

Preston Hudlow

GEOG 419

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Proposal for Coastal Erosion Risk Assessment at Pilkey's Folly

1. Overview

Dewey, Seldem, and Howe Inc. (DSH) has requested a coastal erosion risk assessment for Pilkey's Folly, a property near the mouth of the Rappahannock River, Virginia. Atlantis GeoConsultants will conduct a comprehensive hazard analysis, focusing on identifying current erosion threats, forecasting future risks due to sea-level rise and storm surges, and proposing cost-effective, sustainable erosion mitigation strategies.

2. Technical Approach

To effectively assess the shoreline erosion risks and recommend solutions, the following technical approach will be followed:

a. Data Requirements

- **Shoreline Position and Erosion Rates:** Historic shoreline data and topographic maps to determine the current position of the shoreline and estimate erosion rates over time.
- **High-Resolution Aerial and Satellite Imagery:** Access recent and historical imagery to assess shoreline retreat.
- **Bathymetry and Topography Data:** To assess water depths and riverbed slope near Pilkey's Folly. Use NOAA nautical charts and LiDAR data.
- **Wave and Fetch Data:** Wave height, direction, and fetch data from NOAA and other meteorological sources.
- **Sea-Level Rise Projections:** Local and global projections to evaluate long-term risks.
- **Storm Surge Data:** Historical and modeled data to assess potential extreme event impacts.

b. GIS and Analysis Tools

- **Shoreline Change Analysis:** Employ the Digital Shoreline Analysis System (DSAS) tool within ArcGIS.
- **ArcGIS/QGIS** for spatial analysis, shoreline delineation, and erosion rate calculation.
- **Fetch and Wave Modeling:** Use fetch calculation tools to estimate wave energy. integrate wave data from NOAA through Raster Interpolation to create spatial representations of wave height and direction.

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- **Erosion Vulnerability Mapping:** Overlay environmental layers to identify critical erosion zones.
- **Scenario Modeling:** Develop best- and worst-case scenarios for future shoreline position based on projected sea-level rise.

3. Project Deliverables

- **Erosion Risk Maps:** Depicting historic shoreline change, current erosion rates, and future risk projections.
- **Fetch and Wave Impact Maps:** Identifying high-energy areas prone to rapid erosion.
- **Risk Assessment Report:** Summarizing the findings, including sea-level rise impacts, storm surge vulnerability, and areas of concern.
- **Solution Portfolio:** Analysis of three mitigation options:
 - Living shorelines with native vegetation.
 - Hybrid structures combining oyster reefs and low-profile sills.
 - Traditional bulkheading (analyzed for comparison, though less recommended).
- **Cost Analysis:** Estimated costs, maintenance requirements, and ecological impacts for each solution.

4. Budget and Timeline

Estimated Budget:

- Data Procurement and Licensing: \$3,500
- GIS and Spatial Modeling: \$4,500
- Field Verification and Surveys: \$6,000
- Consultation and Reporting: \$4,000
- Presentation Preparation: \$2,000

so few students included this...good esti

Total Budget: \$20,000

Timeline:

- Weeks 1-2: Data collection and preliminary analysis
- Week 3: Field survey and ground-truthing
- Weeks 4-5: GIS analysis, scenario modeling, and draft report development
- Week 6: Final report compilation and presentation delivery

Total Duration: 6 weeks

5. Conclusion This project will provide Mr. Potter and DSH with a scientifically grounded understanding of erosion hazards at Pilkey's Folly, offering data-driven recommendations that balance environmental health, property protection, and cost. By favoring natural and hybrid shoreline stabilization techniques, we aim to enhance resilience against future coastal changes.

Citations:

U.S. Geological Survey, "National Assessment of Shoreline Change," accessed April 2025.)

NOAA, "Sea Level Rise Viewer," National Oceanic and Atmospheric Administration, accessed April 2025.