The California Beach Water Quality NowCast Project

NWQMC – March 2019
Ryan Searcy – Heal the Bay
Why Predict Water Quality?
The ‘Current Method’ is Inadequate for Public Notification.
Statistical methods have been successfully used to develop FIB models that can accurately predict water quality standard exceedances.
Models Studied:

- United States
- Puerto Rico
- South Korea
- Germany
- Canada
- Norway
- Brazil
- Australia
- Hong Kong
- Scotland
- Croatia

Endorsed for Implementation:

- European Commission
- United States Environmental Protection Agency

+ more
Implementation of an automated beach water quality nowcast system at ten California oceanic beaches

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The California NowCast System

Check NowCast Prediction

Doheny State Beach

NowCast          15 min ago

Good
Current Method vs. NowCast Predictions

Current Method
1. Public notification/management action based only on a single sample
   • Retroactive
2. Generally low sensitivity
3. Low availability
   • Samples taken typically once weekly

NowCast
1. Predictions are based on the most up to date environmental data
   • Come from models based on years of environmental data
2. Models are tuned to achieve performance levels desired by beach managers
3. Available 7 days/week
NowCast is a Comprehensive Program

1. Automated Modeling Pipeline
2. Technical Oversight
3. Public Notification and Education
4. Beach Manager Communication
NowCast models are designed to be more health protective than the ‘Current Method’ (CM)

Model Evaluation Metrics:

**Sensitivity** = Accuracy of model in predicting ‘Poor’ water quality

**Specificity** = Accuracy of model in predicting ‘Good’ water quality
NowCast for Manhattan (28th St) (Date: 02/16/2018)

Collecting environmental data:
Grabbing wave parameters at CDIP buoy 028 for a sample time
Wave variables obtained
Tide variables obtained
Weather variables obtained
Checking rain advisory status:
Manhattan (28th St) is not under a rain advisory
Environmental data collected and saved to Manhattan_(28th_St)

Running FC model (Manhattan (28th St)):

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>rainH b</td>
<td>0.412</td>
<td>0.00000</td>
</tr>
<tr>
<td>lograin4T</td>
<td>0.097</td>
<td>-2.30103</td>
</tr>
<tr>
<td>pres1</td>
<td>-0.459</td>
<td>30.10000</td>
</tr>
</tbody>
</table>

Constant: 15.731
PM: 1.415

FC (Predicted): 248 CFU/ 100 mL
Posting Decision: No Post

Running ENT model (Manhattan (28th St)):
NowCast provides many more days of water quality information to the public than samples alone.
NowCast provides many more days of water quality information to the public than samples alone.
NowCast Beaches

Summer 2016: 5 beaches
4 partner agencies
NowCast Beaches

Summer 2016: 5 beaches

Summer 2017: 10 beaches

6 partner agencies
NowCast Beaches

Summer 2016: 5 beaches

Summer 2017: 10 beaches

Summer 2018: 19 beaches

8 partner agencies
NowCast Beaches

Summer 2016: 5 beaches
Summer 2017: 10 beaches
Summer 2018: 19 beaches

Winter 2018/19: 5 beaches
NowCast Beaches

Summer 2016: 5 beaches

Summer 2017: 10 beaches

Summer 2018: 19 beaches

Winter 2018/19: 5 beaches

Summer 2019 (TBD): 30-35 beaches
10 partner agencies
Lessons Learned
1. Models can provide more frequent and sensitive information than the CM alone.
Models are typically more sensitive than the CM while maintaining adequate specificity.

<table>
<thead>
<tr>
<th>Performance</th>
<th># Beaches</th>
<th>Mean Sensitivity</th>
<th>Mean Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NowCast Season</td>
<td># Beaches</td>
<td>NowCast</td>
<td>CM</td>
</tr>
<tr>
<td>Summer 2017</td>
<td>10</td>
<td>0.46</td>
<td>0.10</td>
</tr>
<tr>
<td>Winter 2017/2018 (Pilot)</td>
<td>5</td>
<td>0.51</td>
<td>0.28</td>
</tr>
<tr>
<td>Summer 2018</td>
<td>19</td>
<td>0.19</td>
<td>0.12</td>
</tr>
<tr>
<td>Present (Winter 18/19)</td>
<td>5</td>
<td>0.40</td>
<td>0.10</td>
</tr>
</tbody>
</table>
2. Sensitivity and specificity are more useful metrics than traditional statistics
Summer 2018 Results – Model Performance

- 25 (53%) Good
- 15 (32%) Acceptable
- 3 (6%) Under Review
- 4 (9%) Poor

19 Beaches
47 Models
3. Models provide insight on important environmental mechanisms to water quality at the beach.
4. There are a number of benefits from the centralization of a modeling system
5. Communication with beach managers and the public is an important component of predictive modeling systems.
Good morning,

Here are the NowCast Predictions for 01/23/2019:

<table>
<thead>
<tr>
<th>Beach</th>
<th>County</th>
<th>Prediction</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venice Breakwater</td>
<td>LA</td>
<td>Post</td>
<td>Triggered by ENT</td>
</tr>
<tr>
<td>Manhattan (28th St.)</td>
<td>LA</td>
<td>No Post</td>
<td></td>
</tr>
<tr>
<td>Redondo Breakwater (Herondo St.)</td>
<td>LA</td>
<td>No Post</td>
<td></td>
</tr>
<tr>
<td>Huntington City Beach (Beach Blvd.)</td>
<td>OC</td>
<td>No Post</td>
<td></td>
</tr>
<tr>
<td>Santa Ana Rivermouth</td>
<td>OC</td>
<td>No Post</td>
<td></td>
</tr>
</tbody>
</table>

Please contact us with any questions or comments.

NowCast predictions may also be accessed on Heal the Bay’s Beach Report Card website.

Cheers,

The NowCast Team
(310) 451-1500
nowcast@healthebay.org

Heal the Bay
Today’s NOWCAST
50 feet upcoast of the Santa Ana River Mouth at Huntington State Beach

GOOD
Ocean water bacterial levels predicted to meet state health standards at the location above.

Today’s NOWCAST
Surf at the projection of Beach Boulevard at Huntington City Beach

GOOD
Ocean water bacterial levels are predicted to meet state health standards at the location above.

Predicted to exceed State standards for bacteria level in ocean water.
WARNING
Bacteria levels predicted to exceed health standards today
Ocean water contact may cause illness

AVISO
Los niveles de bacterias pronosticados hoy superaron los estándares de salud
El contacto con el agua puede causar enfermedades

For more information on the California NowCast system:
Para más información sobre el sistema NowCast de California:

Catch a wave, NOT A COLD

Water quality can change every day. That is why your local beach managers and Heal the Bay have partnered to provide you daily NowCast predictions at this beach. Know before you go, and check the latest NowCast prediction on the Beach Report Card app

beachreportcard.org
Welcome Beach Lover.

We believe that no one should get sick from a day at the beach, and that's why we've created a simple, yet comprehensive tool that lets you search for the latest water quality information at your favorite beach.

To get started, enter the location of a beach in the search bar or play around with the map to find water quality information for beaches near you.

NowCast Predictions | Beach Report Card Grades
---|---
IQL | Good
A | B | C
IQL - | Poor
D | E | F
Venice City Beach
projection of Windward Ave.

NowCast

Good

Dry Grade: B

Wet Grade: F

This site is situated at the wave wash of the Windward Avenue storm drain. Monitored by The City of Los Angeles Environmental Monitoring Division.

Monitoring Agency Contact Info

Contact
LA City
1-800-773-2489
Website
Contact Information

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Mobile app: Available now on iOS and Android
GitHub: https://github.com/rtsearcy/NowCast
Ref.: Searcy et al. (Journal of Enviro. Management, 2018)