The Political Opportunities of Climate Catastrophes
U.S. 2017 Billion-Dollar Weather and Climate Disasters

North Dakota, South Dakota, and Montana Drought Spring–Fall 2017

Western Wildfires, California Firestorm Summer–Fall 2017

California Flooding February 8–22

Colorado Hail Storm and Central Severe Weather May 8–11

Midwest Severe Weather June 12–16

Midwest Severe Weather June 27–29

South/Southeast Severe Weather March 26–28

Minneapolis Hail Storm and Upper Midwest Severe Weather June 9–11

Midwest Tornado Outbreak March 6–8

Central/Southeast Tornado Outbreak February 28–March 1

Missouri and Arkansas Flooding and Central Severe Weather April 25–May 7

Southeast Freeze March 14–16

Southern Tornado Outbreak and Western Storms January 20–22

Hurricane Harvey August 25–31

Hurricane Irma September 6–12

Hurricane Maria September 19–21

This map denotes the approximate location for each of the 16 billion-dollar weather and climate disasters that impacted the United States during 2017.
This map denotes the approximate location for each of the 14 separate billion-dollar weather and climate disasters that impacted the United States during 2018.
1980-2018 Year-to-Date United States Billion-Dollar Disaster Event Frequency (CPI-Adjusted)

Event statistics are added according to the date on which they ended.
Beyond Partisanship

1. What mobilizes political action on environmental problems?
2. Does extreme weather open up windows of opportunity for dealing with climate adaptation?
3. What are the hardest policy choices with regard to climate adaptation?
Policy Window

Issue on agenda, knowledge becomes important

Politics
(e.g. change in government, creation/break up of supra-national government)

Policies
(New technologies able to solve old problems, practical policies proven to work on the ground)

Problems
(e.g. epidemic, natural disaster, economic crash)
Case# 1: Hole in the Ozone Layer and CFCs (1974)
The Ozone Hole Was Super Scary, So What Happened To It?

When the ozone hole was discovered, it became a worldwide sensation. Thirty years later, what’s become of it?
Why successful?

• Potential serious consequences for life, property, quality of life (problem salience)

• Straightforward cause and effect (policy solution)

• Limited economic interests at stake (politics)

• Low ideological/partisan polarization (politics)
Case #2: Acid Rain (1972-80)

This image illustrates the pathway for acid rain in our environment:
(1) Emissions of $\text{SO}_2$ and $\text{NO}_x$ are released into the air, where (2) the pollutants are transformed into acid particles that may be transported long distances. (3) These acid particles then fall to the earth as wet and dry deposition (dust, rain, snow, etc.) and (4) may cause harmful effects on soil, forests, streams, and lakes.
Progress on Acid Rain is Helping Adirondack Fish Survive Climate Change

By John F. Sheehan - Adirondack Council Director of Communications

January 5, 2017

It troubles me deeply to hear members of the Trump transition team talk about gutting the U.S. Environmental Protection Agency (EPA) and bringing back coal as a fuel for making electricity. Burning coal leads to acid rain, smog, mercury contamination, and climate change.

New York can't protect itself. We have some of the best clean air laws in the nation, but they aren't enough to protect the Adirondack Park from smokestacks in the Ohio Valley, if they start burning coal again. Coal smoke from the Ohio Valley has already damaged the Adirondack Park worse than anywhere else in America.

From the 1960s through the 1990s, Adirondack scientists used state and federal funding to measure the horrendous losses we suffered. They helped us tell a story that focused national attention on solving the problem. The solution was to shut down coal-fired power plants. As a result, the pollution that causes acid rain and smog in the Adirondacks has decreased significantly.

More recently, Adirondack research scientists have had the pleasure of studying the Park's recovery from acid rain damage. One team has identified a hopeful trend in Adirondack lakes that had been heavily damaged by acid rain, but are now recovering their vitality as pollution levels fall.
Why a little harder?

• Potential serious consequences for life, property, quality of life (problem)

• Straightforward cause and effect (policy)

• Broader economic interests at stake (politics)

• Beginning of partisan polarization ramp-up (politics)
Case #3: Climate Change Mitigation

Climate Change

Greenhouse Gasses in the Atmosphere:
- Water Vapor
- CO2
- Nitrous Oxide
- Methane

Natural Sources of Greenhouse Gasses:
- Plant & Animal Respiration
- Volcanic Eruptions
- Forest Fires

Human Actions Increasing Greenhouse Gasses:
- Urbanization
- Deforestation
- Burning Fossil Fuels: Automobiles For Electricity For Some Industry
- Agriculture: Fertilizing Crops Raising Livestock

Effects of Climate Change:
- Warmer Oceans
- Rising Oceans
- More Acidic Oceans
- Shrinking Glaciers
- Melting Arctic Sea Ice
- Rising Global Temps
- Melting Antarctic Sheet Ice
- Increasingly Severe U.S. Heat Waves

© Sheri Ansel
www.exploringnature.org
Why is GHG Emissions a much more difficult (i.e. wicked) problem?

- Climate effects manifest in the intensity and frequency of *weather events over time*

- **More nuanced science** due to co-mingling of human and nature effect

- **Substantial and varied** economic interests impacted

- Current US politics is **much more polarized** than 50 years ago
LONG-TERM CHANGES IN DROUGHT AREA IN THE WEST

THE CENTRAL DATES OF THE SIGNIFICANT (p<0.05) EPOCHS ARE INDICATED WITH ARROWS

DRIER
WETTER

DROUGHT TREND: 1900 - 2003

CURRENT DROUGHT
Perception of the scientific community and their view on global climate change

- Most scientists think global climate change is happening
- There is a lot of scientific disagreement about climate change
- Most scientists think global climate change is not happening
- Don't know enough to say

Party Identification:
- Dem
- Rep
- Ind/other

% of sampled group
1. What mobilizes political action on environmental problems?

2. Does extreme weather open up windows of opportunity for dealing with climate adaptation?

3. What are the hardest policy choices with regard to climate adaptation?
How much do you think extreme climate events harm/will harm you personally?

- Not at all
- Only a little
- A moderate amount
- A great deal
- Don't know

% of sampled group

Region:
- West coast
- Plains
- BorderSW
- Interior
A Puzzle: Sea Level Rise Inaction in California
Majorities across the state support California's climate leadership.

- Central Valley: Somewhat important 24%, Very important 45%
- Inland Empire: Somewhat important 26%, Very important 51%
- Los Angeles: Somewhat important 23%, Very important 59%
- Orange/San Diego: Somewhat important 24%, Very important 50%
- San Francisco Bay Area: Somewhat important 25%, Very important 60%

Even the least engaged Californians see climate change effects

Table 1. Distribution of opinion about global warming by groups

<table>
<thead>
<tr>
<th>Event</th>
<th>General population sample</th>
<th>Activist sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1</td>
<td>Group 2</td>
</tr>
<tr>
<td>They have already begun to happen</td>
<td>51%</td>
<td>73%</td>
</tr>
<tr>
<td>They will start happening within a few years</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>They will start happening within your lifetime</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>They will not happen within your lifetime but will affect future generations</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>They will never happen</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Don’t know</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>538</td>
<td>1314</td>
</tr>
</tbody>
</table>

Note: The cells in each column may not add up to 100% due to rounding.
Facts
San Francisco Bay’s waters already have risen:

8 inches since the mid-1800s
6 inches since 1950

Recent studies by the U.S.G.S. and National Academy of Sciences predict that water in SF Bay will rise up to

2 feet by 2050
5 feet by 2100
Property at Risk

- $100 billion dollars at *current* value and level of development.
- *Only* buildings and contents.
• 30 coastal power plants

• Generating capacity of 10,000 MW
- 28 wastewater treatment plants
- Combined capacity of 530 million gallons per day
Oakland International Airport

- Sixteen Inch Sea Level Rise
- Fifty-five Inch Sea Level Rise
The Cycle of Benign Neglect

**Voters**
- Reluctance to pay for future "protection" with present day costs
- Failure to appreciate the secondary costs of infrastructure loss

**Public Officials**
- Rewarded for fixing not preventing disaster
- Other pressing problems higher on their agenda

**Institutional**
- Fractured jurisdictional structure—no one in charge with regional perspective
- Suspicion of state government leadership regardless of party
The Co-benefits Alternative Strategy

ESTUARY COMMONS CREATES A NETWORK OF PUBLIC SPACES, ADAPTS ECOLOGICAL SYSTEMS, AND STRENGTHENS SOCIAL AND ECONOMIC RELATIONSHIPS FOR A FUTURE OF COMMUNITY-DRIVEN RESILIENCE.

Recognized by the Resilient by Design Jury for finding a way to bring culture, institutions, and the environment forward by design. Their metaphor of the Commons, which became a tangible vision, could be the platform needed to move this project forward and is an opportunity to bring everyone in.

READ THE FULL ESTUARY COMMONS REPORT HERE  WATCH THE ESTUARY COMMONS FINAL PRESENTATION
PUBLIC SEDIMENT FOR ALAMEDA CREEK AIMS TO RECONNECT SEDIMENT FLOWS FROM ALAMEDA CREEK TO THE MARSHES AND MUDFLATS AT THE BAY’S EDGE, CREATING PROTECTIVE ECOSYSTEM INFRASTRUCTURE THAT ADAPTS TO SEA LEVEL RISE.
Does more extreme weather open up a wider window?
## Paradise Fire Damages

| Cost   | $16.5 billion
| Date(s) | November 8, 2018 – contained November 25, 2018
| Burned area | 153,336 acres (62,053 ha)
| Cause | Electrical Fire Transmission by PG&E
| Buildings destroyed | 18,804
| Fatalities | 85 civilians
| Non-fatal injuries | 12 civilians and 5 firefighters
| Missing people | 1 civilian
| Evacuated | 52,000
Oklahoma wildfires: Hundreds evacuate, 120,000 acres burned, officials say

Wildfires prompt evacuations in Oklahoma
Fast-moving wildfire burns homes, prompts mandatory evacuations in Los Angeles
Appendix 5. Devastation caused by the 2018 California mudslide

Appendix 6. Wildfire damage insurance claim totals - California 2017
Figure-09
Wildfire Damages

- Nominal overall losses
- Normalized overall losses (in 2017 values)
The convergence of climate change and WUI population expansion

Figure-01

Millions of acres burned


Source: Abatzoglou/Williams 2016, PNAS 113
Figure-02
Number of Houses in the WUI by State

Number of Houses
- Brown: 3,000,001 – 4,457,884
- Dark Brown: 1,500,001 – 3,000,000
- Orange: 1,000,001 – 1,500,000
- Light Orange: 500,001 – 1,000,000
- Light Yellow: 5,058 – 500,000
Figure-03
Proportion of Dwelling Units with High / Very High Average Risk Scores

Proportion of Dwelling Units with High/Very High Avg. Risk Scores (%)
- 80.10% - 100.00%
- 60.01% - 80.00%
- 40.01% - 60.00%
- 20.01% - 40.00%
- 0.00% - 20.00%
Policy Window

<policies>
(New technologies able to solve old problems, practical policies proven to work on the ground)

<problems>
(e.g. epidemic, natural disaster, economic crash)

<politics>
(e.g. change in government, creation/break up of supra-national government)

(issue on agenda, knowledge becomes important)
Comparing Extreme Weather as a Policy Problem

Components of Risk

**Hazard**—magnitude of event destruction

**Exposure**—the number of people/properties involved

**Vulnerability**—susceptibility of community to hazard impact

Low to High End of Continuum

<table>
<thead>
<tr>
<th>LOW</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuisance Flooding—Wildfires</td>
<td>SLR North CA Coast—Drought/Extreme Heat or Cold</td>
</tr>
<tr>
<td>High capacity cities—Poor Rural Areas</td>
<td></td>
</tr>
</tbody>
</table>
Level of Experience with Wildfires for Californians in the Past 12 Months

percent

- Concern
- State
- Smoke
- Personal
CA’s very bad wildfire year...

<table>
<thead>
<tr>
<th></th>
<th>California Only</th>
<th>All Western States</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Reported wildfire happened in the state in past 12 months</td>
<td>55%</td>
<td>35%</td>
</tr>
<tr>
<td>% Experienced wildfire personally in past 12 months</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td>% Knew someone who experienced wildfire in past 12 months</td>
<td>18%</td>
<td>15%</td>
</tr>
<tr>
<td>% Experienced wildfire smoke in past 12 months</td>
<td>52%</td>
<td>37%</td>
</tr>
</tbody>
</table>
Wildfires Undermine Air Quality Improvements in the San Joaquin Valley

Federal standards for fine particle (PM$_{2.5}$) air pollution exceeded

Number of days each year exceeding federal standard

Source: Analysis of San Joaquin Valley Air Pollution Control District data

Figure 6: Air Quality in the San Joaquin Valley during Peak Wildfire Season

Do people adequately protect themselves?

• 52% Californians said that experienced the smoke from wildfires in the past 12 months (similar in Coastal and Interior States)
• About half of these people took some precautionary measures.
• Most often, this only meant paying attention to the Air Quality Reports (79%) or staying indoors (83%).
• Few wore respirator N95/P100 (28%), wore a dusk/paper/or cloth mask (35%), used an air purifier (30%), left town (18%) or consulted a healthcare provider (9%)
Prescribed Burns vs Wildfires

Prescribed Burn 2015

Wawona Burn 2 phase 2/26 to 3/30

Blood draws from 5/18 to 7/23

3 months

Prescribed Burns vs Wildfires

Tenaya Wildfire 9/7 to 9/21

Blood draws from 11/10/15 to 1/7/16

2 to 3 1/2 months

Wildfires 2015

(Prunicki et al, Allergy, 2019)
Pollutants Inhaled

(a) NO₂
(b) NOx
(c) PAH₄₅₆

(p < 0.0001 for each pollutant)

(d) EC
(e) CO
(f) PM₁₀
(g) PM₂.₅

(Prunicki et al, Allergy, 2019)
Findings:
• Decreased Th1 cells in wildfire group
• Increased methylation in wildfire group
• Increased wheezing and asthma exacerbations
• Trend rise in pulse pressure in wildfire group

Conclusion
This suggests that the health impacts of a prescribed fire are less detrimental to the respiratory and possibly, cardiovascular system, than a wildfire in school-aged children and that T-cell skewing and epigenetic modulation will occur with exposure to wildfire more than from exposure to a prescribed fire.

Th1 Cell percentage of CD 4+ cells for children 90 days after being exposed to a prescribed fire, wildfire or no exposure (1-way ANOVA, p<.0001).

(Prunicki et al, Allergy, 2019)
Is the window of opportunity open long enough?

Two years after Harvey, has Houston lost its urgency on flood repairs, prevention?
Today’s Questions

1. What mobilizes political action on environmental problems?
2. Does extreme weather open up windows of opportunity for dealing with climate adaptation?
3. What are the hard policy choices with regard to climate adaptation?
Policy Window

- Problems (e.g. epidemic, natural disaster, economic crash)
- Policies (New technologies able to solve old problems, practical policies proven to work on the ground)
- Politics (e.g. change in government, creation/break up of supra-national government)
Policy Options

- Problem—harm to people, property and infrastructure
- Options:
  - Accommodation: fortify vulnerable areas
  - Removal and retreat people/property/infrastructure from vulnerable areas
  - Let the people/market decide
Which of the following government policies come closest to your view, even if neither is exactly right?
Do you agree or disagree that the government should use public funds in affected areas to do the following to protect against potential wildfire damages?

- Subsidize private home owners to upgrade homes
- Subsidize commercial properties to upgrade properties
- Subsidize private home owners to buy wildfire insurance
- Subsidize commercial properties to buy wildfire insurance
With respect to the policy options

• More support for accommodation than for retreat

• Preference for right/responsibility of individual to take on climate risk

• Willingness to pay for adaptation is shaky at best

• Substantial moral hazard problems with insurance and relief efforts
In short,

• While **partisanship matters** in adaptation politics as it does in mitigation, the differences are **not as great** as one might expect when there are costs assigned to the steps

• In general **protecting infrastructure** is perceived to be more a public responsibility and protecting property a private one

• There is an **aversion to allowing governments to compel** adaptation as opposed to letting people take care of themselves thru insurance or upgrades
The End