Assessing Science Knowledge that Inextricably Links Core Disciplinary Ideas and Practices

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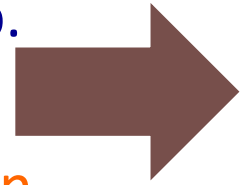
Example of Tri-Dimensional Fused (Inextricably Linked) Knowledge

Core Disciplinary /Crosscutting

Because many animals rely on each other, a change in the number of one species can affect different members of the web.

Practice Students build a complete scientific explanation consisting of a claim, two pieces of evidence and reasoning



Fused Knowledge

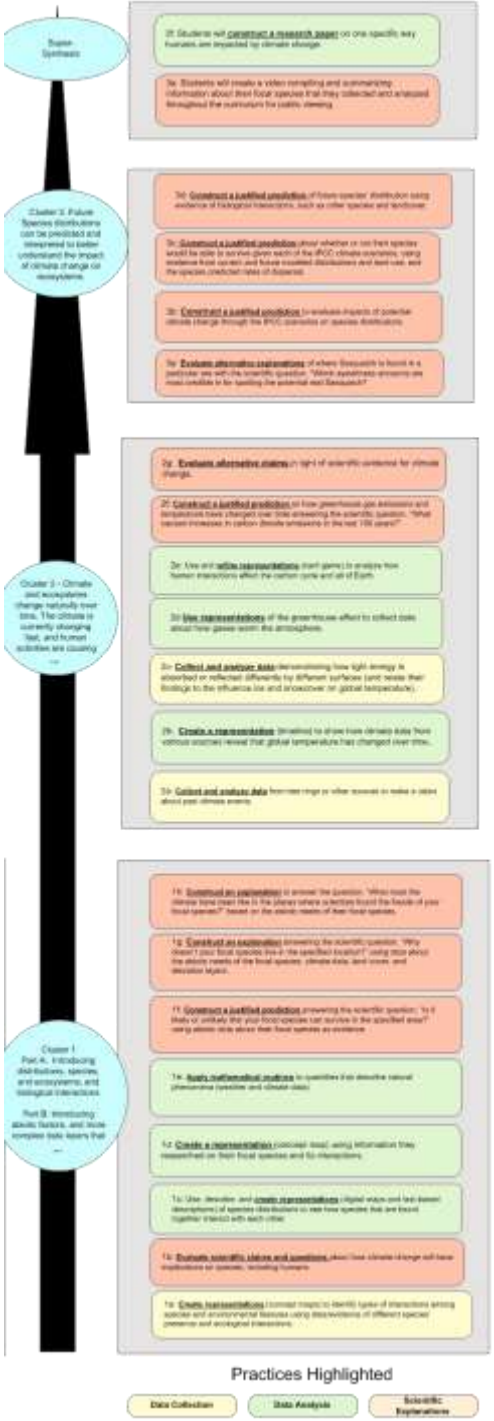
Students construct scientific explanations to address the question, How have recent changes in the Detroit River affected yellow perch populations?

Two Samples of Fused Knowledge from a Learning Progression Focused on Climate Change

Students *construct a scientific explanation* based on evidence about how greenhouse gas emissions and temperature have changed over time.

Students *construct a explanation* to address the question, Is there evidence that climate change will impact the distribution of the Red Squirrel?

Tri-Dimensional Fused Knowledge Learning Progression



Fused Knowledge Learning Goals are the Template for Curricular Units, Assessment, and Instruction

Fused Knowledge 3b. From Learning Progression

3b. Students *construct a explanation* to address the question, Is there evidence that climate change will impact the distribution of the Red Squirrel?

Curricular Activities

Assessment Tasks

Instructional/ Prof. Development Resources

How Do We Design Assessment Tasks Focused on Fused Knowledge ?

Students *construct a explanation* to address the question, Is there evidence that climate change will impact the distribution of the Red Squirrel?

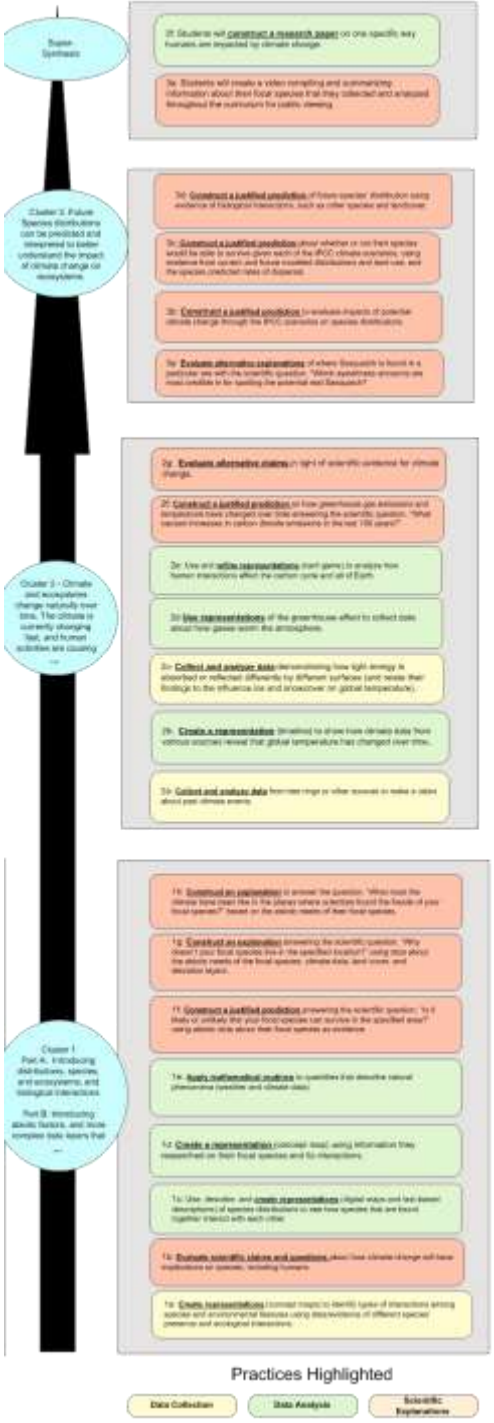
Assessment Task

Summative Assessment >

Embedded Assessment >

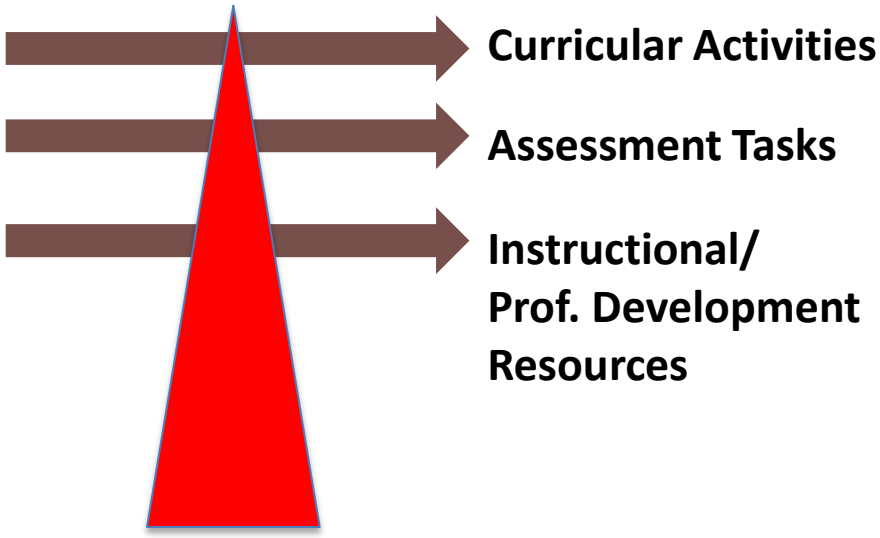
Embedded Assessment >

Embedded Assessment >



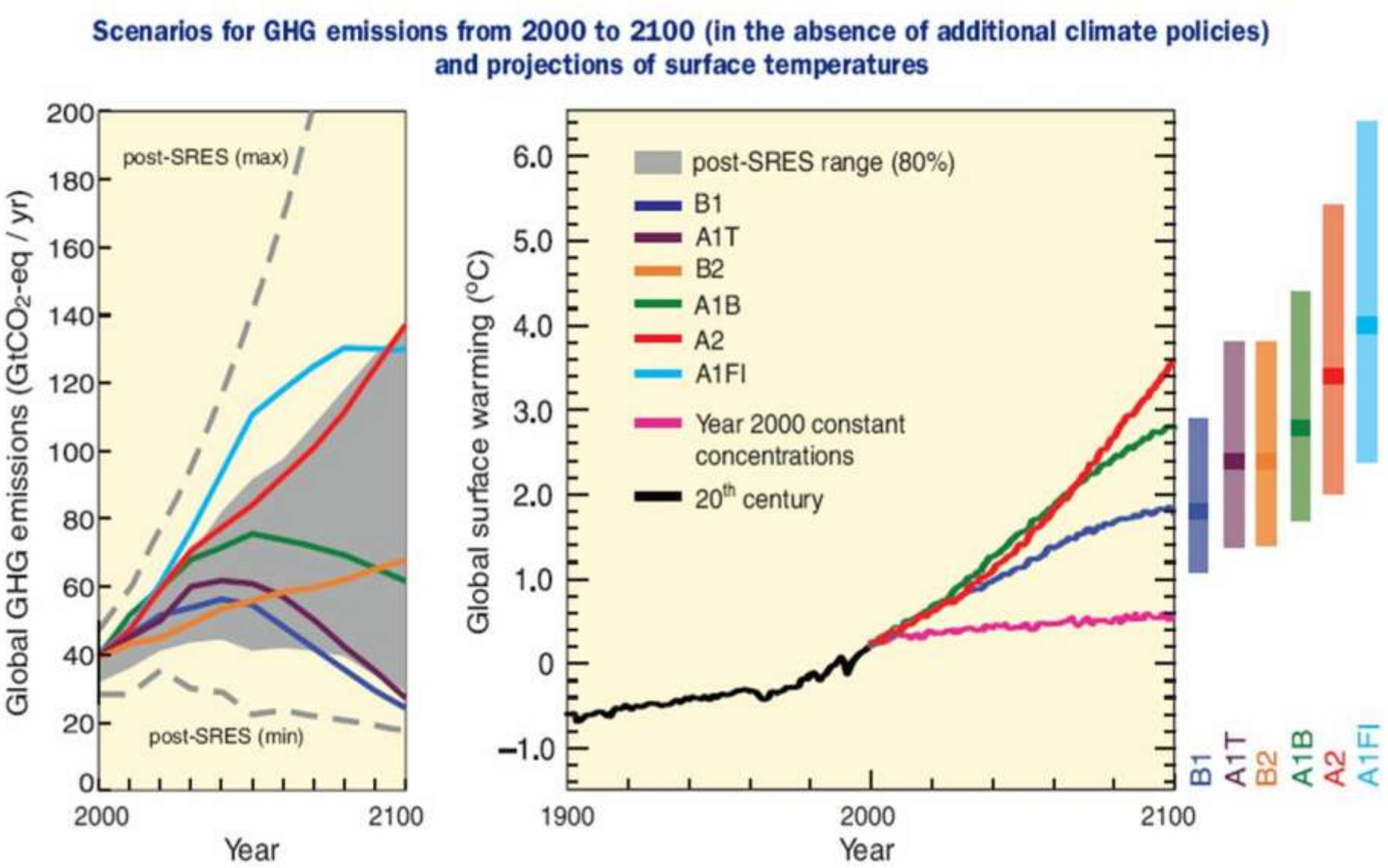
Step One: Cognitive Analysis and Strategic Simplification

Students *construct a explanation* to address the question, Is there evidence that climate change will impact the distribution of the Red Squirrel?

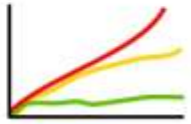


1. Strategic Simplification

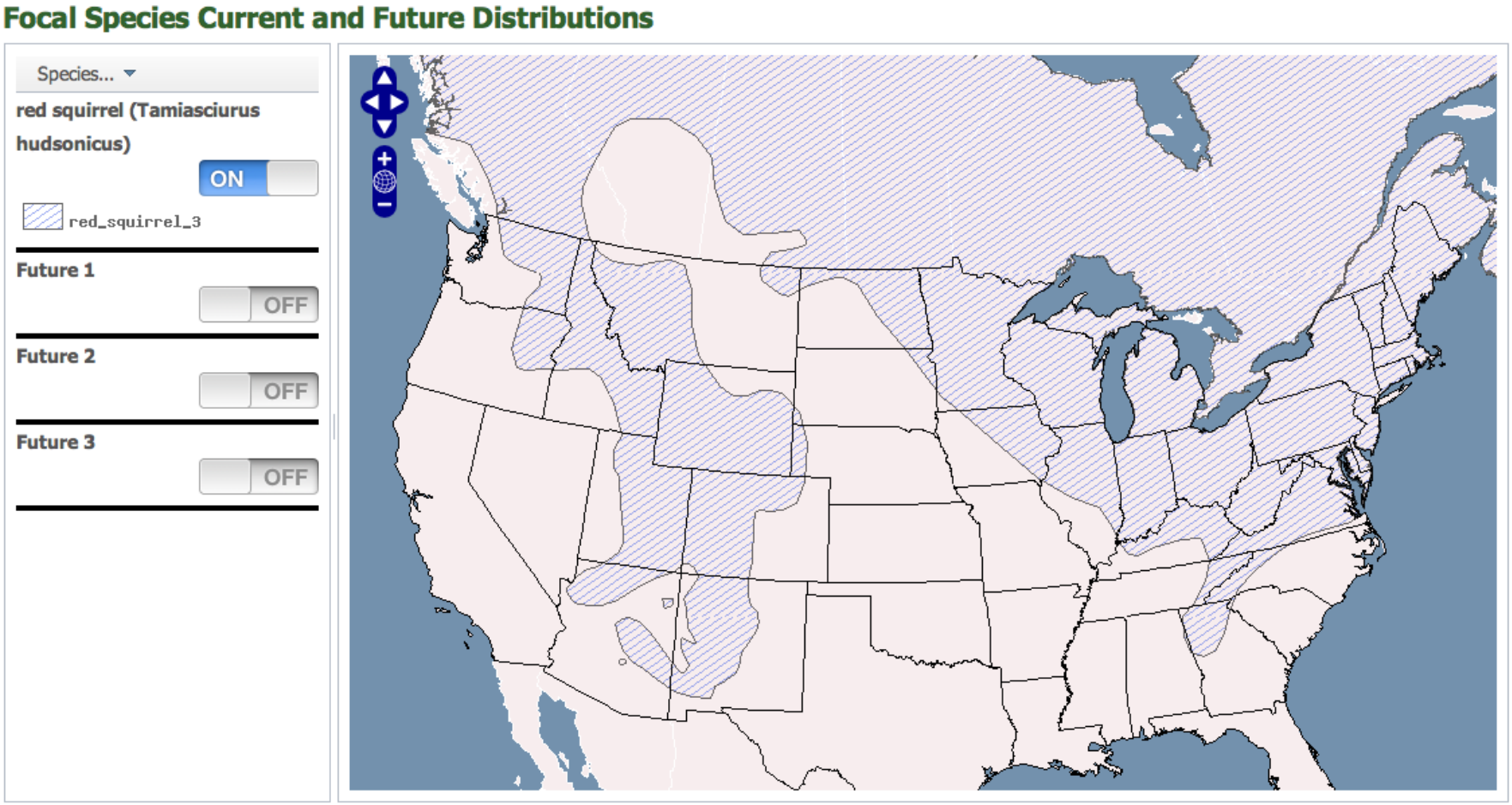
Example:
Intergovernmental Panel on Climate Change (IPCC) Future Scenarios



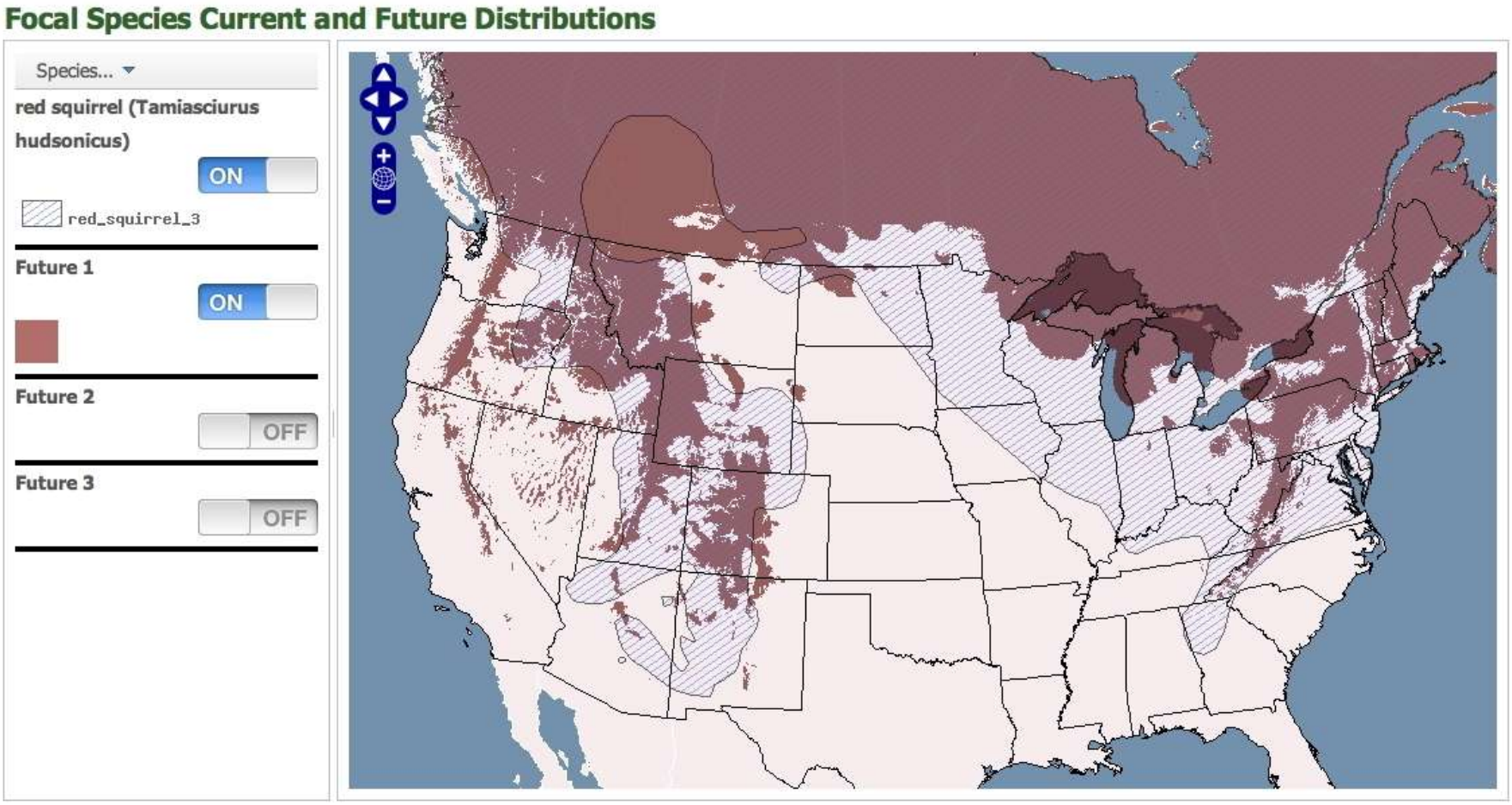
Strategic Simplification of Aspects of (Content) Necessary to Support Students' Ability to Construct Explanation or Prediction

	Population growth rate	Energy use per person	Proportion clean energy	Total CO_2 emissions by 2100 (gigatons)
				
Future 1	Fast	Low	Low	1862
Future 2	Slow	High	High	1499
Future 3	Slow	Low	High	983

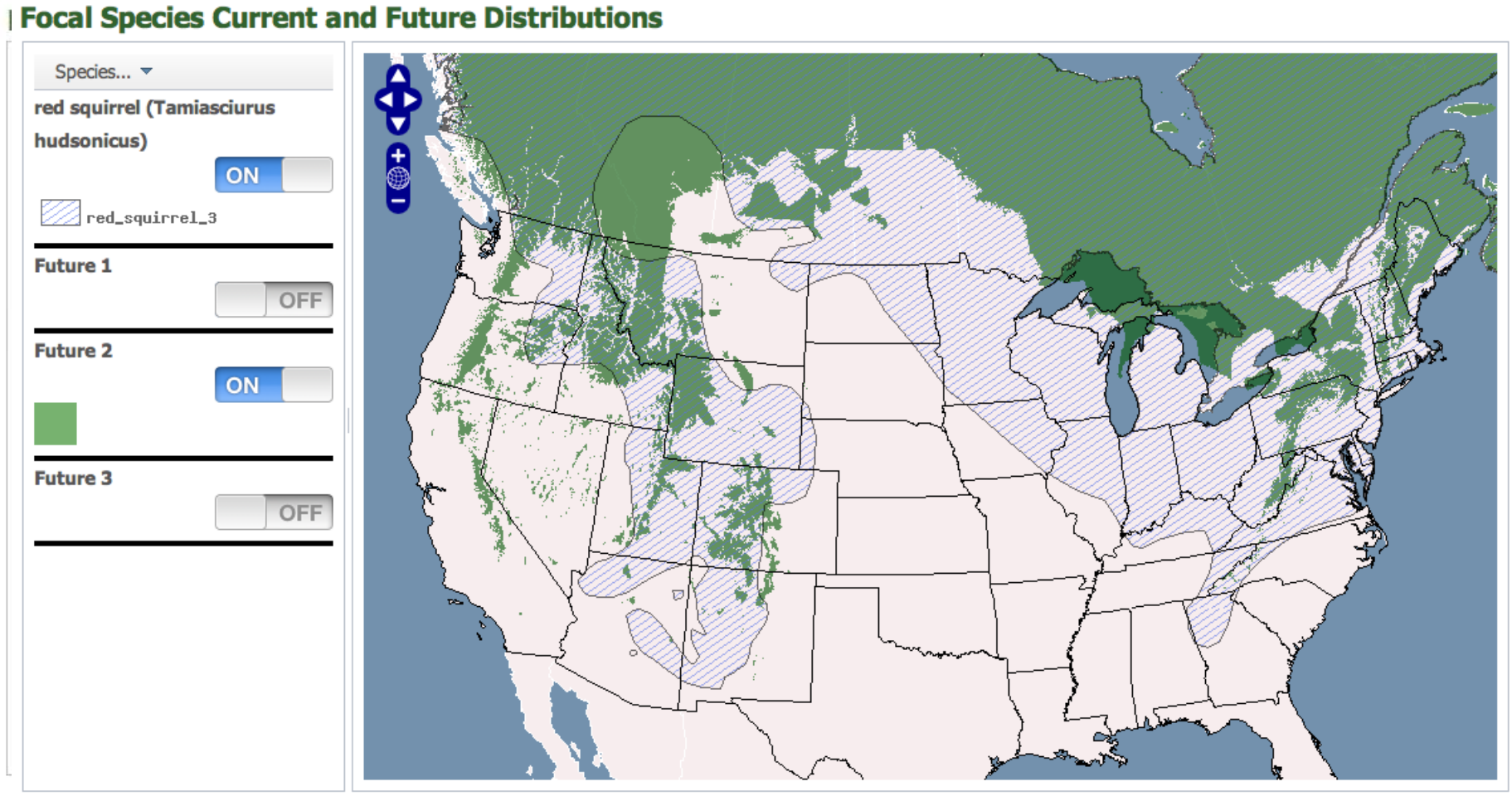
Step 2: Create Stimulus Materials
Current Distribution of the Red Squirrel (real data)



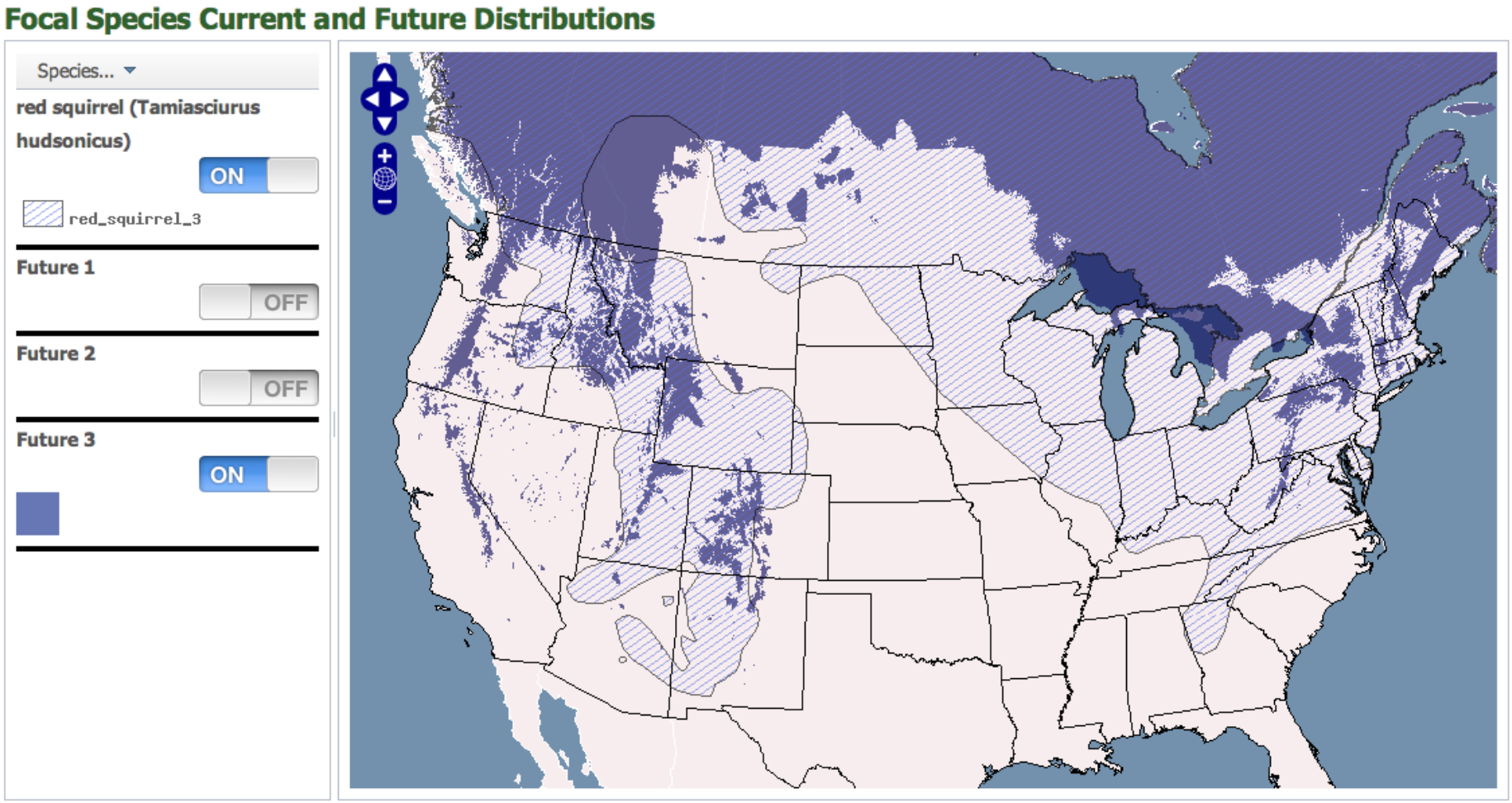
Red Squirrel Distribution Under IPCC Scenario Future 1 (modeled data)



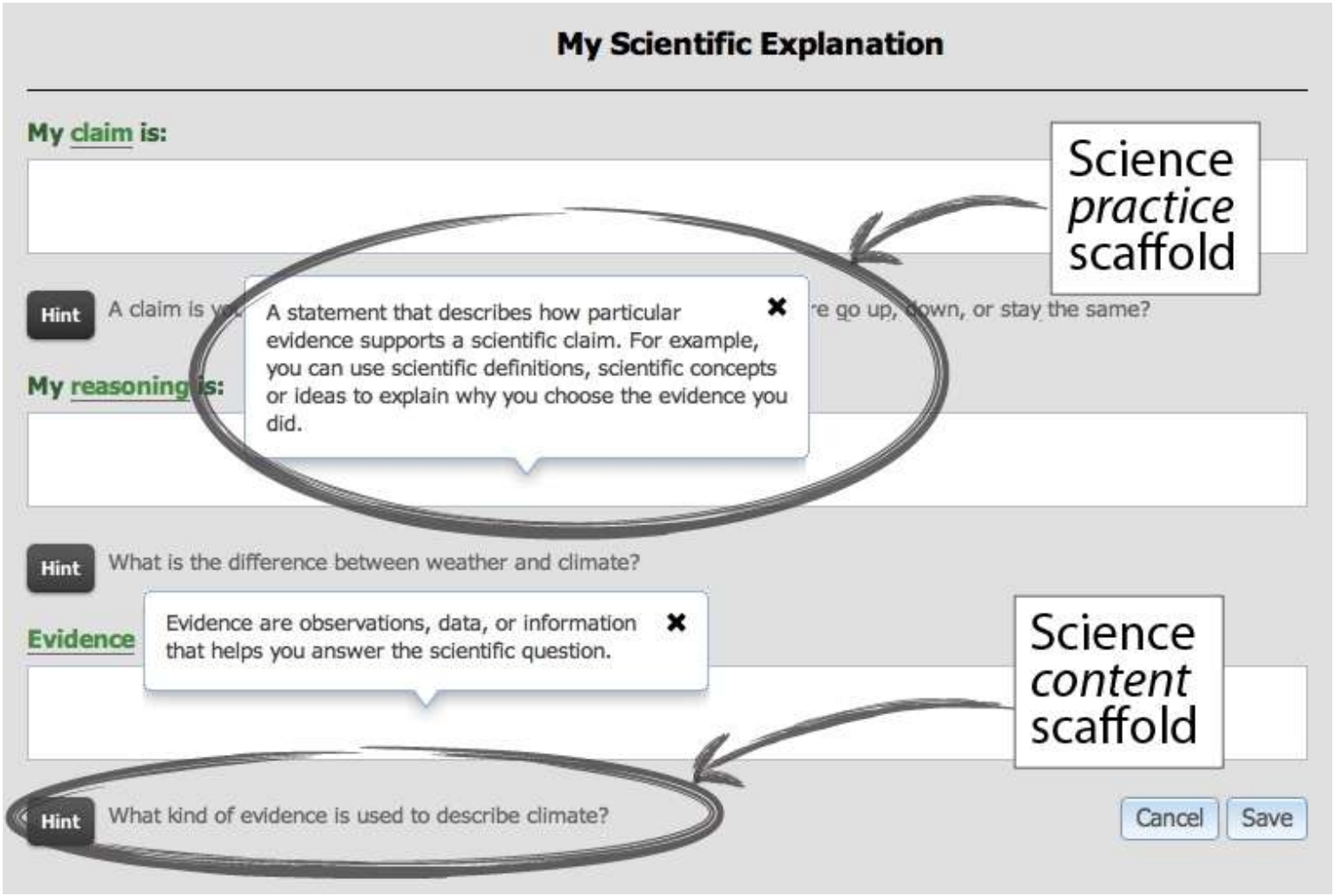
Red Squirrel Distribution Under IPCC Scenario Future 2



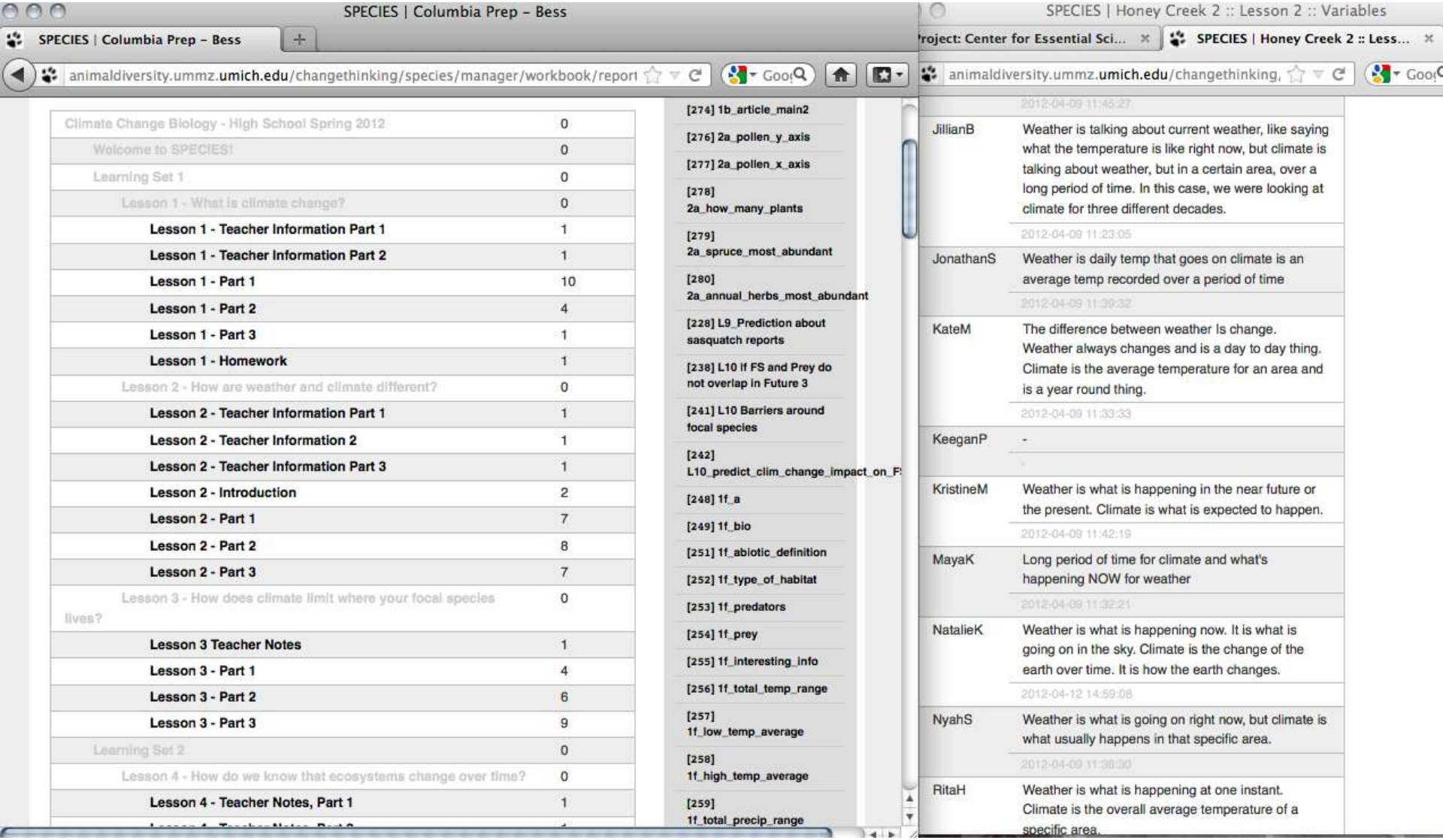
Red Squirrel Distribution Under IPCC Scenario Future 3



Is there evidence that climate change will impact the distribution of the Red Squirrel?



Online Assessment Information Available for Teachers and Students in Real or Near Time



Summary Ideas

1. **Our learning progressions are a series of fused knowledge statements organized into one of several possible sequences**

1. **Our assessment constructs are fused knowledge statements**

1. **Cognitive analysis leading to strategic simplification of some or all of the three dimensions of knowledge is necessary so that target audience can focus on generating fused knowledge**

1. **Our curricular activities and our assessment tasks always focus on fused knowledge even as they variously provide support and fading of support appropriate for target audience**

1. **Assessment items can be coded for either core disciplinary ideas, practices and/or fused knowledge (when appropriate)**