



WASHINGTON STATE UNIVERSITY
EXTENSION

The Resilient Yard: Vegetable Gardening with EASE

Laura Matson
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matsonl@mac.com



Master Gardener Vision

Engaging university-trained volunteers to empower and sustain diverse communities with relevant, unbiased, research-based horticulture and environmental stewardship education.



Master Gardener Volunteers teach creative ways to build resilient landscapes that can adapted to our changing climate in order to support resilient and healthy communities.



Master Gardener Volunteers promote the use of sustainable techniques for growing food to improve access to fresh, nutrient-dense foods and support individual and community health and wellness.



Who is in the audience?



- Years of experience vegetable gardening?
 - Less than 2 years
 - 3-10 years
 - More than 10 years
- How do you rate your gardening knowledge and skills under our current climate change conditions?
 - Novice
 - Beginner
 - Advanced
 - Expert



Presentation Overview

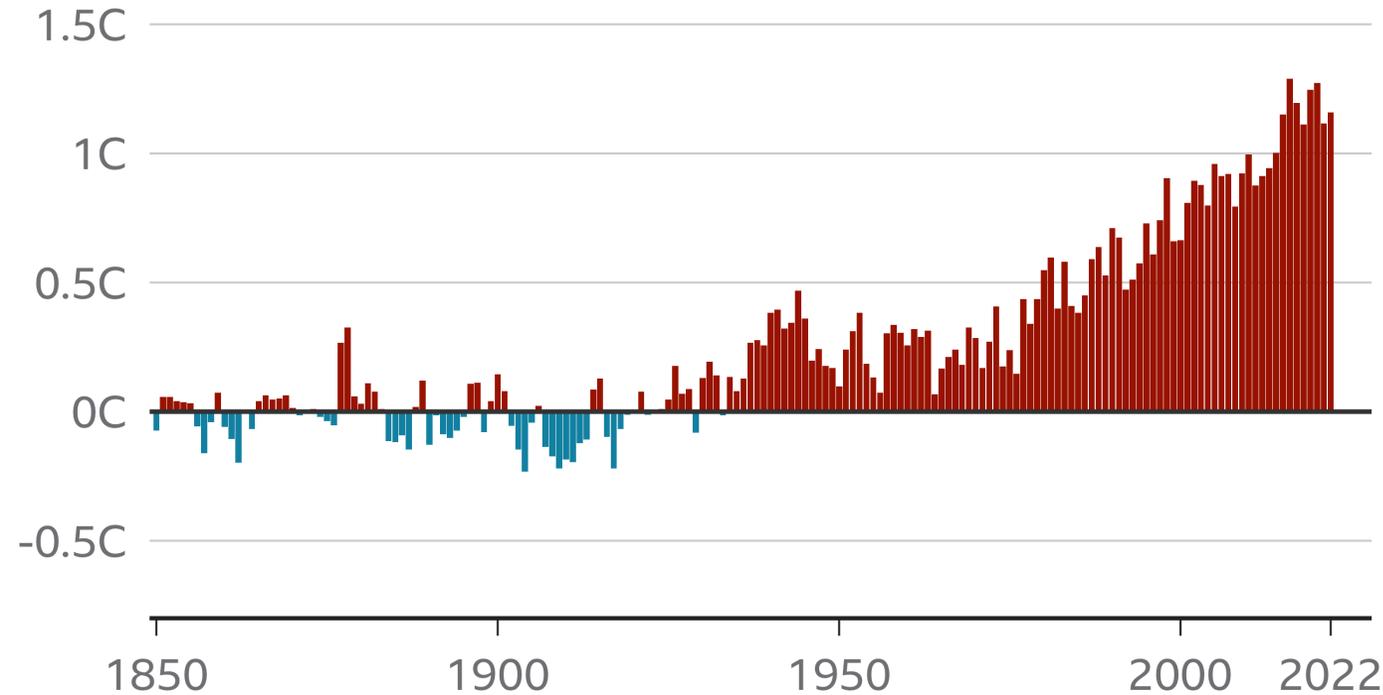
- Review of Changing Climate Realities
- Rationale for becoming a resilient Vegetable Gardener
- Ideas for becoming a resilient Vegetable Gardener
- Wrap-up & Questions





The world has been getting warmer

Change in annual average global temperature from pre-industrial levels (1850-1900) in degrees C



Note: Average calculated from HadCRUT5, NOAA GlobalTemp, GISTEMP, ERA5, JRA-55 and Berkeley Earth climate datasets

Source: Met Office



The world is now about 1.1C warmer than it was in the 19th Century - and [the amount of CO2 in the atmosphere has risen by 50%](#).

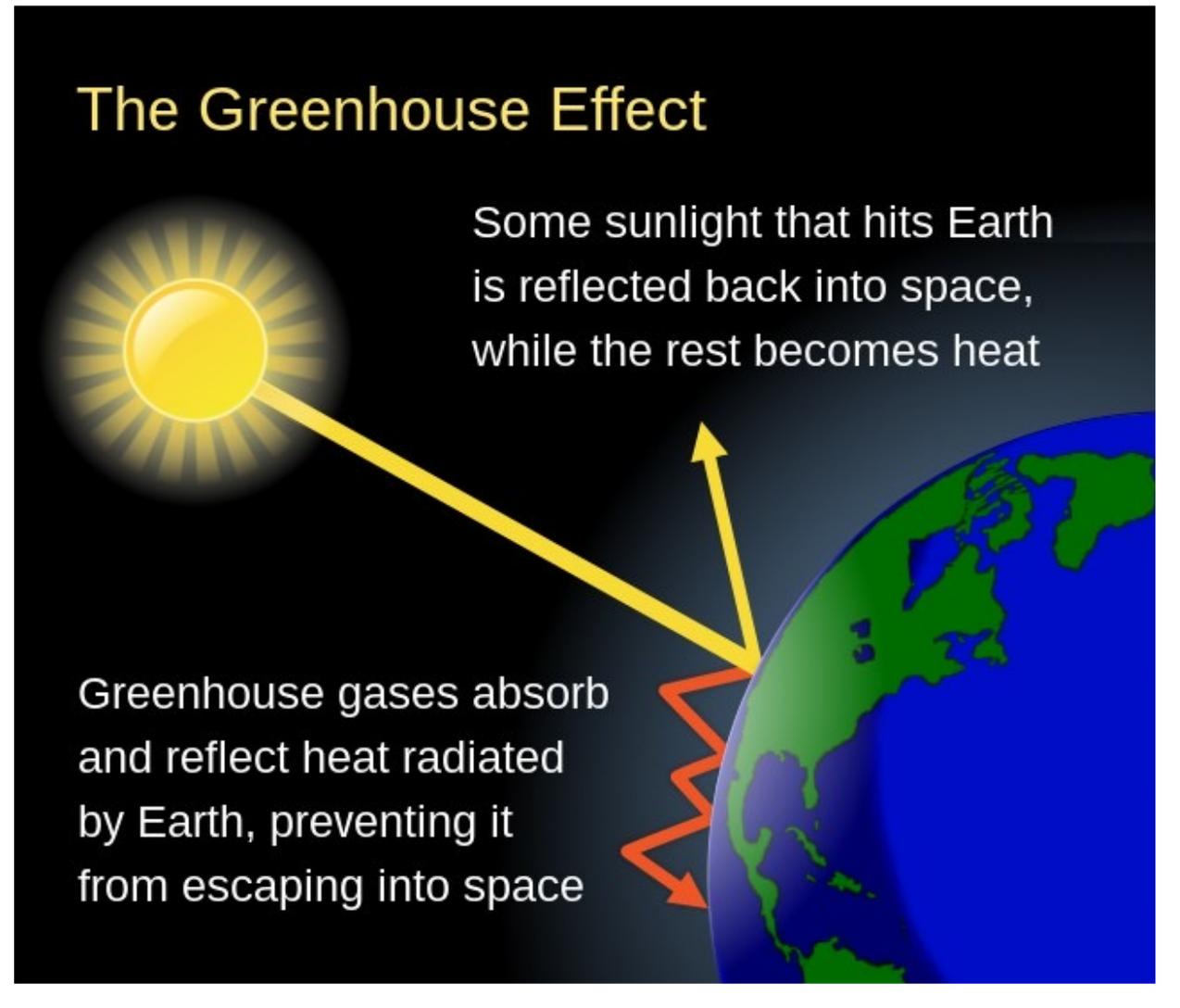
- Climate is the average weather in place over many years
- There has been a shift in those average conditions over the years
- The rapid change we are now seeing is caused by humans using oil, gas and coal for their homes, factories and transport.
- When these fossil fuels burn, they release greenhouse gases - mostly carbon dioxide (CO₂). These gases trap the Sun's heat and cause the planet's temperature to rise.

<https://www.bbc.com/news/science-environment-24021772>

Humans add ~ **50 Billion Tons** of CO₂
to the atmosphere each year*

Greenhouse Gasses:

- Trap the heat from the sun within the earth's atmosphere, warming the planet.
- Carbon Dioxide (CO₂) is the dominant gas.
- NOTE: the amount of carbon on earth is **FIXED**.
- The issue comes in changing carbon from a solid/liquid to a gas

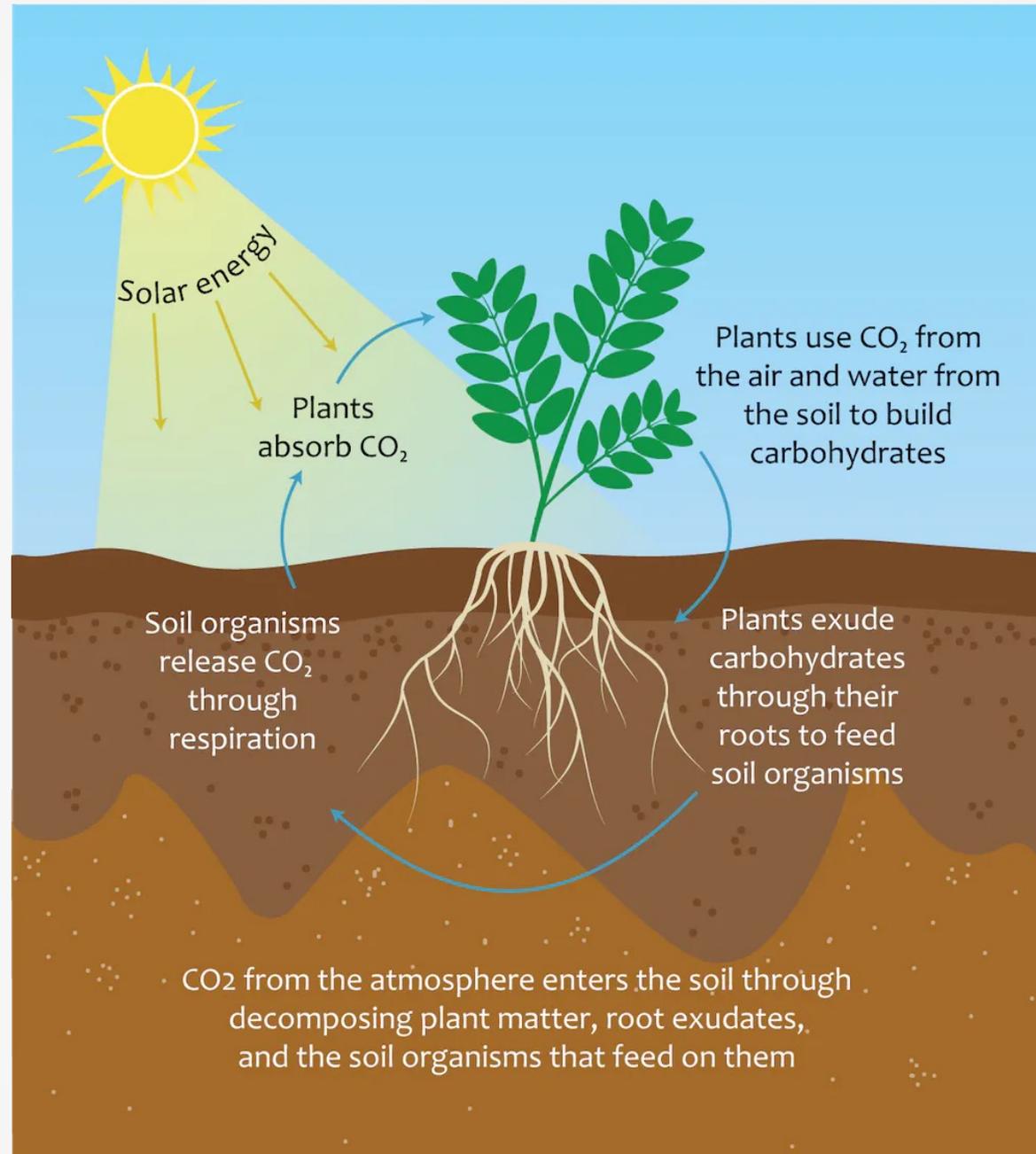


* Source: *How to avoid a Climate Disaster* by Bill Gates



As a gardener....you grow plants that capture CO₂ and store CO₂!

Capturing and storing CO₂ reduces the amount of CO₂ released into the atmosphere as greenhouse gas





Climate Change Effects

- More erratic weather
 - Storms
 - Excessive rain
 - High winds
 - Droughts
 - Extreme temperatures (hot and cool)
- Reduction in Biodiversity
 - Plants
 - Birds
 - Insects`

Impact on

Vegetable Gardens

- Changes in growing seasons
- Plants stressed by weather events- making them susceptible to pests and disease
- Less bio-diversity may result in fewer pollinators and beneficial insects for your garden

Be an Intentional Resilient Gardener



“Resilience to climate change is defined as the capacity to

- **prepare for,**
- **respond to,** and
- **recover from**

the impacts of hazardous climatic events while incurring minimal damage to societal wellbeing, the economy and the environment. “

Mehryar, S *What is the difference between climate change adaptation and resilience?* (2022)

“If you want to improve the climate resilience of your garden, you need more biodiversity, both in the soil and above the ground.”

Morgan & Stoddart, *The Climate Change Garden* (2023)

“A billion tiny actions have brought us to the edge of environmental crisis. And a billion tiny actions can pull us back from the brink.”

Sally Nix, How to Garden the Low Carbon Way: The steps you can take to help combat climate change. 2021



Vegetable Gardening with EASE

Evaluate your carbon footprint

Adapt to climate change realities

Satisfy your plants' need for healthy soil

Enjoy designing, planting and harvesting



"Carbon footprint: the amount of greenhouse gases and specifically carbon dioxide emitted by something (such as a person's activities or a product's manufacture and transport) during a given period"

- *Merriam Webster*

- **Gas Powered Equipment**
 - An average gas-powered lawn mower puts 90 pounds of carbon dioxide—and 50 pounds of other pollutants—into the air every year
- **Synthetic Fertilizers & Pesticides**
 - Consider the carbon footprint involved with the manufacturing, packaging and transporting
 - Application emits potent greenhouse gas nitrous oxide into the air
 - "For every 2.25 lb of fertilizer you scatter on the garden, you add about 6 lb of greenhouse gases to the atmosphere."
- **Potting soil & seed starting mixes that include Peat Moss**
 - Peat bogs store large amounts of carbon. (408 megatons a year)
 - Using alternatives to Peat Moss leaves peat bogs undisturbed and they retain CO₂.

Store Bought Produce: Carbon Footprint

Vegetables	Carbon Footprint
Cucumbers	<u>1.00 kg (2.2 lbs) of CO₂e per pound of cucumbers</u>
Tomatoes	<u>0.82 kg (1.8 lbs) CO₂e per pound of tomatoes</u>
Bell Peppers	<u>0.73 kg (1.6 lbs) of CO₂e per pound of bell peppers</u>
Salad Mix	<u>0.41 kg (0.9 lbs) of CO₂e per pound of salad mix</u>
Broccoli	<u>0.27 kg (0.6 lb) CO₂e per pound of broccoli</u>
Celery	<u>0.27 kg (0.60 lb) of CO₂e per pound of celery</u>
Lettuce	0.26 kg (0.57 lb) of CO₂e per pound of lettuce
Carrots	<u>0.18 kg (0.4 lb) of CO₂e per pound of carrots</u>
Potatoes	<u>0.12 kg (0.26 lb) of CO₂e per pound of potatoes</u>
Onions	<u>0.11 kg (0.25 lb) of CO₂e per pound of onions</u>

Consider Lettuce

- 90% of lettuce comes is transported from California and Arizona
- Transported in special refrigerated trucks that emit more particulate matter and nitrogen oxides than most diesel trucks
- Often lettuce is packaged in plastic- has a carbon footprint and is hard to recycle
- 40% of bagged lettuce is wasted annually; if put in the landfill releases CO₂ (methane gas)



Reduction in Carbon Footprint

If you grow lettuce in your garden,

- Use your feet for transport
- Harvest as you use it
- Refrigerate it in a reused bag or a bowl
- If it goes bad, add it in your compost



Check out your Diet's Carbon Footprint

Which food would you like?

Beans

How often do you have it?

1-2 times a week



150g, or just over a third of a can per serving

Over an entire year your consumption of beans is contributing **7kg** to your annual greenhouse gas emissions.



That's the equivalent of driving a regular petrol car **20 miles (32km)**.



OR

the same as heating the average UK home for **1.2 days**.

Your consumption of beans also uses



1,905 litres of water, equal to **29 showers** lasting eight minutes.



Adapt: Too Much Water

- Plan for good drainage
 - Raised beds, vertical gardens, container gardening, straw bed bales
- Use mulch to absorb excess rain
- Capture excess rain
 - rain barrels, storage tank, rain gardens
- Avoid walking on/working waterlogged soil



Adapt: Too Little Water

- Water in the morning when cooler
 - Aim for 1 inch per week
- Water for long periods of time and less often
- Water with drip systems or soaker hoses
 - Overhead watering inefficient and wastes water
 - Timer systems: pros and cons
 - Mulch thirstier plants



Adapt: Wind and Heat

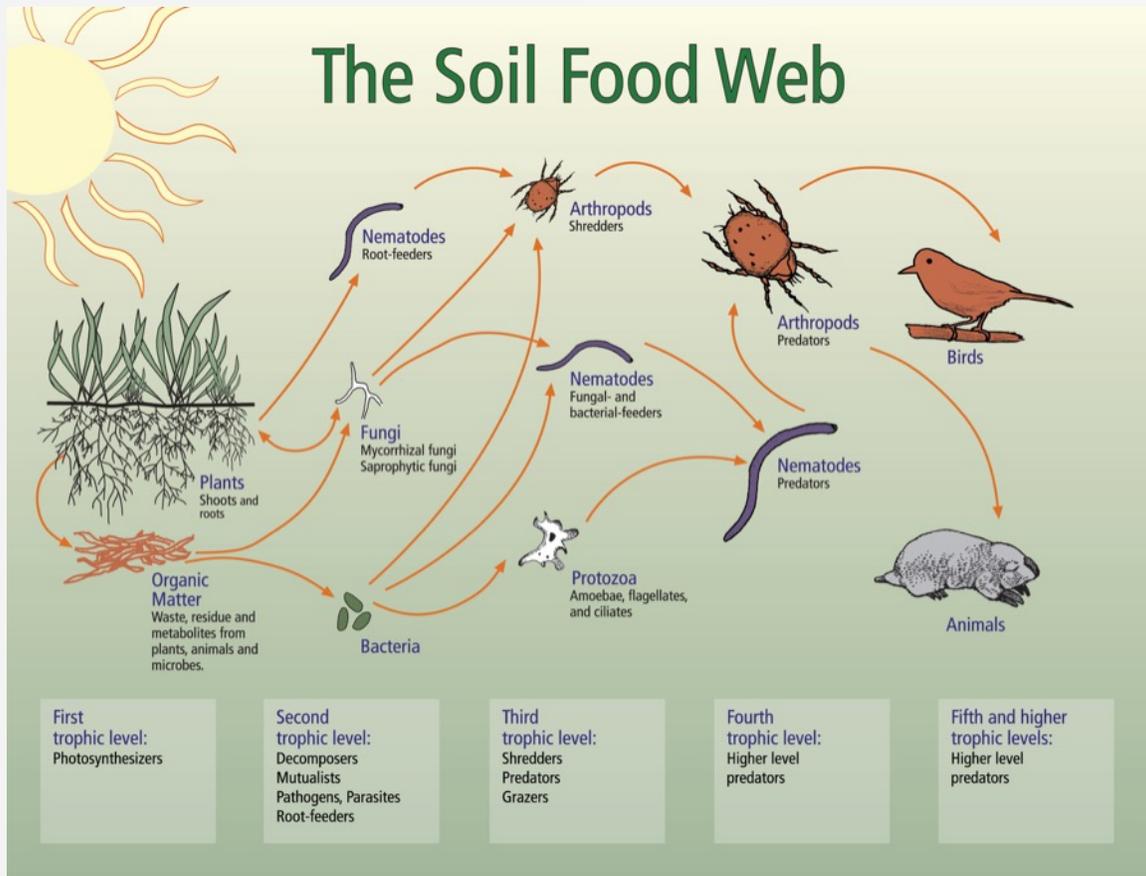
- Use windbreaks to shelter “fragile” plants
- Use stakes, trellis’ or tomato cages to provide plants extra support
- Create shade areas in your vegetable garden
- Take advantage of the heat and explore crops that like the warmth
 - Examples: eggplant, melons, tomatoes



Adapt: Reduction of Biodiversity

- Plant a variety of vegetables & rotate crops yearly
- Have water source nearby to attract birds
- Plant flower in or near vegies to attract pollinators
 - Intentionally plan to support pollinators in early spring and late fall
- “Untidy” gardens provide habitat for beneficial critters

Satisfy your plants' need for healthy soil



Healthy soil...

- Captures CO₂
- Retains water, which allows plant roots to have a good water source
- Provides needed nutrients for healthy plants
 - More nutrition for you
 - Increase the plants ability to withstand effects of climate change and pests

Satisfy your plants' need for healthy soil



1. Add organic matter- Compost, Compost, Compost
2. Avoid damaging the soil with compacting or tilling
3. At end of gardening year, add 2"-3" of compost
 - Your goal is to maintain an 6"-8"mulch layer





When you till your garden, you ...

- Reduce the firm soil structure that your plants need
- Damage the networks of fungal growth, which reduces ability of roots to obtain water and nutrients
- Tend to only till the top part, thus creating 2 layers of soil, which can cause drainage issues
- Bring buried seeds to the surface
- Release carbon into the atmosphere



When you garden without tilling, you...

- Increase your soil's population of earthworms & organisms
- Retain carbon in the soil
- Improve your soil by adding compost to it each fall
- Improve your soil's natural aeration and water drainage
- Develop soil that enhances the plants' roots
- Develop soil that is more resistant to wind and water erosion
- Reduce the need to weed,
 - Buried weed seeds, stay buried and don't grow
 - The mulch suppresses weed development



“No dig saves time and allows gardeners to enjoy themselves more, while a simple annual mulch of compost improves soil fertility and its ability to hold carbon and feeds the soil ecology; for a health balance between pests and predators.”

Charles Dowding, No Dig, pg 9

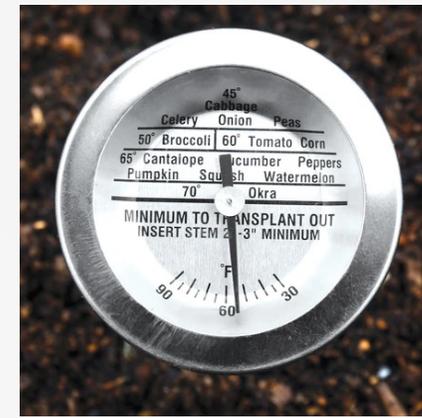
“Modern soil science is teaching us new ways to understand soil life. We now know that most of the active creatures that make soil alive live in the top few inches of soil. When we disturb the soil layers through tilling and double digging, we are actually destroying healthy colonies of soil biota”

Ann Lovejoy, Handbook of Northwest Gardening, pg 60.

Enjoy designing



Enjoy planting for biodiversity



Cool Season Crops

- Includes:
 - leafy greens (such as lettuce, spinach, mustards, chard, kale),
 - peas,
 - cilantro and
 - many roots (such as beets, carrots, radishes)
- Grow best when temperatures are 40-60°F
 - May have a spring & fall cool season crop
- Some can also grow when temperatures are warmer (especially heat-tolerant varieties), or if you have shade areas in your garden

Warm Season Crops

- Includes fruiting vegetables: tomatoes, beans, cucumbers, peppers, corn, eggplant and squash.
- Grow best when temperatures are 60°F or higher,.
- Timing is critical
 - Too early: shock or failure to thrive,
 - Too late: not have enough time to fully mature.
- Are typically planted out in the garden in May and June.



Enjoy planting for biodiversity

- Experiment with what you can grow year round
 - Use cold frames, greenhouses, hoop houses, row covers,
- Consider establishing perennial vegetables
 - Leaves soil undisturbed and established root structures less susceptible to challenging weather (e.g. Rhubarb, Jerusalem Artichokes, Berries)
- Explore Succession Planting
 - Seeding a plant over 2-4 consecutive weeks, spread out harvest time
 - Harvest a plant at different stages of maturity (e.g. lettuce, greens, turnips)
- Explore Companion Planting
 - increase diversity
 - Provide nutrient sharing
 - Protection from pests attacking single crop plantings

Enjoy harvesting

- Take daily strolls to sample your bounty
- Learn the signs for harvest time
- Usually best to harvest in cool part of the day
- Remember to harvest “hidden crops ”
- Excess?
 - Share with friends
 - Preserving: canning, freezing or dehydrating
 - COMPOST!!! (Replenish your soil)



Resources from your Master Gardeners



WSU Extension Pierce County Master Gardeners | Pierce County | Washington State University



WSU Extension Pierce County Master Gardener Program

Volunteer Community Educators—cultivating plants, people, and communities since 1973

[From the Ground & Up Workshop ▶](#)

[Ask a Master Gardener ▶](#)

[Visit our Gardens ▶](#)

[WSU Master Gardener Advanced Education Conference ▶](#)

[Childrens Programs ▶](#)

[Gardening Resources ▶](#)

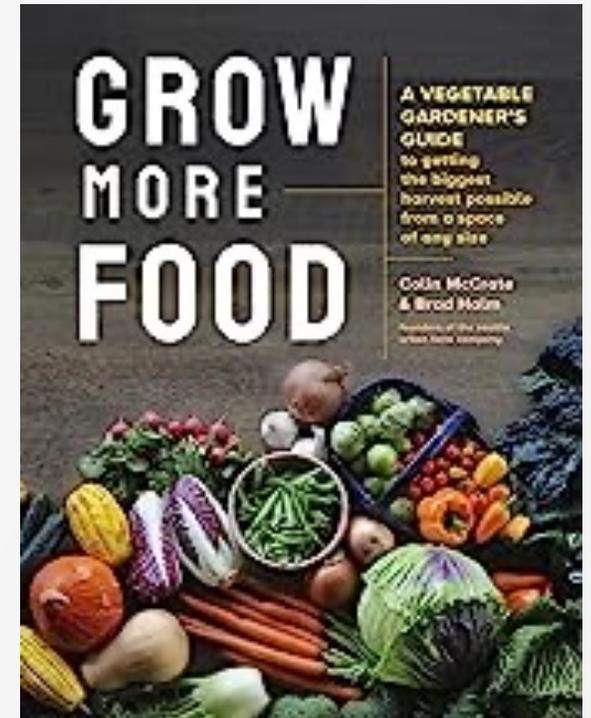
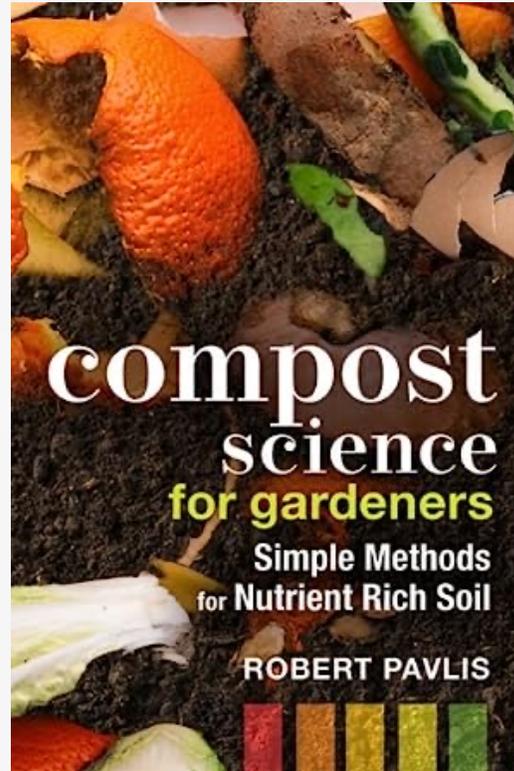
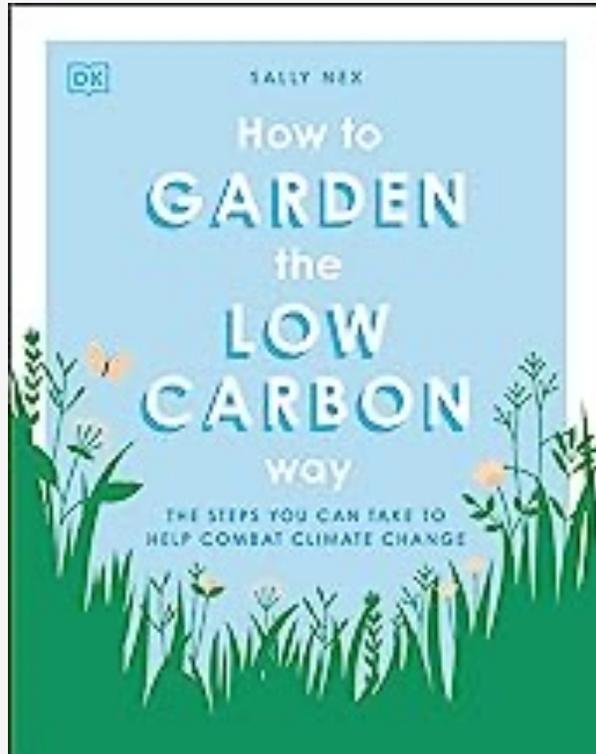
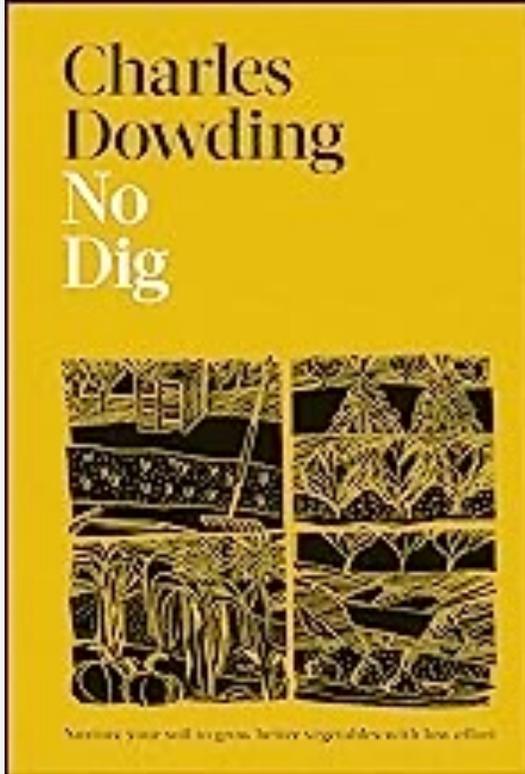
[Our Foundation ▶](#)

[Request a Master Gardener ▶](#)





Resources from your Pierce County Library





Vegetable Gardening with EASE

-
- **Evaluate your carbon footprint**
 - **Adapt to climate change realities**
 - **Satisfy your plants' (and the planet's) need for healthy soil**
 - **Enjoy designing, planting and harvesting**
- How do you rate your gardening knowledge and skills under our current climate change conditions?
 - Novice
 - Beginner
 - Advanced
 - Expert
 - What is at least one resilient gardening strategy you will try?

QUESTIONS?





EVENT FEEDBACK

www.mastergardener.wsu.edu
www.extension.wsu.edu/pierce/mg

pierce.mg@wsu.edu
253.798.7170

Pierce County Human Services
Extension Office
3602 Pacific Ave, Suite 200
Tacoma WA 98418

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Pierce County



SCAN ME



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