

Sediment in the Sanctuaries



Greater Farallones National Marine Sanctuary *Final Coastal Resilience Sediment Plan* *Findings & Results*

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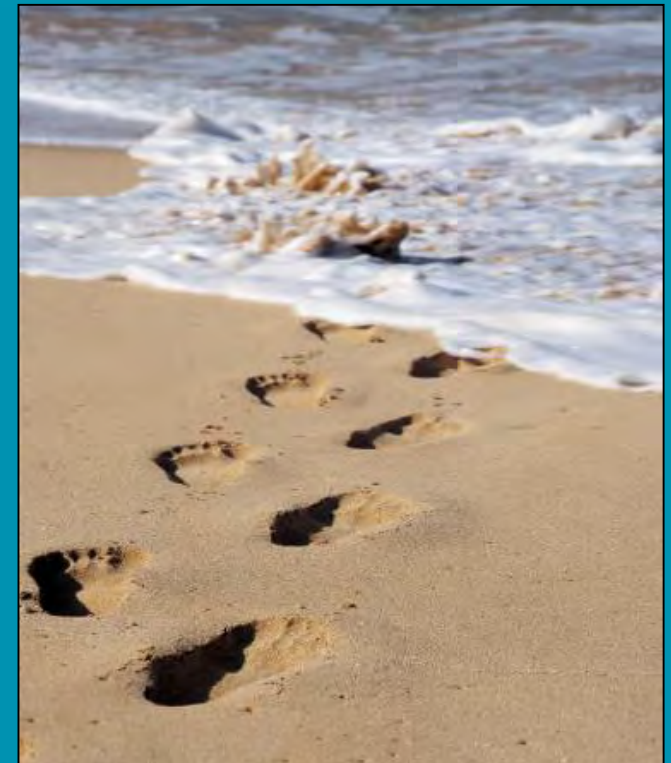
Greater Farallones Association

Max Delaney

Greater Farallones National Marine Sanctuary

GFNMS SAC Meeting

November 13, 2019, San Francisco



Coastal Resilience Sediment Plan

GOAL:

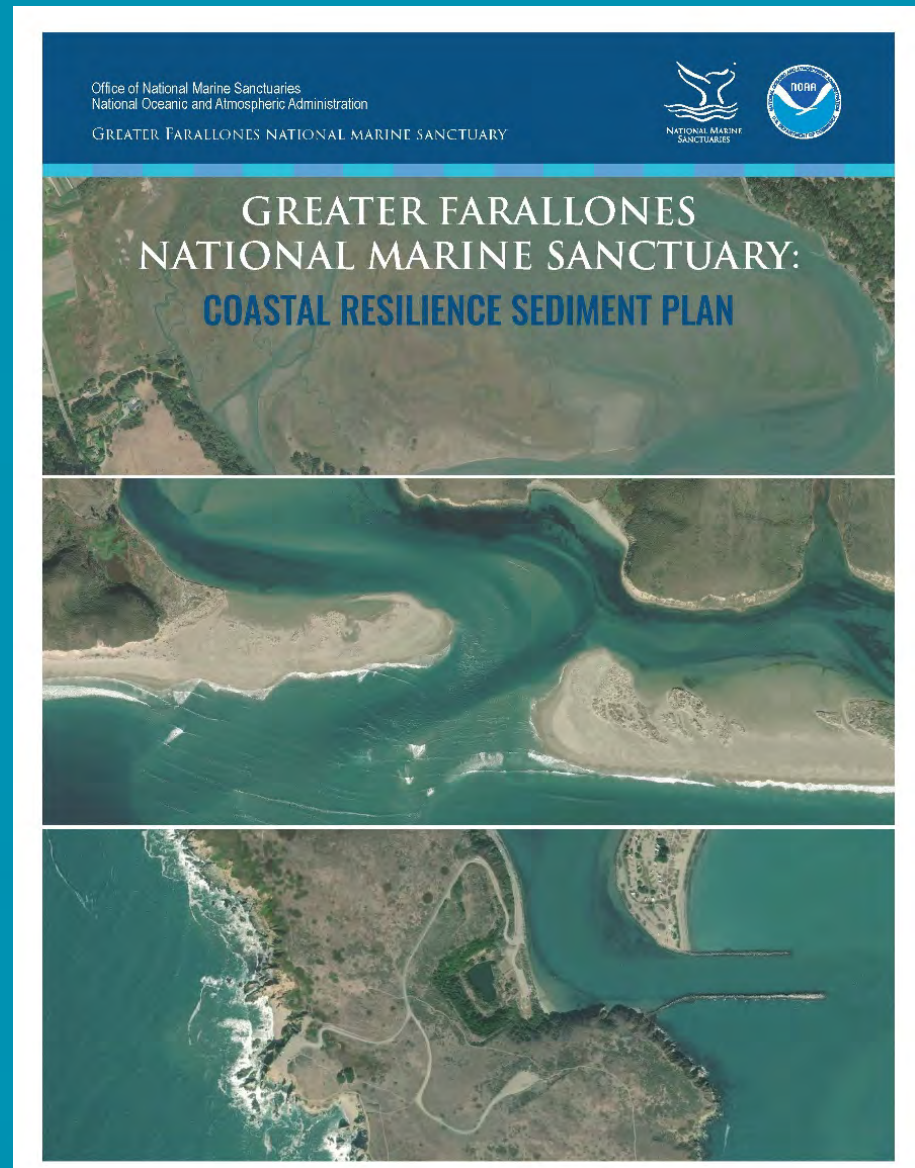
Identify and guide Sanctuary-focused approaches to sediment management for coastal resiliency

BUILT UPON:

GFNMS Climate Adaptation Plan

+

4 Four Coastal Regional Sediment Management Plans



Sanctuary Focused Study Area

This Plan's Area

Gualala



4 Coastal Regional Sediment Management Plans

Sonoma-Marin

San Francisco Central Bay

San Francisco Littoral Cell

Santa Cruz Littoral Cell

Point Año Nuevo

Plan Objectives

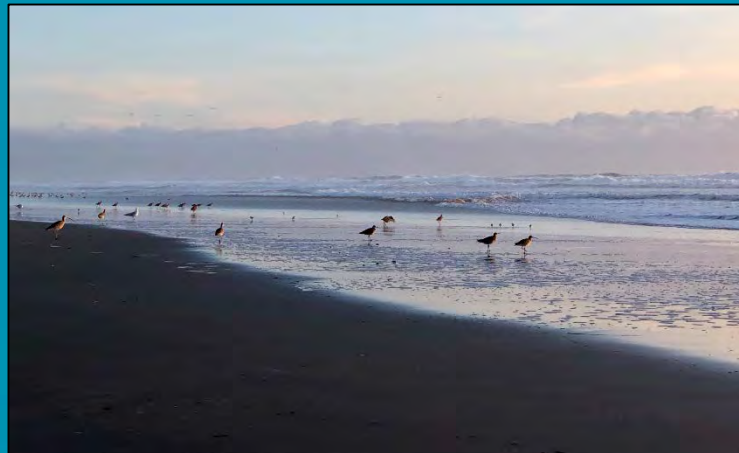
1. *Identify sediment imbalances in the sanctuary's boundaries.*
2. *Coordinate collaborative sediment management actions within the sanctuary.*
3. *Restore natural sediment transport and ecological functions of the North-central California coastline.*
4. *Increase public understanding of, and support for, regional sediment management.*



Coastal Resilience Sediment Plan

OUTCOMES:

- 29 site-specific strategies at 15 locations in the Sanctuary
 - 73 site-specific strategies at 37 site locations forwarded to partner agencies
 - 11 site-specific strategies not consistent with policies and regulations
- 3 Case studies
- 6 regional themes for sediment management in the North-central Coast
- A new multi-agency Sediment Coordination Committee



Site Level Strategies

County	Location	Watershed Network	Restoration of Tidal/Upland and Marsh Ecosystems	Beach Nourishment/Restoration	Perched Beach	Multi-purposed Artificial Reef	Gravel and Rubble	Dune Stabilization by Seawall	Hold the Line	Living Shorelines Research	Elevation	Inland Sediment Management	Dredging
San Francisco Bay													
	State Parks	Fwd									Fwd		
	Gualala River											Fwd	
	Sea Ranch	Fwd											
	Salt Point State Park									Fwd			
	Fort Ross Historic Park	Fwd											
	Russian River - Driftwood Beach											Fwd	
	Russian River - Jenner to Estuary	Fwd								Fwd	Fwd	Fwd	
	Russian River - Goat Rock	Fwd										Fwd	
	Wrights Beach	Fwd	Fwd									Fwd	
	Gleason Beach	Fwd	Fwd									Fwd	
	Salmon Creek Beach	Fwd	Fwd									Fwd	
	Bodega Head	Fwd								MSSL	MSSL		
	Bodega Harbor	Fwd								Fwd	Fwd	Fwd	
	Doran Park	Fwd								Fwd	SSL		
	Doran Park	Fwd	Fwd	SLL						SLL	Fwd	SLL	
	Estero Arroyo		SLL							SLS	MSSL	Fwd	SLS
	Estero de San Antonio									SLS	MSSL		
	Dillon Beach (N)	Fwd					Not a Fit			Fwd	Fwd		
	Dillon Beach (S)		Fwd							Fwd	Fwd		
	Marshall									SLH	SSLH		
	Chicken Ranch Beach		SLL							SLL			
	Inverness	Fwd								SLS		Fwd	
	Pt Reyes Station - Bivalve		Fwd							SLL			
	PRNG - Drakes Beach									Fwd			
	PRNG - Schooner Bay		Fwd										
	Duxbury Reef and Off-shore Area									SLH			
	Bolinas Cliffs	Fwd	SSL				Fwd						
	Bolinas Lagoon		SSLH							SLH	SLH	SLH	
	Stinson Beach	Fwd	Fwd	SLH	SLLH						MLL	SLH	
	Muir Beach	Fwd											
	San Francisco Gate North Reach									Fwd			
	Baker Beach		Fwd										
	Middle Ocean Beach	Fwd	Fwd		Fwd			Not a Fit					
	South Ocean Beach	Fwd	Fwd		Fwd			Not a Fit					
	Manor	Fwd	Fwd		Fwd			Not a Fit					
	Beach Blvd	Fwd	Fwd		Fwd			Not a Fit					
	Sharp Park	Fwd	Fwd		Fwd			Not a Fit					
	Rockaway Beach (Cove)	Fwd	Fwd		Fwd			Not a Fit					
	Linda Mar	Fwd	Fwd		Fwd			Not a Fit					
	Princeton - Pillar Point Harbor		Fwd	Fwd			Not a Fit	Not a Fit					
	El Granada County (Surfer's) Beach	Fwd		SSLH			Not a Fit						
	Pescadero Lagoon - Butano Creek												Fwd
	Total (115)	23	14	12	1	8	1	3	7	5	18	8	10



Compiled and assessed
115 strategies
at 41 site locations

Site-Specific Recommendations Assessed in this Plan from Four Coastal Regional Sediment Management Plans

- Sonoma & Marin
- San Francisco Littoral Cell
- Santa Cruz Littoral Cell
- San Francisco Central Bay
- Study Area of Coastal Resilience Sediment Plan

Map produced by Sage Tezak. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors. Esri, Garmin, GEBCO, NOAA, NCEM, and other contributors. Greater Farallones National Marine Sanctuary. August 13, 2019.

Sanctuary Site Level Strategies

6 STRATEGIES

15 Site Locations

CRSHP Site Number	Location	Restoration of Dune/Upland and marsh environments	Beach Nourishment/Restoration*	Living Shorelines	Research	Education	Dredging*
1	Salmon Creek Beach				MSSL	M&L	
2	Bodega Harbor**				SLL		
3	Doran Park		SLL	SLSL			
4	Estero Americano	SLL			SLSL	MSSL	SLSL
5	Estero de San Antonio				SLSL	MSSL	
6	Marshall			SLH	SSLH		
7	Chicken Ranch Beach	SLL			SLL		
8	Inverness			SLSL			
9	Pt Reyes Station – Bivalve				SLL		
10	Duxbury Reef and Off-shore Area				SLSH		
11	Bolinas Cliffs	SSL					
12	Bolinas Lagoon	SSLH		SSLH	SLH	SSLH	
13	Stinson Beach	SLLH	SLLH		SSLH	SSLH	
14	Muir Beach				MLL		
15	El Granada County (Surfer's) Beach		SSLH				
Total		5	3	4	11	5	1



Not a fit

Forward

Implement

29 Sanctuary-focused strategies

Sorted by Implementation Feasibility
(benefit/resources/support/urgency)

* The Sanctuary could consider allowing beach nourishment or dredging only for restoration purposes.

** Bodega Harbor is not within Sanctuary Boundaries, however the Sanctuary would be involved in the beneficial reuse of material for restoration of beach/marsh habitat at sites that could be in the Sanctuary.

Sanctuary Site Level Strategies

6 STRATEGIES

15 Site Locations

CRSHP Site Number	Location	Restoration of Dune/Upland and marsh environments	Beach Nourishment/Restoration*	Living Shorelines	Research	Education	Dredging*
1	Salmon Creek Beach				MSSL	M&L	
2	Bodega Harbor**				SSL		
3	Doran Park		SLI	SLSL			
4	Estero Americano	SLI			SLSL	MSSL	SLSL
5	Estero de San Antonio				SLSL	MSSL	
6	Marshall			SLH	SSLH		
7	Chicken Ranch Beach	SLI			SSL		
8	Inverness			SLSL			
9	Pt Reyes Station – Bivalve				SSL		
10	Duxbury Reef and Off-shore Area				SLH		
11	Bolinas Cliffs	SSL					
12	Bolinas Lagoon	SSLH		SSLH	SLH	SSLH	
13	Stinson Beach	SLH	SLH		SSLH	SSLH	
14	Muir Beach				MLL		
15	El Granada County (Surfer's) Beach		SSLH				
Total		5	3	4	11	5	1

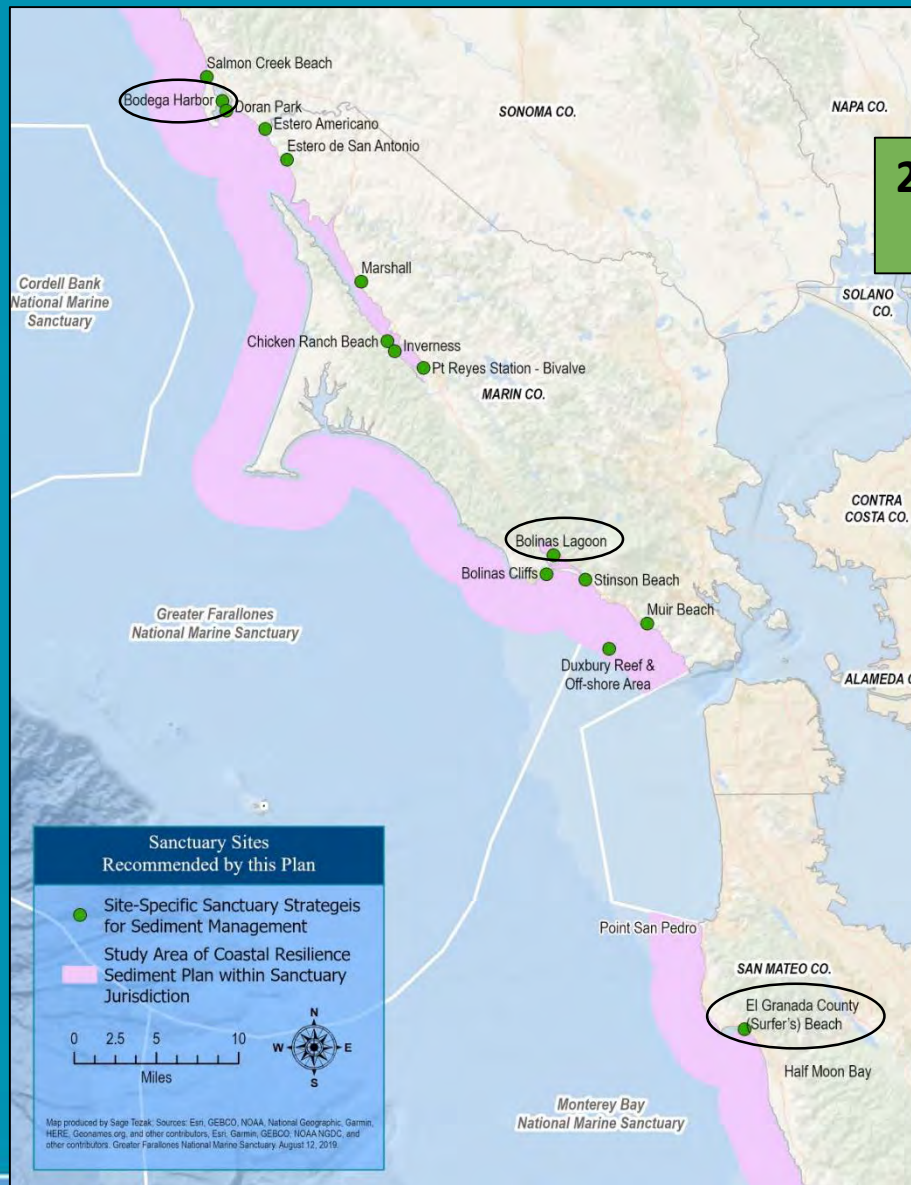
6 Strategy Categories

1. Restoration of Dune/Upland and marsh environments
2. Beach Nourishment/Restoration*
3. Living Shorelines
4. Research
5. Education
6. Dredging*

* The Sanctuary could consider allowing beach nourishment or dredging only for restoration purposes.

** Bodega Harbor is not within Sanctuary Boundaries, however the Sanctuary would be involved in the beneficial reuse of material for restoration of beach/marsh habitat at sites that could be in the Sanctuary.

Sanctuary Site Level Recommendations



29 Sanctuary-focused strategies at 15 site locations

1. *Salmon Creek Beach*
2. *Bodega Harbor*
3. *Doran Park*
4. *Estero Americano*
5. *Estero de San Antonio*
6. *Marshall*
7. *Chicken Ranch Beach*
8. *Inverness*
9. *Point Reyes Station – Bivalve*
10. *Duxbury Reef and Offshore Area*
11. *Bolinas Cliffs*
12. *Bolinas Lagoon*
13. *Stinson Beach*
14. *Muir Beach*
15. *Surfer's Beach*

Case Study 1: Bodega Harbor



Bodega Harbor Dredged Material Reuse Project



Case Study 1: Bodega Harbor

2. Bodega Harbor, Sonoma County

<i>Shoreline Characterization</i>	
General Setting	Geology: Qs; Shoreline: Beaches
Shoreline Change (m/yr)	Average: 0.24 ± 0.24; Maximum: 0.64; Minimum: -0.17
Primary Landowners	California Department of State Parks and Recreation
Critical Habitat; MPA	Tidewater Goby; Bodega Head SMCA
Public Access and Trails	Access Points: 2 Beach Access Points; ~2.5 km of CA Coastal Trail
Infrastructure	Roads: ~4 km local roads; Culverts: 1; Armor: none



Recommended Strategy(ies) from Table 3.6:

<i>Sanctuary Strategies</i>	
Location	Bodega Harbor
Concerns	Dredged material from harbor has historically been disposed off offshore; GFNMS would prefer the sediment stays in the littoral system
Goal	Sand stays within the system and is reused for restoration
Management Strategy	Research
Implementation Feasibility	Strategy with 3 of 4 codes 'More Feasible (SLL); Substantial benefit and large amounts of support but has low urgency)
Timeframe	Near-, mid- and long-term
Strategy Detail	Research opportunities to beneficially reuse clean dredged material from Bodega Harbor for habitat restoration and creation of living shorelines at sites within the littoral system.
Potential Agency Partners	USACE; EPA; CCC; SLC; Water Board; State Parks; County
Notes	In the past, dredged materials from Bodega Harbor have been relocated to Doran Park. Important to follow guidelines regarding beneficial reuse of sediments and avoid potential source of invasive species. Though Bodega Harbor is outside the boundaries of the sanctuary, GFNMS intends to help promote the beneficial reuse of material dredged from the harbor and coordinate with other agencies to identify potential restoration sites in the vicinity and within the boundaries of the sanctuary.

Case Study 2: Bolinas Lagoon



Bolinas Lagoon South End Living
Shoreline Project



Case Study 2: Bolinas Lagoon

12. Bolinas Lagoon, Marin County

<i>Shoreline Characterization</i>	
General Setting	Geology: Qs, Tms, QTs, af, Qha, Qoa, fsr, Kfs Shoreline: Coastal Marsh, Tidal Flats
Shoreline Change	No data available
Primary Landowners	National Park Service (GGNRA), Audubon Canyon Ranch, Marin County Open Space District, Private
Critical Habitat; MPA	Tidewater Goby; none
Public Access and Trails	3 Access Points: 1 Beach Access, 1 City/Town, 1 Historical/Cultural Site ~10 km of trail
Infrastructure	Roads: Hwy 1 and ~10 km local roads Culverts: ~60 Armor: none



Recommended Strategy(ies) from Table 3.6:

<i>Sanctuary Strategies</i>				
Location	Bolinas Lagoon			
Concerns	The loss and/or degradation of lagoon habitats			
Goal	Ensure access and protect and restore habitats.			
Management Strategy	Education	Research	Living Shorelines	Restoration of Dune/Upland and Marsh Environments
Implementation Feasibility	Strategy that may be the most easily implemented, with all 4 codes 'More Feasible' (SSLH)	Strategy that may be the most easily implemented, with all 4 codes 'More Feasible' (SSLH)	Strategy that may be the most easily implemented, with all 4 codes 'More Feasible' (SSLH)	Strategy that may be the most easily implemented, with all 4 codes 'More Feasible' (SSLH)
Timeframe	Near-term	Mid-term	Near to Mid-term	Mid-term
Strategy Detail	Gather long-term trends and work on communications with the community to help facilitate sediment management decisions.	Consider alternatives to protect the roadway including create a living shoreline or horizontal levee or elevating Highway 1 (bypass). Understand changes in depths of water level and road and habitat impacts.	Identify locations that are currently impacted by flooding and erosion, where nature-based shoreline protection projects could have co-benefits for natural systems and human communities.	Remove or modify structures that disrupt the delivery of sediment. Identify potential demonstration sites for nature based infrastructure projects.
Potential Agency Partners	NPS; CCC; SLC; County	NPS; CCC; SLC; County	NPS; CCC; SLC; County; Resource Agencies	NPS; CCC; SLC; County; Resource Agencies
Notes	See Bolinas North End project and Kent Island Restoration Project	Refer to general recommendation regarding CalTrans task force	See Bolinas South End Living Shorelines Project	See Bolinas Lagoon Ecosystem Restoration Project: Recommendations for Restoration and Management (2008)

Case Study 3: Surfer's Beach



Surfer's Beach Pilot Beach
Restoration Project



Case Study 3: Surfer's Beach

15. El Granada (Surfer's) Beach, San Mateo County

Shoreline Characterization	
General Setting	Shoreline: Beach
Shoreline Change	Not available
Primary Landowners	San Mateo County
Critical Habitat; MPA	Black Abalone; none
Public Access and Trails	Highway 1 and a segment of the California Coastal Trail
Infrastructure	Roads: 1 (Highway 1) Culverts: 2 Armor: 800 feet riprap along the highway, outfall in the riprap/bluff adjoining the beach



Recommended Strategy(ies) from Table 3.6:

Sanctuary Strategies	
Location	El Granada or Surfer's Beach, including Vallejo Beach and Miramar Beach
Concerns	Area has experienced significant erosion of the beach and bluff since the construction of the breakwater; threat of erosion to Highway 1 is imminent.
Goal	Reduce erosion and preserve beach habitat.
Management Strategy	Beach Restoration*
Implementation Feasibility	Strategy that may be the most easily implemented, with all 4 codes 'More Feasible' (SSLH).
Timeframe	Near-term; mid-term
Strategy Detail	Beach restoration using dredged materials from the harbor side of the East Breakwater at Pillar Point Harbor. Dredging sand from Pillar Point Harbor and placing it at El Granada County Beach (Surfer's Beach) could restore sandy beach habitat and provide considerable erosion mitigation effects for a period of several years while also protecting adjacent beach and dune habitat.
Potential Agency Partners	USACE; CCC; Caltrans; San Mateo County; Resource Agencies
Notes	Primary land owners include San Mateo County Harbor District and Caltrans. San Mateo County Harbor District is currently leading the development of a pilot restoration project.

*GFNMS could consider allowing beach sand placement only for restoration purposes.

6 Regional Themes for the North-central Coast

- The four CRMSP/Rs list 39 recommendations
- GFNMS condensed these into 6 overarching themes



6 Regional Themes for the North-central Coast

1. Leverage Partnerships and Agency Coordination and Information Sharing
2. Engage Communities and Stakeholders through Education and Outreach
3. Maintain and Expand Sediment Research and Monitoring Activities.
4. Restore Natural Habitats and/or Sediment Dynamics and Pursue Nature-Based Solutions to Avoid Hardening the Shoreline
5. Encourage and Increase the Beneficial Reuse of Sediment
6. Utilize a Holistic, Watershed Approach to Sediment Management



How will this plan be used?

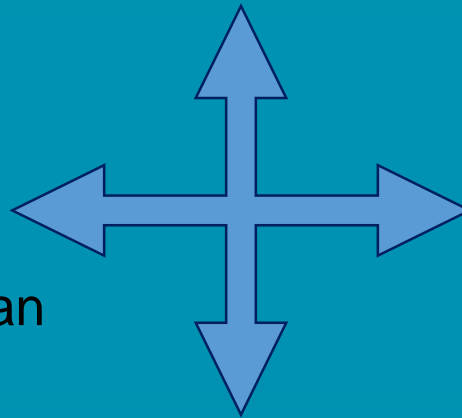


Roadmap:

GFNMS to plan and/or coordinate future projects

Resource:

Product for CSMW (CNRA) to further Sediment Master Plan



Resource:

Project development by partner Agencies

Resource:

Model for newly formed Sediment Coordination Committee planning

What's Happened since the August 2019 SAC Meeting?

- Presented draft plan to CSMW (Sept. 2019)
- Presented to NCC Sediment Coordination Committee (Sept. 2019)
- Finalized headquarters review
- Developing a webstory for ONMS website
- Final Plan out this week



North-central California Coastal Sediment Coordination Committee

- **1st meeting September 2019 at GFNMS**
 - 14 federal, state, and local agencies attended
- **2nd and 3rd meeting scheduled for November and December 2019**
 - Considering adopting 6 regional recommendations from Sanctuary Sediment Plan
 - Expressed interest in using Sanctuary Sediment Plan as a template for committee planning
- **Steering Committee:**
 - GFNMS, State Lands Commission, National Park Service



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