Four Ways (and more) That Salt Marshes Earn Their Keep

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Much like David finds it hard to distill why the oysters that he studies are so intriguing, I often struggle to convey the charisma of the salt marshes and seagrass beds where I spend so much of my time. At least people like to eat oysters! It can be harder for people to find a connection with the plants that form so many of the critical habitats along our coast (unless of course people misunderstand the meaning of "In the Grass" and think I study a VERY different type of plant!). But even if it is not recognized, there is a connection between the salt marsh and our everyday lives. Like oyster reefs, salt marshes provide many benefits to society, particularly along the coast:

1. A place to live (for marine and terrestrial animals)

Even if you're one of those folks who find it hard to get excited about a bunch of plants, don't tune out– the salt marsh is teeming with animals! Snails, fiddler crabs, mussels, grasshoppers, dragonflies, and snakes (!) are all critters that we encounter regularly when the tide is out. And there's always a bit of an adrenaline rush when you see an alligator hauled out nearby. Even better, when the tide comes in, there are lots of animals that you and I (or at least, I) like to eat. Think blue crabs, mullet, and sea trout, for starters. Studies in Florida estimate that marshes provide up to nearly $7000 per acre for recreational fishing alone. Not bad.

Periwinkle snails are among the many animals that make use of the salt marsh habitat.

2. A safer place to live (for people)

Although it's generally frowned upon to build houses in the marsh (since it makes it hard for all those an-imals I just mentioned to live there), it's a great idea to have lots of healthy marshes near your coastal property. Marshes can protect the coastline from waves and storms, leading to less damage in areas with marshes present. One estimate places the dollar value of coastal protection in the U.S. at over $8000 per hectare per year in reduced hurricane damages! Although here's hoping that we don't get an opportunity to test that particular benefit this year.

In addition to reducing the size and strength of waves, marshes also prevent coastal erosion. An unfortunate example of the role of marshes in erosion control came following the Deepwater Horizon oil spill – plants in areas of the marsh that were heavily oiled died, leading to greatly increased rates of erosion in those areas (Silliman et al. 2012). Although the benefit of marshes for reducing erosion and combating sea level rise has been recognized for a long time, there are not any good estimates for what this erosion control is worth in $$. Given expectations of sea level rise in the coming years, I think that the motivation to understand the conditions that lead to sediment accumulation in marshes will only get stronger.

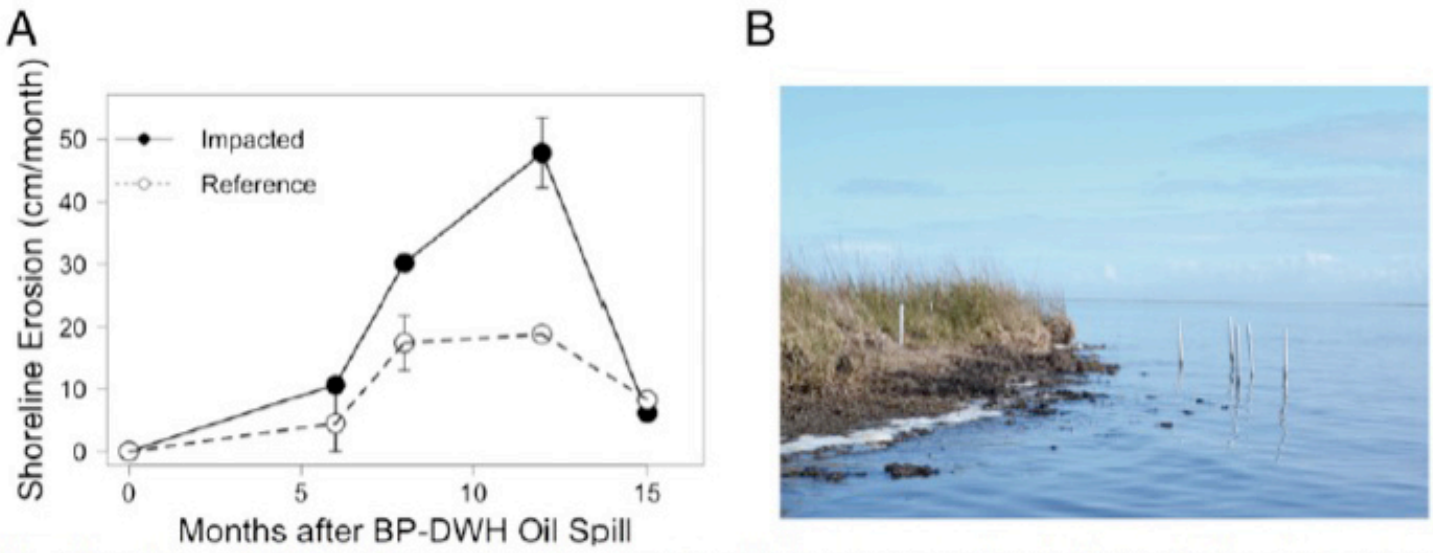

Fig. 4. (*A*) There was a significant increase in average lateral shoreline erosion rate between reference and impacted sites ($P = 0.007$) based on measurements at each site type. Error bars are SEs, and unseen error bars are smaller than symbols. (*B*) Photo of erosion monitoring poles at an impacted site. Right-most PVC poles were installed to mark the marsh platform edge, and retreat of the marsh from this initial starting point is apparent. (*C–F*) Comparison between

3. Clean water (for animals and people)

Because marshes lie at the intersection of the land and the sea, they serve as a filter for things trying to move between the two. When it comes to runoff and pollution from the land, it's a very good thing that they do. Simply having a marsh present can serve as an effective alternative to traditional waste treatment. Of course, the protection can go the other direction too – marshes played a critical role in keeping oil from the Deepwater Horizon oil spill from getting to higher elevations.

4. A place to graze (for livestock)

Support for livestock grazing is an important role of marshes in some areas, including the U.K. Although it's not a benefit commonly associated with marshes in this area, the decaying fence posts that extend out into some areas of St. Joe Bay suggest that it wasn't too long ago that marshes were used for a simi-lar purpose here!

I could go on, but these and other benefits of marshes are described in greater detail in a recent review by Barbier and colleagues (which I referenced on this blog in May of 2011). Here is the table that they put together summarizing the monetary benefits that we derive from intact salt marshes:

TABLE 3. Ecosystem services, processes and functions, important controlling components, examples of values, and human drivers of ecosystem change for salt marshes.

Ecosystem services	Ecosystem processes and functions	Important controlling components	Ecosystem service value examples	Human drivers of ecosystem change
Raw materials and food	generates biological productivity and diversity	vegetation type and density, habitat quality, inundation depth, habitat quality, healthy predator populations	£15.27· ha^{-1}·yr^{-1} net income from livestock grazing, UK (King and Lester 1995)	marsh reclamation, vegetation disturbance, climate change, sea level rise, pollution, altered hydrological regimes, biological invasion
Coastal protection	attenuates and/or dissipates waves	tidal height, wave height and length, water depth in or above canopy, marsh area and width, wind climate, marsh species and density, local geomorphology	US$8236·$ha^{-1}$·$yr^{-1}$ in reduced hurricane damages, USA (Costanza et al. 2008)	
Erosion control	provides sediment stabilization and soil retention in vegetation root structure	sea level rise, tidal stage, coastal geomorphology, subsidence, fluvial sediment deposition and load, marsh grass species and density, distance from sea edge	estimates unavailable	
Water purification	provides nutrient and pollution uptake, as well as retention, particle deposition	marsh grass species and density, marsh quality and area, nutrient and sediment load, water supply and quality, healthy predator populations	US$785–15 000/acre capitalized cost savings over traditional waste treatment, USA (Breaux et al. 1995)†	
Maintenance of fisheries	provides suitable reproductive habitat and nursery grounds, sheltered living space	marsh grass species and density, marsh quality and area, primary productivity, healthy predator populations	US$6471/acre and $981/acre capitalized value for recreational fishing for the east and west coasts, respectively, of Florida, USA (Bell 1997) and $0.19–1.89/acre marginal value product in Gulf Coast blue crab fishery, USA (Freeman 1991)†	
Carbon sequestration	generates biogeochemical activity, sedimentation, biological productivity	marsh grass species and density, sediment type, primary productivity, healthy predator populations	US$30.50·$ha^{-1}$·$yr^{-1}$‡	
Tourism, recreation, education, and research	provides unique and aesthetic landscape, suitable habitat for diverse fauna and flora	marsh grass species and density, habitat quality and area, prey species availability, healthy predator populations	£31.60/person for otter habitat creation and £1.20/person for protecting birds, UK (Birl and Cox 2007)	

† One acre = 0.4 ha.
‡ Based on Chumra et al. (2003) estimate of permanent carbon sequestration by global salt marshes of 2.1 Mg C·ha^{-1}·yr^{-1} and 23 September 2009 Carbon Emission Reduction (CER) price of the European Emission Trading System (ETS) of €12.38/Mg, which was converted to US$2000.

Luckily for us, salt marshes keep working their magic even in the absence of accolades or appreciation. But greater appreciation is needed to help curb the decline of salt marshes around the world – estimated to be as much as 2% per year! We hope that this blog will help generate greater understanding and enthusiasm for the incredible coastal habitats that we are lucky enough to work in every day. Let us know how we're doing!

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