Existing Segmentation

Regional Water Quality Control Board (RWQCB): Major bridges define segments for regulatory purposes.

Andrew Gunther, 1987: Major segments are shown. Further segmentation was proposed.
Existing Segmentation

Andrew Gunther, 1987:
Further segmentation of each section was proposed based on depth, salinity, ecology, and anthropogenic discharges.

Number of subdivisions
Lower/South Bay 12
Central Bay 11
San Pablo Bay 10
Suisun Bay 4

Important when considering how to allocate samples.

May be more important for sediment than for water
Dr. Wim Kimmerer:
San Francisco State University:
   Zooplankton studies and general, long-term knowledge of the Bay.

Dr. Jon Burau:
USGS
   Water circulation studies. Identified density driven circulation “cells” bounded by geographic sills or shoals.

Dr. Dave Schoelhamer:
USGS
   Water circulation studies. Geographical constrictions effecting water flow and also discussed the importance of depth considerations, temporal variability, and tidal action.

Dr. Alan Jassby:
University of California - Davis
   Estuarine Sampling Design – Statistical analysis using water quality attributes from sampling transects.

Dr. Bruce Thompson:
SFEI
   Benthic assemblage distributions. Boundaries move in seasonal patterns.
Professional Judgement

Important considerations:

- Tidal influences
- Temporal variation
- Is the data representative of the Bay?
- Shallow vs. Deep
- Influence of sediments on water quality (TSS)
- Random Allocation to the entire Bay?
- Anthropogenic sources
Important considerations:

Tidal influences

Temporal variation: seasonal and tidal

Is the data representative of the Bay? Mostly have deep data for water

Shallow vs. Deep Sediment is an important player in WQ: suspended solids are very different in the shallows vs. the channels.

Influence of sediments on water quality (Schoelhammer TSS)

Random Allocation to the entire Bay? (Jassby (BT explain?)

Anthropogenic sources (Gunther careful to identify potential sources such as outfalls and storm drains).
Cluster Analysis of Water

Six water quality attributes were used in a cluster analysis.

RMP and BPTCP data (1989-1998)

Cluster analysis results using 6 water quality variables:
- temperature
- dissolved oxygen
- dissolved organic carbon
- total suspended solids
- pH
- salinity

RMP monitoring site

Water (All Year)
Water (Wet season)
Water (Dry season)
Partition Analysis of Water

Dry weather water samples were grouped based on similar salinity and temperature regimes.
Cluster Analysis of Sediment

% Fines and TOC were used in a Sediment cluster analysis.

Results indicated that large sections of the Bay (proper) consist of:

< 60 % Fines & > 4 % TOC

Bay (margins) however are more variable.

Partition Analysis of Sediment

Dry weather sediment samples showed more distinct segmentation:

<table>
<thead>
<tr>
<th></th>
<th>% Fines</th>
<th>%TOC</th>
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</thead>
<tbody>
<tr>
<td>Black</td>
<td>75-100</td>
<td>&lt; 4</td>
</tr>
<tr>
<td>Blue</td>
<td>50 – 75</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Green</td>
<td>0 – 50</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Yellow</td>
<td>70 –100</td>
<td>4 – 7</td>
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<tr>
<td>Pink</td>
<td>50 – 70</td>
<td>2 – 4</td>
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Note: Bay margins have higher organic material than the Bay proper.
## Summary

### Existing*

<table>
<thead>
<tr>
<th>Segment Boundary</th>
<th>Expert Opinion</th>
<th>Water Cluster</th>
<th>Water Partition(d)</th>
<th>Sediment Partition(d)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipps Island*</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Benicia Bridge*</td>
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<td>2</td>
<td>1</td>
<td>0</td>
<td>8 ✓</td>
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<td>Carquinez Bridge*</td>
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<td>2</td>
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<tr>
<td>Carquinez Straight (west end)</td>
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<td>1</td>
<td>1</td>
<td>6 ✓</td>
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<tr>
<td>Pt. Pinole</td>
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<td>1</td>
<td>2</td>
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<tr>
<td>Pt. San Pablo</td>
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<td>0</td>
<td>5 ✓</td>
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<td>1</td>
<td>3</td>
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<tr>
<td>San Bruno Shoal</td>
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<td>1</td>
<td>7 ✓</td>
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<td>San Mateo Bridge*</td>
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<td>1</td>
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<tr>
<td>Dumbarton Bridge</td>
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<td>0</td>
<td>4 ✓</td>
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<tr>
<td>Sloughs</td>
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<td>1</td>
<td>1</td>
<td>5 ✓</td>
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</tbody>
</table>

### Expert Opinions

Survey results from Bay "experts" soliciting professional judgement about Bay segmentation.

**Wim Krieger**
**Jon Burks**
**Dave Schothhammer**
**Bill Jacobs**
**Bruce Thompson**

### Water Cluster

Cluster analysis results using 6 water quality variables:
- Temperature
- Dissolved oxygen
- Dissolved carbon
- Total suspended solids
- pH
- Salinity

### Sediment Partition

Sediment Partition Analysis:
- %Total
- TDS

(Dry season)
Suggested Segmentation

Chipps Island
Benicia Bridge
Carquinez Str. – west
Pt. San Pablo
San Bruno Shoal
Dumbarton Bridge
Southern Sloughs
Further Considerations

Shallows vs. channels
Different sediment types
Mouths of rivers
Sloughs
Margins
Seasonality