Flagler County's Coastal Erosion and Management

Comprehensive Report

February 5, 2025

Introduction - Flagler County: Delayed Development of a Beach Management Plan

Beach management is essential to preserving our natural coastal resources, supporting economic development, and maintaining quality of life for residents and visitors. Flagler County, unlike many other coastal communities in Florida, did not initially prioritize the development of a beach management plan due to the gradual and relatively slow loss of its beaches over time. However, this steady erosion was dramatically accelerated by the impacts of Hurricane Matthew in 2016, transforming what had been a manageable issue into a critical challenge.

Reasons for the Delayed Beach Management Plan

1. **Gradual Erosion Over Time:**
    - Prior to Hurricane Matthew, Flagler County experienced a slow, incremental loss of sand and dune systems due to natural erosion processes, including wave action, tides, and seasonal storms.
    - The gradual nature of this erosion made it less visible and less urgent compared to regions experiencing rapid, large-scale coastal degradation.
2. **Limited Immediate Threats:**
    - Before Hurricane Matthew, the county's infrastructure and properties were not as severely threatened by erosion compared to other coastal communities.
    - The dunes and beaches, though eroding slowly, still provided sufficient protection, reducing the perceived need for a formal management plan.
3. **Resource Allocation:**
    - With limited immediate threats, the county focused its resources and attention on other priorities, such as infrastructure development and community services.
    - The absence of major storm events prior to Matthew may have reinforced a sense of complacency about the state of the coastline.

Background: Impacts on Flagler County's Coastline Prior to Hurricane Matthew.

Flagler County's coastline has a long history of erosion and storm impacts predating Hurricane Matthew in 2016. The region’s beaches and dunes, which are vital for protecting coastal communities and ecosystems, have been subject to natural factors contributing to erosion and vulnerability.

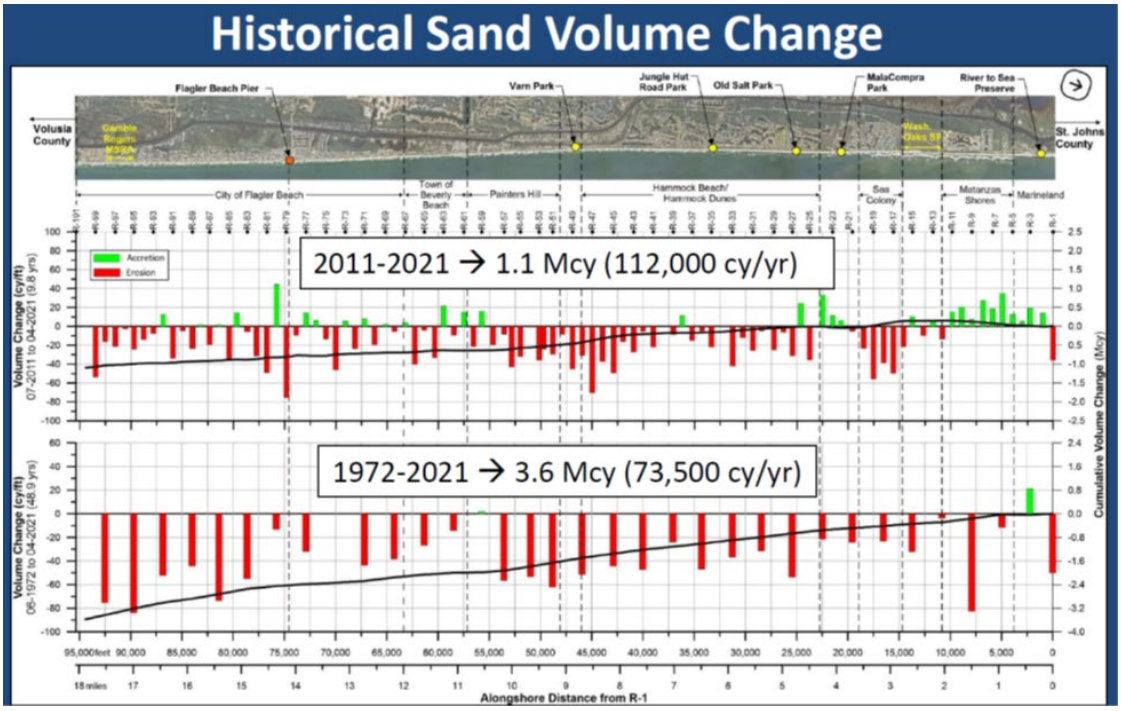
Natural Erosion and Storm Events

Flagler County’s coastline, like much of Florida’s Atlantic shore, has naturally been prone to coastal erosion due to wave action, tidal currents, and the dynamics of barrier islands. This natural process was amplified by several storm events over the decades:

1. Hurricane Dora (1964): One of the most significant early hurricanes to impact Florida's northeast coast, Dora caused widespread damage to beaches and dunes in Flagler County. The storm's powerful surge reshaped the coastline and highlighted the need for coastal management strategies.

2. Frequent Nor'easters: Repeated winter storms, characterized by strong winds and high surf, caused gradual but persistent dune erosion and sand loss throughout the 20th and early 21st centuries. These storms contributed to the degradation of the natural barriers that protected coastal communities.

3. Hurricane Floyd (1999), Tropical Storm Gabrielle (2001) and Hurricanes Frances/Jeanne (2004): These storms caused significant erosion and dune damage. Hurricane Floyd, though offshore, generated high waves that stripped sand from beaches, while Frances and Jeanne in 2004 made landfall and resulted in further degradation of the dune system.



The average annual sand loss rate increased by 52% in the 2011-21 period over the 1972-21 period due to Hurricanes Matthew, Irma & Dorian.

Pre-Matthew Mitigation Efforts

Before Hurricane Matthew, Flagler County engaged in limited mitigation efforts to address its erosion challenges:

- Localized Beach Renourishment Projects: Smaller-scale sand replenishment efforts were undertaken in high-priority areas, though funding and scope were limited.

- Coastal Vegetation Planting: Native vegetation was planted along dunes to stabilize them and prevent further erosion.
- Initial Planning for Long-Term Management: Early initiatives to create coastal management plans and seek funding for more extensive projects were underway but had not reached full implementation.

Overall Coastal Vulnerability

By the time Hurricane Matthew struck in 2016, Flagler County's coastline was already in a weakened state due to decades of cumulative impacts. The loss of dunes, combined with the pressures of development and inadequate long-term mitigation measures, left the region highly susceptible to the severe damage inflicted by Matthew and subsequent storms.

Background: Impacts on Flagler County's Coastline (Hurricane Matthew to present)

Flagler County's coastline, an essential natural and economic resource, has faced significant challenges over the years due to hurricanes, tropical storms, and ongoing erosion. In October 2016, Hurricane Matthew delivered a devastating blow to Flagler County's coastline, exposing the vulnerabilities created by decades of slow erosion. This narrative outlines the critical impacts from Hurricane Matthew (2016) to the present, with a focus on dune loss and subsequent mitigation efforts.

Hurricane Matthew's Impact (October 2016)

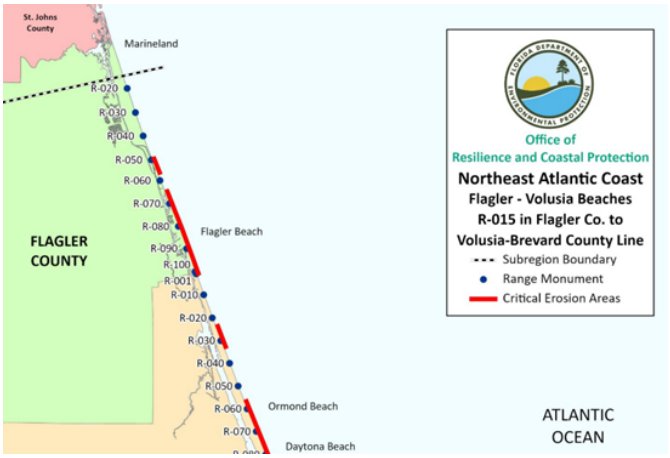
Hurricane Matthew had a catastrophic effect on Flagler County's coastline. The storm caused severe beach and dune erosion and infrastructure damage, leaving approximately **8.1 miles of the county's coastline critically eroded**. Matthew's storm surge and high waves removed sand from the entire coastal system stripping away the sand bar, beach, and sand dunes which serve as natural barriers against flooding and storm surge. Additionally, this loss of beach and dunes exposed properties, roads, and coastal ecosystems to greater risks from future storms. Key areas such as Flagler Beach saw extensive damage to State Road A1A, requiring costly emergency repairs and temporary protective measures.

Subsequent Hurricanes and Cumulative Damage

Following Hurricane Matthew, Flagler County's coastline continued to be impacted by subsequent nor'easters, hurricanes and tropical storms, including Hurricane Irma (2017), Hurricane Dorian (2019), and back-to-back Hurricanes Ian and Nicole (2022). Each storm exacerbated erosion, depleted previously restored dunes, and delayed long-term recovery efforts. These repeated events underscored the fragility of the coastline and the need for sustainable shoreline management.

Current Conditions and Challenges

As of now, Flagler County remains a focus of state and federal erosion mitigation programs. There are 8.1 miles of critically eroded areas that persist, and the loss of protective dunes continues to pose risks to coastal infrastructure and habitats. Rising sea levels, increased storm intensity and frequency, linked to climate change, add further complexity to the region's recovery and resiliency efforts.



Source: Florida Department of Environmental Protection

Mitigation and Restoration Efforts

In response to these challenges, Flagler County has partnered with state and federal agencies to implement restoration projects. Key initiatives include:

- **Beach and Dune Restoration Projects:** Efforts focused on emergency protective measures, sand replenishment and dune vegetation planting to stabilize the shoreline and provide habitat for local wildlife.
- **Seawall and Revetment Construction:** Engineered structures have been deployed in some areas to provide protection while natural dunes are rebuilt.
- **Federal and State Support:** Funding from USACE, FEMA, Florida DEP and DEM has been critical in addressing the ongoing erosion crisis. A notable example is the multi-million-dollar beach renourishment project for Flagler Beach.

Outlook

Despite these efforts, Flagler County's coastline remains vulnerable. Long-term success will depend on continued investment in restoration, proactive land-use planning, and innovative solutions to address the dual challenges of erosion and climate change. Strengthening community engagement and securing sustainable funding will be essential to ensure the preservation of this vital natural resource for future generations.

Flagler County's Coastal Storm Risk Management Efforts

Beach and dune erosion, both long-term and storm induced, is the greatest problem in the Flagler County area. Due to unique beach sediments and the closeness of State Road A1A and existing coastal development, the county's dune system is experiencing a long-term erosion trend with little opportunity for natural recovery. The establishment of a functional beach and dune system is key to reducing damage to infrastructure and maintaining environmental quality. State Road A1A is the only north-south hurricane evacuation route for communities along the coastline, which makes it essential for public safety during evacuation events. Flagler County has undertaken

significant initiatives to address the challenges of coastal erosion and storm vulnerability through comprehensive planning and strategic implementation. These efforts focus on assessing risks, studying beach conditions, and implementing a beach management plan to enhance the resilience of its coastline.

Coastal Storm Risk Management Assessment

Purpose and Scope

A federal feasibility study was initiated in 2006. The primary purpose of the Flagler County Coastal Storm Risk Management (CSRM) Assessment is to reduce storm damage to coastal infrastructure, including residential and commercial property and public facilities. The CSRM assessment is designed to evaluate the risks posed by nor'easters, hurricanes, tropical storms, and sea-level rise to Flagler County's coastline. The primary objectives are:

1. **Identify Vulnerable Areas:** Analyze erosion-prone and flood-susceptible regions, particularly focusing on infrastructure like State Road A1A and residential properties.
2. **Assess Storm Impacts:** Evaluate how storm surges, wave action, and extreme weather events affect the natural and built environment.
3. **Recommend Mitigation Strategies:** Develop actionable plans to reduce risks and enhance coastal resilience.

Key Actions

- **Data Collection and Modeling:** Advanced tools and historical data are used to predict storm surge, wave behavior, and erosion patterns under various storm scenarios.
- **Collaboration with Federal Agencies:** The County collaborates with the U.S. Army Corps of Engineers (USACE) for technical expertise in conducting the CSRM assessment and funding opportunities.

Outcome

Opportunities to reduce the risk of coastal damage and improve eroded conditions were examined, and approximately 9.7 miles of Flagler County coastline were investigated during the feasibility study process. The Corps' authorized project provided a large beach and dune nourishment project for the protection of upland infrastructure, including SR A1A. The original authorized project consisted of a 10-foot seaward extension of the existing dune along 2.6 miles between South 6th to 28th streets in central Flagler Beach. Over the extended period between project authorization in 2016 and going to construction in 2024, the project area experienced significant erosion due to hurricane and nor'easter events, including Hurricanes Matthew, Irma, Dorian, Ian, and Nicole. These storms significantly increased the volume required for initial construction from an estimated 330,000 cubic yards (as recommended in the feasibility study) to approximately 1,300,000 cubic yards as per the 2024 conditions. The project evolved to include a 20-foot extension of the existing dune and an and an elevated beach berm of 10 feet above sea-level, essentially widening the beach by 140feet. To build the project, the Corps used dredged sand

from an offshore borrow site and pumped it onto the beach. It is anticipated that the project will be renourished every 11 years or sooner if needed.

Beach Management Study

Objective

Flagler County's Beach Management Study was a comprehensive study of the coastline performed by Olsen Associates which was completed in 2022. It aimed to evaluate and address the challenges facing the county's coastline while promoting sustainable solutions to preserve its natural resources, protect infrastructure, and enhance the community's resilience to coastal hazards. The study is a scientific evaluation of the county's coastline aimed at understanding the dynamics of erosion, sediment movement, and dune health. The study serves as a foundation for developing effective beach management strategies.

Key Components

1. **Erosion Analysis:**
    - Identify critically eroded areas and determine the rate of sand loss over time.
    - Examine the causes of erosion, including wave action, storm impacts, and human activities.
2. **Sediment Budget Evaluation:**
    - Assess sediment sources and sinks to understand how sand naturally moves along the coast.
    - Identify potential sources of compatible sand for beach renourishment projects.
3. **Dune Health Assessment:**
    - Monitor the condition of dunes and the vegetation that stabilizes them.
    - Measure dune erosion during storm events and recovery afterward.

Beach Management Plan Implementation

Purpose

The Beach Management Plan is a strategic framework to preserve and restore Flagler County's coastline. It integrates findings from the Army Corp's CSRM assessment and the Beach Management Study to create a holistic approach to coastal management. The Flagler County Beach Management Plan was adopted by the Board of County Commissioners on October 16th, 2023. This Beach Management Plan is focused on restoring and maintaining a healthy beach and dune system through periodic beach nourishment to benefit the community at large. The document lists the implementation strategies, as a "roadmap", for how the County plans to build the beaches and dunes back to a level that offers storm protection, a healthy coastal ecosystem, and supports a thriving tourism industry in Flagler County.

Strategies and Actions

1. **Beach Nourishment Projects:**
    - Regularly replenish sand in critically eroded areas to maintain beach width and protect dunes.
    - Ensure the use of environmentally compatible sand to support ecosystems and recreation.
2. **Dune Restoration:**
    - Enhance dunes with vegetation planting and fencing to stabilize them and improve their ability to absorb wave energy.
    - Establish setbacks for development to protect dunes from human interference.
3. **Shoreline Hardening and Soft Solutions:**
    - In areas where erosion threatens infrastructure, combine hard solutions (like seawalls) with soft solutions (like beach nourishment) for balanced protection.
4. **Public Education and Outreach:**
    - Raise awareness about the importance of dunes and beaches in protecting coastal communities.
    - Involve residents in dune planting and conservation efforts.
5. **Monitoring and Adaptive Management:**
    - Continuously monitor beach conditions and assess the effectiveness of implemented measures.
    - Adjust strategies based on new data, storm impacts, and changing environmental conditions.

Partnerships and Funding

Flagler County has partnered with state and federal agencies, including the USACE, FEMA and the Florida Department of Environmental Protection (FDEP), to secure funding and technical expertise. Federal cost-sharing programs, grants, and local funding sources play a critical role in the execution of these initiatives.

Conclusion

Flagler County's proactive approach to coastal storm risk management, beach studies, and beach management planning demonstrates a commitment to protecting its coastline. By integrating scientific research, community engagement, and strategic implementation, the county is working to preserve its natural resources, safeguard infrastructure, and enhance the quality of life for residents and visitors.

The Importance of Beach Nourishment: Benefits and Value

Beach nourishment is a vital coastal management strategy that involves adding sand to eroding beaches to restore their width, protect infrastructure, and maintain ecological balance. It is particularly important for areas like Flagler County, where erosion poses significant risks to both the environment and the local economy.

Key Benefits of Beach Nourishment

1. **Shoreline Protection:**
    - **Barrier Against Storm Surges:** Wide, nourished beaches and healthy dunes act as natural barriers, absorbing wave energy and reducing the impact of storm surges and high tides.
    - **Reduced Infrastructure Damage:** By buffering coastal roads, buildings, and utilities, nourishment helps minimize the costly damage caused by flooding and erosion.
2. **Environmental Benefits:**
    - **Habitat Restoration:** Nourished beaches provide critical nesting areas for sea turtles and shorebirds, supporting biodiversity and protecting endangered species.
    - **Coastal Ecosystem Stability:** Replenished sand stabilizes dunes and fosters the growth of native vegetation, which anchors the shoreline and reduces further erosion.
3. **Economic Value:**
    - **Tourism and Recreation:** Beaches are a cornerstone of Florida's tourism economy. Wider, well-maintained beaches attract visitors, support local businesses, and generate revenue through lodging, dining, and recreation.
    - **Property Value Preservation:** Healthy beaches enhance the aesthetic and protective value of waterfront properties, ensuring their long-term market appeal.
4. **Resilience to Climate Change:**
    - **Adaptation Strategy:** Beach nourishment helps mitigate the effects of sea-level rise and increasing storm intensity, providing a flexible and sustainable response to climate change.
5. **Community Well-Being:**
    - **Public Access and Recreation:** Nourished beaches ensure continued access for residents and visitors, promoting outdoor activities and fostering a strong connection to nature.
    - **Cultural and Historical Preservation:** In some areas, nourished beaches help protect archaeological sites and cultural landmarks from erosion.

The Value of Beach Nourishment in Flagler County

In Flagler County, where the coastline is a critical asset, beach nourishment provides both tangible and intangible benefits:

- **Economic Resilience:** A robust shoreline supports the tourism-dependent economy, which is a primary source of jobs and tax revenue.
- **Coastal Security:** Nourished beaches protect essential infrastructure like State Road A1A, which is vital for local transportation and emergency response.
- **Community Identity:** The beaches are central to Flagler County's quality of life, providing a sense of place and a unique identity for its residents.

Challenges and Considerations

While beach nourishment offers numerous advantages, it is not without challenges. Costs can be significant, and projects require continuous maintenance and funding. Moreover, sourcing compatible sand and managing potential environmental impacts are key considerations in planning successful projects.

Beach nourishment is a proven and valuable tool for preserving coastal communities, ecosystems, and economies. In areas like Flagler County, investing in beach nourishment is not just a protective measure—it is a forward-looking strategy that ensures the sustainability and resilience of the coastline for generations to come.

Community-Wide Benefits of Investing in Beach Management

Investing in beach management provides far-reaching benefits, including protection from storm surge and flood inundation, which can impact properties miles inland. Healthy beaches and dunes serve as natural buffers, reducing the intensity of storm surges and mitigating flood risks during extreme weather events. This protection safeguards critical infrastructure, homes, and businesses, minimizing repair and recovery costs while enhancing public safety.

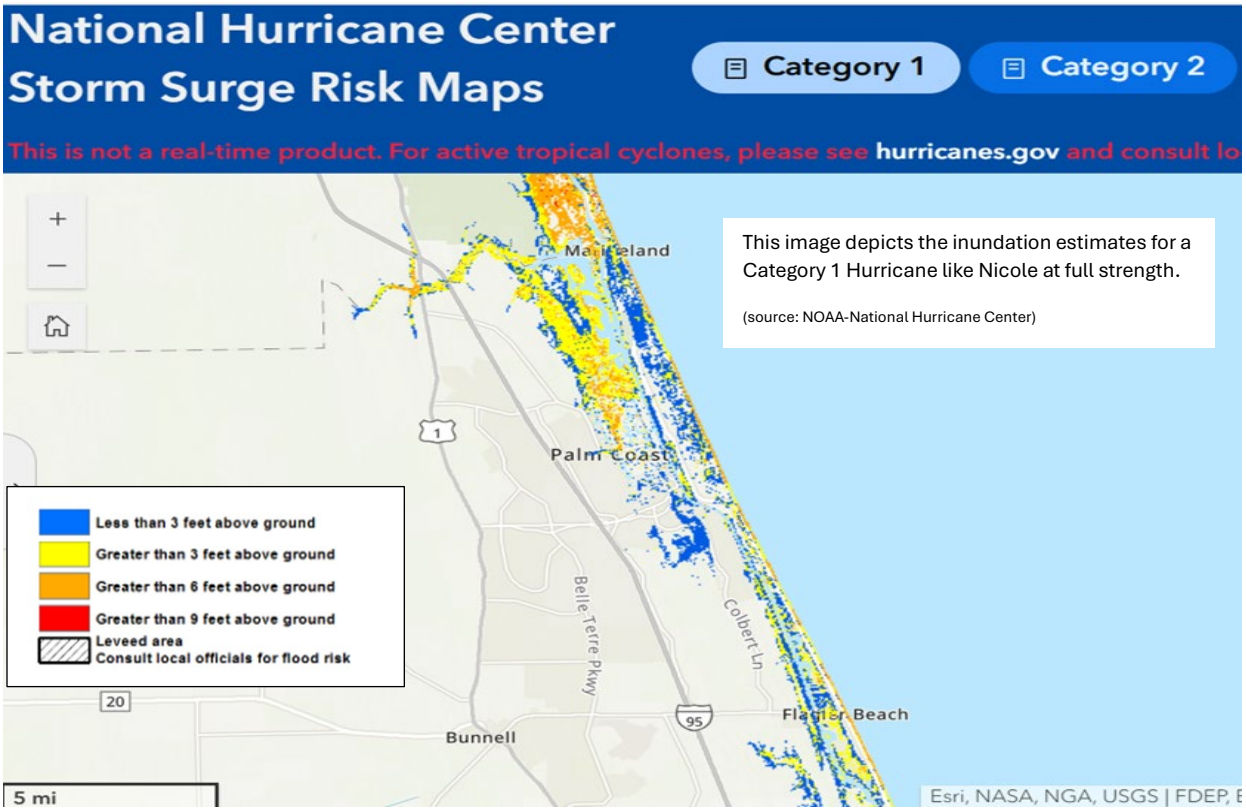
In addition to storm protection, well-managed beaches provide significant recreational value for residents. They serve as spaces for outdoor activities, relaxation, and community events, fostering a higher quality of life and strengthening social bonds. By preserving these spaces, beach management enhances the local economy through tourism, supports property values, reduces insurance premiums, and promotes environmental conservation.

Ultimately, beach management is an investment in the community's safety, economy, environment, and recreational well-being, ensuring a resilient and vibrant future for all residents.

Storm Surge Risk – Flood Inundation

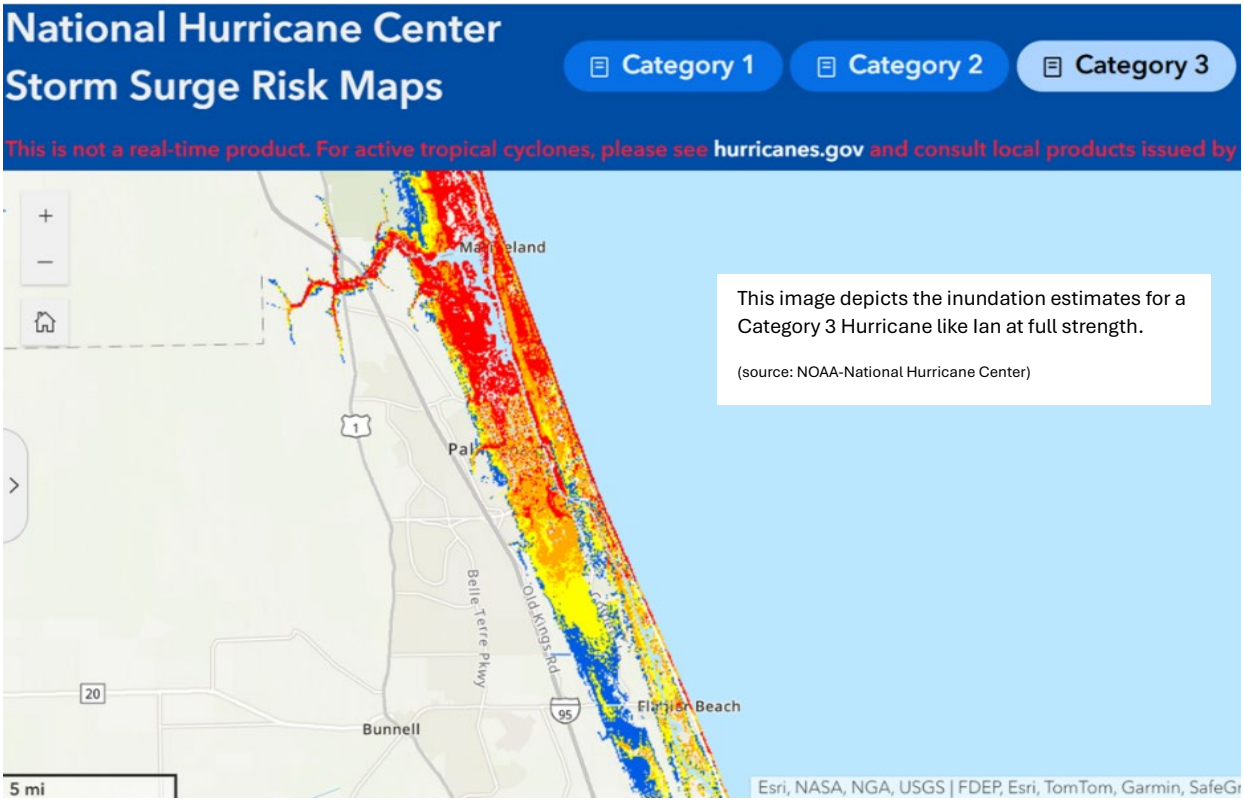
With the use of the National Oceanic and Atmospheric Administration (NOAA) modeling tool to predict storm surge inundation, this national depiction of storm surge flooding vulnerability helps people living in hurricane-prone coastal areas. These maps make it clear that storm surge is

not just a beachfront problem, with the risk of storm surge extending many miles inland from the immediate coastline in some areas.



This image depicts the inundation estimates for a Category 1 Hurricane like Nicole at full strength.

(source: NOAA-National Hurricane Center)



This image depicts the inundation estimates for a Category 3 Hurricane like Ian at full strength.

(source: NOAA-National Hurricane Center)

This NOAA modeling tool predicts that regardless of the category of storm, storm surge inundation will affect properties located beyond the Flagler County coastline. While most of these effects are east of Interstate 95, varied impacts depending on the strength of the storm could be seen as far west as US-1 (Freedom at Sawmill). These potential impacts would include properties within the unincorporated areas of Flagler County, City of Palm Coast, City of Flagler Beach, Town of Beverly Beach and Town of Marineland. In addition to all properties located on the barrier island, including the Island Estates neighborhood, properties located in Palm Coast off Palm Harbor Parkway (F and C Section, and Sanctuary), areas off Colbert Lane (Woodlands, Forest Park Estates, Wild Oaks, some sections of Grand Haven, and Palm Coast Plantation), properties located in Flagler Beach along Lambert Ave and Palm Drive, and those properties located along John Anderson Highway such as Veranda Bay, Seaside Landings and Polo Club.

Community Stakeholder Survey Highlights Public Benefits of the Beach

A recent community stakeholder survey was conducted county-wide by PFM Consulting Group, LLC in 2024 that revealed overwhelming awareness of beach erosion, recognition of the public benefits provided by our beaches, support for public funding of beach management, and a willingness to contribute. Participants acknowledge the critical role beaches play in protecting homes and infrastructure from storms and flooding, supporting local tourism and the economy, and offering recreational opportunities that enhance quality of life.

A summary of the results is as follows:

95% - Aware of current beach conditions and the actions being taken by Flagler County

90% - Report having been to the beach over the past year for use & enjoyment

85% - Felt the beach was important to Flagler County's quality of life

80% - Felt the importance of coastal health & preservation for the future

94% - Were in favor of plans to fix, restore and protect the Flagler County beaches

79% - Support the use of public funds to support beach management

76% - Support annual household contributions to support beach management

The survey underscored the broad value of beaches, not just for those living along the shoreline but for the entire community. This feedback reinforces the importance of continued investment in beach management, including restoration, ongoing maintenance, and renourishment. Our beaches are not only a cherished natural resource but also an essential asset for the prosperity and resilience of our entire community, contributing to Flagler County's overall attractiveness as a place to live, work and visit.

Overall Potential Financial Impact from Loss of Revenue

A decline in taxable property values and tourism-related revenues would significantly impact Flagler County's economic stability and public services.

Impact on Taxable Property Values:

According to information obtained from the Flagler County Property Appraiser's Office, Flagler County's gross taxable property value is approximately $16.478 billion, with about $4 billion coming from property on the barrier island of which approximately $2.9 billion is from the unincorporated area. If Flagler County were to experience a reduction in property values due to the potential loss of properties on the barrier island, this would decrease property tax revenues, which are essential for funding local services such as education, infrastructure, and public safety. To compensate for reduced revenues, the county might need to increase property tax rates or cut public services, both of which could adversely affect residents' quality of life.

Entity	Taxable Value	Millage Rate	25% Reduction	50% Reduction
Flagler School Board	$4,057,906,827	5.3650	$5,442,667	$10,885,335
Flagler County	$4,057,906,827	8.2343	$8,353,505	$16,707,011
Flagler Beach	$1,012,847,415	5.4500	$1,380,004	$2,760,009
Beverly Beach	$119,348,157	1.0800	$32,224	$64,448
Marineland	$10,019,108	10.000	$25,048	$50,095

Impact on Tourism-Related Revenues:

Tourism is a vital component of Flagler County's economy. In 2024, the county welcomed approximately 948,600 visitors, resulting in $617.7 million in direct spending. This spending supported **$890.9 million in economic impact** in Flagler County, 11,490 direct tourism jobs, supporting $266.67 million in wages and salaries, and generated $4.32 million in Tourist Development Tax (TDT) revenue, mostly from overnight stays in the Hammock and within the City of Palm Coast. Visitors to Flagler County saved residents $443 in taxes per household in 2024.

A decline in tourism would lead to reduced business income, job losses, and decreased sales tax and TDT revenues. This reduction could hinder the county's ability to fund tourism promotion and maintain attractions, creating a negative feedback loop that further diminishes tourism appeal.

Broader Economic Consequences:

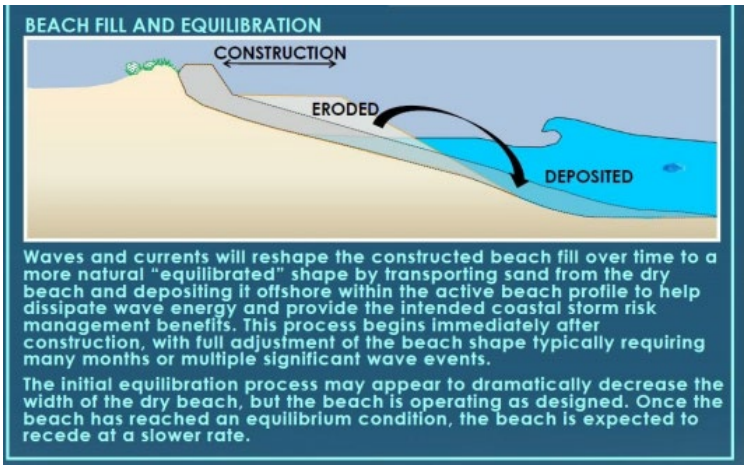
The combined effect of declining property values and tourism revenues would strain Flagler County's budget, potentially leading to:

- **Service Reductions:** Cuts in essential services like education, public safety, and infrastructure maintenance.
- **Tax Increases:** Higher taxes to offset revenue losses, placing additional financial burdens on residents and businesses.
- **Economic Contraction:** Reduced consumer spending and business investment, slowing economic growth and diminishing the county's attractiveness to potential residents and investors.

In summary, maintaining robust property values and a thriving tourism sector is crucial for Flagler County's fiscal health and the well-being of its residents.

The Dynamics of Beach Nourishment: Offshore Sand Migration, Equilibration, and Wave Energy Reduction

Beach nourishment is not only about restoring visible sand on the shore but also about creating a broader and more resilient coastal system. When sand is added, it elevates both the beach and the nearshore seabed, which helps reduce wave energy, protect dunes, and stabilize the coastline. This process involves a natural adjustment phase called **equilibration**, where the newly added sand redistributes until the beach achieves a stable profile.



How Beach Nourishment Builds a Protective Sand Floor

1. **Raising the Nearshore Seafloor:**
    - During nourishment, sand is placed not only on the dry beach but also in the nearshore zone. This raises the seafloor elevation, effectively extending the underwater slope of the beach.
    - The raised seabed forces waves to break farther offshore, dissipating energy before reaching the beach and dunes.
2. **Wave Energy Dissipation:**
    - As waves encounter the elevated sand floor, they lose energy through breaking and friction.
    - Reduced wave energy means less force exerted on the shoreline, which minimizes the risk of dune erosion and flooding during storms.
3. **Dune Protection and Stabilization:**
    - By reducing the direct impact of waves on the shore, beach nourishment helps preserve and protect dunes, which serve as a natural defense system against storm surges.
    - The added sand also supports dune rebuilding by creating a buffer zone that allows dunes to grow and recover naturally over time.

Offshore Migration and Equilibration

After nourishment, some of the added sand migrates offshore as part of the natural equilibration process:

1. **Temporary Offshore Sand Storage:**
    - Sand moves from the steeper, nourished beach profile to form sandbars in the nearshore zone. These sandbars help dissipate wave energy and act as reservoirs for sand that can return to the beach.
2. **Adjustment of the Beach Profile:**
    - Over weeks to months, waves redistribute the sand to create a more gradual slope that balances with natural waves and current patterns.
    - This equilibration phase helps ensure the beach becomes more stable and resilient.
3. **Natural Recovery of Sand:**
    - Calm conditions, especially during summer months, often move sand from offshore sandbars back onto the visible beach.
    - This cycle ensures that sand remains within the coastal system and continues to protect the shoreline.

Additional Benefits of Nourished Sand Floors

1. **Storm Surge Mitigation:**
    - Elevated nearshore areas reduce the depth of water approaching the beach during storms, diminishing the energy of storm surges and waves.
2. **Long-Term Coastal Resilience:**
    - By breaking waves farther offshore, the nourished sand floor helps preserve the overall stability of the beach-dune system, reducing the need for emergency repairs after storms.
3. **Improved Ecosystem Support:**
    - A nourished beach and nearshore zone create habitats for marine life, including fish, crustaceans, and sea turtles, while supporting dune vegetation.

The integration of beach nourishment into the nearshore system not only restores lost sand but also transforms the coastline into a more robust defense system. By elevating the beach and seabed, nourishment creates a first line of defense against wave action, protecting dunes, infrastructure, and habitats from erosion and storm damage.

Beach nourishment is a comprehensive strategy that addresses both immediate and long-term coastal challenges. By building up the sand floor, it reduces wave energy, minimizes dune loss, and enhances the beach's ability to recover naturally. This dynamic approach ensures that

nourished beaches not only protect the coastline but also sustain the natural and economic resources critical to coastal communities.

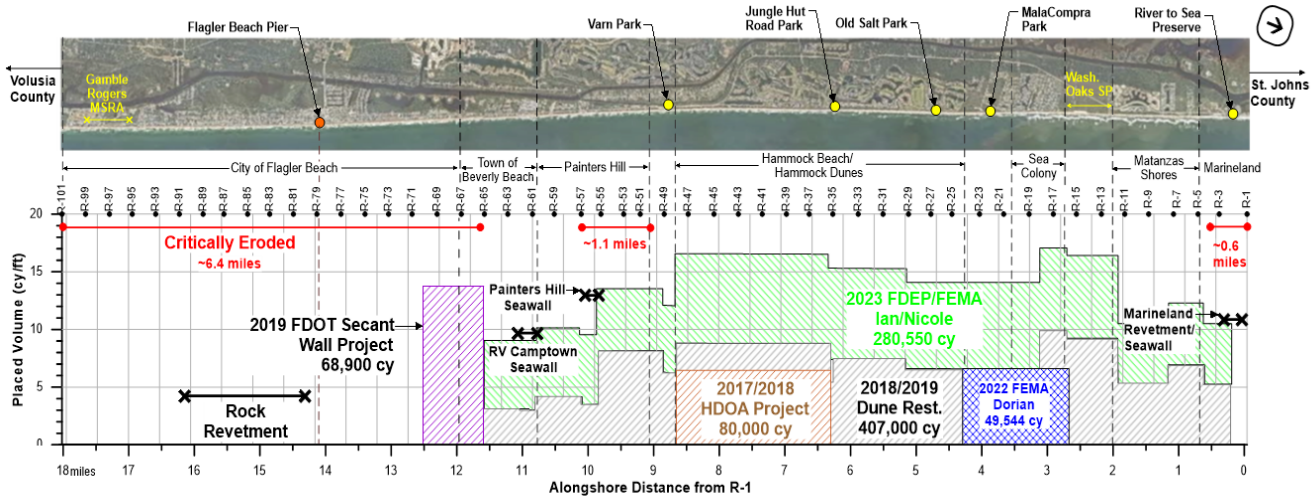
County Efforts and Lessons Learned

Over the past twenty-five years Flagler County has experienced impacts on coastal erosion, with Hurricane Matthew, serving as a wake-up call. Since then, Flagler County has taken significant steps to address its coastal vulnerabilities:

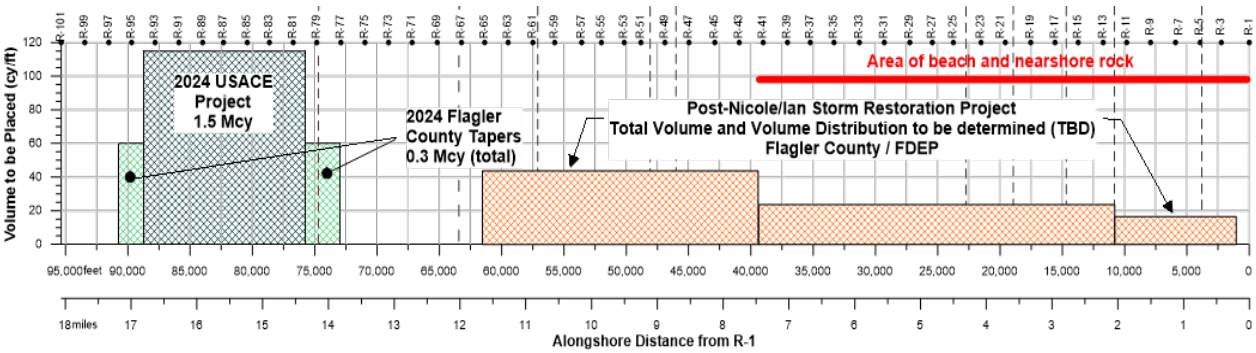
- **Development of a Beach Management Plan:**
    - The plan integrates scientific assessments, community input, and sustainable practices to restore and protect the coastline.
- **Regular Beach Nourishment:**
    - Flagler County now prioritizes regular sand replenishment in critically eroded areas to mitigate future risks.
- **Focus on Resilience:**
    - The county has adopted a proactive approach to coastal management, aiming to build long-term resilience against erosion and storm impacts.
- **Beach Management Activity Over the Past 25 Years**
    - Erosion at the northern 0.6 mile of beach (R1-R4) is threatening development and recreational interests at Marineland. This area has a rock revetment and coquina rock groins. Following storm damage by Hurricane Floyd in **1999**, the revetment was restored, and new revetment was constructed to the south at a more landward alignment with dune restoration.
    - In **2006**, the Florida Department of Transportation (DOT) constructed a segment of vertical seawall in Flagler Beach, between R76-R94.8. This is a 3.3-mile segment of critically eroded beach along the midsection of Flagler Beach. Most of this area has been armored with a rock revetment constructed by the Florida Department of Transportation following Tropical Storm Gabrielle (2001) and Hurricane Jeanne (2004).
    - In **2006**, a request for a federal feasibility study was initiated which encompasses all of Flagler County.
    - The Flagler County Hurricane and Storm Damage Reduction Project Final Integrated Feasibility Study and Environmental Assessment (USACE-SAJ, 2014) had been approved by the Civil Works Review Board and authorization by the U.S. Congress occurred in December of **2016** through the Water Resources Development Act (WRDA). The selected plan from the federal feasibility study for Flagler County at Flagler Beach resulted in a construction concept of a 10- foot seaward extension of the existing dune and beach profile between R80 to R94 (2.6 miles), using an offshore borrow site.

- Phase I dune reconstruction activities were conducted by Flagler County following the 2016/2017 hurricane seasons (after Hurricane Matthew devastated the coastline in 2016) between R12 and R35 with placement of approximately 116,500 cy of material and the dune work was started in **2017** and completed in early **2018**.
- Phase I and phase II placed a total of 403,287 cy of material along 11.4 miles of dune in Flagler County from R2 to R65 starting in November **2017** and completion in March **2019** using an upland sand source.
- The County constructed two seawalls made of vinyl sheet pile with a concrete cap within the Painters Hill segment of critically eroded beach, along with post-storm dune restoration work in summer of **2018**. The contiguous seawalls were constructed between R55 and R57, with the first seawall being 434 ft long and the second seawall is 805 ft long.
- The Florida Department of Transportation (FDOT) in **2019** constructed a Low-Impact Secant-Pile Seawall seaward of A1A between R65 (Osprey Dr.) to R70.1 (N. 18th St.) that is 4,902 feet in length.
- Dune restoration activities began again in January **2023** in northern Flagler County along approximately 11 miles of coastline between River to Sea Preserve (R-2.3) to Beverly Beach (R-64.5). This North Flagler County Dune Restoration Project was in response to the erosion losses caused by a nor' easter in 2021, Hurricane Ian (2022) and Hurricane Nicole (2022) and placed approximately 300,000 cy of upland sand at 6 cy per-foot A majority of the cost was covered by FEMA and Florida DEM and DEP.
- The Flagler County Beach Management Plan was passed by the Board of County Commissioners on October 16th, **2023**. This Beach Management Plan is focused on restoring and maintaining a healthy beach and dune system through periodic beach nourishment to benefit the community at large. The document lists the implementation strategies, as a "roadmap", for how the County plans to build the beaches and dunes back to a level that offers storm protection, a healthy coastal ecosystem, and supports a thriving tourism industry in Flagler County.
- In December **2023**, the County issued a letter of intent in support of the Jacksonville District of the U.S. Army Corps of Engineers (USACE) requesting Federal Funds for the new Flagler County Back Bay and Shoreline Coastal Storm Risk Management (CSRM) Feasibility Study.
- Beach restoration was performed by the USACE in the southern portion (R80 to R94.7) of Flagler County between South 6th to 28th streets in central Flagler Beach, which created a 19-foot-high dune with a 20-foot seaward extension of the existing dune and a 140-foot-wide dry beach along 2.6 miles in **2024**, using approximately 1.3 million cy of offshore sand. This area was severely impacted by Hurricane Matthew (2016), which damaged approximately 3,350 ft of State Road A1A and approximately 7,920 of rock revetment.
- As a result of a task force team being formed between FDOT, Flagler County, and the City of Flagler Beach to evaluate long term solutions for areas along A1A to the south that continue to experience significant erosion from storm activity, the extension of a buried secant-pile wall from South Flagler Beach to Ormond-by-the-Sea is currently being constructed and will be completed in 2025.

- In December **2024**, the County issued a letter of intent in support of the Jacksonville District of the U.S. Army Corps of Engineers (USACE) requesting Federal Funds for the new Flagler County Back Bay and Shoreline Coastal Storm Risk Management (CSRM) Feasibility Study.
- The County is pursuing a local plan for a beach and dune restoration project north of the pier (R46 to R79) and is obtaining the necessary permits at the state and federal level. The beach restoration project is scheduled for mid-**2025**.
- In Southern Flagler Beach, R98-R101/south county line, this is a 0.6-mile segment of critically eroded beach in southern Flagler County where FDOT is completing construction on the secant wall that extends into Ormond-by-the-Sea. This area was impacted by Hurricane Matthew (2016) with dune erosion that threatened State Road A1A. In **2025**, the design for beach nourishment in front of the secant wall is currently being conducted by the County. Beach restoration funding has yet to be identified, and the scheduling timeframe is to be determined.



This above graphic demonstrates the beach management efforts both public and private that have transpired in Flagler County from early work in Marineland (1999) through Hurricanes Ian/Nicole emergency protective measures (2023)



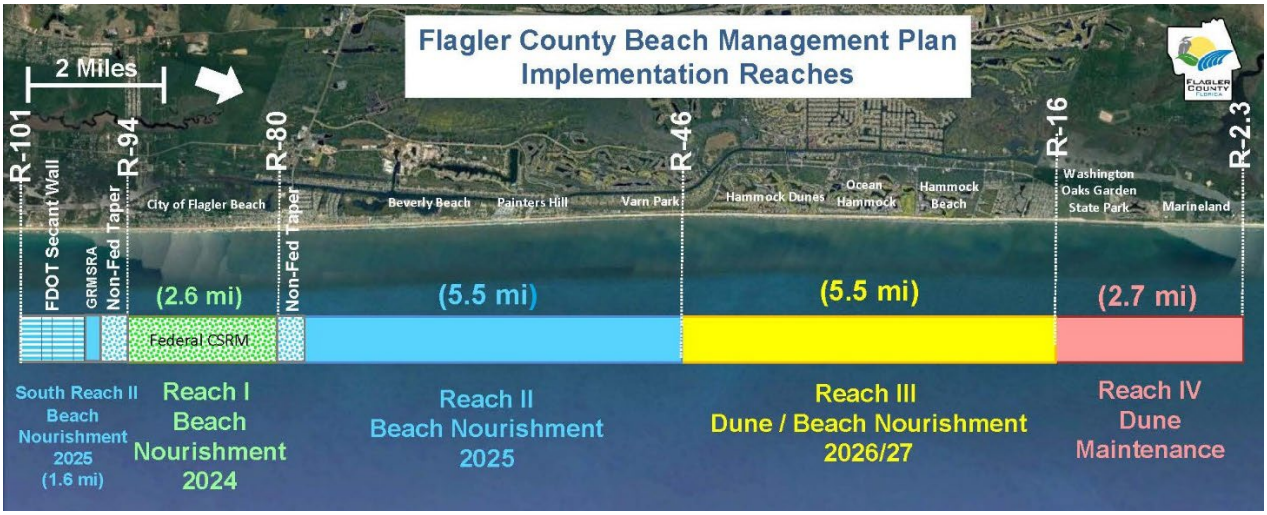
This graphic demonstrates the recent dune and beach nourishment work completed by USACE and Flagler County in Flagler Beach (2024) as well as some of the future beach nourishment work to be completed in 2025 through 2028.

- **Beach Management Plan Implementation**

In 2023, the Flagler County Board of County Commissioners approved a Beach Management Plan that is intended to guide the County through beach and dune restoration and management needs along the 18 miles of Flagler County Atlantic Ocean shoreline for the next 50 years. The Plan identified beach and dune restoration and maintenance as the preferred approach to meet the County's long-term beach management objectives.

As part of the Plan, the County has identified four (4) beach and dune nourishment reaches along which restoration and management efforts will be pursued. The reaches were identified considering physical characteristics of the beach and dune, funding opportunities that vary between reaches and environmental conditions. The four beach management reaches are:

Beach Management Areas. The location and extent of the four Flagler County beach management reaches are depicted in the figure below.



The reaches were selected with consideration of existing and planned project needs, schedule, and regulatory constraints. The implementation plan for each reach is described below.

Reach I

Project Description:

Reach I is in the City of Flagler Beach coastline between Gamble Rogers Park (R-94) and South 6th Street (R-80) and consists of the US Army Corps of Engineers (USACE) Coastal Storm Risk Management Federal beach nourishment project. The federal project is between FDEP monuments R-80 (~6th Street South) and R-94 (~ 28th Street South) is eligible for a share of federal funds for initial construction costs, long term maintenance costs, and replacement in the case of a declared disaster.

Initial construction of the Reach I beach and dune nourishment project by offshore dredging included 1.4 million cubic yards of sand along over approximately 2.6 miles of the shoreline.

Project Funding and Costs:

Federal Segment initial and long-term costs, funding shares and sources as follows,

- Initial Construction Costs: $22.7 million at 65% USACE share and 35% FDOT/FDEP share
- Projected long-term Maintenance Costs for the entire Reach I: $1,606,400 per year with the following cost sharing: 50% ($803,200) USACE share, and 25% ($401,600) FDEP share, and 25% ($401,600) Local share
- The Federal Segment will be eligible for 100% FCCE Restoration Funding following a declared disaster.

Non-Federal Segments initial and long-term costs, funding shares and sources as follows,

- Permitting/Design Costs: $1 million at 100% paid by FDOT
- Initial Construction Costs: $4.3 million at 100% paid by FDOT/FDEP
- Projected long-term Maintenance Costs: will be included in Reach II Maintenance Costs.

Project Construction Schedule:

Beach/Dune construction completed on August 30, 2024. Installation of dune vegetation, rope and posts, sand fencing, and signage completed in Fall 2024.

Challenges:

Monitoring and protection of marine habitats during construction phase to avoid and minimize impacts.

Reach II

Project Description:

Reach II includes the Non-Federal segments of the coastline in the City of Flagler Beach, Town of Beverly Beach, Painters Hill, to ~1,900 feet north of Varn Park at R-46. Flagler County is currently seeking to modify existing FDEP and USACE permits to allow for comprehensive beach and dune restoration along the entirety of Reach II using offshore sand resources.

The initial beach and dune restoration construction project along Reach II will be by dredge from an offshore sand source and consist of 1,800,000 cy along 5.5 miles of shoreline.

Future maintenance of Reach II may include sand placement along sand tapers north and south of the USACE project and in front of the FDOT Secant Wall north of the Volusia County line.

Project Construction Schedule:

The County intends to construct Reach II in Summer 2025.

Project Funding and Cost:

Initial and long-term costs, funding shares and sources as follows,

- Permitting/Design Costs: $1 million at 100% FDEP (Post-Ian/Nicole Grant)
- Initial Construction Costs: $32 million FDEP (Post -Ian/Nicole Grant) with anticipated funding share of $5 million from FEMA.
- Projected long-term Maintenance Costs: $4,506,800 per year at 50% FDEP and 50% Local share

Reach II will be eligible for 87.5% FEMA/FDEM Public Assistance (Cat G) following declared disaster. Additionally, funding for this beach nourishment project is being sought through the FEMA Hazard Mitigation Grant Program which would provide savings of the FDEP funds in Reach II that could be applied to Reach III.

Challenges:

About 8,000 feet of Reach II shoreline currently is not classified by FDEP as Critically Eroded. This will impact FDEP funding eligibility for Reach II. Flagler County is currently requesting review of eligibility by FDEP.

Reach III

Project Description:

Reach III is in north-central Flagler County along the Hammock Dunes, Ocean Hammock, Hammock Beach, and Sea Colony shorelines between point about 1,900 feet north of Varn Park (R-46) and the southern limit of Washington Oaks Gardens State Park (R-16). Flagler County is seeking FDEP and USACE permits to allow for comprehensive beach and dune restoration along the entirety of Reach III. Reach III is 5.5 miles in length.

The scope of the comprehensive beach and dune restoration will be determined through detail design engineering analyses and permitting planned for 2025 - 2026.

Project Construction Schedule:

The County intends to construct Reach III in 2026/2027 depending on permitting review.

Project Funding and Cost:

Initial and long-term costs, funding shares and sources as follows,

- Permitting/Design Estimated Costs: $1.5 million at 100% FDEP (Post-Ian/Nicole Grant)
- Initial Construction Costs: $49.8 million – Funding of approximately $15 Million in FDEP grants are pending.
- Projected long-term Maintenance Costs: $7,572,600 per year at 100% Local Cost.

Reach III will be eligible for 87.5% FEMA/FDEM Public Assistance (Cat G) following a declared disaster.

Challenges:

- There is widespread nearshore beach rock along this entire reach. The presence and extent of the beach and nearshore rock is expected to limit the project scope and make permit acquisition difficult.
- The most likely sand sources for beach and dune restoration along Reach III will be upland commercial mines and/or offshore sand in Federal waters. The use of offshore sand will likely require construction of a sand stockpile and movement of the sand to Reach III by truck. The costs above are associated with the most expensive truck-haul method, and if dredging is used without mitigation, the costs may decrease. Both sand sources will be more expensive than the offshore sand sources used for Reach I and II.
- There is no allowance for hardbottom mitigation costs in this projection.

Reach IV

Project Description:

Reach IV is in northern Flagler County along the Washington Oaks Gardens State Park, Matanzas Shore, and Marineland shoreline between the southern limit of Washington Oaks Gardens State Park (R-16) and the St. Johns County line (R-1). Flagler County currently holds FDEP and USACE permits that allow restoration and maintenance of the dune from R-2.3, south of the revetment/seawall at Marineland along this reach of the County. Reach IV is 2.5 miles in length.

The dune along Reach IV was restored in 2023 following Hurricanes Ian and Nicole. Because of the widespread beach and nearshore coquina rock along Reach IV, only dune restoration and maintenance are feasible.

Project Construction Schedule:

- The County intends to maintain the dune on an "as needed" basis.
- Flagler County is currently seeking FEMA Cat G Dune Restoration for a $6.3 million project with a local cost of approximately $1 million.
- The most likely need for future dune maintenance will be following severe storm events.

Project Funding and Cost:

- Projected long-term Maintenance Costs: $1,830,500 would be needed for dune restoration after major storm events with funding provided by FDEP, FEMA, and Flagler County.
- Reach IV is eligible for 87.5% FEMA/FDEP Public Assistance (Cat B/Cat G) following declared disaster.

Challenges:

- Maintenance of dune will continue to be difficult due to limited access and presence of beach rock.

Conclusion

Flagler County's delayed development of a beach management plan reflects the challenges of addressing slow, incremental issues that only become critical under extreme conditions. Hurricane Matthew underscored the importance of proactive coastal management, prompting the county to take decisive action. Today, Flagler County is working to make up for lost time, ensuring its beaches, dunes, and communities are better protected against future threats.

The Value of Coastal Living and the Role of Public Investment in Beach Management

Living in a coastal community such as Flagler County offers unparalleled benefits: stunning natural beauty, vibrant recreational opportunities, and a strong connection to the environment. These attributes contribute to a high quality of life and attract residents, visitors, and businesses, making coastal communities vital economic and cultural hubs.

However, preserving these benefits requires proactive investment in beach and dune systems. Public funding for initial reconstruction following storms, as well as ongoing monitoring, maintenance, and renourishment, is essential to protect coastal areas from erosion, storm surges, and flooding. These investments ensure the safety of residents, the protection of inland properties and infrastructure, and the long-term stability of local economies reliant on tourism and recreation.

Supporting beach and dune management is not just about safeguarding our coastlines; it's about securing a resilient, thriving, and beautiful future for everyone who calls Flagler County home. Public investment is a commitment to the people, the environment, and the enduring vibrancy of these cherished places.

Initial Estimated Construction Cost

Segment	Initial Cost	Distribution of Initial Cost		
		USACE/FEMA	State	Local
Reach 1 (Federal)	$22,700,000	$16,000,000	$6,700,000	
Reach 1 (Non-Federal)	$4,300,000		$4,300,000	
Remaining Work within Reach 2, 3 and 4	$93,125,000	$9,743,750	$40,940,625	$42,440,625
Total	**$120,125,000**	**$25,743,750**	**$51,940,625**	**$42,440,625**

Estimates based on Beach Management Implementation Plan by Olsen Associates

The first phase of the beach management plan implementation is the initial construction cost for the entire 18 miles of Flagler County coastline. Based on the planning assumptions and estimates, the total estimated cost is close to $120M for the entire coastline. The initial shortfall for this work was $42.4 million, however in FY25 Flagler County set aside $5 million, and submitted grant applications to FDEP for $15 million. This leaves a remaining **shortfall balance of $22.4 million**, which will be needed within the next three years. Flagler County is developing a funding plan to ensure the money is available when needed.

Estimated Ongoing Nourishment Cost

All Segments	Future Event Cost	Distribution of Nourishment Cost		
		USACE/FEMA	State	Local
Entire Coastline	$97,107,600	$13,056,450	$11,921,490	$72,129,660

Estimates based on Beach Management Implementation Plan by Olsen Associates

All Segments	Equivalent Annual Cost (EAC) ($/year)			
	Nourishment Cost	Distribution of Nourishment Cost		
		USACE/FEMA	State	Local
Entire Coastline	$16,184,600	$2,176,075	$1,986,915	$12,021,610

Estimates based on Beach Management Implementation Plan by Olsen Associates

Following the initial construction of the beach and dune, it is anticipated that ongoing future nourishment will be needed. These costs are for planning values only, based on 6-year project intervals. All values are subject to change following detailed engineering and permitting. Based on the planning assumptions and estimates, the total cost (every 6 years) is approximately $97.1 million, which equates to an **annual cost of $16.1 million** for the entire coastline. A funding strategy has not been developed for the estimated ongoing nourishment for the entire coastline.

Over the past couple years, Flagler County has evaluated several funding options which included the potential implementation of a Municipal Service Benefit Unit (MSBU) within the unincorporated area of Flagler County on the barrier island to assist with the required local funding within this area. A decision on funding will need to be completed to address the incorporated areas, or for consideration a holistic approach to the entire coastline.

Potential Funding Strategies

Beach management is essential to preserving our natural coastal resources, supporting economic development, and maintaining quality of life for residents and visitors. To achieve these objectives, we recognize the importance of leveraging various public funding options to sustain and enhance our beaches.

Available funding mechanisms may include:

1. **Local Government Revenues:** Property taxes, sales taxes, and tourist development taxes can provide critical resources for beach nourishment, erosion control, and public access improvements.
2. **State and Federal Grants**: Matching grants and direct funding from programs such as FEMA and FDEP can help address large-scale projects, disaster recovery, and ongoing maintenance needs.
3. **Special Assessments and Districts**: The establishment of special taxing districts or assessments for property owners directly benefiting from beach management can ensure equitable funding for targeted improvements (such as MSBU or MSTU).
4. **User Fees and Permits**: Parking fees, or beach access permits, can generate revenue to directly support beach-related projects while promoting responsible use of coastal spaces.

A Call to Action: Investing in Our Coastline, Securing Our Future

Our beaches and dunes are more than just scenic landscapes; they are vital protectors of our homes, businesses, and way of life. They shield us from storms, support our economy, and

provide spaces for recreation and connection. However, maintaining their resilience requires proactive investment.

By funding beach construction and ongoing maintenance, we are investing in the safety, stability, and prosperity of our community. It's a cost-effective strategy that reduces future risks, protects property values, and ensures the long-term health of our coastline.

Now is the time to act. We must come together to support a financial plan that ensures these critical resources are restored, maintained, and ready to meet the challenges of tomorrow. Let's commit to safeguarding our beaches, our community, and our future; because together, we can build a stronger and more resilient coastal legacy.

Sources:

Florida Shore and Beach Preservation Association

https://fsbpa.com/documents/1222Shoreline.pdf

USACE

https://www.saj.usace.army.mil/Missions/Civil-Works/Shore-Protection/Flagler-County/#:~:text=Beach%20and%20dune%20erosion%2C%20both,public%20safety%20during%20evacuation%20events.

NOAA National Hurricane Center – Storm Surge Risk Maps

https://experience.arcgis.com/experience/203f772571cb48b1b8b50fdcc3272e2c/page/Category-1/

https://experience.arcgis.com/experience/203f772571cb48b1b8b50fdcc3272e2c/page/Category-3/

Florida DEP - Strategic Beach Management Plan Northeast Atlantic Coast Region (May 2023)

https://floridadep.gov/sites/default/files/SBMP-NortheastAtlanticCoastRegion_2023_1.pdf

PFM Financial Group LLC - Analysis of Flagler County Beach Nourishment Survey and MSBU Recommendation for Special Assessment (June 3, 2024)

Palm Coast and the Flagler Beaches - Fiscal Year 2024 Tourism Economic Impact Report