

**Regenerative Gardening:
Growing food successfully & sustainably
in a changing climate**

We will be starting in a minute!!

Thanks again to our co-sponsors:



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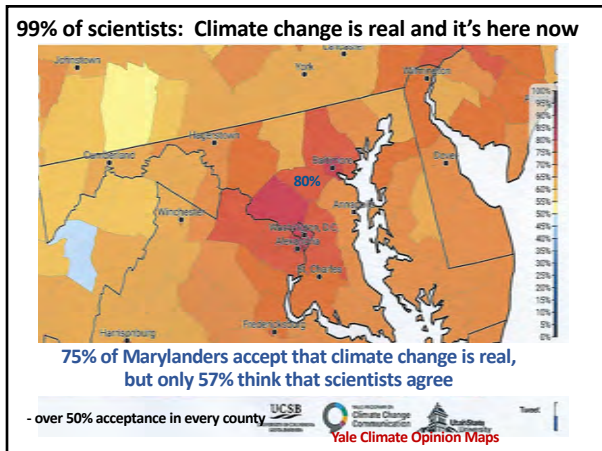


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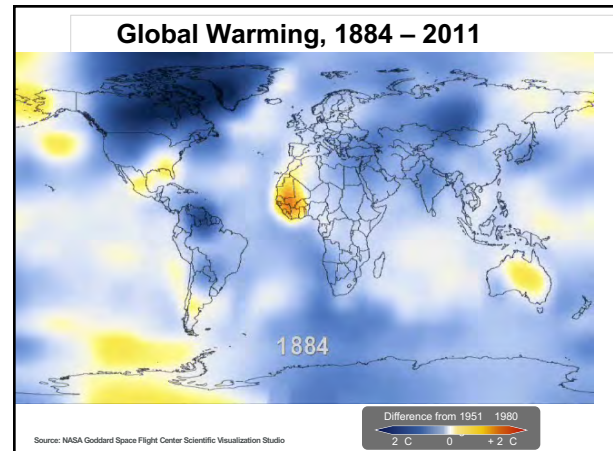
Dr. Sara Via
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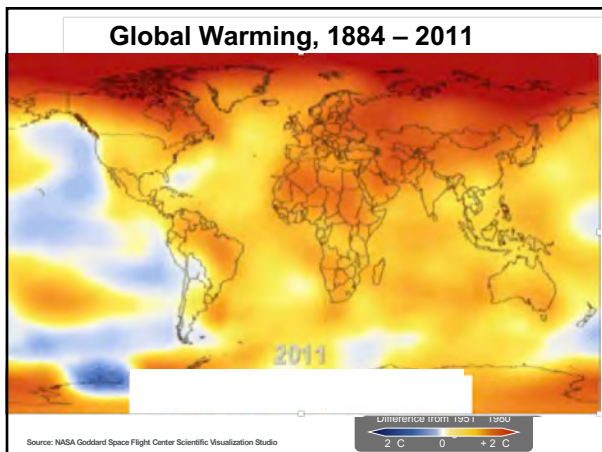
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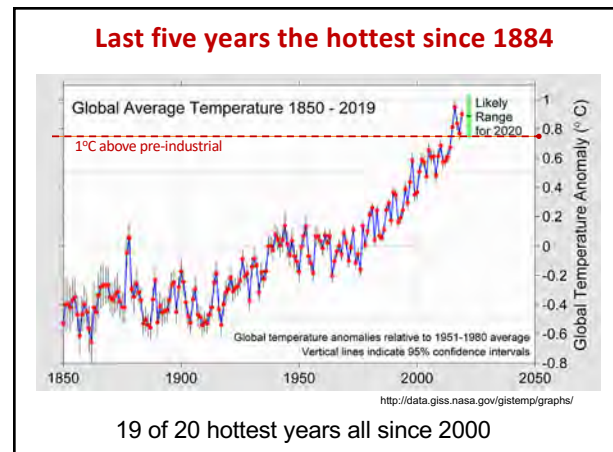
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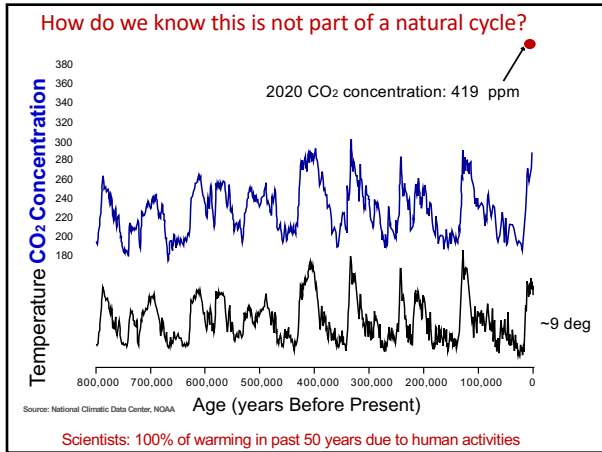
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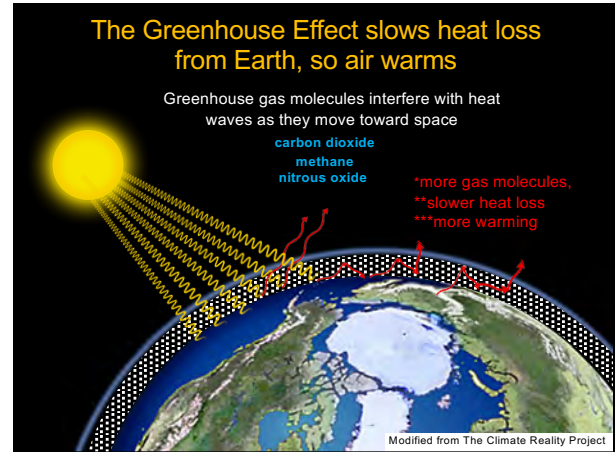
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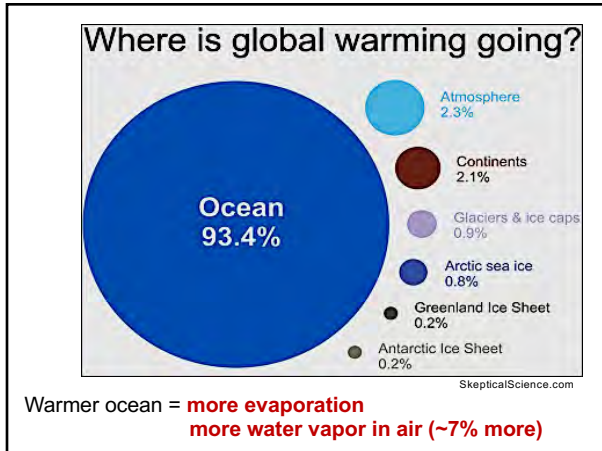
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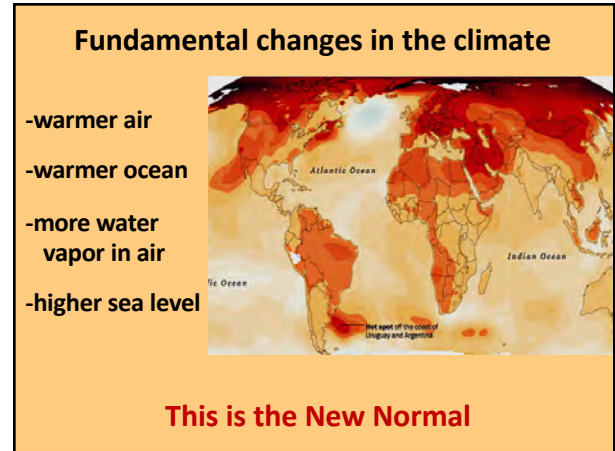
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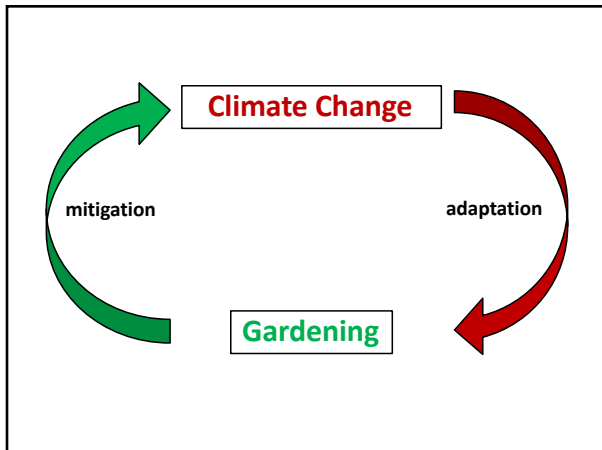
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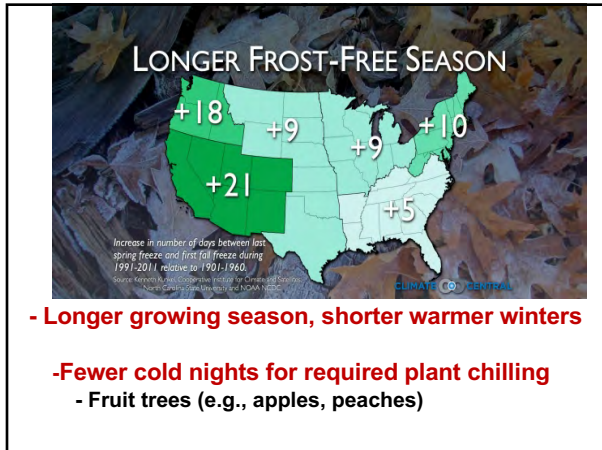
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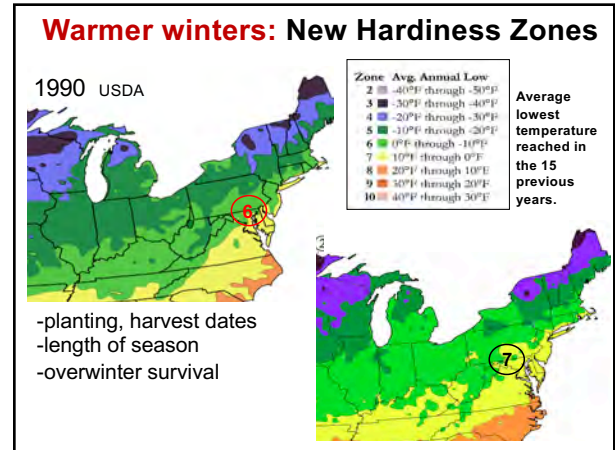
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- The New Normal in the Garden**
- 1. Rising temperatures**
 - warmer winters, earlier springs
 - more extremely hot days, longer heat waves
 - fewer cool nights
 - increased temperature variability
 - 2. Heavier downpours**
 - 3. More possibility of drought**

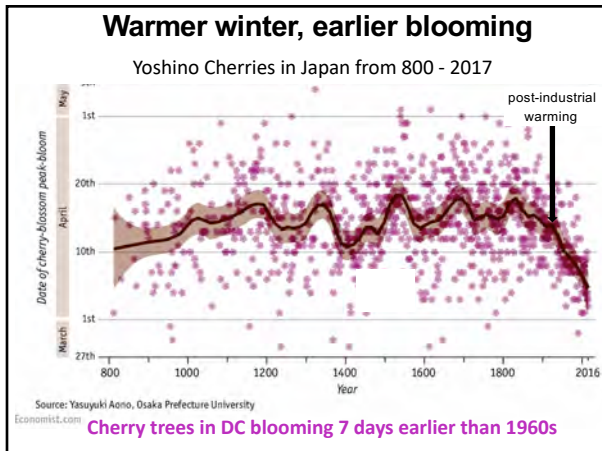
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Effects of warmer winters: weeds



Weeds benefit more than native plants or crops

- better overwinter survival
- earlier flowering time

Weeds have a competitive edge

Mulch in fall to slow down overwintering weeds

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Adapting to increasing weed pressure

- Mulch!
- Stop tilling
- Weed early
- Weed often
- Get them when they're small!






"Garden Bandit"
 Hand hoe
 Scuffle hoe

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Effects of warmer winters: animals

- Deer: more food available during winter**
 - healthier populations
 - higher overwinter survival
 - increase in # offspring
- **White-footed mouse** also benefits, so more Lyme disease



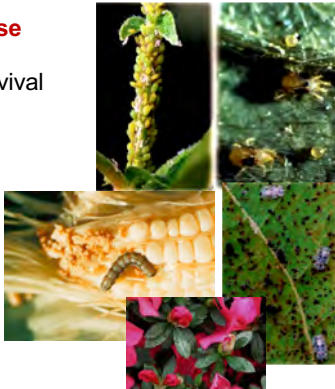
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Effects of warmer winters: animals

Pest insects & disease

- better overwinter survival
- earlier appearance
- more generations/yr
- range expansion

What to do??



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Pests appear earlier, reproduce more quickly and may differ year to year.

- Be vigilant (learn signs of damage!)




- Consider row covers
- Decide on control strategy before pests arrive

Consult the experts at Home & Garden Info Center
<https://extension.umd.edu/hgic>



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Call in the cavalry: Natural enemies!

Attract insect predators and parasitoids with flowers & native plants!





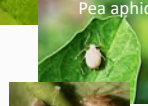


- Native flowers provide nectar, pollen, and protection
- Mulch your beds to provide cover & winter protection



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Biocontrol: Encourage parasitoid wasps or flies

What's a parasitoid?

Tomato hornworm
 Corn earworm egg
 Pea aphid
 Pathogenic fungus

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Hazard of warmer winters: "False Spring"


Warm February then hard freeze in March or April

cover up if valuable

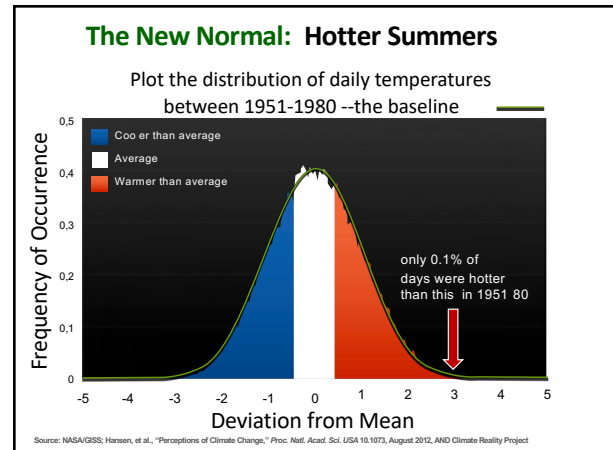


2017

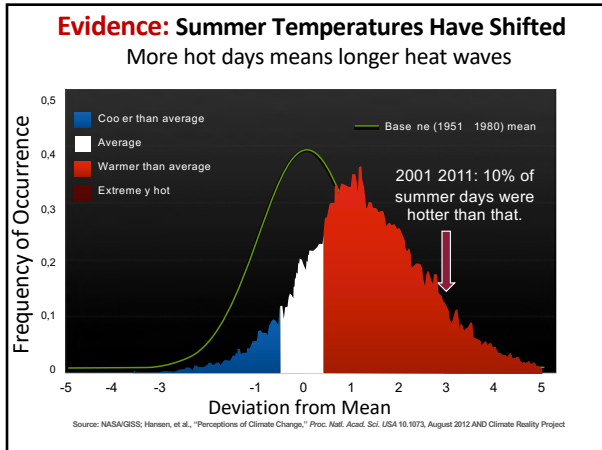
Flowering trees may lose the year's blooms



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Heat stress reduces pollination, fruit set & quality

Tomato Pollination and Excessive Heat July 12, 2012 Jerry Brust, IPM Vegetable Specialist University of Maryland; jbrust@umd.edu

Combination of Pollination Failure and Kernel Abortion

Peppers drop flowers and fruit when Day temp > 90 Nite temp > 75

Take care of yourself too!

Source: TAMU

Adapting to increased temperature

- Plant earlier in spring, later in fall (last/first frost dates are changing)
- Mulch (plant material, white or reflective)
- Try heat tolerant varieties
- Build shade or use row cover for heat sensitive crops

Reflective mulch, shade cloth save GA peppers (Carlos Diaz-Perez UGA)

HEAT TOLERANT CROPS BEAT THE HEAT

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Drought is more likely with climate change

Warmer & longer summers but no increase in rain

California: extreme case with prolonged drought expected.

Maryland will not escape
Flash drought in 2019
Oct 1: "Abnormally Dry" to "Moderate Drought"

Watering wisely is crucial

US Drought Monitor <https://droughtmonitor.unl.edu/>

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Use water wisely

- Mulch!!
- Use drip irrigation, soaker hoses or water breakers
- No nozzles or sprinklers
- Water deeply every few days

Water breaker & full-flow cutoff

Soaker hoses under paper

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Heavy Downpours Increasing

to 2012 in the amount of precipitation falling in very heavy events. is defined as the heaviest 1% of all daily events from 1958-2012.

Center for Urban Agriculture

May delay planting, wash out or contaminate fields, stunt or kill plants, increase disease, cause soil compaction (healthy soil helps!)

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What's a gardener to do?

Too much water?

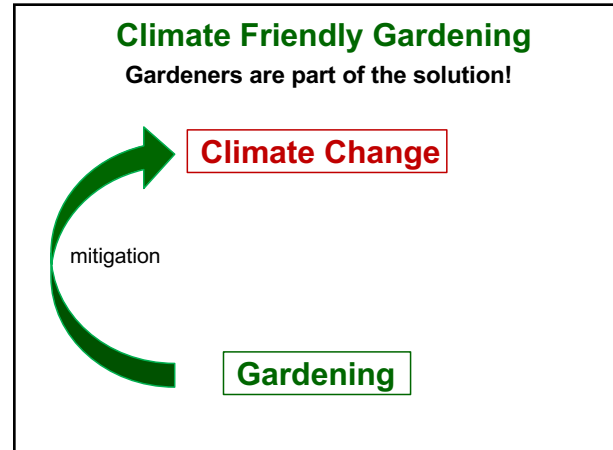
- Improve drainage
- Monitor food safety
 - throw produce that has touched floodwater away
 - many foods can't be washed
 - fruits off the ground may be OK
- Try raised beds






Foodsafetynews.com

<https://ohioline.osu.edu/factsheet/hyg-1154>




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Start with climate-friendly transplants

Garden Center transplants: Usually in disposable plastic pots, may have been sprayed, potted in peat-based mix

Growing your own transplants is easy!

- need a few shop lights (preferably LED)
- 4' wide shelving unit, timer
- reusable pots or plug flats





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Start with climate-friendly transplants

Sustainable potting mix means reduced peat moss


Alternatives:

- coconut coir
- rice hulls
- paper (Pittmoss)
- sand
- compost

Possibilities:

- 50% regular seed starting mix & 50% coir
- 20-25% each: regular mix, coir, sand, compost, paper or rice hulls

Watch out for water retention, & fertility since these will differ from regular mix




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Regenerative Gardening

Build soil health!

- Don't till!
- Use organic material for mulch-- holds water, yet drains, decomposes to feed soil
- Add compost – food scraps, and compost your leaves this year!
- Plant cover crops
 - add organic material
 - can add nitrogen
 - feed soil microbes
- Control erosion by keeping soil covered






Oldworldgardenfarms.com

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Climate-Friendly (Regenerative) Gardening

Reduce emissions

- Use hand tools (or electric)
- Reduce lawn, plant low-mow mix
- Weed smart, weed early
- Mulch-- NO bare soil around plants
- Cover crops-- NO bare soil in beds overwinter
- limit synthetic N fertilizer







<https://rodaleinstitute.org/science/articles/choosing-the-best-cover-crops-for-your-organic-no-till-vegetable-system>

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Climate Friendly Gardening: No-Till



Reduce emissions: Stop tilling

- Leaves soil structure intact, improves infiltration
- Keeps decomposable carbon underground
- Keeps weed seed underground
- Bonus: saves fuel and your back

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No-Till Gardening!

Make permanent beds & rows

- Don't walk on beds
- Deep mulch in rows

Set up drip irrigation in rows

No bare soil -- cover crops!

Choose cover crops for your purpose

- Terminate cover crops with mower, string trimmer, tarps...




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Thank you!



Email me anytime with questions:

Dr. Sara Via
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July 15: Regenerative Landscaping

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**THE OHIO STATE UNIVERSITY**COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCESextension.osu.edufcs.osu.eduplantpath.osu.edu

Food Safety and Garden Flooding

HYG-1154

Date: 12/02/2016

Melanie Lewis Ivey, PhD, Assistant Professor, Fruit Pathologist, Department of Plant Pathology
Sanja Ilic, PhD, Assistant Professor and Food Safety State Specialist, Department of Human Sciences, Human Nutrition

Heavy rains followed by flooding can negatively affect plants in the garden. When plants are exposed to floodwater for prolonged periods of time the roots are deprived of oxygen and the plants can suffocate and die. For vegetables and other tender plants, several days of flooding can cause rapid rotting and death. In addition, contamination of fruits and vegetables by floodwater can create a food safety hazard.

As floodwater moves into your garden it can come into contact with raw sewage overflow, farm and domestic animal waste, river or pond water, compost piles, and agricultural run-off, all of which are sources of human pathogens and hazardous chemicals. If your garden has been exposed to floodwater, human and foodborne pathogens such as norovirus, *Salmonella*, pathogenic *E. coli*, Hepatitis A, Giardia and Cryptosporidium, have likely been introduced into the garden. Gardeners and other people who mishandle and/or consume fresh produce exposed to floodwater are at risk of gastrointestinal illnesses (i.e., vomiting, stomach cramps and diarrhea).

Not all produce in the garden is equally at risk of becoming contaminated by pathogens present in floodwater. Factors such as the level of submersion, crop type, crop maturity and the method of food preparation all need to be considered when determining the best way to handle produce exposed to floodwaters.

Guidelines for Handling Produce Exposed to Floodwater

Discard produce that has come into direct contact with floodwater

The most conservative approach to handling any produce that comes into *direct* contact with floodwater is to destroy it. Fruits and vegetables do not have to be completely submerged in floodwater to become contaminated with pathogens. Produce that has had indirect contact with floodwater, for example by



splashing, does not have to be destroyed but should not be harvested or consumed immediately. Wait 72 hours prior to harvesting, then thoroughly clean and cook the product before eating it. Root and tuber crops such as carrots, beets, onions and radishes, are not protected from floodwater and should not be consumed raw. Whether exposed directly or indirectly to floodwater, any produce that is meant to be eaten raw should not be consumed.

High-risk crops should not be consumed

Several crops present a higher food safety risk than others. Leafy greens, berries and other soft fruits, and cantaloupe should be thrown away as pathogen removal by washing or sanitation is nearly impossible.

Consider crop maturity

Plants with fruit (i.e., tomatoes, strawberries, peppers) that have not fully matured or ripened at the time of flooding present an unknown food safety risk in terms of foodborne pathogens. If immature fruit have not come into *direct* contact with floodwater they can be left on the plant and consumed once they are mature (ripe). Any fruit *directly* exposed to floodwater, whether ripe or not, should be destroyed.

Contaminated produce should not be preserved

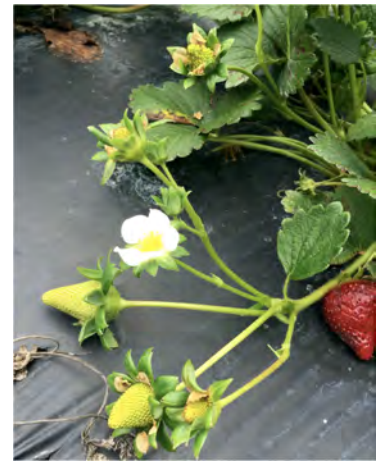
The quality of produce exposed to floodwater is likely low and therefore it is not recommended for home food preservation. Floodwater may contain hazardous chemicals as well as foodborne and human pathogens, which can affect the quality of the produce. As preserving will not change the quality of the produce it may provide an environment for harmful bacteria and viruses to grow and/or survive.

Wash hands and surfaces to prevent cross-contamination

Cross-contamination is the physical movement of harmful microorganisms from contaminated produce to other food, surfaces or gardeners. After handling produce exposed to floodwater thoroughly wash your hands with soap and water for at least 30 seconds and dry your hands with a disposable paper towel. Remove soil, plant debris, and sap from garden tools and harvesting containers and then sanitize them with a disinfectant such as Lysol, diluted bleach (one part bleach to nine parts water), or rubbing alcohol (ethanol or isopropyl). These practices will also prevent the spread of plant diseases. A resource on disinfecting gardening tools is provided under Suggested Resources.

Do not immediately replant your garden

Soil saturated with floodwater is a source of human pathogens and parasites. Limited information is available on the persistence of foodborne pathogens in soils following a flooding event. To minimize the potential of product re-exposure by contaminated soil, do not replant into soil for 2–3 months.



Consider raised bed gardening

One way to prevent direct contact of floodwater with fruits and vegetables is by raising the soil level using raised beds. Beds should be 18 to 36 inches tall and filled with a mixture of peat moss, compost and clean soil to optimize drainage. Details on how to build a raised bed are provided in the fact sheet “Home Garden Series—Raised Beds,” which is listed under the Suggested Resources section below. Raised garden beds also prevent soil compaction and erosion, improve soil drainage, and serve as barriers to pests such as small animals, slugs and snails.

Suggested Resources

Fontenot, K., and Johnson, C.E. 2015. Home Garden Series—Raised Beds. Pub#3360. School of Plant, Environmental and Soil Sciences, LSU AgCenter, Baton Rouge, LA.

University of Florida. 2015. Disinfecting Your Garden Tools. University of Florida-IFAS Extension, Gainesville, FL. Available online at gardeningolutions.ifas.ufl.edu/care/tools-and-equipment/disinfecting-tools.html.

References

Centers for Disease Control and Prevention. 2011. Guidance on Microbial Contamination in Previously Flooded Outdoor Areas. Department of Health and Human Services, Atlanta, GA.

Lewis Ivey, M.L., Xu, W., and Fontenot, K. 2016. Food Safety and You: Microbial Safety of Fresh Produce in Home Gardens After Flooding. Pub#3536. LSU AgCenter, Baton Rouge, LA.

Schmid, D., Lederer, I., Much, P., Pichler A.M., and Allerberger, F. 2005. Outbreak of norovirus infection associated with contaminated floodwater, Salzburg, 2005. *Eurosurveillance* 10.

Ohioline

<https://ohioline.osu.edu>

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