Bonnie Peterson

Geoscience Embroidery Proposal & Images

Vibrant works that translate climate and geoscience data into tangible art.

- 14 wall embroideries
- 10 oil can graphs
- banner (89 H x 60” W or 226 x 152 cm) - a labyrinth of climate consequences
- globe of climate anomalies
- 3 + framed annotated topographic maps: fire ecology + climate consequences

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Geoscience Embroidery Proposal Bonnie Peterson

https://bonniepeterson.com/PetersonGeoscienceEmbroideryProposal.pdf

My embroidered graphs and annotated maps were initiated during artist/scientist projects. They explore glacier melting, ocean heat, wild fire, lake chemistry and climate science. One example is *Fires of Change*, an NEA and Southwest Fire Science Consortium project exploring the impact of wildfire on the landscape. Other projects with dendochrinologists at University of Arizona, glaciologists at Yosemite, and permafrost scientists in Alaska have been a rewarding opportunity to share new research in environmental science. *Geoscience Embroidery* provides a novel opportunity for the consideration of current events and ethical questions.

The human-sized topographic map has an astounding labyrinth of arrows connecting future temperature and CO2 scenarios to the consequences of warming. Its approachable at this scale and viewers can follow the connections as well as enjoy the topographic details. Installation photos are in this pdf.

The urgency of climate change motivates my artwork. I design explanations for some of the complex modeling scenarios in environmental science and draw these concepts on paper or embroider them in novel colors and threads onto silk and velvet fabrics. I translate the abstract scientific data collected by global agencies such as WMO, NOAA, and NASA, into visual artwork that challenges people regardless of their level of scientific knowledge.

Transportation of this work is easy as the textiles can be folded into my car, in boxes or a suitcase. Their hanging sticks can ship in a tube or be made on-site. The maps fit into standard “mirror” boxes.

I appreciate your consideration and especially welcome your feedback and suggestions.

- One-page image summary: http://bonniepeterson.com/Geoscience%20Embroideries.htm
- More environmental work is at this web page: http://bonniepeterson.com/Art+Science.htm
- Visit my website to see additional work and detailed images. www.bonniepeterson.com
- Link to artist Statement/bio and vita

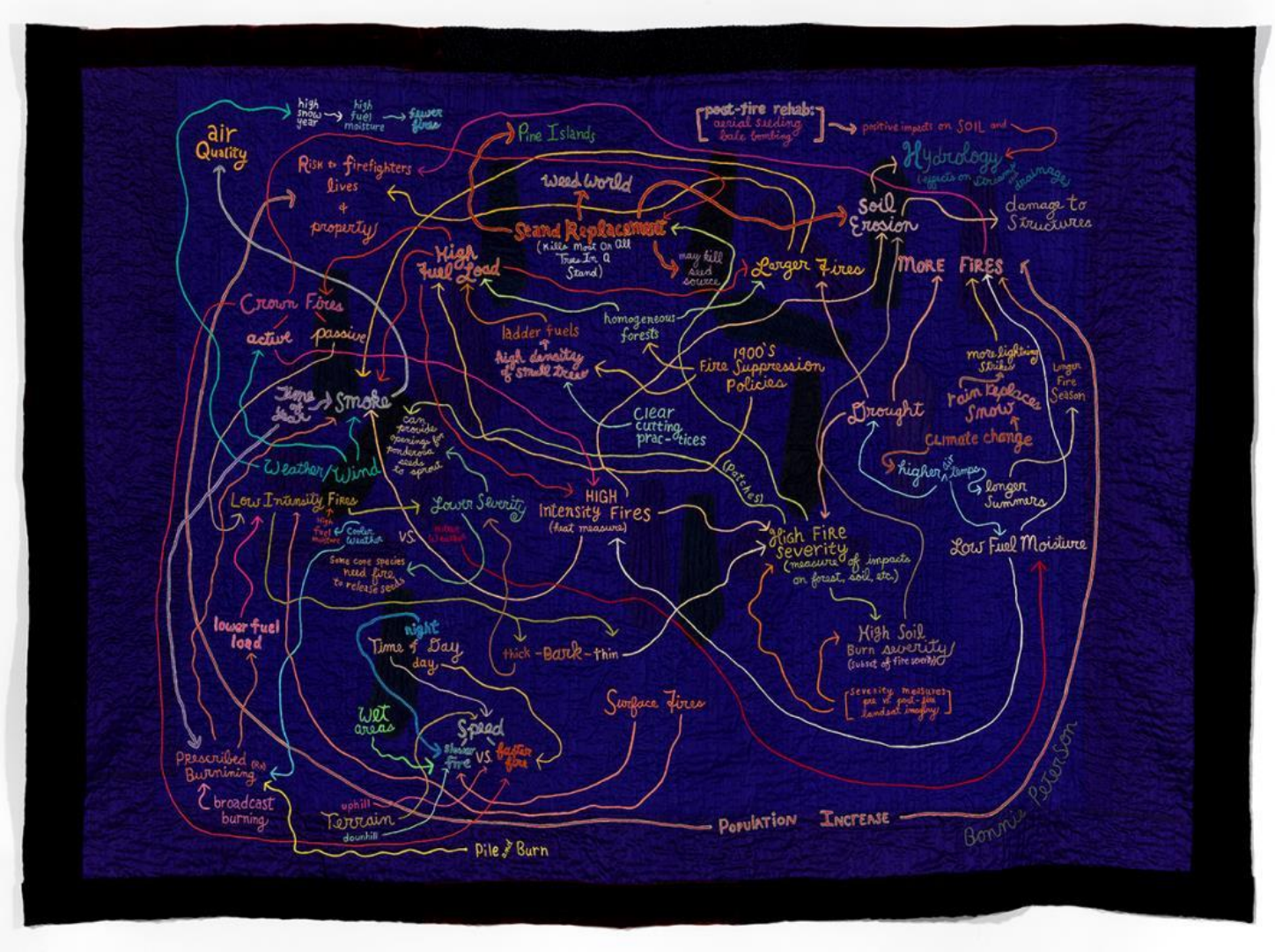
Click on each image for details & larger images

Oil Can Graphs

Embroidery on silk, each is approx. 8 x 30” + (20 x 76 cm)

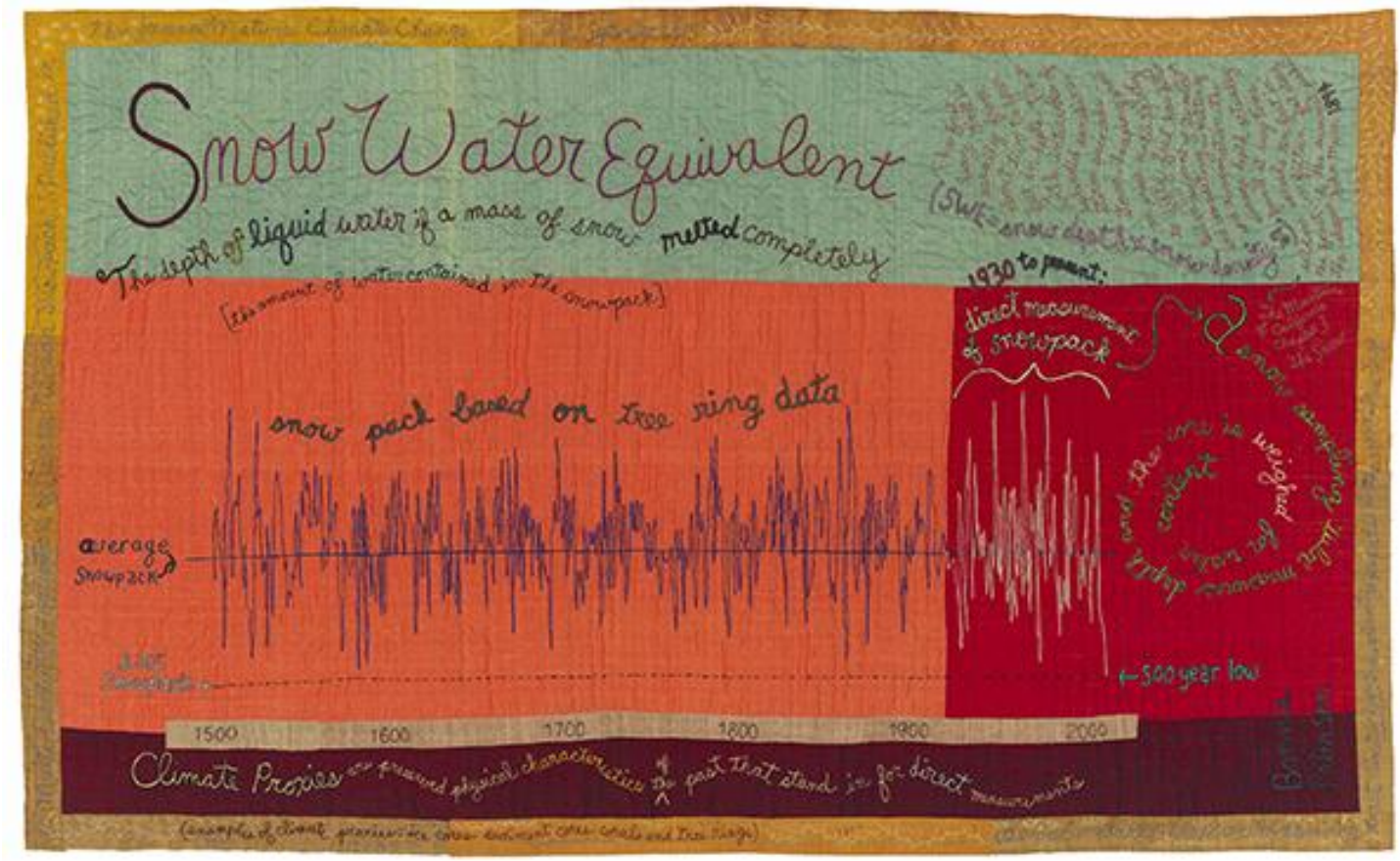
Starting at the center top (12:00 position) and going clockwise:

Yellow graph: Heatwaves
Dark blue: Collapse of Atlantic Meridional Overturning Circulation Thermohaline (AMOC)
Dark Red: Atmospheric Warming
Green: 800,000 years of CO2 in Earth's atmosphere
Bright red: Arctic Amplification
Light blue: Mass loss of the Greenland ice sheet
Orange: Sea Level Rise
Brown: Duration of ice on Lake Mendota in Madison, WI
Purple: Fire Acres Burned
Pink: Global Annual CO2 Fossil Fuel Emissions



On the Nature of Fire, 65" H x 85" W (165 x 216 cm)

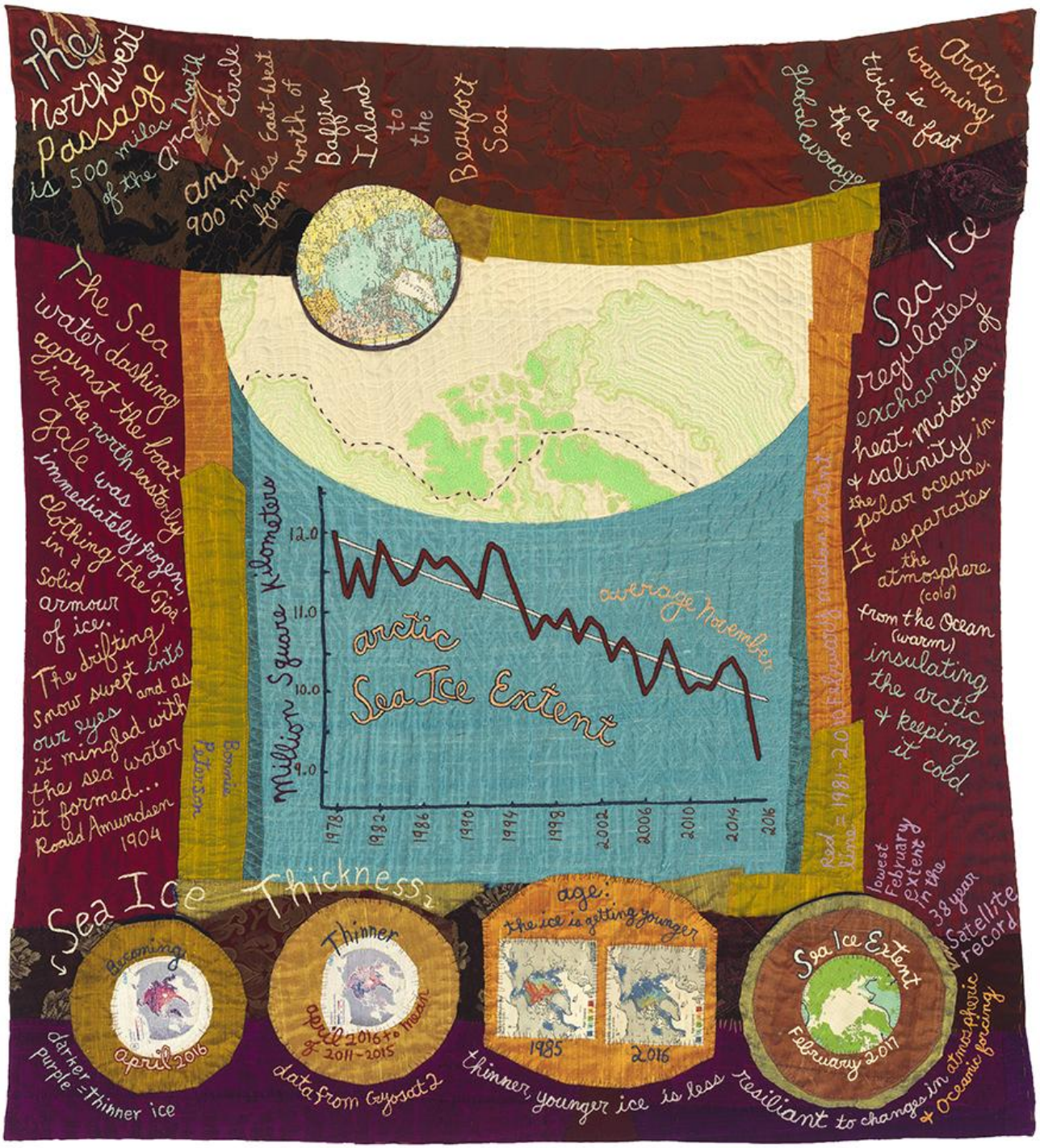
Embroidery on silk and velvet explores how fire as an ecosystem process is impacted by climate change and societal development. The work is from an artist/scientist project during which artists, fire scientists and land managers participated in a week of education on the North Rim of the Grand Canyon. Funded by NEA and the Joint Fire Science Program. My "blog" about the project explains my artistic process in engineering this complex artwork. The Fires of Change project link: **https://www.swfireconsortium.org/fires-of-change/**



Drought, Embroidery on silk, 38" H x 55" W (97 x 140 cm)

Snow water equivalent data and tree ring science were used to determine California's "500 year drought."

In 2015, California was in the fourth year of a severe drought. At the annual April 1st mountain snow measurement, state officials found no snow in the Sierra Nevada for the first time in 75 years. Valerie Trouet and colleagues at the University of Arizona's Tree-Ring Research Laboratory analyzed blue oak tree rings in California's Central Valley and demonstrated that the amount of mountain snow was the lowest since the 1500's. Snow water equivalent data is gathered annually on April 1st in the Sierras.



Arctic Sea Ice, Embroidery on silk, 36" H x 32" W (91 x 81 cm)

Embroidery on silk and brocade explores Arctic sea ice melting and the Northwest Passage using data & history. Contemporary satellite imagery and sensor technology capture the thickness and age of Arctic sea ice, and provides a fascinating look at recent melting data. Text describes the environmental significance of Arctic sea ice. Roald Admunsen's journal describes his 1904 navigation of the Northwest Passage. Other text deliniates the geographic parameters of the Northwest Passage.

Global Temperature Anomaly, Embroidery on silk & velvet, 26" H x 38" W (66 x 97 cm)

Global Temperature Anomaly is a graph of the annual mean earth temperature difference (or anomaly) from the pre-industrial baseline (1850-1900). It is from the WMO's State of the Global Climate 2021. The past seven years are on track to be the seven warmest on record based on data for the first nine months of 2021.
Other embroidery explains the basics of the **Paris Agreement**, a legally binding international treaty on climate change with a goal to limit global warming to below 2 degrees Celsius (3.6 degrees Fahrenheit), preferably to 1.5 degrees Celsius (2.7 degrees F), compared to pre-industrial levels. The **Emissions Gap Report** is an annual science-based assessment of the gap between countries' pledges on greenhouse gas emissions reductions and the reductions required to deliver a global temperature increase of below 2°C by the end of this century. Sustainable Development Goals (**SDG**s) were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity**.** **Sustainable Development Goal 13** is Climate Action. **NDC**s (Nationally Determined Contributions) are national climate plans, climate actions, and climate related targets, policies and measures governments aim to implement in response to climate change and as a contribution to global climate action.

Permafrost Boreholes, Embroidery on silk and velvet, 50 H x 52 W (127 x 132 cm)

This graph shows permafrost temperatures at 20 meters depth in boreholes on Alaska's North Slope for the past 40 years. Permafrost is defined as ground (soil or rock & included ice or organic material) that remains at or below 0°C for at least two consecutive years. Most permafrost areas have been frozen since the last ice age, about 10,000 years ago. They trap vast amounts of carbon in layers of frozen organic soil varying from less than one meter up to a mile thick. The Arctic is warming more than two times faster than the global average. Permafrost temperatures are rising at a much faster rate than the temperature of the air in the Arctic, and have risen between 1.5 to 2.5 degrees Celsius (2.7-4.5 deg F) in the last 30 years. As a result, permafrost layers are melting. Permafrost thaw contributes to a positive feedback loop that further accelerates the warming of Earth, releasing carbon dioxide and methane directly into the atmosphere and contributing to the spread of devastating Arctic wildfires. Permafrost can be used as a paleothermometer—fluctuations of air temperature from the late 19th and 20th centuries can be obtained by measuring temperature in deep permafrost boreholes.

Days of Lead (Pb), Embroidery on silk & velvet, 50" H x 50" W (127 x 127 cm)

Embroidery on silk and velvet chronicles the first 1,000 days of toxic Lead (Pb) in Flint, Michigan's water supply.

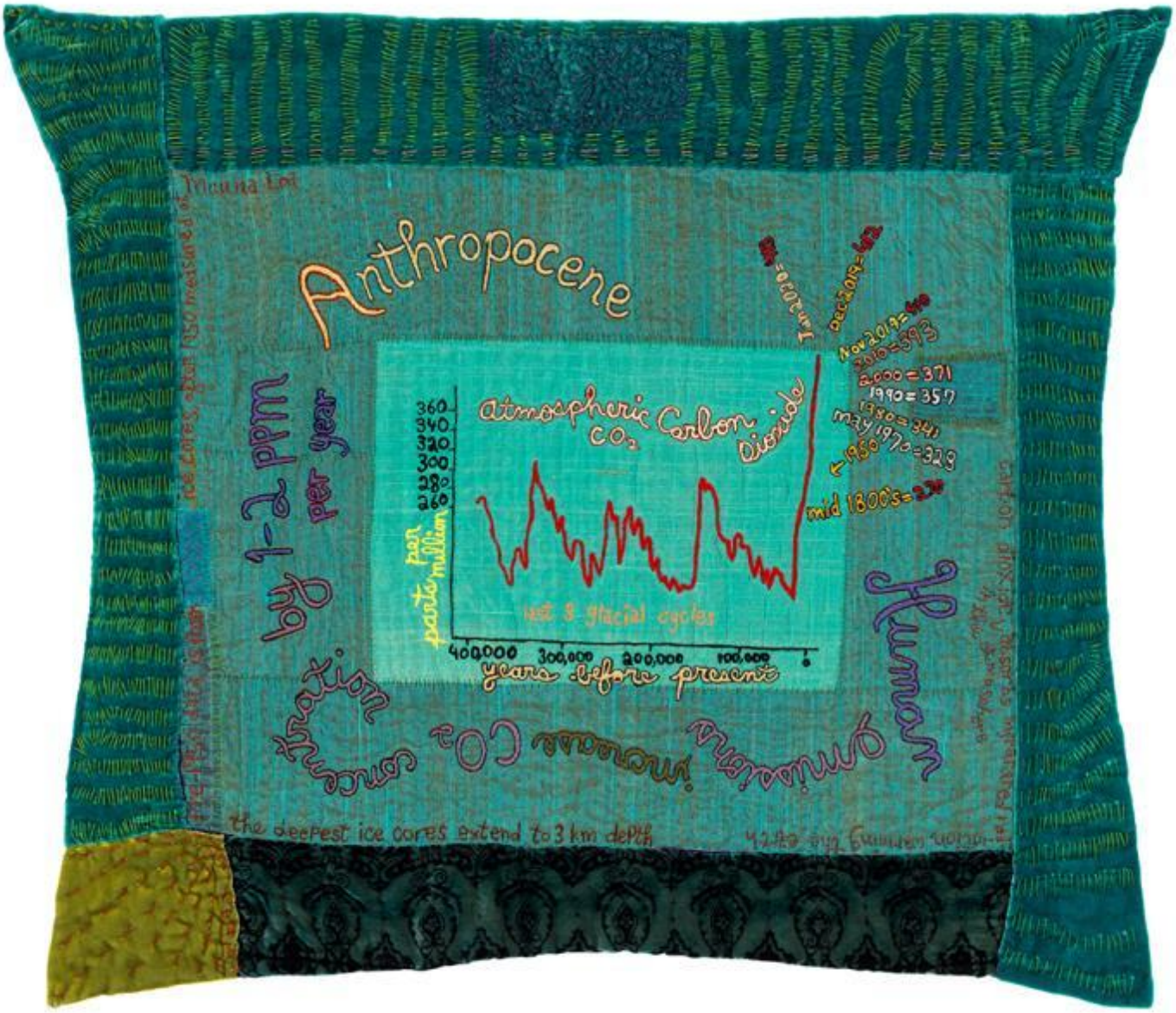
The discovery of lead (Pb) in Flint, MI's water supply and the subsequent significant events and consequences are chronicled, day by day, for the first 1,000 days. Environmental details about lead (Pb) surround the spiral. For example, for the first day: “Day 0 April 25, 2104 Flint switches from Detroit (Lake Huron) to Flint River.” The 271st day: “+271 days, Jan 21, 2015 residents bring discolored water to city hall.” A citizen science collaboration between Flint residents and a team of scientists from Virginia Tech helped uncover the crisis.

Ocean Heat, Embroidery on silk, 38" H x 41" W (97 x 104 cm)

Embroidery on silk shows heat content in the top 700 meters (2300') of the ocean, data collection tools, and the relevance of heat content to climate science.

Heat stored in the ocean causes its water to expand, which is responsible for one-third to one-half of global sea level rise. Most of the added energy is stored at the surface, at a depth of zero to 700 meters. The last 10 years were the ocean's warmest decade since at least the 1800s. The year 2023 was the ocean's warmest recorded year.

Instruments that measure ocean heat include Argo floats. Argo is a global array of 3,800 free-drifting profiling floats that measures the temperature and salinity of the upper 2000 meters (about 6562 feet) of the ocean. This allows, for the first time, continuous monitoring of the temperature, salinity, and velocity of the upper ocean, with all data being relayed and made publicly available within hours after collection. For more information on Argo, go to: What is Argo?



Anthropocene, Embroidery on silk & velvet, 23" H x 27" W (58 x 69 cm)

Embroidery on silk & velvet explores CO2 in earth's atmosphere over the past 400,000 years. The Anthropocene Epoch is a unit of geologic time used to describe the most recent period in Earth's history when human activity started to have a significant impact on the planet's climate and ecosystems.

Permafrost Active Layer, Embroidery on silk and velvet, 25 " H x 25" W (64 x 64 cm)

The portion of the soil above permafrost that thaws and freezes seasonally is the active layer. It plays an important role in cold regions because most ecological, hydrological, biogeochemical and soil forming activity takes place within it. Changes in active layer thickness are influenced by many factors including surface temperature, physical and thermal properties of the surface cover and substrate, vegetation, soil moisture and duration and thickness of snow cover.

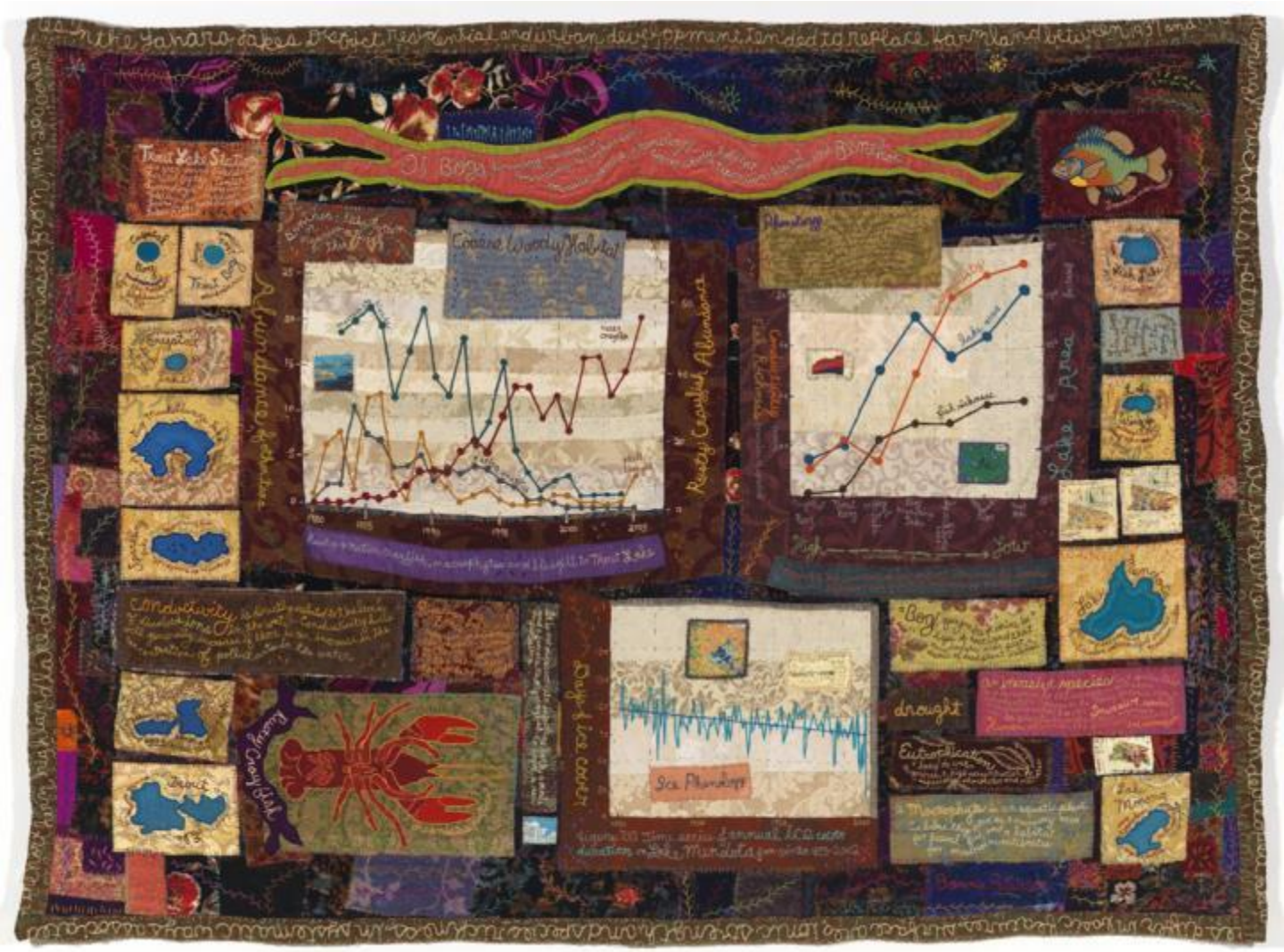
A graphic representation of permafrost physics is here:
https://graphics.reuters.com/CLIMATE-CHANGE/PERMAFROST/oakveelglvr/

Insect Apocalypse, Embroidery on silk& velvet, 25 " H x 23" W (64 x 58 cm)

Biodiversity of insects is threatened worldwide. Loss of insect diversity and abundance is expected to provoke cascading effects on food webs and jeopardize ecosystems. A citizen science project by the Krefeld Entomological Society measured the biomass of flying insects in protected areas for 27 years. The journal article, "More than 75 percent decline over 27 years in total flying insect biomass in protected areas." was published in PLoS ONE 12 (10): e0185809 (2017).
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809
A November 27, 2018 article by Brooke Jarvis in the New York Times Magazine, "The Insect Apocalypse is Here" mentioned this research: https://www.nytimes.com/2018/11/27/magazine/insect-apocalypse.html

Sierra Glacier Update, Embroidery on silk & velvet, 26" H x 30" (66 x 76 cm)

Glaciers provide some of the most visible evidence of climate change. They respond to the combination of winter snow and spring and summer temperatures. Over the twentieth century, with few exceptions, alpine glaciers throughout the world have retreated in response to a warming climate. The surface area of seven Sierra Nevada glaciers has decreased dramatically since the beginning of the twentieth century. The graph shows the fraction of the area of these glaciers relative to the year 1903. These glaciers are among the largest at higher elevations for which data are available. Historical photographs and field measurements were used to estimate the surface area of each glacier.



Of Bogs and Benthos, Embroidery and heat transfers on satin, silk, velvet and brocade
52" H x 72" W (132 x 183 cm)

Scientific graphs, limnology terms, lake chemistry concepts, demographics and climate change challenges are presented. The work is part of an artist/scientist project made possible by: The University of Wisconsin – Center for Limnology, the Trout Lake Research Station, the National Science Foundation, and the Long Term Ecological Research (LTER) Program.

Banner Installations: I can make a canvas banner (89 x 60” or 226 x 152 cm) using a local map.

Click on each image for details & larger images:

Drakes Bay Quadrangle was originally drawn on a 27 x 21” (69 x 53 cm) USGS topo map (left). On right, it’s enlarged and printed onto a canvas banner, and hung on the wall. Since the arrows and network of connections is enlarged on the human-sized banner, viewers can follow some of the arrows easily and look at the topographic details.

Double Point Quadrangle started out as a 27 x 22” (69 x 56 cm) USGS topographic map (left) & was enlarged to 89 x 60” (226 x 152 cm) for a canvas banner (right)

Santa Cruz Island C Quadrangle, below left, started out as a 27 x 22” (69 x 56 cm) USGS topo map & enlarged to 89 x 60” (226 x 152 cm) for a canvas banner (right)

Link to more of The Climate Consequences Project.

Globe with Climate Anomalies

Climate Anomaly Globe, 17 H x 17 W x 17 D (43 x 43 x 43 cm)

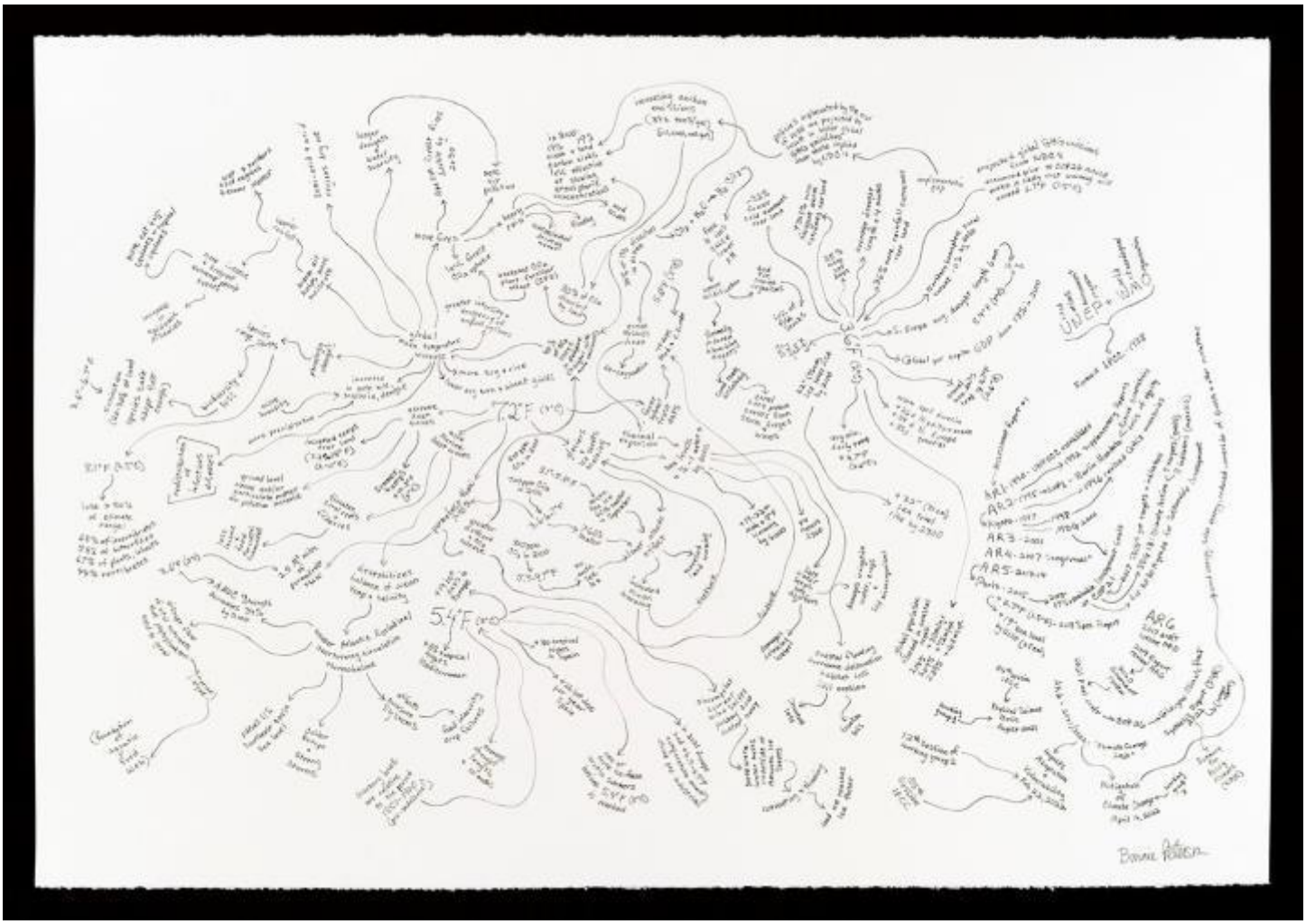
More than 100 climate anomalies (deviations) for 2017-2020 are positioned at relevant locations around the globe. 2020 Anomalies are on red needles, 2019 are green, 2018 are blue, and 2017 are yellow. For example, one of the red needles that's planted in the Arctic region says:
"2020 Arctic: 11th smallest maximum sea ice extent on record & 2nd smallest minimum extent on record."

The anomalies are from NASA and the World Meteorological Organization (WMO). They are printed on over 100 flags and pinned onto a traditional school globe. For more info, look at this Carbon Brief map.

Labyrinth of Climate Arrows:

Drakes Bay Quadrangle, 27" H x 23" W, (69 x 58 cm) USGS topographic map and marker
Climate warming variables are complex and dynamic. This graphic labyrinth connects several future temperature scenarios with the consequences of warming. Link to more of The Climate Consequences Project.

Atmospheric, oceanic, polar and land climate data reported by collection instruments such as satellites and ocean floats are published by the WMO, Global Carbon Atlas & Budget, Carbon Brief, NOAA, Ocean Health Index, European Environment Agency, NASA, and the United Nations IPCC Assessment Reports. I created this work while hiking at Pt Reyes National Seashore where this topo map is located. This work was supported by the Lucid Art Foundation, The Puffin Foundation, Ltd, & Michigan Arts & Culture Council.

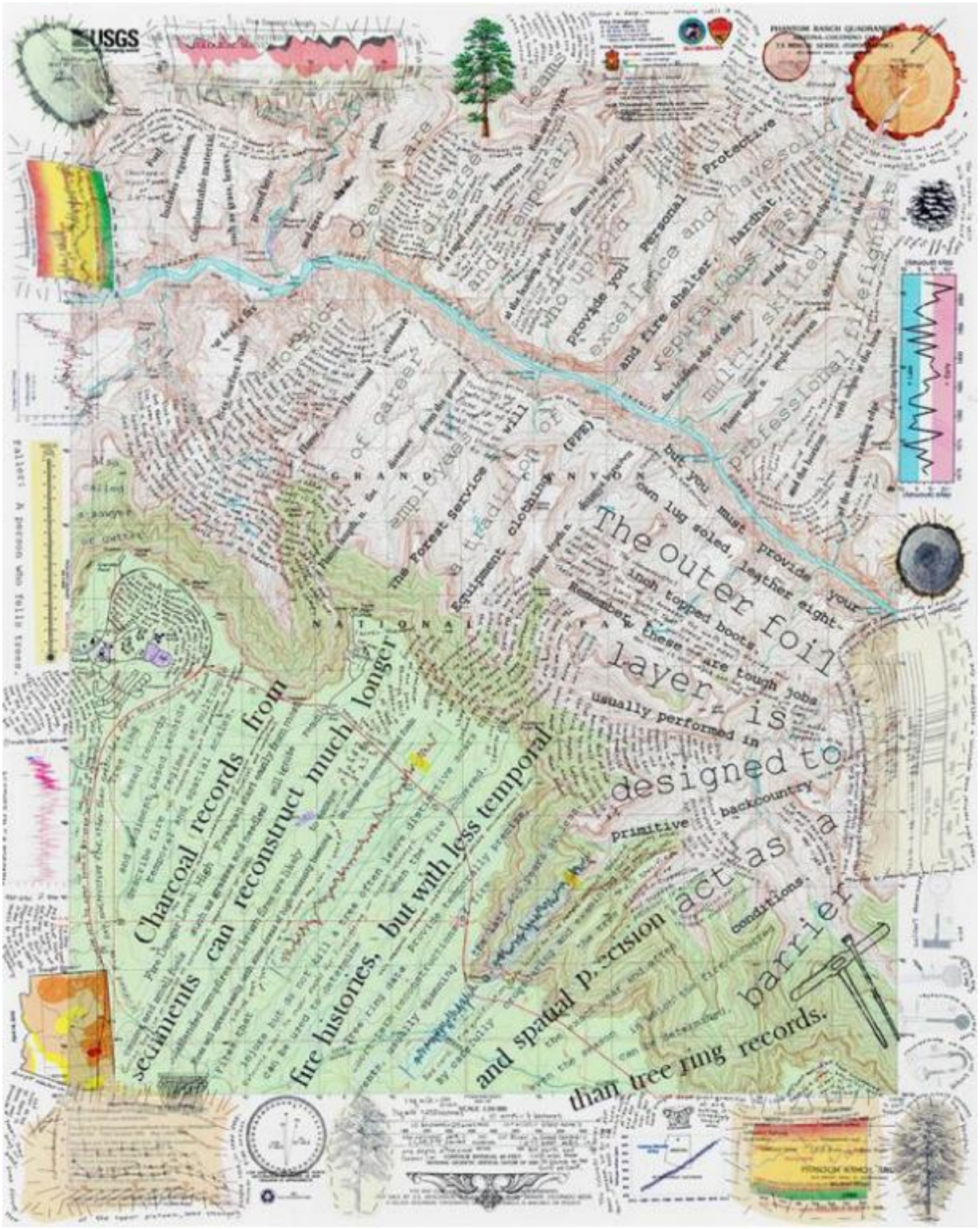


Natural Consequences, Marker on cream drawing paper, 30 H x 44 W, (76 x 112 cm)

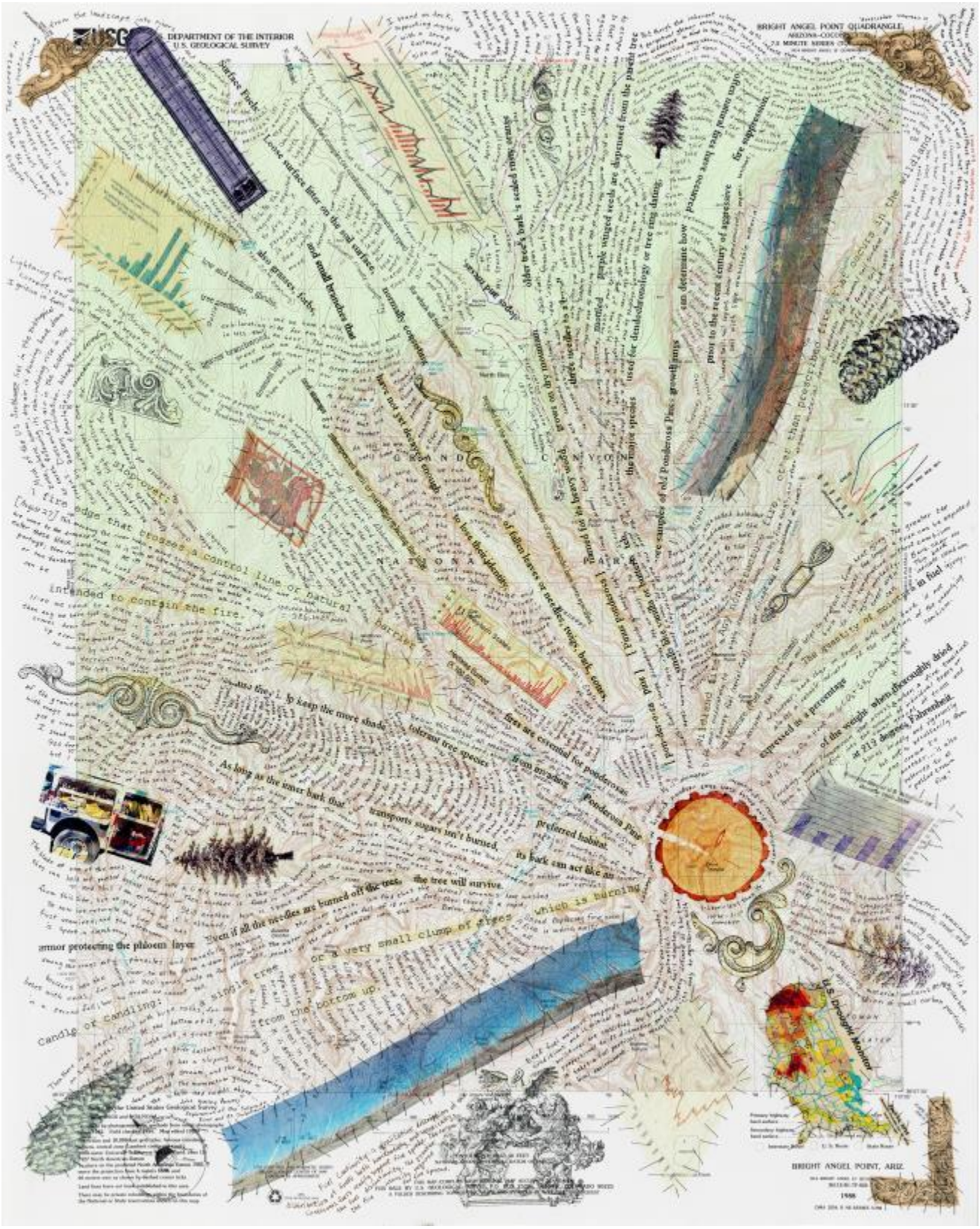
Climate warming variables are complex and dynamic. This web of arrows connects several future temperature scenarios with the consequences of warming.

Atmospheric, oceanic, polar and land climate data reported by collection instruments such as satellites and ocean floats were published by the WMO State of the Climate, Global Carbon Atlas & Budget, Carbon Brief, NOAA Arctic Report Card, Ocean Health Index, European Environment Agency, NASA Sea Level Change Program, and the United Nations Intergovernmental Panel on Climate Change (IPCC) Assessment Reports.

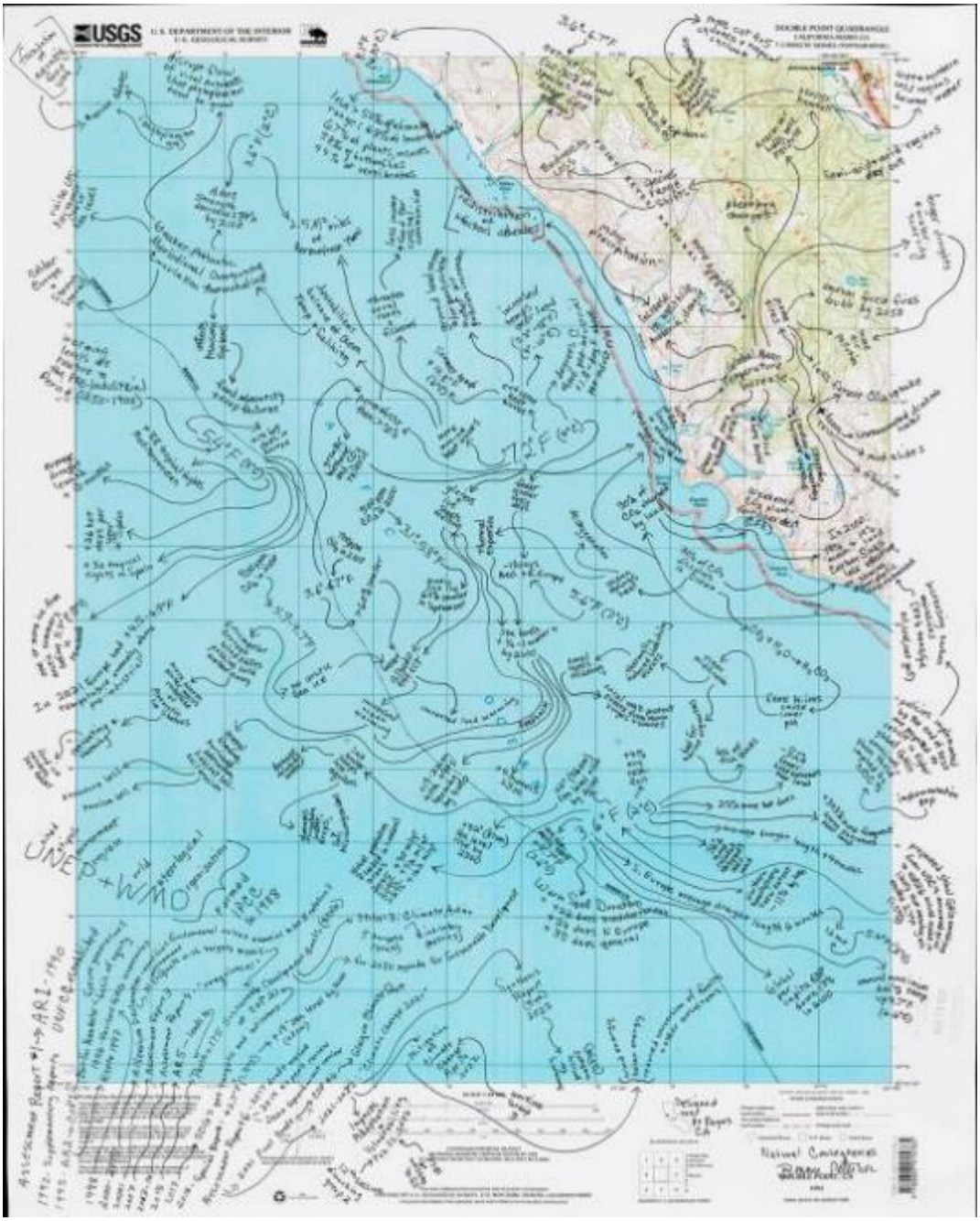
This work was supported by the Lucid Art Foundation, the Michigan Arts & Culture Council and The Puffin Foundation Ltd. Link to more of **The Climate Consequences Project**.



Phantom Ranch Quadrangle, 27 H x 22" W (69 x 56 cm) *(framed: 30 x 24" or 76 x 61 cm)*
Collage on paper; heat transfers, silk transfers, pen and stitching on a USGS, 7.5 minute topographic map. The text contains fire terminology, the firefighter's job description, information about their fire shelters, and fire history from tree ring research. Also text from John Wesley Powell's *Exploration of the Colorado River*, 1895. ***Fires of Change: the art of fire science*** is an artist/scientist project that explores *how fire as an ecosystem process is impacted by climate change and societal development.* **More maps & globes** are **here**.



Bright Angel Quadrangle, 27 H x 22" W (69 x 56 cm) *(framed: 30 x 24" or 76 x 61 cm)*
Collage on paper; heat transfers, silk transfers, pen and stitching on a USGS, 7.5 minute topographic map. The text contains information about ponderosa pine ecology, fire terminology, and text from Clarence Dutton's 1882 Canyon Country journal.
Fires of Change: the art of fire science is an artist/scientist project that explores *how fire as an ecosystem process is impacted by climate change and societal development.* **More maps & globes** are **here**.



Double Point Quadrangle USGS topographic map and marker, 27" H x 21.5" W, (69 x 56 cm)

Climate warming variables are complex and dynamic. This web graphic connects several future temperature scenarios with the consequences of warming. Atmospheric, oceanic, polar and land climate data reported by collection instruments such as satellites and ocean floats were published by the WMO State of the Climate, **Global Carbon Atlas** & **Budget**, Carbon Brief, NOAA Arctic Report Card, **Ocean Health Index**, European Environment Agency, NASA Sea Level Change Program, and the United Nations Intergovernmental Panel on Climate Change (IPCC) Assessment Reports. I created this work while hiking at Pt Reyes National Seashore where this topo map is located.

Link to more of **The Climate Consequences Project.**

This work was supported by the Lucid Art Foundation, The Puffin Foundation, Ltd, & Michigan Arts & Culture Council.

Installation at Notebaert Nature Museum, Chicago (October 15, 2022-October 15, 2023):


NATURAL
CONSEQUENCES
The Geoscience embroideries of
BONNIE
PETERSON
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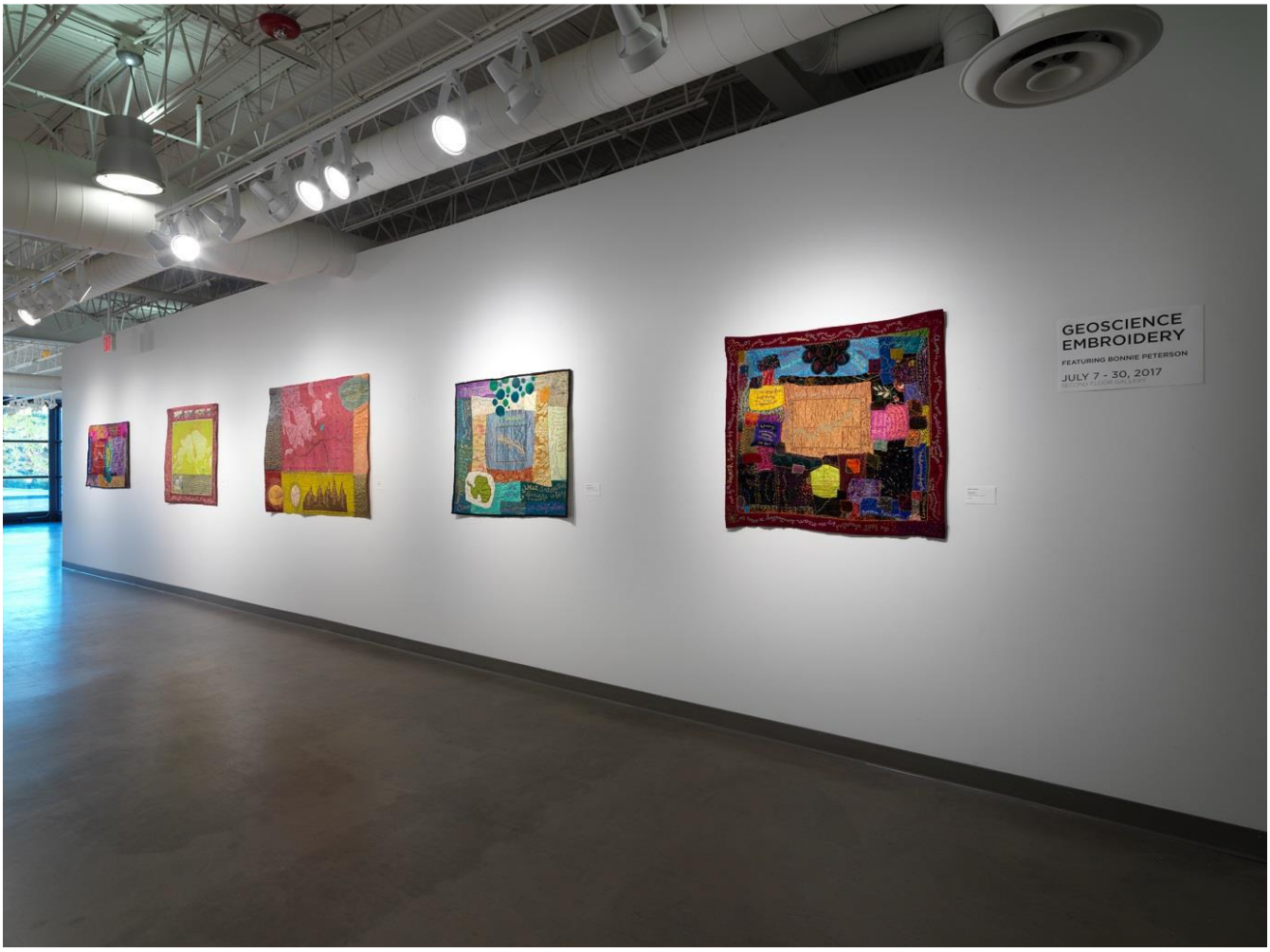
Installation at Evanston Art Center, Evanston, IL



Geoscience Embroidery Proposal

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https://bonniepeterson.com/PetersonGeoscienceEmbroideryProposal.pdf

Fire Acres, approx. 5 x 8 x 30"
Embroidery on silk

Fire and climate science are integrated with the annual wildfire burned area in millions of acres.

Wildfire is a natural process that has shaped many ecosystems for centuries. In a warming climate with unnaturally dense stands of young trees from past management practices, high-severity fires can create treeless patches so large that forests are not likely to return, even given many decades or centuries. Of the 10 years with the largest acreage burned, all have occurred since 2004, including the peak year 2015 This period coincides with many of the warmest years on record.