

# 1980 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 8
- 8.01 - 10
- 10.01 - 12
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- 16.01 - 18
- 18.01 - 20
- 20.01 - 22
- 22.01 - 24
- 24.01 - 26
- 26.01 - 28
- 28.01 - 30

0 3.75 7.5 15 Miles

### About this map

The January to June seasonal salinity gradient is plotted in the SF Estuary beneath the annual average CPUE of longfin smelt (total population) for each monitoring station in the SF Bay Study mid-water trawl, consistent with the salinity-abundance relationship published in Kimmerer (2002), Marine Ecology and Progress Series 243: 39-55.

WTR1502244.3

E. Foresman 7/13/2015

### Data sources

Fish CPUE - San Francisco Bay Study CA Department of Fish and Wildlife and the Interagency Ecological Program  
Salinity Gradient - Coarse-grid version of UnTRIM San Francisco Bay-Delta Model, Delta Modeling Associates  
Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors



# 1981 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

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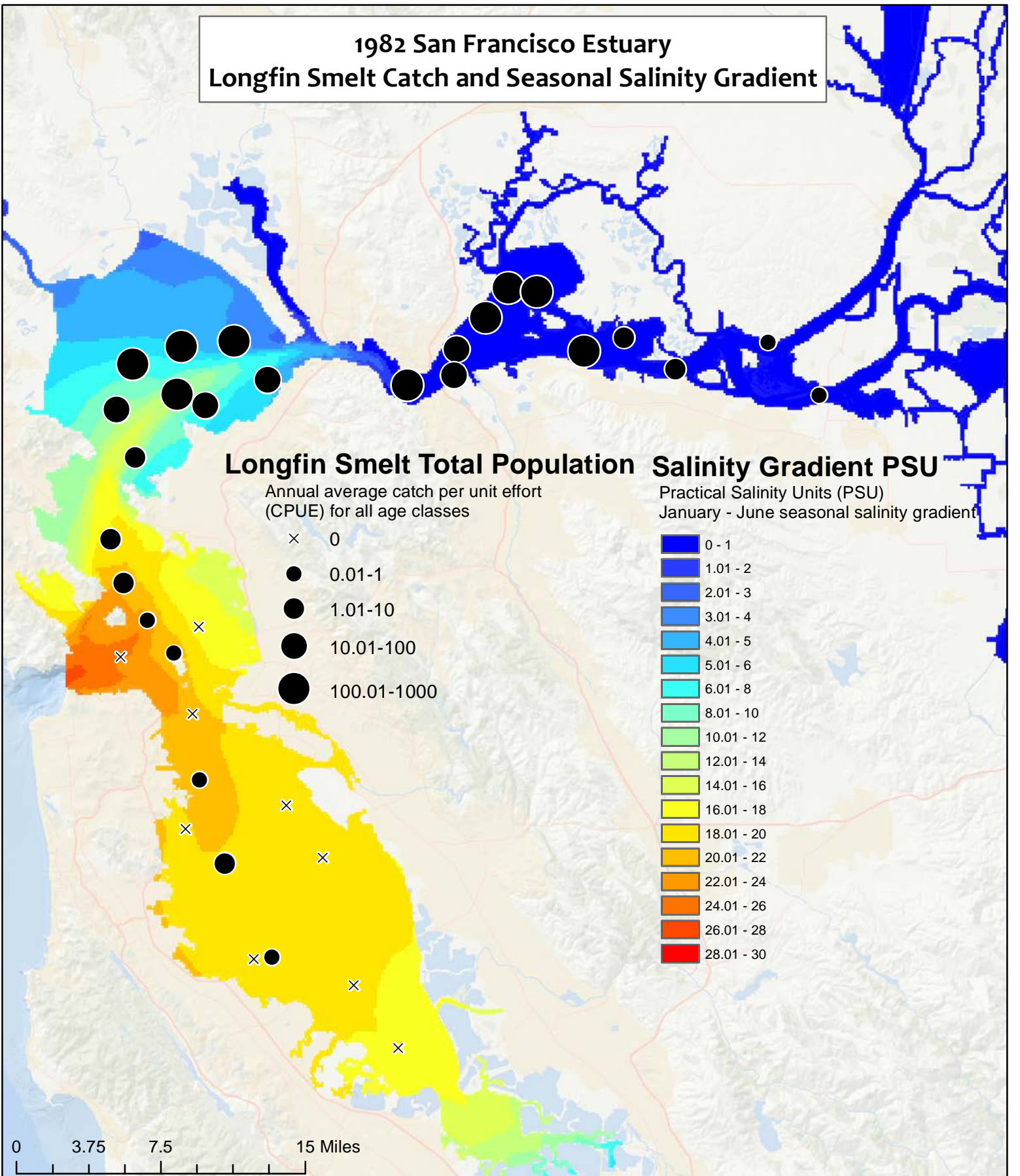
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# 1982 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



**About this map**

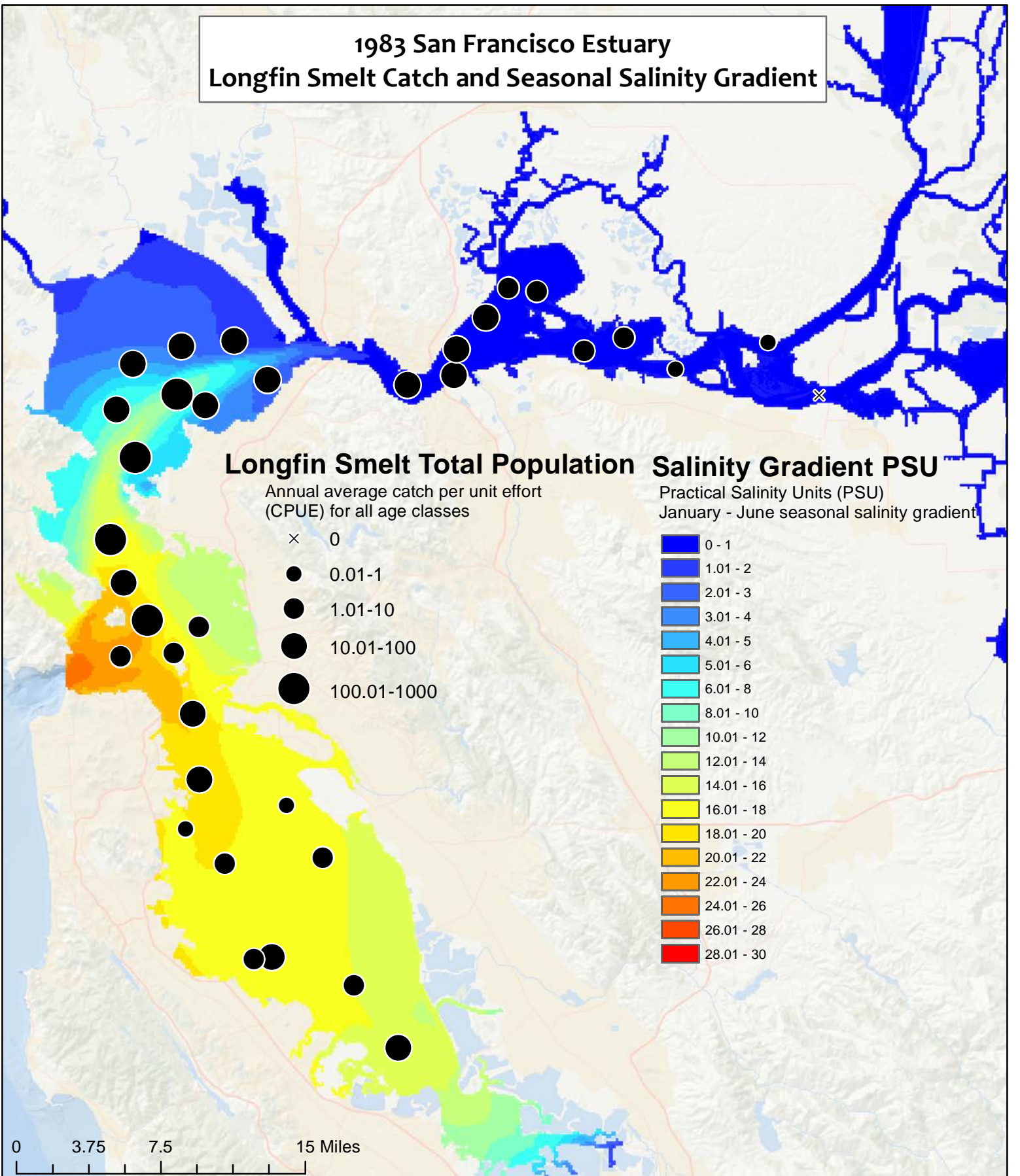
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# 1983 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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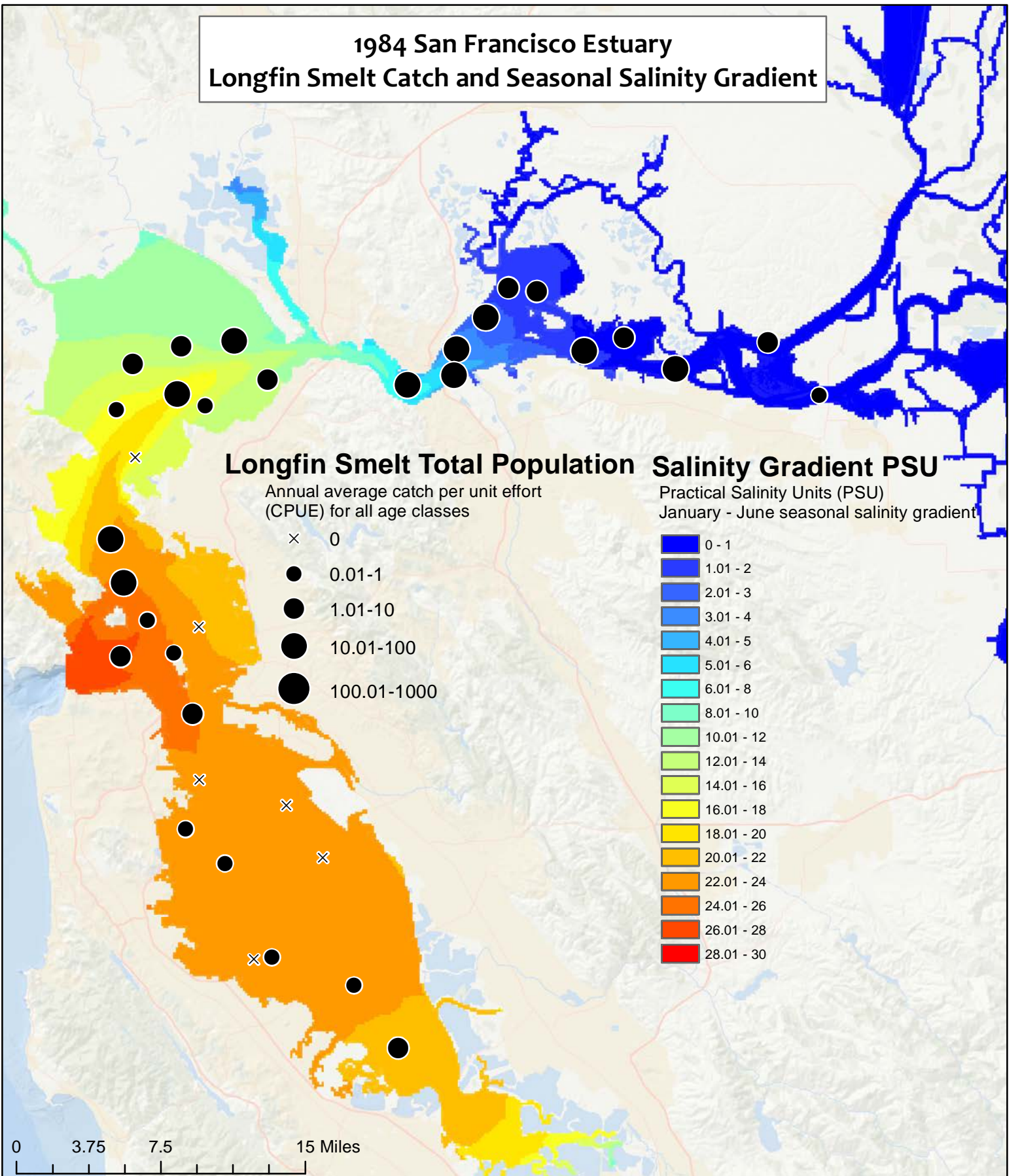
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**Data sources**

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# 1984 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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**Data sources**

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Salinity Gradient - Coarse-grid version of UnTRIM San Francisco Bay-Delta Model, Delta Modeling Associates  
Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others



# 1985 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
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# 1986 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

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# 1987 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
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# 1988 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)

January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
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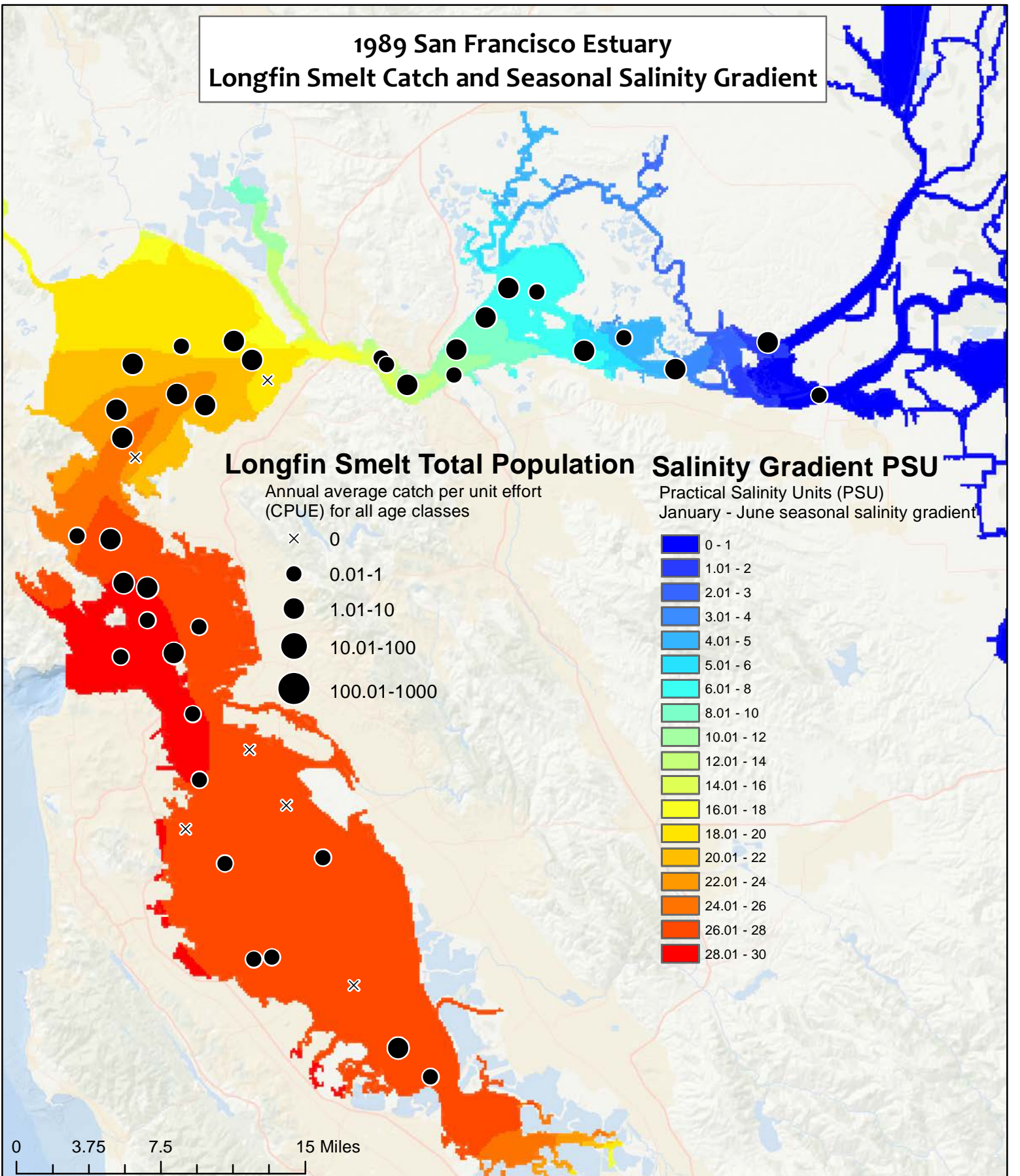
E. Foresman 7/13/2015

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# 1989 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



**About this map**

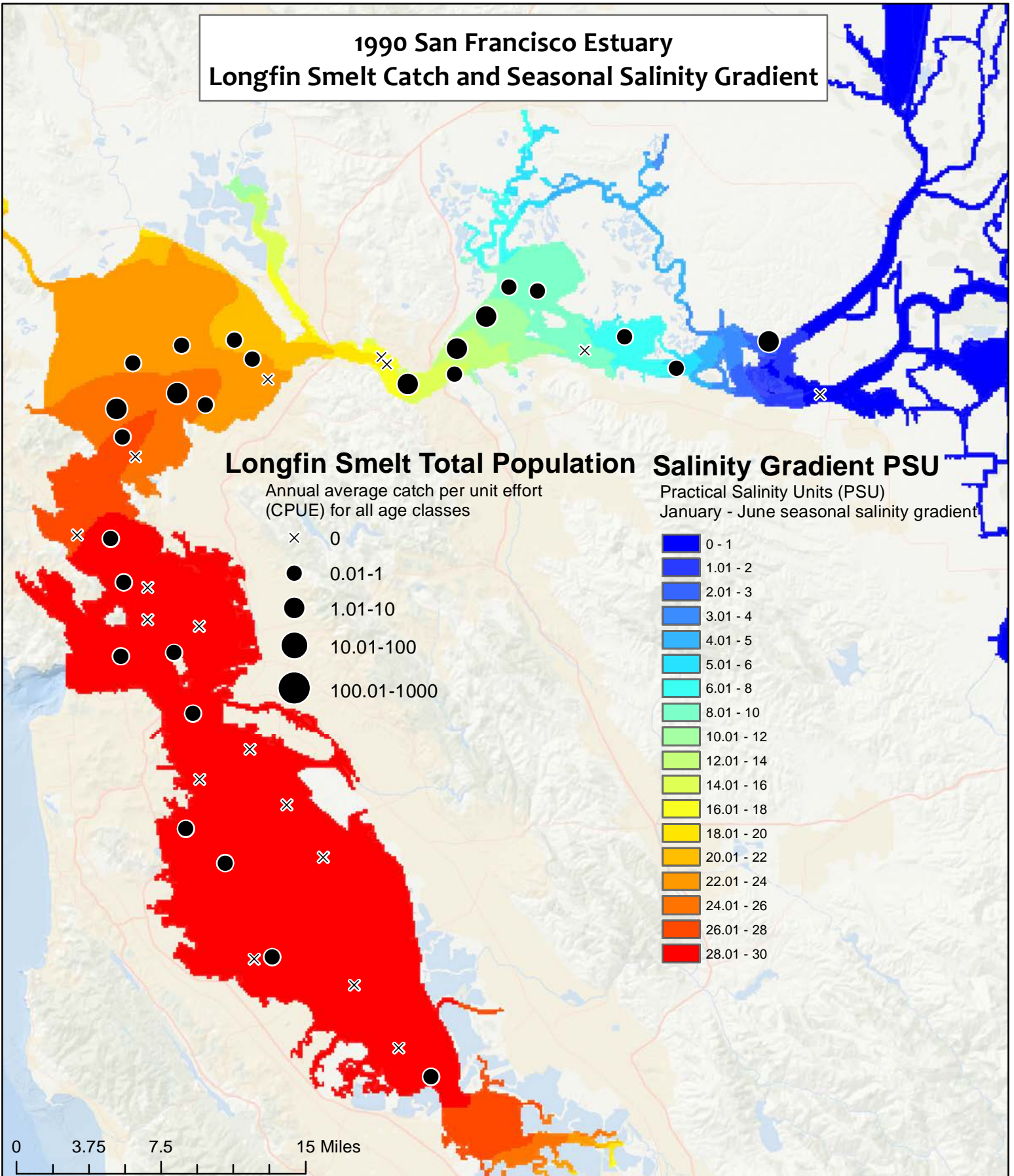
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# 1990 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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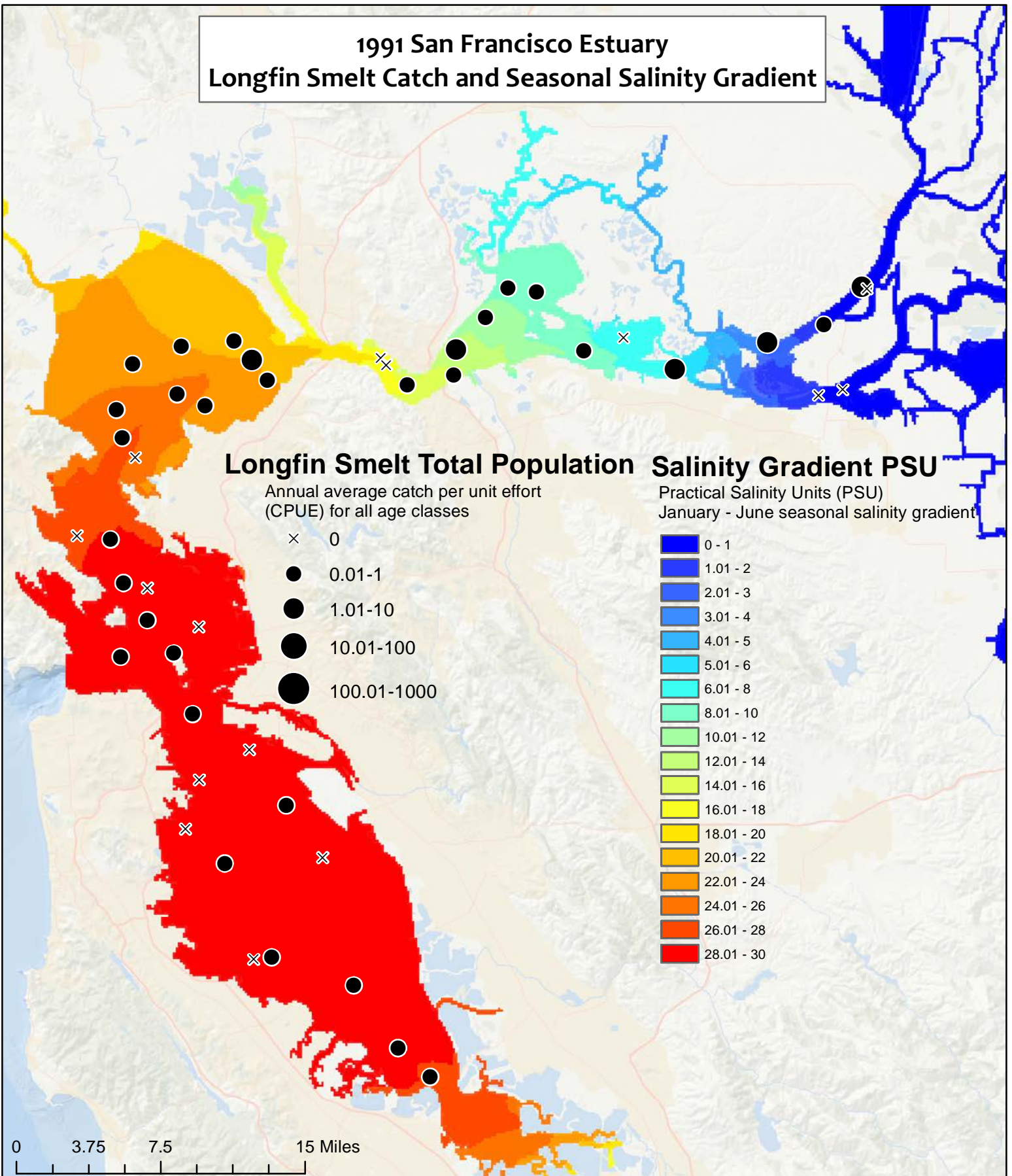
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# 1991 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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**Data sources**

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Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others



# 1992 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)

January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
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- 6.01 - 8
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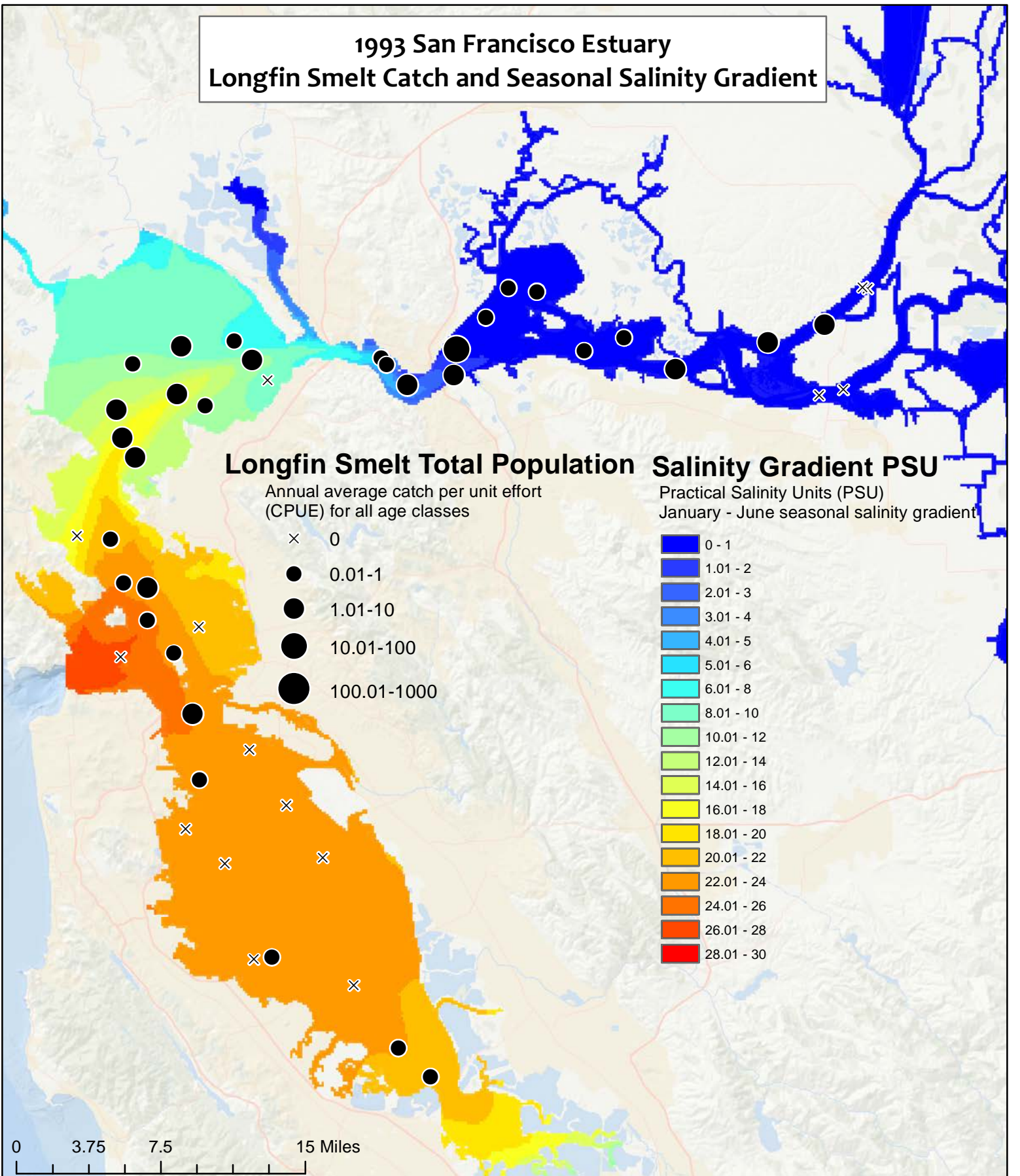
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# 1993 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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# 1994 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
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# 1995 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
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## Salinity Gradient PSU

Practical Salinity Units (PSU)  
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# 1996 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

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Annual average catch per unit effort (CPUE) for all age classes

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## Longfin Smelt Total Population

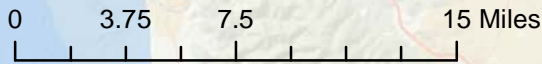
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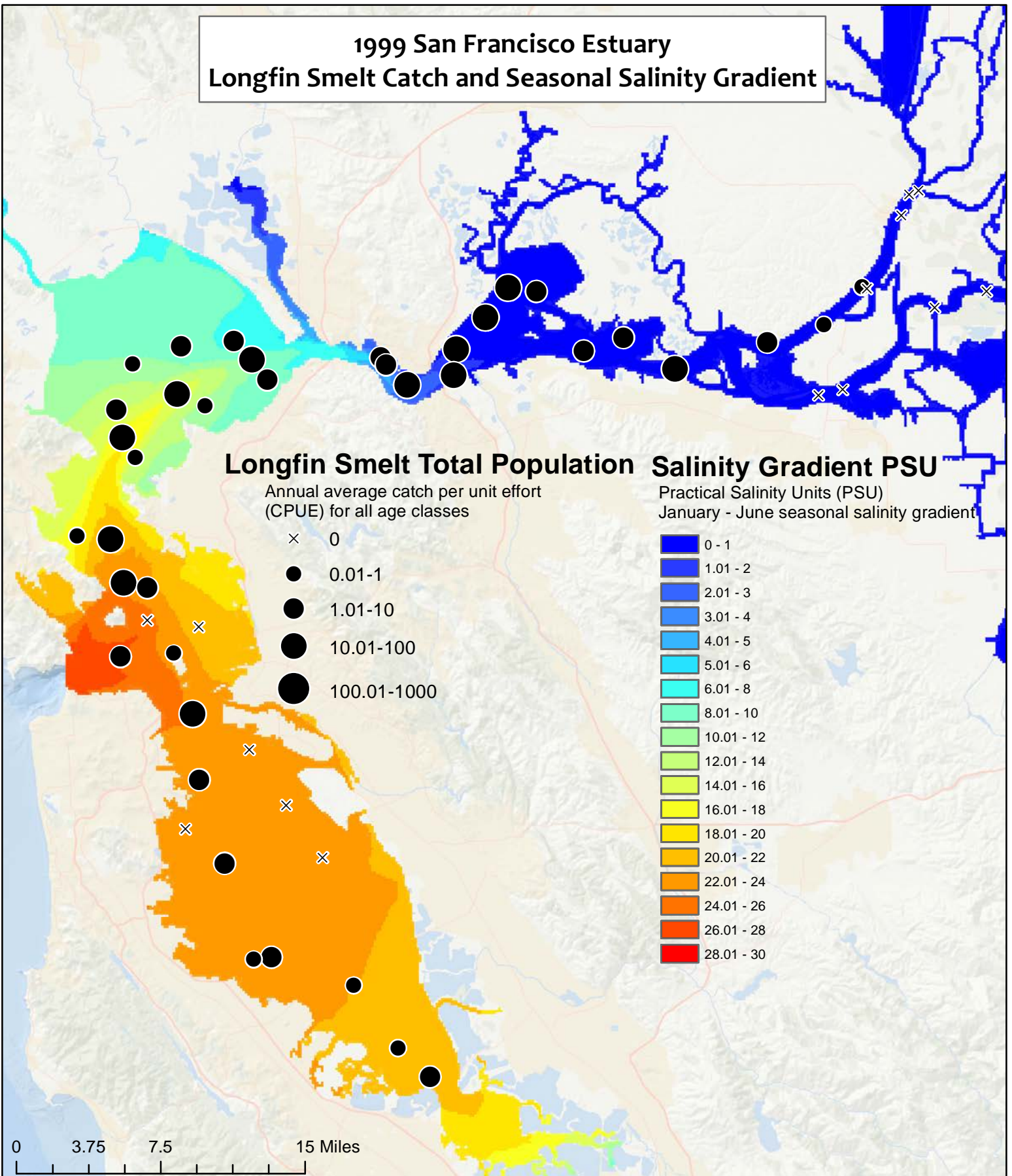
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# 1999 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



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Salinity Gradient - Coarse-grid version of UnTRIM San Francisco Bay-Delta Model, Delta Modeling Associates  
Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others



# 2000 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

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Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others



# 2001 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)

January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 8
- 8.01 - 10
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- 26.01 - 28
- 28.01 - 30

0 3.75 7.5 15 Miles

### About this map

The January to June seasonal salinity gradient is plotted in the SF Estuary beneath the annual average CPUE of longfin smelt (total population) for each monitoring station in the SF Bay Study mid-water trawl, consistent with the salinity-abundance relationship published in Kimmerer (2002), Marine Ecology and Progress Series 243: 39-55.

WTR1502244.3

E. Foresman 7/13/2015

### Data sources

Fish CPUE - San Francisco Bay Study CA Department of Fish and Wildlife and the Interagency Ecological Program  
 Salinity Gradient - Coarse-grid version of UnTRIM San Francisco Bay-Delta Model, Delta Modeling Associates  
 Basemap - ESRI, DeLorme, BEBCO, NAANGDC, & others



# 2002 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)

January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 8
- 8.01 - 10
- 10.01 - 12
- 12.01 - 14
- 14.01 - 16
- 16.01 - 18
- 18.01 - 20
- 20.01 - 22
- 22.01 - 24
- 24.01 - 26
- 26.01 - 28
- 28.01 - 30

0 3.75 7.5 15 Miles

### About this map

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# 2003 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 8
- 8.01 - 10
- 10.01 - 12
- 12.01 - 14
- 14.01 - 16
- 16.01 - 18
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- 22.01 - 24
- 24.01 - 26
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- 28.01 - 30

0 3.75 7.5 15 Miles

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# 2004 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
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- 4.01 - 5
- 5.01 - 6
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- 26.01 - 28
- 28.01 - 30

0 3.75 7.5 15 Miles

### About this map

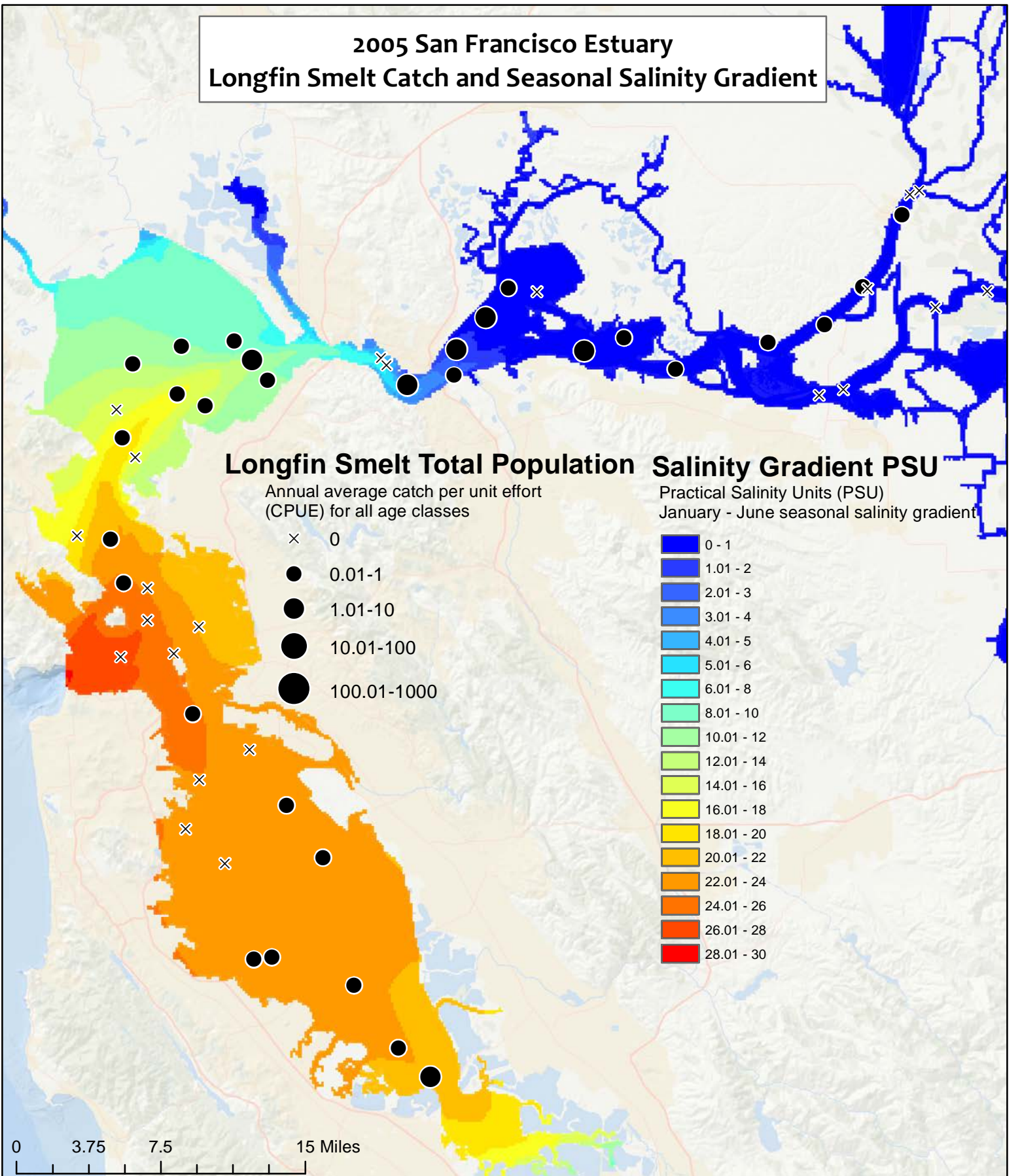
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# 2005 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



**About this map**

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# 2006 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 8
- 8.01 - 10
- 10.01 - 12
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# 2007 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
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- 3.01 - 4
- 4.01 - 5
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# 2008 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
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- 3.01 - 4
- 4.01 - 5
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# 2009 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
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### About this map

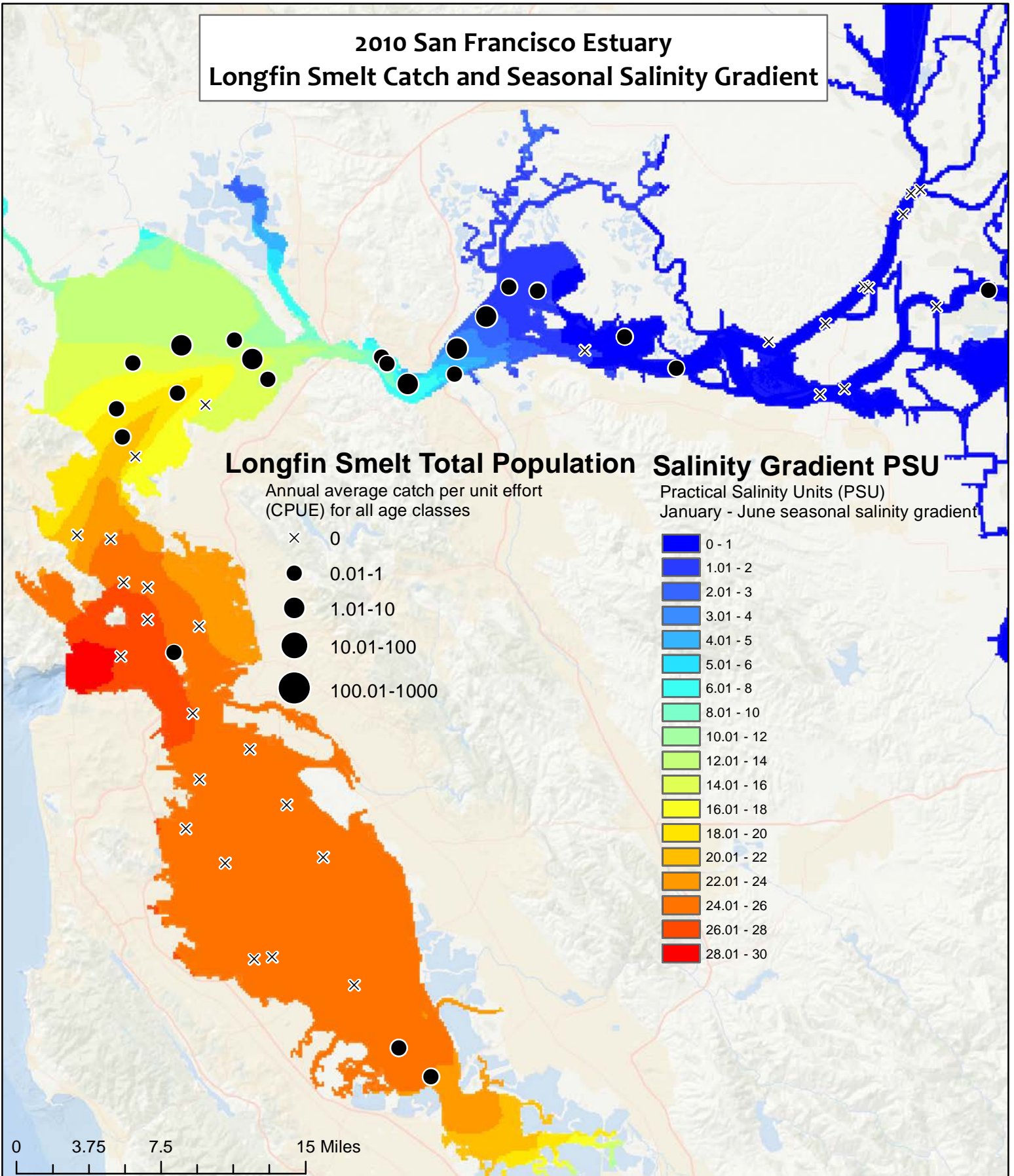
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# 2010 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient



**About this map**

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# 2011 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)  
January - June seasonal salinity gradient

- 0 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
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- 8.01 - 10
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# 2012 San Francisco Estuary Longfin Smelt Catch and Seasonal Salinity Gradient

## Longfin Smelt Total Population

Annual average catch per unit effort (CPUE) for all age classes

- × 0
- 0.01-1
- 1.01-10
- 10.01-100
- 100.01-1000

## Salinity Gradient PSU

Practical Salinity Units (PSU)

January - June seasonal salinity gradient

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