

Assessing Areas of Special Biological Significance Exposure to Stormwater Plumes Using a Surface Transport Model

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EXECUTIVE SUMMARY

Introduction

Areas of Special Biological Significance (ASBS) are state water quality protected areas that, by legislative order, are not allowed to “receive discharges of waste” and must “maintain natural water quality.” However, there are currently over 1,600 stormwater outfalls to ASBS statewide, the vast majority draining extremely small coastal catchments. The regulated parties have been rigorously working with the State Water Resources Control Board to ensure these outfalls do not contain waste. Meanwhile, much larger watersheds that discharge nearby ASBS, but not in them, are not subject to ASBS regulations. As a result, there is concern that plumes from these much larger watersheds may be transported into ASBS altering natural water quality. The goal of this study is to conduct preliminary modeling exercises to assess the potential of the plumes from large, neighboring watersheds to negatively impact ASBS water quality in southern California.

Methods

The conceptual approach for this study was to estimate the probability of plume exposure in ASBS based on a transport model that uses High Frequency (HF) radar derived surface current data as input. The model used two years (January 1 2008 - December 31, 2009) of surface current data for model runs and was applied to 20 rivers that discharge proximal to six ASBS from Malibu to San Diego. The plume probability exposure map was created by tracking 50 virtual water parcels released hourly, 1 km offshore of each river system. The cumulative number of tracers for a moving 3-day window (3600 tracers) were tracked for a given modeled time period. The probability of exposure was calculated for each ASBS by dividing the total number of virtual water parcel tracers advected into the ASBS by the total number of parcels introduced into the study region. A detailed description of the model assumptions, limitations and validation results is included in the full report.

Plume Exposure Probability

The ASBS with the greatest extent and largest magnitude of exposure probability is the Mugu Lagoon to Latigo Point ASBS (Table 1, Figure 1). Nearly half of this ASBS has a probability of plume exposure between 10-20% from the discharge of Calleguas Creek. The Robert Badham and Irvine Coast ASBS had the second greatest extent and magnitude of exposure probability; 100% of these ASBS had a probability of exposure between 1-10% from the discharge through Newport Bay. The ASBS with the least extent and smallest magnitude of exposure probability is Heisler Park where there was virtually no (<1%) probability of plume exposure. However, the probability of exposure from the Laguna Canyon Channel could not be determined.

The next steps for the Mugu Lagoon to Latigo Point or Robert Badham ASBS is to conduct more detailed studies focused on empirically measured plume tracers and associated water quality. Examples of

appropriate follow-up studies might include ship-based salinity and turbidity measurements, in conjunction with real-time HFR surface currents. These measurements can then be placed in context with similar measurements from the smaller, but more localized, regulated ASBS discharges.

Table 1. Relative extent (as % of ASBS) of increasing plume exposure probabilities from neighboring river discharges. Modeled estimates of exposure are on an annual basis from 2008–2009.

ASBS Name	River	Extent of ASBS Potentially Impacted			
		Probability 0%	Probability <1%	Probability 1-10%	Probability 10-20%
Mugu Lagoon to Latigo Point	Calleguas Creek	53%			47%
	Malibu Creek	84%		16%	
Robert Badham	Newport Bay			100%	
Irvine Coast	Newport Bay			100%	
Heisler Park	Aliso Creek		100%		
	Laguna Canyon				
San Diego - Scripps	Los Penasquitos		100%		

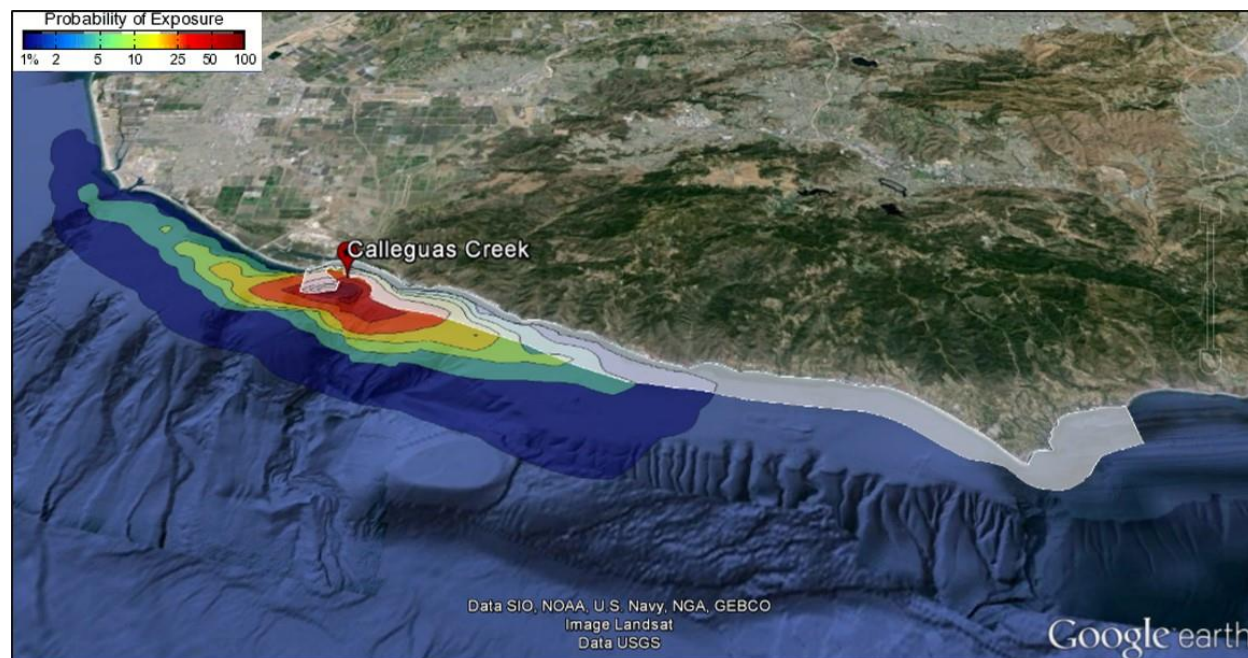


Figure 1. Plume probability contours for the Calleguas Creek watershed adjacent to the Mugu Lagoon to Latigo Point ASBS (in translucent white).

Full-text:

http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/817_ASBSPlumes.pdf