

# Climates Change.

That's what climates do.

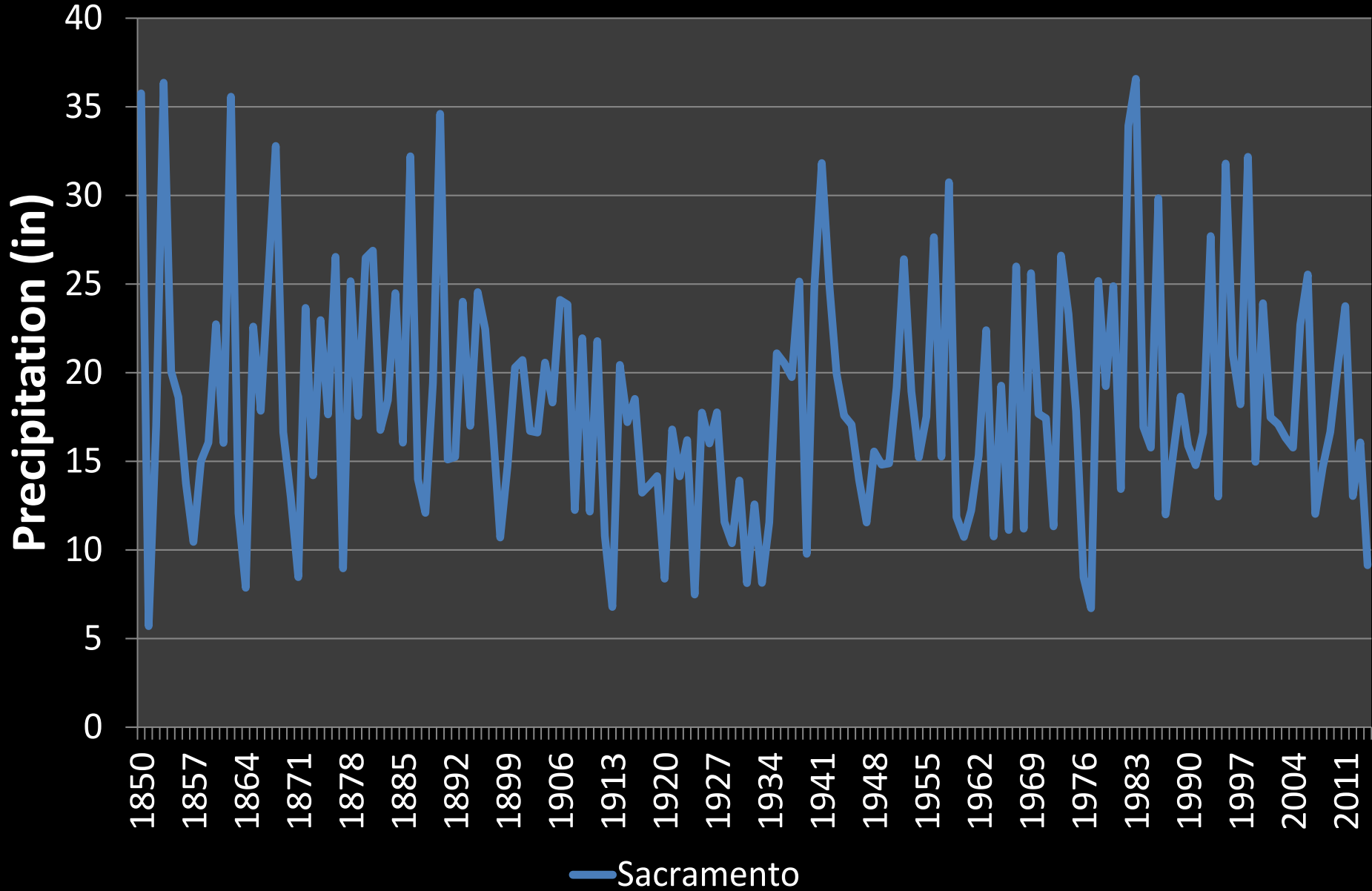
*David C. Curtis, Ph.D.*

*WEST Consultants*

**Limited data**

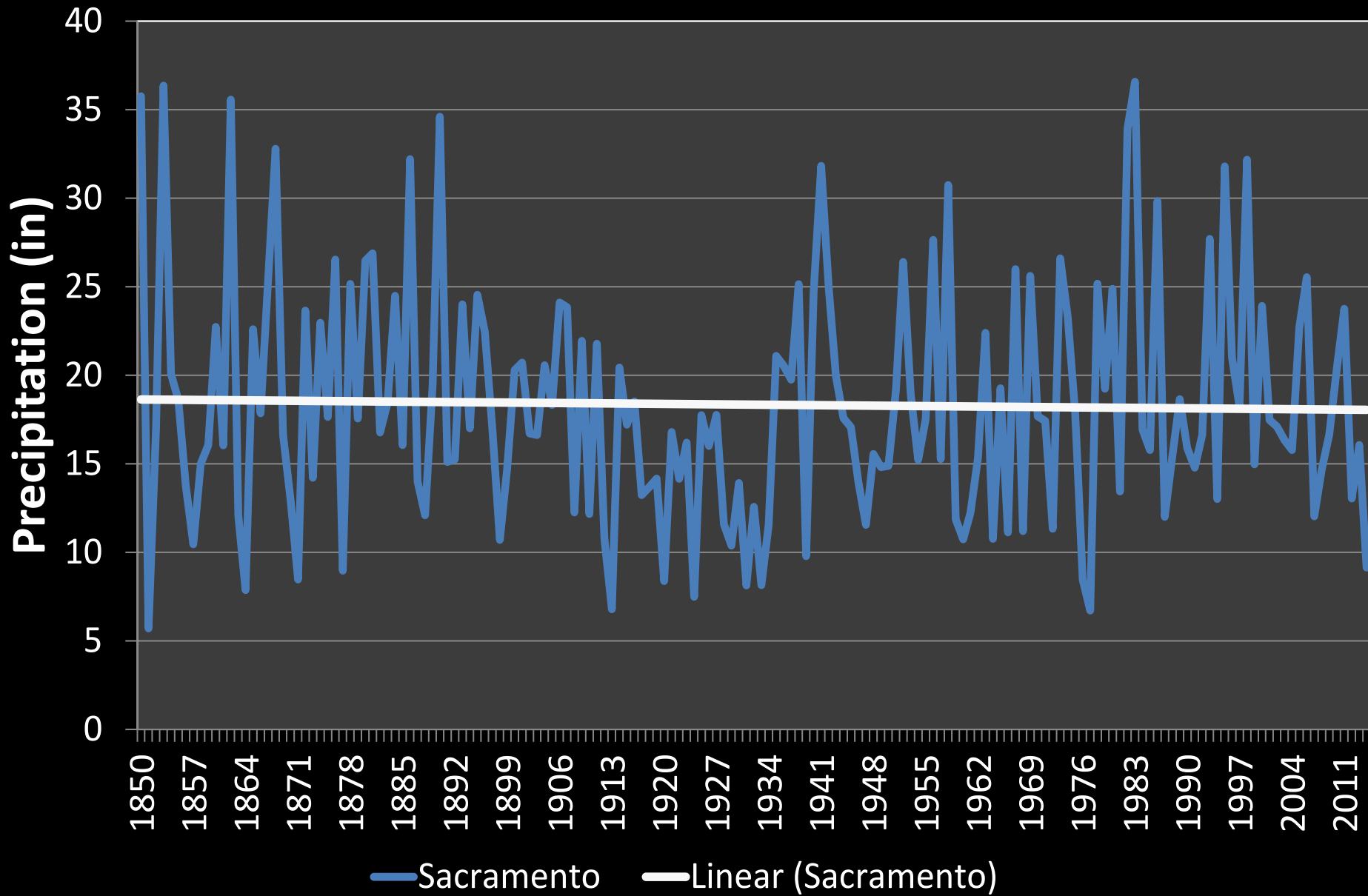
# Annual Precipitation - Sacramento, CA

## 1850-2014



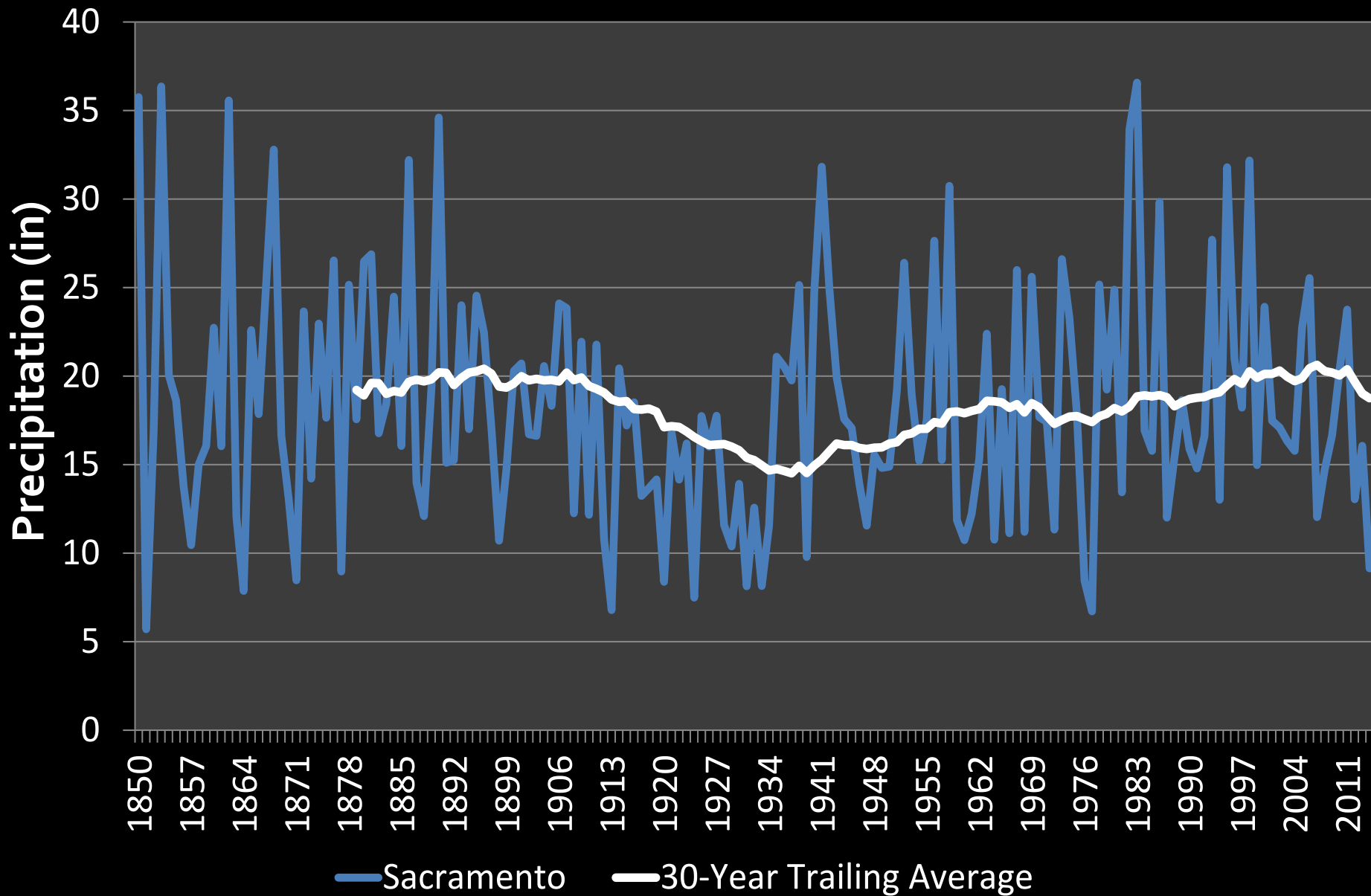
# Annual Precipitation - Sacramento, CA

## 1850-2014

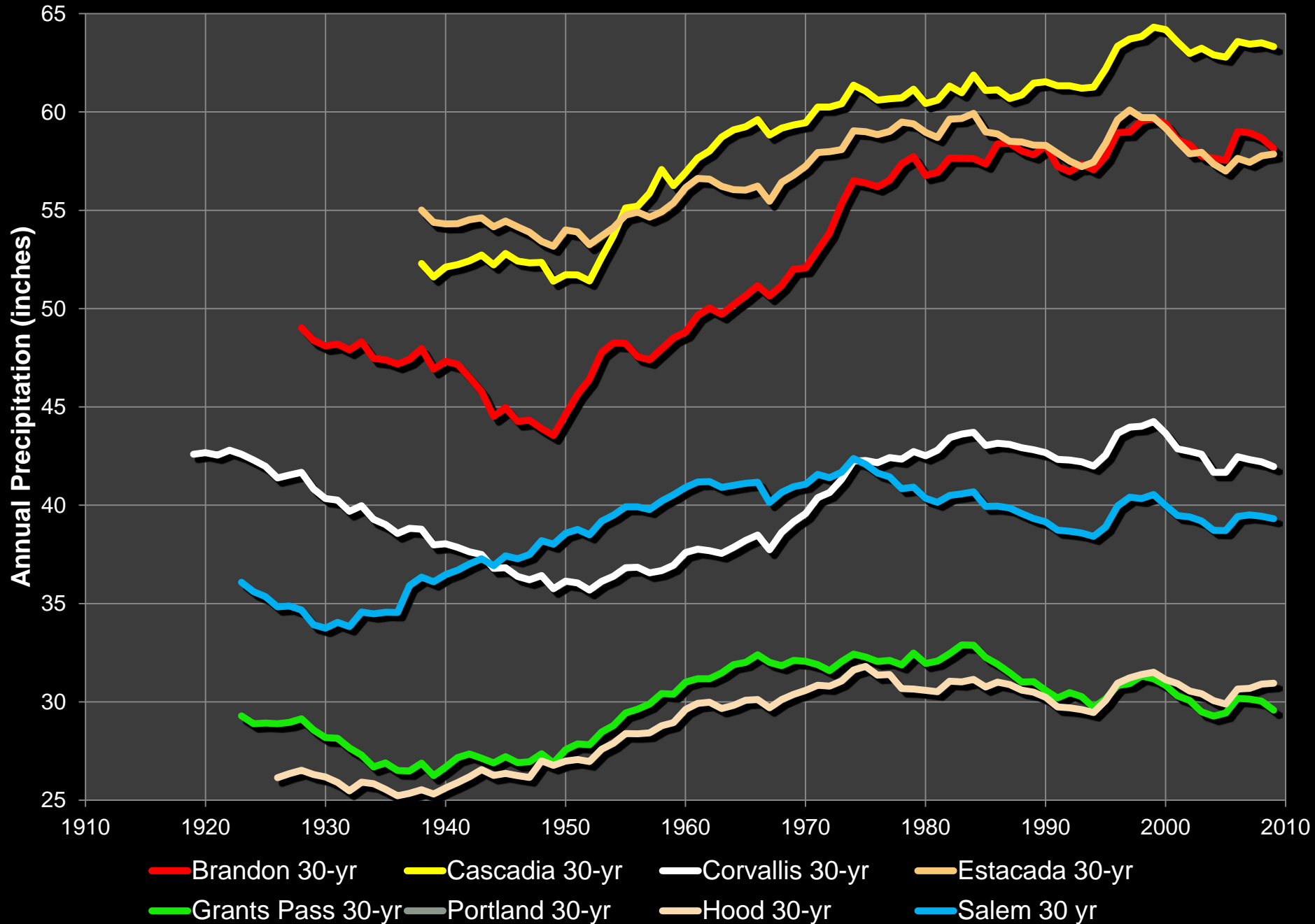


# Annual Precipitation - Sacramento, CA

## 1850-2014



# 30-Year Moving Average Annual Rainfall, Oregon

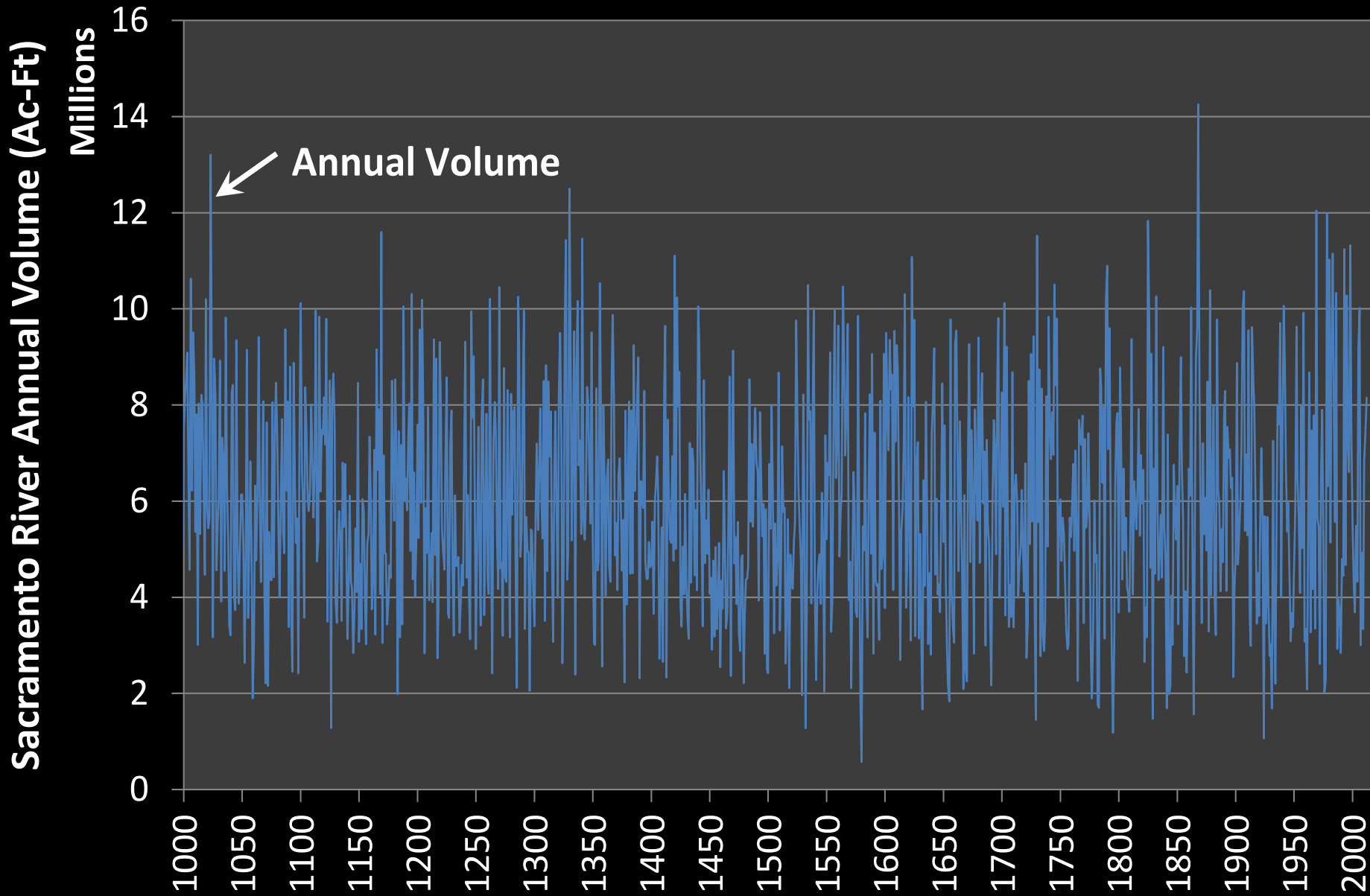


# Centralia Annual Precipitation

## 30-Yr Average

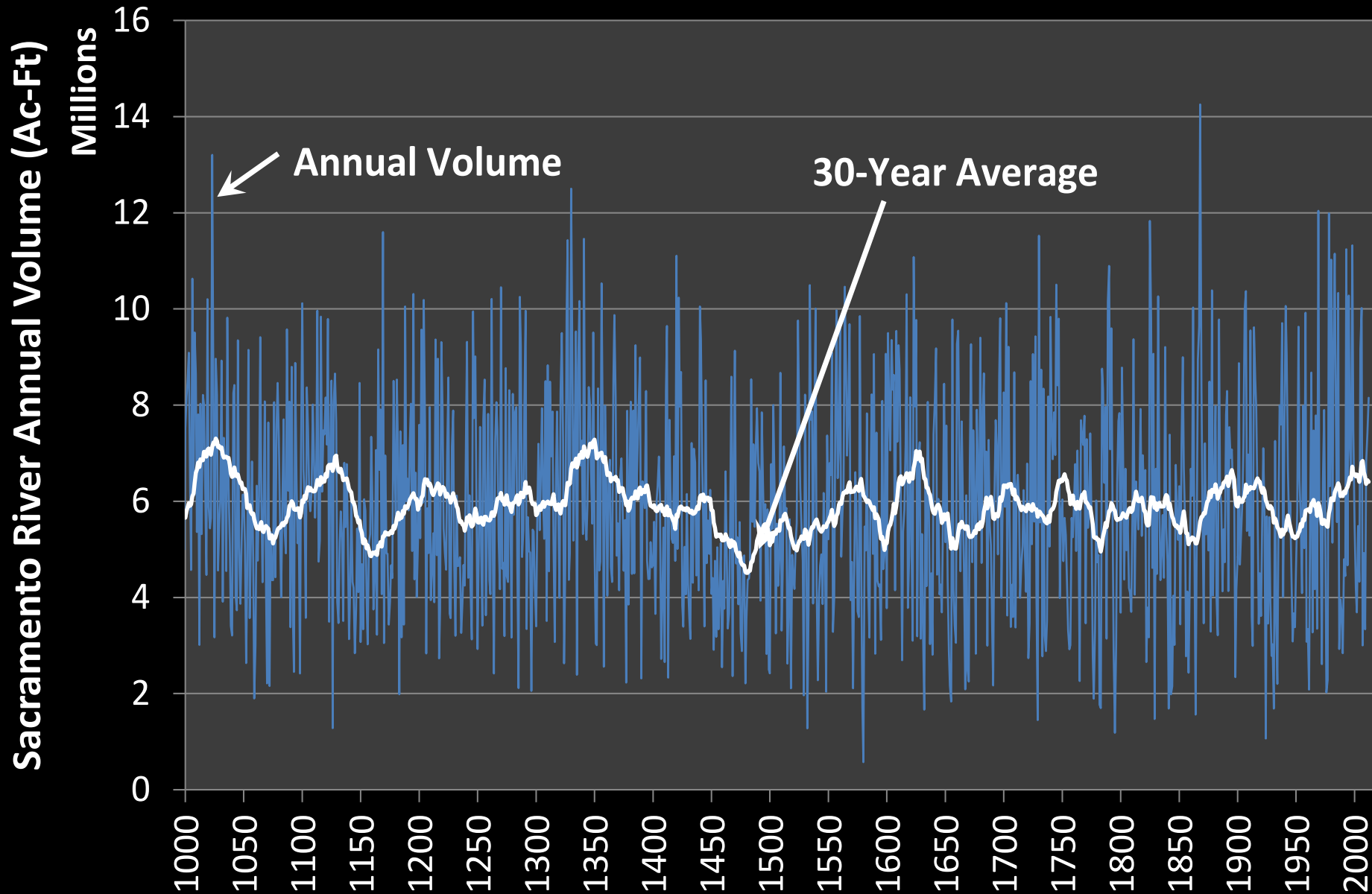


# Sacramento River Reconstructed Annual Flow Volume





# Sacramento River Reconstructed Annual Flow Volume



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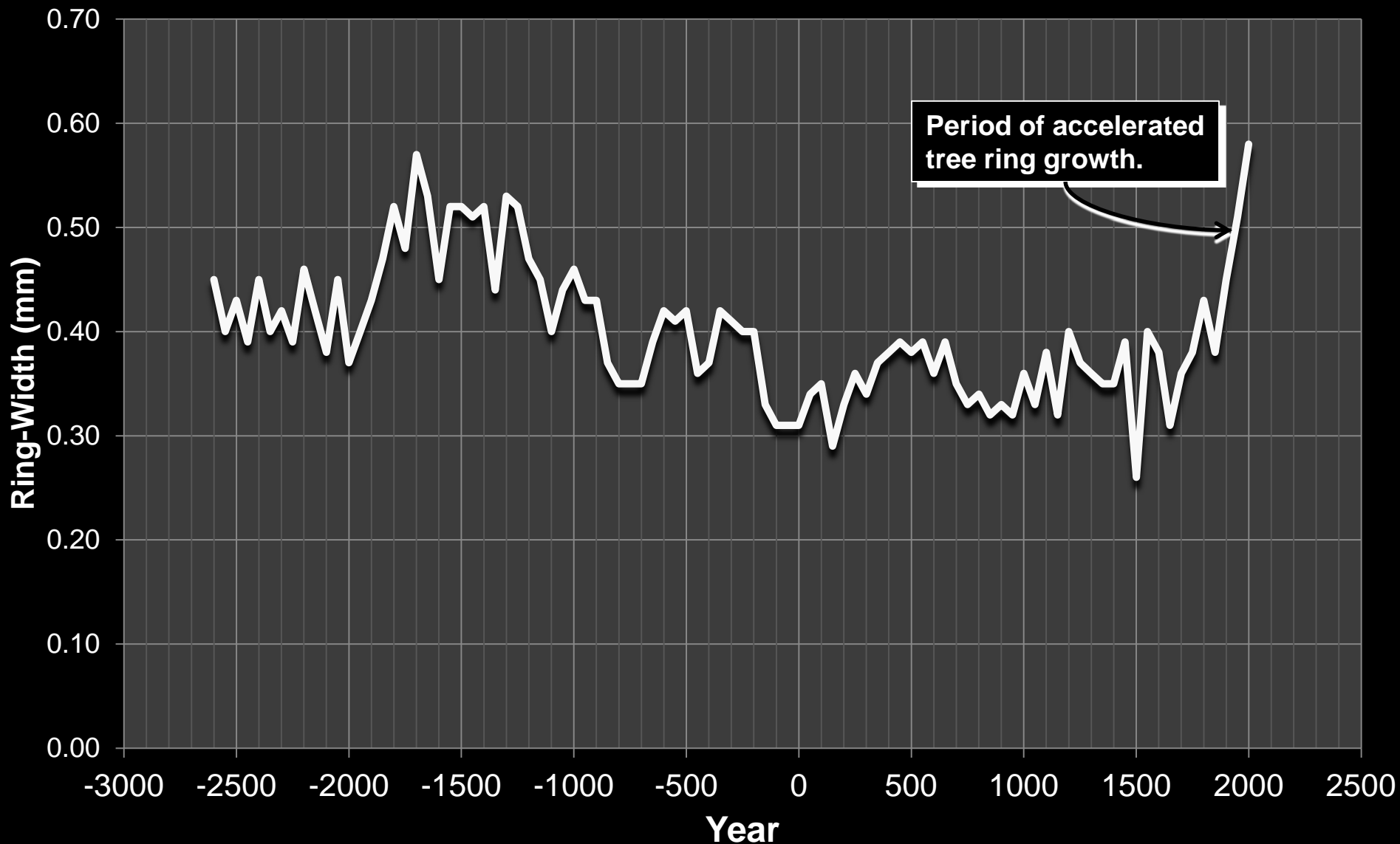
**Climates Change.**

**Natural?**

**Man-made?**

*It's both!*

# Tree Ring-Width Analysis

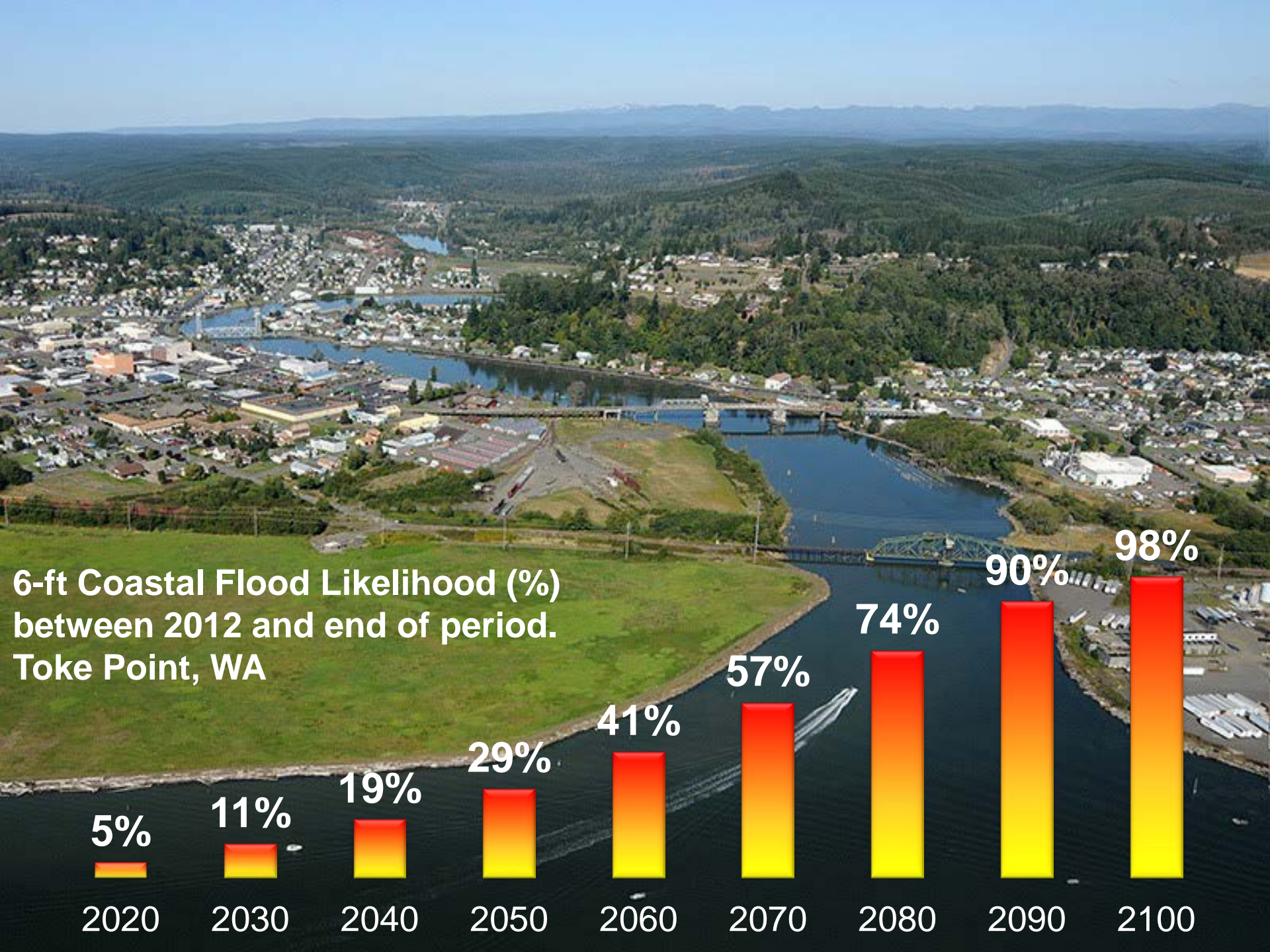


Upper forest border *Pinus Longaeva* from three sites in western North America

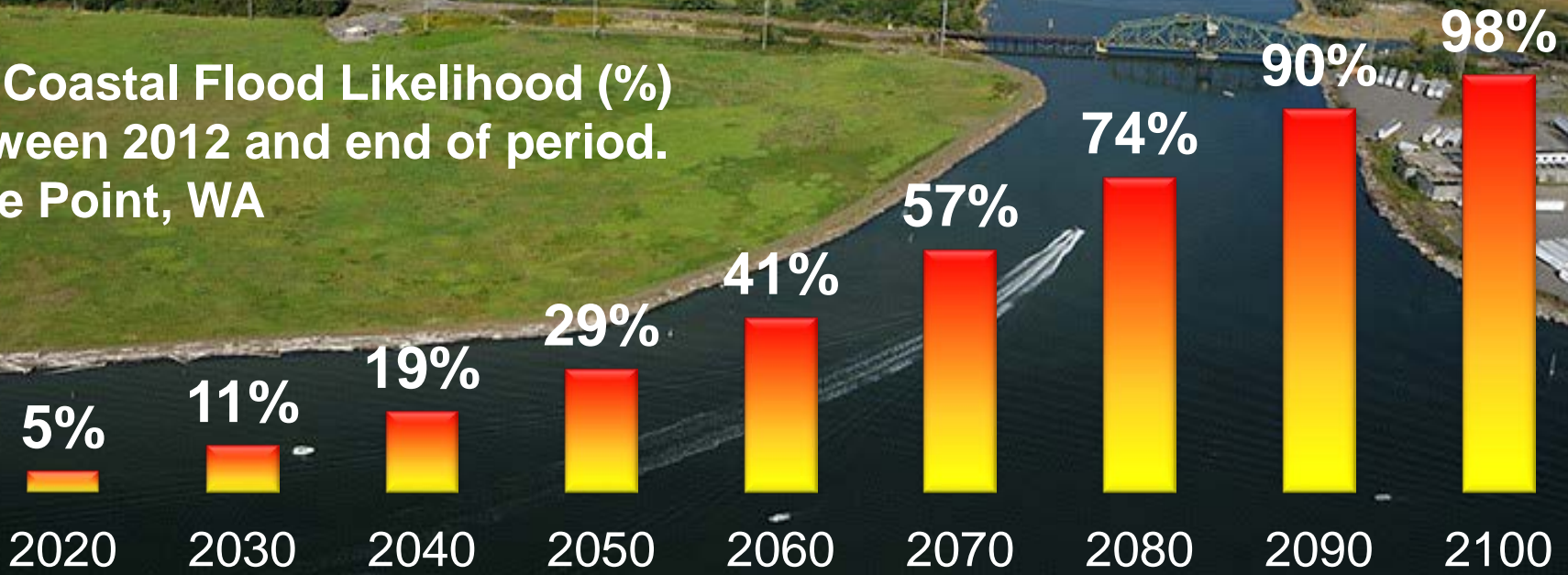
Salzar, M. W. et al., PNAS 2009:106:20348-20353

# Climate Change Concerns for the Authority

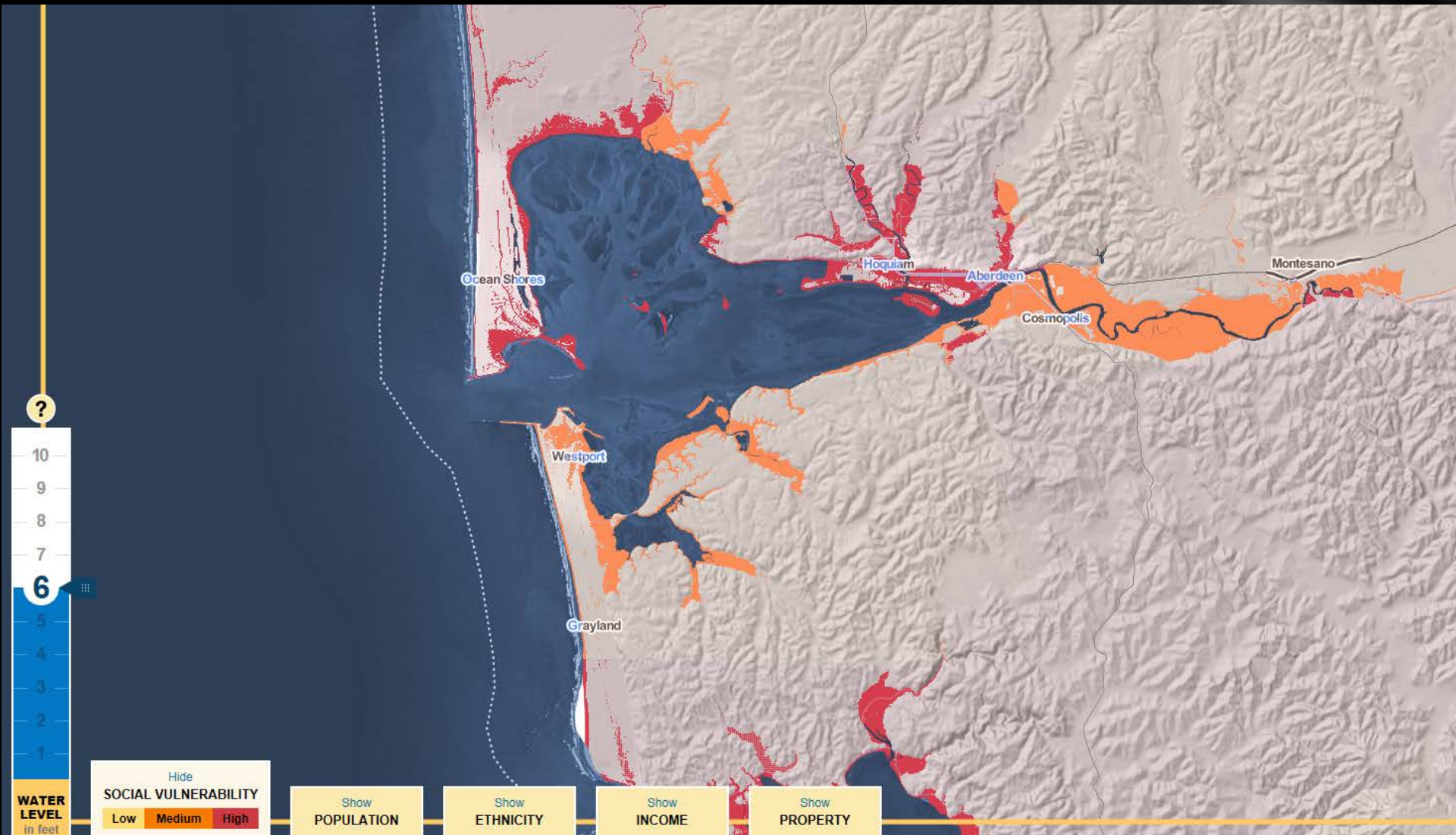
- Temperature Changes
  - ✓ Strong signal for warming
- Precipitation Changes
  - ✓ Weak signal
    - ❖ Averages
    - ❖ Extremes



**6-ft Coastal Flood Likelihood (%)  
between 2012 and end of period.  
Toke Point, WA**



# Sea Level Rise



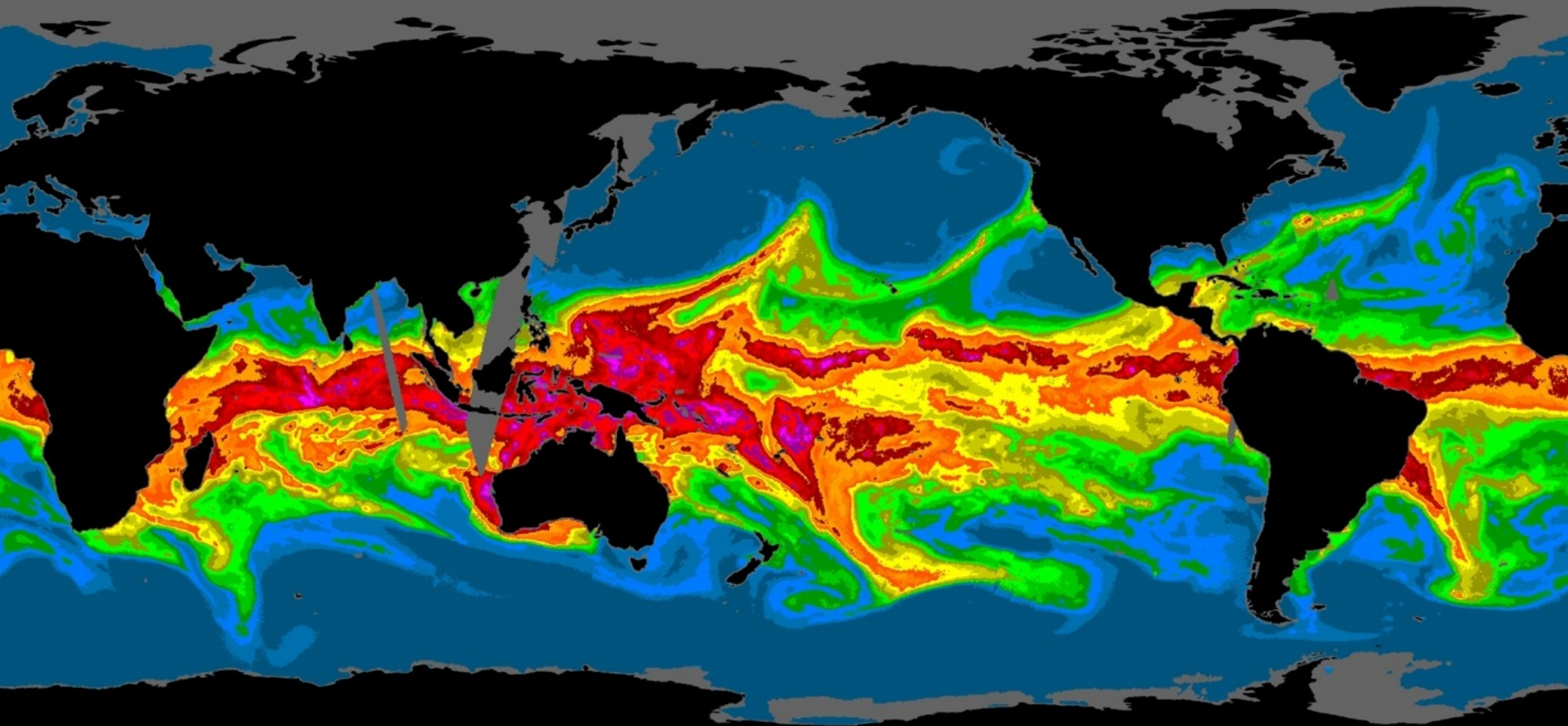
# Grays Harbor County Impacts

6 ft. Coastal Flood, Toke Point, WA

	Total Exposure	Excluding Isolated Areas
Acres of land	25,900	25,016
Population	20,601	20,365
High social vulnerability pop.	14,749	14,620
Housing units	9,465	9,300
<b>Property (\$ millions)</b>	<b>1,086</b>	<b>1,045</b>
Road miles	184.0	179
EPA listed sites	89	88
Schools	14	0

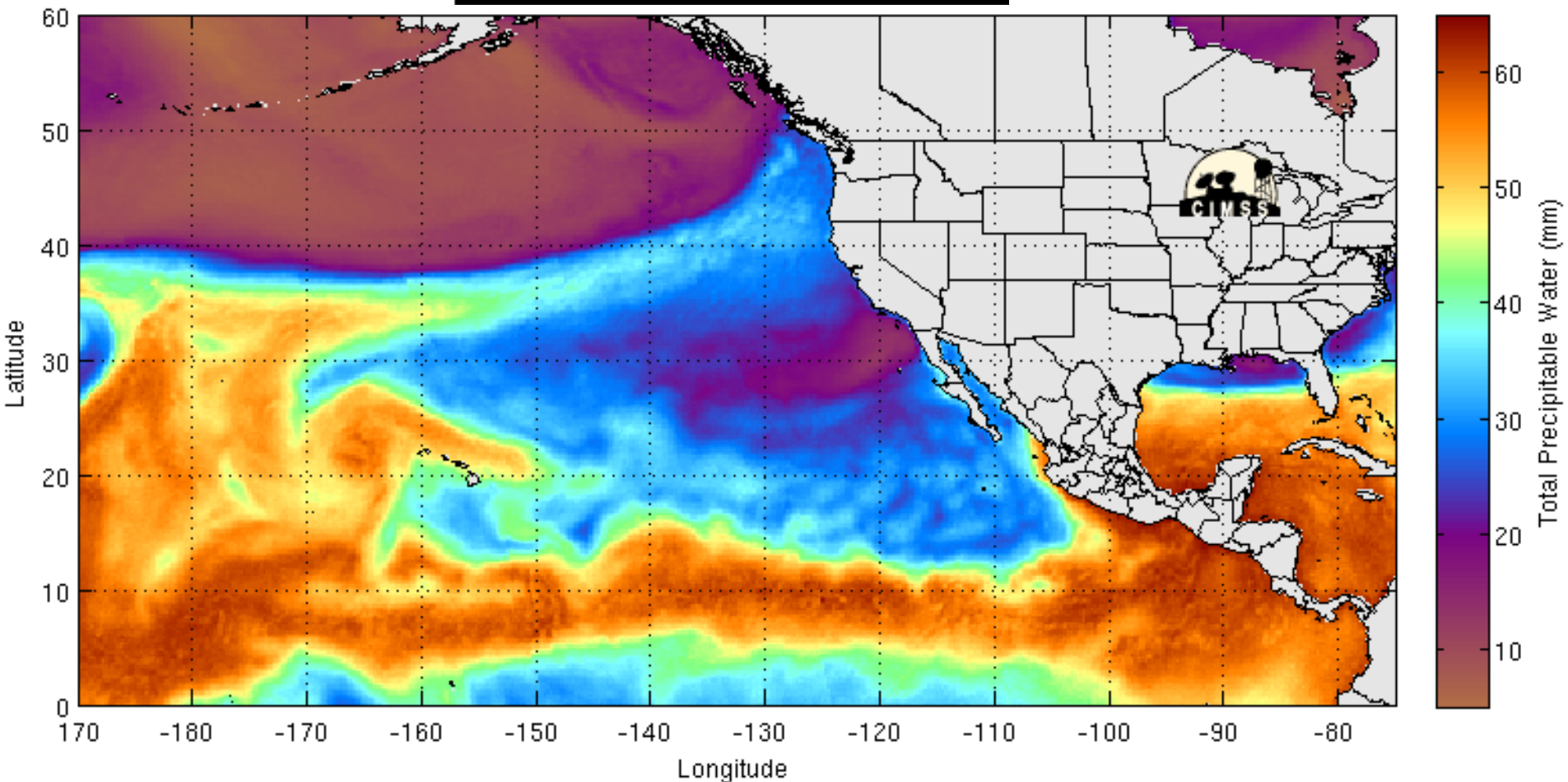


# Atmospheric Rivers



# More intense Atmospheric Rivers?

October 22, 2014



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# Action Items to Consider

# Improve Rating Curves

*Chehalis River at Centralia and  
Skookumchuck River at Centralia*

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# Improve Forecasts and Inundation Mapping

*Lower Chehalis River and  
Grays Harbor*

# Inundation Mapping

No Flood



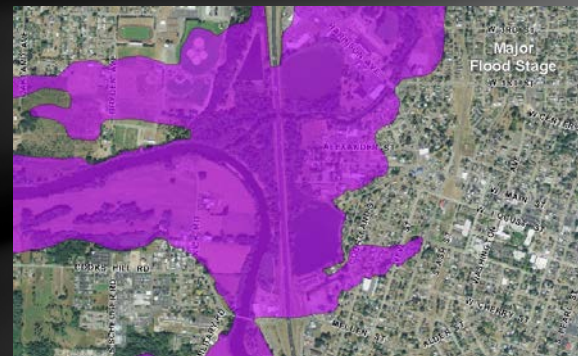
Moderate



Action



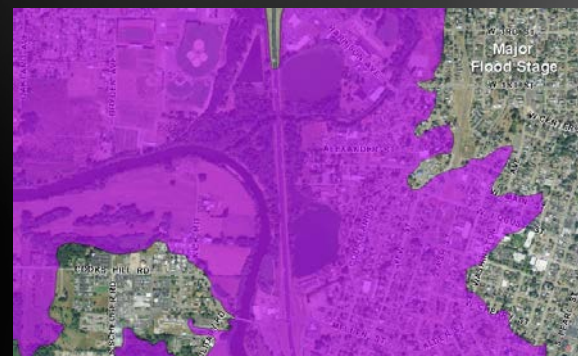
Major



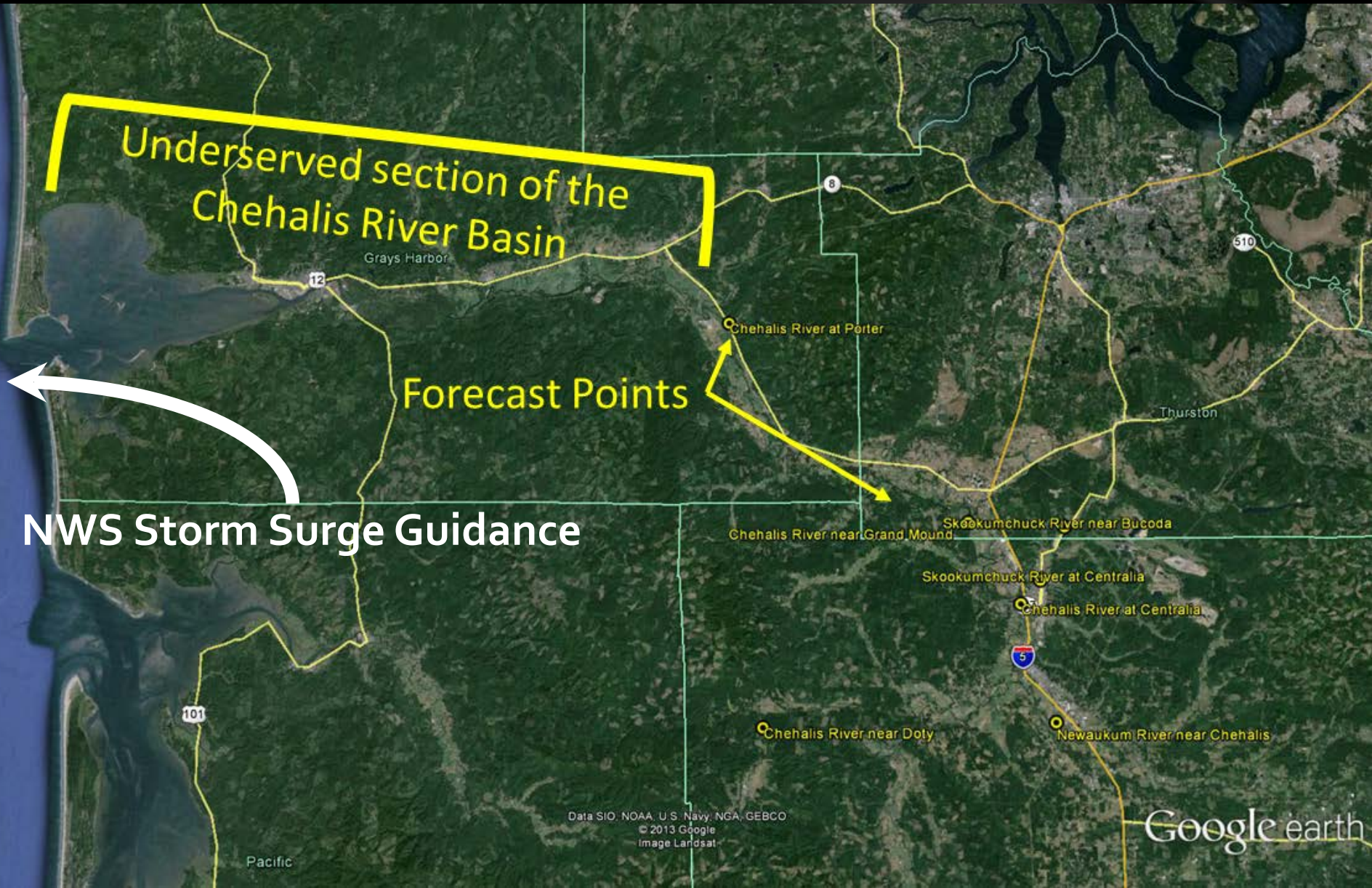
Minor



Major



# Forecasting Lower Chehalis



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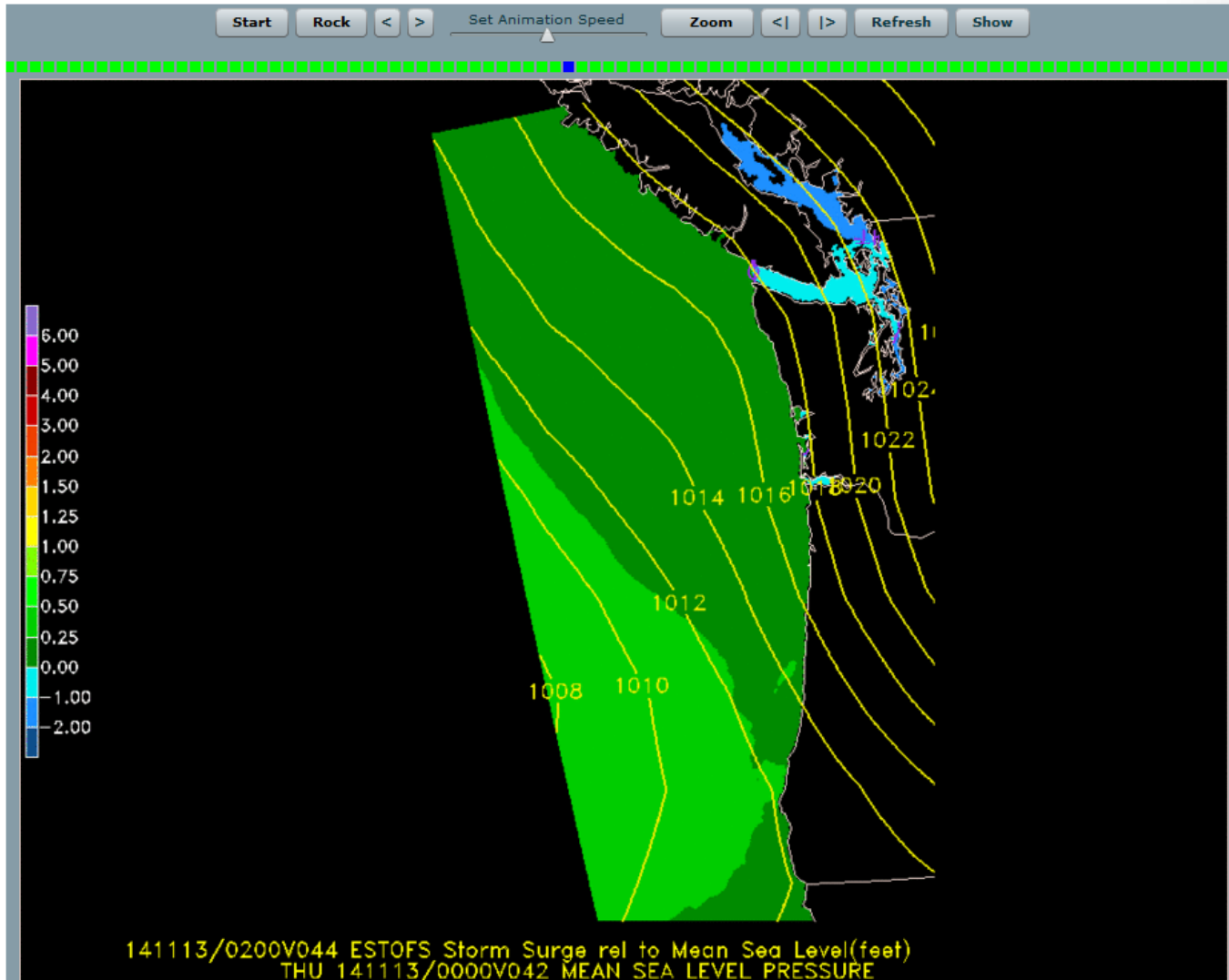
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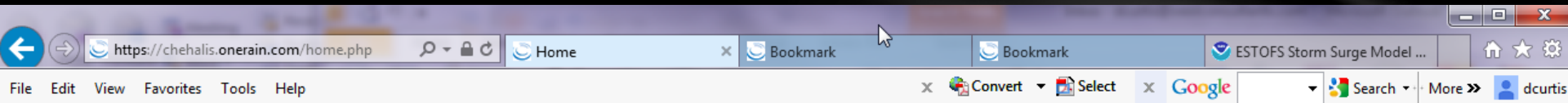
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## ESTOFS Storm Surge Model Guidance - Washington and Oregon Coasts (F00-F96)





# New Links on Website



[Ocean Storm Surge Forecast \(NEW!\)](#)  
[CoCoRAHS \(NEW!\)](#)

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# Grays Harbor Flood Forecast Gap



**Questions?**

# Climates change. That's what climates do.

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