Appendix A: Example Lessons

Fourth-grade erosion and landslide unit (By Valerie Nixon, Crook County Schools)

Summary
A team of fourth-grade teachers developed a landslide and erosion unit that introduces landslide data from HJA, followed by erosion table experiments and development of erosion models. They started by going over long-term sediment and erosion data from HJA and using these data to discuss cause-and-effect relationships with their classes. Students also practiced graphing and interpreting data. For the erosion experiment, teachers engaged their students in developing a model to determine the impact slope had on the amount of erosion that occurred in HJA and at what degree a hill would have total failure. Students looked at the data they collected for this experiment on a graph and then discussed mitigating the problem through the use of boulders.

Standards
NGSS 4- ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
CCSS 4.MD.C.6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

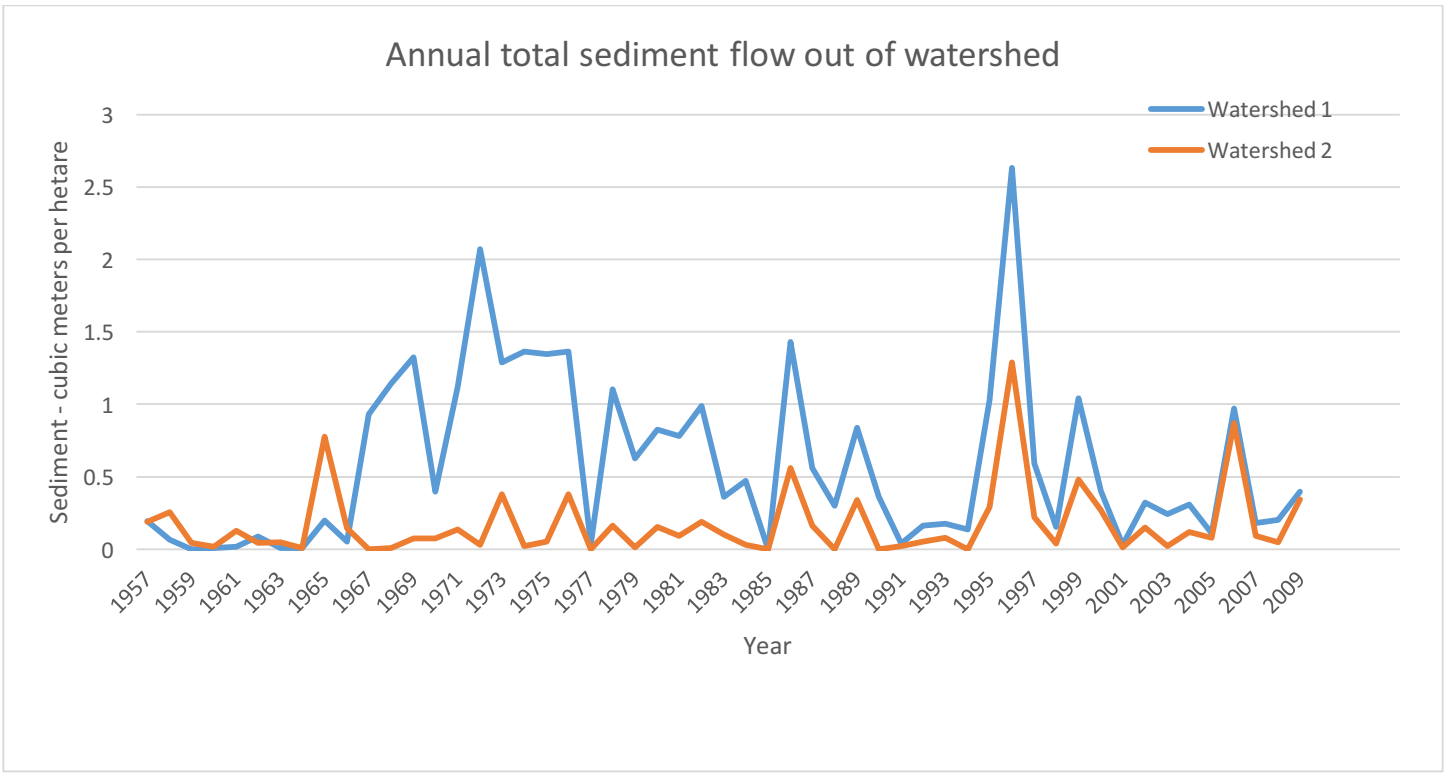
Teacher reflections on the unit

- "Students went from feeling overwhelmed by graphs and tables to at least being able to draw one [or] two conclusions (in general) about the data."
- "We then took the data points [amount of sediment at varying angles with no boulders and then with] and graphed both together. Students had never done this before. But it was great for them to understand how to put the data together and how putting them on the same graph really drove home the point the data collected [represented]—that mitigation with boulders was successful in prevention of erosion."
- "We are in the middle of doing the experiment and one of my high-absentee, not-into-school kiddos shouts and smiles, 'This is the best day I have ever had in school!'"

Associated files
Students working with the landslide model:
https://drive.google.com/file/d/0BwXUSAkF1XyMU3JQdGhyY0V4NkE/view?usp=sharing

Excerpt from student assessment using HJA data

Use the graph below to answer the following questions:



1. What is the title of the *x* axis?

   _____

2. What is the title of the *y* axis?

   _____

3. Write two conclusions you can draw from the graph. Explain your answers.

Interpreting functions (high school algebra by Bryce Withers, Redmond Schools)

Summary
A high school algebra teacher used a data set about when sockeye salmon return to the Columbia River to teach about interpreting functions. An HJA scientist walked him through sense-making of the data and helped him figure out how to present the data set and graph to his students.

Standards
CCSS.Math.Content.HSF.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.
CCSS.Math.Content.HSF.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Teacher reflection on the unit
"I used [sockeye salmon] data, and I didn't narrow it down enough as I should have, which was my mistake … And I give the kids the numbers and then I'm like, 'Okay, that's way too much data to be working with.' And so I think that when I use that later, I'm going to have them narrow it down more…" —High school teacher

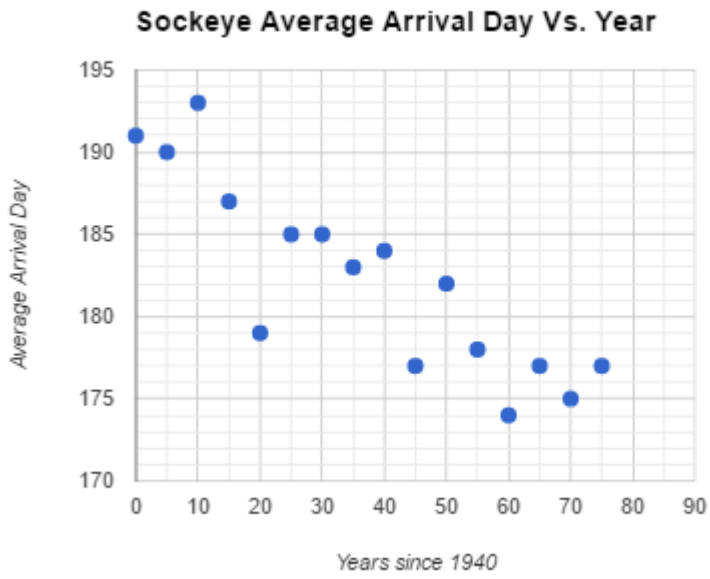
Associated files
After the teacher had worked with the scientist to develop a data set that could highlight a linear relationship, his students were able to tell a contextualized data story rather than simply examining abstract variables.

Contextual problems

Use the sockeye average arrival day graph to answer the following questions.

Year (0 = 1940)	Average arrival day (1 = Jan. 1)
0	191
5	190
10	193
15	187
20	179
25	185
30	185
35	183

40	184
45	177
50	182
55	178
60	174
65	177
70	175
75	177



1. Identify the independent and dependent variables.
    a. Independent variable:

    b. Dependent variable:

2. Is the domain for this function discrete or continuous?
    a. Discrete
    b. Continuous

3. What is the y intercept? _____

4. What is the slope? _____

5. In the context of the problem, what does the following mean in words: y is 175 when x is 70.

6. Find y when $x = 90$.

7. Tell the story of the data in a paragraph and identify any patterns or trends that you recognize.