

Sea Otters and Kelp Lab

mrsajdak.com/otters · Low-write

Sea otters eat sea urchins. Sea urchins eat kelp. Otters never eat kelp.

Name _____

Date _____

Period _____

Part 1. Survey the seafloor (Tab 1)

SEP 5 Using Math · CCC Scale, Proportion, and Quantity

Tap every urchin and every kelp plant in the square. Press **Record this quadrat**. Do two on each island by hand. Then press **Count the rest of this island for me**.

1. Copy your counts.

Quadrat	A urchins	A kelp	B urchins	B kelp
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Total				
Average per m ²				

Example: 10 quadrats add up to 50. Average = $50 \div 10 = 5$ per m². Press **Show averages** to check.

2. How many times as many urchins on Island B?

Example: $40 \div 4 = 10$ times as many.

_____ $\div$ _____ = _____ times as many

3. A 10 m $\times$ 10 m patch = 100 m². Multiply the average by 100.

Island A: _____ urchins Island B: _____ urchins

4. Why count 10 quadrats, not 1? Tick one.

- ☐ One square could be unusual. Ten give a fair average.
- ☐ Divers like to swim far.
- ☐ Ten squares always have more urchins.

5. **Claim:** Otters live around ☐ Island A ☐ Island B

Evidence: Island A has _____ urchins per m².

Island B has _____ urchins per m².

Reasoning: Otters eat urchins, so an island with otters has ☐ more urchins ☐ fewer urchins

Island A was _____ Island. B was _____ Island.

WORD BANK Amchitka · Shemya · Adak

Part 2. Keystone coast (Tab 2)

SEP 2 Using Models · CCC Cause and Effect

Check only what the row says. Pick your prediction in **Predict first**. Press **Skip to the end**. Your runs keeps the numbers at year 50.

6. Circle your prediction first: $\uparrow$ up, $\downarrow$ down, = same. Then write the numbers.

What is checked	Urchins will	Kelp will	Otters /km ²	Urchins /m ²	Kelp %
Otters at the start (only)	$\uparrow$ $\downarrow$ =	$\uparrow$ $\downarrow$ =			
Otters + killer whales	$\uparrow$ $\downarrow$ =	$\uparrow$ $\downarrow$ =			
Otters + fur hunters	$\uparrow$ $\downarrow$ =	$\uparrow$ $\downarrow$ =			
No otters + a few swim in	$\uparrow$ $\downarrow$ =	$\uparrow$ $\downarrow$ =			

7. Use the killer-whale run. Fill the chain from the word bank. **WORD BANK** go up · go down · stay the same

Killer whales eat otters $\rightarrow$ otters _____ $\rightarrow$ urchins _____ $\rightarrow$ kelp _____

CLUE: fewer eaters means more of what they eat.

8. A **keystone species** has a much bigger effect than its numbers suggest. With otters, kelp ends at _____. Without otters, kelp ends at _____. So the otter ☐ is a keystone species ☐ is not a keystone species

9. Fur-hunter run: hunting stops in year 20. By year 50 the otters are at _____ and the kelp is at _____. Tick one.

☐ The kelp came back as fast as the otters.

☐ The kelp is slow to come back. Once a forest is lost, it takes many years to return.

Part 3. California comeback (Tab 3)

SEP 4 Analyzing Data • CCC Stability and Change

Dots = real counts. Red dashed line = **carrying capacity**, the most otters the coast could hold. Pick settings, press **Skip to the end**, read **Average miss**. Smaller miss = better fit.

10. 1938: about _____ otters. 1985: _____. Highest: _____ in _____. 2019: _____

11. Growth rate 10%. "Range can spread" unchecked. Write the numbers.

Settings (growth rate 10%)	Model in 2019	Model in 2040	Average miss
No sharks, no disease			
Disease only			
Shark bites only			
Shark bites + disease			

12. Best fit: ☐ no sharks, no disease ☐ disease only ☐ sharks only ☐ sharks + disease

I know because its average miss is the ☐ smallest ☐ biggest

13. The coast could hold 6,500 otters. The best fit levels off near _____. What holds it below? Tick two.

☐ shark bites ☐ disease from runoff ☐ no room left on the coast ☐ too much kelp

These ☐ add deaths ☐ add births, so the population stays below its carrying capacity.

14. Recovery goal: above 3,090. In 2040 the best fit is at _____. It is

☐ above the goal ☐ about at the goal ☐ far below

To grow more, otters would need fewer _____ or fewer _____.

Wrap it up

SEP 1 Asking Questions • CCC Cause and Effect

15. Build a question in **Your question**. Save it. Copy it here.

Example: How does the amount of kelp affect the number of otters found dead from shark bites?

How does _____

affect _____ ?

16. A classmate says, "California's otters stopped growing because the coast is full." Tick one.

☐ I agree ☐ I disagree

The model levels off near _____, but the coast could hold _____. With no sharks and no disease it reaches _____. So _____

NYSSLs: building toward HS-LS2-1, HS-LS2-2 and HS-LS2-6 (DCI LS2.A; LS2.C). Environmental Science, Chapter 5: Sea Otters Step Up, and Case Study: The Southern Sea Otter. SEP = Science and Engineering Practice, CCC = Crosscutting Concept.