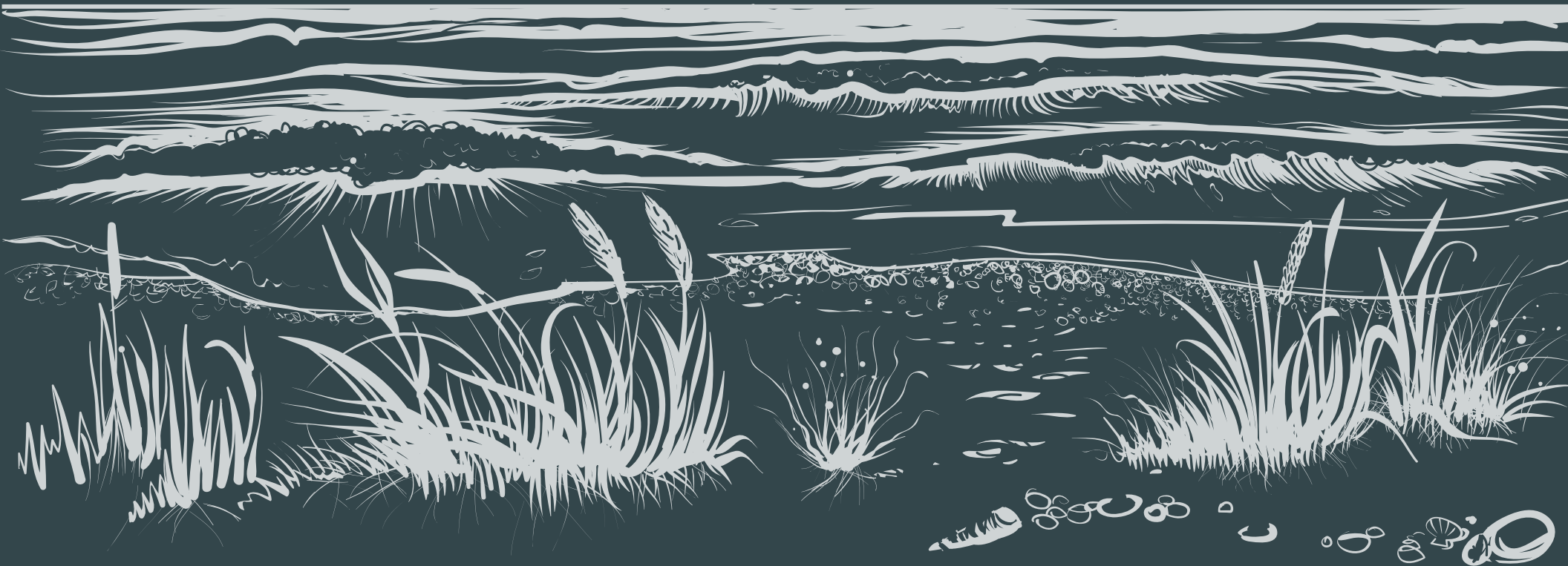


2026 Update Science Research Agenda

DRAFT

BEACON

Beach Erosion Authority for Clean Oceans and
Nourishment



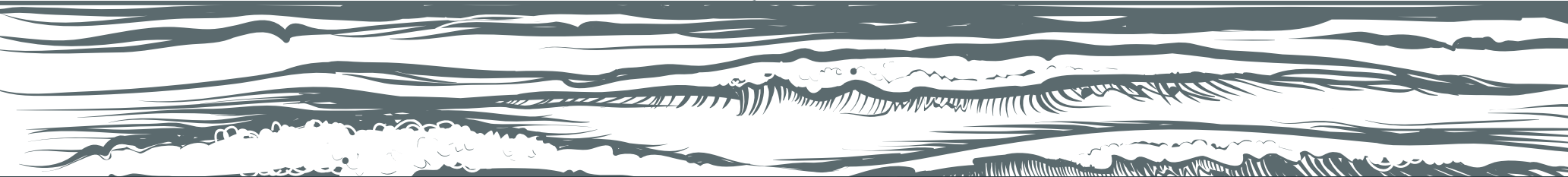
The BEACON Coast



Coastal Santa Barbara and Ventura counties, encompassing the Santa Barbara Littoral Cell. Included rivers and watersheds.

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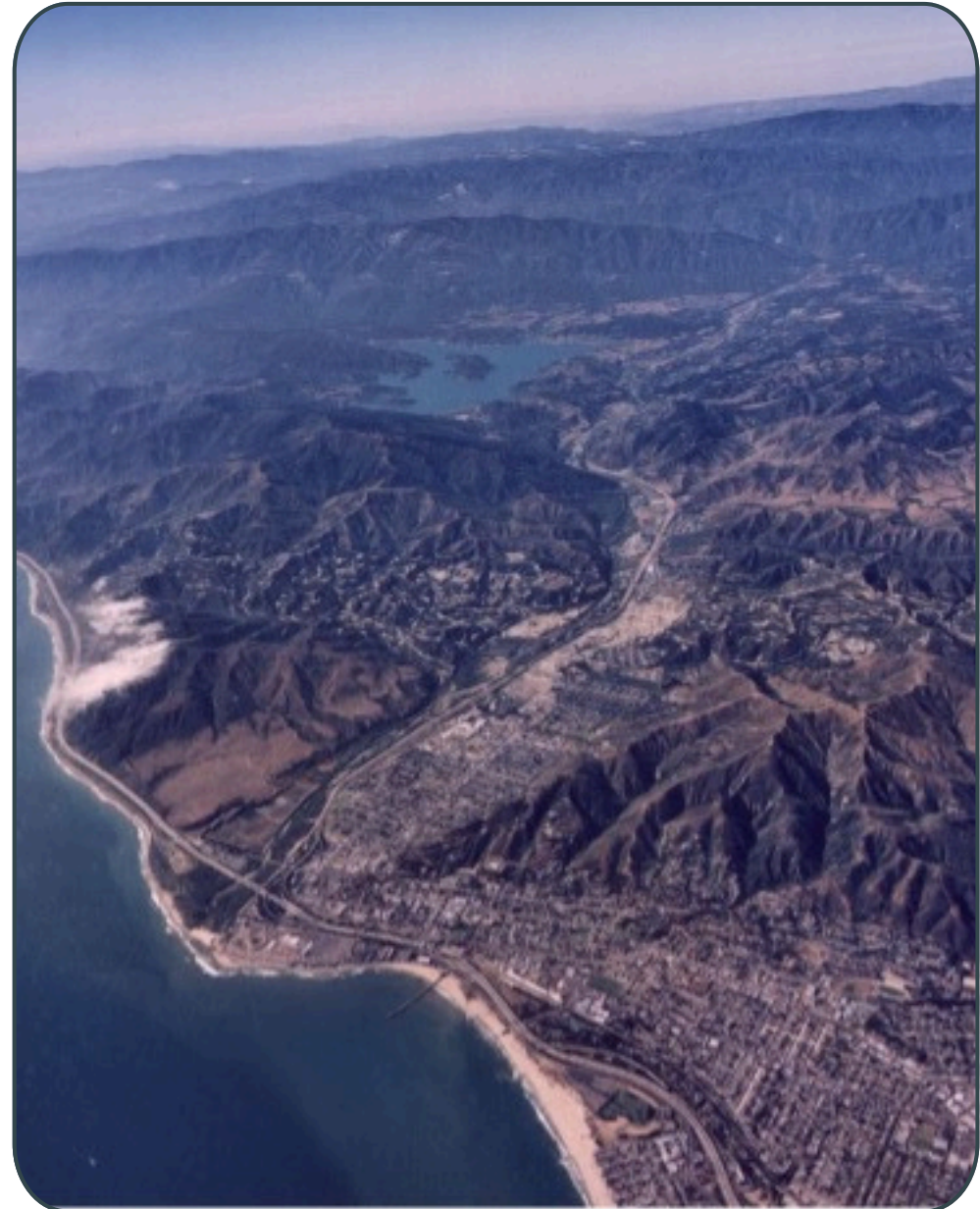
Purpose of the Update

This 2026 update to the initial BEACON Science Research Agenda (2021) provides a summary of the current status of implementation actions and activities undertaken by BEACON, members of the Science Advisory Committee (SAC), its partners, or other researchers between 2020-2025 and provides information describing additions to the original research topics. This update identifies on-going and planned priorities to inform short and long-term science research activities and actions in support of BEACON's multiple complementary goals.

The BEACON Science Staff, with support from the SAC and extensive input from experts, managers, stakeholders, and the public, crafted this update to pinpoint the research actions needed to implement BEACON's core goals. It addresses key areas such as regional sediment management, coordinated coastal-resource planning, climate and sea-level-rise adaptation, community outreach, and tribal collaboration, and integrates

The BEACON "Coast", the coast of Santa Barbara and Ventura counties, includes the Santa Barbara Littoral Cell (SBLC), the largest littoral cell along the California Coast, stretching more than 150 miles from the Santa Maria River in the north to the Mugu Submarine Canyon to the south, draining several large coastal watersheds providing sediment and sand to the coast.

This important coastal region faces many threats and many challenges, including an array of management and governance demands, requiring BEACON to seek out the best available science and support new initiatives or activities that would assist with improved decision-making and outcomes.



On-going Research Priorities

Expand Outreach and Engagement

Increase transparency and encourage input from the community

Extend Shoreline Change Analysis

Synthesize coastal change measurements and provide actionable coastal change information

SBLC Sediment Budget Analysis

Produce updated sediment budget for the littoral cell to guide coastal adaptation.

Sandy Beach Habitat and Species Ecology

Expand beach monitoring, focussing on sediment placement and habitat restoration

Prototyping and Demonstration Projects

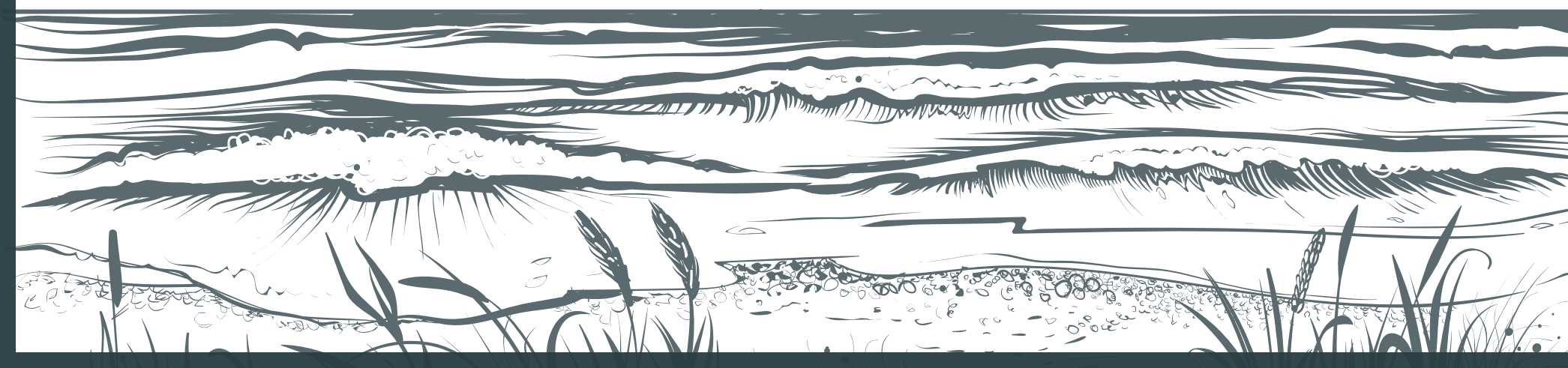
Develop proof-of-concept pilots for nature-based sandy beach and dune living shorelines adaptation.

Shoreline Retention and Stabilization Projects

Develop reef and green-groin pilots to assess sand-retention and environmental impacts.

Socio-Cultural

Develop integrated social-cultural beach-use data, dashboard, and comprehensive economic assessment tools statewide.



BEACON's integrated coastal management planning, including regional sediment management (RSM) programs and activities, and coastal sea level rise (SLR) adaptation planning seeks to support multiple complementary public policy goals. BEACON's science and policy work in the past five years has continued a focus on regional sediment management, watershed and coastal restoration activities supported by implementation of nature-based projects and initiatives, long-term monitoring of coastal natural resources, and the development of robust regional data and information.

BEACON is in a unique position to better connect science and policy as it acts as a boundary organization, translating science and technical information for decision makers and the public. BEACON serves as a facilitator, connecting regional to local coastal resilience, science, and decision making, linking these efforts to larger state and federal planning and management. As detailed in the original Agenda document, a key objective going forward remains bridging identified gaps between science and decision-making, focused on building decision support data, tools, and frameworks better integrating science into BEACON's program and project initiatives.

BEACON has received recommendations for additions to the initial Research Agenda supporting regional management and decision-making, integrating coastal resource management and regional climate change and sea-level rise adaptation planning, community and stakeholder outreach, and tribal consultation and collaboration. Since the original Agenda document was completed in 2021, the SAC has held two annual Manager-Scientist workshops, as well as organized additional meetings and workshops to support discussion and review of research needs and priorities. Annual Manager-Scientist meetings were held in 2022 and 2023, where discussions were



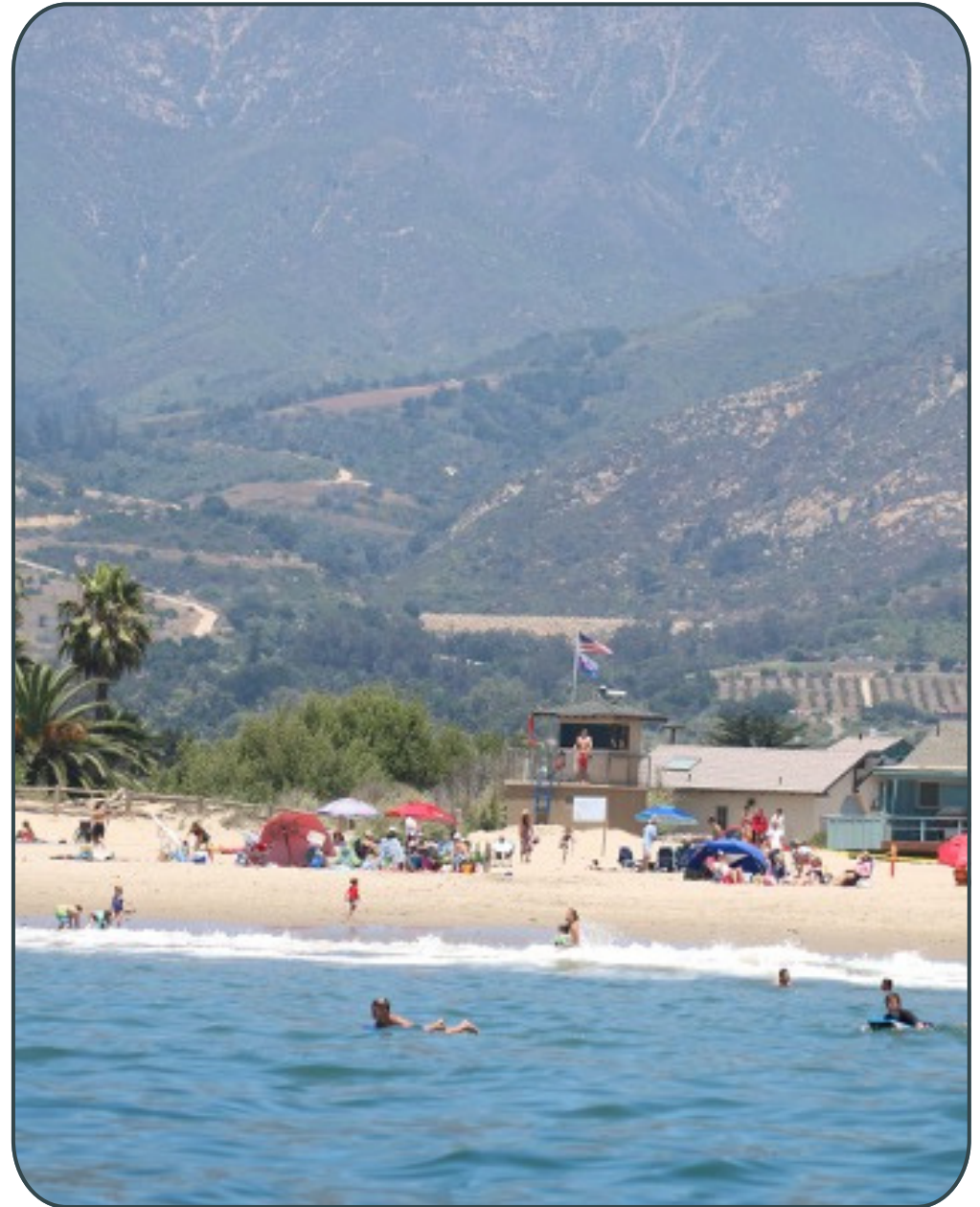
held regarding various topics addressed in this update. The status of SRA activities was reviewed at the November 2024 SAC meeting. This Update addresses the input received from these various and multiple outreach opportunities, highlighting gaps in research and data needs.

The original SRA outlined a multi-goal planning framework; this update adds a focus on implementing complementary environmental, ecological, and social research within a Social-Ecological Systems (SES) approach that evaluates the full suite of ecosystem services. It also frames scientific work as a co-production effort involving technical staff, stakeholders, the public, and tribal partners. The updated bibliography lists relevant studies, reports, and peer-reviewed papers, reflecting new recommendations to expand the Research Agenda for regional management, integrated coastal-resource and climate-SLR adaptation planning, community outreach, and tribal collaboration.

Stakeholder Outreach and Engagement

BEACON has received substantial input regarding the need to recognize the importance of providing opportunities for the full involvement of members of the public and interested stakeholders to solicit input, plan review, program development and policy priorities. The BEACON staff supports and recommends developing additional communication and engagement projects such as workshops and webinars, supported volunteering opportunities, and web resources that increase transparency and encourage input from the community. These communication efforts will also emphasize outreach and engagement of underrepresented communities.

In 2024, BEACON appointed an additional SAC member: the SAC Equity and Justice specialist. The Equity and Justice specialist, Dr. Castro-Sotomayer is highly experienced in planning approaches addressing social and environmental justice and contributions to the BEACON SAC are informed by principles from environmental and social justice, community-based research, ecocultural framework, and Indigenous worldviews.



Chumash Tribal Consultation and Collaboration

Chumash representatives have provided recommendations addressing physical, ecological, and social science research areas, identifying assessment of sensitive coastal physical and ecological resources used for purposes of social-cultural and traditional practices as a knowledge gap not addressed in either existing physical and ecological monitoring. Tribal representatives cited lack of adequate research on governance and engagement needs, especially new or innovative Tribal consultation models, and new collaborative community-based science and research models.



The California Natural Resources Agency’s updated 2025 Tribal Consultation Policy defines meaningful, timely, government-to-government consultation that respects cultural values, tribal sovereignty, and confidentiality. As a state-authorized joint-powers authority, BEACON will follow this policy, seeking Chumash input on science activities and any projects of tribal interest.

Beyond compliance, BEACON will work closely with tribal leaders and networks to target future projects, partnerships, and funding that match tribal priorities. It will prioritize transparent, ongoing engagement to ensure shared decision-making, culturally informed research design, and long-term stewardship that reflect tribal values. In 2025, OPC added the Santa Ynez Band of Chumash Indians to its Marine Stewards Network; BEACON will coordinate with this network for collaborative opportunities, adhering to the CNRA policy throughout.

To strengthen tribal representation, BEACON staff recommend that the SAC add a tribal liaison. This dedicated role would provide a tribal perspective, support culturally informed technical review, guide project prioritization, and enhance ongoing consultation, ensuring that BEACON’s research and implementation align with tribal knowledge systems and stewardship practices.

Integrating RSM and Climate and SLR Adaptation Planning

Multiple BEACON research activities address integrating RSM and Coastal Adaptation Planning:

Coastal Resilience Prop 68 Grant Project:

BEACON’s Coastal Resilience Prop 68 Grant, completed in December 2024, convened an interdisciplinary team that included CSU CI, USGS, UCSB, and SBF to advance regional sediment management and coastal climate adaptation. The project delivered an integrated suite of research and analysis tasks, such as sediment characterization, fate-and-transport analysis, evaluation of sediment placement protocols, beach-ecosystem assessment, and updates to regional permitting performance criteria and protocols. Focusing on three case-study locations—Carpinteria City Beach, Goleta Beach, and the Surfers’ Point project—the team gathered high-resolution UAV aerial imagery, conducted vegetation surveys, and performed photo-point monitoring. Using the Coastal Storm Modeling System (CoSMoS) and ArcGIS Pro, CSU CI examined historical nourishment projects and projected sea-level-rise impacts on sediment dynamics within the Santa Barbara Littoral Cell, producing spatial models that clarified sediment behavior under various scenarios and offered actionable guidance for adaptive management.

The project’s key outcomes include multiple beneficial uses of sediments and sand resources. The project documents opportunities for improved regional permitting systems including pre-application coordination to reduce overall approval times. The project contributed sediment-transport modeling expertise that identified timing, extent, and locations for sediment placement to meet ecological and operational goals. There were additional recommendations for future nourishment projects; and conceptual impact models that link sediment grain size, placement volume, proximity, timing, and frequency to predicted ecological effects, coupled with guidance for ecological monitoring, marine-protected-area protection, and sediment-reuse frameworks such as fines thresholds, expanded monitoring, and best-practice placement.





Photo Credit: BEACSMART Program

BEACHSMART

Currently, BEACON is partnering with Santa Barbara County on its BeachSMART project, providing technical and scientific support contributing to project identification, necessary data collection and analysis, and recommendations for project monitoring and project adaptation within a regional sediment management approach encompassing the south Coast of Santa Barbara County within the Santa Barbara Littoral Cell. BEACON will work to identify preferred placement methods and capacities to receive sediments, focused on developing criteria for deposition within sensitive beach and nearshore marine environments, and requirements for deposition methods and practices will be developed to enable BEACON to implement selected demonstration projects. An analysis of placement protocols will be conducted to provide up-to-date information on the impacts from historic beach and ocean deposition placement, and to develop updated sediment placement protocols and project requirements.

This research has been focused on assessing the transport and fate of sediment fines. BEACON staff are currently pursuing opportunities to extend this research to a fuller range of sediments—particularly cobbles, which represent a critical knowledge gap in understanding beach-nourishment impacts on sensitive coastal resources. The team will continue intensive data collection and modeling of sediment sources, transport pathways, and ultimate fate to inform coastal-adaptation planning. An analysis of historic placement protocols will be updated with these new insights, producing revised sediment-placement standards and project requirements. Between 2025-2028, BeachSMART and BEACON will pursue additional research and analysis to support sustainable, resilient beach-nourishment while refining project protocols, approvals, and ecological-protection goals.

The initial science research agenda identified gaps and voids in regional monitoring needed to support coastal sediment management, coastal access and recreation, coastal restoration and coastal climate and SLR adaptation. Since 2021 BEACON staff have been working with local agencies to identify opportunities for funding to support advancing regional monitoring programs addressing the multiple topic areas of physical, environmental, ecological, and social and human use. Several examples of current BEACON efforts are included in the Update and described briefly below.

Physical Data: BEACON supports on-going Physical Shoreline Data Collection currently being undertaken as part of a long-term science partnership with the USGS.



Regional Coastal Adaptation Monitoring Plan (RCAMP): BEACON is developing the Regional Coastal Adaptation Monitoring Plan (RCAMP) that encompasses Santa Barbara and Ventura Counties. As an objective of the program, the RCAMP provides local management agencies with the information needed to assess whether changed conditions warrant new adaptation approaches and implementation actions resulting in regional resilience benefits or impacts. The RCAMP contains monitoring topics including sandy beach shoreline change, storm events, damage, and emergency response, and combined coastal and fluvial flooding. Monitoring plan components are suggested for each of the topics, laid out by current and suggested data and monitoring, analysis, and products. (BEACON, 2025). The current pilot projects include partnership with USGS to analyze recent shoreline change combining shore transects with satellite imagery and develop recommended methods for future shoreline monitoring.

BEACON is collaborating with USGS and CSUCI to develop the Shoreline Change Hazard Tool (Shore Chat) that will synthesize coastal change measurements and provide actionable coastal change information. The proposed project addresses the absence and need of shoreline change information to support sea-level rise planning in California. New technologies, including satellite-derived shorelines and airborne and drone remote sensing, are able to fill these data gaps and provide decades of shoreline change information. These data provide essential input for forecasts of future shoreline change under sea-level rise, leading the development of use of these new data to discover patterns, trends, processes, and projections of coastal change along the California coast.

Ecological Data:

OPC Prop 68 Coastal Resilience Project: The project report included a recommended ecological monitoring and recovery framework for sandy beaches, identifying several complementary

key activities, including completing baseline and reference site assessments, developing 'Key Ecological Indicators', and undertaking long-term monitoring. The framework includes specific monitoring of ecological impacts of sediment placement, encompassing a range of species, including invertebrate species diversity and population density, shorebird and fish community monitoring and coastal vegetation.



The framework identified habitat protection and resilience protocols, research and monitoring priority actions, focusing on two important habitats and coastal natural resources, eelgrass and kelp beds in the nearshore ocean environment and dunes onshore. Both of these important and sensitive habitats require additional research and long-term monitoring on a regional and place-specific level. Beacon supports additional research on these sensitive coastal and ocean habitats, region-wide as both are critical coastal natural resources. The suggested additional research efforts can be integrated with on-going regional monitoring efforts in Santa Barbara County and in Ventura County within the Santa Barbara Littoral Cell.

The framework includes a suggested set of performance criteria to evaluate the success of sediment placement and beach nourishment activities, including importantly, habitat protection and nature-based coastal resources adaptation.

Coastal Access and Beach Use Data:

In the past decade, BEACON's social science data assembly and analysis efforts have included social cultural as well as socioeconomic monitoring and survey data. The BEACON Science Research Agenda has recognized the limits to, the expense of, and the lack of funding to support, traditional beach access data. BEACON has been pioneering the use and applicability of new geo-located cell-phone location-derived beach use data. BEACON, and its project partners, have completed a pilot project involving this use of mobile device location-derived data. In its initial phase, BEACON, and its project partners, organized and conducted a Beach Count/Survey project in 2024, for a select number of SoCal beaches, in Ventura, Santa Barbara and Los Angeles counties. These coordinated beach use research efforts contribute to regional beach use and beach monitoring programs, incorporating data collection, data management, and development of decision-support tools.



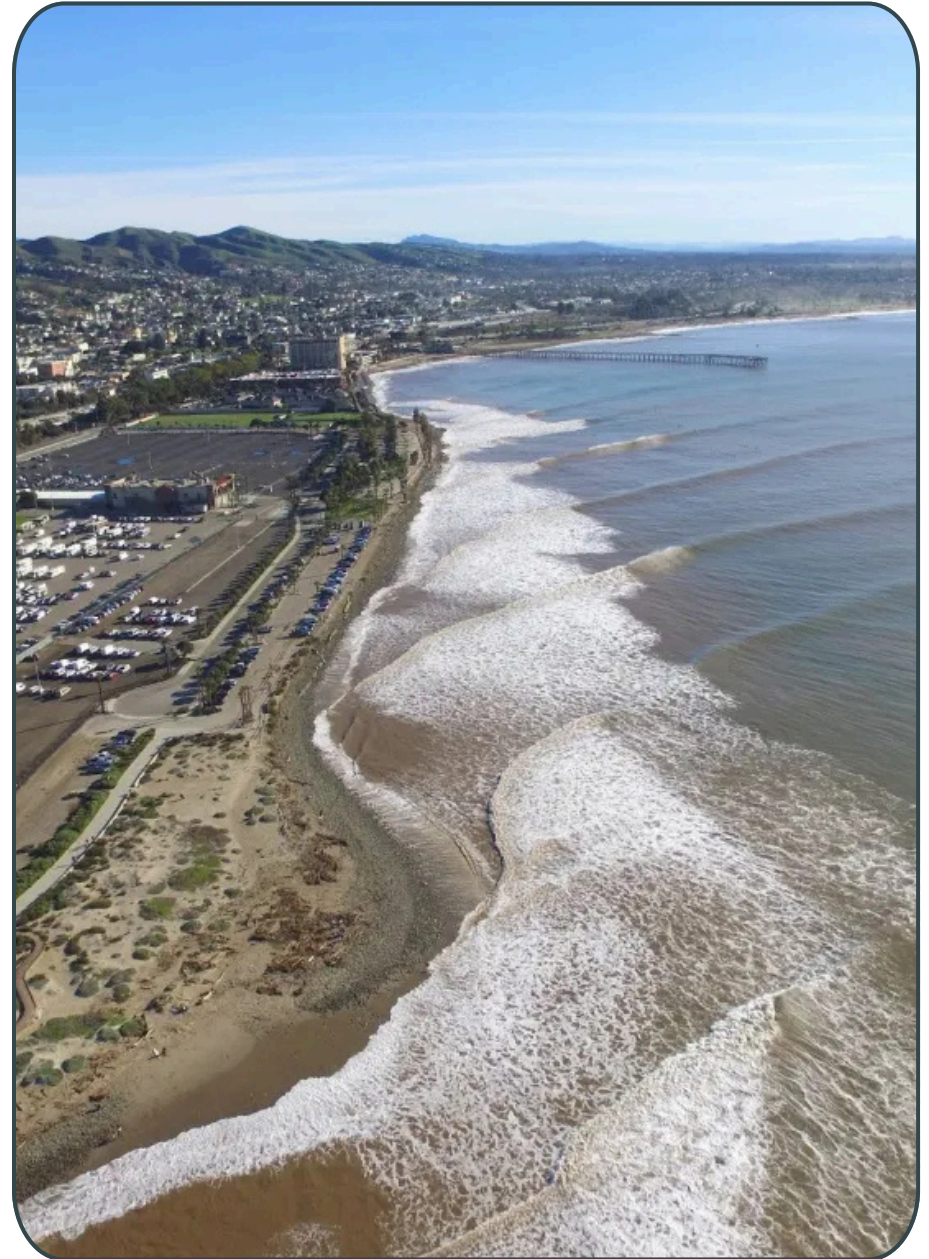
BEACON' Science Research Agenda, and BEACON's staff efforts have both emphasized the need to consider interdisciplinary approaches to research topics and efforts. Several of BEACON's research initiatives seek to address topics of physical, ecological and social science from multiple disciplines including continued monitoring of demonstration projects at Surfers point, collaboration with the California Dunes Science Network, and the Prop 68 grant).

Applying ecosystem planning tools and assessment frameworks is an important element of incorporating interdisciplinary science into decision support. One important way in which ecosystem approaches can be used, including ecosystem services analysis, is to contribute to improved cost benefit assessment (CBA) addressing both market and non-market ecosystem services.

Surfers Point Regional Sentinel Monitoring Site Monitoring:

Organized in 2020, with monitoring conducted in 2021, 2023, and 2024, BEACON coordinated monitoring of the SP Living Shoreline and Managed Retreat Project. This monitoring pilot project built on the project monitoring conducted from 2013-2017 for the Phase 1 project. The most recent BEACON Monitoring expanded monitoring, incorporating 3-D aerial data and imagery.

The lessons learned from Surfers' Point's expanded long-term monitoring program illustrate the need for a consistent monitoring framework that can be applied across multiple sites within the SBLC. Additionally, the project demonstrates the benefits of interdisciplinary collaboration in addressing coastal management challenges. This project will be used to seed additional projects and research on regional sediment and coastal management, for example insert Jon Warrick's paper on sediment science.



BEACON seeks to identify issues and topics that can benefit from the application of computer modeling. BEACON collaborated with USGS to undertake sediment modeling of transport and fate at select beach locations at Goleta County Beach and Carpinteria City Beach to expand our knowledge of the shoreline extent and character from beach nourishment deposition projects. This research has been focused on assessing the transport and fate of sediment fines.

BEACON staff are currently pursuing opportunities to extend this research to a fuller range of sediments, including fines and cobbles. The focus on fines and cobble has been identified as a gap in our knowledge of impacts of beach nourishment activities on coastal sensitive resources. BEACON staff will continue to emphasize data collection and modeling of sediment source, transport, and fate to help inform regional sediment management and coastal adaptation activities.

BEACON has continued to support innovative prototyping efforts, including evaluation of 'soft' nature-based stabilization and retention structures such as hybrid dune restoration elements in its long-standing demonstration pilot project at Surfers Point at the Ventura River mouth. Current monitoring efforts support assessing project performance. Results of the monitoring efforts provide technical and scientific data and information to support outreach and education regarding project success metrics and successful prototyping.



Photo: Dave Hubbard

Surfers Point Regional Sentinel Monitoring Site Monitoring:

Efforts have broadened to include 3-D aerial video and photographic imagery. Additional monitoring data collection is being investigated including additional imagery and remote sensing monitoring. BEACON has coordinated and collaborated in project planning, design, and construction and monitoring with the City of Ventura, the Ventura County Fairgrounds (property owner), and through its participation on the Surfers' Point Working Group. In addition, BEACON has coordinated on-going project regional monitoring. Beacon has coordinated preparation of technical reports on the project to share project results to a wider audience of practitioners and project developers.

The project is an important model of a living shoreline, nature-based project on the high-energy southern California coast. The first phase of the project was constructed in 2010-2012. The City conducted physical monitoring of the site from 2011 through 2017, for which several monitoring reports were prepared. BEACON coordinated funding for final planning and construction of the second phase of the project, initiated in 2024, with the living shoreline and retreat elements completed in 2025 (Battalio, et.al., 2025).



Regional Dune Science Network (CDSN):

The California Dune Science Network (CDSN) coordinates partner-based coastal dune restoration efforts statewide, identifies science-based indicators of coastal resilience, and synthesizes best management practices. BEACON will continue its partnership with the CDSN, reporting on restoration methods and performance results of BEACON living shoreline projects, and the participation in sharing methods, practices, and project performance, providing actionable research and guidance for the usage of hybrid living shoreline beach and dunes as nature-based solutions. BEACON will work to co-develop restoration and site selection frameworks by providing feedback on restoration goals and framework priorities.

Information, Data Management, and Decision-Support Tools

There is an array of monitoring programs focused on coastal resilience throughout the BEACON region; however, availability and accessibility of this data has been identified as a major constraint to coastal resilience collaboration. BEACON is examining integrated data management system options for a demonstration pilot project, a Regional Data Information Station (RDIS), in order to further develop information infrastructure. Such a system would address accessibility to multiple users including technical and scientific staff, agency coastal management and resource staff, interested stakeholders, and the public. This hub can serve to support improved and expanded data accessibility, transparency and usability allowing for better sharing of data and information.



BEACON has been developing additional social cultural data and information focused on beach use and beach user attendance and practices in order to inform improved and expanded coastal and beach access. Managing complex data and information has required BEACON to partner with government and university expertise to investigate and develop accessible data management alternatives. One component of any RDIS would involve managing this type of data and information for users. Socio-cultural data would be a component added to the information station. This would involve a complete and publicly accessible database of socio-cultural data for the BEACON region including beach user data, public access data, and transportation.



1. Expand Outreach and Engagement

BEACON is developing additional communication and engagement activities that increase transparency and encourage input from the community. Specifically, these projects will focus on providing transparency of BEACON's plans and projects to community members, and the incorporation of more public voice in project processes. Currently, BEACON is partnering with SB County in outreach and consultation efforts through the BeachSMART project.

2. Extend Shoreline Change Analysis

There is a documented need for more locally-specific, or down-scaled models on sea level rise to assess community vulnerability. BEACON seeks to expand research and understanding of local Shoreline Change and Hazards. BEACON is collaborating with USGS and CSUCI to develop the Shoreline Change Hazard Tool (Shore Chat) that will synthesize coastal change measurements and provide actionable coastal change information.



The proposed project addresses the absence and need of shoreline change information to support sea-level rise planning in California. New technologies, including satellite-derived shorelines and airborne and drone remote sensing, are able to fill these data gaps and provide decades of shoreline change information. These data provide essential input for forecasts of future shoreline change under SLR, leading the development of use of these new data to discover patterns, trends, processes, and projections of coastal change along the California coast.

3. SBLC Sediment Budget Analysis

BEACON is partnering with CSU Channel Islands on an 18-month effort to produce an updated, synthesis-based sediment budget for the SBLC. The project integrates existing datasets from the USGS, CSU Channel Islands, and regional partners, emphasizing careful synthesis, professional judgment, and transparent documentation. The new budget will capture temporal dynamics often missed in regional planning, such as lag times between watershed delivery and beach response, seasonal versus long-term shoreline change, episodic sediment pulses from drought-wildfire-flood events. The resulting budget will directly inform BEACON's ongoing regional sediment management, coastal adaptation planning, and future CRSMP updates and regional adaptation strategies.

4. Sandy Beach Habitat and Species Ecology

BEACON will continue to expand its monitoring of beaches across the region, including regional typology analysis, targeted habitat-restoration and ecological-function improvements relating to climate change and sea level rise adaptation. The effort will also identify preferred placement methods and capacities to receiver sediments, focused on developing criteria for deposition within sensitive beach and nearshore marine environments, and requirements for deposition methods and practices.

Ongoing monitoring of the Surfers Point demonstration, in partnership with the Coastal Data Services Network (CDSN), will be supported by BEACON funding while additional resources are pursued to sustain long-term monitoring of the Ventura River–Seaside Wilderness coastal corridor, extending from Emma Wood and Seaside Wilderness Park in the west to the Surfers Point area in the east. This integrated approach builds on existing regional monitoring initiatives such as the Southern California Beach Processes Study and the Coastal Data Information Program, which have demonstrated the value of high-resolution aerial, LiDAR and wave-measurement data for assessing beach dynamics and informing adaptive management

5. Prototyping and Demonstration Projects

Sandy Beach and Dune Living Shorelines (see above): Beacon will continue to support nature-based solutions, especially those addressing sandy beach and dune ecosystems. The experience with the Surfers point project demonstrates the important role for BEACON; is to develop a proof of concept, pilot and demonstration projects to inform larger coastal adaptation planning and project design analysis.

6. Shoreline Retention and Stabilization Projects

BEACON is expanding its evaluation of sand-retention structures by supporting research and analysis of both reef and groin projects as potential model or demonstration efforts, although dedicated funding for these proposals has not yet been secured. The Resilient Reef-Oil Piers Demo Project will produce an updated assessment of a reef structure, exploring multiple design options for installation at oil-pier locations. The Green Groins initiative will identify suitable demonstration sites, compare various groin designs, and develop feasibility studies that incorporate environmental-impact considerations for near-shore marine and coastal ecosystems. BEACON will investigate how existing groins affect sand resources in

Santa Barbara and Ventura counties, examine alternative designs to mitigate adverse environmental effects, and design one or more pilot “green-groin” projects within the Santa Barbara Littoral Cell.



7. Socio-Cultural

BEACON will continue to invest in additional data focused on the social cultural topics including both social and economic data on beach use and beach users, including both traditional and nontraditional sources of data. BEACON is developing additional social science data sources, methods, and preparing a regional beach use and beach user regional monitoring program, integrating traditional on-the-ground data methods, with new sources of georeferenced, mobile device origin and destination data.

One important component missing from coastal access and beach use data research is the lack of a transparent and accessible data ‘dashboard’ and the identification of a management agency to house such a data access portal (see above-Information Hub). BEACON is working with Dr. Nathaniel Merrill to further develop the integrated coast access data project to support an updated economic assessment of recreational beach use.

Governance, Organization, and Funding

Since 2021, BEACON's executive and program staff have continued to develop program elements addressing governance, organization, and funding. A recent analysis (Integral Report)—published in October 2025—examined options for better integrating regional sediment management with climate- and sea-level-rise (SLR) adaptation in California.

The study reviewed regional sediment management plans (RSMPs), local adaptation plans, BEACON member agencies' climate-vulnerability assessments, and a statewide practitioner survey, uncovering gaps, barriers, and coordination opportunities. Key findings highlight: integration of sediment-adaptation planning; governance and permitting obstacles; need to account for sediment variability in plans; funding and public-outreach challenges.

BEACON is aiding the federal-state Coastal Sediment Management Workgroup (CSMW) to implement the California Sediment Master Plan, supporting regional sediment management within the Santa Barbara Littoral Cell. BEACON has also joined with three other regional sediment efforts to form the Southern California Sand Collaborative (SCSC).



BEACON is a very small public agency with very limited financial resources. BEACON supports the activities of the SAC with a small amount of annual operational funding.

BEACON'S research and applied science activities are supported primarily through extramural grants and contracts from other state and federal agencies.

In the past five years, BEACON staff have successfully secured multiple grants from a range of partner organizations including the California Coastal Commission, the California State Coastal Conservancy, the California State Coastal Conservancy, and The Bay Foundation. BEACON currently supports funding for science support staff and contractors, providing GIS and data science services to the agency.

Future implementation of research and science activities will require BEACON to continue to leverage its limited program funding with external funding from partner organizations.

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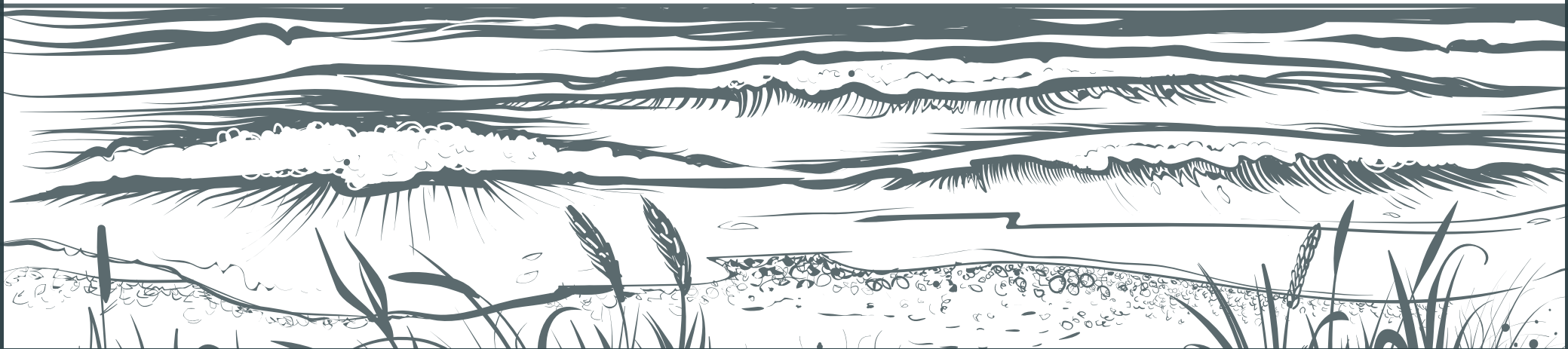
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Coastal Adaptation Planning Dashboard: Ocean and Coastal
Policy Center UCSB & OPC

