone species from an ecosystem or introducing invasive species into an ecosystem of your choice, providing evidence to clarify your analysis. What conclusion or implications can you draw? A bibliography is required.3. Culminating National Geographic Conference Presentation: Students will present their LDC research through class presentations with visuals.	<p>Rubrics, including LDC rubric</p> <ol style="list-style-type: none">1. Lab simulation: Points with scoring criteria (available on teacher version of document).2. LDC rubric: Focused on controlling Idea, reading/research, organization, conventions, content understanding, proposing a solution, content vocabulary, and bibliography.3. Presentation: Rubric with point conversion.
<p>Supports/Scaffolding</p> <p>How will learning and assessment tasks be scaffolded/supported for ALL students (ELL, special ed, low performing, etc.)?</p> <ol style="list-style-type: none">1. Lab Simulation: All students will engage in the simulation experience. For advanced classes and/or at teacher discretion, class averages of data will be collected and analyzed2. LDC Module: Students will engage in pre-writing activities to help them develop topic focus. There are a variety of reading and writing scaffolds for students available in the module. Students will take ownership of their writing piece by choosing their own keystone/invasive species to research. Students will incorporate prior ecology content knowledge in an effort to describe their species and the human impact on that species. Peer edits and self-assessment will be utilized in the writing process to ensure student progression as writers.3. Culminating National Geographic Conference Presentation: Students will base their presentations on the writing that students produce in the LDC module. Students who struggle with literacy have an alternative method of demonstrating their content understanding in the short oral presentation of their work. Additionally, students will be asked to share a visual representation to aid in the presentation. The presentation and the visual appeal to multiple modalities of the range of learners in the teachers' classrooms.	

Learning Plan

Unit Texts and Materials

Lab Materials

- Plastic cup (optional—for collecting beans)
- String
- Meter sticks/rulers
- Tweezers (optional)
- Four plot markers (skewers)
- Lentils/split peas
- White beans
- Stopwatch
- Calculator

The lab is an outdoor lab and requires sufficient space for student work. Additionally, the lab requires a large amount of beans. Per class (24–30 students), it is suggested that two bags of each bean color are used. Beans may be reused; however, they often disappear or are difficult to collect from the lawn after the lab is finished.

Writing Materials

It is suggested that computer lab/library time be provided for students in order for them to research and complete their paper. It is also suggested that pre-writing activities and peer edits are used to help students create a quality product.

Presentation Materials

For digital presentations, necessary technology is required, such as presentation software (e.g., Prezi, PowerPoint, Keynote, etc.), a screen, and a projector.

Assessment Tasks

Measurable mile markers of student growth (tasks that will get evaluated)

Pre-Assessment

Pre-writing tasks/assignments (this is not a common assessment across the CAS group, but is suggested to help aid in the writing process)

Mid-Assessment

Lab simulation—population dynamics

Summative/unit assessment

LDC Informative Essay

National Geographic Conference presentation

Learning Tasks

The instructional ladder: Sequence of learning activities to prompt and guide student growth. Add pages accordingly.

Class Activities

Teachers will determine additional instructional activities that will best meet the needs of their students to support them with the three identified common tasks for this unit.

Common Assignment 1

Population Dynamics Lab Report

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1. Teacher Materials

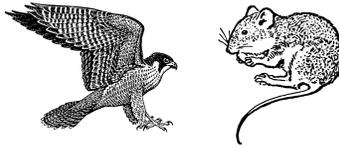
- a. [Analyzing Human Impacts on Population Dynamics—Teacher Instructions](#)

2. Student Materials

- a. [Analyzing Human Impacts on Population Dynamics—Student Instructions](#)



Analyzing Human Impacts on Population Dynamics



Introduction

This lab is designed to give students exposure to the effects that indirect/direct human impact has on biodiversity. Students will be working in groups to investigate the results of different impacts and recording/analyzing data.

Previous Knowledge

Before this lab, the following vocabulary terms should be introduced:

- Biodiversity (species diversity, genetic diversity)
- Keystone species
- Invasive species
- Population density
- Cover (habitat)
- Mitigate
- Predator-prey interaction
- Logistic growth
- Exponential growth

Group Structure

Students should be split into groups no smaller than four, no greater than five.

- Three students will be the mice who are gathering food.
- One to two student(s) will be recording data.

Material Preparation

Each group will need the following:

- Plastic cup (optional—for collecting beans)
- String
- Meter sticks/rulers
- Tweezers (optional)
- Four plot markers (skewers)
- Lentils/split peas
- White beans
- Stopwatch
- Calculator

Before the Lab:

- Prepare plastic bags of colored beans to make material distribution easier.
- Each group will need **one** full bag of beans that has both colors (green and white).
- Although a specific number of beans is not required, **make sure the amount in each bag is plentiful to account for the multiple students who will be gathering food.**



Procedure

- Students will begin by gathering their materials, then measuring a **two-meter by two-meter** plot in the lawn. This area represents their ecosystem and will be marked with the yarn and plot markers provided.
- Beans (of both colors) will be spread throughout the ecosystem. Make sure the beans are distributed through all parts of the plot, not just poured in one particular spot.
- Three team members will gather food (beans) for a full minute for each scenario.
- At the end of the minute, beans will be counted and recorded in the data tables provided. Each scenario has its own data table.
- Once the bean numbers are recorded, the students will use the following food calculations to determine the population numbers for the mice and hawks:
 - a. three beans feed one mouse
 - b. four mice feed one hawk
- Once the calculations are complete, students will sprinkle the collected beans back into the ecosystem. This will happen each time you are finished gathering food to represent reproduction.
- Different interactions occur for each scenario, all of which are caused by direct and indirect human impact. Descriptions are provided in the lab for each event.
 - a. **Scenario 1—Normal conditions:** Nothing changes
 - b. **Scenario 2—Disease introduction:** All the food gathering mice are sick except for one
 - c. **Scenario 3—Invasive species (worm) introduction:** Only green beans can be gathered, the white beans have been eaten by the invasive species.
 - d. **Scenario 4—Predator number increase:** New food calculations based on food availability; worms still present so only green beans can be gathered.
 - e. Six beans feed one mouse
 - f. Two mice feed one hawk
 - g. **Scenario 5 – Land development:** Ecosystem (and therefore the space in which students are allowed to collect food) is decreased in size by half; worms still present so only green beans can be gathered; continue to use food calculations from scenario 4.

Example completed data table:

1	No. of Beans Collected	No. of Mice (3 beans = 1 mouse)	No. of Hawks (4 mice = 1 hawk)	Total No. of Organisms (community)	Area (m ²)	Total Mouse Population Density	Total Hawk Population Density
Group Trial	24	8	2	34	4 m ²	2	0.5

Post Lab Discussion Points

- The range of human impact on population dynamics (both direct and indirect)
- Impact of invasive species
- Food equation for population numbers—accuracy
- Population requirements—how many organisms required for reproduction and growth?
- Bottleneck effect
- Lab error and correction/prevention
- Human mitigation (reducing impact) and unexpected consequences



Grading

Total lab value: 40 points

Pre-Lab Questions

1. **1 point** for hypothesis
2. **1 point** for identification of producers/consumers (all or none)
3. **2 points total** for pyramid
 - a. **1 point** for correct placement in pyramid (based on answer to question 2)
 - b. **1 point** for correct math

Data Analysis

4. **5 points total**
 - a. **1 point** for title
 - b. **1 point each (2 points total)** for each axis label with units and scale
 - c. **1 point** for correctly plotted data
 - d. **1 point** for correct graph (bar graph)
5. **4 points total**
 - a. **2 points** for each justification with data
 - i. **1 point each** for minimal justification
 - ii. **2 points each** for thorough justification
6. **3 points total**
 - a. **1 point** for stating whether hypothesis was accepted/rejected
 - b. **2 points** for justification
 - i. **1 point** for minimal justification
 - ii. **2 point** for thorough justification

Drawing Conclusions

7. **3 points total**
 - a. **1 point** for explanation
 - b. **2 points** for solution
 - i. **1 point** for reasonable solution
 - ii. **2 points** for detailed solution
8. **2 points total**
 - a. **1 point each** for sources of error with explanation

Application

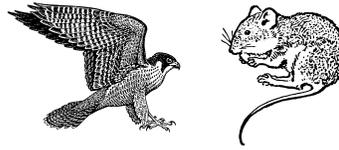
9. **1 point**
10. **1 point**
11. **1 point**
12. **2 points total**
 - a. **1 point** for correct identification
 - b. **1 point** for reasonable justification
13. **4 points total**
 - a. **1 point each** for minimal explanation
 - b. **2 points each** for thorough explanation

Data Tables

- **2 points each—10 points total**
 - **1 point** for a correctly filled in data table
 - **1 point** for accurate units and calculations



Analyzing Human Impacts on Population Dynamics Outdoor Lab Activity—Biology



Introduction

The populations of various organisms in an ecosystem can be impacted both directly and indirectly by human interaction. Four examples of human impact on population dynamics that will be analyzed in this lab include: (1) accidental introduction of disease, (2) accidental introduction of invasive species, (3) changes in predator-prey relationship, and (4) habitat loss.

An ecosystem is home to many species, and within an ecosystem there are various food chains. In this lab, your group will be acting as mice, working to gather food for your mouse population back at the nest. Your population will experience various changes that affect not only your population of mice, but also other organism populations in your area. You will each be given an area that will serve as your ecosystem. Once you have collected food and fed your population, the hawks will feed on your growing population of mice.

For your ecosystem, this is how organisms are fed:

Three beans will feed one mouse
Four mice will feed one hawk

Pre-Lab Questions

1. Based on the introduction given above, develop a hypothesis that explains the relationship of population dynamics to direct/indirect human impact.

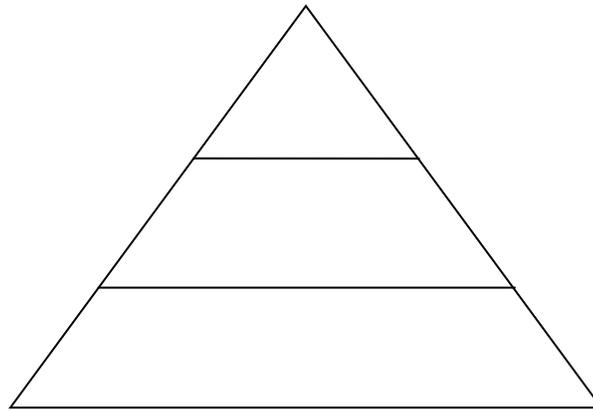
Human Impact on Ecosystems and Population Dynamics: Common Assignment 1

Population Dynamics Lab Report



2. Based on the organisms described in the lab, identify the producers, primary consumers, and secondary consumers.
 - a. **Producers** = _____
 - b. **Primary consumers** = _____
 - c. **Secondary consumers** = _____

3. Using your answers from question 2, start with **1,000 J** at the first trophic level and construct an energy pyramid with the correct energy quantities at each level.



Materials

Each group will need the following:

- Plastic cup
- String
- Meter sticks/rulers
- Four plot markers (skewers)
- Tweezers (optional)
- Lentils/split peas
- White beans
- Stopwatch
- Calculator

Human Impact on Ecosystems and Population Dynamics: Common Assignment 1

Population Dynamics Lab Report



Procedure

Scenario 1—Normal Conditions

- Measure out a **two-meter by two-meter** plot of grass on the lawn. Mark your plot with the yarn provided. This area is your ecosystem!
- Spread your beans throughout your plot of land.
- Three team members will be gathering beans using their hands for **one minute**. Each “mouse” can only pick up **one bean at a time**.
- After one minute is up, count the total number of beans collected and record this number in the data chart below.

1	No. of Beans Collected	No. of Mice (3 beans = 1 mouse)	No. of Hawks (4 mice = 1 hawk)	Total No. of Organisms (community)	Area	Total Mouse Population Density	Total Hawk Population Density
Group Trial							
Class Average							

- Using the number of beans recorded in the data table above, **calculate the number of mice, hawks, and total number of organisms**. When calculating, **round down** to the nearest whole number. Do not worry about population density just yet, you will calculate this later!
- **Sprinkle** the beans back into your ecosystem. This will happen each time you are finished gathering food, thereby representing reproduction of your bean plants each year.

Scenario 2—Disease Conditions

Oh, no! A group of local hikers have recently returned from a cross-country trip and brought back some unexpected hitchhikers on their boots—a fungus that makes many of your mice too sick to gather food for your population. Therefore, **only one mouse is left to do all the collecting**.

- One person in the group will collect beans for another full minute.
- After one minute is up, count the beans collected and record this number in the data chart below. Using this number of beans, calculate the number of mice, hawks, and total number of organisms.
- **Sprinkle** these beans back into your ecosystem.

2	No. of Beans Collected	No. of Mice (3 beans = 1 mouse)	No. of Hawks (4 mice = 1 hawk)	Total No. of Organisms (community)	Area	Total Mouse Population Density	Total Hawk Population Density
Group Trial							
Class Average							

Human Impact on Ecosystems and Population Dynamics: Common Assignment 1

Population Dynamics Lab Report



Scenario 3—Invasive Species Introduction

It seems that your poor mice population cannot catch a break! A truck illegally dumped fill-dirt into your field, completely unaware that the dirt contained a non-native worm species. This particular species begins to feed off the roots of the white beans your population of mice depends upon! Although your sick mice have recovered from the recent fungus outbreak, your food supply is cut short and you can only gather the **green beans** for food.

- **All the group members** who collected food in scenario 1 will **collect only the green beans** for one minute.
- After one minute is up, count the beans collected and record this number in the data chart below. Using this number of beans, calculate the number of mice, hawks, and total number of organisms.
- **Sprinkle** these beans back into your ecosystem.

3	No. of Beans Collected	No. of Mice (3 beans = 1 mouse)	No. of Hawks (4 mice = 1 hawk)	Total No. of Organisms (community)	Area	Total Mouse Population Density	Total Hawk Population Density
Group Trial							
Class Average							

Scenario 4—Predator Increase

A group of people have shown up and cut the grass in your field—you feel so exposed! You can no longer hide from predators in patches of tall grass when you are out collecting food. Consequently, the hawks in the area have taken notice and are increasing in number. As a result of the changing ecosystem, your equations for determining population numbers have changed. Since gathering food is now more difficult, the mice need double the energy/food to survive. Because of less cover, the hawks, on the other hand, require half the energy to hunt and therefore need less food to survive. **Don't forget**, those pesky invasive worms are still eating up your white bean supply. **You must continue to only collect the green beans.**

- **All the group members** who collected food in scenario 1 will collect **only green beans** for one minute.
- After one minute is up, count the beans collected and record this number in the data chart below. Using this number of beans, calculate the number of mice, hawks, and total number of organisms.
- **Sprinkle** these beans back into your ecosystem.



Your **NEW** food totals are as follows:
Six beans will feed one mouse
Two mice will feed one hawk

4	No. of Beans Collected	No. of Mice (6 beans = 1 mouse)	No. of Hawks (2 mice = 1 hawk)	Total No. of Organisms (community)	Area	Total Mouse Population Density	Total Hawk Population Density
Group Trial							
Class Average							

Scenario 5—Land Development

Your population of mice has figured out why those people cut the grass back so far last year – these crazy humans are building an apartment complex in your field! As a result of this habitat loss, the area of your ecosystem has been significantly decreased. Your two-meter by two-meter plot of land is now decreased to one meter by one meter. Again, remember that the worm species is still present in your ecosystem and so you can still **only** collect green beans.

- **All the group members** who collected food in scenario 1 will collect **only green colored beans** for one minute. Make sure to have the young mouse keep time again!
- After one minute is up, count the beans collected and record this number in the data chart below. **Continue to use the food calculations given in scenario 4.**
- Pick up all remaining beans in your plot, clean up the area, and return all supplies to your teacher.

5	No. of Beans Collected	No. of Mice (6 beans = 1 mouse)	No. of Hawks (2 mice = 1 hawk)	Total No. of Organisms (community)	Area	Total Mouse Population Density	Total Hawk Population Density
Group Trial							
Class Average							



Data Analysis

Once you have finished collecting beans across all 5 scenarios, calculate the area for your plot of land and use this number to determine the population density of hawks and mice for your ecosystem.

$$\text{AREA} = \text{length} \times \text{width}$$
$$\text{POPULATION DENSITY} = \text{population}/\text{area}$$

4. Plot the **population density** numbers for **both** hawks and mice across each scenario in the graph provided below. Make sure to include title, axis labels (with proper scale), and units.

5. Pick **two** scenarios and compare the population density data from these two scenarios to that of scenario 1 (normal conditions). Using the data from your graph, **make inferences** about your findings (trends, similarities, differences, etc.).
6. Based on the data, do you accept or reject your initial hypothesis stated in question 1? **Justify your answer.**



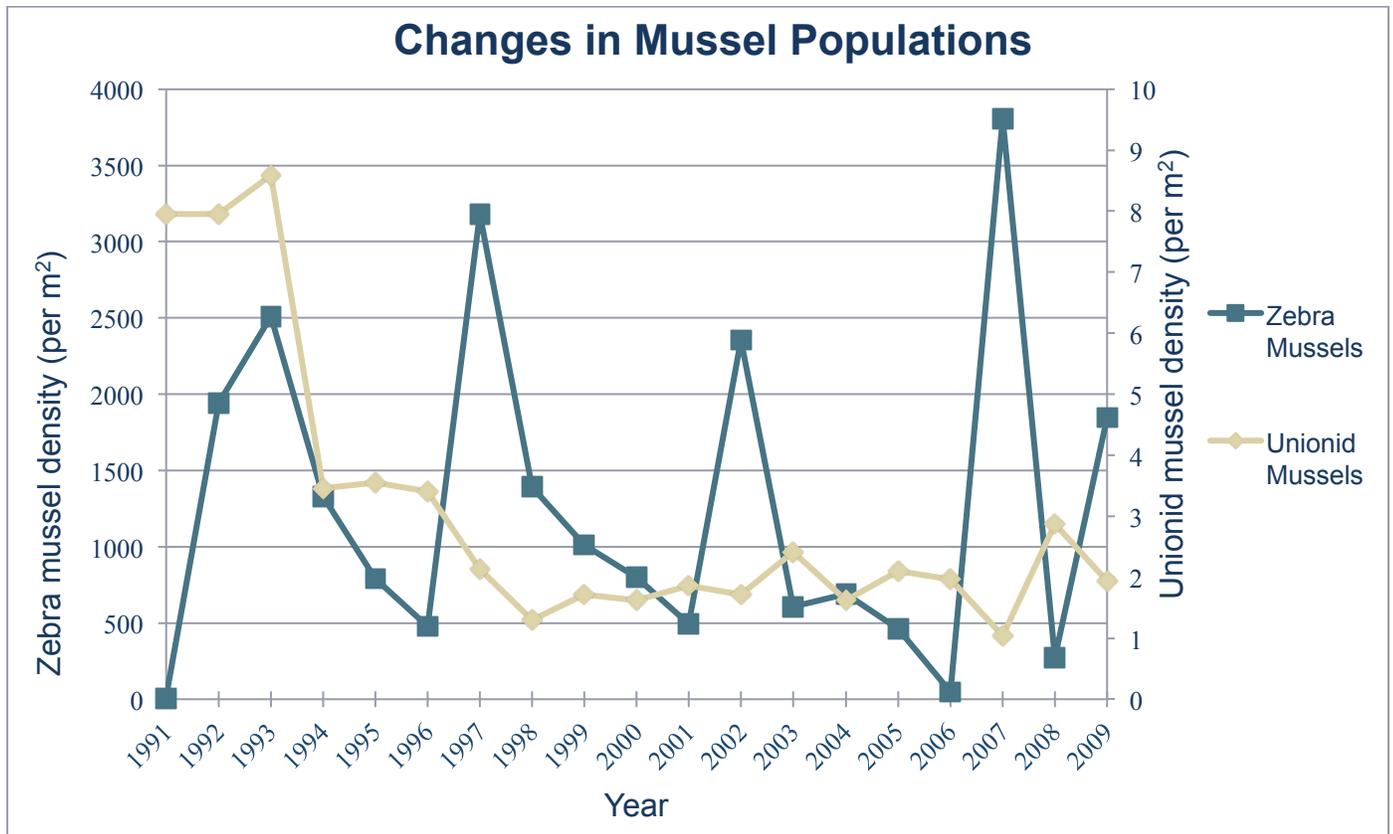
Drawing Conclusions

7. Choose **one** of the human impacts mentioned in the lab and design a solution for reducing or **mitigating** those impacts of human activities. **Explain** how your solution will mitigate the impacts.
8. **Explain** two possible sources of error in the lab procedure **and** the impact of error on your data. (Meaning, what do you think did **NOT** work or was possibly confusing about this lab, and how did it affect your work?)

Application—Apply What You Have Learned!

Using the graph *on the next page*, answer the following questions.

9. Which **species of mussel** was present in this waterway in 1991?
10. What was the **population density** of unionids in 1998?
11. What was the **population density** of the zebra mussels in 1993?
12. Which of these species is the **invasive species**? Use data to **support** your answer.
13. Explain **two** different ways that the invasive species may bring about the decline of the native species.



Data taken from <http://www.caryinstitute.org/educators/teaching-materials/changing-hudson-project/zebra-mussel-invasion-data>, accessed 7/22/2014.



Common Assignment 2

LDC Module

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Human Impact on Ecosystems and Population Dynamics: Common Assignment 2—LDC Module Prompt Rubric

PROMPT: After researching human impact on biodiversity in regard to either keystone species or invasive species, write a magazine article (in *National Geographic* style) that analyzes and interprets data, in order to provide a solution to mitigate the impact of removing keystone species from an ecosystem or introducing invasive species into an ecosystem of your choice, providing evidence to clarify your analysis. What conclusion or implications can you draw? A bibliography is required.

Scoring Elements	Not Yet		Approaches Expectations		Meets Expectations		Advanced
	1	1.5	2	2.5	3	3.5	4
Focus	Attempts to address prompt, but lacks focus or is off-task.		Addresses prompt appropriately, but with a weak or uneven focus.		Addresses prompt appropriately, and maintains a clear, steady focus.		Addresses all aspects of prompt appropriately and maintains a strongly developed focus .
Controlling Idea	Attempts to establish a controlling idea, but lacks a clear purpose.		Establishes a controlling idea with a general purpose.		Establishes a controlling idea with a clear purpose maintained throughout the response.		Establishes a strong controlling idea with a clear purpose maintained throughout the response.
Reading/ Research	Attempts to present information in response to the prompt, but lacks connections or relevance to the purpose of the prompt.		Presents information from reading materials relevant to the purpose of the prompt with minor lapses in accuracy or completeness.		Presents information from reading materials relevant to the prompt with accuracy and sufficient detail.		Accurately presents information relevant to all parts of the prompt with effective selection of sources and details from reading materials.
Development	Attempts to provide details in response to the prompt, including retelling, but lacks sufficient development or relevancy.		Presents appropriate details to support the focus and controlling idea.		Presents appropriate and sufficient details to support the focus and controlling idea.		Presents thorough and detailed information , to strongly support the focus and controlling idea.
Organization	Attempts to organize ideas, but lacks control of structure.		Uses an appropriate organizational structure to address the specific requirements of the prompt, with some lapses in coherence or awkward use of the organizational structure.		Maintains an appropriate organizational structure to address the specific requirements of the prompt.		Maintains an organizational structure that intentionally and effectively enhances the presentation of information as required by the specific prompt.
Conventions	Attempts to demonstrate standard English conventions, but lacks cohesion and control of grammar, usage, and mechanics.		Demonstrates an uneven command of standard English conventions and cohesion. Uses language and tone with some inaccurate, inappropriate, or uneven features.		Demonstrates a command of standard English conventions and cohesion, with few errors. Response includes language and tone appropriate to the audience, purpose, and specific requirements of the prompt.		Demonstrates and maintains a well-developed command of standard English conventions and cohesion, with few errors . Response includes language and tone consistently appropriate to the audience , purpose, and specific requirements of the prompt.
Content Understanding	Attempts to include disciplinary content in explanations, but understanding of content is weak; content is irrelevant, inappropriate, or inaccurate.		Briefly notes disciplinary content relevant to the prompt; shows basic or uneven understanding of content; minor errors in explanation.		Accurately presents disciplinary content relevant to the prompt with sufficient explanations that demonstrate understanding.		Integrates relevant and accurate disciplinary content with thorough explanations that demonstrate in-depth understanding .

Sources in correct format included (2 points)

Total score: /30 points



Biodiversity: End of Term Paper Biology

Prompt

After researching human impact on biodiversity in regard to either **keystone species** or **invasive species**, write a magazine article (in *National Geographic* style) that analyzes and interprets data, in order to **propose a solution** to mitigate the impact of removing keystone species from an ecosystem or introducing invasive species into an ecosystem of your choice, providing evidence to clarify your analysis. What conclusion or implications can you draw? A bibliography is required.

Your Task

Students will:

1. Choose an environment they would like to research in terms of human impacts on biodiversity in regard to **keystone species or invasive species**.
2. Find at least two **reliable** sources of **data-driven** information on this topic. (Wikipedia is **NOT** a reliable source.)
3. Complete **one** of the following: the proposition support outline, thesis generator, outline for a feature article, and/or Question, Claim, Evidence, Explanation (QCEE) form.
4. Write a scientific article addressing the **prompt above**.

Format Requirements

- Typed, double-spaced, 12-point font, Times New Roman font, 1" margins, double spaced
- Three pages **minimum**
- Title page: title of paper, student name, class, teacher name, date
- Separate "works cited" page—**two source minimum**
- Minimum of three in-text citations

Thesis Development

A thesis statement is a sentence or two in your text that contains the focus of your essay and tells your reader what the essay is going to be about. Your thesis statement should state your position on the question/problem that is posed and the reasons behind your stance.

Example

In the Pacific Northwest, sea otters are a very important keystone species that enables the organisms of the environment to live harmoniously together. Removal of the otter population in the area would result in various negative environmental impacts including overpopulation of sea urchins, a kelp shortage, and an overall disruption of the ecosystem.



Works Cited/References

Citations

Your paper **must** have a works cited page, which needs to be **separate** from your actual essay. You are required to use **at least** two sources for this essay and cite them in APA format.

Examples

Book with One Author

- Name of author. (Year of publication). *Title of work: Capital letter also for subtitle*. Location: Publisher.
 - Calfee, R. C. (1991). *APA guide to preparing manuscripts for journal publication*. Washington, DC: American Psychological Association.

Journal Article

- Name of author. (Year of Publication). Title of article. *Journal title*, volume number (issue number), pages.
 - Estrada, E. (2007). Characterization of topological keystone species. *Ecological Complexity*, 4(1–2), 48–57.

Website without author

- Article or website title. (Year, month, date of publication). Retrieved from <URL>.
 - All 33 Chile miners freed in flawless rescue. (2010, October 13). Retrieved from http://www.msnbc.msn.com/id/39625809/ns/world_news-americas/.

Website with author

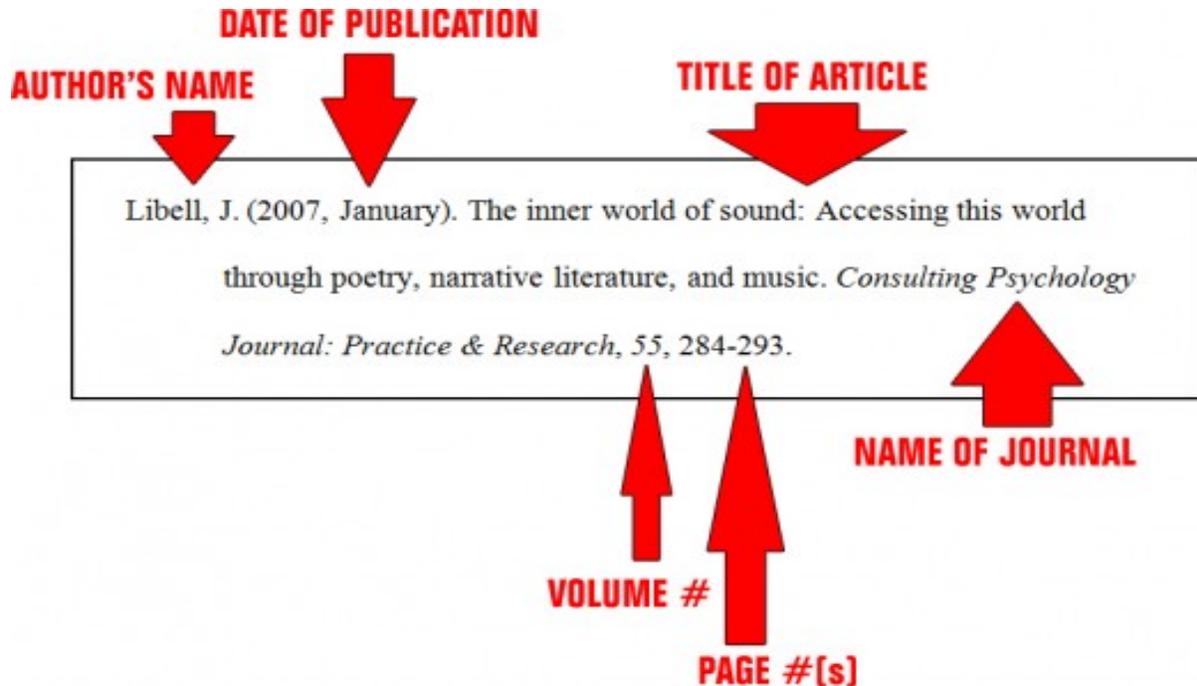
- Name of author. (Year, month, date of publication). *Title of Article*. Retrieved from <URL>.
 - Satalkar, B. (2010, July 15). *Water aerobics*. Retrieved from <http://www.buzzle.com>.

Newspaper Article (Print)

- Name of author. (Year, month, date of publication). Title of Article. *Title of Newspaper*, pp. (pages).
 - Schultz, S. (2005, December 28). Calls made to strengthen state energy policies. *The Country Today*, pp. 1A, 2A.

Newspaper Article (Found on the Internet)

- Name of author. (Year of publication). Title of Article. *Title of Newspaper*, volume (issue). Retrieved from <URL>.
 - Bernstein, M. (2002). 10 Tips on Writing the Living Web. *A List Apart: For People Who Make Websites*, 149. Retrieved from <http://www.alistapart.com/articles/writeliving>.



In-Text Citations

As a writer, it is your job to verify facts as clearly as possible for your readers. A reader should be able to quickly and easily verify anything and everything in your paper. Therefore, if you use a quote from an article, book, etc. or provide a fact, make sure you use an in-text citation to allow the reader to verify and give credit for that information. Per APA format, in-text citations should be formatted as follows:

- a. **Book:** (Author last name, year) → (Schwab, 2013)
- b. **Internet article**
 - i. **with known author:** (Author last name, year) → (Pallow, 2013)
 - ii. **without known author:** (*Title*, year) → (*Solving the Global Warming Crisis*, 2015)

Presentation Guidelines

Please see the National Geographic letter for presentation guidelines.



Proposition/Support Outline

Topic
Proposition
Support
1. Facts
2. Statistics
3. Examples
4. Expert Authority
5. Logic and Reasoning

Originally accessed from the www.iacademy.org.



Thesis Generator

Topic: Compare and contrast the different types of relationships humans have with nature. Include examples from your own experience and the different texts we have read or viewed. After comparing and contrasting, make a claim about what you feel are our rights and responsibilities toward the natural world in general. Provide reasons and evidence to support your claim.

Example

1. Identify the <i>subject</i> of your paper.	Relationships between teenagers and their parents
2. Turn your subject into a guiding question.	How does the relationship between teenagers and their parents change?
3. Answer your question with a statement.	As teens grow more independent, they resent and resist the limitations and expectations their parents impose on them.
4. Refine this statement into a <i>working</i> thesis.	Conflict between teenagers and their parents is a difficult but necessary stage in kids' development.

1. Identify the <i>subject</i> of your paper.
2. Turn your subject into a guiding question.
3. Answer your question with a statement.
4. Refine this statement into a <i>working</i> thesis.



ACE Response System

Answer
What is the article about and the main topic of the reading?
Cite
Give a citation that supports your summary (FATREDS*).
Expand
Give supports for why your citations are significant. Describe, interpret, predict and draw conclusions, make connections.

*FATREDS: Facts, Anecdotes, Testimony, Reasons, Examples, Details, Statistics



Example Outline of a Paper

I. Introduction/Thesis

- a. Tell the reader what an **invasive/keystone** species is, depending on which one you are focusing on.
- b. Give a **brief overview** of your organism and what it does for its environment—your **thesis** statement.
 - i. **For example:** *In the Pacific Northwest, sea otters are a very important keystone species that enables the organisms of the environment to live harmoniously together. Removal of the otter population in the area would result in various negative environmental impacts including overpopulation of sea urchins, a kelp shortage, and an overall disruption of the ecosystem.*

II. Body Paragraph I

- a. Tell the reader all about your organism.
 - i. What is it?
 - ii. Where is it normally found?
 - iii. Scientific name
 - iv. Diet
 - v. Size
 - vi. Coloring
 - vii. Anything interesting about it?
 - viii. Give the **facts** about the organism.

III. Body Paragraph II and III (maybe even IV)

- a. Discuss the reasons why your organism is an invasive/keystone species.
 - i. Give **specifics**.
 - ii. Give **details**.
 - iii. Let the reader know why it's labeled as it is (keystone or invasive).
 - iv. If you are focusing on a **particular location**, tell the reader about that location.
 - v. Tell the reader about the things that the organism has impacted.
 1. **For example:** *The wolves of Yellowstone feed on the elk population.*
 - a. Tell the reader why that's so important. What do elk do to the environment? How might maintaining or decreasing the elk population size be beneficial?
 2. **Another example:** *Jaguars feed on more than 80 different species.*
 - a. Tell the reader why that's important. Tell the reader some things about those species that jaguars feed on.

IV. Body Paragraph IV (or V)

- a. Talk about how **humans** have impacted this species.
 - i. Did we introduce it?
 - ii. Are we overhunting it?
 - iii. Human impacts on the species play a huge role in biodiversity; if we introduced it or are overhunting it, then we are impacting the biodiversity.

Human Impact on Ecosystems and Population Dynamics: Common Assignment 2—LDC Module



V. Body Paragraph V (or VI)

- a. Solutions
 - i. If you are writing about a **keystone** species:
 1. What would happen if we took the species out of its environment?
 2. What could we do to fix the problem of its extinction?
 3. Is it being overhunted? Could we fix that somehow? (Laws, bans, rally, raise awareness, etc.)
 - ii. If it's an **invasive** species:
 1. What can we do to get rid of the species?
 2. What could we do to counteract/mitigate the problems it is causing?
 - iii. This can be **your** unique suggestion of a solution, but it would be good to have a resource to cite—especially if you are suggesting solutions that are already being implemented.

VI. Conclusion

- a. Summarize everything the paper presented.



Example Paper Layout

Jaguars—Keystone Species *(title)*

Jane Smith *(name)*

Biology *(class)*

Ms. Schwab *(teacher)*

May 27, 2014 *(due date)*

Actual Paper

I. Introduction

II. Discussion of organism

III. Discussion of why/how it's an invasive **or** keystone species

IV. Discussion of solution

- **If you are writing about an invasive species**, how could we get rid of it?
- **If you are writing about a keystone species**, how could we protect it?
- **If you are writing about a keystone species**, what could we do if it went extinct?

V. Conclusion

Works Cited

Estrada, E. (2007). Characterization of topological keystone species. *Ecological Complexity*, 4(1–2), 48–57.
Keystone Species. (2014, May 11). Retrieved from <http://education.nationalgeographic.com>.

Example of how to use in-text citations

- If you used the **first** reference, you would cite the source in your paper by putting (Estrada, 2007).
- If you used the **second** reference, you would cite the source in your paper by putting (*Keystone Species*, 2014).



Helpful links for students to use when researching their species of choice

Keystone Species Examples

- <http://examples.yourdictionary.com/examples-of-keystone-species.html> ↗
- <http://animals.about.com/od/animalswildlife101/f/keystonespecies.htm> ↗
- http://education.nationalgeographic.com/education/encyclopedia/keystone-species/?ar_a=1 ↗

Invasive Species Examples

- <http://www.nwf.org/Wildlife/Threats-to-Wildlife/Invasive-Species.aspx> ↗
- <http://www.invasivespeciesinfo.gov/animals/main.shtml> ↗
- <http://science.jrank.org/pages/3669/Invasive-Species-Examples-invasions.html> ↗



Peer Review Checklist

Author's Name: _____ Initial Peer Review Date: _____
Peer Reviewer's Name: _____ Final Self-Check Date: _____

Checklist items	Excellent	Developing	Needs work	Notes
Identifies the keystone/invasive species				
Gives adequate background and factual information on species				
Describes the reason why the species is known as invasive or keystone				
Lists one or more proposed solutions				
Provides adequate conclusion that summarizes paper's main idea				
Uses proper grammar and punctuation throughout				
Uses complete sentences				
Uses three or more in-text citations in APA format				
Uses two or more references formatted in APA format				
Includes title page with: name of paper, student name, class, teacher, and date				



Self-Check

Checklist items	Check
I have focused the paper on either a keystone or invasive species.	
I have given adequate factual information on my species.	
I have adequately described why/how my particular species is invasive or keystone.	
I have proposed one or more solutions to either help the keystone or mitigate the invasive species.	
I have included a suitable conclusion that serves as a summary of my paper.	
I have checked my paper for proper grammar and spelling.	
I have checked my paper for complete sentences and run-on sentences.	
I have included three or more in-text citations in APA format	
All information, thoughts, and quotes that are not my own have been properly cited , thus nothing is plagiarized in this paper.	
I have included two or more references used and formatted in APA format.	
My references are on a separate page.	
I have included a title page with: name of paper, my name, class, teacher, and date.	
My title page is a separate page.	
My paper is three or more pages long.	
My paper is formatted correctly—12-point font, Times New Roman, 1" margins, doubled spaced.	
I have stapled my rough draft to the back of my final paper.	

I affirm that this work is my **own**, I have **not** plagiarized, and this is my **best** work!

Name: _____

Signature: _____

Common Assignment 3

National Geographic Conference Presentation

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Human Impact on Ecosystems and Population Dynamics: Common Assignment 3

National Geographic Conference Presentation Rubric

Presenter: _____

SPEAKING SKILLS

	<i>All elements present</i>	<i>Most elements present</i>	<i>Some elements present</i>	<i>No elements present</i>
Delivery (Presenter doesn't rush; shows enthusiasm; and avoids "like," "um," "kind of," "you know," etc. Uses complete sentences.)	4	3	2	1
Body Language (Presenter keeps head up, does not read, speaks to the whole audience, stands up straight, faces audience, and doesn't fidget.)	4	3	2	1
Volume (Presenter can be easily heard by all. No gum, etc.)	4	3	2	1

CONTENT

	<i>All elements present</i>	<i>Most elements present</i>	<i>Some elements present</i>	<i>No elements present</i>
Introduction Presentation begins with a clear focus/thesis.	4	3	2	1
Topic Development				
a. Presentation includes all elements: description of ecosystem, description of species, human impacts, and proposed solution.	4	3	2	1
b. Presentation is clearly organized. Material is logically sequenced, related to thesis, and not repetitive.	4	3	2	1
c. Presentation shows full grasp and understanding of the material using supporting evidence.	4	3	2	1
d. Presenter makes connections using the visual aid, including formatting, graphics, and/or multimedia to aid in comprehension.	4	3	2	1
Conclusion				
a. Presentation highlights key ideas and concludes with a strong final statement.	4	3	2	1
b. Presenter fields questions easily.	4	3	2	1

Total Points = _____/40

Modified from www.betterhighschools.org/MidwestSIG/documents/Szachowicz_handout3.pdf



Gary E. Knell
President, CEO



Chris Johns
Editor in Chief

2016 Article Conference

[insert current date here]

Dear Colleagues:

Greetings! The time is upon us—our 2016 National Geographic Article Conference has arrived! National Geographic has the pleasure of inviting you to attend our conference and present your research to fellow colleagues. The conference will be held on [insert date here] at [insert school here].

This year, one article will be chosen and used as our feature article in the July 2016 edition of *National Geographic* magazine. In addition to having his or her article chosen as the feature, the winning author will be awarded a prize. The winner will be chosen based upon both colleague feedback and presentation quality. To better help you prepare for your presentation, please read through the presentation requirements listed below:

- Describe the abiotic and biotic factors of the **ecosystem** on which your article focuses.
- Identify and describe the **keystone species** or **invasive species** on which your article focuses.
- Describe the **human impacts** and their connection to the keystone/invasive species discussed in your article.
- Present the **proposed solution(s)** researched in your article.
 - If you are writing about an invasive species, how could we get rid of it?
 - If you are writing about a keystone species, how could we protect it?
 - If you are writing about a keystone species, what could we do if it went extinct?
- Provide a **required visual** (graph, PowerPoint, map, etc.).

Your presentation is required to be **three to five minutes in length**. Your presentation skills—eye contact, voice volume, etc.—will be evaluated in the presentation.

We look forward to your attendance at our most prestigious conference and wish you the best of luck on your presentation.

Sincerely,

[insert your name here]
Conference Manager