How Sea Otters Can Reduce CO_2 in the Atmosphere: Appetite for Sea Urchins Allows Kelp to Thrive

Text Mark Up Directions:

1. Preview and number the paragraphs.
2. Read once and circle the vocabulary terms- define/synonym in margin.
3. Reread and highlight the main points (per paragraph) and paraphrase in the margin.

Annotations

ScienceDaily (Sep. 7, 2012) — Can an abundance of sea otters help reverse a principal cause of global warming? A new study by two UC Santa Cruz researchers suggest that a thriving sea otter population that keeps sea urchins in check will in turn allow kelp forests to prosper. The spreading kelp can absorb as much as 12 times the amount of CO_2 from the atmosphere than if it were subject to ravenous sea urchins, the study finds.

The theory is outlined in a paper released online September 7, 2012 in *Frontiers in Ecology and the Environment* by lead authors UC Santa Cruz professors Chris Wilmers and James Estes. "It is significant because it shows that animals can have a big influence on the carbon cycle," said Wilmers, assistant professor of environmental studies. Wilmers, Estes, a professor of ecology and evolutionary biology, and their co-authors, combined 40 years of data on otters and kelp bloom from Vancouver Island to the western edge of Alaska's Aleutian Islands. They found that otters "undoubtedly have a strong influence" on the cycle of CO_2 storage.

Comparing kelp density with otters and kelp density without otters, they found that "sea otters have a positive indirect effect on kelp biomass by preying on sea urchins, a kelp grazer." When otters are around, sea urchins hide in crevices and eat kelp scraps. With no otters around, sea urchins graze **voraciously** on living kelp. Kelp is particularly efficient at **sequestering** CO_2 from the atmosphere through photosynthesis. CO_2 concentration in the atmosphere has increased 40 percent since the beginning of the industrial revolution, causing global temperatures to rise, the authors write.

Wilmers and Estes acknowledge that a spreading otter population won't solve the problem of higher CO_2 in the atmosphere but argue that the restoration and protection of otters is an example how managing animal populations can affect ecosystems abilities to sequester carbon. "Right now, all the climate change models and proposed methods of sequestering carbon ignore animals," Wilmers said. "But animals the world over, working in different ways to influence the carbon cycle, might actually have a large impact. "If ecologists can get a better handle on what these impacts are, there might be opportunities for win-win conservation scenarios, whereby animal species are protected or enhanced, and carbon gets sequestered," he said.

Mitigating increased CO_2 in the atmosphere is a pressing issue in global environmental conservation with many obstacles and no easy solutions, the authors

write. They note that markets have been established in Europe and the United States to trade carbon credits and thus inject an economic **incentive** into either reducing CO_2 output or increasing CO_2 sequestration. They estimate that the CO_2 removed from the atmosphere via the otter-kelp link could be worth between $205 million and $408 million on the European Carbon Exchange. "An **alluring** idea," they write, would be to sell the carbon indirectly sequestered by the sea otter protected kelp forest "as a way to pay for their reintroduction and management or to compensate losses to shell fisheries from sea otter predation."

Citation:
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Follow Up Questions:

1. What are sea urchins? What do they do to the kelp?

2. How do sea otters change the behavior of the sea urchins?

3. What is kelp? How does kelp affect the amount of carbon dioxide in the atmosphere?

4. Look up the term sequester. Does the definition fit the way that it is used in paragraph 3? Explain your answer.

5. The central claim of the article is that sea otters can reduce the amount of carbon dioxide in the atmosphere. Do you agree or disagree with that claim? Support with evidence and reasoning from the article.