Rip-Rap

Overview

- Rip-rap is an engineered shoreline protection strategy that consists of large rocks and geotextile placed along the shoreline to protect the shoreline slope, bank, channel, or any other area that is subject to wave action induced erosion.
- Rip-rap is used to stabilize shoreline slopes. It also can slow runoff velocities (when compared to impervious or dirt surfaces).
- Rip-rap is useful in a variety of areas where other erosion control practices are not able to stabilize the banks such as:
  - Cut-and-fill slopes
  - Side slopes and bottoms of channels
  - Inflow and outflow areas of culverts, bridges, and storm drains
  - Steep streambanks
- Any erosion control structure being placed directly on the shoreline will require rigorous engineering analysis showing that the structure does not cause harm or increase coastal storm/flooding vulnerability for the surrounding properties.
- Rip-rap should only be used if nature-based solutions are not feasible at the shoreline's location.
- Disadvantages of rip-rap:
  - Potential for increased scour at the toe and at the ends of the rip-rap
  - No habitat enhancement that vegetative practices provide
  - Can be more expensive than nature-based solutions
  - May not be as long-lasting as some nature-based solutions

Key Takeaways

During coastal storms, high-energy waves and high velocity runoff can cause major erosion on multiple types of shorelines. Shoreline erosion can lead to receding and the eventual loss of shoreline.

If the shoreline is destroyed, it no longer offers flood protection for the structures around it.

Installing rip-rap can make shorelines more likely to withstand flooding events and can potentially reduce costs associated with storm damage.

Estimated Costs/Benefits

*U.S. dollars (2022), estimates are subject to change

Potential Costs (residential property)		**Potential Benefits (1,000 sq ft structure)**	
Item	*Estimate*	*Post-Flooding Recovery Action*	*Estimate*
Rip-rap materials and labor	$1,000-$7,000	Rebuild unprotected structure (the original structure was taken off it's foundation or falling into the water)	Cost of new structure + cost of demolition/debris removal
ESTIMATED TOTAL COST	**$1,000-$7,000**	**ESTIMATED TOTAL SAVINGS**	**Cost of new structure + demolition/debris removal**

I-ADAPT

Shoreline Adaptation

Rip-Rap

Photo credit: DNREC

Potential Funding Sources

- Building Resilient Infrastructure and Communities (BRIC)
- FEMA Flood Mitigation Assistance Grant (FMA)

Additional Actions

- Encourage neighbors to also protect their shoreline to help increase shoreline stability.

Expected Maintenance

- Rip-rap must be examined annually and after all major storm events for moved stones, sagging, and edge erosion. If damage is found, repairs must be made immediately.
- Any woody vegetation must be removed from the rip-rap as tree roots can dislodge the rocks.
- Any fallen trees, debris, etc. should be removed from the rip-rap as these obstructions could damage and/or displace the rip-rap.

Additional Resources

- EPA: Stormwater Best Management Practice: Riprap

Resources can also be found at https://de.gov/iadapt

Permitting Agencies

Contacts for permitting requirements include but are not limited to the following:

- Your city and/or county government for local flood ordinances or regulations
- Your city and/or county government for building permits
- DNREC Coastal Construction Permit
- DNREC Wetlands and Subaqueous Lands Permit

Who to Contact

- Shoreline contractor
- Design engineer
- 811 Call Before You Dig

Technical definitions and more information are located on the I-ADAPT website: https://de.gov/iadapt.

This information is intended to be used for planning purposes. It is not intended to substitute or take precedence over the guidance of design engineers, contractors, utility companies or regulatory agencies.

For more information, contact DNREC's Division of Climate, Coastal and Energy at DNREC_IADAPT@Delaware.gov