Adapt Your Garden to Climate Change

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Forward

First, let me say this article has some facts that aren't fun. I wanted to address climate change issues before our class, to ensure everyone starts with the same background. While this handout is about problems, I promise the class will be about solutions.

Your homework is to complete reading this article. Also, when you arrive at the link " U.C. Davis researchers know our future temperature profile …" please read the first article on "becoming Arizona".

Introduction

Since the beginning of the Industrial Revolution, we have increased the amount of carbon dioxide (C02) from 300.0 ppm to 409.8 ppm. This is 121 billion Gigatons of carbon dioxide emitted into the Earth's atmosphere by using fossil fuels in transport, manufacturing, and agriculture. More important is the increasing rate of emissions and temperature rise. Doubling C02 in the Earth's atmosphere from the last ice age raised our global temperature enough to intensify the frequency and severity of weather events. The global temperature has risen by 1.5 ℃. Climate modeling indicates reaching 2 ℃ would move us from climate change to climate disruption. Climate disruption implies reaching tipping points from which all species, including humans, would face mass extinctions.

NASA - Climate Change Data and Research Conclusions

Accelerated C02 emissions starting in 1950 coincide with an increase in global average surface temperature rise.

Effect One - Global Warming

Atmospheric C02 from Glacial Ice Age 2019

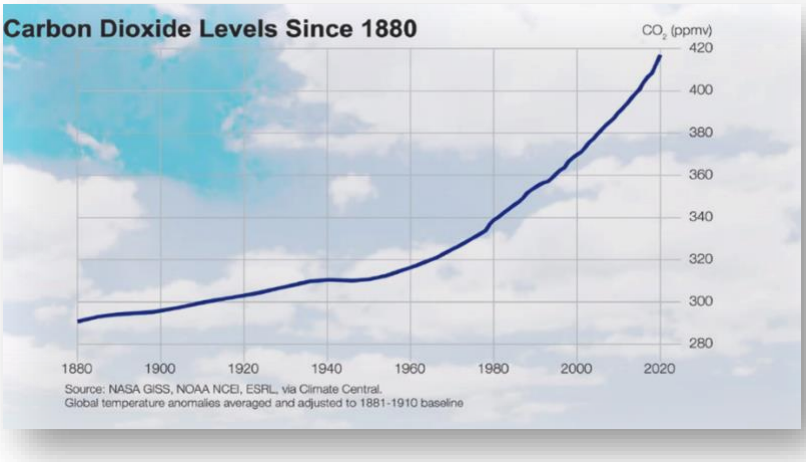

Figure 1.0 – Increasing Atmospheric Carbon

Global Rise in Average Surface Temperature

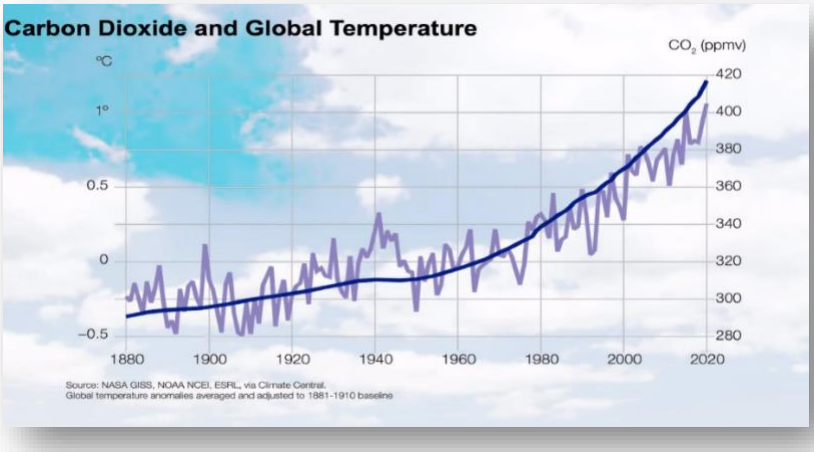

Figure 2.0 – Increasing C02 and Surface Temperature

Effect Two - Loss of Biodiversity

Increased global warming hastens the loss of biodiversity. The term biodiversity refers to life on Earth from genes to ecosystems. It encompasses the evolutionary, ecological, and cultural processes that sustain life. The most severe losses have been identified as biodiversity hotspots. The criterion to identify geographical hotspots are:

1. The biome must have at least 1500 endemic plants (vascular plants found nowhere else in the world).
2. The biome must have 30% or less of its original natural vegetation.

The International Union for Conservation of Nature (ICUN) has identified thirty-four hotspots around the world. If left unchecked, the combination of global warming and species extinction will result in massive desertification, food scarcity, and mass migration from uninhabitable areas in the world. California is a designated biodiversity hotspot.

NASA Climate Change - Mitigation, Restoration, Adaption

Currently, three main strategies are being developed to prevent climate disruption.

1. Mitigation by reducing global carbon emissions to zero within the next twenty to thirty years.
2. Draw Down of C02 which persists for hundreds of thousands of years in the atmosphere without intervention.
3. Adaption through conservation and restoration of species habitats based on temperature changes within regional biomes.

U. C. Davis - California Climate Predictions and Adaptive Strategies

The university's research on climate change is specific to the Sacramento Valley. U.C. Davis has this mission: "Sustainability". While many processes are global, solutions can be applied in local communities and scaled up to the state and national level. UCD is researching ways to adapt to impending climate changes through mitigation and conservation practices specific to the Sacramento Valley. Two degrees Celsius may seem like a few degrees we could tolerate. But global warming is not local weather. UCD has a website devoted to sustainability and climate change. It discusses future changes and solutions to global warming that apply to the Sacramento area. U. C. Davis researchers know our future temperature profile will mimic Arizona's climate today. The university is in touch with Phoenix and Tucson to research Arizona plants and animals adaptable to Sacramento's changing climate.

Recent California wildfires hint at a climate-disruptive future if we do not accelerate plans for mitigation, drawdown, and adaption. Are you thinking that California's climate is disruptive already? Certainly, California foreshadows unpredictable weather calamities. However, climate disruption forecasts more severe ecological events. Think of climate disruption in the same way you think of COVID-19. It is a global disruptive influence, from a known biological process (influenza), that is unpredictable.

Some climate disruptions are more severe than others. Scientists who study climate disruption are modeling for temperature tipping points within biomes. The Intergovernmental Panel on Climate Change's fifth climate assessment, AR5, defines a tipping point as "an irreversible change in the climate system". A climate model at the Woodwell Climate Research Center, Northern Arizona University, identified critical temperature tipping points beyond which plant's ability to capture and store atmospheric carbon dwindles. Such a process reversal would inhibit soil carbon sequestration.

Currently, photosynthesis acts as a carbon sink, drawing off some of the C02 we place in the atmosphere. The Woodwell Climate researchers noticed, in nearly every biome across the globe, there is a temperature maximum at which carbon uptake declines while carbon dioxide released back into the atmosphere accelerates. Looking at the current rate of global warming, they believe a photosynthetic maximum temperature may be reached within twenty to thirty years.

U.C. Davis – How Do Master Gardeners Support Local Habitat Mitigation, Restoration, and Adaption Strategies?

Yolo and Solano Master Gardeners are volunteer employees of the University of Davis. We can assist with community awareness regarding global temperature transitions affecting regional gardening. Additionally, we can offer conservation methods to support and restore biodiversity. Promoting species conservation, native plants, and regenerative gardening practices are part of the solution. Master Gardeners employ many climate-adaptive techniques that allow us to contribute insights and horticultural advice for impending climate changes.

Finally, we can follow UCD's continuing research on adaptive methods to connect our local communities to practical advice for our changing climate to deliver information to our communities. For example, the UC ANR Strategic Initiatives Group has a local research plot with native Arizona trees that fit well in the Sacramento area increasing our resilience as temperatures rise. The trees were chosen for their ability to blend with our current climate and biodiversity profile. Interspersing them with our natives will assist with food and nesting sources as some of our current natives become less resilient.

Take a look at the research about trees from Arizona for Northern California tomorrow. And continue checking in with the UCD's Sustainability website for updates on research about emerging adaption strategies.

In April 2021, our incoming Master Gardener class will train on climate change adaption techniques applied to home gardens. The class will survey useful traditional methods, along with new tools and technologies. They will emphasize gardening with biodiversity and biome conservation practices in mind.

Post-Graduation

Two classes, open to the public, will follow in the Summer –"Beginning and Advanced Adaptive Garden Design and Construction". The classes will address habitat restoration techniques for native plants and pollinators. We look forward to encouraging climate change actions to achieve resilience and sustainability in Yolo and Solano counties. Information and contact on classes will be posted on our Facebook page – Yolo County Master Gardeners.