Backyard Composting Workshop

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CHANDLER arizona

My Composting Background

A Few Composting Facts. . .

- According to the EPA, 66 million tons of food is wasted in the US every year! And only 5% of that food ends up being composted.

- Food is the single most common material sent to landfills and makes up to 24% of landfill waste. When yard trimmings, wood, and paper/paperboard are added to this, the organic materials comprise over 51% of municipal solid waste in landfills!

- Municipal solid food waste landfills are the third-largest source of methane emissions in the US, and wasted food makes up 58% of landfill methane emissions.

Backyard Composting Workshop Goals

1. **Demystify Compost: It's science, but not rocket science**

2. **There is a compost for everyone (how to compost *almost* anything, *almost* anywhere here in the low desert!)**

3. **Worms are a gardener's best friend: How to harness the power of worm castings and let them work for you!**

Part 1: COMPOSTING 101

What is compost? And what is it not?

Why should everyone make compost? What are the benefits?

How does composting happen? What's actually going on in a pile?

Hot vs. Cold Composting? Does it have to get hot? Does it even matter?

What is Compost?

- Fully decomposed organic matter
- Produced by the work of composting organisms
- A nutrient dense, biologically complete, stable soil amendment that is recommended as part of seasonal soil preparation for gardens and landscapes
- Can also serve as a wonderful mulch to make new garden beds or to put around plants
- Good compost is very dark in color and smells sweet and earthy like a forest

What is Composting?

- Managing the aerobic (oxygen-requiring) decomposition of organic materials under a controlled environment
- The compost pile is the system – a large microbial farm (habitat) managed for the purpose of creating compost
- **The secret to successful composting?**

Balancing the ratio of Browns (Carbon) to Greens (Nitrogen) – 25-40:1 to start and a minimum ratio of 10-15:1 to finish

. . . and balancing moisture and air!

Not Compost!

Not sure if it’s compost? Just use your senses . . . except taste!

Why Compost?
So many Benefits!

Better soil

Loosens clay & compacted ground
Improves soil PH
Stimulates life in the soil
Reduces erosion
Improves soil tilth

Plant health

Improves plant growth & health
Provides nutrients in organic form
Reduces the need for fertilizers and amendments

Conserves Water

Holds in moisture

Better drainage

Reduces waste

Diverts material from landfill

More room in your garbage can

How Does Composting Happen?

- **The Formula**: **GREENS** + **BROWNS**
  (+ **moisture** and **air**!)
- **The Labor**: Composting organisms (and you! We'll get to your role shortly!)

Composting Begins:
As soon as raw organic materials are mixed together

Initial stages of composting:
Easily degradable components and oxygen are rapidly consumed by microorganisms

During composting:
Temperature in the pile changes in relation to microorganism activity and indicates what is happening in the pile

"GREENS"

green leaves

coffee / tea grounds

grass

veggie scraps

green plant material

fruit / fruit peels

NITROGEN – provides protein synthesis (growth and reproduction)

"BROWNS"

dry brown leaves

straw / hay

shredded paper

egg shells

dryer lint

wood chips

CARBON – provides energy

Material	C:N Ratio
Chicken Manure	6-14:1
Cow Manure	10-30:1
Coffee Grounds	20:1
Grass Clippings	17:1
Alfalfa Hay	15-19:1
Vegetable Waste	11-19:1
Fruit Waste	35-40:1
Blood Meal	4:1
Bark	100-130:1
Dry Leaves	40-80:1
Newspaper	400-850:1
Sawdust and Wood Chips	442:1
Pine Needles	60-110:1
Paper	150-200:1
Straw	70-80:1

Balancing Browns and Greens

- **All compost piles need a balance of BOTH Browns and Greens**
- Mixing 2 parts Brown for every 1 part Green by volume is a good starting point for hot composting. . . BUT
- Adding different types and amounts of Greens or Browns can change the decomposition process!
- If you have more Greens than Browns in your pile, you've probably gone too far (and you will smell it!)

Greens (Low C:N Ratio – more Nitrogen)	Browns (High C:N Ratio – more Carbon)
Recently living	Woody
Bacteria dominant	Fungal dominant
Heats a pile	Cools pile
Speeds up decomposition	Slows down decomposition
Adds moisture	Dries (absorbs moisture)
Can decrease oxygen	Increases oxygen

Moisture

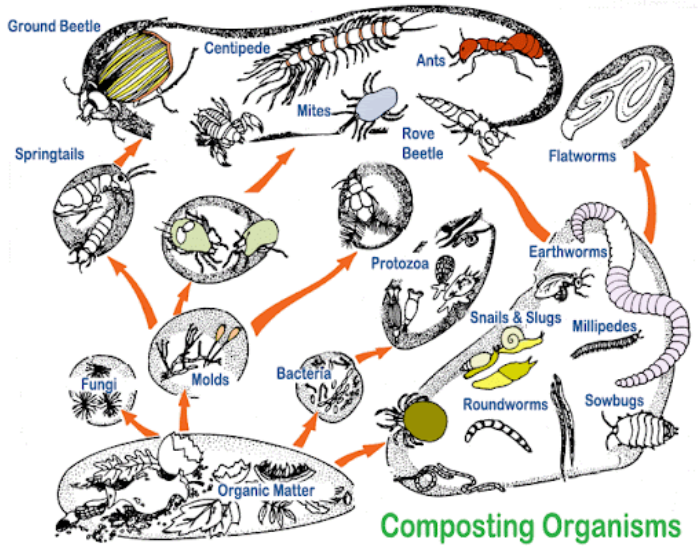
- **Biggest challenge to composting in the low desert!**
- Absolutely necessary to support life in the pile
- Some moisture comes from greens, but you will need to add more. . . Shade also helps!
- 40-65% moisture – “damp sponge”
- Too dry and decomposition slows down; too wet and water displaces air
- Moisture decreases during composting, and smaller piles dry out faster than larger ones

Air

- Composting consumes lots of oxygen in early stages
- Need to prevent anaerobic conditions (unsafe pathogens)
- Keeping the pile loose and lifting/turning periodically introduces oxygen and kills off anaerobic organisms
- Turning more frequently can be labor intensive, but it will speed up decomposition and prevent bad odors

The Workers: Composting Organisms

- Most composting is done by microorganisms – so even if you can't see them, they are working!
- "If you build it, they will come!": You do not need to add composting organisms to your compost pile
- Bacteria often start process and are responsible for much of the initial decomposition work
- The metabolism of some bacteria (thermophilic) creates the heat of the compost pile
- At lower temperatures, other bacteria (mesophilic), fungi, protozoans, earthworms, centipedes, millipedes, beetles, and mites assist in breaking down organic matter



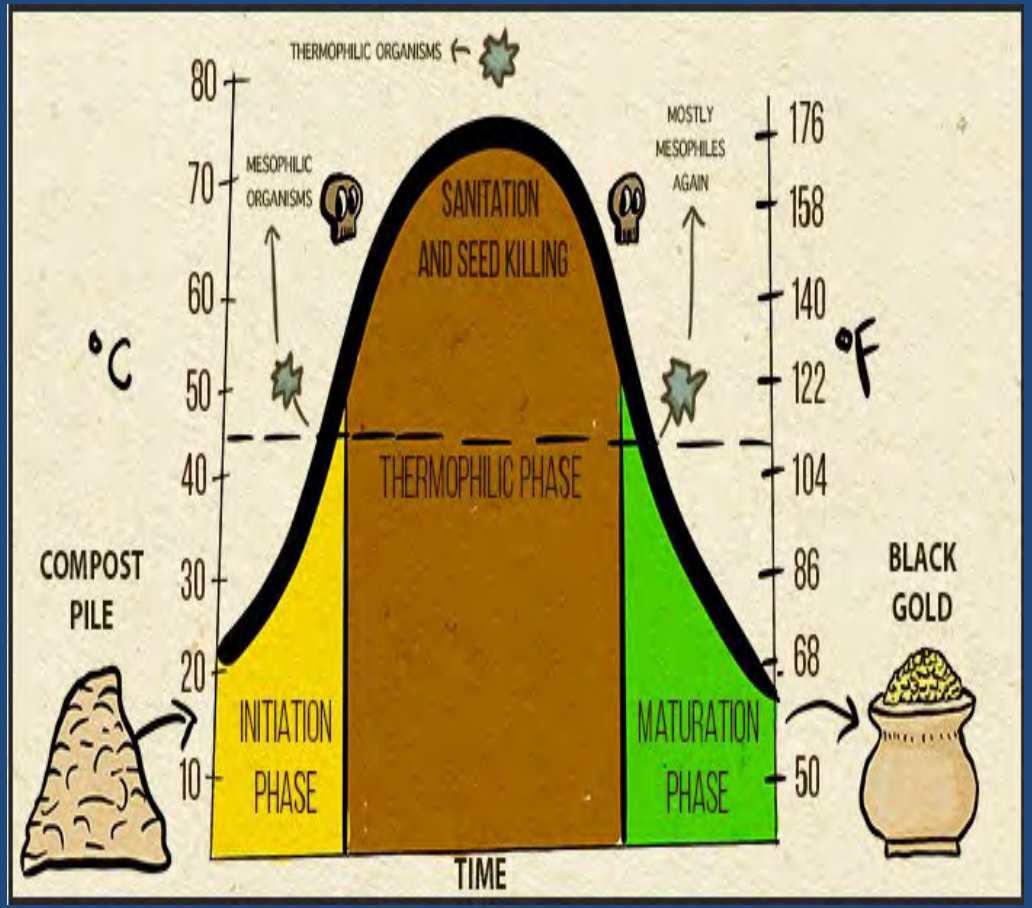
Composting Temperature

HOT

- Fast decomposition
- Active Management
- Composting pieces are small and uniform, and at least 1 cubic yard in volume (3 ft X 3ft X 3ft)
- Temperatures between 110-160F
- Sustained initial temperatures will destroy many pathogens and weed seeds
- Requires more frequent turning and temperature checks!

COLD

- Slower decomposition
- Passive management
- Composting pieces are chunky or less uniform
- Temperatures stay between 50-105F
- Does not reach temperatures that will kill all pathogens or weed seeds
- Requires patience – may take several months to multiple years to complete!
- This is the required method for worm composting!


THERMOPHILIC ORGANISMS
MESOPHILIC ORGANISMS
SANITATION AND SEED KILLING
MOSTLY MESOPHILES AGAIN
°C
°F
80
70
60
50
40
30
20
10
176
158
140
122
104
86
68
50
THERMOPHILIC PHASE
COMPOST PILE
BLACK GOLD
INITIATION PHASE
MATURATION PHASE
TIME


GrowVeg

Part 2:
10 Steps to Successful Backyard Composting in the Low Desert

What tools, containers, or other equipment do I need to get started?

How do I select the right types and amounts of Greens and Browns?

Are there things I shouldn't add to my compost?

How do I keep my compost pile moist enough outside?

How often should I turn my compost pile?

How do I keep my compost pile from smelling?

How do I know when my compost is done and safe to use?

Step 1: Assess your Composting Goals and Lifestyle

- What are your compost priorities?
- How much compost do you want to produce, and how quickly do you need it?
- How much composting material do you have and/or you can easily source?
- How much physical work you are willing and able to contribute?
- What are your personal time constraints or logistical limitations?
- **You can always change your composting process over time!**

Step 2: Choose the Best Site for Composting

- **Sufficient space!** Especially if hot composting – you will want room for multiple containers
- **Access to water** – essential here in AZ!
- **Shade** – will help the compost pile/container stay moist longer and will be more comfortable for you!
- **Convenient** – to the kitchen or source materials or where you will be gardening

Step 3: Have the Correct Tools for Composting

- **Wheelbarrow / cart** – makes it much easier to move materials. Highly recommend a dumping feature and four wheels!
- **Hose with spray wand** – essential for efficient watering
- **Scoop-type Shovel** – can be helpful for adding materials or removing finished compost
- **Turner** – helps stir compost and aerate
- **Pitchfork** – most effective way to turn/lift pile manually
- **Thermometer** – essential for monitoring temperatures inside the pile

Step 4: Decide How to Contain Your Compost

Contained Bin

- Recommended for most backyards – easier to retain heat and moisture
- Any container is suitable if it is accessible, resists decay, and allows airflow/gas exchange while keeping animals out
- Can be hoops, box setups, barrels, or bins – many municipalities offer recycled trash bins
- For hot compost, containers need to contain at least 1 cubic yard (and no more than 2 cubic yards)
- Helpful to have multiple containers to facilitate turning and starting multiple piles

Uncontained Pile/Heap

- Harder to keep cubic yard minimum (3ft X 3ft X 3ft) to retain heat and moisture
- Works best for no-turn passive composting where pile is left alone for several months or more
- Will often dry out in our climate unless large enough and managed/turned frequently
- An option for those with a front loader

Step 5: Select and Add Your Raw Materials

YES

- Veggies & fruits
- Yard trimmings
- Eggshells*
- Coffee Grounds
- Lint
- Shredded paper
- Sawdust
- Wood chips
- Straw
- Cardboard

NO

- Meat
- Bones
- Dairy
- Oil & Fat
- Pet Animal Waste (Dog & Cat)
- Weeds w/seeds*
- Diseased plants*

MAYBE

- Citrus Peels
- Fruit pits
- Vegetarian Animal Waste
- Ash*
- Bermuda grass*

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Connects local arborists and landscapers with folks who want FREE mulch and woodchips!

Register a free account, place a request, and expect delivery within 2-3 days

Composting is like making lasagna!

Fill your container with alternating layers of Browns and Greens (followed by water)

- **Hot composting:** aim for 2 parts Brown (4-6 inches) followed by 1 part Green (2-3 inches), then repeat until your container is filled and you have at least 1 cubic yd
- **Cold composting**: add more parts Brown (and you can add more layers as you go)
- Always top Greens (particularly food waste or manure) with a Brown layer to avoid flies and bad smells!
- It can help speed up decomposition if you tear up materials into smaller uniform pieces
- Recommend stirring the layers once filled

Step 6: Keep the Compost Pile Moist

- **As you build the pile**: Give each layer a gentle spray with water
- Consistency of a damp sponge
- Water drains when you squeeze materials = TOO WET
  - ADD BROWNS (or stir and remove cover)
- Doesn't feel moist and no droplets come out when squeezed = TOO DRY
  - ADD WATER (or add Greens)
- **You <u>will</u> need to FREQUENTLY check the moisture level and add water during composting process!**
- Shade helps – slows evaporation and retain moisture

Step 7: Maintain the Proper Compost Temperature

- Once decomposition starts, pile may quickly heat up between 110 – 160 F
- Use a compost thermometer to monitor temperature
- **Hot Composting**: aim for 130-150F for at least 3 days, then turn and add moisture (repeat 1-2 times a week for at least 2-3 weeks or until temperature naturally drops)
- **Cold Composting**: add Browns to prevent pile from getting hot!
- Sustain temps above 140F+ to kill weed seeds and pathogens
- Can piles get too hot? YES technically – spontaneous combustion (monitor and turn your piles!)

Step 8: Turn Your Compost Pile Regularly

- First build oxygen into your container by loosely layering Browns
- **Layers are NOT meant to last. . . Stir it, THEN TURN IT:** 1-2x per week if hot composting; once a month is fine if cold composting; and/or any time it starts to smell funky
- Move the edges, which dry out fastest, to the middle
- Yes, it is a workout! A multiple bin system helps!

Step 9: Troubleshoot

Problem	Causes	Solutions
Smells	Too much moisture Too much Greens Too much compaction	Add Browns Add Air
Pests	Wrong type of material Food too close to surface	Remove unwanted materials Cover with Browns
No Decomposition	Not rotating Too large of pieces Too thick of layer Too much of one type of material	Turn pile Break up into smaller pieces Check ratio of Browns to Greens
Pile Doesn't Heat Up (or stay hot)	Too dry Poor aeration Not big enough Not enough nitrogen Compost is done	Add water Rotate pile Add layers – at least 1 cubic yd Add more Greens

Step 10: Let the Compost Finish and Cure Before Applying

Compost is finished when:

(1) No longer heats up

(2) Dark, crumbly, and smells earthy

(3) Ingredients are no longer recognizable

(4) Has only 25-40% of its original volume

- Decomposition continues at a slower rate after compost drops below 110F
- **Best practice:** Let your compost “cure” for multiple months even if it looks finished – will result in a more stable safer end-product
- How long does this take? IT DEPENDS!

Backyard Compost FAQs

- ***Do you need inoculants or native soil?*** No, do not waste your time/money!
- ***Do I have to use manure or animal-based products?*** No, there are lots of plant-based greens
- ***Should I add worms to my hot compost container?*** NO! (do worm composting instead!)
- ***I see grey-like threads in my compost!?*** Great! Your microbes are hard at work!
- ***Is newspaper or magazine ink dangerous?*** Newspapers (and most magazines) use water or soy-based inks, which does not create significant toxicological concern; only older glossy magazines that use heavy metal-based ink for color would be potentially more concerning.
- ***Can compost replace fertilizers?*** It depends. Compost contains macro- and micro-nutrients, but in small doses delivered gradually over time. Heavy feeders, like many vegetable crops, may need supplemental organic fertilizer – particularly in raised beds that are prone to nutrient leaching.
- ***Do I need to use only "certified organic" inputs for organic compost?*** No, compost is compost! Fortunately, most pesticides/herbicides are bio-degradable and do break down. However, be sure your compost does not contain synthetic fertilizers or materials that were exposed to persistent herbicides like clopyralids. Be careful with certain hay, straw, and manures.
- ***Are there alternatives to traditional composting in a container/pile?*** YES! Lasagna Gardening/Sheet Mulching; Hügelkultur; JADAM/KNF; Bokashi; Vermicomposting etc.

Bombproof Sheet Mulch
As described by Toby Hemenway in *Gaia's Garden*

1-2" of Seedless Mulch

1-2" of Compost or Manure

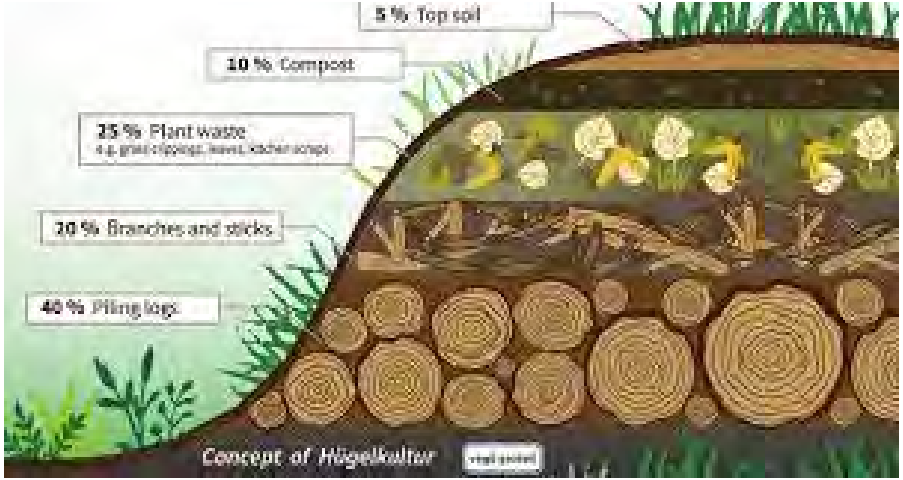
8-12" Mulch

1/2-1" Manure

1/2" Newspaper/Cardboard

1/2-1" Manure

Surface of Ground


5 % Top soil
10 % Compost
25 % Plant waste
20 % Branches and sticks
40 % Piling logs
Concept of Hügelkultur


Straw Mulch
Compost
Newspaper/ Cardboard
Grass Clippings
Rough Mulch
Branches

Part 3: Vermicomposting

Letting Worms Do the Work!

Why Compost With Worms?

Smaller Space

In bed gardens
Containers
Indoors

Faster Compost

Worms doing the work

No curing needed

Less work

Smaller container
Less layering

No turning or keeping hot

Unique Benefits for Soil & Plants

High porosity
Excellent water-holding capacity
Neutral PH
Hold nutrients longer
Nutrients are more readily available
Contains all nutrients including trace minerals

Faster germination and seedling development
Pathogen and pest suppression
Increase root growth
Improve amount of flowering/fruiting
Inoculates soil with diversity of beneficial life

Makes great compost tea and/or drenches!

The Worms of Vermicomposting

- Red Wigglers are most common composting worm (European nightcrawlers are another option)
- Live in thin layer between soil and leaf litter
- Worms grind down organic matter in their gizzards, and then microbes in the gut do the rest!
- Worm movement naturally aerates and homogenizes castings so it is highly decomposed
- Frequent reproduction – lay eggs in 1 to 2 months and live 1 to 2 years so population will reach 2 pounds per square foot!
- Start with ½ pound to 1 pound per square foot

Where to Get Worms

Red Wigglers – Arizona Worm Farm

Add worms outdoors October – May
Nighttime temperature below 85°

Living Conditions: The Vermicompost Bin

- Temperatures must stay between 30-95F (aim for 50-85F)
- Moisture between 60-90% - should appear “sweating”
- Need air but no light
- Surface area more important than volume
- Can be kept indoors or outdoors
- **If outdoors**: worms will cook or try to escape if conditions get too hot!
  - Larger bins (50-100 gallons) have less heat fluctuation
  - Protect from direct sunlight
  - Best option is to place bin in a pit or raised bed


GROWING IN THE GARDEN


GROWING IN THE GARDEN

Vermicompost Bedding

- Need lots of highly absorbent, low-bulk density Brown material – keeps conditions cool and comfortable
- Controls moisture and temperature, and serves as barrier to pests
- Shredded material works best:
  - Coconut Coir
  - Newspaper
  - Cardboard
  - Shredded paper
  - Chipped Wood

Feeding the Worms

YES	NO
Fruits (melon!)	Citrus
Veggies (squash!)	Onions
Coffee grounds	Garlic
Eggshells	Mustard
Grains	Spicy
Composted Manure	Meat
Aquatic Plants	Dairy
Fish waste	Oil/Fat

Keeping Worms Happy

- Do Not Overfeed!
- Add a diversity of food in small thin layers and always mix/cover with Browns
- Chopping food in small pieces breaks down quicker
- Periodically add more bedding
- Food will typically add sufficient moisture, but you may need to add more if keeping bin outdoors
- Most problems can be solved by adding Browns: Too hot, too moist, too buggy, etc.

Harvesting and Using Worm Castings

- Sift castings to remove any chunky material or worms
- Finished castings will be very dark and broken down
- When using, a little goes a long way – can add to native soil, compost, potting soil, or seedling mixes
- Makes great compost tea and drench

Weekly

Check water
Feed scraps

Monthly

Start to see changes in about 6 weeks
Finished in about 3 months

Worm Castings

Sprinkle in garden
Make compost tea
Start again with bedding – no need to add more worms

COMPOST TEA RECIPE

1. Fill 5-gallon bucket with rainwater or dechlorinated tap water (let sit overnight)
2. Add microbial food: a tablespoon of blackstrap molasses or seaweed and fish liquid fertilizer or mashed up boiled potatoes
3. Put 1 cup of fresh worm compost in a mesh bag or cheesecloth and steep in the bucket for 24 hours
4. Optional: Aerate the tea with a bubbler or pump to increase the microbe population
5. Once the surface has a bubbly/foamy crust (usually the next day), use the liquid as a beneficial and nutritious foliar spray or soil drench!



Questions?

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