



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
West Coast Region  
1201 NE Lloyd Blvd, Suite 1100  
Portland OR, 97232

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## **Recommendations to reduce potential adverse effects of shoreline armoring in Puget Sound**

Shoreline armoring constructed or reconstructed within the intertidal zone reduces the availability of nearshore habitat and alters the natural functions of the intertidal zone, adversely affecting salmon and rockfish and their intertidal habitat. This alters and reduces ecosystem functions provided by intertidal zones and may result in adverse effects on ESA-listed species and their designated critical habitat as well as salmon and groundfish Essential Fish Habitat.

1. We recommend that where possible, bulkheads be located above the elevation of Highest Astronomical Tide (HAT). For all new bulkheads, and bulkhead repair or replacement projects, a feasibility assessment of locating the bulkhead above HAT should be completed. The necessity of the bulkhead should also be fully assessed.
2. Where locating the bulkhead above HAT is determined to not be feasible, we recommend an alternate soft-shore armoring option, as described in Washington Department of Fish and Wildlife's Marine Shoreline Design Guidelines (available at: <http://wdfw.wa.gov/publications/01583/>), and that a feasibility assessment be completed.
3. For all projects involving bulkhead construction, repair or replacement, we recommend that appropriate mitigation be implemented to avoid, minimize or offset all potential adverse effects of the project, including short-term construction-related effects and long-term effects related to permanent structures. On-site mitigation options are preferred, but off-site/compensatory mitigation options may be appropriate if suitable opportunities for on-site mitigation are not identified. Off-site mitigation programs should provide similar ecosystem functions to the same species and populations affected by the project. Examples of mitigation options (on-site or off-site) that may be incorporated into the project include (this is not an exhaustive list):
  - Riparian planting with native trees and shrubs adjacent to the impacted shore zone, which should include a long-term monitoring and maintenance/replanting plan.



- Beach nourishment with substrate appropriate to surf smelt and sand lance that may spawn on the beach, which should be provided in perpetuity, with a monitoring and replenishment plan.
  - Removal of artificial structures (e.g. pilings, concrete debris, adjacent bulkheads, etc.) from the nearshore.
4. NMFS provides additional resources at  
<http://www.westcoast.fisheries.noaa.gov/habitat/conservation/index.html> and  
[http://www.westcoast.fisheries.noaa.gov/publications/habitat/fact\\_sheets/nearshore\\_habitat.pdf](http://www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/nearshore_habitat.pdf)

Sincerely,



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