

# What makes the sea otter a keystone species?



*Sea otter. Photo by Lisa Hupp, U.S. Fish and Wildlife Service.*

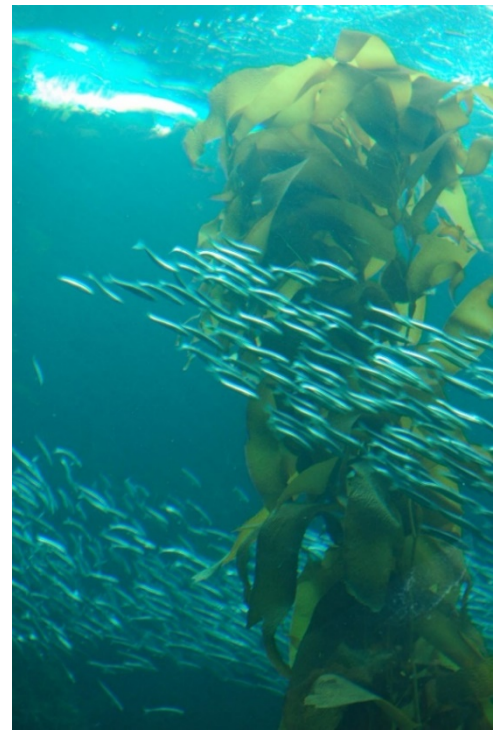
A “keystone” species is a species that has an effect on its environment disproportionate to its abundance -- in other words, just a few individuals can have a big impact. The sea otter is considered a textbook example of a keystone species (e.g., Sadava et al. 2016) because of its role as a predator at the top of multiple “trophic cascades” that result in the creation and maintenance of healthy kelp forests and seagrass beds (Estes and Palmisano 1974; Estes et al. 1978; Hughes et al. 2013).



*Nearshore kelp beds in Oregon. Photo by David Ledig, U.S. Fish and Wildlife Service.*

The sea otter functions as a keystone species in the environment through its role as a top predator in the nearshore marine ecosystem. Sea urchins are a favorite food of the sea otter if they are locally abundant. By preying on sea urchins, a voracious consumer of kelp, sea otters keep urchin populations in check, which allows kelp forests to thrive (Estes and Palmisano 1974). Healthy kelp forests in turn support greater species diversity (rockfishes are one example; Markel and Shurin 2015) and are highly efficient at sequestering carbon, which helps reduce ocean warming and acidification (e.g., Wilmers et al. 2012; Krause-Jensen and Duarte 2016).

Until relatively recently, sea stars helped to control sea urchin populations off the coast of northern California and Oregon despite the absence of otters, but beginning in 2013 sea star wasting disease decimated sea star populations, hitting the sea urchin's primary predator, the sunflower star (*Pycnopodia* spp.), particularly hard. Recent estimates show that areas of northern California have subsequently lost up to 90% of their kelp forests and multiple factors are tipping these ecosystems toward urchin barrens (Rogers-Bennett and Catton 2019). Similarly, [the coast of Oregon has seen an explosion in purple sea urchins](#). In southern Oregon, the Oregon Department of Fish and Wildlife has reported an astonishing [increase in purple sea urchin densities of well over 10,000%](#) in just 5 years (S. Groth, pers. comm. 2021).



*Schools of fish and macroalgae (kelp).  
Photo by Tania Larson, U.S. Geological  
Survey.*



Both kelp forests and seagrass beds have been shown to recover surprisingly quickly when sea otters have been reintroduced (e.g., Hughes et al. 2013; Lee et al. 2016; Burt et al. 2018).

*Urchin barrens result when sea urchins overgraze and locally eliminate kelp beds. National Park Service photo.*

Bringing back sea otters could result in benefits to ecosystem services and local ecotourism, and also have cultural significance for coastal native peoples. But not everyone may see the potential reintroduction of sea otters in a positive light. Those who make their living in commercial fisheries may be apprehensive about competing with sea otters for shellfish resources. Recreational users may worry about the impact sea otters could have on their catch of crab or clams as well. A selection of information and viewpoints on this issue is available in the "For More Information – Research and Perspectives" section below.

*Sea otter eating clam. Photo by Nicole LaRoche, U.S. Geological Survey.*



Carefully laying out all of the potential costs and benefits for consideration will be an important component of the U.S. Fish and Wildlife Service's reintroduction assessment and report back to Congress.



*Kayakers viewing sea otters at Moss Landing in California. Photo by Lilian Carswell, U.S. Fish and Wildlife Service.*

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### **For More Information – Research and Perspectives**

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**Blogs specific to sea otter reintroduction in Oregon from the Geospatial Ecology of Marine Megafauna (GEMM) Lab – Oregon State University, Marine Mammal Institute:**

[Can sea otters help kelp under changing climate?](#)

[Lingering questions on the potential to bring sea otters back to Oregon](#)

[Oregon sea otter reintroduction: opinions, perspectives, and theories](#)