STARTING COMMUNITY COMPOSTING PROGRAMS ON TRIBAL LANDS

DATE

Introduction and Welcome

- Meet your instructor
- Your name and Tribe/organization
  - What interests you about composting?
  - What benefits do you see?
  - What drew you to this class?

Program Scale and Audience

- **Program**: Community composting
- **Scale**: Less than 100 cubic yards of compostable materials on a site of less than 750 square feet
- **Audience**: Tribal environmental staff

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Community Composting Scale

- < 100 cubic yards (CY)
  - Dimensions (2 piles)
    - 6 feet high
    - 6 feet wide at base
    - 100 feet long
- Each pile: 50 CY

100 CY is about 50 pick-up truck loads

Objectives

By the end of this course, you will be able to:

1. Describe what compost is and its benefits
2. Identify community composting practices that might work well in your community
3. Pick a path for developing your community composting program

Presentation Topics

Objective 1:

Describe compost and its benefits

- What Composting Is
- Benefits of Composting

Objective 2:

Identify community composting practices that might work well in your community

- Compost Science
- Composting Methods

Objective 3:

Pick a path for developing your community composting program

- Assessing Needs and Capacity
- Program Planning

WHAT IS COMPOSTING?

What is Composting?

- The process of breaking down organic materials into a soil-building substance that feeds the land
- Composting makes the natural process of decomposition happen well and fast

Composting Perspectives

- **Technical View**

Compost means the **product** resulting from the **controlled biological decomposition** of **organic wastes** that are **source separated** from the municipal solid waste stream, or which are separated at a centralized facility

Source: State of California, Public Resources Code §40116

- **Scientific View**

Composting is the **biological decomposition** and stabilization of organic substrates, under conditions that allow development of **thermophilic** temperatures as a result of biologically produced heat, to produce a final product that is stable, free of pathogens and plant seeds, and can be beneficially applied to land

Source: The Practical Handbook of Compost Engineering, Roger T. Haug, 1993

Composting Perspectives

- **A Chef's View**

How do you become a good chef? Learn from experienced people and from one's own mistakes and successes.

The same is true with becoming a good composter

Composting Perspectives

- **A Poet's View**

Excerpts from *This Compost*, Walt Whitman, 1856

"Behold this compost! Behold it well!
The grass of spring covers the prairies.
The bean bursts noiselessly through the mould in the garden.
The delicate spear of the onion pierces upward.
The apple-buds cluster together on the apple-branches.
The resurrection of the wheat appears with pale visage out of its graves.
The tinge awakes over the willow-tree and the mulberry-tree.
Out of its little hill faithfully rise the potato's dark green leaves.
Out of its hill rises the yellow maize-stalk, the lilacs bloom in the dooryards.
The summer growth is innocent and disdainful above all those strata of sour dead.
What chemistry
…the Earth…gives such divine materials…."

What is Mulch/Mulching?

- Mulch: Organic materials that are spread on top of soil to: (a) conserve water, (b) control weeds, (c) beautify the landscape, and (d) help plants to grow

- Mulching: A mechanical size-reduction process (chopping, grinding, or shredding) used to make mulch

- Benefits:
  1. Save resources (especially water and labor)
  2. Promote healthy plants
  3. Minimize soil erosion
  4. Improve looks
  5. Reduce fire risk

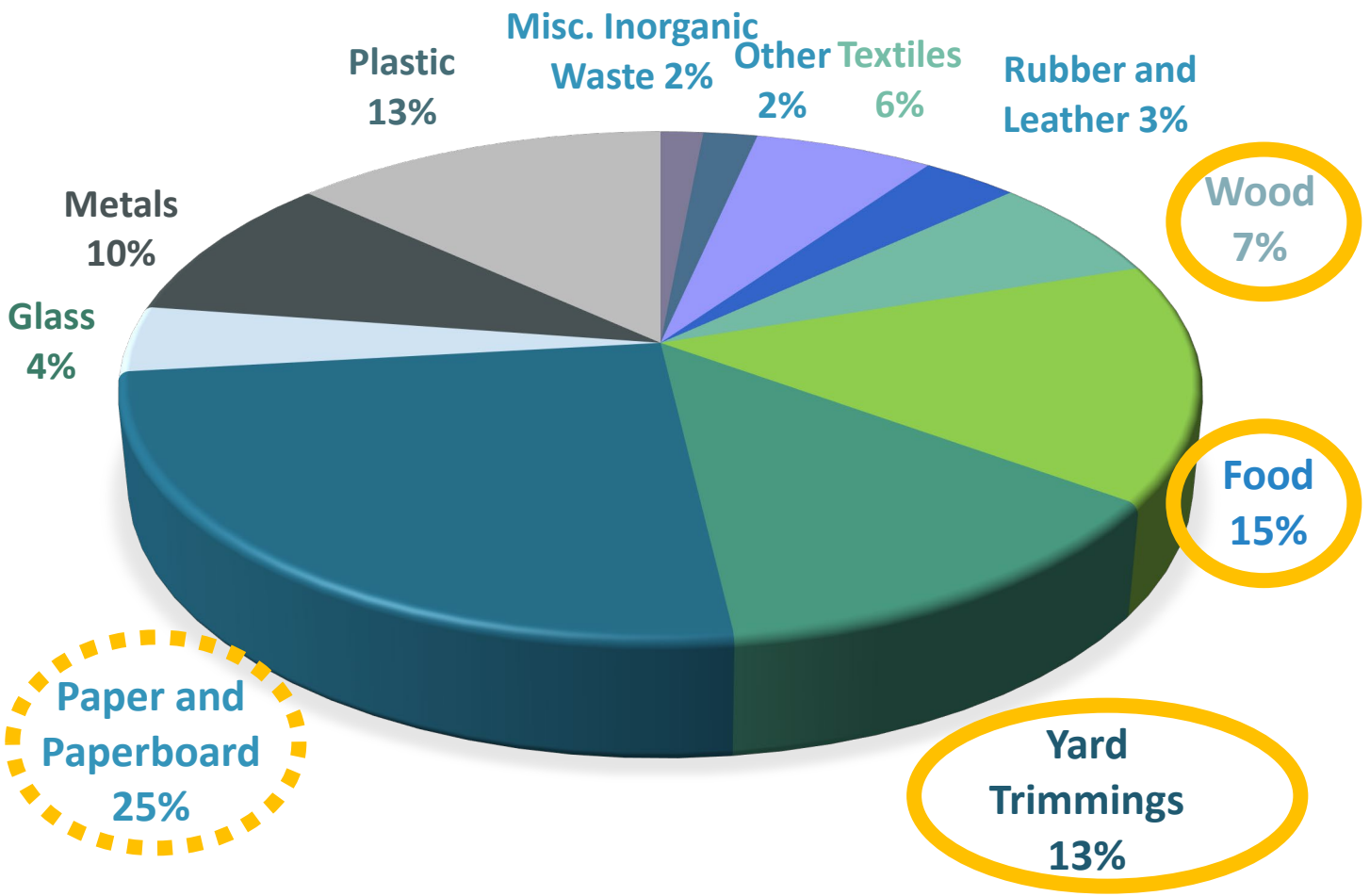
Mulch Benefits Soil and Plants

1. Improves water-holding ability of soil
2. Reduces soil erosion, compaction, and temperature extremes
3. Reduces salt build-up on soil surface
4. Reduces plant disease, weeds, and need for pesticides
5. Improves plant growth

BENEFITS OF COMPOSTING

Compostable Materials in US Waste Stream

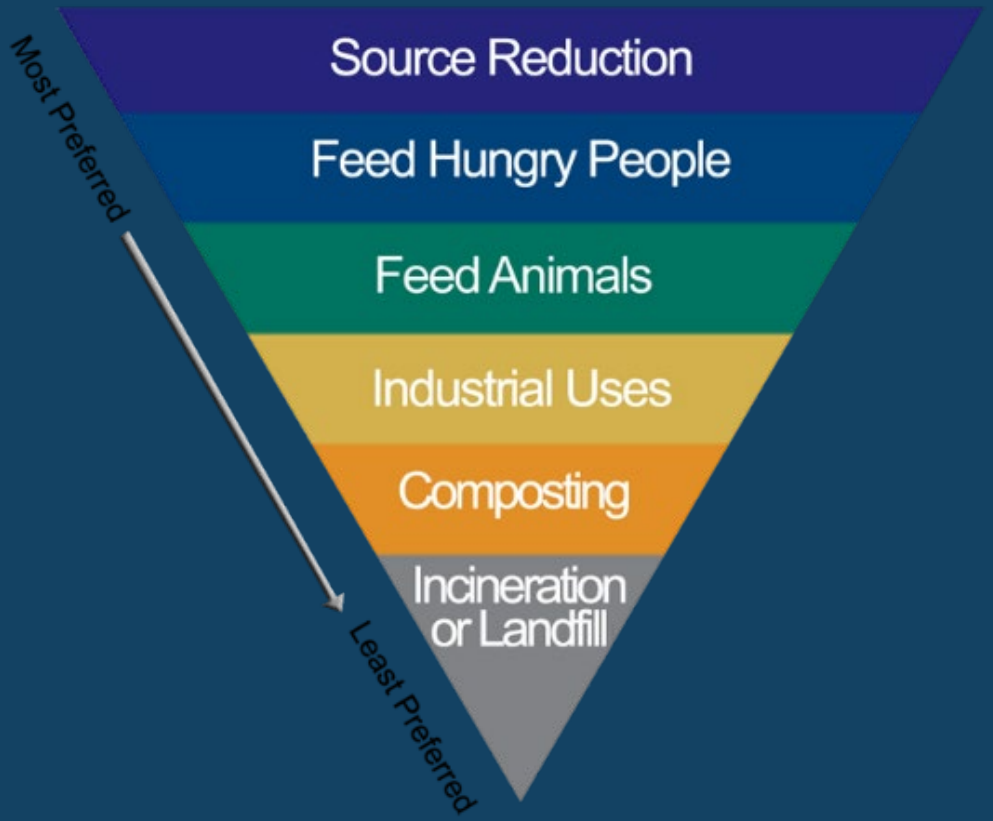
Municipal Solid Waste Generated in the U.S. by Material
268 million tons (2017)



Reduce Food Waste

Preventing waste matters most of all

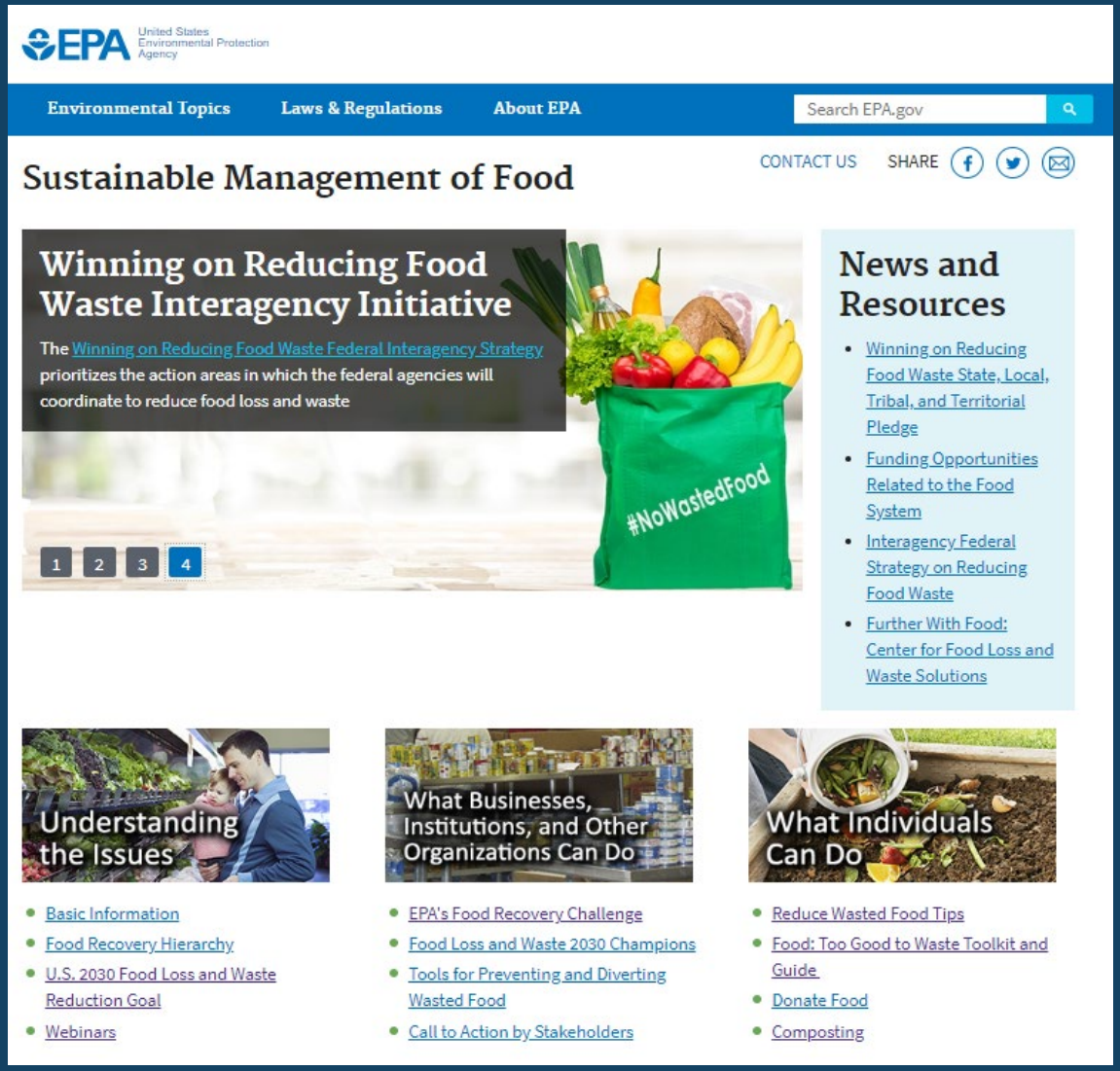
EPA's Food Recovery Hierarchy



Reduce Food Waste

EPA has strategies, tools, and tips for reducing wasted food

www.epa.gov/sustainable-management-food



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Benefits Of Community Composting

- Reduce landfilling
- Reduce greenhouse gas emissions
- Reduce open burning
- Support community gardening and food sovereignty
- Create jobs

Benefits Of Compost

- Improve soil quality and reduce erosion
- Store more carbon in soil
- Hold more water in soil
- Replace manufactured fertilizers
- Grow more food

Using Compost and Mulch

- Compost
  - Mix into soil
    --Poor soil: 4 to 8 inches
    --Established gardens: 1 to 3 inches per year
  - Adds soil structure, nutrients, helpful microbes
  - Reduces watering
  - Improves soil health, plant growth

- Mulch
  - Spread on top of soil
    --2 to 6 inches deep
    --Do not cover tree flare
  - Reduces watering, weeding, soil erosion, fire risks
  - Helps plants to grow by reducing soil temperature changes, and by holding in water and soil

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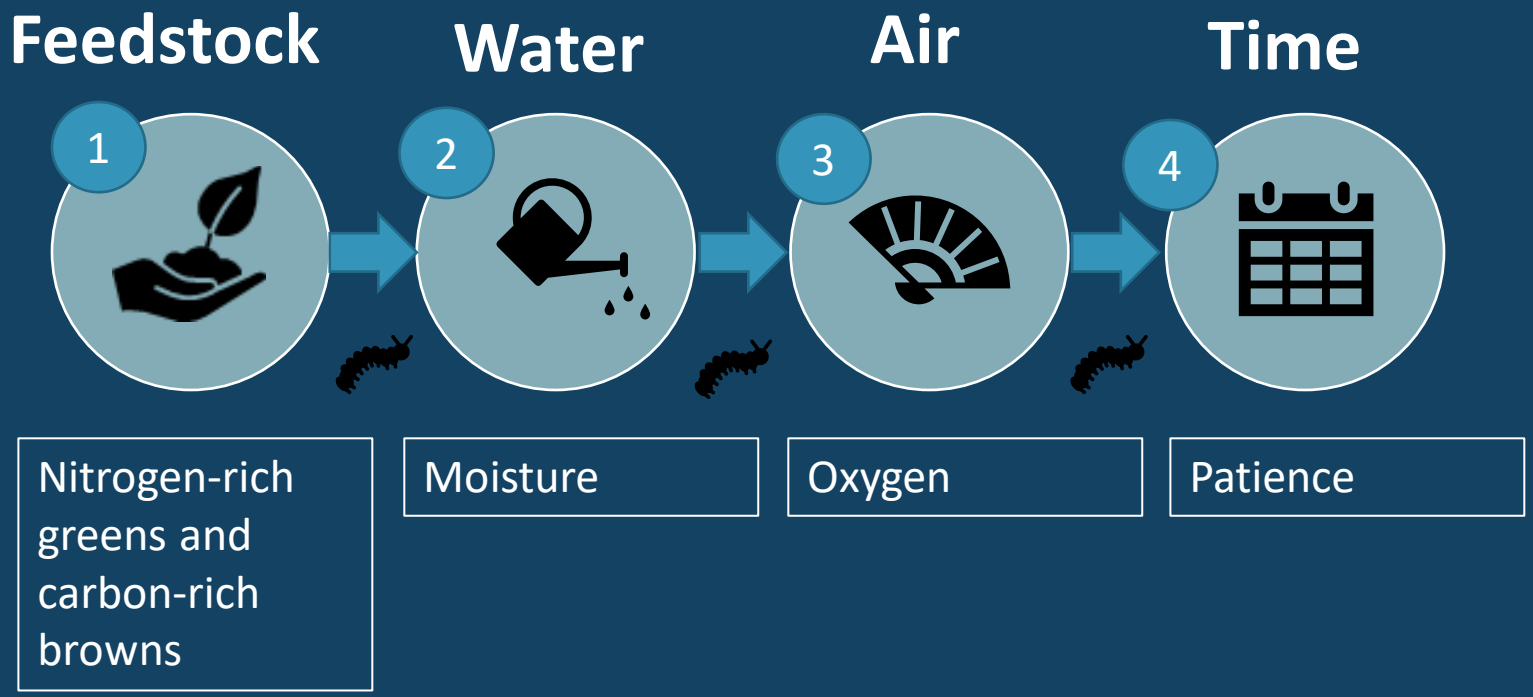
HOW COMPOSTING WORKS:

THE SCIENCE

Feeding Your Compost Pile: The Big Four Ingredients

Feed good microbes in your compost pile. They need food, water, air, and time to make good things happen, just like us. And some love!

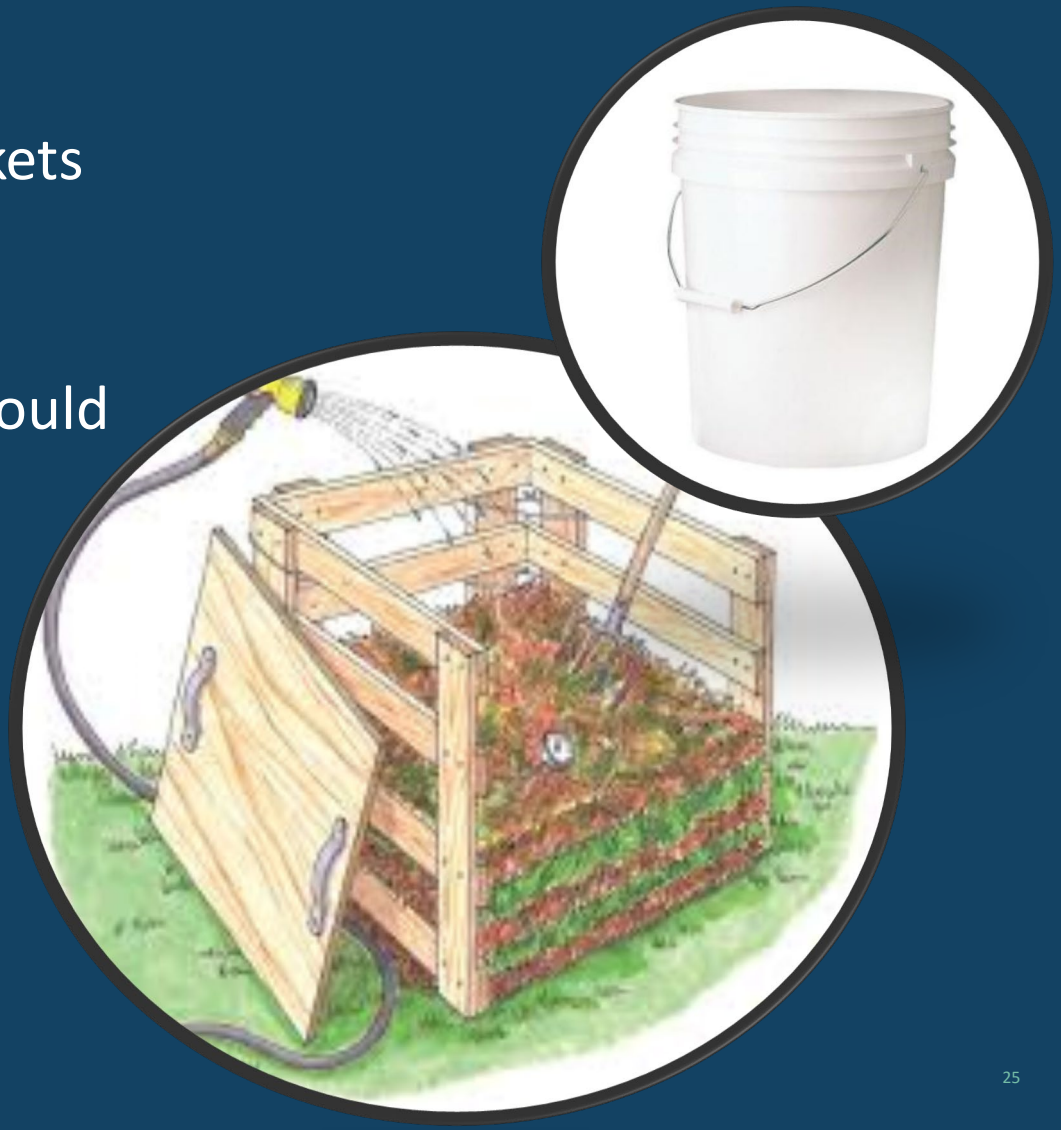


1. Feedstock: Browns and Greens

BROWNS - Carbon to Nitrogen Ratio		GREENS – Carbon to Nitrogen Ratio	
Leaves	(30 to 60:1)	Fruit & vegetable scraps	(15 to 20:1)
Straw	(75:1)	Coffee grounds	(20:1)
Corn stalks	(75:1)	Grass clippings	(15 to 25:1)
Pine needles	(80:1)	Animal manure	(7 to 25:1)
Woody plant prunings	(100:1)	Fresh alfalfa	(15:1)
Mixed paper	(200: 1)	Hay	(25:1)
Wood chips	(400:1)	Seaweed	(20:1)

1. Feedstock: A Simple Mix that Works

- Three or four 5-gallon buckets of food scraps
- One cubic yard of leaves would fill an average compost bin made from wood pallets



1. Feedstock: Sample Mixes

- Leaves
- Leaves, grass
- Leaves, food scraps, woody prunings
- Animal bedding (manure/straw)
- Leaves, animal bedding, woody prunings
- Leaves, food scraps, animal bedding, shredded paper
- Food scraps, shredded paper or straw (if worm composting)

1. Feedstock: Yard Trimmings

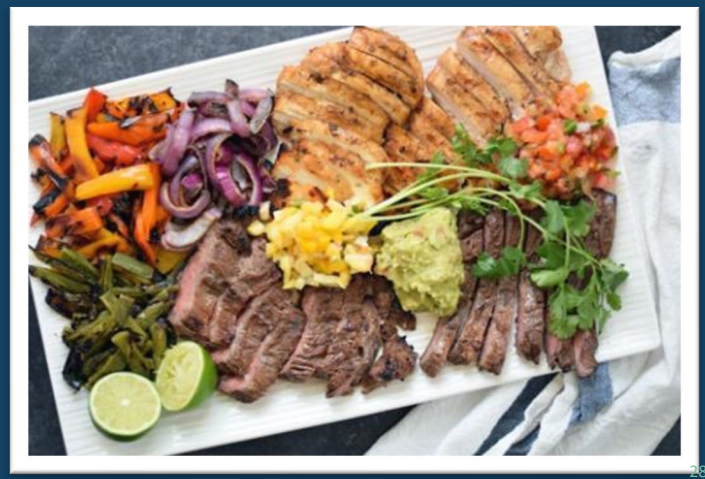
- Leaves
  - Easiest to compost
  - Medium decomposition rate
  - Compost alone, or mix with grass, ground up or shredded woody materials, or food scraps

- Grass Clippings
  - Reasonably simple to compost, provided they are mixed with leaves
  - Often smells if composted alone
  - Rapid decomposition rate, to point of self-combustion if mixed in big pile with woody material, and left untended
  - Compost grass with leaves

- Brush/Woody Materials
  - Grind or shred
  - Use directly as mulch, or compost with other materials
  - Slow decomposition rate
  - Loose brush should not be stockpiled with grass clippings due to potential fire hazard

1. Feedstock: Food Scraps

- Vegetative Only
  - No food of animal origin
  - Relatively easy to compost
  - Similar to composting yard trimmings
- Meat/Dairy + Vegetative
  - Strongly recommend following health/safety requirements (Process to Further Reduce Pathogens)
  - Might attract animals

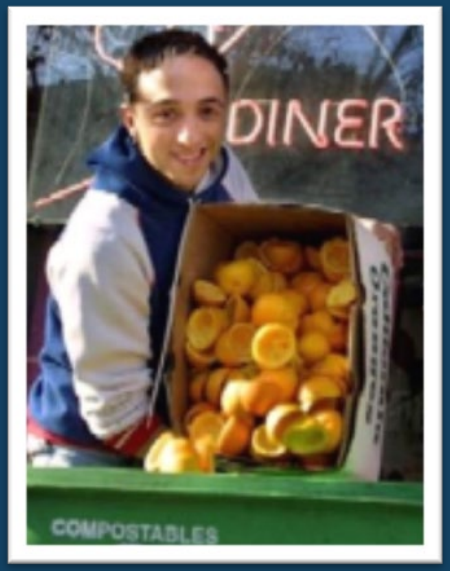


1. Feedstock: Paper

- Paper can be composted, in modest amounts:
  - Up to 10% by volume of compost pile
  - Shredded paper better than whole paper
  - Softer paper better than more rigid paper
  - Unwaxed cardboard better than waxed or plastic-coated
- Paper poses challenges for composting if:
  - Large quantities (high carbon)
  - Cardboard (too thick)
  - Milk cartons (plastic liner)

1. Feedstock: Considerations for Sourcing

- Materials Generators
- Quantities
- Collection/Access
- Seasonality



1. Feedstock: What's In and What's Out

- Many possible feedstocks
- Choose what works well for your program
- Start simple
- Add more feedstocks over time

1. Feedstock: Preventing Contamination at Food Facilities

Common Contaminants to Avoid

- Plastics (shrink wrap, straws, small packet wrappers, nitrile gloves)
- Paper (plastic-lined milk cartons, laminates, composites)
- Metal (occasional lost utensils)
- Glass (occasional bottles)
- Grease and cooking oil (not suitable for composting)

Need for education and training of food preparation, food service, dishwashing, and custodial staff

2. Water

- Compost piles need water
- Science: Target starting range is 40% to 60% water by weight
- Practical: Use “squeeze test” to check moisture level (Wet as wrung-out sponge)

Hoop Barn

2. Water

ACTIONS

If too wet, you can:

- Add brown materials
- Use a cover (tarp or open-air structure)

If too dry, you can:

- Add green materials
- Increase watering {most important}
- Use a pile cover (e.g., tarp or mulch) to hold in moisture
- Reduce drying effects of wind by blocking it with a physical barrier, called a “wind break” (e.g., trees, mound of dirt), or moving the compost pile to a less windy area

3. Air ("Aerobic Composting")

- Compost piles need air
  - The little critters (microbes) who do the actual composting work need to breath!
- You may hear the term "aerobic" to describe composting or exercise; it means "with oxygen"
- If not enough air, good microbes die, "anaerobic" microbes thrive, and then compost piles can smell bad

3. Air ("Aerobic Composting")

- How to make sure the pile has enough air?
  - Feedstock mix: mix of greens and browns, to make sure there is enough structure to the pile for air flow

  AND EITHER
  - Pile-turning: pitchfork (small systems); tractor/front-end loader or other (larger systems) OR
  - Passive aeration: perforated pipes layered in compost pile

Building Your Compost Pile: 3 Key Actions

Chop

- Brushy or woody materials

Maintain

- Air flow
- Moisture

Mix

- Greens and browns
- Make sure food scraps are buried at least one foot deep in the pile

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4. Time

- Composting takes between 2 months and 18 months
  - Can be sped up by managing the feedstock, air and water
  - Is a forgiving process – you will get the same results in the end regardless of how long it takes
- If you are composting animal-based food scraps
  - Turn the pile five times within 15 days and maintain 131 degrees Fahrenheit in the pile (Turning Method)
  - Maintain 131 degrees Fahrenheit in the pile for 15 days (Static Pile Method)

Determining When Compost is Ready

- ✓ **Compost is ready** when it looks, feels and smells like rich, dark earth
- ✓ It should be dark brown, crumbly and smell like earth

Troubleshooting

Problem	Cause	Solution
Compost pile does not heat up	Too wet	Turn the pile; add dry materials (i.e. sawdust)
	Too dry	Water the pile well (penetrate heap, without making it soggy)
	Not enough nitrogen	Turn the pile and add “greens” (i.e. grass, animal manure, food scraps, coffee grounds)
Compost pile smells putrid (like rotten eggs)	Too wet/ not enough air (pile is putrefying, not decomposing)	Turn the pile to increase air flow through it. Add dry materials that absorbs water
Compost pile has ants	Too dry	Turn the pile and add water
Compost pile is attracting small animals	Food scraps, especially meat, dairy, and grains	Enclose compost pile with ½ inch wire mesh and secure lid (if 1 to 3 bin system), add food to center of pile, turn the pile, ensure adequate heating of pile

Questions?

HOW COMPOSTING WORKS:

APPROACHES & METHODS

Community Composting Methods

Smaller Scale (generally less than 10 cubic yards)

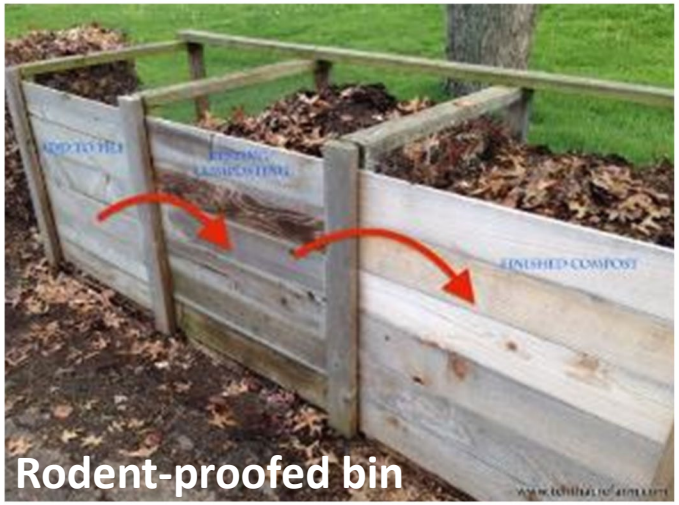
- Three-bin systems
- Trench
- Worm composting
- In-vessel

Larger Scale (defined as up to 100 cubic yards on site)

- Windrow (long pile)
- Passive aerated static pile

Composting Methods: Bins


Three-bin


Rodent-proofed bin


Repurposed pallet


Cinderblock stall

Composting Methods: Bins

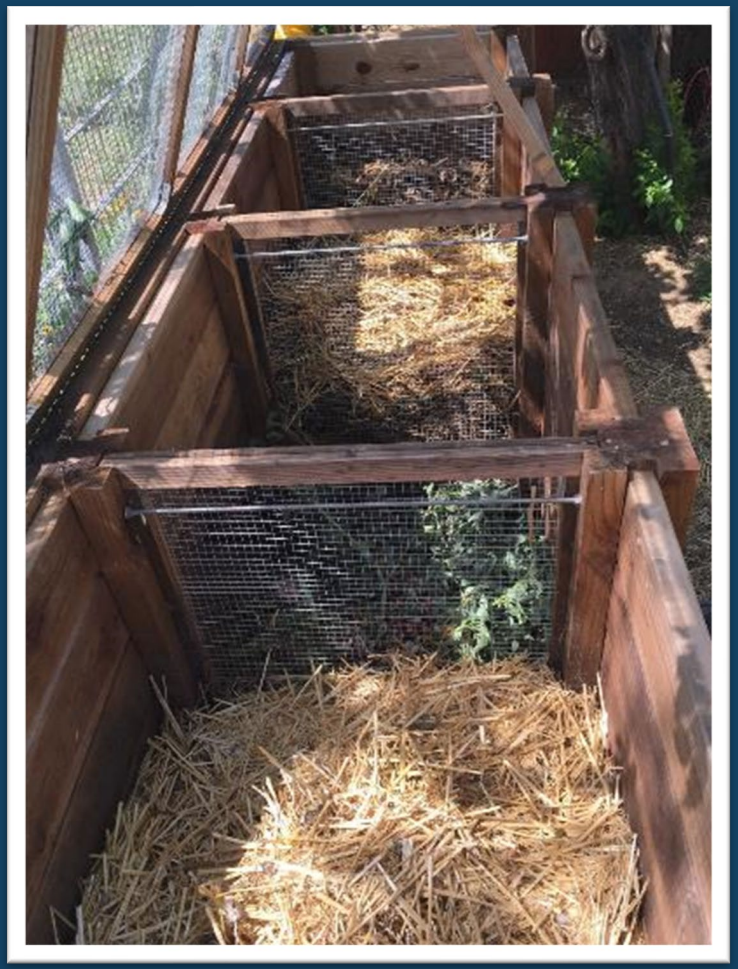
Size	Cost Estimate
1-10 CY	$100 to $300

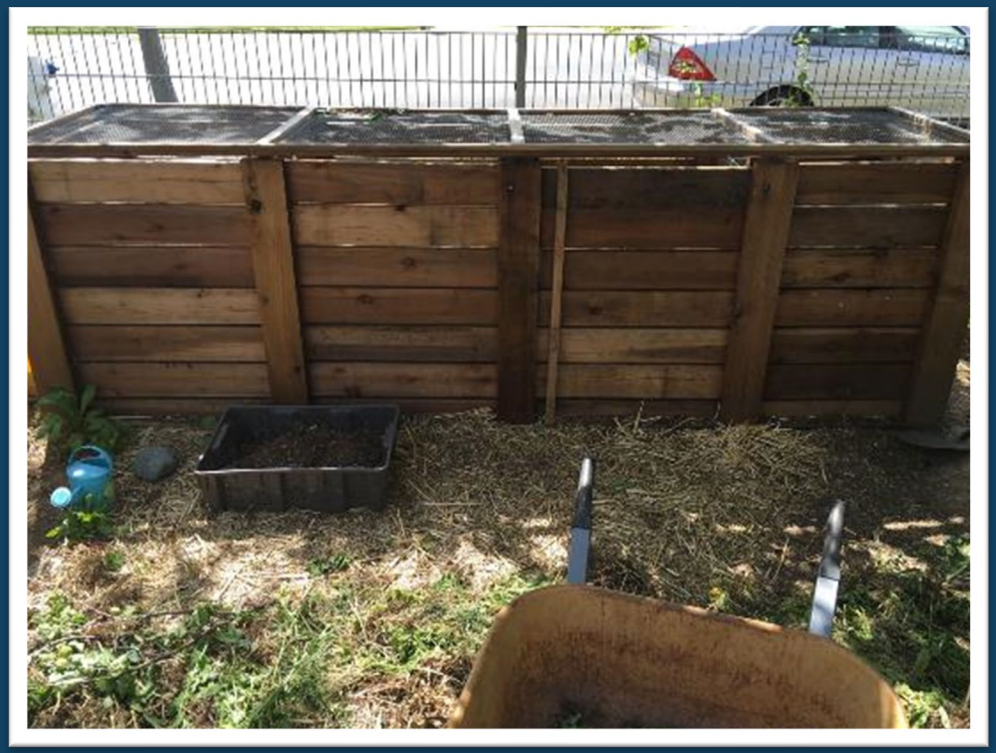
Advantages	Limitations
• Low Cost • Able to customize • Pride in Do It Yourself (DIY) • Neat, tidy • Easy set-up	• Turning piles by hand • Costly unless stick to basic models

Recommended Supplies

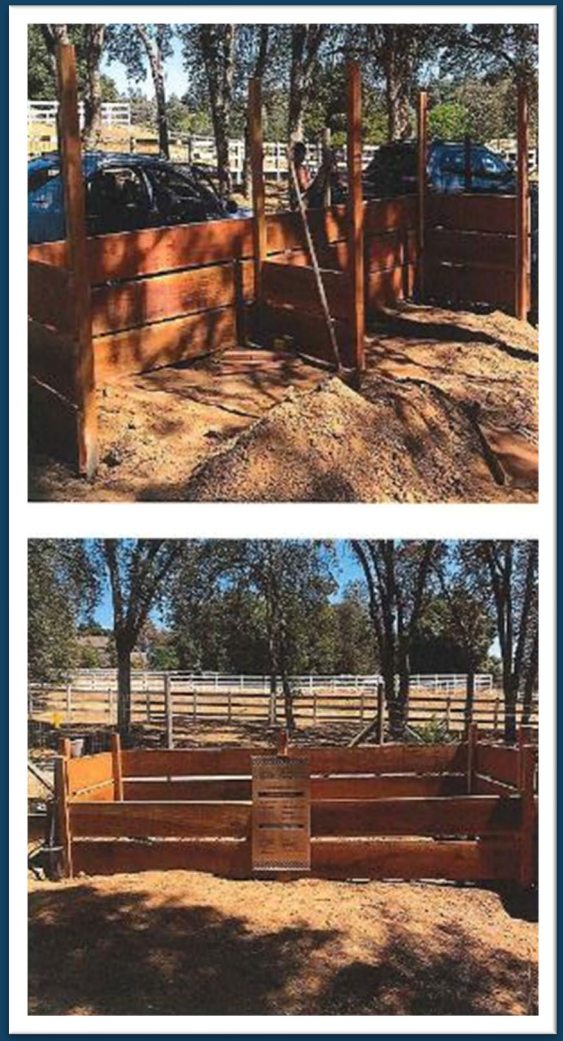
- Scrap wood, discarded pallets ,or cinder blocks
- Pitch fork
- Water and hose
- Rodent-proof wire mesh (if composting food)

Yocha Dehe Wintun Nation Community Composting





Shingle Springs Community Composting



Composting Methods: Trench Composting

Size

1-3 foot wide by 10-100 feet long by 2-3 feet deep

Cost Estimate

$0 to $500

Advantages

- No cost
- Low maintenance
- No watering

Limitations

- Digging might be hard
- Need space
- May attract animals

Recommended Supplies

- Minimum equipment needed: shovel(s)
- Desired equipment: small mechanical digger/excavator

Composting Methods: Worms

Size

Scalable from the size of a cardboard box to the maximum for community composting

Cost Estimate

$200 to $10,000 depending on initial size of system

Advantages

- Easy, tidy, quiet
- Fun, educational for kids
- Makes excellent fertilizer

Limitations

- Narrow range of feedstocks: vegetative food scraps
- Narrow range of suitable temperatures: worms die if they freeze (32° F) or overheat (above 85-90° F)

Recommended Supplies

- Scrounged dimensional lumber or fruit crates
- Trowel(s)
- Shredded paper or straw
- Rubber gloves
- Water bucket
- Homemade screen

Excellent Sourcebook: The Worm Farmer's Handbook by Rhonda Sherman

Composting Methods: Turned Windrows

Farm-scale windrow turner attachments

Tractor with bucket

Composting Methods: Turned Windrows

Size

Up to 100 CY on site at any one time (for "community composting")

Cost Estimate

Estimates will vary widely, depending on whether heavy equipment can be borrowed periodically for windrow formation and turning, rented on a short-term basis, or purchased used or new.
As a large placeholder, assume a cost of $10,000 to $75,000 for equipment and supplies.

Advantages

- Shape allows for easy access, mechanical turning, containment of possible run-off
- Can add new materials to end of small windrow or start new one

Limitations

- May need frequent watering and mechanical turning in first 30-60 days
- Needs available land, water, and buffer zone

Recommended Supplies

- Tractor with bucket or windrow turner attachment, or front-end bucket loader
- Water; water hoses or sprinkler system
- Large compost thermometer
- Shovels
- Possibly a wood/brush grinder/shredder
- Possibly a large truck to transport feedstocks

Composting Technologies: Passive Aerated Static Pile

Composting Technologies: Passive Aerated Static Pile

Size

Up to 100 CY on site at any one time (for "community composting")

Cost Estimate

Similar to turned windrow

Advantages

- Same as above, plus aerated drain pipes reduces or eliminates need for pile turning to add air
- Conserves water more than windrow turning

Limitations

- Pipes may need to be unclogged occasionally
- Periodic turning may be needed or desirable to ensure all parts of compositing mass meets PRFP
- Needs available land, water, and buffer zone

Recommended Supplies

- Tractor with bucket attachment, or front-end bucket loader
- Shovels
- Water; hoses or sprinklers
- Large compost thermometer
- Perforated drain pipe
- Possibly a pile cover
- Possibly a wood/brush grinder/shredder
- Possibly a large truck for transporting feedstock

Area for Further Investigation: Small In-Vessel Composting Systems

- Fully enclosed and mechanical

- Offers advantages of rapid composting, less labor, more system controls
- Poses potential disadvantages of high cost, need for electricity, need for spare parts and maintenance

DEVELOPING A COMMUNITY COMPOSTING PROGRAM:

ASSESSING NEEDS & CAPACITY

Community Assessment: Needs and Capacity

Issues and Strengths

- What are one or two important issues that composting could help to address?
- Which area(s) are we strongest in:
  - project management;
  - community mobilization;
  - figuring things out on our own;
  - access to outside resources;
  - other?
- What would give us more confidence about implementing a successful program?

Community Assessment: Needs and Capacity

Support

- Who in the community do we need to convince first and second?
- What specific existing or natural partnerships does the tribe have that could be particularly useful? What new or unexpected partnerships might be useful? Brainstorm “existing” and “new” partnerships.
- Who will help champion the project and what is their motivation to do so? Describe and rank by category:
  - community leaders
  - specific parts of our community
  - funders
  - partners

Community Assessment: Needs and Capacity

Success Indicators

- What would a moderately successful outcome look like?
- How can we tell if our program or project is successful?
- What would our program or project have to achieve for our community to consider it reasonably successful?
- Who will document our efforts, and how?

Community Assessment: Action Items

- [Community Assessment Discussion]

DEVELOPING A COMMUNITY COMPOSTING PROGRAM:

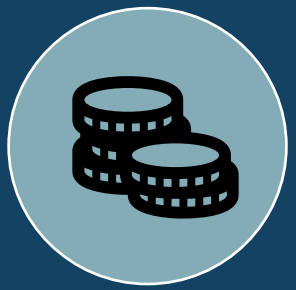
PROGRAM PLANNING

Community Composting Program Planning

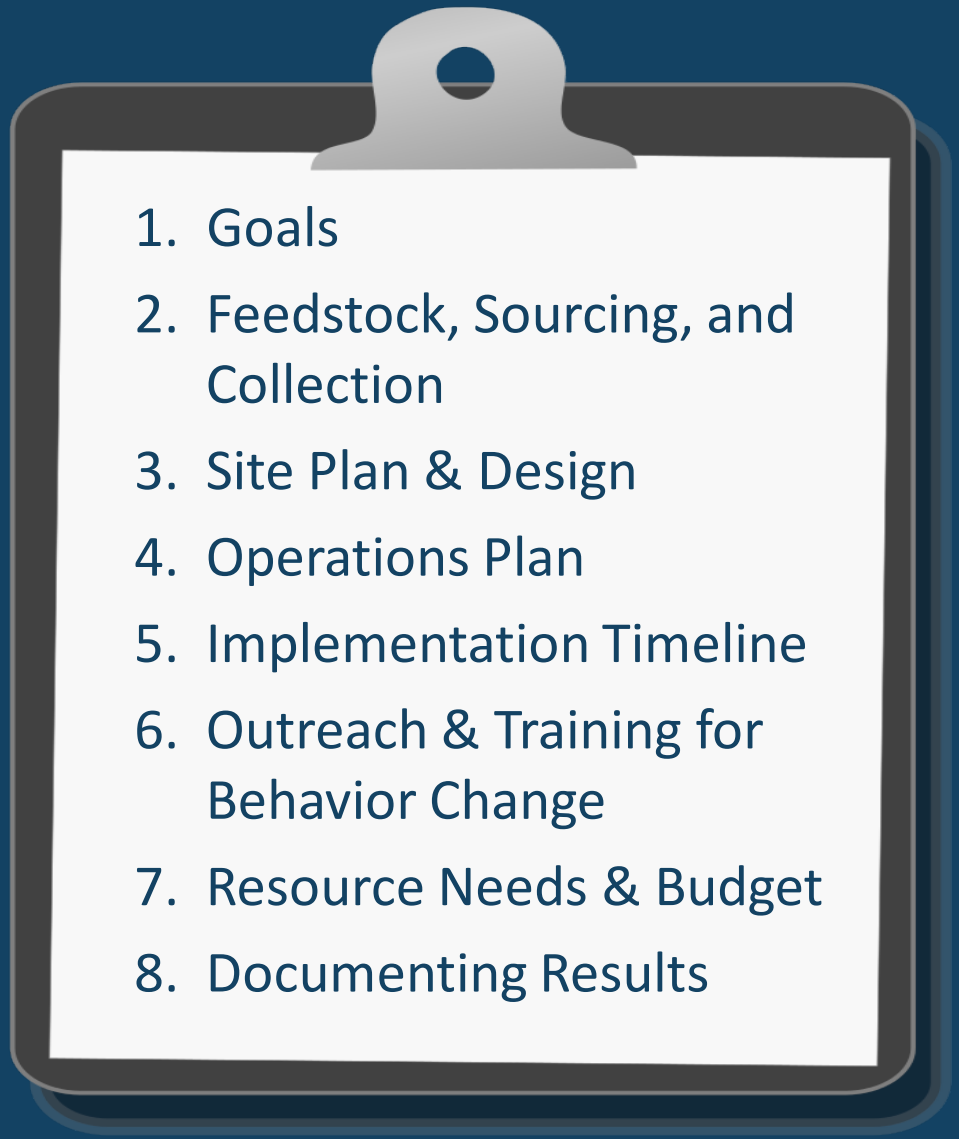
Develop a Plan

Build Community Support

Get Resources



Program Plan: Outline



Program Planning

1. Goals

- Purpose and vision
- Objectives
- Measurable outcomes
- Time frames

Program Planning

2. Feedstock, Sourcing, and Collection

- Methods
  - On-site
  - Drop-off by car or small pick-up truck
  - Other
- Sequencing Roll-Out
  - Which materials generators to involve first?
  - Next?

Program Planning

3. Process Site Plan and Design

- Site Plan
  - Space needs
  - Water availability
  - Site preparation
  - Site access and security
- Consider your Maximum Scale Site Design and Operations

Program Planning

4. Operations Plan

- Operations Plan
  - Site supervision
  - Description of regular operations
  - Site maintenance
  - Nuisance control (odor, run-off, animals, dust, noise, intruders)
  - Safety and accident prevention (people, spills, fires)

Program Planning

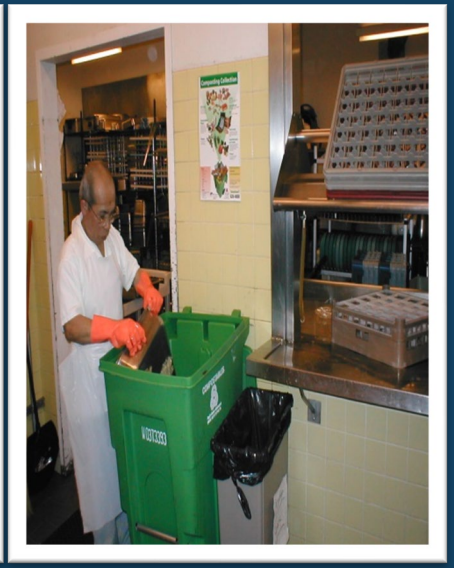
5. Implementation Timeline

- Sequencing of activities
- Setting target dates for phases
- Pilot phase
- Expansion phase
- Full-scale phase

Program Planning

6. Outreach & Training for Behavior Change

- Training is key to getting clean food scraps from casinos, restaurants, community centers, and grocery stores
- Training should focus on simple actions, reinforced by periodic re-fresher trainings
  - New, good habits take time and several positive reminders
- Education and training may be needed about the use of compost and mulch



Program Planning

7. Resource Needs & Budget

- Capital
- Operational costs
- Staffing (paid? part-time? all volunteer?)
- Community support
- Community partnerships
- Budget preparation (examples to follow)
- Funding

Budgets: *Potential* Cost Components

Initial Cost

- Site Improvements (grading, access road, fencing, utility hookups)
- Building/Covered Area
- Processing Equipment (tractor or front-end loader, compost turner attachment, hoses, compost cover, large thermometer, other)
- Design and Construction
- Start-up

Annual Cost

- Labor (administration, collection, site operation)
- Maintenance (parts and repair)
- Fuel
- Electrical Power
- Water
- Supplies
- Laboratory Services
- Other

Sample Budgets

Sample Budget - $70,000

$66,000 Year 1 Cost

• Concrete Pad (100 sq. ft.)	$ 1,000
• Pick-up Truck (used)	$10,000
• Wood chipper/shredder	$24,000
• Front-end loader w/bucket	$25,000
• Water line	$ 1,000
• Electrical	$ 2,000
• Hand tools/supplies	$ 1,000
• Other (shed, fence, misc.)	$ 2,000
Total Initial Costs	**$66,000**

Annual Operational Costs $ 4,000

- (300 cubic yards/year,
- 250 CY yard trimmings (40 tons),
- 50 CY vegetative food (20 tons)),
- Assumes part-time paid hauler/operator

Total Year 1 Costs $70,000

Sample Budgets

Sample Budget - $35,000

$10,000 Year 1 Cost

- Wood chipper/shredder $24,000
- Hand tools/supplies $ 1,000
- Other $ 3,000

Total Initial Costs **$28,000**

- **Annual Operational Costs**
- Discount occasional use of used tractor with bucket **$ 3,000**
- Part-time paid operator **$ 4,000**
- Drop off of materials
- (same size operation)

Total Year 1 Costs **$ 35,000**

Program Planning

8. Documenting Results

- Cost-benefit analysis (can be simple to complex)
- Amount and type of materials processed annually
- End uses and amounts of compost, mulch annually
- Employment generation, if any
- Volunteer engagement
- Perceived community and environmental benefits
- Other

The Composting Journey: An Endpoint? Or Sprouting Beginnings?

"You must teach your children that the ground beneath their feet is the ashes of our grandfathers. So that they will respect the land, tell your children that the earth is rich with the lives of our kin.

This we know. All things are connected."

--attributed to Chief Seattle

Objectives Summary

You should now be able to:

1. Describe what compost is and its benefits
2. Identify community composting practices that might work well in your community
3. Pick a path to developing your community composting program

Additional Resources

- Training Courses
  - U.S. Composting Council: compost operations training courses
  - Solid Waste Association of North America: managing composting programs e-course
  - Maine Compost School: operator training, medium-scale composting (including fish and other animal carcasses)
  - Institute for Tribal Environmental Professionals, Northern Arizona University: composting strategies and tribal food security
- Funding and Partnership Opportunities
  - U.S. Environmental Protection Agency
  - Land-grant State Universities: sustainable agriculture, food security, waste management (e.g., UC Davis, Oregon State University)
  - State Cooperative Extension Services (e.g., Washington State University, University of Idaho Extension)
  - Statewide Recycling Trade Associations (e.g., Association of Oregon Recyclers, California Organics Recycling Council, Arizona Recycling Coalition, Northern California Recycling Association)
  - County Master Composter groups

Solutions Are in Our Hands

Composting is a hopeful act,

showing faith in the future

and in future generations

Instructor's Contact Information

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EPA Tribal Solid Waste Coordinators

For additional assistance, please reach out to your EPA Tribal Solid Waste contact

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More Regional EPA Tribal Waste contacts:

https://www.epa.gov/tribal-lands/forms/contact-us-about-tribal-waste-management

BACKUP

Picking the Right Composting Technique for You
Hint: For Your Program, Use More Than One

TYPE	SIZE	ADVANTAGES	LIMITATIONS	BEST APPLICATION	MATERIALS NOT TO USE
Heap	1-5 CY	No cost. Low maintenance. Easy.	Slow decomposition. May attract animals. Can look untidy. Possible fire risk.	Area not directly visible to neighbors.	Meat, bone, dairy, excessive food.
Bins—Build Your Own	1-10 CY	Low cost. Able to customize. Pride in DIY.	Turning piles by hand.	Home, school, community center.	Wide range of acceptable materials.
Bins—Purchase		Neat, tidy. Easy set-up.	Costly unless stick to basic models.		
Trench	< 1 CY	No cost. Low maintenance. No watering.	Digging might be hard. Need space. May attract animals.	For new gardens or landscapes.	Wide range of acceptable materials.
Worms	< 1 CY	Easy, neat, tidy. Fun for kids. Makes excellent fertilizer.	Narrow range: vegetative food scraps.	Indoor or outdoor, food scraps	Meat, bone, excessive citrus

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TYPE	SIZE	ADVANTAGES	LIMITATIONS	BEST APPLICATION	MATERIALS NOT USE
Windrow	Up to 100 CY on site at any one time (for "community composting")	Shape allows for easy access, mechanical turning, containment of possible run-off. Can add new materials to end of small windrow or start new one.	May need frequent watering and mechanical turning in first 30-60 days. Needs available land, water, and buffer zone.	Upper end of community composting size range.	Wide range of acceptable materials.
Passive Aerated Static Pile	Up to 100 CY on site at any one time (for "community composting")	Same as above, plus aerated drain pipes reduces or eliminates need for pile turning to add air. Conserves water more than windrow turning.	Pipes may need to be unclogged occasionally. Periodic turning may be needed or desirable to ensure all parts of composting mass meets PRFP. Needs available land, water, and buffer zone.	Upper end of community composting size range.	Wide range of acceptable materials.

Low organic matter

High organic matter

add compost

Healthy soil, healthy food, healthy communities