Communicating Climate Change & Invasive Species Science

1990
So, this climate change thing could be a problem...

1995
Climate change: definitely a problem.

2001
Yup, we should really be getting on with sorting this out pretty soon...

2007
Look, sorry to sound like a broken record here...

2013
We really have checked and we're not making this up.

2019
Is this thing on?

TAP TAP TAP

Melissa Osgood
Carrie Brown-Lima
Cornell University

Alex Bryan
NE CSC

Northeast RISCC Management Symposium July 27, 2017
Goals of this session:
(per your responses to the survey … Thank You!)

❑ “**Engagement strategies**”
  ❑ “How to reach particular audiences with messages that are relevant to them”
  ❑ “Making requests of people” (e.g., not to purchase/propagate certain species)

❑ “**Bringing complex scientific research to the public**”
  ❑ “Specifically identify some of the consequences of climate change”
  ❑ “Describe some of the synergistic impacts between invasives and climate change”
  ❑ “Can we share a prediction/picture of what will likely happen?”

❑ “**Tools for dealing with skeptics**” / “**addressing denialism**”

❑ “Elicit action
  ❑ “Bringing the conversation…to the forefront [in management]”
  ❑ “What can the public do…?” / “Making requests of people…”
Engagement Strategies

☐ Know your audience
ASSESSING THE IMPACT OF CLIMATE CHANGE...

THE SCIENTISTS

THE POLITICIANS
Communicating Science

- Scientific/Scholarly Communication
- Process
- Details
- Conclusion

- Communicating with the Public
- Conclusion
- Process
- Details

Communicating with the Public
Audience:

• Know your audience
  • What language, information, and ideas connect with your audience?
  • What do they know about this topic?
• What is their age?
• Where do they live?
• What do they read? Watch?
MESSAGE

So What?

Does this support my agenda? Do my constituents care?

What will it cost - time, effort, money? Who supports this?

How does this fit our agenda?

Is it groundbreaking? It is robust? How does it affect my work?

Is it news? Will it sell? Is it a good story?

Does this fit within our portfolio?

How does this effect safety/health, livelihoods and natural resources?

Source: https://www.compassscicomm.org/
Area of work/interest:
- Outdoor enthusiasts (anglers, hunters, hikers, forest owners, gardeners, landscapers, water gardeners, aquarium owners, mountain bikers, watercraft users)
- Landowners (e.g., Adirondack residents)
- Bait dealers
- Pet owners and sellers
- Aquatic garden industry and its customers
- Aquarium owners
- Schools and school lab suppliers
- Certain religious and cultural groups
- Foodies as Farmers Markets
- Nurseries and Landscapers
- Tourists

Age groups:
- "mostly adults"
- "some local elementary and high school"
- "college students"
- "kids and teens"
- "children to adults"
- "K-12 students and educators"
**Goal:** What you want to achieve?

**Message:** What do you want to say?

**Difficult Question(s):**

---

**Audience:** Who are your audiences?

---

**The COMPASS Method**

- **Problems?**
- **Issue**
- **Solutions?**
- **Benefits?**
- **So What?**

---

Source: https://www.compassscicomm.org/
**Goal**: What you want to achieve?

**Message**: What do you want to say?

**Difficult Question(s)**:

- What language, information, and ideas connect with your audience?
- What do they know about this topic?
- What is their age?
- Where do they live?
- What do they read? Watch?
**Audience:** Who are your audiences?

**Goal:** What you want to achieve?

**Message:** What do you want to say?

**Difficult Question(s):**

What you want the audience to think, do or say as a result of the interview?
Engagement Strategies

- Know your audience
- Localize it
IT IS BRUTAL OUT. SO MUCH FOR GLOBAL WARMING, HUH?

*SIGH*

THIS USED TO HAPPEN ALL THE TIME.

WHAT?

YOU'RE FROM ST. LOUIS, RIGHT?

ON AVERAGE, IT USED TO GET BELOW 0°F THERE A HANDFUL OF DAYS PER YEAR.

BUT YOU HAVEN'T HAD A DAY LIKE THAT SINCE THE NINETIES.

DAYS WITH LOUIS < 0°F


SOURCE: RCC-AIO/CLIMATECENTRAL

THEN, IN 2014, WHEN THE FIRST POLAR VORTEX HIT, IT DIPPED BELOW ZERO FOR TWO DAYS.

AND EVERYONE FREAKED OUT

BECAUSE WHAT USED TO BE NORMAL NOW FEELS TOO COLD.

IT IS TOO COLD!

THE FUTURE:

LOOK AT THIS—ICE! IN ST. LOUIS! SO MUCH FOR GLOBAL WARMING.

*SIGH*
Zoom in to the street level!
Zoom out to show regional context
Engagement Strategies

- Know your audience
- Localize it
- Forgive ignorance
Engagement Strategies

- Know your audience
- Localize it
- Forgive ignorance
- How and where to reach difficult-to-reach audiences
Bringing complex scientific research to the public

- Translate to meaningful metrics
IT IS BRUTAL OUT. SO MUCH FOR GLOBAL WARMING, HUH?
*SIGH*
THIS USED TO HAPPEN ALL THE TIME.

WHAT?

YOU'RE FROM ST. LOUIS, RIGHT?
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BUT YOU HAVEN'T HAD A DAY LIKE THAT SINCE THE NINETIES.


SOURCE: RCC-AC15/CLIMATECENTRAL

THEN, IN 2014, WHEN THE FIRST POLAR VORTEX HIT, IT DIPPED BELOW ZERO FOR TWO DAYS.
AND EVERYONE FREAKED OUT

BECAUSE WHAT USED TO BE NORMAL NOW FEELS TOO COLD.
IT IS TOO COLD!

THE FUTURE:
LOOK AT THIS—ICE! IN ST. LOUIS! SO MUCH FOR GLOBAL WARMING.

*SIGH*
The annual mean temperature in Massachusetts has risen 2.4 °F since 1895.
The last 24 years have all been warmer than a typical year last century. That’s every year since 1993!
Our coldest years were once our warmest years.
Higher Emissions
Lower Emissions


Union of Concerned Scientists
Other Northeastern states available.
Climate Change Shifting US Plant Zones, Will Shift Pacific Ecosystems Hundreds of Miles

Mat McDermott (@matmcdermott)
Science / Climate Change
September 25, 2012

Climate Voyager (climate.ncsu.edu/voyager) shows future Hardiness Zones based on a range of climate models!
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
<table>
<thead>
<tr>
<th>These words...</th>
<th>Really mean...</th>
</tr>
</thead>
<tbody>
<tr>
<td>emission scenarios, SRESs, RCPs</td>
<td>How much greenhouse gases we continue to emit</td>
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<tr>
<td>AR4, AR5</td>
<td>Assessments of the Earth’s climate conducted by the Intergovernmental Panel on Climate Change</td>
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<tr>
<td>mitigation</td>
<td>Actions to reduce greenhouse gas emissions</td>
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<tr>
<td>parts per million, ppm</td>
<td>How CO2 is measured (unit) -- like a percentage, except over 1 million instead of 100</td>
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<tr>
<td>Word</td>
<td>Meaning to public</td>
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<tr>
<td>enhance</td>
<td>improve</td>
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<tr>
<td>uncertainty</td>
<td>not knowing</td>
</tr>
<tr>
<td>risk</td>
<td>low-probability event</td>
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<tr>
<td>bias</td>
<td>unfair and deliberate distortion</td>
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<tr>
<td>mean</td>
<td>angry</td>
</tr>
<tr>
<td>adaptation</td>
<td>“going with the flow” (i.e. doing nothing!)</td>
</tr>
<tr>
<td>invasive</td>
<td>purple loosestrife</td>
</tr>
</tbody>
</table>
BEFORE:
Examining nearby creeks and outflows, our research found that the amount of road salt in winter and spring runoff that flushes into streams is of near-oceanic salinity levels.

AFTER:
Ever accidentally swallowed sea water? It’s awful. When I found out that’s the kind of water flushing into our local streams due to salt use, I knew we needed to learn more.
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
- Use simple diagrams
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
- Use simple diagrams
- Use analogies
Warming and severe weather events — what’s the connection?

Photo credit: MassLive

Photo credit: NASA
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
- Use simple diagrams
- Use analogies
- Find the “So What?”
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
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- Use analogies
- Find the “So What?”
- Avoid too much information
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
- Use simple diagrams
- Use analogies
- Find the “So What?”
- Avoid too much information
- Keep it simple, but not too simple
Oversimplified Invasive Species Messaging:

Non-Native Species = “Bad”
Native Species = “Good”
Growing debate among scientists surrounding invasion biology

Another call for the end of invasion biology
Loïc Valéry, Hervé Fritz and Jean-Claude Lefèvre

The Potential Conservation Value of Non-Native Species
Martin A. Schlaffer,1* Dov F. Sax,2 and Julian D. Olden

Native and alien invasive plants: more of the same?
Ken Thompson, John G. Hodgson and Tim C. G. Rich

Don’t judge species on their origins
Conservationists should assess organisms on environmental impact rather than on whether they are natives, argues Mark Davis and 18 other ecologists.

Traits, not origin, explain impacts of plants on larval amphibians
Jillian S. Cohen,1,3 John C. Maerz,2 and Bernd Blossey1

Over the past few decades, 'non-native' species have been blamed for driving 'native' species to extinction and generally polluting 'natural' environments. Intuitively or not, such characterizations have helped to create a pervasive bias against alien species that has been reinforced by approaches to the conservation and management of species — approaches better suited to one-fast-changing planet.

The concept of nativistism was first outlined by the English botanist John Healow in 1815. By the late 1800s, botanists had adopted the term 'natives' and alien from common law.
Are invasive species as bad as we thought?

The Rise of Invasive Species Denialism

Russel and Blackburn 2016
Bringing complex scientific research to the public

- Translate to meaningful metrics
- Avoid jargon
- Use simple diagrams
- Use analogies
- Find the “So What?”
- Avoid too much information
- Keep it simple, but not too simple
- Tips for communicating uncertainty
Communicating uncertainty

- Focus on the *certainty* (more later...)
  - Start there *and* come back to.
- “Uncertainty” → “Risk”
- “Will” → “Could”
**Message:** What do you want to say?

No more than three key messages

Must be:
- The truth
- States your position concisely
- Your area of expertise

Details that make your talking points relevant and understandable
- Examples: Be specific; avoid jargon
- Analogies: Simplify complex ideas
- Personal Experience/Story of the Quest (with caution)

**Audience:** Who are your audiences?

**Goal:** What you want to achieve?
**Audience:** Who are your audiences?

**Goal:** What you want to achieve?

**Message:** What do you want to say?

**Difficult Question(s):**

- What are you seeing in your research that makes you want to communicate?
- How does it affect people and the environment?

**Problems?**

- Who does this help, and how?
- What improves in the short term?
- What improves in the long term?

**Benefits?**

- If you were looking for information online, what would be the 2-3 word search term you’d use?
- What signal does your word choice send (i.e. ‘climate change’ vs. ‘global warming’)?

**Issue**

- What does your audience value?
- How does it impact them, or something they care about it?
- What is important about what you’re sharing (scale, effects)?

**Solutions?**

- What changes can be made to the way things currently stand?
- Who can make those changes?
- What would it take to solve the Problems identified?

Source: https://www.compassscicomm.org/
Preventing the introduction of imported forest pests
Invasive Forest Pests in the United States
COMMUNITY IMPACTS AND OPPORTUNITIES FOR TREE-SMART TRADE

EXECUTIVE SUMMARY
People and Communities Depend on Trees for Health and Resilience
Towns and cities are investing in trees as low-cost natural infrastructure to help contend with the intensifying effects of climate change and urbanization. Trees cool neighborhoods, reduce flooding, filter air pollution, and store carbon dioxide—a greenhouse gas. Local economies benefit from the wildlife habitat, forestry, and recreation enterprises that trees and forests support. Pollution removal alone by US trees provides human health benefits worth $6.8 billion per year. Unfortunately, these same trees are threatened by unintentionally imported forest pests, and the risk of new invasions is intensifying.

Imported Forest Pests Jeopardize Trees and Cost Billions of Dollars Every Year
Forest pests (insects and disease) are imported to the US as a preventable consequence of global trade. The number of imported forest pests in the US increases each year (Figure 1). Imported pests affect all US states and cost local governments and homeowners billions of dollars every year (Figure 2). Solid wood packaging material, such as pallets, and imported live plants are the two largest sources of imported forest pests in the US. The rapid expansion of global trade raises the risk that new highly damaging forest pests will arrive in the US.

Five Actions Can Help Stem the Flow of Damaging Forest Pests to the US
Growing reliance on both trees and trade makes imported forest pests the most pressing, and under-appreciated, forest health issue in the US today. Five high-priority policy actions that build on proven prevention measures can reduce the arrival and establishment of new forest pests.
Problems:

- Imported forest pests are the most urgent and under-appreciated forest health threat in the U.S.
- On average, 25 new damaging insect pests become established in the US each decade.
- Solid wood packaging and nursery plants shipped from other countries are the largest sources of imported forest pests.
- This is a growing problem that affects forests and communities in all 50 states.

Preventing the introduction of imported forest pests
So what:

- Economic impacts are substantial causing billions of dollars in annual damages
- Ecological impacts are severe and very long term causing loss of entire tree species
- The impacts of existing imported forests pests are expected to worsen over time. Scientists forecast that approximately 825 million acres, or 63% of the nation’s forestland, are at risk for additional mortality of host trees due to the spread of pests that have already been imported into the country.
- The rapid expansion of global trade raises the risk that new highly damaging forest pests will arrive in the US.
- Current policies are not providing adequate protection against the threat of burgeoning trade
- Under the current system, homeowners, local governments, and the federal government are left subsidizing most of the costs of unclean international trade

Preventing the introduction of imported forest pests
Solutions:
- Policy actions that build on proven prevention measures can reduce the arrival and establishment of new forest pests.
- Promote incentives for the use of alternative materials that are pest-free (such as plywood, oriented stand board and plastic) to replace solid wood in crates, pallets and other packaging materials used in international trade.
- Restrict the importation of live woody plants for horticultural purposes to only those genera that do not have native species in North America.
- Enhance and better coordinate the national system for surveillance and eradication of new forest pest outbreaks.
- Expand programs with trading partners to ensure that shipments leaving foreign ports bound for the U.S. are free of potentially invasive insects and tree pathogens.
- Improve enforcement of existing regulations that are intended to exclude pests. Local government costs for tree removal, replacement, and treatment are 10x the costs of a federal government containment program.
Benefits:

- Reduce economic impact of imported forest pests
- Avoid ecological impacts of forest pests
- Shift cost of forest pests away from local governments back to trade industry
  - Local government costs for tree removal, replacement, and treatment are 10x the costs of a federal government containment program

Preventing the introduction of imported forest pests
5 Tree-SMART Trade Policy Actions

S witch to non-solid-wood packaging.
M inimize new pest outbreaks by expanding early detection and rapid response programs.
A ugment international pest prevention programs with key trade partners.
R estrict or eliminate imports of live woody plants.
T ighen enforcement of penalties for non-compliant shipments.

Lovett et al. 2016
Key messages about climate change impact on invasive species

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Tools for dealing with skeptics/denialists

- Focus on *personal experience* -- not facts!
Consider this statement...

“We just haven’t seen the cold we used to,…

...which has put us at a huge risk of a takeover by [invasive species X] because there is no longer freezing nights to kill them off,...

... which will kill the [native species Y they care about].

Therefore, we are…”

What have you noticed?  
[Notice: no mention of climate change or data!]

What are the consequences?

How will it affect them personally?

What are you doing about it?  
[Focus on decisions people have to make]
Tools for dealing with skeptics / denialists

- Focus on *personal experience* -- not facts!
- Start with what is certain
We know: The Earth has been warming...
This is a robust measurement... an average of 6,000 weather stations all across the planet...
Lots of other evidence...
VISUAL PROOF (ROBUST!)
We have known this for awhile now…

…nearly 200 years, in fact!

Joseph Fourier

The atmosphere regulates Earth’s temperature

First published observations of the greenhouse effect (1824)
Others agree…

**John Tyndall**
1862

*CO₂, water vapor, and other “greenhouse gases” are what control the Earth’s temperature!*

**Svante Arrhenius**
1895

Tested doubling CO₂ for the first time. Temperature went up!
And, many more agree…

**PAPERS ON LABORATORY MEASUREMENTS OF CO2 ABSORPTION PROPERTIES**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year(s)</th>
</tr>
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<tbody>
<tr>
<td>Lecher &amp; Pernter</td>
<td>(1881)</td>
</tr>
<tr>
<td>Rubens &amp; Aschkinass</td>
<td>(1898)</td>
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<td>Ångström</td>
<td>(1900)</td>
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<tr>
<td>Barker</td>
<td>(1922)</td>
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<td>Martin &amp; Barker</td>
<td>(1932)</td>
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<tr>
<td>Herzberg &amp; Herzberg</td>
<td>(1953)</td>
</tr>
<tr>
<td>Burch et al.</td>
<td>(1962, 1969, 1970)</td>
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<tr>
<td>Davies</td>
<td>(1964)</td>
</tr>
<tr>
<td>Winters et al.</td>
<td>(1964)</td>
</tr>
<tr>
<td>Burch &amp; Gryvnak</td>
<td>(1966)</td>
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<tr>
<td>Ludwig et al.</td>
<td>(1966)</td>
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<tr>
<td>Tubbs &amp; Williams</td>
<td>(1972)</td>
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<td>Miller &amp; Watts</td>
<td>(1984)</td>
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<td>Rothman et al.</td>
<td>(1987)</td>
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<td>(2002)</td>
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<td>(2005)</td>
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<td>Predoi-Cross et al.</td>
<td>(2007)</td>
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<tr>
<td>Toth et al.</td>
<td>(2008)</td>
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</tbody>
</table>

Compiled by AGW Observer
VIDEOS = COMPELLING!
May 2017: 409.7 ppm

First surpassed 400 ppm in May 2013

2016: First year never dropped below 400 ppm!
Tools for dealing with skeptics / denialists

- Focus on *personal experience* -- not facts!
- Start with what is certain
- Correct misconceptions
“The climate is always changing”


800,000 years ago

Today

CO₂ Concentration (ppm)

Thousands of Years Ago

800,000 years ago

Today

Courtesy of Scripps Institution of Oceanography
Lots of helpful resources for correcting common climate change misconceptions...

**Realities vs. Misconceptions about Climate Change Science**

The issue of climate change has received so much attention in recent years that it has become difficult for interested citizens and policymakers to separate facts from fiction. Climate change is one of the most cutting edge research fields in modern science, but the field has existed for more than a century and much knowledge has been established with high certainty and confidence. This brief clears up some of the most common misconceptions about the science of climate change.

**Misconception #1:** Recent global warming is caused by the sun.

**The Reality:** The output of energy from the sun has been monitored by satellites for thirty years and has not increased during this period of rapid global warming.

**Misconception #2:** The climate is always changing or it has changed many times in the past before humans began burning coal and oil. So there is no reason to believe humans are causing warming today.

**The Reality:** This misconception falsely presumes that if the climate changes naturally, then humans have no role to play or that it is impossible distinguish manmade climate change from natural change. In reality, several climate drivers have both natural and human sources and scientists can tell them apart. The evidence strongly supports manmade CO₂ as the primary cause of recent warming.

**Misconception #3:** The world has been cooling for the past decade; or. Global warming stopped in 1998 or 2002 or (insert preferred year).

http://cires1.colorado.edu/education/outreach/climateCommunication/CC%20Misconceptions%20Handout.pdf

Tools for dealing with skeptics / denialists

- Focus on *personal experience* -- not facts!
- Start with what is certain
- Correct misconceptions
- Change the narrative away from “people are evil”
Tools for dealing with skeptics / denialists

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- Avoid charged terms (e.g., “climate change”)
Tools for dealing with skeptics / denialists

- Focus on *personal experience* — not facts!
- Start with what is certain
- Correct misconceptions
- Change the narrative away from “people are evil”
- Avoid charged terms (e.g., “climate change”)
- Frame in terms of the economy
Market is barreling toward renewables

Record set in 2015

FIGURE 1. GLOBAL NEW INVESTMENT IN RENEWABLE ENERGY BY ASSET CLASS, 2004-2015, $BN

Growth:
56% 54% 37% 18% -2% 34% 16% -8% -9% 17% 5%

Tools for dealing with skeptics/denialists

- Focus on *personal experience* -- not facts!
- Start with what is certain
- Correct misconceptions
- Change the narrative away from “people are evil”
- Avoid charged terms (e.g., “climate change”)
- Frame in terms of the economy
- Have a conversation -- not an argument
**Argument**
- Swap facts
- Try to convince the other person
- More talking

**Conversation**
- Ask questions
- Try to understand each other's worldviews
- More listening
Tools for dealing with skeptics / denialists

- Focus on *personal experience* -- not facts!
- Start with what is certain
- Correct misconceptions
- Change the narrative away from “people are evil”
- Avoid charged terms (e.g., “climate change”)
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- Avoid charged terms (e.g., “climate change”)
- Frame in terms of the economy
- Have a conversation -- not an argument
- Find common ground, agree to disagree
- Consider these tips for handling difficult questions
Handling Difficult Questions

• Tips:
  • Don’t lose sight of the audience
  • Be politely assertive, correct errors
  • Body language
  • Keep calm and talk slowly
  • You can be emotional, but not angry
  • Use active listening techniques
Audience: Who are your audiences?
Goal: What you want to achieve?
Message: What do you want to say?

Difficult Question(s):
- The one you don’t know the answer to
- The one that requires you to speculate
- The one that invites you to share a controversial opinion

Source: https://www.compassscicomm.org/
Eliciting action: Management

- Ways to convey urgency
What do we have to lose?

Highlight impacts that matter to your particular audience
Carbon Countdown

How many years of current emissions would use up the IPCC’s carbon budgets for different levels of warming?

- **3°C**: 33% chance of remaining below
- **2°C**: 33% chance of remaining below
- **1.5°C**: 33% chance of remaining below

The Carbon Brief

Eliciting action: Management

- Ways to convey urgency
- Suggest small, low-commitment actions that have impact
Scenario Planning
# Climate Change Vulnerability Assessment

<table>
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<tr>
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<th>Exposure</th>
<th>Sensitivity</th>
<th>Vulnerability</th>
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<tr>
<td></td>
<td>2020</td>
<td>2050</td>
<td>2100</td>
</tr>
<tr>
<td>1. Forest vegetation (UPLAND)</td>
<td>3</td>
<td>3</td>
<td>5</td>
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<tr>
<td>2. Riparian Forest</td>
<td>5</td>
<td>5</td>
<td>6</td>
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<tr>
<td>3. Non-tidal wetlands</td>
<td>3</td>
<td>3</td>
<td>4</td>
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<tr>
<td>4. Tidal wetlands (In General)</td>
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<td>5</td>
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<tr>
<td>4a. Beaches</td>
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<td>4b. Disturbed Tidal Hardwood Swamp</td>
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<td>4c. Salt Scrub</td>
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<tr>
<td>4d. Tidal Bald Cypress Forest / Woodland</td>
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<td>4e. Tidal Freshwater Marsh</td>
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<td>4f. Tidal Mesohaline and Polyhaline Marshes</td>
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<td>4g. Tidal Oligohaline Marsh</td>
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<td>4h. Tidal Shrub Swamp (Wax Myrtle Type)</td>
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<td>6</td>
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<td>5. Herps (COASTAL)</td>
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Other small, low-commitment actions to suggest:

- Install monitoring devices
- Consider “no-regrets” actions
- Scan “watch lists” (see Jenica Allen)

Monitoring invasive ginger at Hawai‘i Volcanoes National Park (NPS Pacific Island Network)
Eliciting action: Public

- (Again) Change the narrative
Eliciting action: Public

- (Again) Change the narrative
- Point out “blind spots”
10 things you can do to stop climate change

To get to 350ppm, we need to act at home and in the streets.

With the urgency of climate change, if we all were just to focus on individual changes to our lifestyles, we might never reach 350ppm. That's why this year, a movement is growing to call for widespread political change by taking action on 24 October, the International Day of Climate Action. But the changes we can make in our personal lives, and in the ways our community deals with food, energy, and waste are all really important parts of addressing climate change and environmental issues locally - and if we all do it, globally. Here are a few places to start:

**Sustainable Transport**
Lace up your shoes, hop on your bike, or find your seat on a train or bus for some low or no carbon ways to get around town.

**Eat Better Foods**
Grow your own food, buy locally grown or organic food, and organize your community to have farmers markets.

**Letters to the Editor**
Become a local spokesperson by following the news, and writing in to the editor when there's an article about climate change or environment.

**Unplug**
Unplug your appliances, cell phone chargers, etc. when you're not using them so they don't waste energy.

**Use less stuff**
Many of us have a lot of unnecessary junk - and it doesn't necessarily make us happier. Focus on acquiring (or getting rid of) less things wherever possible.

**Dispose responsibly**
Be responsible with the waste you produce - recycle, and compost your food scraps. No recycling program? Start a campaign!

**Efficient Lightbulbs**
Replace your lightbulbs with compact fluorescent - and then organize a community-wide lightbulb swap.

**Buy green**
When you do need to buy stuff, make sure it's the most sustainable version of whatever you're getting - this will help take a message to producers.

**Become a transition town**
Google "Transition Towns" and find out how you can get started transforming your town away from fossil fuels!

**Elect climate champions**
Change the system from the inside out and elect climate champions in local office. With your new found organizing skills, get your friends together, and get the campaign going!

350.org is an international climate change campaign calling for a fair Copenhagen climate treaty that meets the latest science. 350ppm represents the safe upper limit of CO2 in our atmosphere. Take part in your community on 24 October, 2009: An International Day of Climate Action. Visit www.350.org or contact organizers@350.org to get involved.
Eliciting action: Public

- (Again) Change the narrative
- Point out “blind spots”
- Try out compelling messages
'How Bad For The Environment Can Throwing Away One Plastic Bottle Be?' 30 Million People Wonder
Eliciting action: Public

- (Again) Change the narrative
- Point out “blind spots”
- Try out compelling messages
- End with a hopeful message
China invested *hugely* in renewables
India — think: Delhi’s air pollution problem — sets ambitious target for renewables

India plans nearly 60% of electricity capacity from non-fossil fuels by 2027

Expansion of solar and wind power will help exceed Paris targets by almost half and negate need for new coal-fired power stations
Major world oil producer invests in clean energy solutions
Activity:

On the back of your sheet....

3-sentence summary of a message for your particular audience
Closing discussion:

How do you anticipate applying what you’ve learned today in your own work / communication projects?
Resources

Resources and other materials available at,
https://cornell.box.com/v/RISCC2017
Connecting on Climate: A Guide to Effective Climate Change Communication

Lead author: Ezra Markowitz, UMass
Excellent resources for communicating climate change simply for public audiences...

**CLIMATE CENTRAL**
climatecentral.org

**CLIMATE COMMUNICATION**
climatecommunication.org

**Skeptical Science**
skepticalscience.com

12 tools for communicating climate change more effectively
*The Guardian*, 2015
https://www.theguardian.com/sustainable-business/2015/jul/06/12-tools-for-communicating-climate-change-more-effectively
Tips & strategies for integrating climate change into conservation management
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Questions? Contact us!

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Resources and other materials available at,  
https://cornell.box.com/v/RISCC2017
Extras

(please keep for using in future talks)
Sweden is going for “net zero”

Swedish on target to run entirely on renewable energy by 2040

Last year 57 per cent of Sweden's power came from renewables

Alexandra Sims | Wednesday 26 October 2016 13:49 BST | 9 comments
How many solar panels would it take to power the **entire U.S.**?
Without prompt, aggressive limits on CO₂ emissions, the Earth will likely warm by an average of 4°-5°C by the century's end.

**How big a change is that?**

In the coldest part of the last ice age, Earth's average temperature was 4.5°C below the 20th century norm. Let's call a 4.5°C difference one "ice age unit."

- **-2 IAU**: Snowball Earth (-4 IAU)
  - 20,000 years ago: My neighborhood: half a mile of ice
- **-1 IAU**: Average during modern times: My neighborhood: hi!
- **0 IAU**: Where we are today
- **+1 IAU**: Where we'll be in 86 years: Cretaceous hothouse
  - +200m sea level rise
  - No glaciers
  - Palm trees at the poles
- **+2 IAU**: ?
What does climate change mean for Massachusetts?

MAKE IT LOCAL!

WITH FAMILIAR LANDMARKS
Forecast vs. Projection

A prediction of **1** possible future

A prediction of **a range of** possible future
Climate *projections* (not forecast or prediction)
Weather vs. Climate

*actual* conditions

- it is raining now
- what you *get*

*Climate*

*typical* conditions

- it is a rainy time of year
- what you *expect*

1 photograph

the whole photo album
Weather vs. Climate

*actual conditions*

- it is raining now
- what you *get*

*typical conditions*

- it is a rainy time of year
- what you *expect*

*Year-to-year variability (El Niño/La Nina)*

1 photograph

the whole photo album
What makes a good story in science?

- A new and surprising discovery
- Mystery
- Conflict or controversy
- Exploration and adventure
- Science/scientist to the rescue
- Just plain cool
Average Global Temperature, 1880-2013

Source: NASA GISS

- Atlantic Multidecadal Oscillation (AMO)?
- Aerosols?
- El Nino
- La Nina
Example storyline: Lake Champlain

Carrie: Can you ask your colleague if they would be willing to share this example, so they have warning? (if you think this is a good idea)
We invented some really useful technology.

So, what happened?
That technology requires burning fuels.

The exhaust? **Greenhouse gases.**