WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

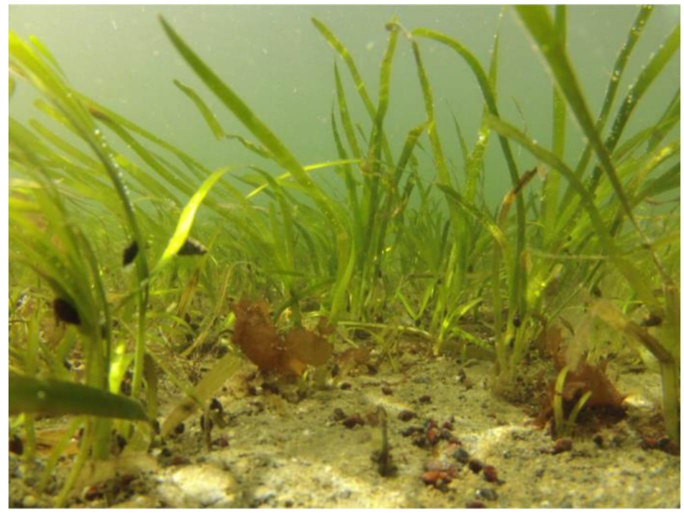
Eelgrass and ocean acidification

Can eelgrass photosynthesis locally counteract ocean acidification?

Our oceans absorb roughly one-third of the carbon dioxide produced by humans, and this absorption is making marine waters more acidic. Eelgrass – like all plants – consumes carbon dioxide during photosynthesis. In 2014, DNR partnered with the University of Washington to test whether eelgrass photosynthesis consumes enough carbon dioxide to increase pH within the meadow and counteract the negative effects of ocean acidification. If so, eelgrass could provide an important tool to protect natural resources from rapid environmental change.

DNR selected five sites in Washington State and identified eelgrass meadows, oyster reefs, and unvegetated areas at each site. To track water movement across these habitats, DNR deployed buoyant 'drifters' to passively follow tidal currents. In kayaks, DNR scientists collected water samples before and after a drifter passed over a given habitat. DNR measured pH and other parameters in the laboratory, and compared before and after samples from each drifter pass to determine rates of change.

DNR used drifters to track water movement.



Eelgrass photosynthesis consumes carbon dioxide.

Why does this matter to DNR?

Ocean acidification poses a serious threat to marine life and to shell-building animals in particular. Shellfish are important to the ecology, culture, and economy of Washington State, and DNR recognizes this importance by investigating practical tools and management strategies to protect shellfish and nearshore ecosystems from acidification.

DNR manages over 2.6 million acres of aquatic lands in Washington State. Eelgrass provide critical habitat for ecologically, commercially, and culturally significant animals such as salmon and forage fish. Understanding how eelgrass affects water quality helps to further provide justification for protecting existing eelgrass meadows.

For more information

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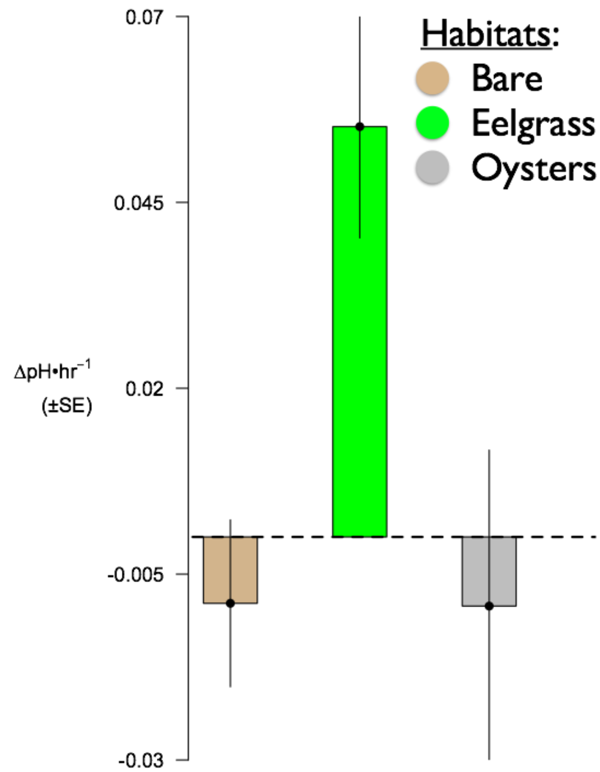
Project Outcomes

On average, water passing over oyster reefs and unvegetated areas showed no change in acidity (pH) or corrosiveness (aragonite saturation state). In contrast, acidity and corrosiveness decreased in water passing over eelgrass.

WDNR found that eelgrass photosynthesis pulls enough carbon dioxide out of nearshore waters to increase local pH. Eelgrass could improve water chemistry for shell-building animals, like oysters and geoduck.



Acidity decreased in water passing over eelgrass, but not over reefs or unvegetated areas.

Future Opportunities

This project demonstrated that eelgrass photosynthesis can have dramatic effects on water chemistry, reducing acidity and corrosiveness in nearshore environments. However, samples were limited to summer daylight hours, when eelgrass photosynthesis is at its peak. WDNR has moved forward with investigations to explore the effects of eelgrass on water chemistry in other seasons and at night, when photosynthesis is reduced or absent. This broader context will help to evaluate the potential of eelgrass as a tool to counteract acidification.

Water passing through an eelgrass meadow.

Project Outputs

Results presented at:

- Pacific Coast Shellfish Growers Association, Vancouver, WA 2014
- NOAA Monster Seminar Jam, Seattle, WA 2014
- Symposium on Shellfish & the Environment, Union, WA 2014
- Washington Ocean Acidification Center Symposium, Seattle, WA 2015

This project produced unanticipated findings on other topics, now published after peer review:

- Ruesink JL, Donoghue CR, Horwith MJ, Lowe AT, Trimble AC, 2019, Comparison of shallow-water seston among biogenic habitats on tidal flats, PeerJ, doi:10.7717/peerj.6116

Project Participants