Nature-Based, Multi-benefit Solutions for a Healthy Future

Ellie Cohen and Point Blue Staff
North Bay Watershed Association
April 22, 2016

Point Blue
Conservation
Science

Advancing nature-based solutions for wildlife & people through science & partnerships

- Founded in 1965 as Point Reyes Bird Observatory
- 140+ staff and seasonal scientists
- Manage >1 billion ecological observations
- CA to Antarctica
- 2016 budget: ~$14 million

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Impending tipping point for the future of life on our planet

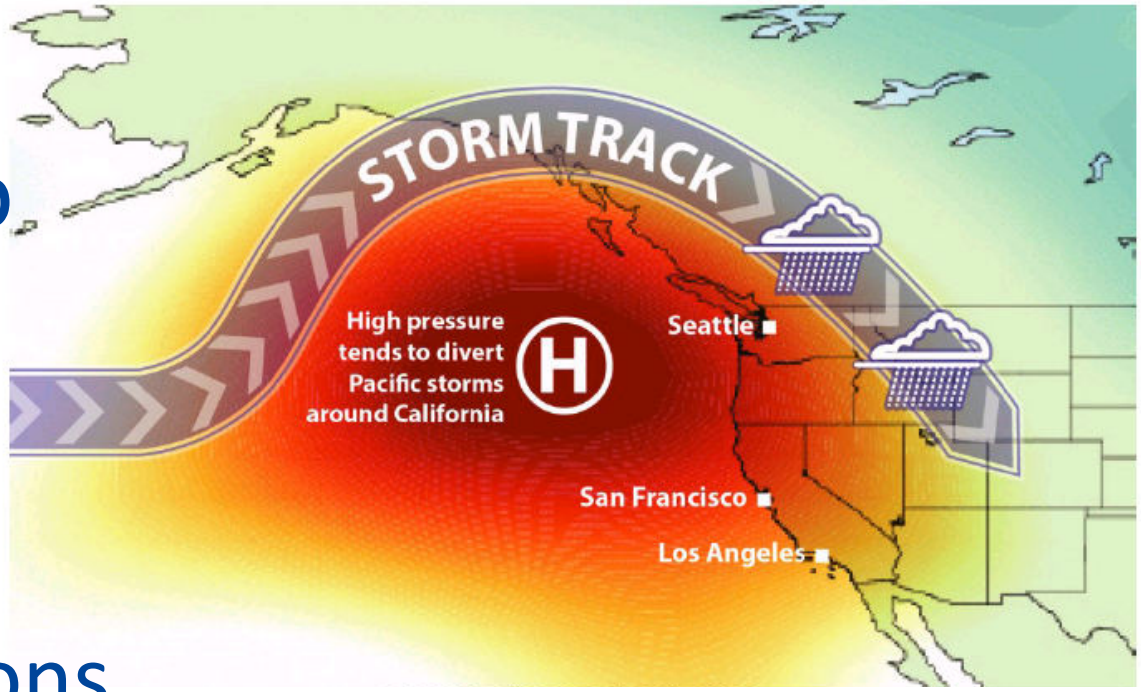
Exceeding 4 of 9 ‘planetary boundaries’

- Climate change
- Species extinction
- Habitat loss (land-use changes)
- Fertilizers (altered biogeochemical cycles)

- Steffen et al, SCIENCE, Jan 2015, Planetary Boundaries
- Natl Acad. of Sci., Abrupt Climate Change Dec 2013
- Barnosky et al, NATURE June 2012

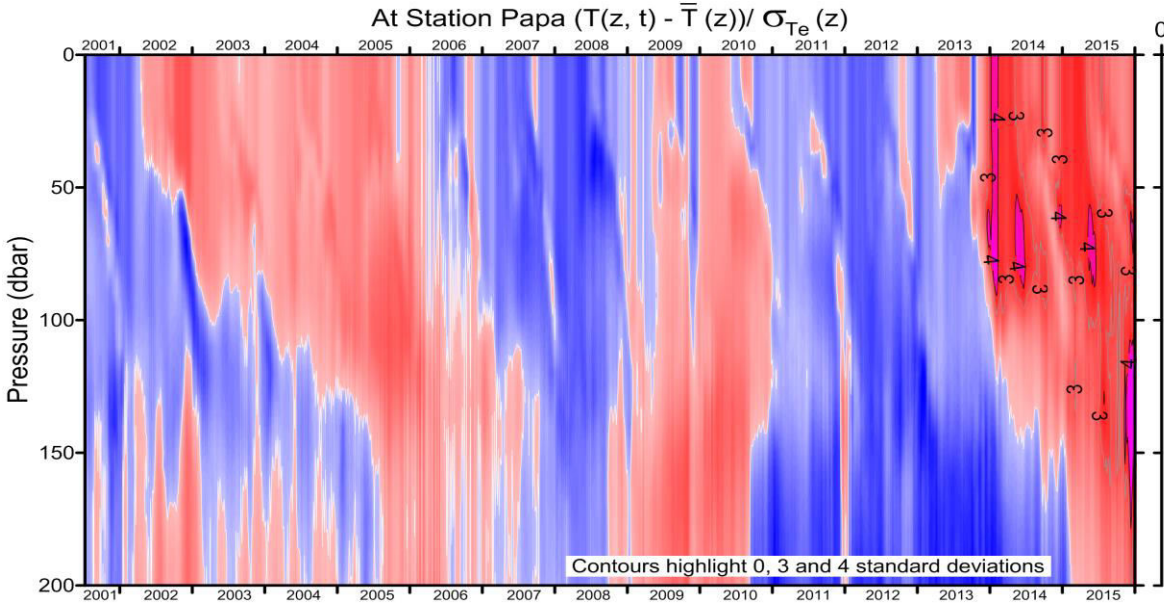
Image Cheng (Lily) Li.

How The Blob impacted El Niño



Uncertain predictions for the future—

High temps go 200m deep



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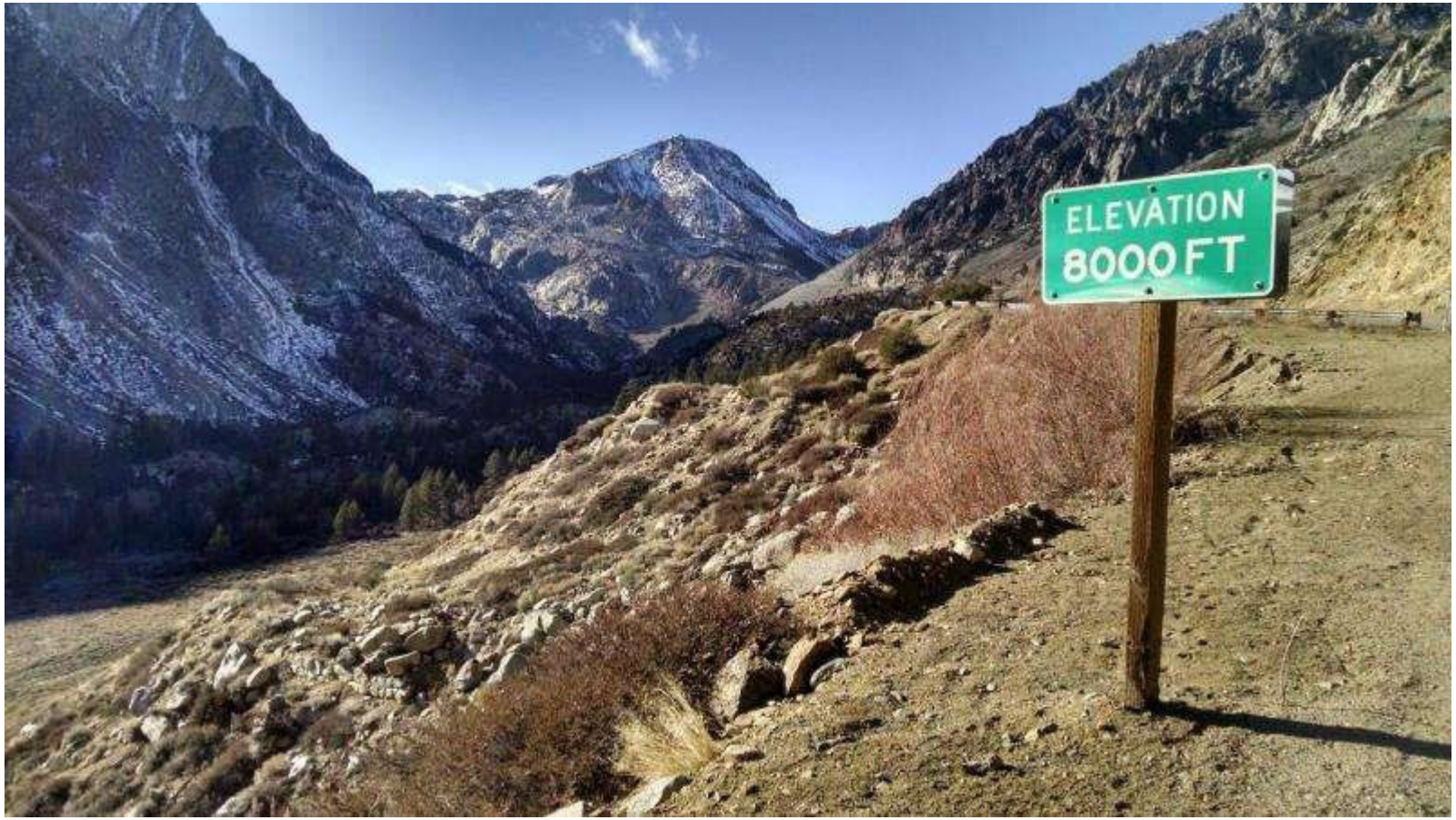
http://www.nanoos.org/resources/anomalies_workshop/workshop2.php

Drought patterns becoming more common



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Diffenbaugh et al Science Advances 2016; Photo Tioga Pass Jan 2015

We are totally reliant on nature

Ecosystem Services or Nature's Benefits

- Freshwater, clean air
- Food, fisheries
- Wood, fiber, fuel

- Climate
- Flood
- Disease
- Water quality

- Recreational
- Educational
- Spiritual

Est value= 2x global GNP or $72 trillion in 2012

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www.millenniumassessment.org/en/index.aspx

databank.worldbank.org

Paris Climate Agreement - Dec. 2015

Goal: hold increase in global avg. temp. below 1.5°C; includes nature-based solutions

…**importance of ensuring integrity of all ecosystems**

…take action to conserve sinks of greenhouse gases…

…support **reducing emissions from deforestation**…and **conservation**

…Build resilience through **sustainable management of natural resources**.

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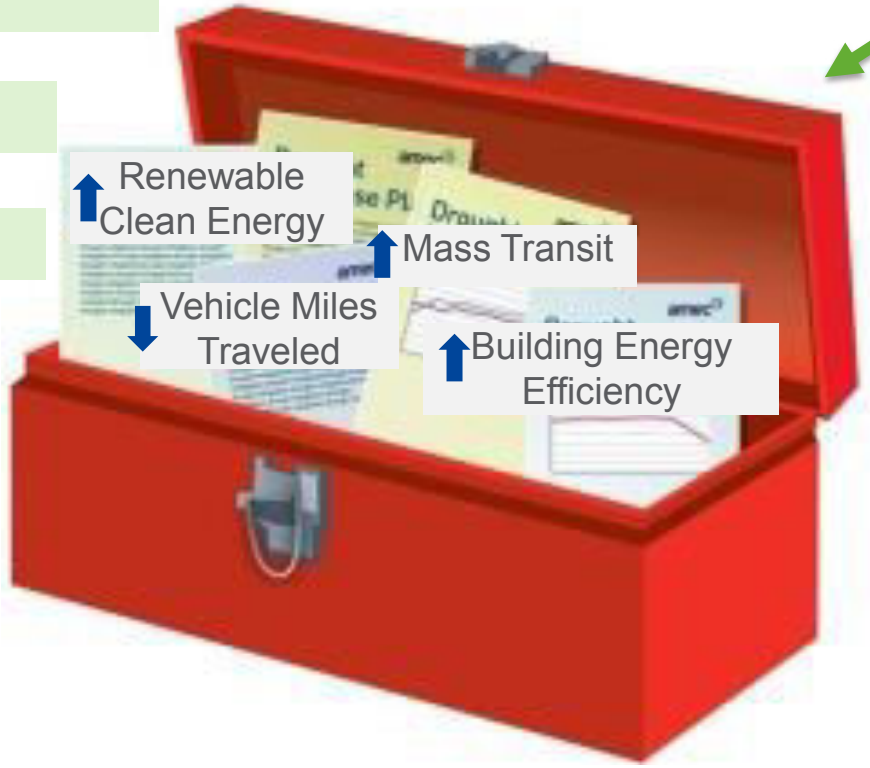
United Nations Framework Convention on Climate Change
http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf
www.pointblue.org/parisagreementecosystems

Climate change tool box…
…must include nature-based solutions

Mitigation: GHG emissions reductions

Adaptation

Sequestration



Nature-based solutions "*climate-smart conservation*"

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Tara G. Martin, James E. M. Watson. **Intact ecosystems provide best defence against climate change**. *Nature Climate Change*, 2016; 6 (2): 122 DOI: 10.1038/nclimate2918

Climate-Smart Conservation Key Principles

1. **Focus on future** conditions, not past; plan ahead to reduce risks
2. Design actions in **watershed/ecosystem/biosphere context** across multiple scales in time and space
3. Employ **flexible, adaptive approaches** for timely response to continual change
4. **Prioritize actions for multiple benefits** to nature *and* people
5. **Collaborate & communicate across sectors** for timely, long term solutions
6. Practice the TEN% Rule: **Test and Experiment Now**!

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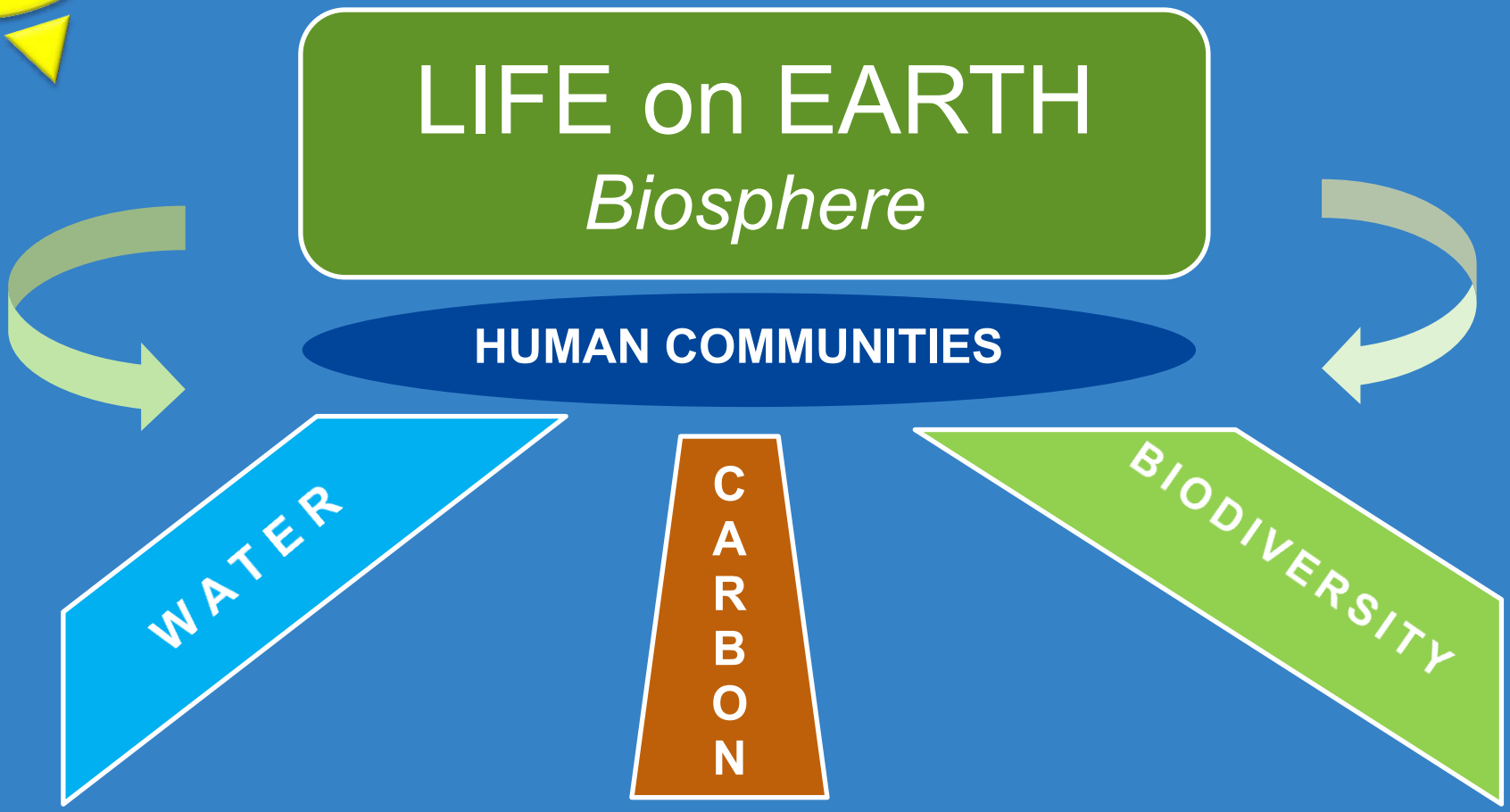
Adapted from: NWF Climate Smart Conservation Adaptation Principles 2011; Draft Principles for CA Resources Agency Adaptation Update 2012; CSIRO's Climate change impacts on Australia's biodiversity conservation & protected areas, Sept 2012 Update

Prioritize actions for multiple benefits

---not just carbon or just water or just single species

Climate Smart



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ecohen@pointblue.org

“Re-water” rangelands >40% of CA

- Multi-benefit: water, carbon, biodiversity, bottom lines

Climate Smart

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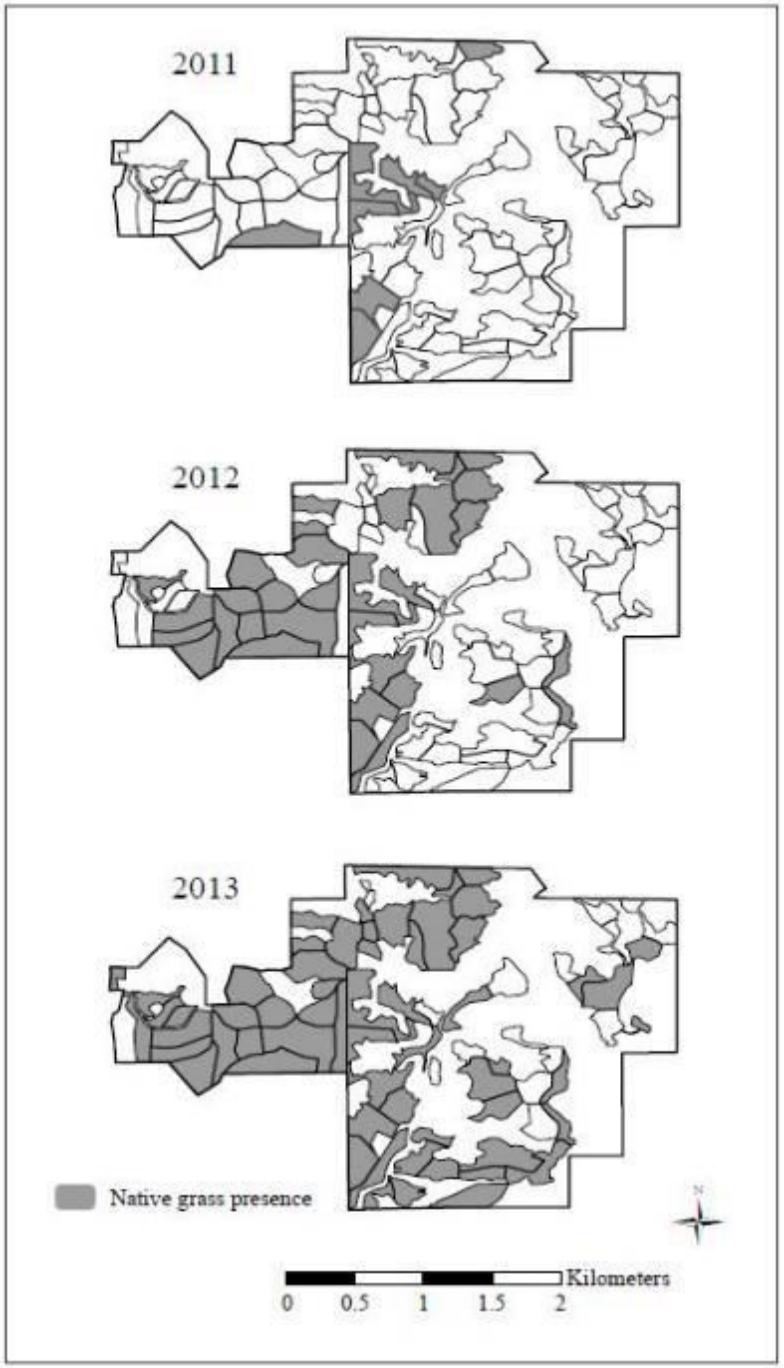
NRCS
Natural Resources Conservation Service

40 m acres @ avg. 1MT CO2e/acre = offset ~9% of CA emissions/year = 2013 residential/commercial emissions

TomKat Ranch Example

~72% increase in perennial grass cover from changes in grazing:

- more cattle rotation
- more pasture rest
- varying timing of rest



Henneman et al. 2014. Restoring Native Perennial Grasses by Changing Grazing Practices in Central Coastal California. Ecological Restoration 32(4): 352-354.
http://phys.org/news/2014-12-rest-grazing-native-grasslands.html

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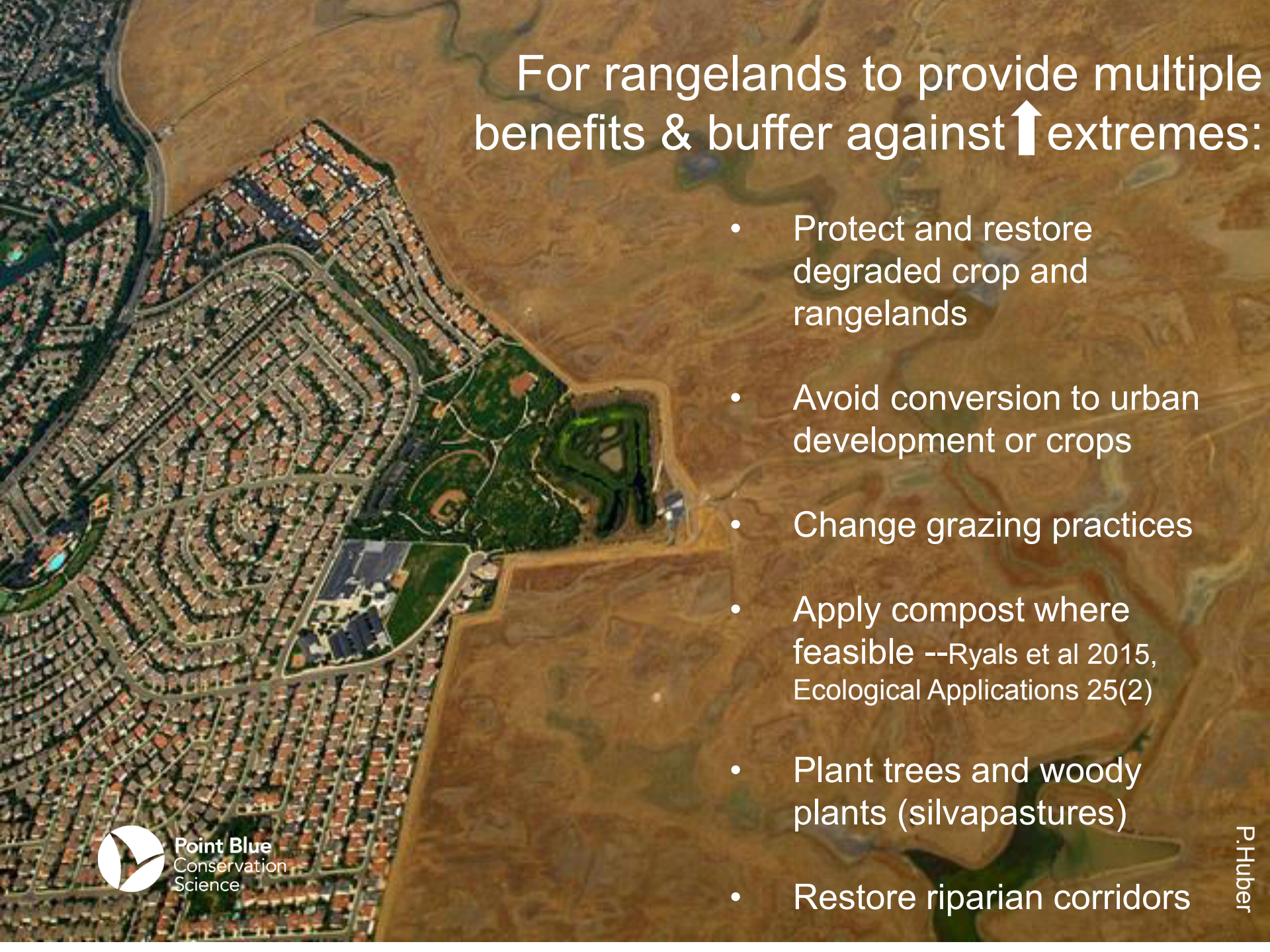

For rangelands to provide multiple benefits & buffer against ⬆ extremes:

- Protect and restore degraded crop and rangelands
- Avoid conversion to urban development or crops
- Change grazing practices
- Apply compost where feasible --Ryals et al 2015, Ecological Applications 25(2)
- Plant trees and woody plants (silvapastures)
- Restore riparian corridors

Point Blue Conservation Science

P.Huber

Riparian habitat: 90% lost in CA-- enormous potential for restoration benefits

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http://www.rivers.gov/california.php
http://www.pointblue.org

Riparian restoration

- Filters out pollutants and recharges groundwater (Tabacchi et al. 2000, Mander and Hayakawa. 2005)
- Captures carbon and prepares ecosystems for change (Lewis et al. 2015, Matzek et al. 2015, Seavy et al. 2009)
- Provides habitat for fish, birds and other wildlife (Knopf and Samson 1994, Pusey and Arthrington 2003, Gardali et al. 2006, Golet et al. 2008)
- Protects soil and supports pollinators – food security (Power et al. 2010)
- Increases property values and provides recreational opportunities (Colby and Smith-Incer. 2005, Bark et al. 2008)

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STRAW- Students and Teachers Restoring a Watershed

Since 1992:

- >550 restorations
- 40,500 Students
- 43,000 native plants
- 36 miles of riparian habitat
- 6.5 acres of marsh/upland transition zone habitat

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STRAW Benefit to Cost Ratio
creek revegetation & water quality improvement
$14.22 to $1 invested

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Analysis by David Mitchell from M.Cubed

Assessed climate vulnerability of ecosystem services

Goal	Climate vulnerability	Action
Protect water quality by slowing run-off	More extreme events (drought, floods, and to a lesser extent fire) kill vegetation	Plant species that can survive extreme events
Provide wildlife habitat	Changes in timing cause mismatches in animal/plant phenology	Increasing the number of months that resources (cover, food) are available

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Test & Experiment Now (TEN%): Developed planning tool

http://www.pointblue.org/our-science-and-services/conservation-science/habitat-restoration/climate-smart-restorationtoolkit/

Common Name	Tolerates full or partial sun	Tolerates clay soil	Tolerates wet conditions	Tolerates dry conditions	Evergreen	Fire Adapted	Wildlife fruit source	Wildlife Nectar source	Wildlife Seed Source	Insectary Plant
Sticky manzanita	1		0	1	1	1	1	1		1
common manzanita	1	1	0	1	1	1	1	1		1
Bearberry	1	1	0	1	1	1	1	1		1
Marin manzanita	1		0	1	1	1	1	1		1
CA Sagebrush	1	1	0	1	1	1	0	1	1	1
Salt Marsh Baccharis	1	1	1	1	0					1
coyote brush	1	1	1	1	1	1	1	0	1	1
spice bush	1	1	1	1	0		0	0	0	1
Ceanothus	1			1	1	1	0	1	1	1
blue blossom	1		0	1	1	1	0	1	1	1
Mountain Mahogany	1	1	0	1	0	1	0	1	1	1
Creek dogwood	1	1	1	0	0		1	1	0	1
hazelnut	1	1	1	0	0		0	1	1	1
Hawthorne	1	1	1	1	0		1	1	1	1
Western leatherwood	1	1	1	0			1			
fremontia/ flannelbush	1	1	0	1	1	1	0	1	1	1
Toyon	1	1	0	1	1		1	1		
Creambush	1	1	1	1	0		0	1	1	1

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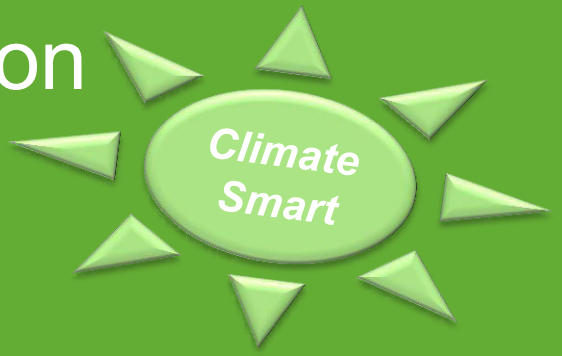
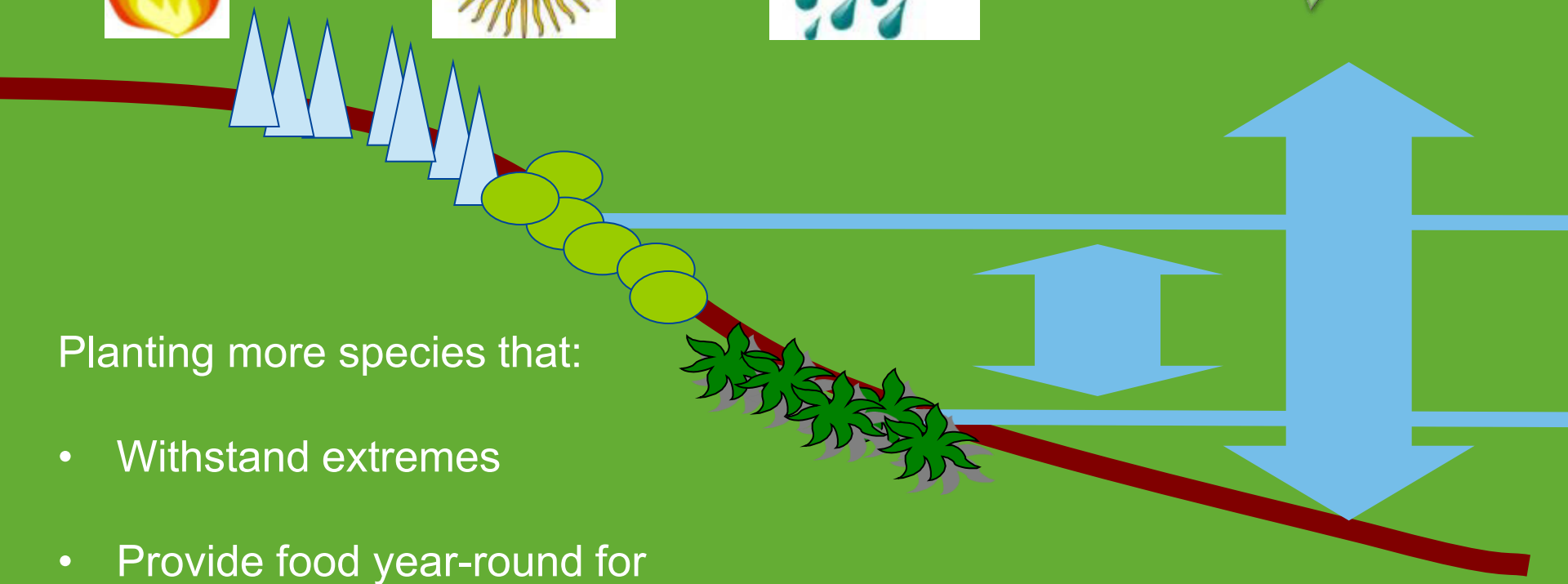
Climate-Smart Ecological Restoration





Planting more species that:

- Withstand extremes
- Provide food year-round for disrupted phenologies

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- **Climate-smart Restoration Tool Kit:** http://www.pointblue.org/our-science-and-services/conservation-science/habitat-restoration/climate-smart-restorationtoolkit/
- Seavy et al., **Why climate change makes riparian restoration more important than ever**. *2009. Ecological Restoration* Ecol. Rest. v27

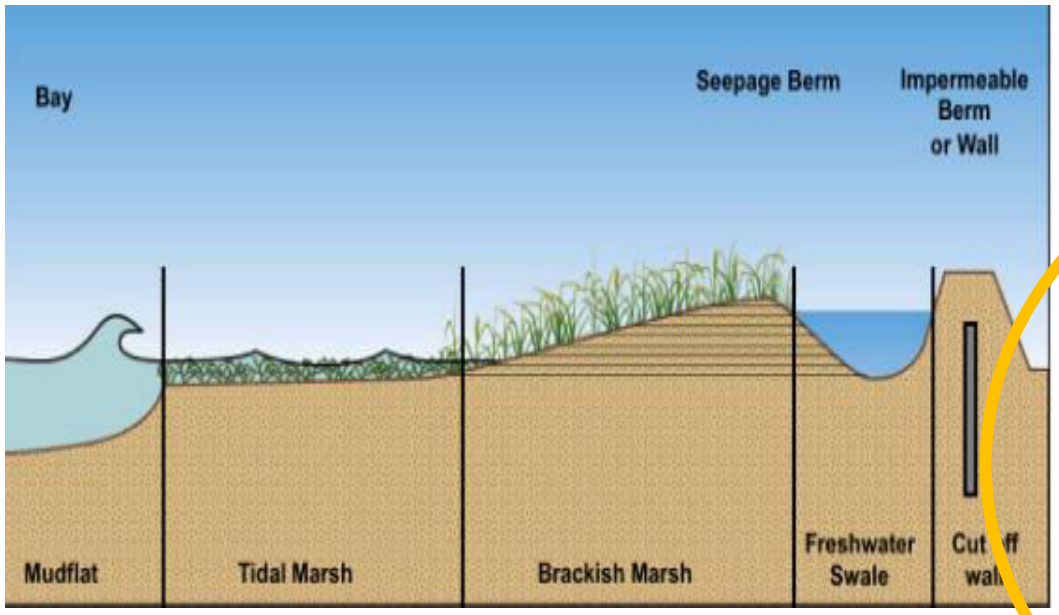
Tidal Marsh Ecosystems: Natural infrastructure

Multiple benefits for wildlife and human communities:

- Reduce flooding
- Slow sea level rise
- Filter out pollutants
- Provide fish and wildlife habitat
- Sequester C –est. ~62,500 T CO2e/year/100,000 acres
- Recreation

- **baylandsgoals.org/science-update-2015/**
- **mavensnotebook.com/2015/07/29/tidal-marshes-and-climate-change/ Callaway, 2015**

Tidal marshes combined with earthen levees can reduce construction and maintenance costs by almost 50%



The Horizontal Levees

Climate Smart

Ecological Engineering

- Disaster risk reduction
- Hard/soft engineering
- Ecosystem-based adaptation

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Cheong et al ***Coastal Adaptation with Ecological Engineering*** Nature Climate Change Aug 2013
The Horizontal Levees Feb 2013 http://www.bay.org/publications/the-horizontal-levee

Coastal habitats –natural infrastructure- reduce risk to people & property by 50%

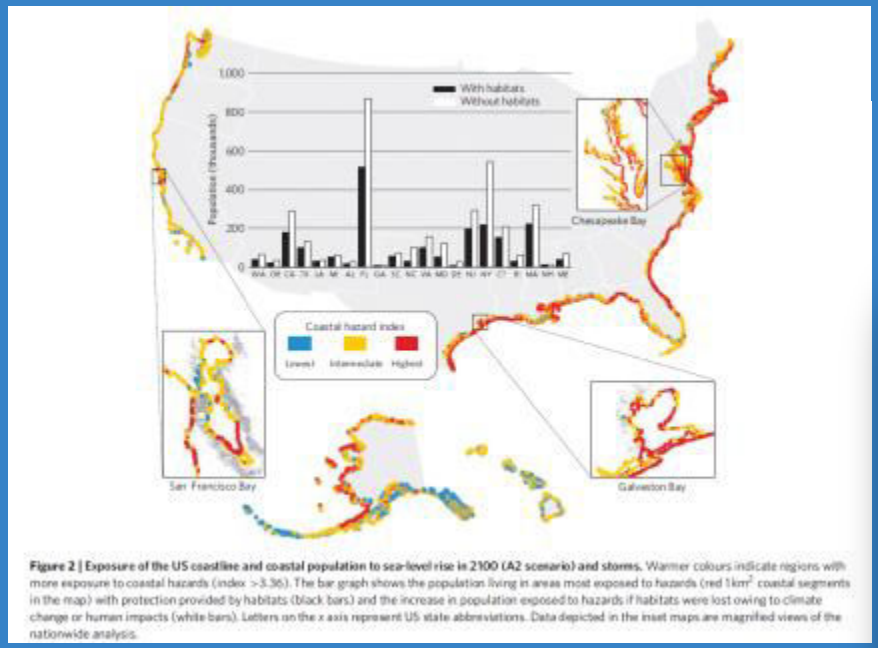
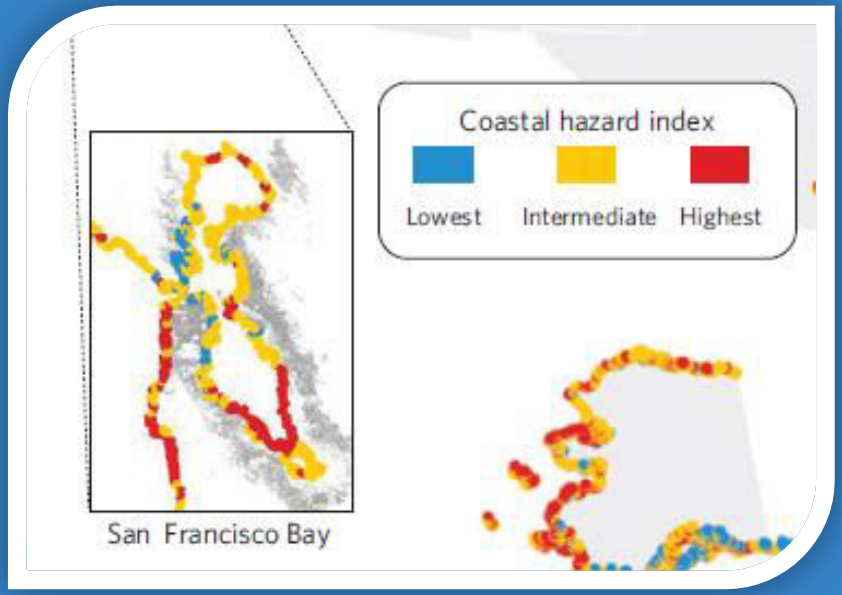


Figure 2 | Exposure of the US coastline and coastal population to sea-level rise in 2100 (A2 scenario) and storms. Warmer colours indicate regions with more exposure to coastal hazards (index >3.36). The bar graph shows the population living in areas most exposed to hazards (red 1km² coastal segments in the map) with protection provided by habitats (black bars) and the increase in population exposed to hazards if habitats were lost owing to climate change or human impacts (white bars). Letters on the x axis represent US state abbreviations. Data depicted in the inset maps are magnified views of the nationwide analysis.



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Arkema et al **Coastal habitats shield people and property from sea-level rise and storms** Nature Climate Change July 2013

Innovating tidal marsh restoration

Sears Point: Engineered for multi benefits- e.g., marsh mounds to capture sediment, grow tidal marsh faster


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Students and Teachers Restoring a Watershed- STRAW

No more ‘business as usual’

- Reverse greenhouse gas emissions,
- Transition to clean, efficient and equitable energy and water-use economy, and,
- Prioritize nature-based solutions-- *required for success.*

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What will each of us start doing differently today?

Be bold, innovate and optimize the power of nature-based climate solutions!

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Major Investments in Nature-based Solutions Pay Off!

Water flows, carbon captured and wildlife increases despite drought and snow-pack loss

August, 2030

South SF Bay Marshes Thriving

Natural Infrastructure Protects Cities, Stores Carbon and Saving Wildlife

January, 2035

Green Infrastructure Protects NYC from Latest Superstorm

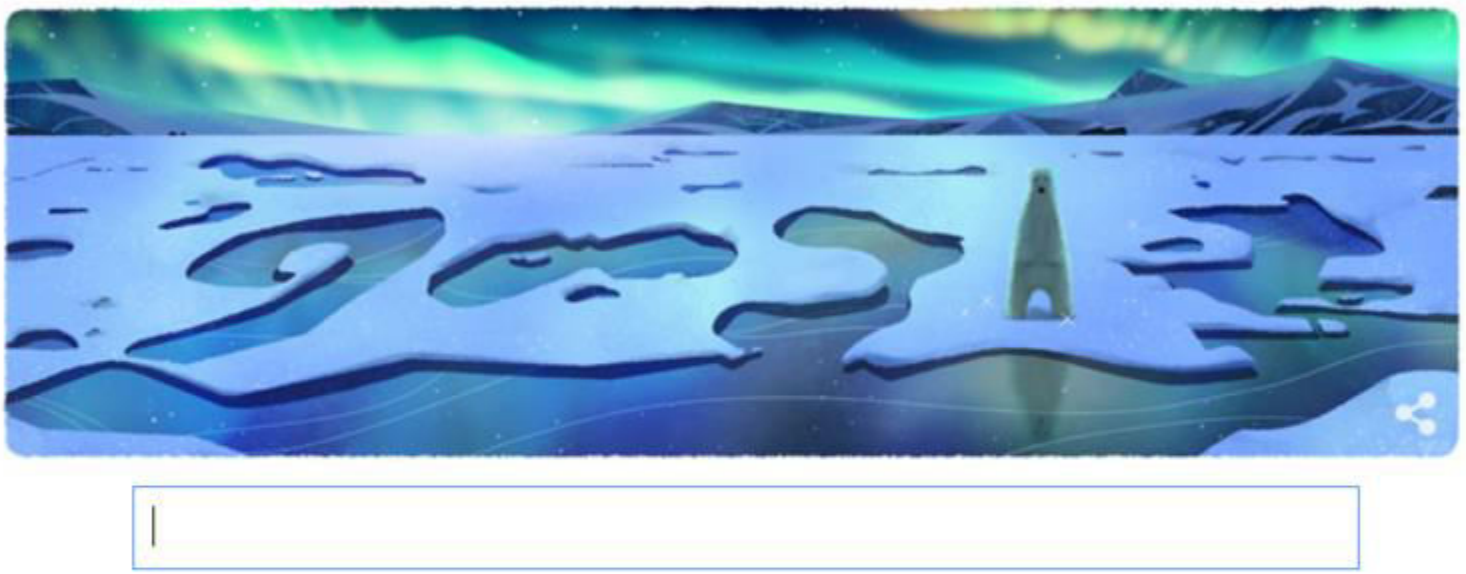
following California's lead

October, 2045

Architecture Research Office and dlandstudio
NY Times Nov 2012


Because of our collaborative climate-smart conservation actions today, healthy ecosystems will sustain thriving wildlife & human communities well into the future…

Happy Earth Day!



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