Special place assignments: connecting ecological concepts to each student's unique locale through scaffolded portfolio assignments.

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The Augustana Campus of the University of Alberta is located at くしてっしゃ ブウィー (asiniskaw sipisis - Stoney Creek) in Treaty 6 territory. This territory provided a travelling route and home to the Maskwacis Nêhiyawak, Niitsitapi, Nakoda, and Tsuut'ina Nations, the Métis, and other Indigenous peoples.

Introduction

- Many ecology courses include standard forms of assessment: midterms, final exam, lab assignments.
- In introductory ecology courses and those that build on them, learning objectives focus on describing & explaining how abiotic and biotic environmental factors interact to contribute to the ecological properties (structure) and processes (function) that are observed from the scale of an individual organism up to a biome.
- We have developed two 'special place' portfolio assignments to help students achieve these learning objectives; these assignments provide undergraduate biology students with opportunities throughout the semester to make linkages between course topics and a physical place that has unique value for them.
- Scaffolded learning opportunities culminate in creation of a final portfolio document that applies the ecological concepts that students have learned to interactions within each of their special places.
- Our goal with these assignments is that by anchoring concepts and ideas to a special physical place, our students can more meaningfully comprehend the importance and relevance of the information they learn about.

Overview of Assignments

BACKGROUND

- Humans are inherently connected to the environment; in these assignment, students have opportunities throughout the semester to make linkages between course topics and a physical place with unique value for them.
- Culminates in a final portfolio document that applies the ecological concepts that students have learned to interactions within their special place.

PICK YOUR SPECIAL PLACE

- Students select a place of special significance to them:
- At the scale of an individual ecosystem: "Picture yourself sitting/standing in the physical space and envisioning what you could observe from your position there".
- Responses vary from their own backyard (which can be on another continent), to a summer camp or cabin, a park, or to a place they have visited during a trip.
- As instructors, it is always fun to see the diverse locations they pick and why they are special to our students, and we get to learn about new areas too. It is more fun grading these assignments than midterms and exams (although we still do these too)!

INTRODUCTORY ECOLOGY ASSIGNMENT

Introductory ecology course students respond to a series of prompts/questions for each ecological concept (topic) we cover in class. Samples for several topics are provided here:

Introduction to Ecology

- Provide a photo and a map showing geographic location of your special place.
- Describe why you picked this location as your favourite place.
- Describe an example of an ecological question that could be asked and studied at each of thes three levels of ecology: i) autoecology, ii) population, and iii) community.

- Identify an i) animal and 2) plant species that you would expect to find in your special place
- (these are also used for other topic questions) provide common and scientific names.
- List what types of thermoregulation both your plant and animal use (e.g., poikilothermic ectotherm, etc.). Provide a citation to support your choice.

- For both the plant and animal species that you identified in your special place:
- What distribution pattern would you expect it to have at the local scale provide rationale for your choice.

ADVANCED ECOLOGY ASSIGNMENT

- Students submit a portfolio entry for 4 of the 8 course topics along with a final reflective paragraph. Each topic portfolio entry is 2-3 paragraphs in length and includes:
- Key learnings from the topic materials (both lecture and discussion portions),
- An explanation of how you envision the material is linked/relevant to your special place,
- A proposed research question that you could attempt to answer in your special place, • An explanation of how (at least) one of the discussion articles of the topic is relevant to
- The final reflection considers the following questions:
- How did the portfolio increase your knowledge about these topics in ecology?

your special place (please provide in-text citation and reference page for each entry).

- Why did you pick these four topics to focus on?
- What topics did you learn the most from?
- Were there any topics that you really struggled with in your portfolio? If so why?
- What made some topics easy and others more difficult for you to answer?
- By the end of this portfolio assignment, students should be able to articulate how each of the four topics that they selected can be applied in the context of their special place.

Connecting students' learning to their own special places can provide an engaging way to reinforce ecological concepts















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Sample Portfolio Components



"7T Stables is my favourite place as it is where I go to do what I love most, spend time with my horse Cash. During the summer I spend hours here enjoying the peaceful quiet, riding

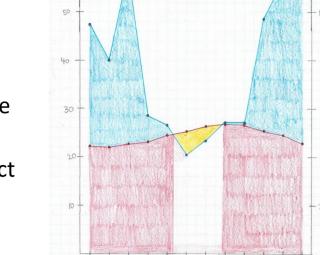
through the trails and spending time in the field just enjoying the day. I also chose this as my favourite place due to the beautiful landscape with rolling fields and areas with patches of trees with trails running through. The stable is my favourite place to go to enjoy both the landscape and time with my favourite animal."

ntro Ecology: Research Questions & Climate Diagrar

Why is it your favorite place?



- Autoecology: How do high rates of sunlight affect Avrainvillea amadelpha algae growth in aquatic environments of Kauai?
- Population: What effect does boat traffic have on the distribution of Mahi Mahi populations of Kauai? Community: How do fishing rates of Mahi Mahi affect the juvenile yellow fin tuna population during high tourism seasons in Kauai?



Advanced Ecology Snippet: Predation

..."While I was in Kauai, I noticed plenty of birds walking around the resort and scrounging for food. It would be interesting to examine how feral cats would influence those birds, considering they have overlapping habitats in this situation. A possible research question for predation would be, how are native birds of Kauai influenced by nonconsumptive effects from predatory feral cats? These invasive cats connect to what we learned in class, where predator-induced stress can negatively influence the stability of prey populations, possibly reducing the clutch size in birds (Clinchy et al. 2013). The protection of bird species is important to the ecosystem of Kauai, because of their intrinsic and functional value as insectivores, which maintain the insect population. Interestingly, feral cats are one of the major causes of extinction in modern birds, so examining their effect in my special place would help expose the consequences of high cat populations on island biodiversity (Doherty et al. 2016)."

Intro Ecology: Population Survivorship



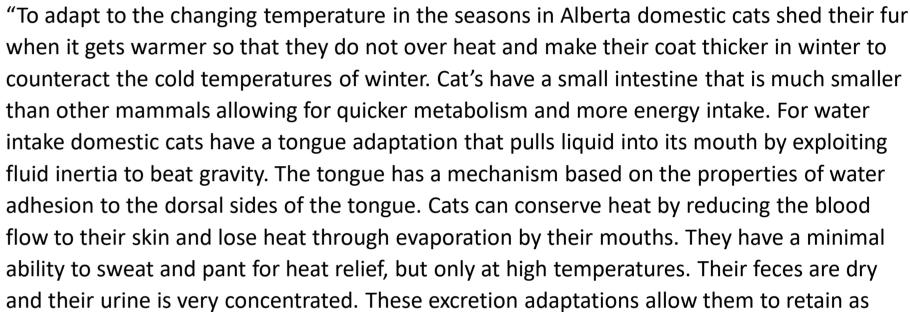
"Ermine (Mustela erminea) . Type 2 Survivorship Curve. The Ermine would likely display a type two survivorship curve. The ermine's kits are independent after 3 months and have a high chance of survival due to the mother caring for and teaching the kits how to hunt. While having a life span of up to

6-7 years, the majority of individuals do not survive past the age of 2. The most common cause of this is due to predation, the ermine's small size makes them an easy prey for most larger carnivores. However, they are very rarely targeted by as they are very aggressive and agile."

Intro Ecology: Temperature & Water Adaptations



Domestic cat (Felis catus)



much water as possible in their environment. Their kidneys are also very efficient."

Intro Ecology: Energy and Nutrient Cycling



- Northern Pike (Esox lucius) As a predator that can hunt and eat other smaller predators the Northern Pike's trophic
- level is that of a secondary predator; as a predator it is a heterotroph. The Pike as juveniles feed on zooplankton, aquatic insect larvae and small fishes, the adults feed on preferably fish about 1/3 of their size such as Yellow Perch but is an opportunistic hunter and will eat almost anything it can catch such as leeches, frogs, crayfish, mice, muskrats and ducks.
- The adult Pike is an apex predator, so it is rarely eaten by anything except humans, however the juveniles will be eaten by other fish, birds and mammals.

Lodgepole pine (*Pinus contorta*)

Lodgepole pines use C3 photosynthesis, as they live in a cool to moderate climate and have moderate water levels available to them.

Evaluating Portfolio Elements

Table 1. Sample rubric for topic entries

	0-0.5	0.5-0.65	0.7-0.85	0.9-1.0
		Adequate grasp of the topic.	Good grasp of topic.	Grasp of topic exceeds expectations –
	Weak grasp of topic. Poor	Some connection to the topic	Demonstrates solid connection to	went above and beyond with the level
Topic	connection to topic	questions. Some evidence of	assignment. Answered questions	of information provided. Demonstrates
Content	questions posed. Appears	thoughtful reflection and	with strong evidence of	outstanding connections to the topic
Criteria	no thoughtful reflection or	contributions to incorporating	thoughtful research and	questions. Superior evidence of
	research was done	feedback when completing the	reflection on content and	thoughtful research and reflection on
		assignment.	incorporation of feedback.	content.

Conclusions

- Student feedback suggests they find this to be a useful assignment:
- "Through executing this portfolio, I had to make connections with examples we had not talked about in class. Having to do this enabled me to understand many of the concepts better and in a new light depending on how easily the examples fit the concepts." K. Bartley
- "Connecting the topics to a place that I know well allowed me to vividly picture the dynamics in the communities within my special place." M. Berg
- "Everything from topic one to topic eight all has parts which are interconnected, and it was interesting to see how I could relate each topic to the organisms that I had selected." G. Godziuk
- "Overall, I really enjoyed being able to reflect on the material and it gave me a purpose to review it!" S. Paulgaard • "Overall writing this portfolio was an interesting experience that helped me dive into the
- topic of ecological dynamics more deeply. " J. Sweder By anchoring concepts & ideas to a special place, we think this assignment has the potential to open the door to new ecological ideas & questions that will further student learning.
- We encourage other instructors to adapt this type of novel portfolio assignment to the ecology course that they are teaching.

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