

# Participatory GIS: Theory and Practice

**Coastal GeoTools 2009**

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**I.M. Systems Group at the NOAA Coastal Services Center**

**Russell Jackson**

**NOAA Coastal Services Center**

**Dorn Moore**

**The Baldwin Group at the NOAA Coastal Services Center**



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# Welcome

- Grounding: Participatory GIS
- Social Science Techniques
  - Surveys and Stakeholder Engagement
- Technical Considerations



# Participatory GIS

## What do we mean by participatory GIS?

*Activities where participants have the opportunity to engage using spatial information, provide feedback on spatial information, or collect spatial information.*

*Participatory GIS is a flexible process meant to allow for an array of expertise and cultural and resource differences.*



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# Social Science Data

**What are some data that you might use for projects currently?**

- Census
- Employment
- Parcel database?
- Opinions
- Perspectives
- Values



# Using Socio-Economic Data

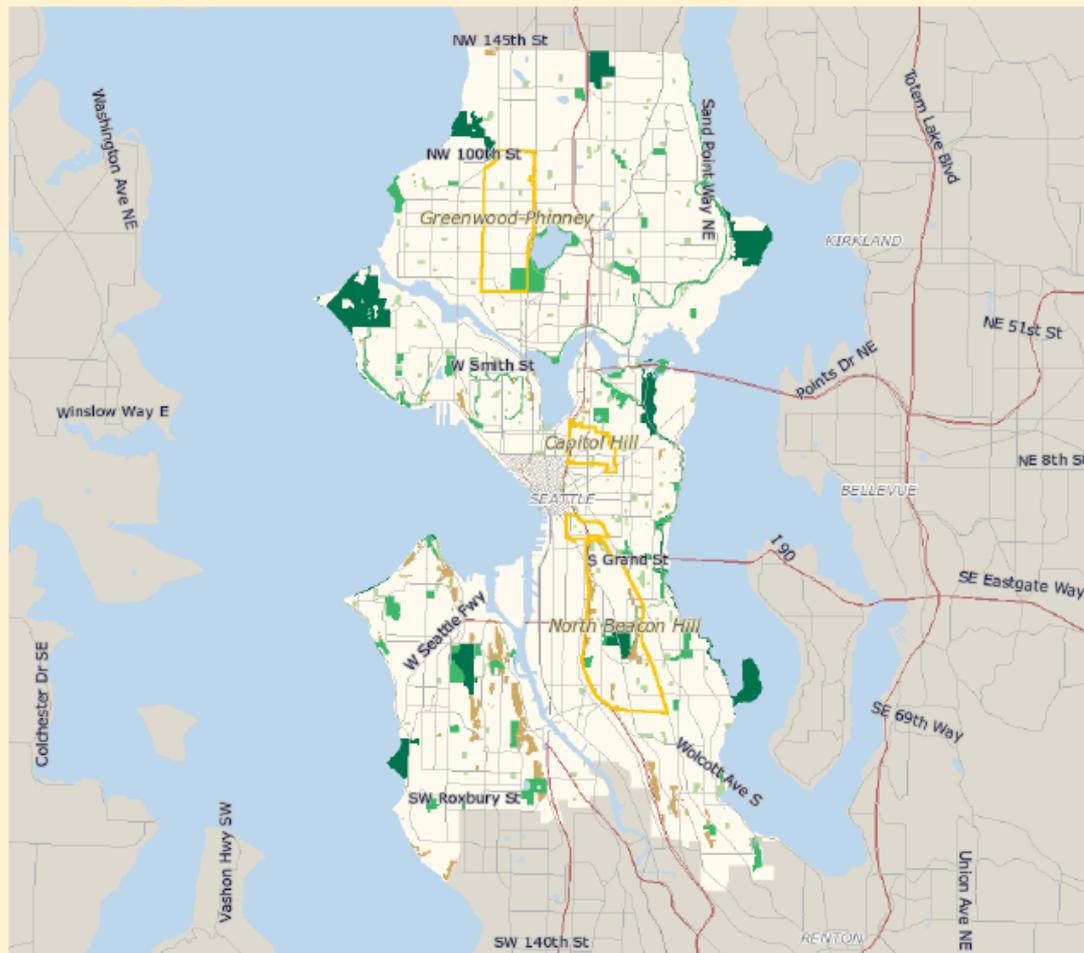
**What social science data could we use to help decide where to place a marine education center?**

- Easily accessible
- Reaches many people
- Fits within existing network of open space





# Sustainable Seattle: Open Space Accessibility



## Map Legend

- Populated Places  
Labeled on map
- Neighborhoods  
Yellow outline
- Roads  
US Highway (Red line)  
State Route (Blue line)  
Major Arterial (Grey line)
- Neighborhoods  
Yellow outline
- Water  
Blue
- Parks (by size)  
Large (>100 ac) (Dark Green)  
Medium (10-100 ac) (Medium Green)  
Small (<10 ac) (Light Green)  
Unimproved (Brown)
- Parks  
Light Green
- City Limits  
Seattle (Yellow outline)

The Seattle Neighborhood Indicators Project (SNIP) works with citizens and city government to collect, disseminate, and use local quality of life data to improve Seattle neighborhoods. Online interactive mapping provided by CommEn Space.



CommEn Space

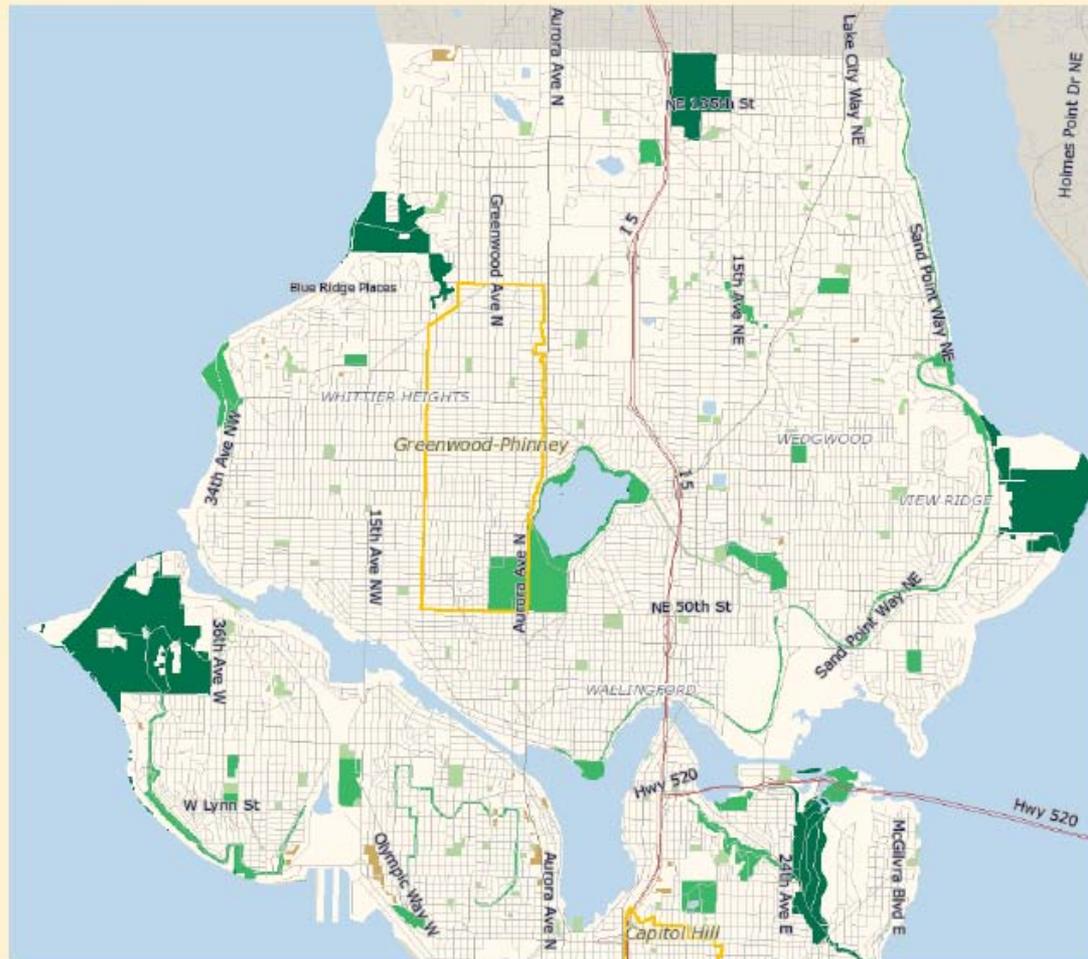
4 mi



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# Sustainable Seattle: Open Space Accessibility



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- City Limits  
Seattle (yellow outline)
- States  
Grey

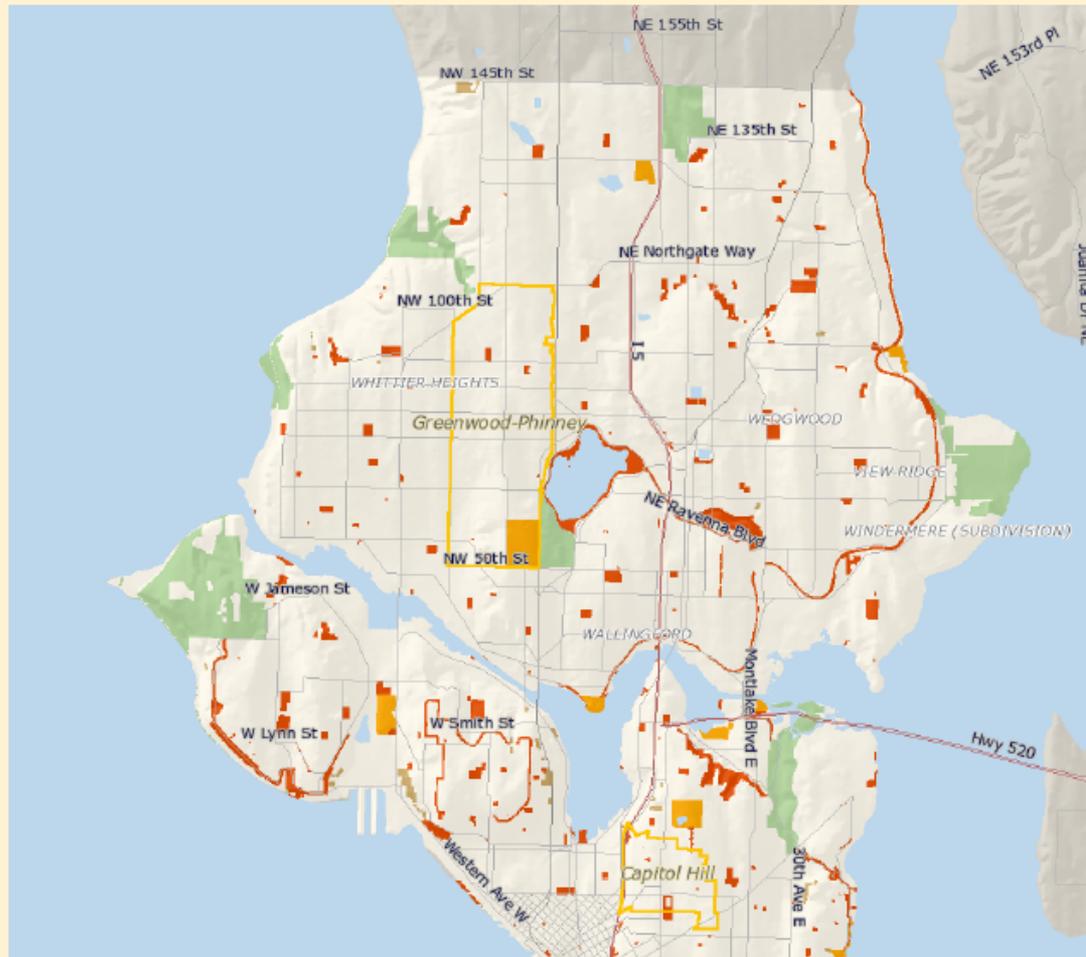
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CommEn Space  
1.5 mi





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Yellow outline
- Roads  
US Highway (red line)  
State Route (blue line)  
Major Arterial (grey line)
- Water  
Blue
- Parks (by demand)  
Green: <50 people / acre  
Yellow: 50 - 100  
Red: >100 people / acre  
Brown: Unimproved
- Parks  
Green
- City Limits  
Seattle (grey outline)
- States  
Grey

The Seattle Neighborhood Indicators Project (SNIP) works with citizens and city government to collect, disseminate, and use local quality of life data to improve Seattle neighborhoods. Online interactive mapping provided by CommEn Space.

 CommEn Space

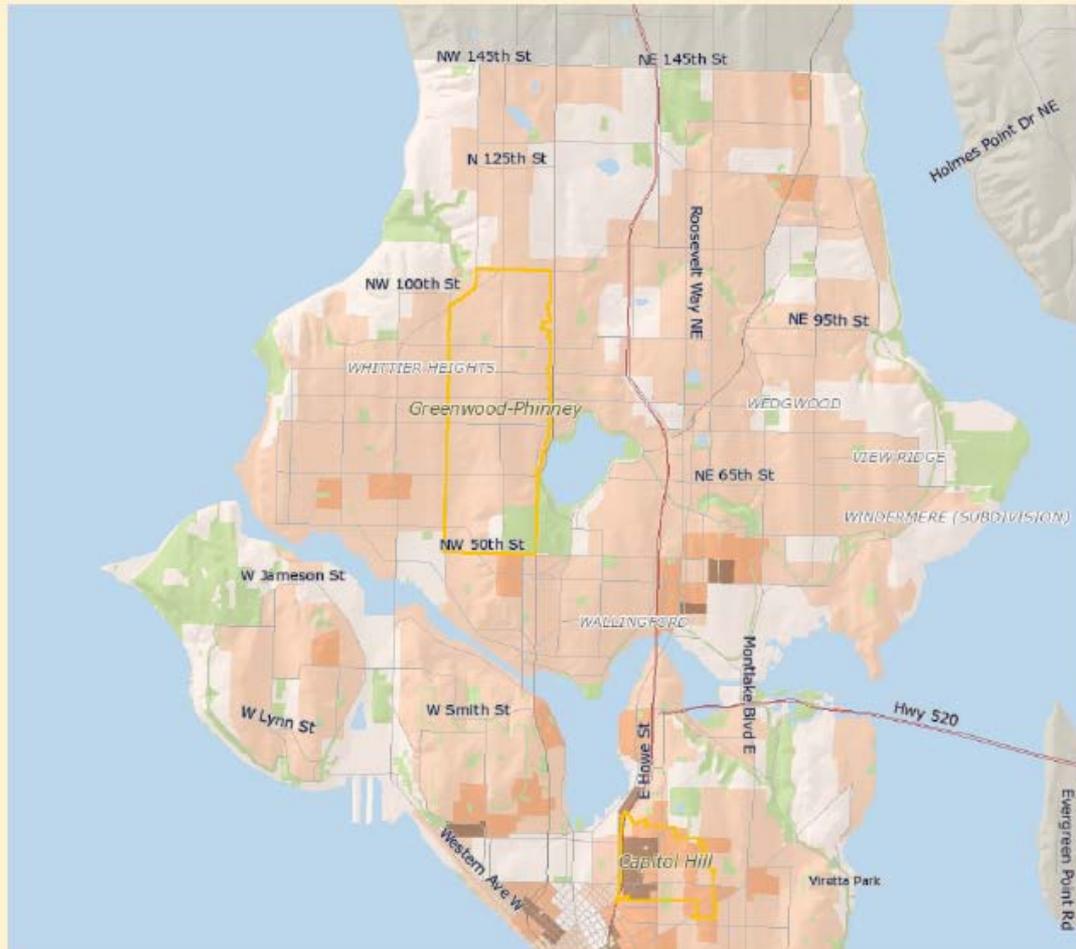
 2 mi







# Sustainable Seattle: Neighborhood Demographics



## Map Legend

### Neighborhood Boundaries



### Roads



### Water



### Parks



### Population Density

Less than 5,500

5,500 - 15,000

15,000 - 35,000

35,000 and above

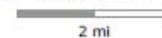
### City Limits

Seattle

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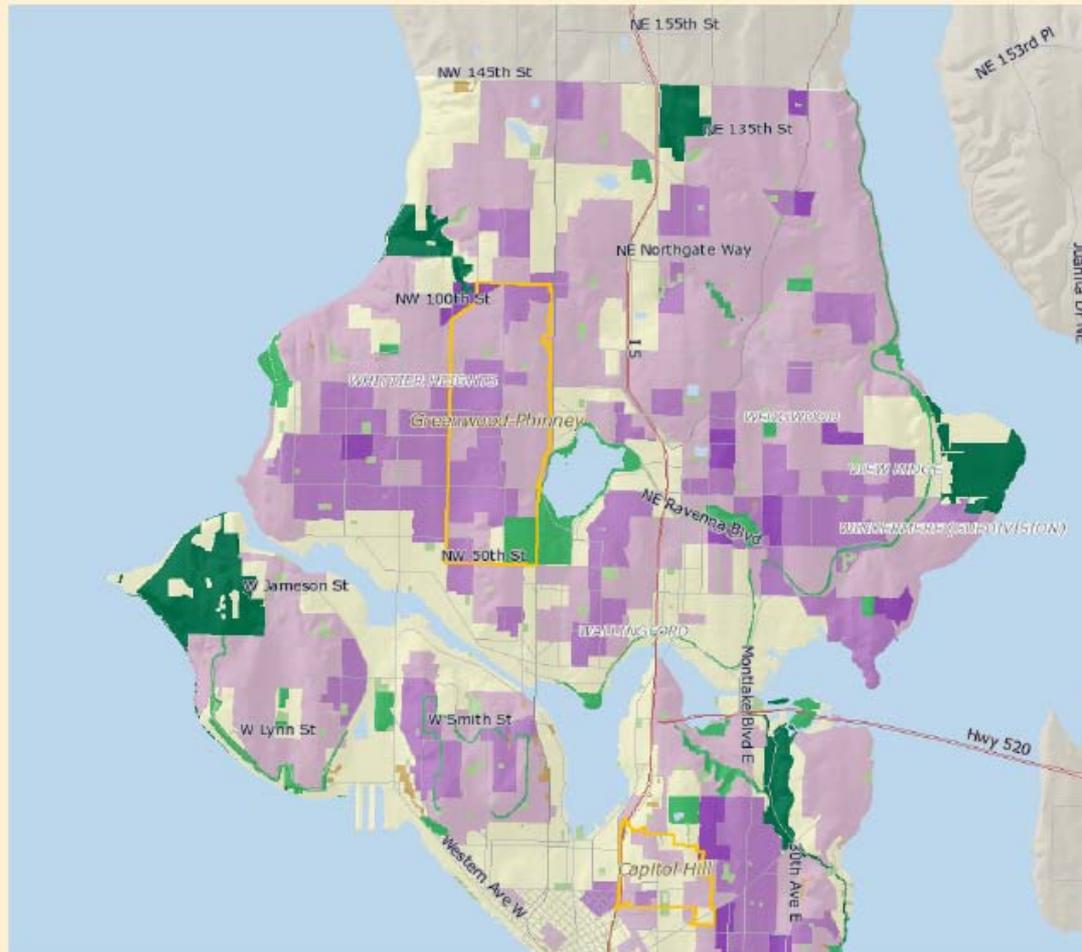
CommEn Space



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# Sustainable Seattle: Open Space Accessibility



### Map Legend

- Populated Places**
  - Labeled on map
- Neighborhoods**
  - Yellow outline
- Roads**
  - US Highway (thick red line)
  - State Route (thin red line)
  - Major Arterial (blue line)
- Water**
  - Blue
- Parks (by size)**
  - Large (>100 ac) (dark green)
  - Medium (10-100 ac) (medium green)
  - Small (<10 ac) (light green)
  - Unimproved (brown)
- Parks**
  - Light green
- Children (5-17)**
  - under 500 / sq. mi. (lightest purple)
  - 500 - 1,000 / sq. mi. (light purple)
  - 1,000 - 1,500 / sq. mi. (medium purple)
  - over 1,500 / sq. mi. (darkest purple)

The Seattle Neighborhood Indicators Project (SNIP) works with citizens and city government to collect, disseminate, and use local quality of life data to improve Seattle neighborhoods. Online interactive mapping provided by CommEn Space.

CommEn Space  
2 mi



# Working with Stakeholders

and

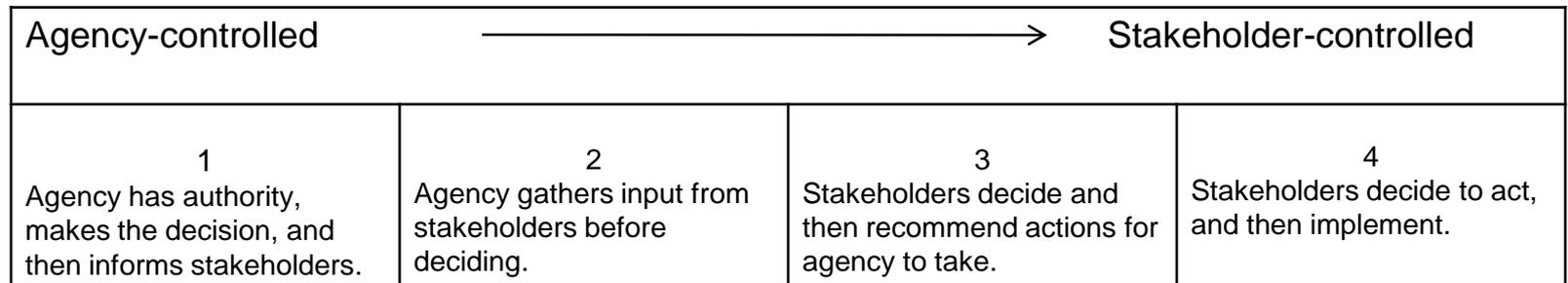
# Asking the Right Questions



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# Coastal Resource Management

**Management has generally moved from agency-controlled to stakeholder-influenced processes.**



Bens, Ingrid. *Facilitating with Ease!* San Francisco: Jossey-Bass, 2005.



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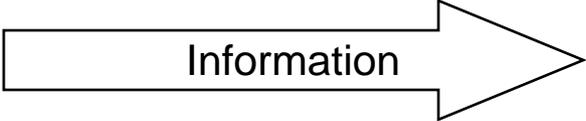
# Benefits of Engaging Stakeholders

- **Generates data on local knowledge, attitudes, values, and perceptions that are not available from other data sets**
- **Increases public understanding of issues and decision-making processes**
- **Garners public support for agencies and their decisions**
- **Reduces conflict and creates new relationships**
- **May increase compliance with new regulations**



# Related But Unique Concepts

## Outreach and public information:

- Sender  Recipient
- Examples: Fact sheets, websites, presentations

## Stakeholder engagement and participation:

- Recipient  Recipient
- Examples: Participatory geographic information systems (PGIS), public meetings, focus groups



# Rules for Engaging Stakeholders

- **There is no “one size fits all” approach or “right” answer.**
- **Understanding the stakeholders helps to determine the methods.**
- **Be honest with stakeholders about how their input will be used.**



# Ways to Engage Stakeholders

- **Participatory mapping or GIS**
- **Surveys**
- **Public meetings**
- **Focus groups**
- **Interviews**
- **The Institute for Participatory Management and Planning identifies more than 70 community participation techniques!**



# The Survey

- **Definition: a systematic way of collecting information from people; NOT just a piece of paper.**
- **Ways to survey:**
  - In person
  - Internet
  - Telephone
  - Mail-back survey
  - Hand-delivered survey



# Creating Survey Instruments

**Write neutral, non-leading questions to avoid bias:**

“What is the cause of current managerial problems in your workplace?”

versus

“Do you believe there are currently managerial problems in your workplace? If yes, please explain.”



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# Creating Survey Instruments

## Use simple wording and avoid combined questions:

“What is the annual frequency of your utilization of county parks for camping and fishing?”

versus

“Approximately how many times per year do you use county parks for camping? And for fishing?”



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# Creating Survey Instruments

**Sequence questions logically and ask sensitive questions last:**

- Gender
- Age
- Income
- Political affiliation



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# Creating Survey Instruments

## **Determine the appropriate question format:**

Open-ended (e.g., essay-style questions)

versus

Close-ended (e.g., multiple choice, rating scales)



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# Creating Survey Instruments

**Minimize questions  
and pilot the survey instrument**



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# Creating Survey Instruments

- **Write neutral, non-leading questions to avoid bias**
- **Use simple wording and avoid combined questions**
- **Sequence questions logically and ask sensitive questions last**
- **Determine the appropriate question format**
- **Minimize questions and pilot the survey instrument**



# Available Resources From the NOAA Coastal Services Center

- ***Introduction to Survey Design and Delivery***
- ***Introduction to Stakeholder Participation***
- **Social science “wheel”**
- **Coming soon: Introduction to PGIS**
- **Special interest meeting on PGIS case studies this afternoon!**



# Questions?

*Zac.Hart@noaa.gov*



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# Social Science Data

**What are some data that you might use for projects currently?**

- Census
- Employment
- Parcel database?

- Opinions
- Perspectives
- Values



# Using Socio-Economic Data

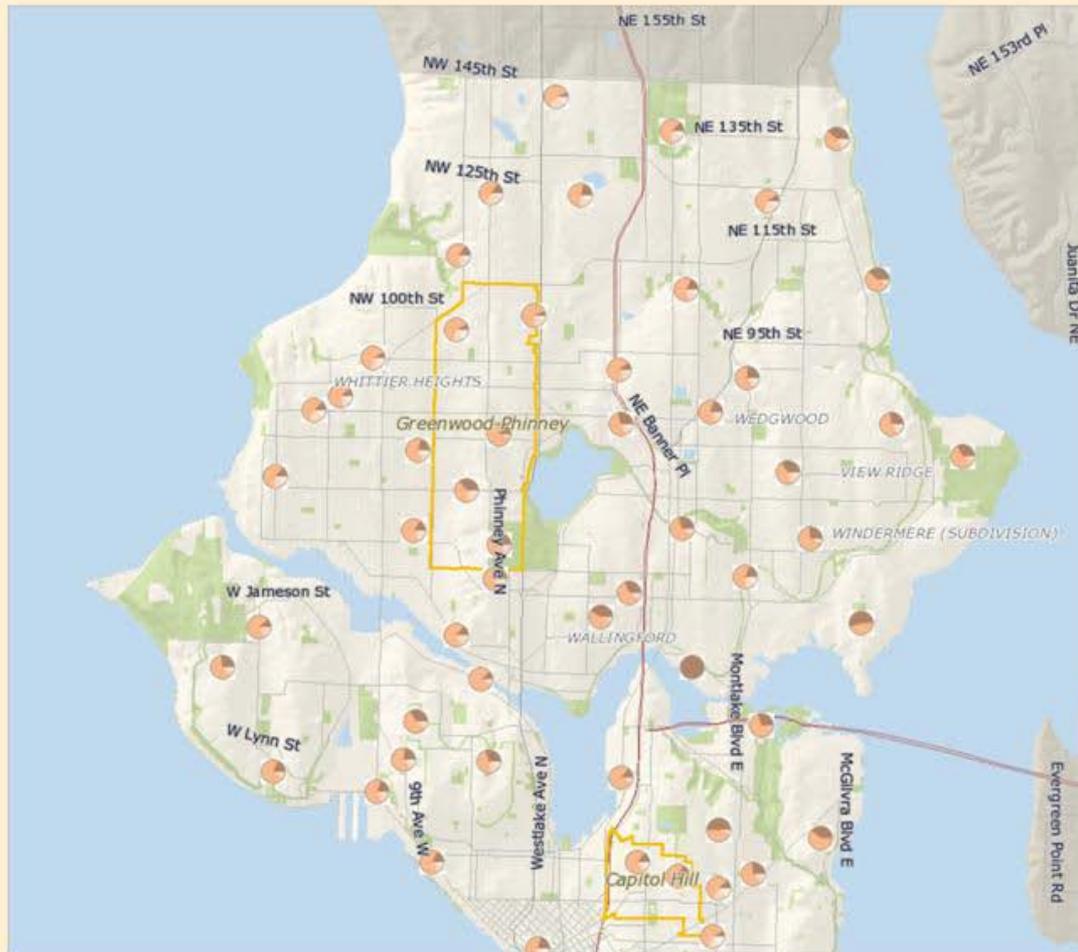
**How can we use these tools to help decide where to place the marine education center?**

- Gather perspectives?
- Identify values?
- Make decisions?





# Sustainable Seattle: Neighborhood Demographics



**Map Legend**

- Neighborhood Boundaries
- Roads
  - US Highway
  - State Route
  - Major Arterial
- Water
- Parks
- Support for Marine Education Center
  - No Response
  - Unsure
  - Support
  - Oppose
- City Limits
  - Seattle

The Seattle Neighborhood Indicators Project (SNIP) works with citizens and city government to collect, disseminate, and use local quality of life data to improve Seattle neighborhoods. Online interactive mapping provided by CommEn Space.

CommEn Space  
2 mi



# Technical Issues

We have the usual challenges of any spatial data.

- Scale
- Accuracy
- Precision
- Data management

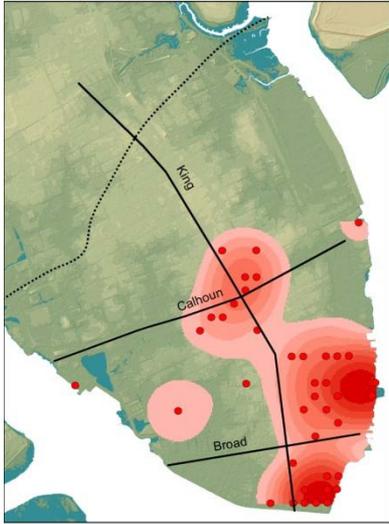


# Participatory GIS: Paper or Pixels?

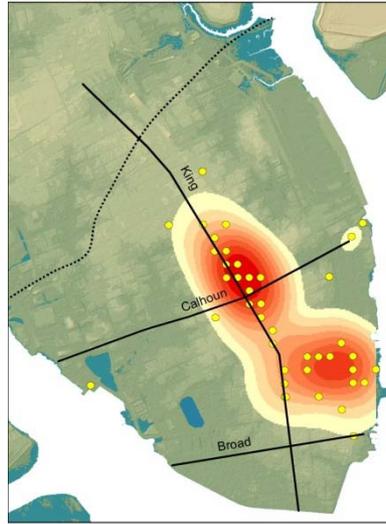
Method	Pros	Cons
<b>Paper Maps</b> Maps can be created that contain pertinent information and can be printed large enough for participants to view, mark on, discuss, etc.	<ul style="list-style-type: none"><li>•Simple to Explain</li><li>•Can use to collect data</li><li>•Inexpensive</li><li>•Usable by most participants</li><li>•Good “take-home” product</li></ul>	<ul style="list-style-type: none"><li>•Static</li><li>•Lacks flexibility</li><li>•Not interactive</li></ul>
<b>On-line Mapping Tools</b> e.g., Google Earth, GeoPDF, OpenStreetMap	<ul style="list-style-type: none"><li>•Inexpensive</li><li>•Can use for data collection</li><li>•Data easily transferred to GIS</li><li>•Widely available and accessible</li></ul>	<ul style="list-style-type: none"><li>•Developer needs to build interface</li><li>•Limited functionality</li><li>•Users must have computer access</li><li>•Users may need to download software</li></ul>
<b>Geospatial Software</b> e.g., ArcGIS, CommunityViz, Habitat Priority Planner	<ul style="list-style-type: none"><li>•Interactive</li><li>•Flexible</li><li>•Thorough</li></ul>	<ul style="list-style-type: none"><li>•Requires expert to operate</li><li>•May require other software</li><li>•Expensive</li></ul>



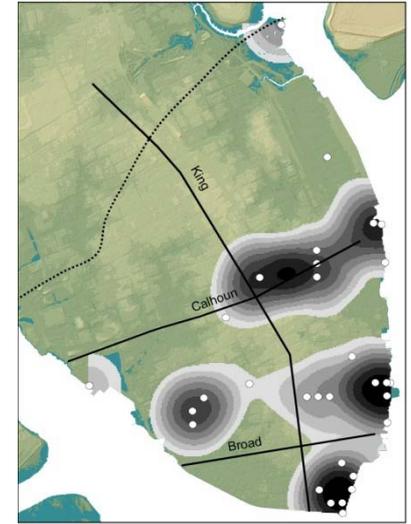
# Value Maps



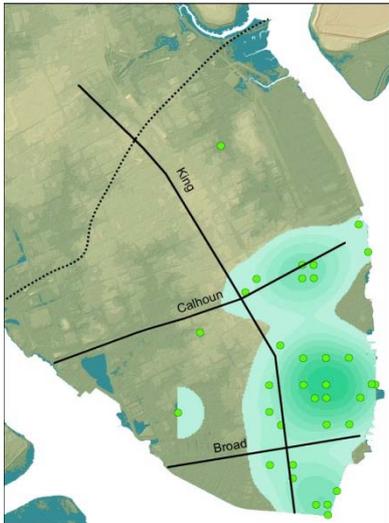
**Aesthetic**



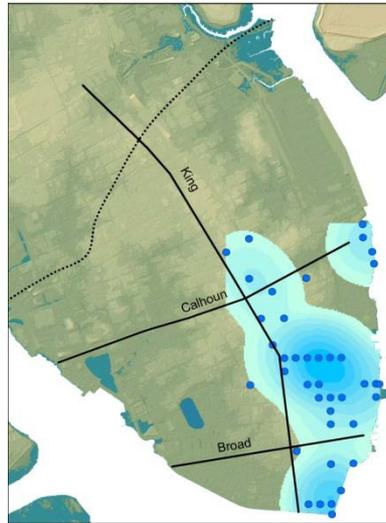
**Economic**



**Recreational**



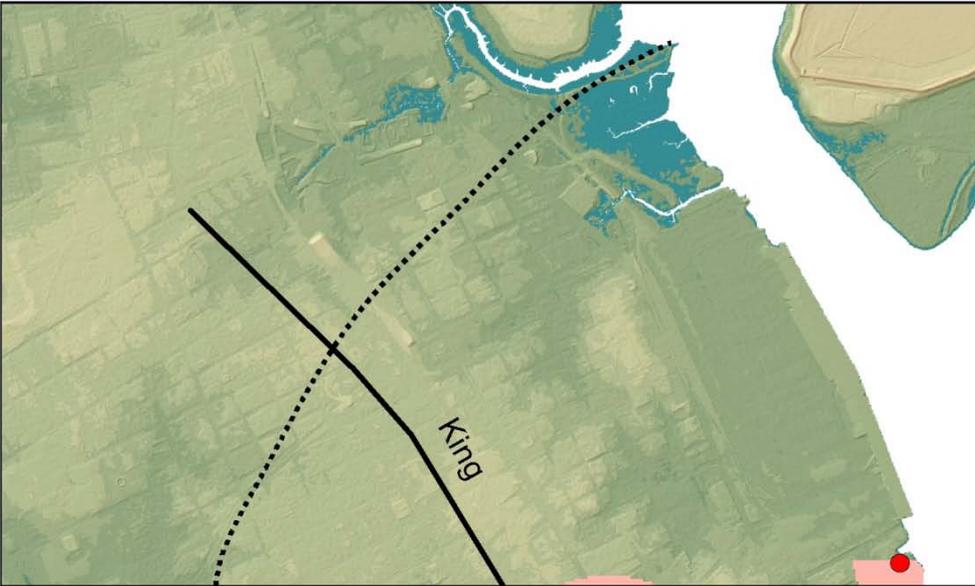
**Spiritual/Cultural**



**Tourist**

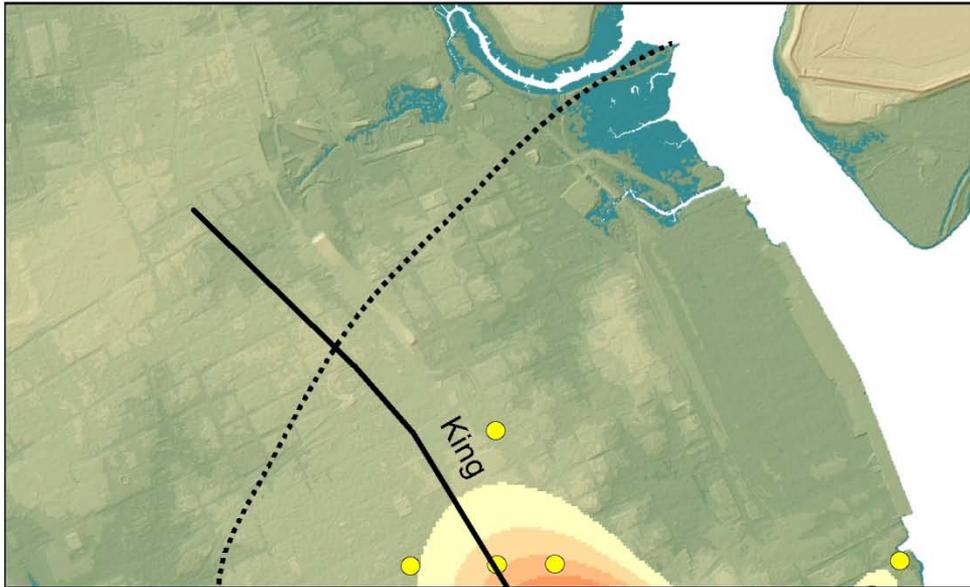


# Aesthetic Value



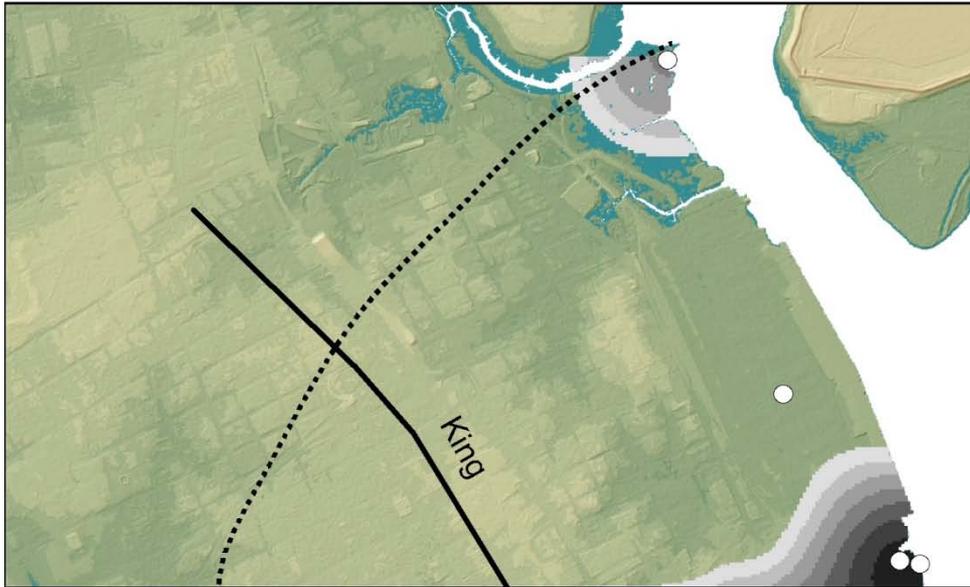
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# Economic Value



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# Recreation Value



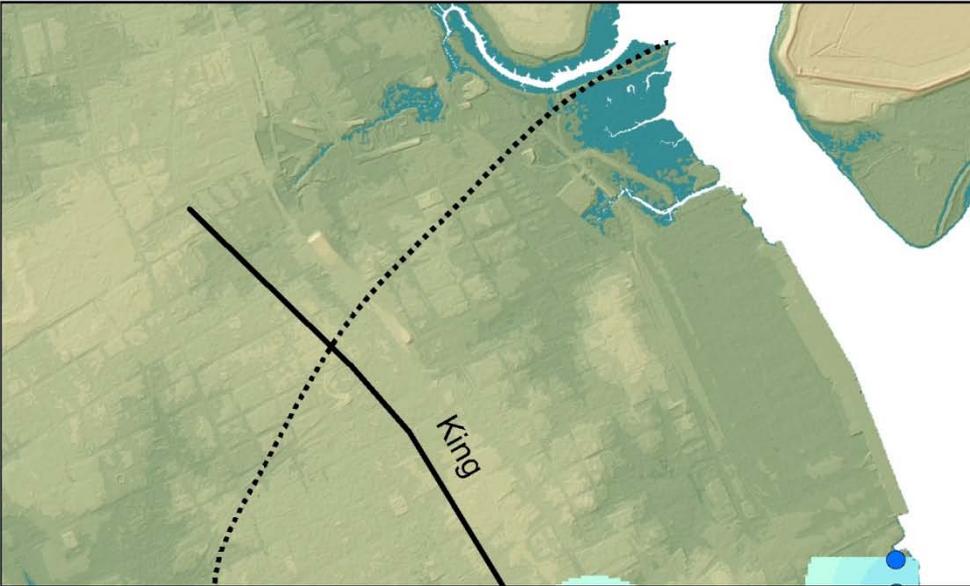
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# Spiritual and Cultural Value



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# Tourist Value



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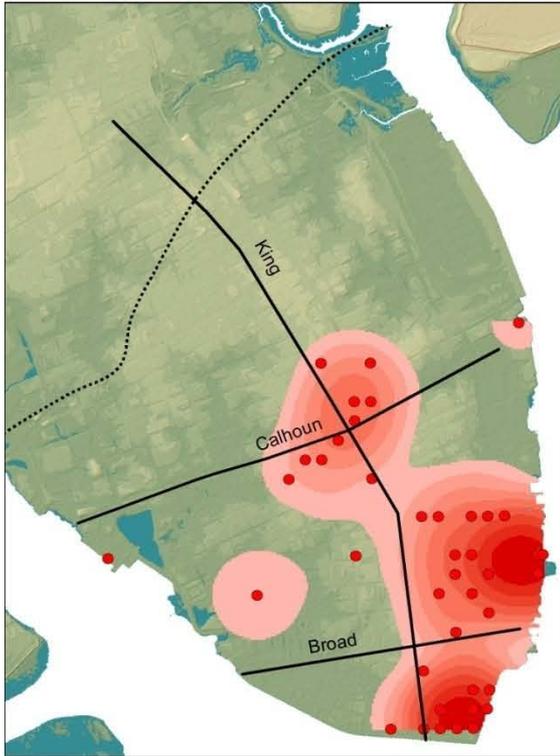
# General Value



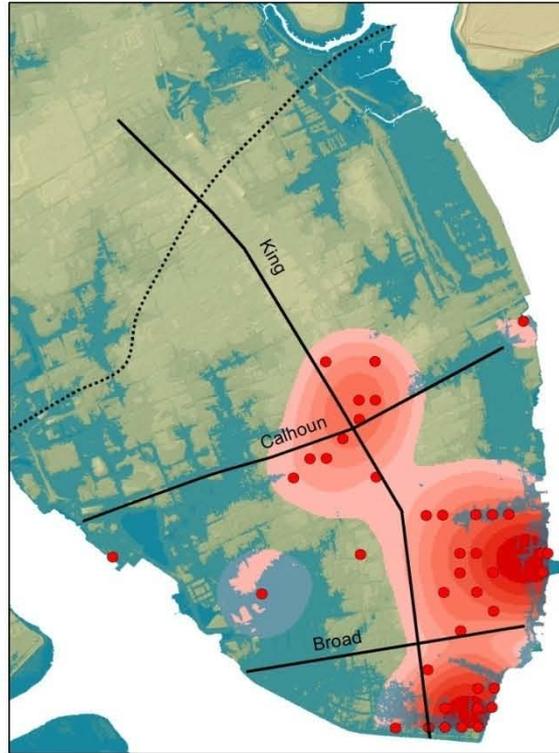
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# Aesthetic Value Maps

Density of Value Points

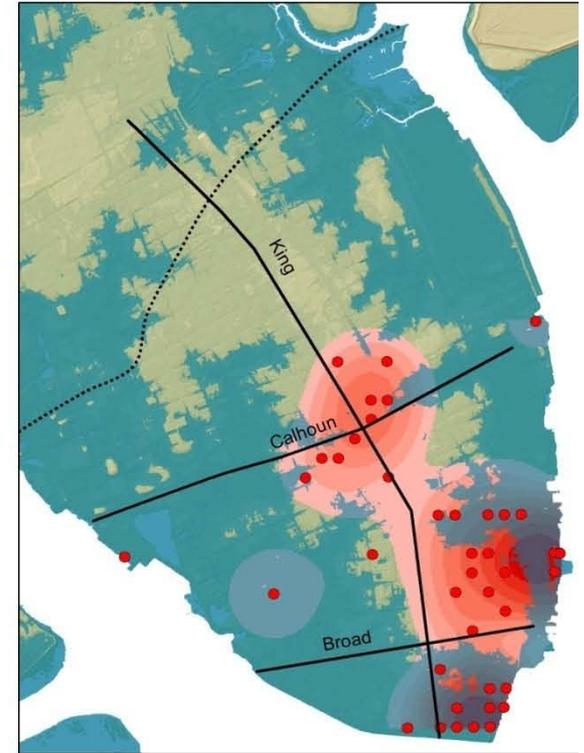


Exposure to 1 Meter SLR



29% of the value points are directly exposed to a 1 meter rise in sea level

Exposure to 2 Meters SLR



68% of the value points are directly exposed to a 2 meter rise in sea level

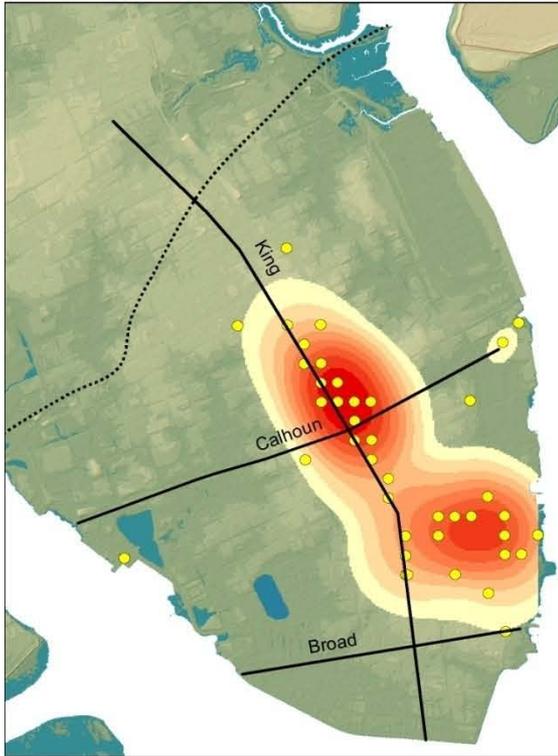
\*SLR – sea level rise



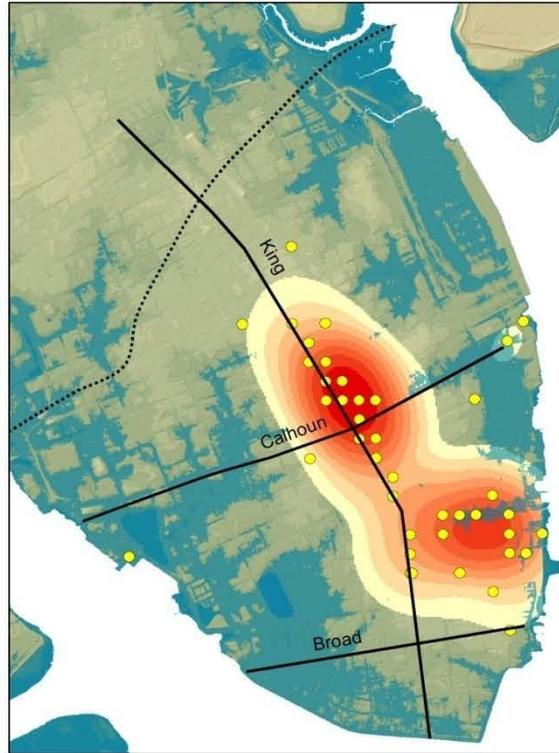
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# Economic Value Maps

## Density of Value Points

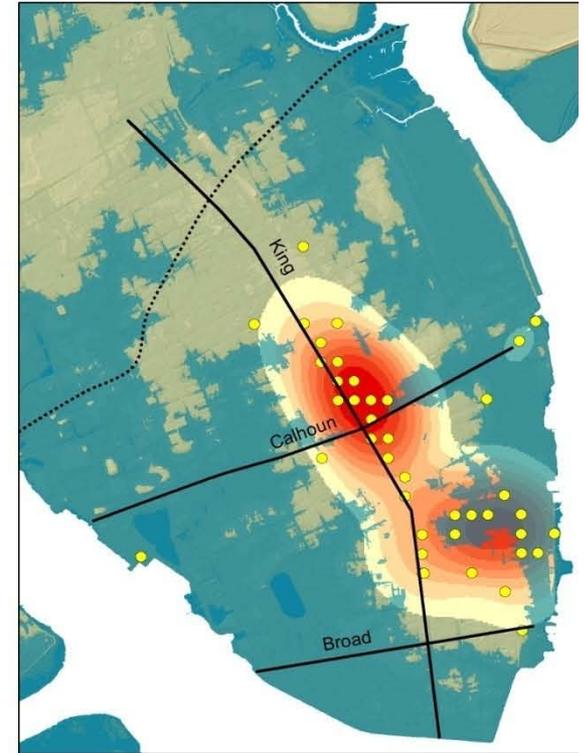


## Exposure to 1 Meter SLR



**15% of the value points are directly exposed to a 1 meter rise in sea level**

## Exposure to 2 Meters SLR

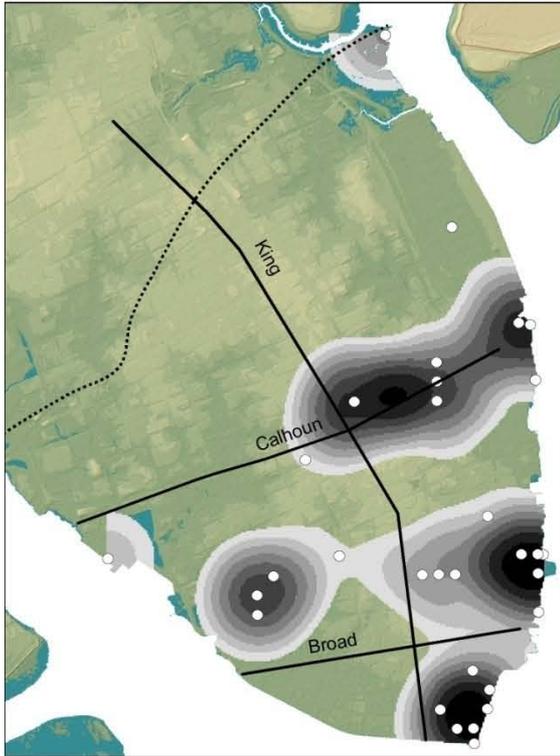


**35% of the value points are directly exposed to a 2 meter rise in sea level**

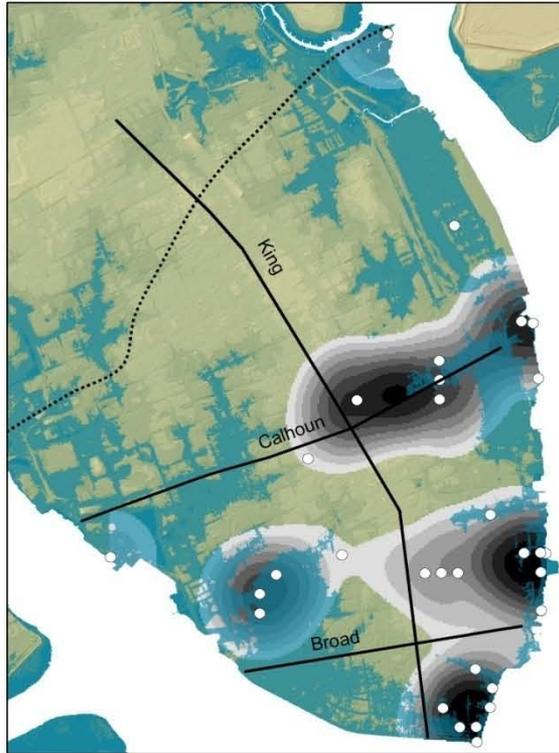


# Recreation Value Maps

Density of Value Points

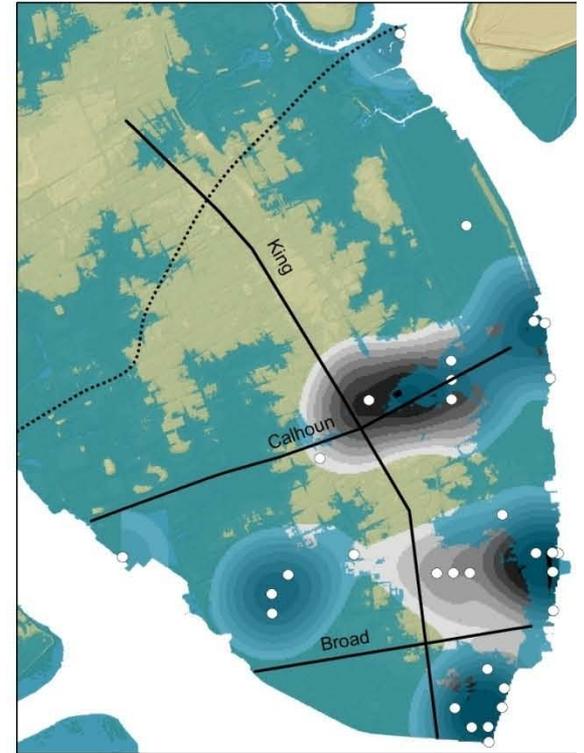


Exposure to 1 Meter SLR



**44% of the value points are directly exposed to a 1 meter rise in sea level**

Exposure to 2 Meters SLR

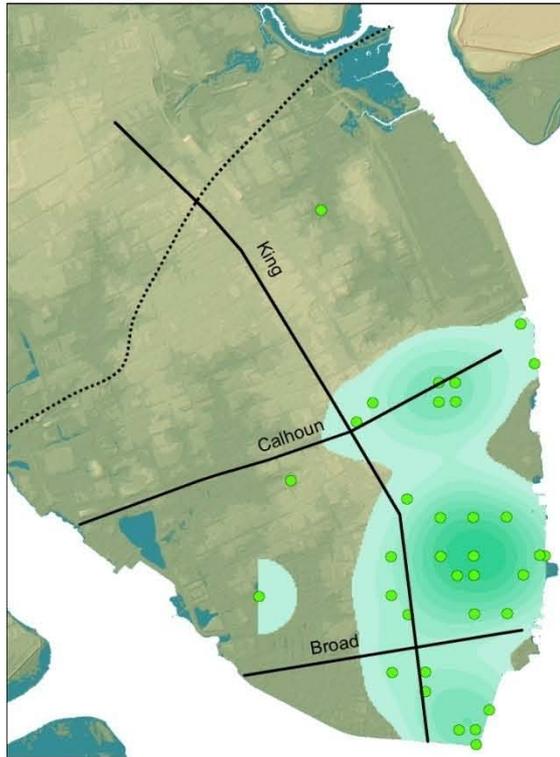


**73% of the value points are directly exposed to a 2 meter rise in sea level**

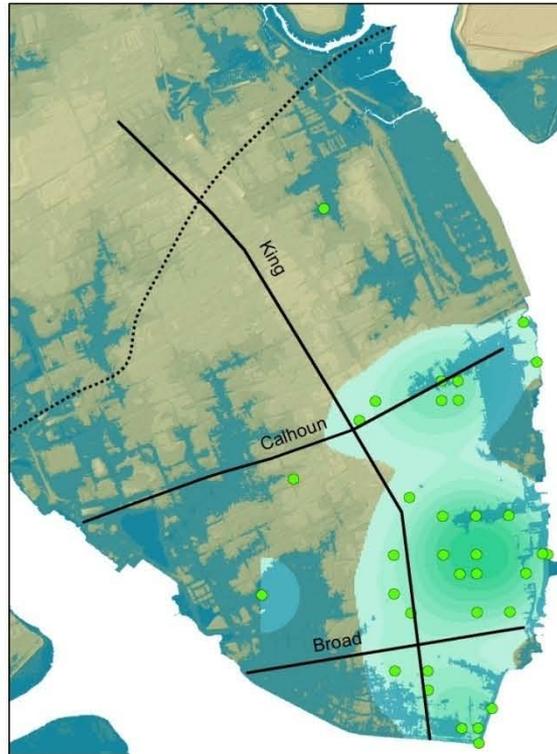


# Spiritual/Cultural Value Maps

Density of Value Points

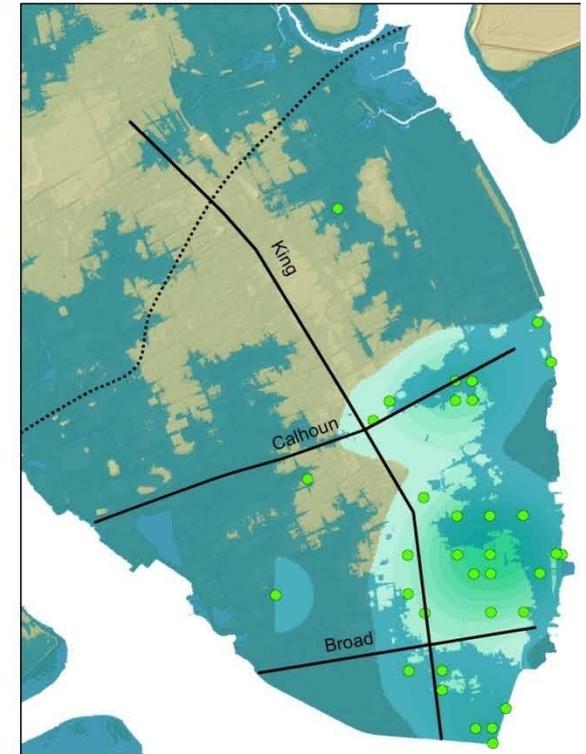


Exposure to 1 Meter SLR



**30% of the value points are directly exposed to a 1 meter rise in sea level**

Exposure to 2 Meters SLR

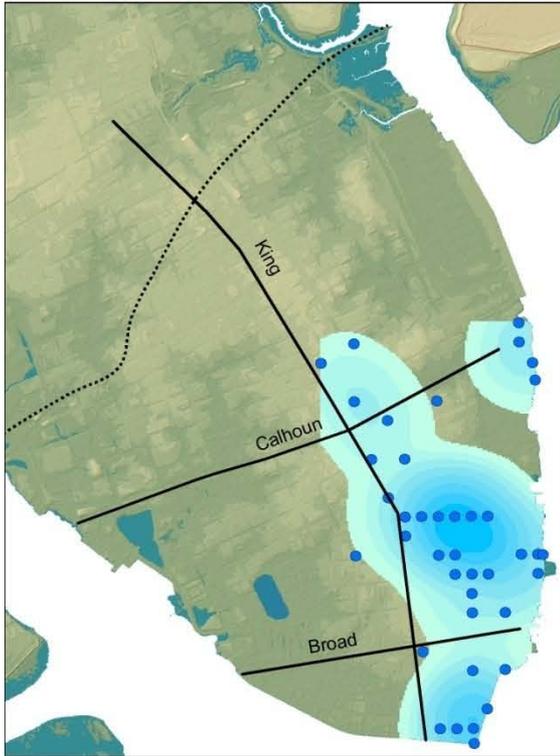


**57% of the value points are directly exposed to a 2 meter rise in sea level**

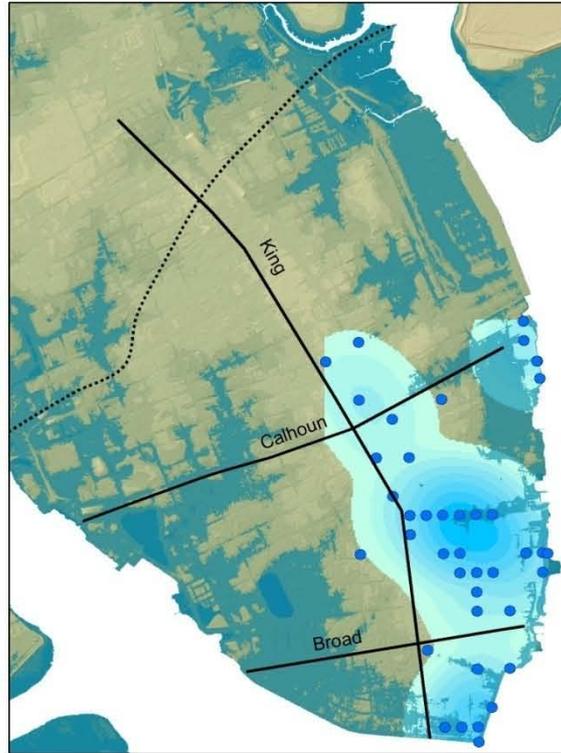


# Tourist Value Maps

Density of Value Points

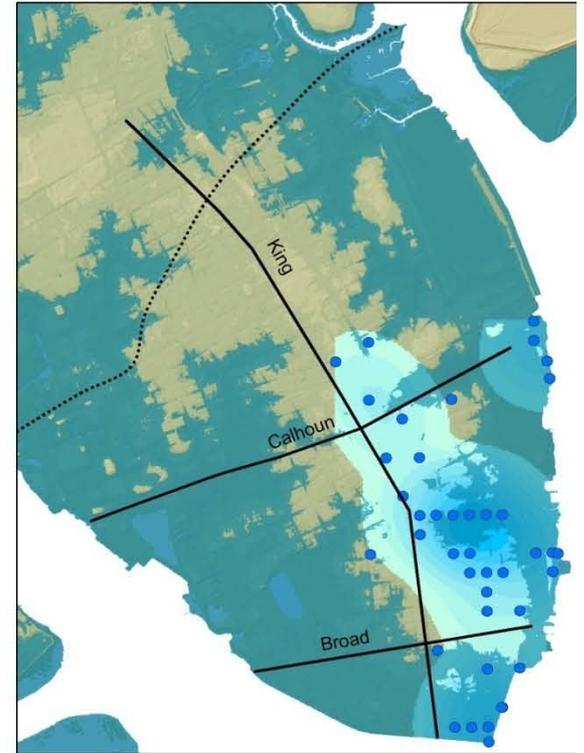


Exposure to 1 Meter SLR



**35% of the value points are directly exposed to a 1 meter rise in sea level**

Exposure to 2 Meters SLR

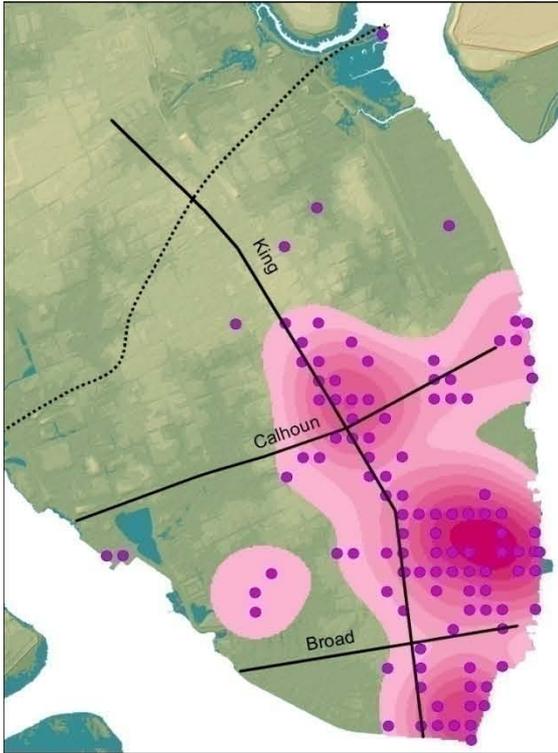


**66% of the value points are directly exposed to a 2 meter rise in sea level**

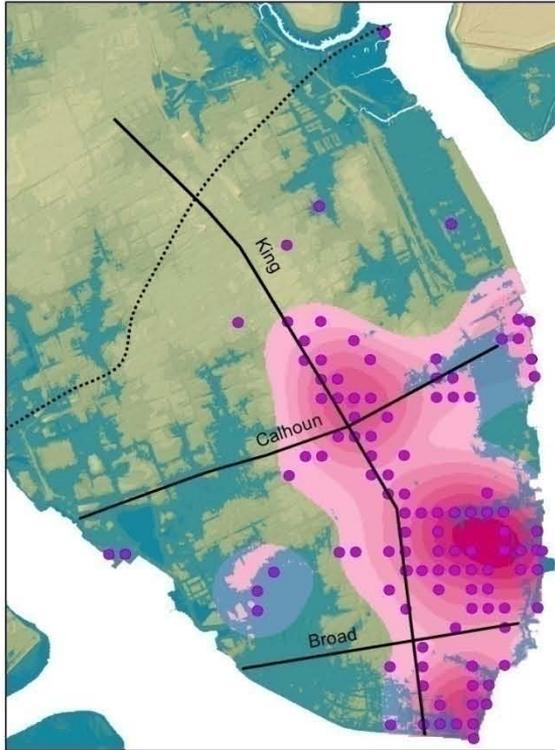


# Value Maps

## Density of Value Points

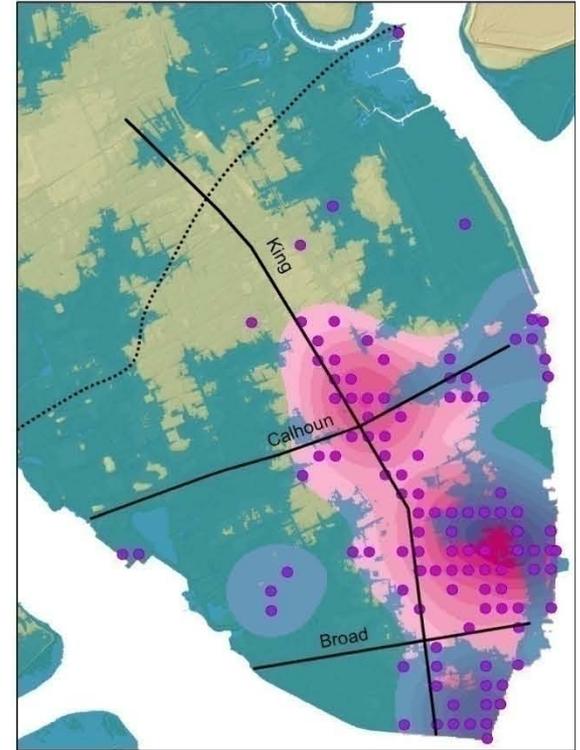


## Exposure to 1 Meter SLR



**30% of the value points are directly exposed to a 1 meter rise in sea level**

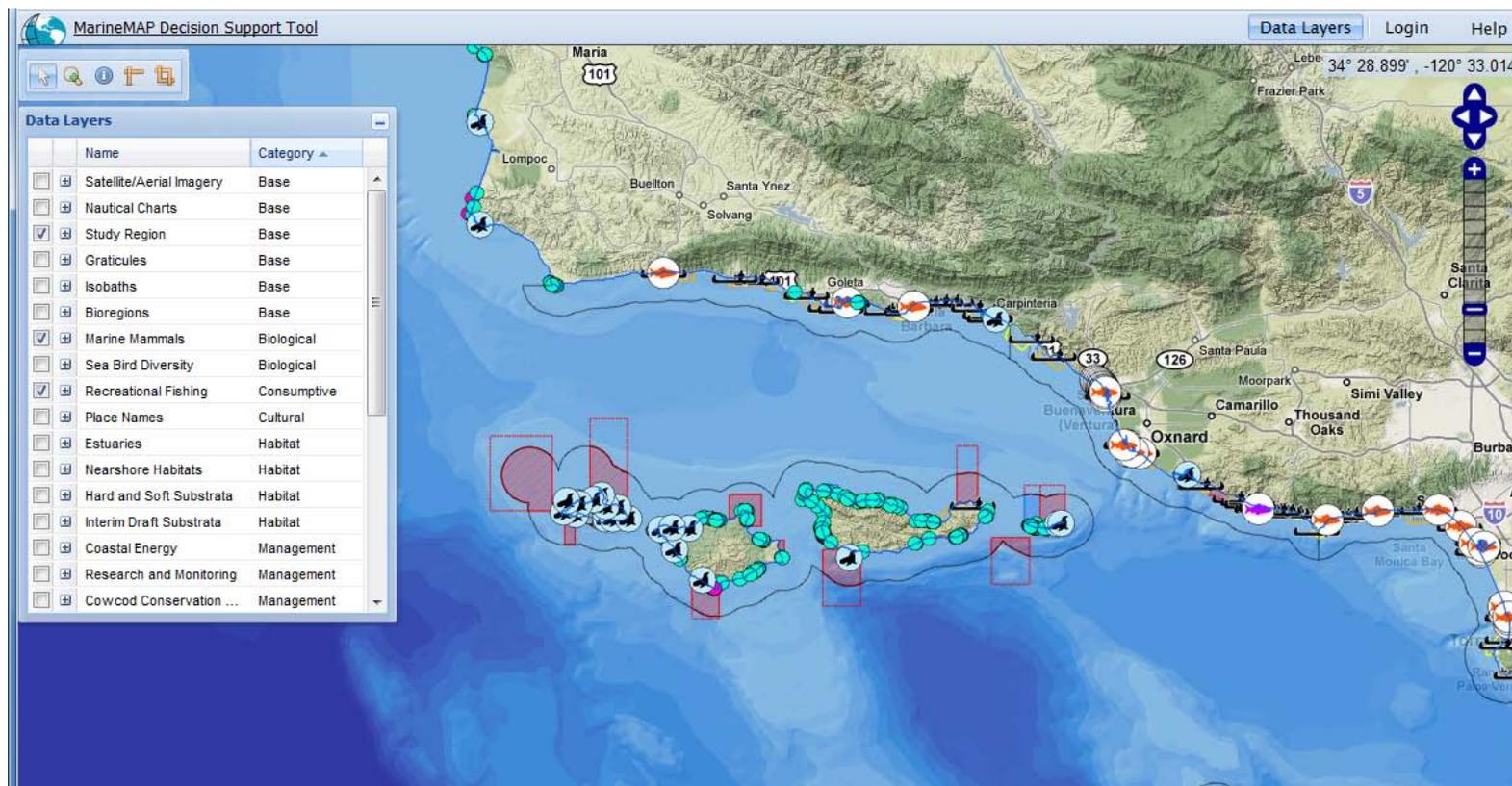
## Exposure to 2 Meters SLR



**60% of the value points are directly exposed to a 2 meter rise in sea level**



# Examples: MarineMap.org



GeoTools Session: Marine Planning: Marine Protected Areas  
(Tuesday 1:30 – 3:00)



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