Gardening in a Warming World

YOUR NE OHIO GARDEN AND CLIMATE CHANGES

PRESENTED BY MASTERGARDENERS OF ASHTABULA

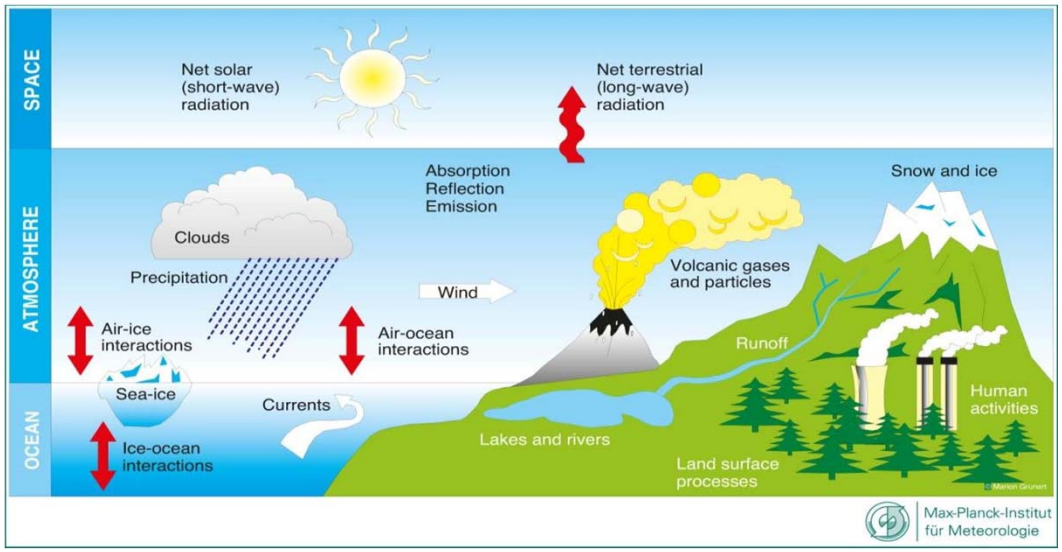
Human-caused climate change is affecting NE OHIO in multiple ways, including:

- an increase in temperatures
- extreme weather events (heavyrainfall, heat waves, and drought)

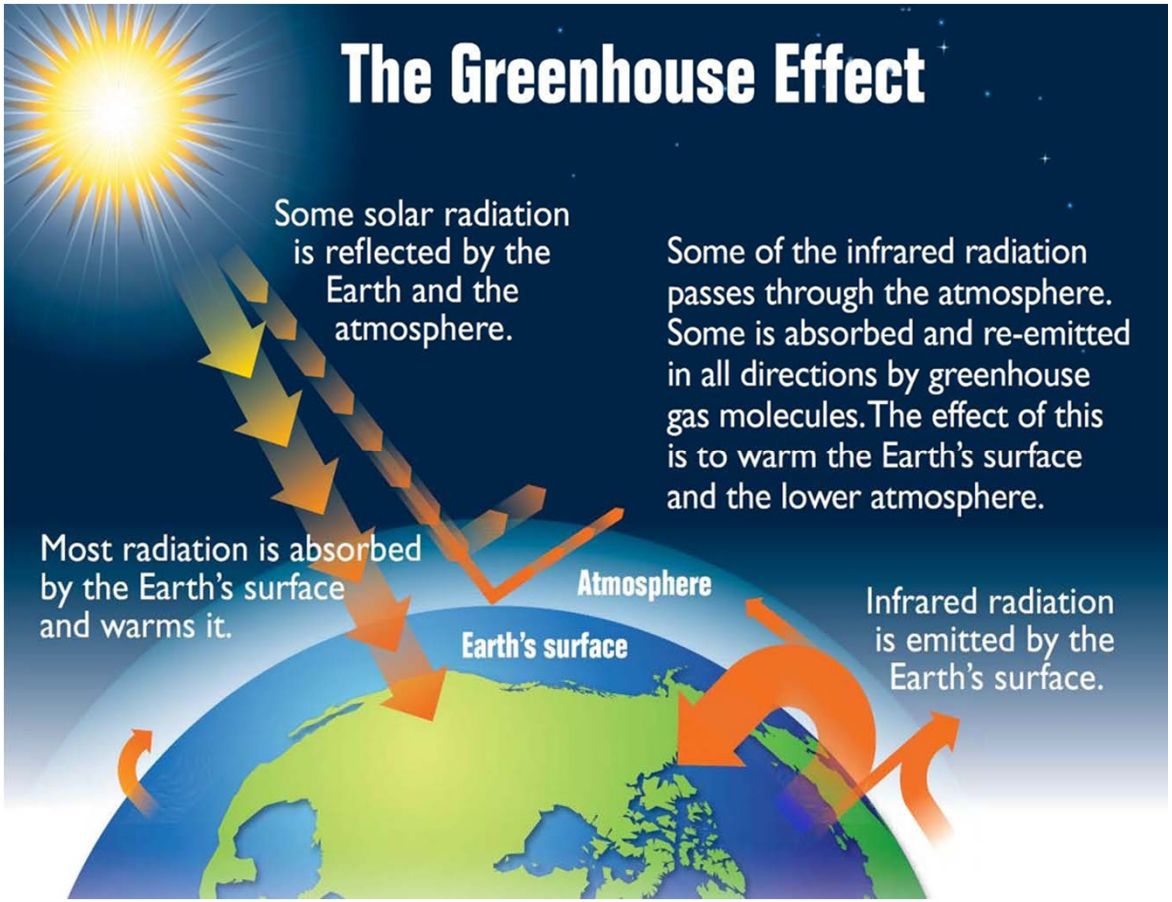
Changes in disease and pest pressure

All these effects pose risks for our farms, forests, garden, landscapes, and communities.

Defining weather and climate



- Weather is theshort-term variations of the atmosphere (from minutes to weeks).
- Climate is the prevalent long-term weather conditions in a particular place, over a period of 30+ years.


The Greenhouse Effect
Some solar radiation is reflected by the Earth and the atmosphere.
Some of the infrared radiation passes through the atmosphere. Some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.
Most radiation is absorbed by the Earth's surface and warms it.
Atmosphere
Earth's surface
Infrared radiation is emitted by the Earth's surface.

Greenhouse gases

Trap heat in atmosphere with

- Water vapor
- Carbon dioxide(CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Ozone (O_3)

Figure 12: U.S. Global Change Research Program. 2009. Climate Literacy: The Essential Principles of Climate Science. Retrieved 31 July 2017. https://www.climate.gov/teaching/essential-principles-climate-literacy/essential-principles-climate-literacy

The Changing Climate…

- 1.5 degrees F increase globally in temperatures since 1880
- US average temp has increased 1.3 degrees F to 1.9 degrees F since 1895, most of the increase since 1970
- Warmest three years: 2014- 2016
- Hottest year ever recorded: 2016
- Longer summers, warmer winters
- Business as Usual= +4 degrees F to 10 degrees F by 2100

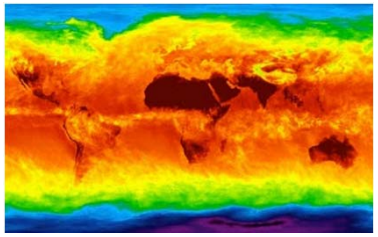


Figure 13: Temperatures on Earth as recorded by an infrared sensor on NASA's Aqua satellite. Credit: AIRS Science Team, NASA/JPL.

- Temperatures on Earth as the last ice age was 8 degrees F colder, June, 2017. Recorded by an infrared sensor on NASA's Aqua satellite. Credit: AIRS Science Team, NASA/JPL. Retrieved

1 https://phys.org/news/2013-05-pressure-density-exoplanets-atmospheres-odds.html

Every Season is Warming

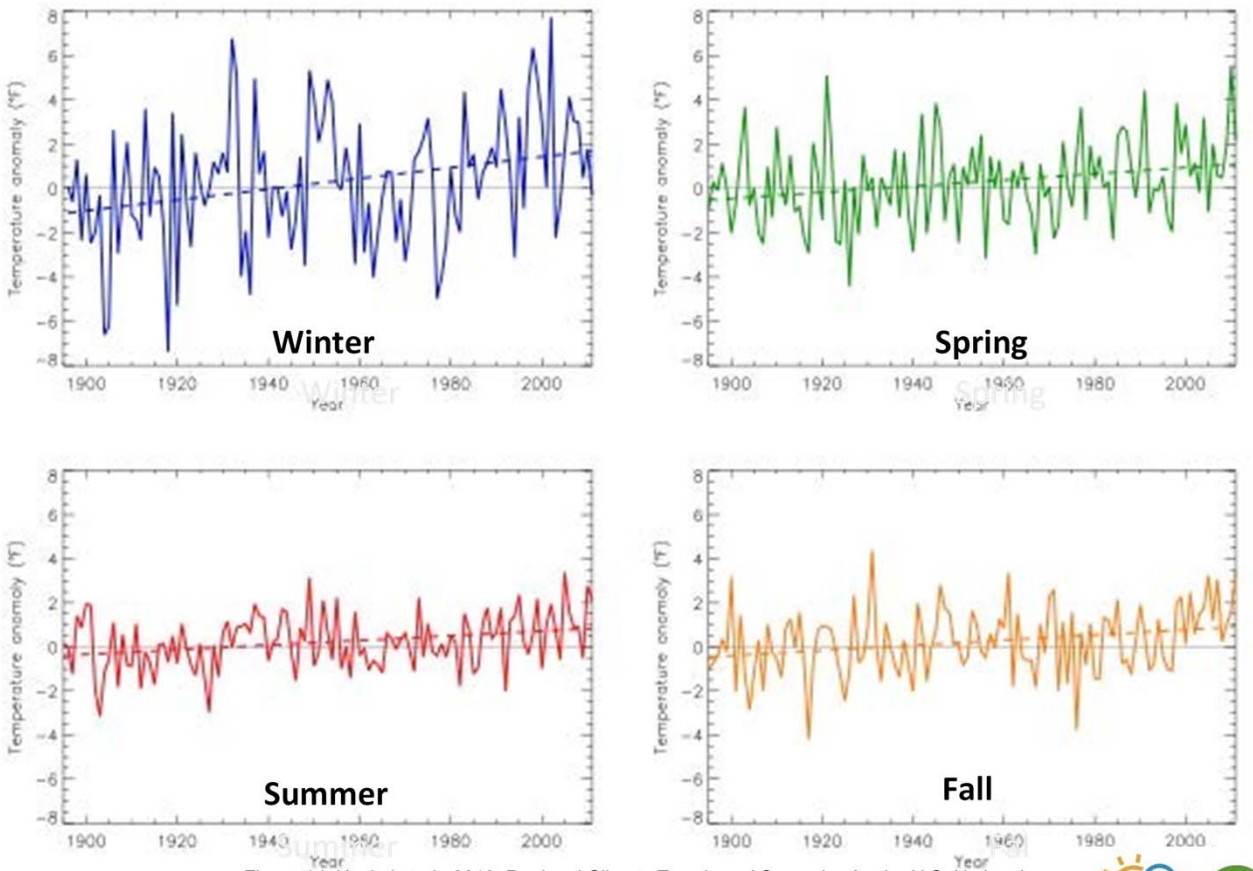


Figure 14: Kunkel et al., 2013: Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 9. Climate of the Contiguous United States. NOAA Technical Report

CSF
Cornell Climate Smart Farming

EPA'S CLIMATE CHANGE INDICATORS

Greenhouse Gases
- U.S. Greenhouse Gas Emissions
- Global Greenhouse Gas Emissions
- Atmospheric Concentrations of Greenhouse Gases
- Climate Forcing

Weather and Climate
- U.S. and Global Temperature
- High and Low Temperatures
- U.S. and Global Precipitation
- Heavy Precipitation
- Drought
- Tropical Cyclone Activity

Oceans
- Ocean Heat
- Sea Surface Temperature
- Sea Level
- Ocean Acidity

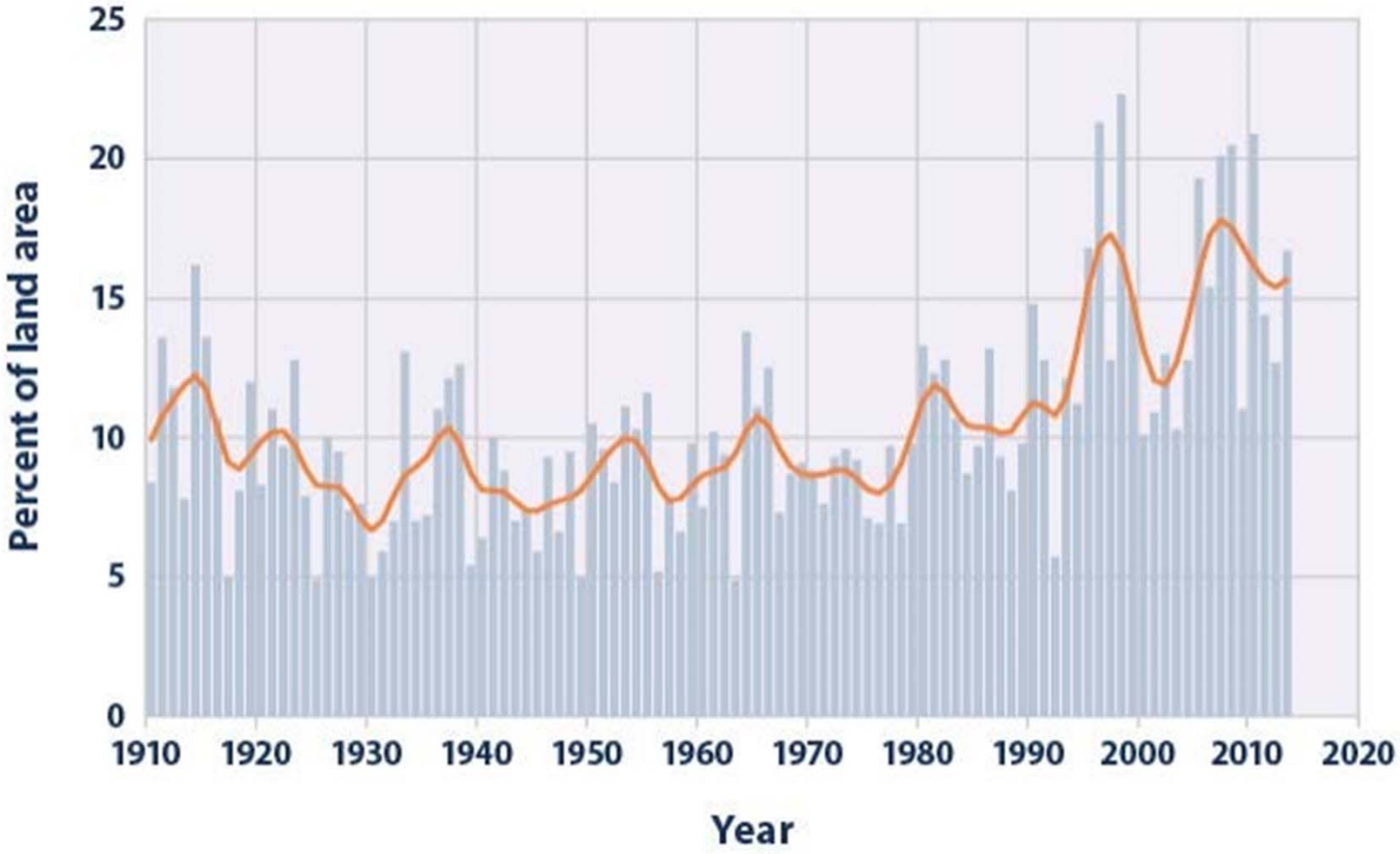
Snow and Ice
- Arctic Sea Ice
- Glaciers
- Lake Ice
- Snowfall
- Snow Cover
- Snowpack

Health and Society
- Heating and Cooling Degree Days*
- Heat-Related Deaths
- Lyme Disease*
- Length of Growing Season
- Ragweed Pollen Season

Ecosystems
- Wildfires*
- Streamflow
- Great Lakes Water Levels and Temperatures*
- Bird Wintering Ranges
- Leaf and Bloom Dates

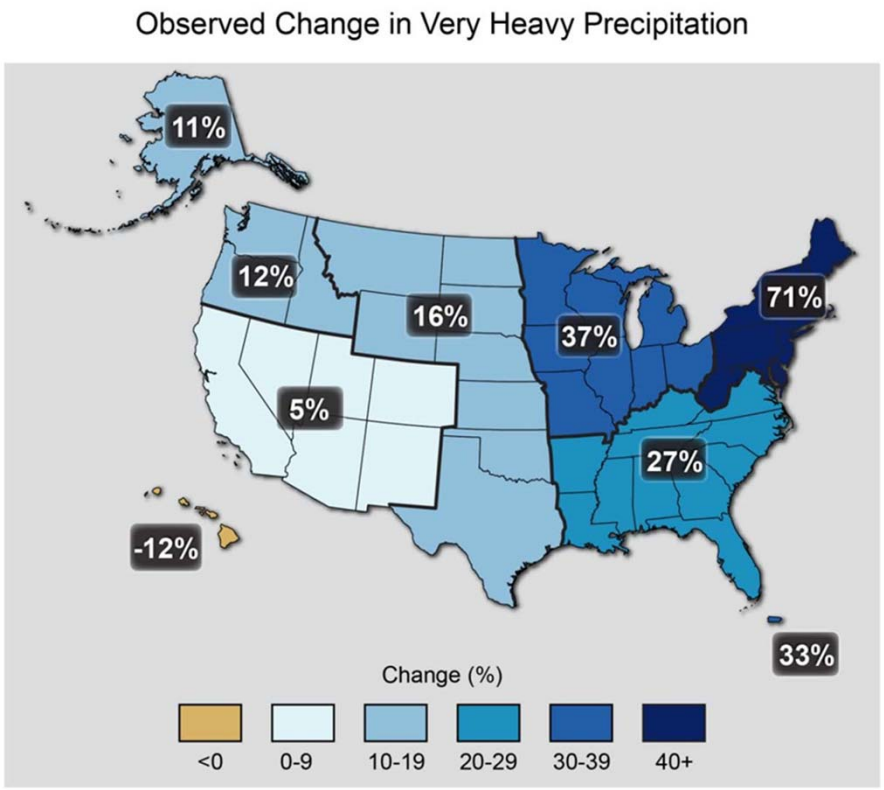
Features * = *new in 2014*

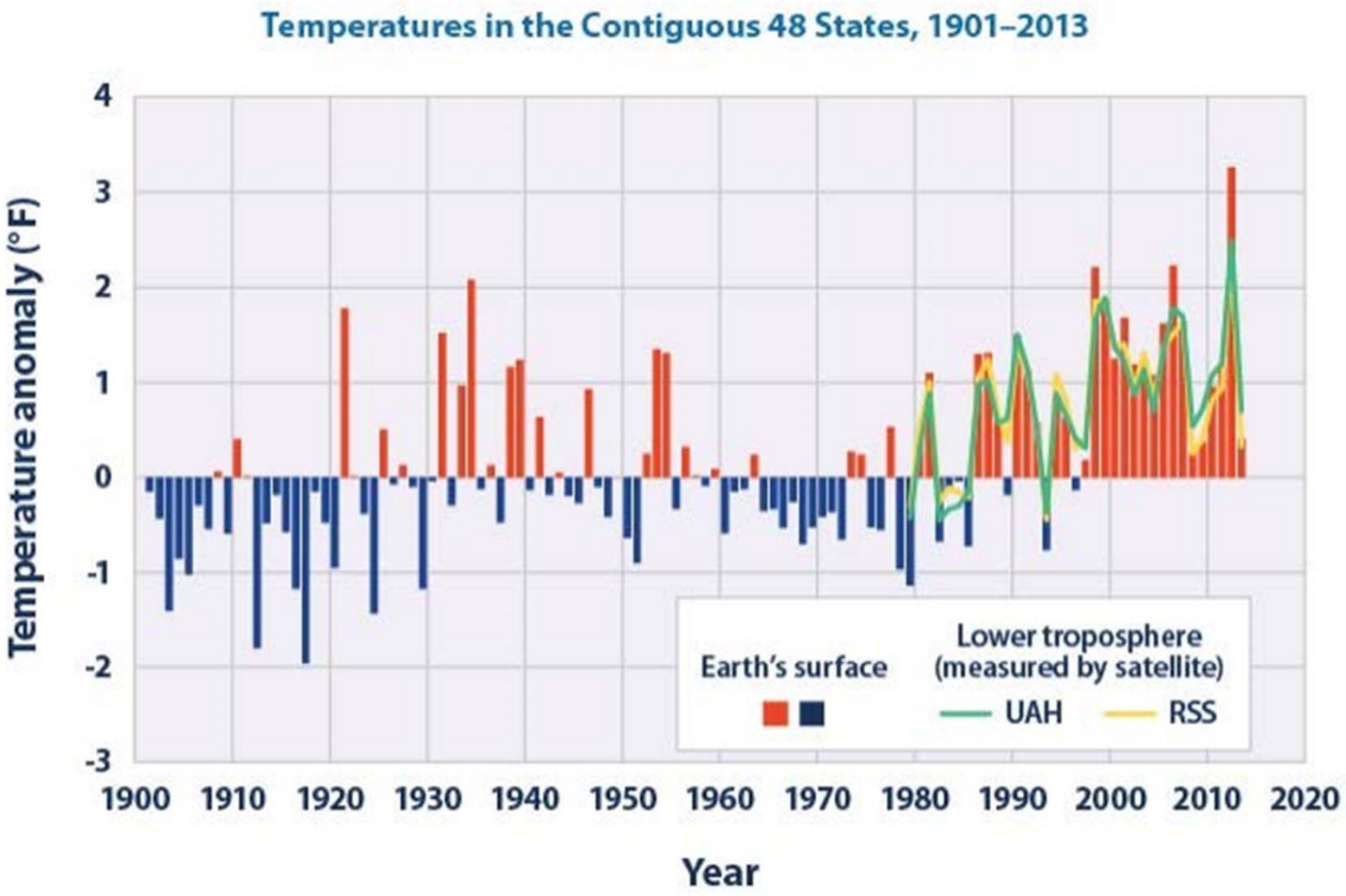
Extreme One-Day Precipitation Events in the Contiguous 48 States, 1910–2013



Data source: NOAA (National Oceanic and Atmospheric Administration). 2014. U.S. Climate Extremes Index. Accessed March 2014. www.ncdc.noaa.gov/extremes/cei.

Observed Trends in 1-day Very Heavy Precipitation (1958 to 2012)





Data source: NOAA (National Oceanic and Atmospheric Administration). 2014. National Climatic Data Center. Accessed May 2014. www.ncdc.noaa.gov/oa/ncdc.html.

CLIMATE CHANGE FACTS

- Invasive species increases
- Earlier spring bloom dates
- Longer growing season
- Sea level rise
- Storm surges
- Changes in water level of the Great Lakes

CLIMATE CHANGE FACTS

Mitigation (of climate change): Implementing actions to reduce the sources of greenhouse gas emissions.

Adaptation (to climate change): The process of adjustment to actual and expected climate and its impacts.

Integration of local knowledge with additional scientific and technical knowledge can improve disaster risk reduction and climate change adaptation. Local populations document their experiences with the changing climate, particularly extreme weather events, in many different ways, and this self-generated knowledge can uncover existing capacity within the community.

CLIMATE CHANGES AND YOUR GARDEN

We are seeing increases in extinction of species, decreasing forestation, decreasing fish stocks, decreasing coral reefs that sustain sea life, increasing CO2 concentrations in our air, increasing methane concentrations that are destroying our permafrost and increasing global temperatures.

The result is that we can look forward to more extreme weather, droughts, and reductions in food supplies.

So……..…what can we, as gardeners, do?

WHAT CAN WE DO?

ACCORDING TO ONE LANDSCAPE DESIGNER, WE CAN DO THE FOLLOWING…….

MAKE OUR GARDENS A GREEN SPACE BY PLANTING **TREES, SHRUBS, FLOWERS AND EDIBLES.**

TREES AND SHRUBS IN YOUR GARDEN ARE FORMS OF **REFORESTATION**. THEY PROVIDE AN ENVIRONMENT FOR VARIOUS SPECIES OF INSECTS, BIRDS, AND MAMMALS.

ORNAMENTALS ATTRACT POLLINATORS REQUIRED FOR OTHER PLANTS, SUCH AS FRUIT TREES.

MINIMIZE THE AMOUNT OF HARDSCAPE (CONCRETE PATIO) WHICH IS NON POROUS AND DO NOT ALLOW WATER TO GET INTO THE GROUND.

WHAT CAN WE DO?

CONSERVE MOISTURE BY ADDING MULCH WHICH KEEPS THE SOIL COOL AND MOIST, KEEPS WEEDS OUT, CONTRIBUTES TO THE SOIL HEALTH.

MANAGE STORM WATER COLLECTION TO REDUCE DAMAGE WITH SWALES, RAISED BEDS, AND WATER STORAGE FOR LATER USE.

We Need to **Adapt** to Climate Change

- **Plant selection-** diversification- experimenting with new species and varieties tolerant to new weather extremes, able to take advantage of longer growing season
- **Earlier planting dates**
- **More vigilant weed and pest monitoring and control**
- **Improved water management**
- **Build healthier soil** with more organic matter for better water holding capacity, better drainage
- **Increase irrigation capacity**
- Better **Drainage systems**
- **Frost and freeze protection**
  - Freeze blankets
  - Mist irrigation
  - Modify pruning timing and severity

Concluding Remarks

- The pace of change today and projected for this century is such that we cannot rely on historical records to tell us what to expect from the weather, and what plants to grow.
- Longer growing seasons and shifts in hardiness zones will allow gardeners to explore new species and varieties, but some long-time favorites may no longer be suitable to the shifting climate.
- Insect, weed and disease pests will be changing and more difficult to control
- Water management will be more challenging with threats for more short term flooding and summer drought.
- There are many things gardeners can do to lead the way in climate change adaptation and mitigation.


THANK YOU!
QUESTIONS?