

## **Climate Change Mixer Questions**

(Suggested During Activity)

**1. Find a voice who is hurt by climate change. Who is this? How have they been hurt or how might this individual be hurt in the future?**

**2. Find a voice who might benefit from climate change, or who contributes substantially to climate change. Who is this? How might the voice benefit or in what way does this voice contribute?**

**3. Find a voice who has been forced to move because of climate change, or may have to move. Who is this? Why might they have to leave and where will they go?**

**4. If a person or family is forced to make a change (career wise, if an oil rig or coal mine closes, or location wise, if a home or employer is destroyed by flooding or wildfire), what resources should be provided to this person, and by whom?**

**5. Find a voice who is affected by climate change in a way that is similar to how you're affected. Who is this? How are your situations similar?**

**6. Find a voice whose story involves a connection between.....**

A) water and climate change. Who is this? What's the connection?

B) fire and climate change. Who is this? What's the connection?

C) biodiversity and climate change. Who is this? What's the connection?

**7. Find a voice who has an idea about what should be done to deal with climate change — or a voice who is taking action in some way. Who is this? What is the idea or action they are taking?**



# Larry Gibson

## Mountaintop removal activist, Kayford Mountain, West Virginia

They say that to move away from oil we need to rely more on “clean coal,” mined here in the USA.

Clean coal. That’s a lie. That so-called clean coal comes from mountains in Appalachia that have been destroyed by coal companies, like Massey Energy. They blast mountains apart to get at the coal and dump every-thing they don’t want in the valleys and streams, poisoning everything around.

When they talk about clean coal, they sure don’t mean how they got it. They want you to focus on the fact that burning coal today produces less sulfur dioxide than it used to. That’s the stuff that causes smog and acid rain. But burning coal still releases about twice as much carbon dioxide as natural gas, and a third more than oil — for the same amount of energy. And carbon dioxide is a greenhouse gas, the gasses that cause global warming.

So mining coal is bad for the people of Kentucky and West Virginia, but it’s also bad for the planet.

I’ve been fighting mountaintop removal of coal for more than 25 years. I’m not going to sit around and watch my home and the planet be destroyed. The coal companies care about the money. For me, it’s not about the money. It’s about the land. My mother gave me birth. The land gives me life.

# Chris Loken

## Apple grower, Hudson Valley, New York

Everybody is saying awful things about global warming, and I know that it’s bad for a lot of people. But recently Fox News did a report on climate change “winners” and they came to talk to me. As they said in their report, “There are some upsides to global warming.”

Frankly, I saw this coming. I knew that things were going to get warmer and you know what they say about a crisis: It’s also an opportunity.

I live in a beautiful place. Rolling hills. Good for apple trees. But I decided to diversify. Right next to the apples, I planted peach, apricot, and plum trees. Years ago. As I say, I saw this coming. These trees wouldn’t have survived the winters of the old pre-global warming days. But our winters are getting milder, and I’m betting my trees will do just fine. As I told the Fox News people: “This farm here has been set up for the future.” It’s not easy running a farm these days, and if the weather decides to cooperate a little bit, who am I to argue? I’m sorry for those folks who are hurt by all this, but I’ve got to think of my family.

# Stephanie Tunmore

## Greenpeace climate campaigner

I joined the environmental organization Greenpeace because I felt like I had to do something to make the world a better place. To me, it seems that climate change is the most dangerous problem facing humanity and the environment. The consequences of global warming will be catastrophic, and we have to do something.

I’ve been working to save the Arctic. People think of the Arctic as just one big empty block of ice and snow. Either that, or where Santa Claus and the elves live. But it’s an unbelievable place. There are species of birds and fish that are found only there and a few other places. Polar bears, musk oxen, and caribou reside there; and in the summer, snowy owls, ducks, and swans migrate there to nest. But already Alaska’s North Slope has been taken over by 28 oil production plants, almost 5,000 wells, and 1,800 miles of pipes.

But the oil companies see global warming and the melting ice as an opportunity to drill for even more oil and gas. Haven’t we learned anything? Why are we looking for more fossil fuels? The good thing is that more and more people are determined to stop oil development. We’ve taken direct action and have confronted the oil drillers in places like the Beaufort Sea, where we towed a fiberglass dome with two Greenpeace activists inside into a BP Northstar oil-drilling construction area. Two other activists unfurled a banner: “Stop BP’s Northstar, Save the Climate.” Direct action. That’s what it will take to stop these oil-drilling criminals.



## Rafael Hernandez

### Immigrant rights activist, The Desert Angels, U.S.-Mexico border

In 1986, I crossed the border from Mexico to the United States, looking for a better life for my family. Now I am committed to helping migrants in need. My group, Los Angeles del Desierto — The Desert Angels — patrols both sides of the Mexican-California border near San Diego. We look for lost migrants and leave water, clothing, and food at key spots in desert locations to help people on their journey.

Recently, we rescued María Guadalupe Beltrán, a 29-year-old mother of four who had been burned severely in the huge Harris Fire on the border. Her father had died in Mexico and she had returned home to attend his funeral. She was caught in the fire coming back into the United States. But after suffering terribly, Beltrán died of her injuries. Afterward, I spoke to her husband, Rafael, who sat by her hospital bed for two weeks. He told me: “I asked the Virgin: ‘Tell me whatever you want, please just don’t take her.’ But she did. At 11 in the morning my wife went away. She died at 11.” Six migrants died in the fire and eight were injured.

The border patrol has pushed migrants to cross in unsafe desert areas. And global warming is making these areas even more unsafe, more deadly. Climate experts say that these wildfires, just like the awful ones in Greece, Australia, and Colorado, are going to happen more and more as the climate shifts. So María and other wildfire victims are also victims of global warming.

## Richard H. Anderson

### CEO, Delta Airlines, Atlanta

I am CEO of Delta Airlines, and live in Atlanta. I’m a businessman and a lawyer, and have been in the airline business for more than 20 years. My job is to oversee Delta’s long-term goals. Ultimately, I need to keep the company profitable for our investors and a secure and fulfilling place to work for our 80,000 employees.

I’ve been reading that air travel is bad for global warming. People say our jets produce a huge amount of carbon dioxide and other greenhouse gasses that increase global warming. An article I read recently said, “Flying is one of the most destructive things we can do.” This researcher concluded that “the only ethical option . . . is greatly to reduce the number of flights we take.”

But ethics are complicated: Don’t I have an ethical responsibility to my employees and stockholders — and to the 160 million customers who fly Delta every year, on more than 15,000 flights each day? And that means expanding air travel, advertising low fares, and trying to get people to take vacations to faraway places like Japan and China, to keep Delta profitable. Sure, we will try to pollute less, but we’ll leave global warming to the politicians and scientists to figure out. I’m a businessman.

## Steve Tritch

### President and CEO, Westinghouse Electric

Before I became the head of Westinghouse I was senior vice president for Nuclear Fuel, providing nuclear fuel products and services to nuclear power plants throughout the world. Before that, I led the merging of the former ABB nuclear businesses into Westinghouse Electric, and was senior vice president of nuclear services. And before that, in 1991, I became manager of the Nuclear Safety Department, and later was appointed general manager of Westinghouse’s Engineering Technology. Today, I belong to the American Nuclear Society and serve on the Nuclear Energy Institute’s board of directors. I guess you could call me Mr. Nuke.

You might say that I’m a man on the hot seat these days. Not only are we running out of easy-to-find oil, but oil is also blamed for global warming. Coal is an abundant source of power, but it produces even larger amounts of greenhouse gasses than oil — or natural gas. People are looking to my company, Westinghouse, for solutions. The solution is obvious: nuclear power. As I tell my employees, “What’s good for the planet is good for Westinghouse.”

Sure, the accident at the Fukushima nuclear plants in Japan was serious, and people were hurt. But the whole industry has learned from this accident, and even Japan still knows that nuclear power is the best way to go. The real threat is global warming. Global warming could destroy much of life on Earth. But nuclear power produces no greenhouse gasses. They say nuclear power has dangers. Well, last year 5,200 Chinese coal miners died in accidents — and that’s a lot more than have ever been hurt in a nuclear power accident. I see hope for the planet and Westinghouse is here to play our part.



# Nancy Tanaka

## Orchard Owner, Hood River Valley, Oregon

Our family has owned and operated fruit orchards in Oregon's Hood River Valley since my husband Ken's grandparents bought land here in 1917. The only time our family left this land was when the U.S. government locked our family in internment camps during World War II. But that's another story.

Every generation of our family has farmed this land. And then we woke up to the front-page article in our local newspaper. It was a shocker. In fact, it scared us half to death. A study by Oregon State University found that 75 percent of the water during the summer months in the Upper Middle Fork of the Hood River comes from melting glaciers on Mt. Hood. And because of global warming, the glaciers are disappearing. That's our river. Well, we don't own it, but it's the river that irrigates our pears and cherries. Our family has grown fruit on this land since before we were born, and now they tell us that our irrigation water may be disappearing?

To tell you the truth, I never knew so much of the river's water in the summer came from glaciers. You see, glaciers on Mt. Hood are kind of small compared with glaciers on other mountains. Scientists say the problem is that glaciers have been shrinking because of global warming. I always thought global warming might affect the Arctic and the polar bears, but not the Upper Middle Fork of the Hood River.

# Trisha Kehaulani Watson

## Environmental lawyer, Hawaii

I was born and raised in the valley of Manoa, in the district of Kona (known today as Honolulu), on the island of Oahu. I am Native Hawaiian. I am a lawyer specializing in environmental law — but much of my knowledge comes from talking with my family and kupuna, our elders.

Over the years, I have seen the beaches I played on my entire life steadily erode. In many places, the sand is disappearing.

My valley has always been very waiwai (wealthy, rainy, with much fresh running water), yet the waters have changed. We have far more unstable weather. When I was a little girl my grandfather used to take me down to the streams to watch the water rise when the heavy rains came. But things are much different today. The heavy rains are devastating. A few years ago we had a terrible flood wash through the valley. Since then, my street has been shut down numerous times due to dangerous flooding.

The seasons have also changed. It gets much colder than it used to, and also much hotter. The plants have changed because of it. Fruits come at unusual times of the year. Flowers bloom at different times of the year. Health problems also result from these weather changes.

The Earth is not well.

# James Hansen

## Former director, Goddard Institute for Space Studies, National Aeronautics and Space Administration (NASA), New York, City

I am a scientist, but I am also a grandfather. So that makes me especially interested in the future.

Recently, I was arrested at the White House in Washington, D.C., protesting the construction of the 1,700-mile Keystone XL Pipeline to send oil from the Tar Sands of Alberta, Canada, to Texas. Why would a scientist and a grandfather commit civil disobedience and get arrested? That's simple. If this pipeline is built and they continue to take this especially dirty and polluting oil from the Canadian Tar Sands, it makes it very unlikely that we will be able to stabilize the climate and avoid the disastrous effects that we are already beginning to see. As I've said, this pipeline is the fuse to the biggest carbon bomb on the planet.

Many years ago, I was one of the first scientists to warn that as we burn more fossil fuels — coal, oil, natural gas — the carbon dioxide created will heat the Earth to dangerous levels, with terrible, terrible consequences. I thought people would respond to scientists' rational arguments that we needed to end our addiction to fossil fuels. Now I know we need to take more drastic action.

So I volunteered to be arrested with 1,200 other people to draw attention to the importance of stopping this deadly pipeline from being built. I am more than 70 years old, but if need be, I will keep getting arrested.





## Robert Lovelace

### Ardoch Algonquin First Nation leader, Ontario, Canada

A few years ago, I was sentenced to six months in jail and ordered to pay a \$15,000 fine. What was my “crime”? Trespassing on my own land — trying to block a uranium company, Frontenac Ventures, from prospecting on and polluting Algonquin Indian land. It began when we noticed people cutting down trees on land we had never ceded to the Canadian government. Someone had given Frontenac a prospecting license and they had gotten a court to issue an injunction against “trespassing.” But this is our land, and Algonquin Indians and our non-Indian supporters organized a 101-day blockade to physically stop Frontenac from destroying the land. I was arrested and became a political prisoner.

Because of global warming, the nuclear power industry is claiming it is the “clean” alternative, because nuclear power does not generate greenhouse gasses like coal or oil. The price of uranium shot from \$43 a pound in 2006 to \$75 a pound a couple of years after. It came down as a result of the 2011 nuclear disaster in Japan, but it will go back up. Canada is already the world’s leading exporter of uranium, and many in our government want to increase exports and turn Canada into an “energy superpower.”

There is nothing good about uranium mining. Uranium mining has no record other than environmental destruction and negative health issues. Mining companies clearcut the land and destroy the Earth to get at the uranium. Uranium can’t be stored safely and other uranium mines around Canada have left land polluted with heavy metals like arsenic. And nuclear power itself is not clean. Nuclear waste stays radioactive for thousands of years and no one has found a safe way to store nuclear poisons that long.

## Paulette Richards

### Miami, Florida

I live in Liberty City, a mostly low-income and African American neighborhood in Miami, Florida. I love this neighborhood. Just walk down the street and you can smell that wonderful Haitian fried pork and plantains coming out of people’s houses. I bought my home back in 2001 for \$90,000. Recently, I’ve struggled to make mortgage payments because without health insurance my cancer treatments left me with a lot of debt. Somehow, the real estate people must have heard that I was short of money, because I have been getting phone calls everyday from people wanting to buy my home.

It’s the rising seas, caused by climate change. That’s why the rich white folks want my house. For years, those people wanted to live down near the water. They still do, but now they are starting to see that with climate change, it’s risky to live near the ocean. The city of Miami says that by 2060, the sea level will rise anywhere from 14 to 34 inches. For years and years, because of segregation and racism, banks wouldn’t lend to People of Color, and we were only allowed to live in the less desirable high ground — the coral ridge, stretching from north Miami-Dade County to the upper Florida Keys. That’s why suddenly, all the real estate people and developers are trying to buy our places and sell them for lots more money. Community activists in my neighborhood call it “climate gentrification.” And as housing prices go up, so do the taxes. People who rent homes or businesses are seeing their rents skyrocket. What are they supposed to do? But I didn’t buy a house for investment. I bought this to live in, to die in. It’s my legacy, my home, my worth. Without that what else do I have? The good news is that this community is organizing and fighting back — people are talking about rent control and freezing taxes, and forcing developers to build affordable housing, if they want to do business here. This is my community; I’m not going anywhere.

## Matthew Gilbert

### Member of Gwich’in Tribe, Northern Alaska/Northwestern Canada

I am a member of the Gwich’in, the northernmost Indigenous nation on the American continent. There are about 8,000 Gwich’in. Because of global warming, we are threatened as a people.

We survive mostly from hunting caribou. Less snowfall is making sled and snowmobile transportation more difficult. Creeks are freezing later, and the ice is too thin to carry heavy loads. Lakes are drying up.

The worst threat is to the caribou. In 10 years, their number dropped from 178,000 to 129,000. Calves drown when they try to cross rivers that are usually frozen. My grandfather remembers vast numbers of caribou moving in waves near their village during spring and summer. No more. Our environment is in chaos. The hunters find it harder and harder to find the caribou that feed our people.

We must reduce greenhouse gasses. My people are dying.



# Tom Conway

## Miami, Florida

I know that climate change is going to hurt people. But here's the thing: With any change comes opportunity, and if you're smart, you'll take advantage of opportunities that come your way. I am a developer in Miami. Basically, I buy places as inexpensively as I can and then I fix them up either to rent or to re-sell.

As I say on my website, I have a “sharp financial foundation” and “an analytical aptitude.” I began to notice that property values in certain inland neighborhoods were going up faster than property values on the beach. Sure, beachfront property is still expensive and desirable, but the scientists say that by 2060 the sea level here will rise by 14 to 34 inches, so people are becoming more interested in the parts of Miami on higher ground. For years, areas like Liberty City, Little Haiti, and Overtown were where the poor people lived. In these higher ground neighborhoods, property values are increasing three times the average in the rest of Miami-Dade County. So I'm going into these neighborhoods and buying up businesses and homes as cheaply as I can. For example, I just bought up a couple of shopping centers in the Little Haiti neighborhood. The tenants — a travel agency, a tuxedo shop, a clothing store, some restaurants, a tax preparation place, and other businesses — had been there for years, some as long as 30 years, and weren't paying much rent. As wealthier people move into the neighborhood, they want other kinds of businesses — businesses that can pay a lot more rent. So I evicted all the tenants in order to remodel my new shopping centers. I followed the law and gave people 15 days to move out.

People in the community protested — they are still protesting. “Climate gentrification!” they called it. They said I am a racist, because the tenants I removed were Black and I'm white. Look, I have nothing against the former tenants of my buildings. This is just business. I can make more profit renting to people who have more money, people who feel that with climate change, the neighborhoods on higher ground are a safer risk.

# Elizabeth Easton

## Beaumont, Texas/Oakland, California

I guess you could say that I am a climate change refugee. I now live in a big old lot behind an Office Depot with about a hundred other people in Oakland, California. We live in cars, in tents, in old campers, in tiny houses people have put together. But I used to live in Beaumont, Texas, about 90 miles from Houston. Here's the story.

In August of 2017, Hurricane Harvey made landfall on the coast of Texas. Harvey had winds of 150 miles per hour when it hit. In Beaumont, where I lived, we got more than 50 inches of rain! I had never seen anything like it. The worst thing is that the little house where I was renting lost water service — the whole city water system shut down. No drinking water, no way to flush the toilet. It was terrible. Beaumont opened a shelter, but conditions were so unsanitary in the shelters that the city had to get us out of there. I know that there have always been hurricanes, but I heard a scientist on the news who said that climate change made storms like Hurricane Harvey three times as likely, and Hurricane Harvey had 38 percent more rain than if there wasn't any global warming.

I didn't have much, but I lost everything in that storm. I liked Beaumont, but I had to get out of there, so I took a bus to Oakland, California, where I have family. But it is way too expensive to live here. There is no place I can afford. I lost almost everything in the hurricane. Now, my home is here, behind this big Office Depot. I paid someone to let me stay here, but it's not safe — especially at night. Here, I feel forgotten, tossed aside. People talk about the “homeless crisis.” For me, it all started with a hurricane, fueled by climate change.



# Glacier National Park

## Montana, USA

There's no question, the summers are getting hotter and the winters are changing - I can feel it. These changes are threatening the very landscapes I'm famous for. Whole acres of my glacial ice are melting and I've already watched over half of my remaining glaciers slowly melt away in the past 50 years. The scientists that come to measure and take photos of my melting glaciers say that what I have left of this impressive ice could be gone in just ten more years. But they warn that's just an estimate because glacial melting is a vicious cycle; the more glaciers recede the faster they will continue to melt. Will people still come to see me if there are no glaciers to see?

My whole landscape is already feeling the changes. When the glaciers are gone, my summer streams will barely flow without the seasonal meltwater, endangering the whole habitat that these cold clean streams provided. From insects to plants to animals - everyone will notice. Even the animals that walk my rocky cliff faces will notice the change - mountain goats use the glacial ice as air conditioning in the hot summer sun, and with less ice and hotter days coming I worry about my mountain goat residents.

I'm starting to feel naked without my glaciers and I fear for all the beings that I'm watching struggle to adapt to my changing landscape.

# Fair Bluff, North Carolina

## Columbus County, USA

I was never a big town, but now there's only a few residents left to even call me a town. Our main street was a pretty riverside downtown, right along the Lumber River. Until the flooding started. We'd always had flooding now and then (downtown is built on the floodplain) but now scientists say severe storms and the flooding they bring are the new normal, all thanks to climate change.

I've been told warmer temperatures and warmer ocean waters means more evaporation happens out over the ocean, so more water is sucked up into these big storms and then dumped right onto our flood prone town during each storm. I remember in 2016 Hurricane Matthew caused the Lumber River to flood - and I mean really flood - putting all our houses, roads, and stores underwater for weeks. But that wasn't it; we'd barely rebuilt when the next one hit. 2018 brought Hurricane Florence, and it happened all over again. My residents who could, started leaving. It's just too hard to rebuild and repair your house over and over, knowing another big hurricane, and another big flood will come.

And that's just the problem. We're already living with climate change but it will only get worse from here since severe weather, like hurricanes, are only expected to become more intense in the coming years. We can't take more intense rains and flooding, we are still repairing from the damage we already have. I'm shrinking and soon I'll be a climate change ghost town.

# Gila National Forest

## Arizona/New Mexico Border, USA

I'm a pretty diverse forest and an important habitat for many critters of the southwest like the Mexican spotted owl, so just like many of my neighboring states, wildfires and drought are a growing concern for me.

Sweltering temperatures, even for this area, have been melting any snow we got before spring has barely started. Everything is hot and dry, so forest fires are starting easily, just a strike of lightning can start a blaze. I know this because that's exactly what happened with the Whitewater-Baldy Fire that burned 297,845 acres of forest. That's a lot of my forest, but a lot of it actually did okay.

We're used to fires here; the U.S Forest Service who manages the forest has a policy of letting small fires burn naturally when it's safe. And there's good news because their tactic seems to be working. The Whitewater-Baldy Fire was expansive but burned at lower temperatures in the areas that had been burned recently by these smaller fires. More frequent low severity fire is better for the trees and the animals in the forest because it burns built up vegetation so there's less fuel for bigger fires and new vegetation grows back quickly. This new growth after a fire is important because it helps keep the debris and ash in place that could otherwise harm fish like the Gila Trout and cause flooding when summer rain storms come.

Although this management approach of the Forest Service doesn't mean I'm immune to high severity burns in the future, I might be a more resilient forest and have a better chance against climate change.



# North Cascades National Park

## Pacific Northwest, Washington State, USA

Maybe you've seen photos of my majestic snow capped mountains and green forests spreading up to the huge slopes? Those glaciers feed rivers and streams, keeping the forest green with ferns and huckleberry bushes. That's the mountains of the Pacific Northwest, or at least what it has been.

But lately when there's any talk of glaciers the photos getting passed around aren't to show off my beauty, but instead to see how much the glaciers are receding. Planes have been flying overhead here for years taking photos documenting how those glaciers are shrinking. What used to be glaciers that covered whole valleys are now just patches clinging to the shadiest side of the ridges. And while the glaciers shrink each year, the rivers run lower in the summers and the forests dry out a little bit more, leaving space for wildfire to creep in and burn longer and hotter each and every summer. Not only are the old trees that were home to so many animals burned, but trails and campgrounds close, and smoke obscures those beautiful views I brag about. Things just aren't the same as they were in the past.

# Monongahela National Forest

## West Virginia, USA

The early 20ths century stripped me of too much of my red spruce habitat already but it's endangered once again. The logging and mining in the forest weren't exactly good for the health of trees. And now even though people are replanting trees and restoring habitat these red spruce trees aren't out of the woods yet. Now the dry summers and heat waves are reaching up into the mountains where these trees once found refuge. But there's nowhere else for them to go, living on top of mountains means no where to migrate too, just risk replacement as the drought tolerant life moves up the mountains.

But why do I care about the red spruce? Well for one, I wouldn't be the same forest without them, but they're not just trees. Salamanders that are already endangered themselves, keep cool in the shade this treed habitat provides. And the brook trout of West Virginia's cold water streams risk living in stream temperatures that are too warm if the spruce cover is lost. I'm used to change but I hate to lose all this to climate change.

# Valles Caldera National Preserve

## Jemez Mountains, New Mexico, USA

Did you know that land can get scars just like humans can? My grasslands and forests have vast wildfire burn scars of dead trees and ash, especially from the big fire that blazed here in 2011. Some people even described that 2011 fire as a mega-fire. The drought fueled the fire with the dried out grassland and forest letting it burn hotter than other fires. The heat was so intense that it left some places completely burned and dead, with no living trees or even a seed for miles. No seeds means no new trees to hold everything in place and prevent erosion, which means burn scars last even longer and my very land could be washed away with each rain.

But a historic fire like this gets people's attention. Scientists have been studying the soil since the 2011 burn, because it's not just the trees that are impacted by fire. The research is showing that some soils can return to the same or even better condition after the fire passes through. The heat increased some nutrients in the soil and created better conditions for plants to uptake the nutrients they need to grow, though there are some negative effects too. These findings could be so important because the soil and all that goes on within it can change how a forest regrows. All this goes to show that fires and how they impact all parts of the forest are not all good or all bad and there's still so much to learn.

The one thing I do know is that even after the trees that are replanted by helping hands have grown and soils have regenerated, there will be more fire in my future.





# Okefenokee National Wildlife Refuge

## Florida/Georgia Border, USA

Everyone seems to be talking about the big wildfires in the western U.S. these days and the droughts and rising temperatures that are causing them. But I'll tell you it's not just happening in the West. You might only hear about the hurricanes that hit here in the southeast on the news, but the drought is here too. Even a swamp wetland like me has been dried out just like droughts have done to forests in the West. A swamp might sound like a wet place that wouldn't burn very well, but when the water dries out after too many hot dry days, the decomposing plants that accumulate making my swamp a rich ecosystem are exposed and become fuel for any spark of fire.

Over the past 15 years there's been too many fires to count that burn in a cycle as drought conditions dry the swamp and then fires burn across the refuge. Like many places, fire is natural here, but these big fires that burn for months and come back with the drought each year are dangerous and becoming more common.

# Boundary Waters Canoe Area

## Minnesota, USA/Canada Border

For now I'm still the Boundary Waters the people know, but you should probably come to see my boreal forest and extensive lakes before things change. It's the trees that will start to move on first; I can tell the black spruce, balsam fir, paper birch and others are already feeling parched in the summers. And I hear that the summers will keep getting hotter, and if that heat starts evaporating more moisture than we get, things will start to shift. I know my rocky soils won't be able to support a whole boreal forest when they're dried out so the forest will have to give way to something different.

The oak and maple trees from further south have already started to move up with the warming conditions and when it really heats up the grasses won't be far behind. I'll have shed my boreal forest with its spruce and fir trees, so you might not recognize me in my new coat of grasslands but I'll still be here in this future of climate change.

# West Maui Reef System

## Hawaii, USA

When you picture coral reefs in the tropical water of Hawaii you probably think of colorful coral and fish of all kinds swimming through the vibrant structures. That's what you'll see in my reef system too, we even have organisms that don't live anywhere else on earth. But some areas are looking a little more dull recently.

It's not just the air temperatures that are rising around the world, but us underwater ecosystems are feeling rising water temperatures too. Warmer waters might sound nice for swimming, but when a marine heatwave comes, the corals are more likely to bleach. It's called coral bleaching because coral literally gets bleached of their color — the symbiotic algae that give coral their color and food leave due to the stress of the high water temperatures. If the heatwave continues for too long and the algae don't return this can even kill the coral. That's just what happened in 2015 when I saw living corals die due to a heatwave. Dead coral doesn't just look bad to tourists who want to come to Maui to scuba dive, but it also means the fish that live in these reefs face trouble too. Without habitat these reef fisheries could decline, changing the whole food web.

But it won't just be the animals of the reef that feel these heat waves, everything's connected in the reef, and the food web includes humans who fish these waters too.



# Red Rock Lakes National Wildlife Refuge

## Greater Yellowstone Ecosystem, USA

I'm home to over 200 species of birds, including many migratory species that use my wetlands and lakes to breed and overwinter. Originally I was designated as a wildlife refuge to give protection to trumpeter swans who were struggling due to lost nesting grounds. I'm proof that protecting important habits can really save animals because I now host a rebounded and healthy population of these swans.

Although the refuge has been a great success, many of the birds I host might start facing challenges as the climate here changes. Warmer temperatures in both the summer and winter seasons and less water availability means that other non-native species, of plants and animals, will likely start colonizing the refuge to take advantage of new conditions that suit their needs. While new species move in, species like wetland rushes that traditionally made up most of the wetlands might not be able to compete in the drier conditions. With all this change of new species coming and others getting pushed out, my whole habitat could start looking very different. I might not be the right place for many of the birds that have long called me home, and they might even have to move on to new locations. But I'll still be here as things change into the future, providing habitat to whoever can successfully make their home here.

## Gila Trout

### Gila River, USA

I'm one of the rarest trout species in the U.S, but it's certainly not easy being rare. I've been fighting to survive for a long time already. I was even listed as an official endangered species back in 1973. Although I'm doing better, they only call me a threatened species now, I'm facing new challenges.

Before I took cold mountain water for granted, but now I have to worry about the temperature of the water I'm swimming in, or if there's even any water to swim in. With less water in the streams from less winter precipitation the streams aren't full anymore and the rising air temperatures heat these especially shallow waters quickly. I can't survive long in waters that are too warm; it makes life difficult at all stages of life. Fires are also burning away the vegetation on the banks of the creeks, exposing those of us living in the water to even more heat. The ash from these fires is also dangerous. When too much ash gets washed into the creek when it rains it can be toxic and even deadly to us already stressed Gila trout.

But we're not totally on our own. Recently, when fires are looking particularly dangerous forest managers will move us to a safer section of stream. With people looking out for us and good forest fire management we'll have a shot at continuing to survive in the Gila River.

## American Bullfrog

### Columbus County, USA

Everyone's talking about how life is getting harder, but I've got to say us bullfrogs are doing okay - I'd even say we're doing good!

It's not so hard to survive when I can find more habitat as places are warming up. Some people might call it "invading" but I'm just living where I can find a good home and food to eat. I'm originally from the eastern U.S, but I've found good spots across the country and even down in South America and on other continents. I can travel pretty far on my own, even miles in a night time rain, but sometimes humans are even helping me get to new places and they don't even know it. Even the warming temperatures are helpful because now I'm living in places that used to be too cold.

I'm well adapted to living with changes. I'll eat just about anything so it's easy to stay well fed even in a new place. I eat invertebrates, snakes, frogs, rodents, and even my own young if I need to. Plus, away from my original home I have less predators who are adapted to hunting and eating me which makes life easier too. For now I'm going to keep enjoying what climate change is giving me so you won't hear me complaining.



# Southern Pine Beetle

## Eastern Texas to Maryland, USA

I might be small, almost too small for you to see with your eyes, but I'm making big moves in this warming world. I burrow into pine trees to lay eggs and live inside the wood. I'll admit that when I make my home in a tree it can cut the tree off from water and nutrients and the tree eventually dies. But I'm just doing what I can to survive and even thrive.

These days it's even easier to find trees to burrow into since so many trees are already weak from drought and overcrowding. Weak trees are good for us beetles because they can't fend us off. Whole forests of these weak trees are helping us Southern Pine Beetles move in and reproduce quickly, which is great for our growing population.

All this warmer weather is great in other ways too. We're from the South where it's warm all year, so our biggest danger is when temperatures drop below 14 degrees F. But we've noticed even up in the northeastern U.S. the winters aren't as cold these days and less freezing temperatures means we can survive all winter instead of dying off with the winter freezes. As long as temperatures keep warming we'll keep going where we can find trees and mild winters. Maybe we'll even head up into Canada in a few years when the winters warm up a bit.

# Western Larch

## Crown of the Continent, USA

I'm a unique kind of conifer tree that takes part in the annual fall foliage show in the northwestern U.S. and Canada. My needles turn a bright yellow and orange in the fall with the other deciduous trees and then fall off for the winter. But in the future the fans of my colorful needles may have to search further and further north to find me.

Dry and warm conditions could start shrinking my already limited habitat zone in the northern U.S., pushing me further into Canada. My seedlings prefer cooler and wetter areas to start our long lives, so these young larches may suffer in the heat. All of this change could weaken us, making larches more susceptible to diseases and insect outbreaks that threaten to further shrink our population. And like other western trees, the danger of fire looms on the horizon. But I might have some advantages here. I'm fire resistant to natural low severity fires thanks to my thick bark and deciduous needles. Fire even helps distribute my seeds. All this is helping me in the short term, but as drought encourages fires to burn hotter and longer, my natural adaptations might not be enough to spare me from fire damage and the impacts of climate change.

# Peach Trees

## California to Georgia, USA

As a peach tree, success comes when we bloom plenty of blossoms that turn into juicy fruit in the summer. But it's not only sun and blue skies that makes a peach tree bloom. It's cold winters that we need to bring the country a booming peach harvest.

Peach trees need between 650 to 850 hours in the winter that are below 45 degrees F to have successful spring blooms when the temperatures start to rise. These cold winter hours that we call 'chilling hours' allow the tree to go dormant for the winter until the spring temperatures signal the time to bloom. But if we can't get enough chilling hours we stay dormant, unable to bloom.

Winters aren't as cold as they used to be. Recently some places aren't even getting enough cold winter days to fulfill the needed chilling hours, and my lack of spring peach blossoms prove it. The warm winter of 2017 caused so many of us Georgia fruit trees to stay dormant we hardly had fruit that year. It's just a shame to see us peach trees bare with hardly any fruit to share around. Some scientists are looking to wild peach trees to get clues about how to create climate change resilient fruit trees, but until then I'll be hoping for cold winters.



# Corn

## Iowa, USA

Iowa and the Midwest are known as the Corn Belt of the U.S. for a reason - we've been growing successfully for many years. But we might not be bragging much longer. We've all heard about the drought and warmer temperatures climate change is bringing. So far our corn plants have been getting by knowing that after an extra hot day a cool night will follow. But now even the cover of night is not going to provide a reprieve from the summer sun. We usually use nighttime as a chance to breathe out, literally releasing oxygen without losing too much water to the sun. But now warmer nighttime temperatures mean we get no break from the heat and we'll lose more water to evaporation. These frequent hot days and nights mean we won't grow as tall and will look dried out and brown. We might even lose some of the development of our corn kernels we're known for.

As a plant I know the soil is the other half of the equation. The soil helps me get the nutrients and water I need to grow strong. But these drying conditions mean that soil can be washed or swept away in the strong storms we do get. It's hard to grow from unhealthy and eroding soil so we can't risk losing too much of it. Some farmers are finding ways to protect the soil by using cover crops when corn plants are out for the season. We're going to need these techniques to help us keep growing like we have been through these changes.

# Monarch Butterfly

## United States

I've become an icon because of my extensive migration patterns from the U.S. down to Mexico and back again every year. Although this migration path has never been easy, life at every step of the way is becoming more challenging and our numbers are shrinking because of it.

Before migration can even start, we begin our lifecycle as eggs laid on our favorite plant - milkweed. Once we transition to life as caterpillars, milkweed becomes our food too. Milkweed used to be abundant amidst crops in the midwest, making for great Monarch habitat. But the use of pesticides and pesticide resistant crops means we're losing our habitat on milkweed.

Habitat loss isn't our only struggle though, warming temperatures are confusing our internal calendars that tell us when to head south for the winter. We usually depend on the first cool fall days to tell us when to leave the northern U.S., but lately warm fall temperatures mean we are staying up north longer, up to six weeks sometimes. This later migration cue means we're traveling south later and risk getting caught in cold winter weather and storms. These storms are terrifying for such a small being and are oftentimes deadly. Fewer and fewer of us are surviving the harrowing journey to Mexico where the Monarch Butterfly Biosphere Reserve offers some protection. But even within this reserve our habitat on oyamel fir trees is not guaranteed. The oyamel fir is another species threatened by climate change, making it difficult to know if our winter safehaven will be around in the future.

# American Lobster

## New Jersey to Maine, USA

I used to be found all along the Northeast coast of the U.S., but recently water temperature changes are hurting lobsters in the southern waters.

As sea surface temperatures rise in my southern range, off the coast of New Jersey, New York and Connecticut, the lobster populations there have been falling. These warming waters make it harder for our young in the larval stages to survive to become adults. Temperatures above 20 degrees C increase our stress levels and weaken our immune systems making us susceptible to mass die offs and deadly parasites. This all sounds like us lobsters are in hot water, and we are, but thankfully our populations in northern areas of the Atlantic coast seem to be doing just fine for now.

Lobsters in Maine aren't yet experiencing sea surface temperatures warming above the 20 degree C/68 degree F stress threshold that is causing death further south. The Maine population is actually booming, as lobstermen will tell you. Although these cooler waters up north are keeping our population numbers up, we might have to keep shifting north as sea surface temperatures continue to rise. Even the Maine waters could soon be too warm. Researchers here in Maine tell us that these waters are warming 99% faster than sea surface temperatures in the rest of the world's oceans. All this warming makes it hard to tell where we'll be in the future, but it's likely we'll be further north where temperatures might stay cooler.





# Steelhead Salmon

## California, Oregon, Washington, USA

I'm one of the Pacific salmon species that migrates from freshwater to the ocean to grow into an adult and then back to my home freshwater stream to spawn and reproduce. These travels mean my habitat stretches great distances, but it seems that there's similar problems appearing across the waters I swim through.

Both in the freshwater streams us steelhead salmon are born in and then return to, and in the salty Pacific Ocean, water temperatures are increasing. Our inland waters are warming due to high temperatures and less tree cover over streams due to deforestation and development. Low stream flows due to shrinking glaciers and water diversion for other uses will only further this warming. Cold water not only keeps us salmon cool enough to survive at our early life stages, but it also holds more oxygen than warmer waters. We need plenty of dissolved oxygen in the water to breathe, just like humans need oxygen to breathe. And once we've migrated out to the ocean, cold waters aren't always a guarantee there either. Marine heat waves are becoming more frequent, and warm ocean waters make survival in our adult stages difficult too.

If only we could return to the furthest reaches of our traditional habitat in the mountains where waters may still be cold and clean. But the construction of dams from California up to Washington have shrunk our available spawning habitat and contributed to smaller population sizes. Fish ladders and other technologies at some dams are helping a few of us move up stream, but the loss of so much spawning habitat is hard to overcome.

# Eastern Beech Tree

## Appalachian Mountains, USA

As a common part of many forests in the eastern U.S., I'm concerned about where I'll be with this changing climate. The rising temperatures and more frequent droughts are concerning to many of us trees of the Appalachian Mountains and I'm worried about how I'll grow in these conditions. A warmer climate is likely to benefit my biggest nemesis, beech bark disease. This disease occurs when a scale insect and the fungal infection that follows infects our thin bark. It can kill young and old beech trees alike. Many of us are already infected, likely making us more susceptible to the stressors and pests that a warming climate will bring.

With more frequent drought and wildfires I'm again at risk because of my thin bark that does little to protect against fire. In stands where beech bark disease has taken hold the downed trees and limbs will only provide more fuel, creating more dangerous fires. On the other hand, winter will still bring challenges too. Like other hardwood trees, we can suffer damage after strong winter storms and we're slow to heal and regrow. With more extreme storms likely there's no doubt we'll keep facing losses to these storms. These weaknesses make me susceptible to the threats of climate change that could begin to push me out of my home forests.



# Jade Leyva



**I Have a Soul:** Is a piece that encompasses the duality of the Earth as well as the individual one represented as the day and the night. The tree as a central piece represents life itself and many things that come with it. Each branch ends with a hand doing something meaningful and fun. Many cultural subjects are depicted here for inspiration about diversity. Characters in the painting include: John Lennon, Gandhi, Isaac Newton, Virgin of Guadalupe and her son, Buddha, the feathered serpent, Catrina (Mexican iconic day of the dead figure), Krishna among others.

## Jade Leyva



**Let Your Creative Heart Flow:** This piece was created as the basic design for a seed mural Jade Leyva did with 19 detained young women at a youth detention center in Albuquerque, NM. The theme was created by her to inspire young people to let their creativity flow and they can then see how it evolves into beautiful things. The landscape is inspired in the central New Mexico area, the Rio Grande, local indigenous people, plants and fauna.

# Jade Leyva



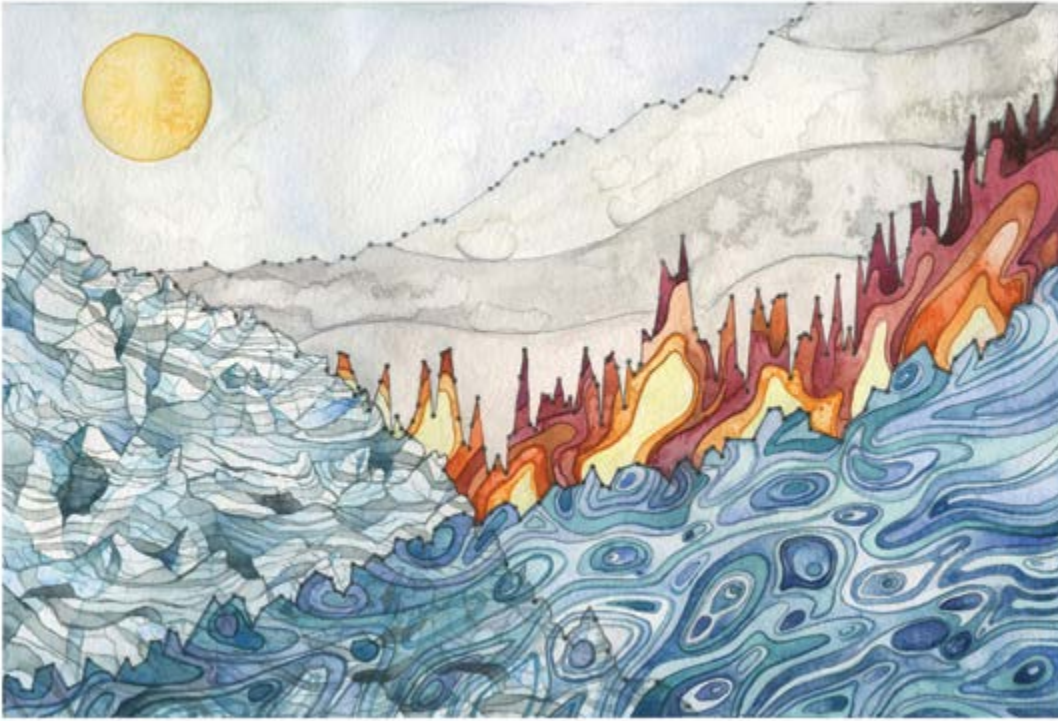
**Bee the Change:** This segmented mural was part of Jade Leyva's environmental awareness project which included several large scale murals made with seeds brought by Jade Leyva into 105 different locations in New Mexico. This one mural has 9 sections and they were designed by many New Mexico Artists that Jade Leyva asked to volunteer their work for it, including Endion Schichtel, Priscilla Garcia, Noel Dora Chilton, Ashley Cummings, Cate Clark, Christian Michael Gallegos, Dona Dowell, Dennie York, Emily Schuyler & Jade Leyva.

Each hexagon measures 3' wide and it was created by different communities gluing on seeds following the painted colors and patterns previously painted by local artists. All this work on this piece was meant to raise awareness about the importance of bees and their deep connection to everything else. This mural was donated to Valle del Oro Wildlife Refuge in Albuquerque and to be and it will be used to educate the community about bees.

We handed out free educational material and organic, local & drought tolerant wildflower seeds encouraging people to help our little buzzing friends by planting them in their gardens.



## Jill Pelto



**Landscape of Change** uses data about sea level rise, glacier volume decline, increasing global temperatures, and the increasing use of fossil fuels. These data lines compose a landscape shaped by the changing climate, a world in which we are now living.

## Jill Pelto



**Gulf of Maine Temperature Variability** tells the story of increasing temperature fluctuations in Maine's coastal marine environment. The watercolor uses ocean temperature data from the past 15 years to highlight how greater variability affects various species including ourselves. The piece also highlights the inattention to the coupled relationship between human action and environmental responses that has contributed to depleted fish stocks and increased ocean acidification. This Gulf of Maine story spans the water column: from the burrowing clams and bottom-dwelling lobster and shrimp, to the overfished cod which disappear across the painting as they struggle to return to a changing habitat, and finally up to the surface where fishers and managers may adopt sustainable practices or continue the practices that have resulted in overfishing and by-catch. Each species has a complex interaction with the environment, and if the imbalance of our give-and-take relationship with the ocean persists, we will continue to see new stresses that irreversibly change ocean conditions within the intertidal mudflats and into the yet unexplored ocean depths.



## Xavier Cortada



**Pinecrest Mangrove Forest 2, 2019:** In 2019, Xavier Cortada created Pinecrest Mangrove Forest, the county's first urban mangrove forest alongside his 200-ft long mural which was unveiled with representatives from local schools coming to plant the mangroves. The path between the mural and mangrove forest serves as a public space that connects Pinecrest Gardens and the Pinecrest Community Center. The area is also a beautiful backdrop to the popular Farmers Market held every Sunday year-round. Fifteen years after Miami Mangrove Forest, Cortada led the creation of Pinecrest Mangrove Forest, a mural that depicts the fully-grown mangrove forest the seedlings from the original mural would eventually become. However, Pinecrest Mangrove Forest functions more than just a metaphoric reforestation of the local area, but as a prompt for literal reforestation, a conceptual and practical evolution from its predecessor.

Mangroves are salt-tolerant plants that eventually grow into large trees most often found along coastlines. The environmental impact of mangrove trees existence in coastal areas should not be understated, as mangroves actively stabilize coastlines by reducing erosion and combat sea level rise by allowing for a buildup of sediment in the water. They also serve as an integral part of coastal ecosystems, the trees themselves providing shelter for a variety of marine and avian life. After witnessing the removal of mangrove forests within his community, Cortada set out to reclaim urban environments for nature through the planting and exhibition of mangroves throughout Miami. The focus of mangroves in Cortada's work can be initially seen in projects like Miami Mangrove Forest, a large-scale public art project from 2004 that saw the artist and volunteers paint mangrove propagules along the underbelly of Miami's I-95 interstate in an effort to create a conceptual reforestation of the urban area. This eventually led way to a literal reforestation of the urban Miami area in the Reclamation Project, initiated in 2006. The Reclamation Project was an attempt at reintroducing nature into the built environment, specifically to strengthen coastlines from storm surges, but also an acknowledgment of the precarious nature of such a meeting. Plan(T) builds upon this by looking towards the future, the importance of utilizing salt-tolerant mangroves to address issues of climate change facing Miami being paramount.

## Xavier Cortada



**Underwater HOA Elevation Drive, 2018:** Mapping the topography of a conceptual coastline is the basis of Cortada's *Underwater HOA* project, necessary "to make the invisible visible." Working in conjunction with Cortada's Antarctic Ice Paintings from 2006, *Underwater HOA* is a participatory art project that depicts South Florida's vulnerability to sea-level rise, specifically this vulnerability towards homeowners within South Florida. At Pinecrest Village's main thoroughfare, Killian Drive, featured Underwater Markers along a 2.5-mile stretch, between US1 and Red Road, to show drivers the gradual increase in elevation from one end of the street to the next. Art students from four local high schools helped Cortada map the elevation of four major intersections along Pinecrest's Killian Drive by painting his markers on the roadway.



# Xavier Cortada



**Endangered World (2009):** Eastern Hemisphere drawings, 180 graphite drawings on paper, each 9" x 12" 2009. The work depicts endangered animals originally featured in the artist's 2008 North Pole installation. Each animal represents an endangered or threatened species located at one of the globe's 360 longitudinal degrees; this image shows the 180 species of the Eastern Hemisphere. In addition to this installation, Cortada has leveraged this project to include participatory online and social media efforts, installation pieces at the Biscayne National Park, the North and South poles, Holland, and in the Netherlands. Cortada encourages participants to "adopt" a species and engage in eco-actions to help rebuild the ecosystems that these endangered animals need to survive.