

## Introduction

Southern California's coastal wetlands are increasingly recognized for the benefits they provide to human well-being. The potential impacts of sea level rise and population growth in coastal regions further create a growing need to strengthen wetland protection and facilitate their migration. While the physical extent of these wetlands is now protected, their quality is being degraded from upstream impacts such as pollution and development as well as downstream impacts such as encroaching sea level rise. These impacts, along with pressures of a growing population, diminish the level of ecosystem services provided by wetlands. This increases the need to strengthen coastal wetland protection so they can continue to provide the same level of benefits and services to human well-being.

Organizations such as the Southern California Wetlands Recovery Project (SCWRP) seek to protect Southern California's coastal wetlands and expand the benefits they provide. However, due to the non-market nature of these benefits, it is difficult to convey their importance and, as a result, they are often under-represented in development and policy decisions. This project sought to determine a monetary value for Southern California's coastal wetland habitats to provide a common metric that can convey the importance of these areas. These values can further serve as a baseline estimate easily understood by both policymakers and the public.



## Project Objective

Provide a tool to aid in more transparent decision making by:

- Identifying key ecosystem services provided by Southern California Wetlands.
- Assess the value of these ecosystem services to determine gross benefits to society

## Study Area

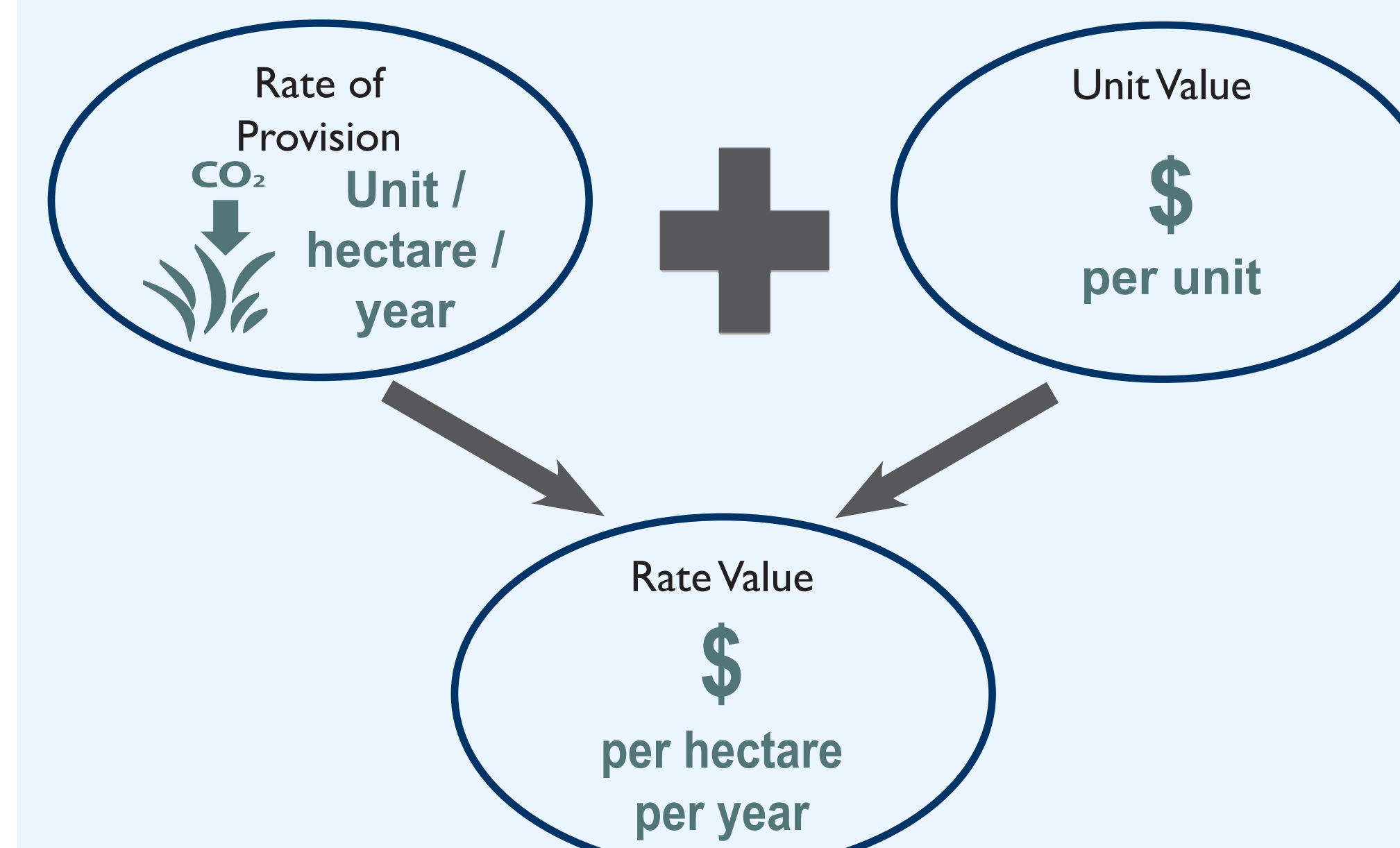


## Methods: An Ecosystem Services Based Approach

We defined ecosystem services as the benefits humans gain from natural ecosystem functions. These benefits include protecting against storm surges, providing aesthetic enjoyment and decreasing pollutants in the atmosphere and coastal waters. This ecosystem service-based valuation is a "bottom-up" approach and ensures that more of these services are taken into account than with other valuation methods. The values of individual ecosystem services for the selected wetland habitats provide context of the value of the greater wetlands as a whole. Since there are not markets for many of these ecosystem services, the following three different valuation methods were used to determine gross benefits to society in dollar values.

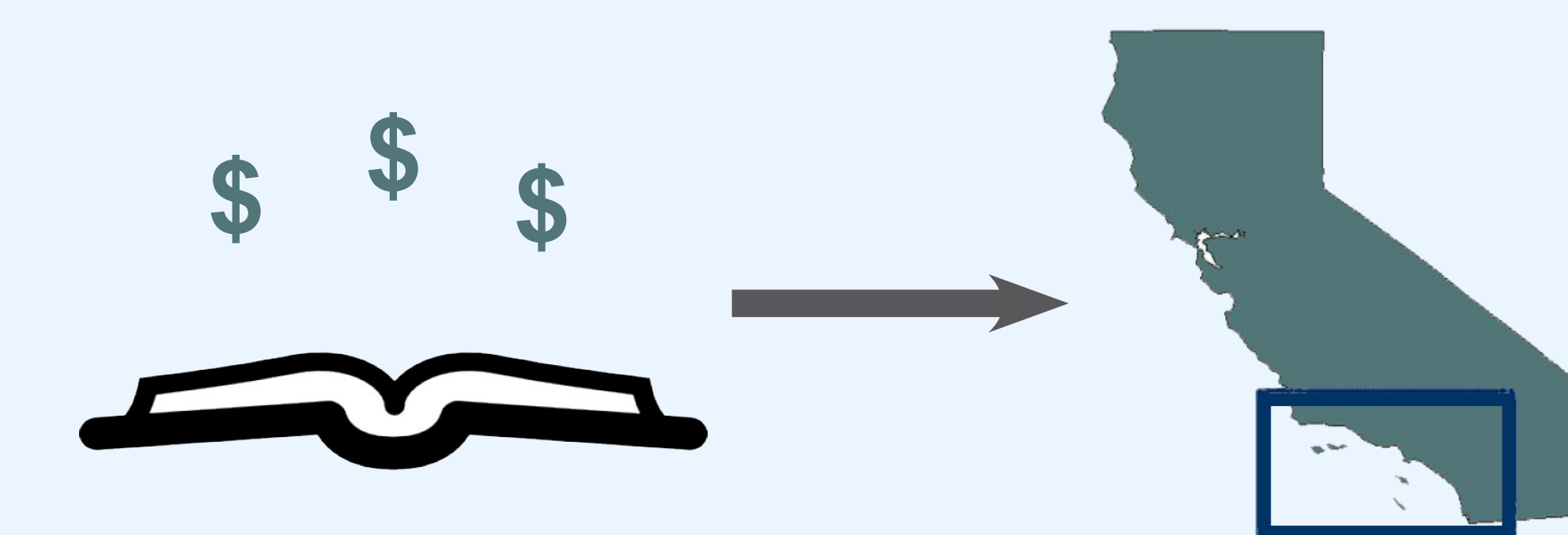
### Ecosystem Service Rate Valuation

This method (ESRV) used annual flow rates for the identified key ecosystem services provided by Southern California's coastal wetland habitats. A commonly accepted dollar value of the ecosystem services was then applied to the flow rates to determine the overall monetary benefit.



### Benefit Transfer

This method (BT) involved using both market and non-market, use and non-use values of ecosystem services from existing literature and research that had been conducted in study areas similar to coastal Southern California. These values were then transferred for use in our study when appropriate.



### Contingent Valuation

This method involved using a survey that provided regionally specific values to Southern California's coastal wetlands. Approximately 400 surveys were distributed through Amazon MTurk, an online crowd-sourcing platform.

Using a hypothetical increase in income tax model, the survey asked California residents what they were willing to pay to avoid degradation of Southern California coastal wetlands. The results provided an upper and lower bound on respondent's willingness to pay, as well as an average annual state value.

In contrast to the two other methods, the survey captured values for avoiding degradation to wetland habitats. Rather than determining the value of individual ecosystem services, the survey provided values for the wetland areas as a whole.

## Results

### ESRV and BT Valuation Results

The table below details the ecosystem services by habitat that we were able to value in our study. With the first two valuation methods (the Ecosystem Service Rate Valuation and Benefit Transfer methods) the overarching benefit coastal wetland habitats provide to humans is based on individual ecosystem services in a "bottom-up" style approach. The habitats were selected based on their unique rates of ecosystem service provision. The type and amount of ecosystem services provided varies by habitat, with particular coastal wetland habitats providing different "bundles" of ecosystem services than others. The value of individual ecosystem services is used to partially assess the value of these bundles and provide context for the value of the selected habitats within the greater wetland system.

Ecosystem Services of Southern California Coastal Wetlands	Beaches & Dunes	Brackish Marsh	Oyster Bed	Saltflat	Salt Marsh	Seagrasses	Shallow Subtidal	Tidal Mudflat	Whole Wetland
Flood and Storm Protection	●	●	●	\$476	\$15,194	●	●	●	\$40
Refugia Habitat	●	●	●	●	●	\$80	\$623	●	\$170
Shoreline Stability and Erosion Control	●	●	●	●	●	●	●	●	\$50
Water Flow Regulation	●	●	X	X	●	●	X	X	\$24
Air Quality	●	●	X	X	\$13	\$47	●	\$17,215	●
Biological Controls	●	●	X	●	●	●	\$61	●	●
Carbon Sequestration	\$42	\$1,174	\$338	X	\$56	\$103	●	\$290	●
Nutrient Cycling	●	●	\$8	X	●	\$30,999	●	●	\$139
Pollution Buffering	●	\$39	●	●	\$1	●	●	●	●
Aesthetics	●	●	●	●	●	●	●	●	\$10
Cultural Activities	\$12	●	●	●	●	●	●	●	\$7
Recreation	\$7,549	●	●	\$5,337	\$5,337	●	●	●	\$154
Science and Education	●	●	●	●	●	●	●	●	\$7

Table 1. ESRV and BT Valuation Results. The table details the ecosystem services by habitat that were valued in this study. All values are for a single hectare of each habitat type and reported in 2015 US dollars. Ecosystem services are listed along the left side of the matrix. Selected habitats are displayed across the top of the matrix. "X" symbols represent ecosystem services that were not provided by a particular habitat. Grey circles indicate ecosystem services that are provided by the habitat but could not be valued in this study.

### Survey Results

In contrast to the other two methods, the contingent valuation survey captured values for avoiding degradation to coastal wetland habitats. Rather than determining the value of individual ecosystem services as a contextual basis, this method provided values for coastal wetland areas as a whole.



Stated Willingness to Pay

**\$65** per year to prevent degradation of coastal wetlands

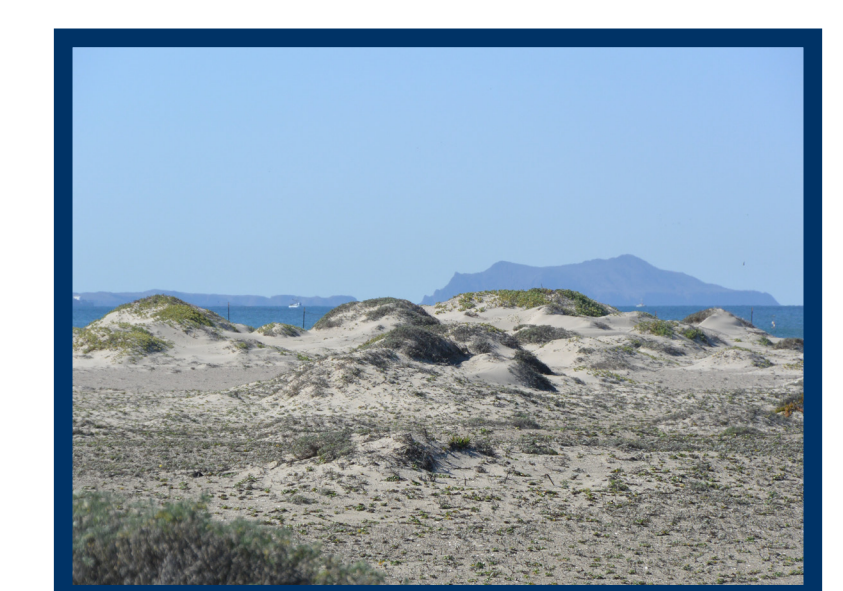
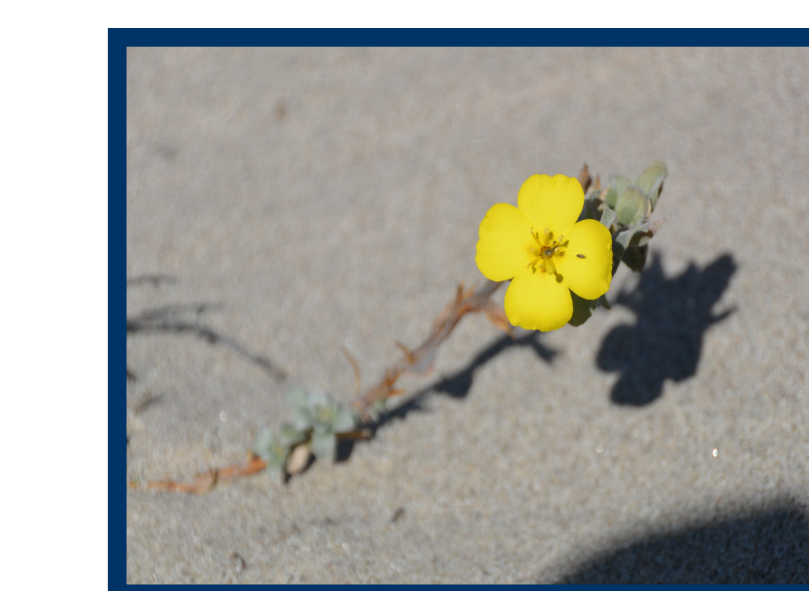
The survey revealed that approximately 60% of California residents would be willing to pay \$45 or more to prevent degradation and, with 24% unwilling to pay anything, and when asked directly residents would willingly pay \$65 on average per year.

## Conclusions & Recommendations

Providing a clearer picture of the value of Southern California coastal wetlands can increase the inclusion of these wetlands in land-use decisions and add to the tools of policy advocacy. The results of this project can be leveraged for two primary purposes: as a communication tool to help inform the public and policymakers of the valuable benefits coastal wetlands provide and as a baseline estimate of land-use values that can be used when comparing the costs and benefits of future projects.

### Communication Tool

The results of this project can be used to encourage and increase the transparency of conversations between environmental groups, community planning organizations, and policy makers in conservation and land use decisions. Public deliberation and discussion can be more fruitful if people have a common metric around which to organize their interactions. Putting wetlands' values in dollars may encourage greater participation in discussions which thus far have not been transparent. If people understand the importance of healthy wetlands and the significance of impacts on these systems, they are more likely to be aware of current and potential threats to these habitats.



### Cost-Benefit Analysis Baseline

When comparing the costs and benefits of future projects, the ranges of values from this project can be used as a baseline estimate for the non-market services provided by wetlands. The inclusion of these non-market benefits in formal analyses will aid in better decision making and allow for more thorough analysis between tradeoffs in development that would limit the provision of these benefits by wetland habitats. Rather than dismissing the value of ecosystem services due to their non-market nature, the value ranges determined in this project provide a middle-ground between theoretical, less-tangible analyses and participatory approaches that lack analysis.

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