



## Science Needs Assessment Impacts of Desalination on Coastal Ecosystems

### Conservation Issue

A better understanding of the long-term ecological impacts of desalination intake methods and discharged brine will allow managers to adequately protect Monterey Bay National Marine Sanctuary (MBNMS) ecosystems from threats associated with planned desalination plants.

### Description

Desalination is the process by which salts and other chemicals are removed from salt or brackish water and other impaired water resources. It is also known as desalinization or desalting, or commonly referred to as “desal.” Without careful planning and mitigation measures, desalination plants have the potential to harm the marine environment through the introduction of brine effluent and other substances to MBNMS waters. Construction of desalination facilities and associated pipelines often causes alteration of the seabed. Intake of water directly from the ocean typically results in biological impacts as a result of impingement and entrainment. Impingement is when larval and adult forms of marine invertebrates and fishes collide with screens at the intake, and entrainment is when species are taken into the plant with the feed water and are killed during plant processes. There has recently been an increase in interest in both private and public desalination plants in central California. Due to population growth in the area, continuing shortages and degradation of conventional water supplies, and advances in desalination technology, this trend will likely continue. Environmental impacts of desalination facilities largely depend on specific physical and biological conditions in the vicinity of the facility, especially in intake and outfall areas. The precautionary approach taken by MBNMS can be strengthened by a review of the cumulative impacts that desalination plants of different sizes have had on coastal ecosystems in other parts of the world.



A California American Water Company test well is installed. Photo: Bridget Hoover/NOAA

### Data and Analysis Needs

1. Effects of mortality due to impingement and entrainment on biological productivity of the affected ecosystem(s) and methods for minimizing impingement and entrainment
2. Effects of decomposition of impinged and entrained organisms on oxygen content of water near the discharge point
3. Synergistic effects of mixing desalination brine with effluent from wastewater treatment facilities and power plants, and whether this can enhance brine dispersion
4. Biological and ecosystem impacts of chemicals and heavy metals released as part of the brine effluent and how these can be reduced
5. Changes in species abundance and composition in areas where desalination facility outfalls are located

6. Long-term effects of brine discharges on biological communities, particularly benthic communities
7. Intake and outfall siting best practices that have been used to minimize adverse ecosystem impacts

## Potential Products

- Guidelines for effluent field monitoring programs to track pre- and post-discharge conditions
- Discharge dispersion modeling tools that incorporate regional oceanographic patterns
- List of site selection, construction, and operations best practices that can be integrated with existing MBNMS desalination guidelines to reduce ecosystem impacts

## Suggested Scientific Approach and Actions

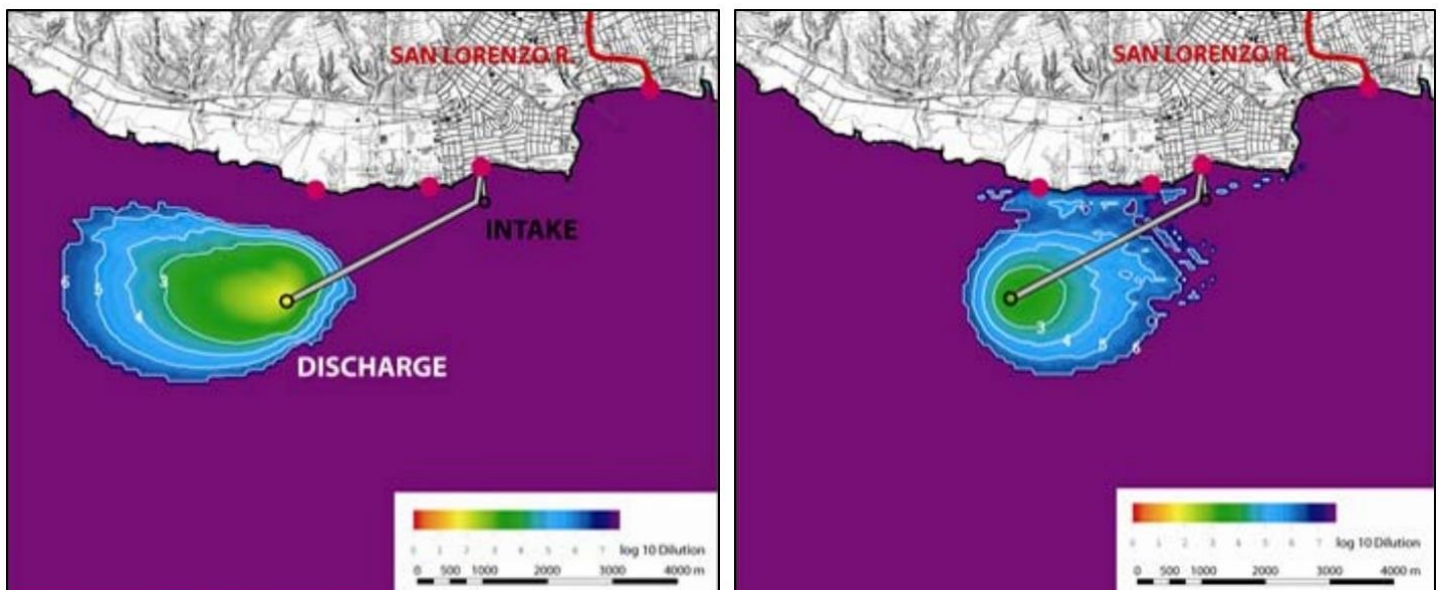
- A comprehensive review of studies on cumulative ecological impacts of existing desalination facilities
- Comparison of long-term ecological impacts of combined desalination brine and wastewater effluent discharge with separate discharge streams
- Identification of threats associated with chemicals and heavy metals that may be released with brine
- Description of special status species that could be affected by desalination in the MBNMS region

## Key Partners

Public works agencies, Moss Landing Marine Labs, NOAA Fisheries, California Coastal Commission, Southern California Coastal Water Research Project, Central Coast Regional Water Quality Control Board, State Water Resources Control Board, California State Lands Commission, California Public Utilities Commission

## Supplementary Information

[California State Water Resources Control Board: Ocean Plan Requirements for Seawater Desalination Facilities](#)



Dilution and dispersion of desalination brine is influenced by ocean temperature, salinity, and wave climate, and seasonal variation must be considered. A scenario for Santa Cruz desalination effluent shows dilution during the upwelling period (left) and the relaxation period (right). Image: Adapted from [Jenkins et al., 2012](#)

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