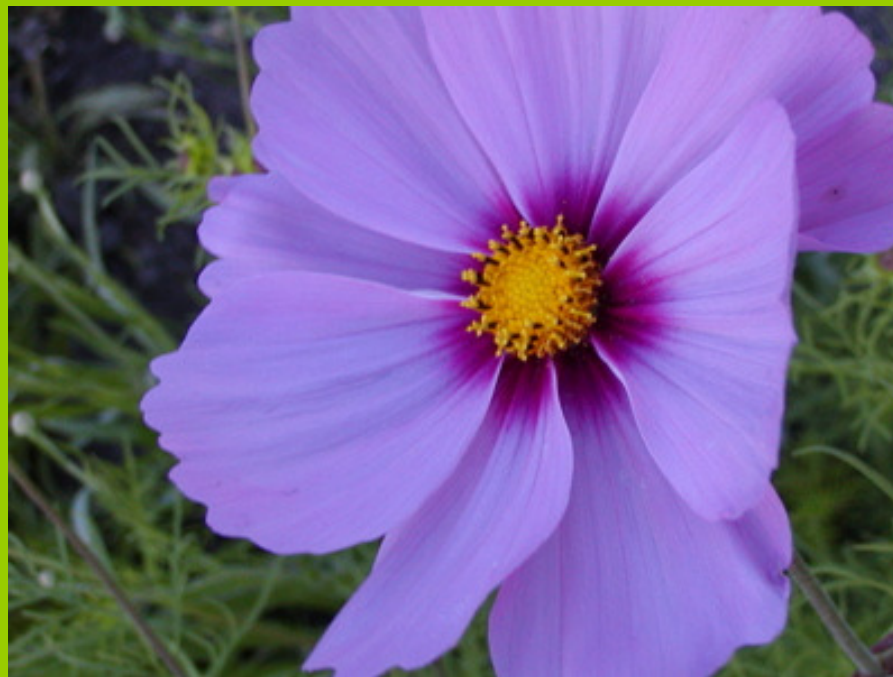


Basics of Organic Gardening



sponsored by

Maine Organic Farmers and Gardeners
Association

www.mofga.org



What's wrong with the conventional approach?



- agricultural chemicals are toxic
- pesticides kill more than their target pests
- implications for human and environmental health
- synthetic fertilizers are manufactured from oil
- the bulk of agricultural chemicals are used in a home garden situation

The organic approach

- Mimics nature
- Recycles nutrients and waste
- Minimizes external inputs
- Preserves and enhances soil biological activity
- Conserves soil
- Conserves soil moisture
- Eliminates the need for toxic chemicals
- Generally promotes human and ecological health

TAKE AN ECOLOGICAL APPROACH

- **The goal is to create a garden environment that tries to mimic nature and maximizes diversity in the system at all levels –**
 - **In the soil**
 - **In the crops**
 - **In the critters (bugs, microbes, nematodes, birds, etc)**
- **The system is “in balance” so pest outbreaks are minimized, and nature works FOR you (i.e., natural predators take care of pests instead of chemical pesticides)**

START WITH THE SOIL

- **Building and maintaining fertile, productive soil rich in organic matter is a key to success with organic techniques**
- **“Feed the SOIL, not the plant”**

Conventional approach – “feed the plant” – uses water-soluble synthetic nutrients to feed the plant

Advantages: accurately provides crops with the nutrient they need when they need it

Disadvantages:

- does nothing to build long-term soil fertility
- degrades soil structure over time
- organic matter levels decrease
- creates an inhospitable environment for soil life (microbes, earthworms, etc)
- high potential for pollution because nutrients are all soluble, and can leach into surface and groundwater
- high environmental impact because nutrients have to be brought into the garden new each year – synthetic fertilizers are derived from petroleum products
- food grown in this system is arguably less nutritious

Organic approach - Feed the SOIL

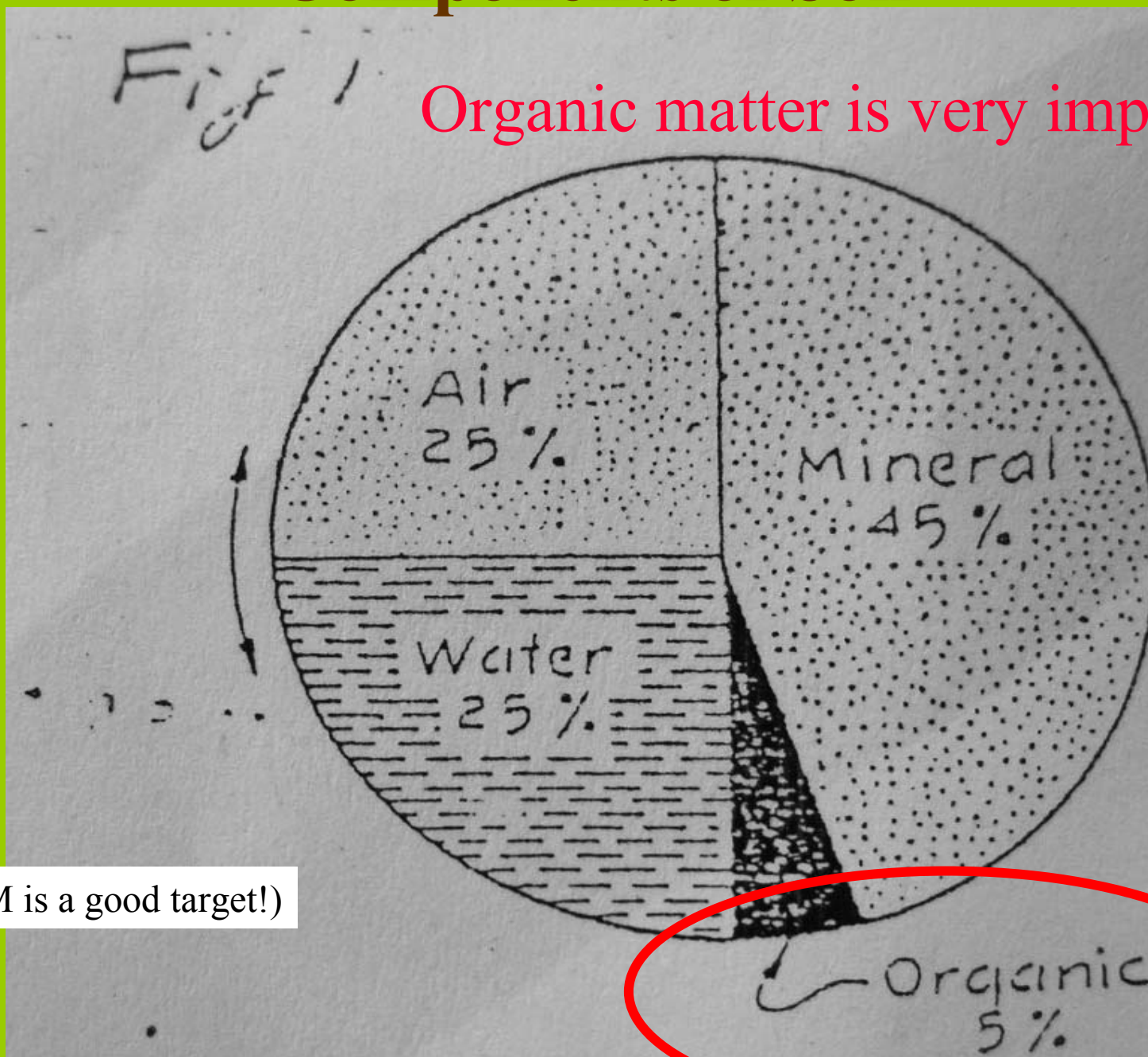
- uses ORGANIC MATTER and minerals in rock powders to build the organic component of soils and soil nutrient levels, which in turn supply the crop with its needs and improves soil structure so the soil has the capacity to hold water, air and nutrients
- nourishes soil microorganisms
- low potential for pollution because nutrients are tied up in complex molecules
- less environmental impact because nutrients are recycled and conserved in the garden

Key To Organic Soil Care

- Build Soil Structure and Encourage Microbial Activity
- Build Reservoirs of Plant Nutrients
- Minimize Environmental Impact

Components of Soil

Organic matter is very important!



(5% OM is a good target!)

Functions of Organic Matter

RAW

- Provide Soluble Nutrients
- Provide Food for Microbes
- Releases glues for Soil Aggregation

HUMUS

- Provides Slow Release Nutrients
- Increases Nutrient Holding Capacity (“cation exchange capacity”)

Organic matter also contributes to good soil structure

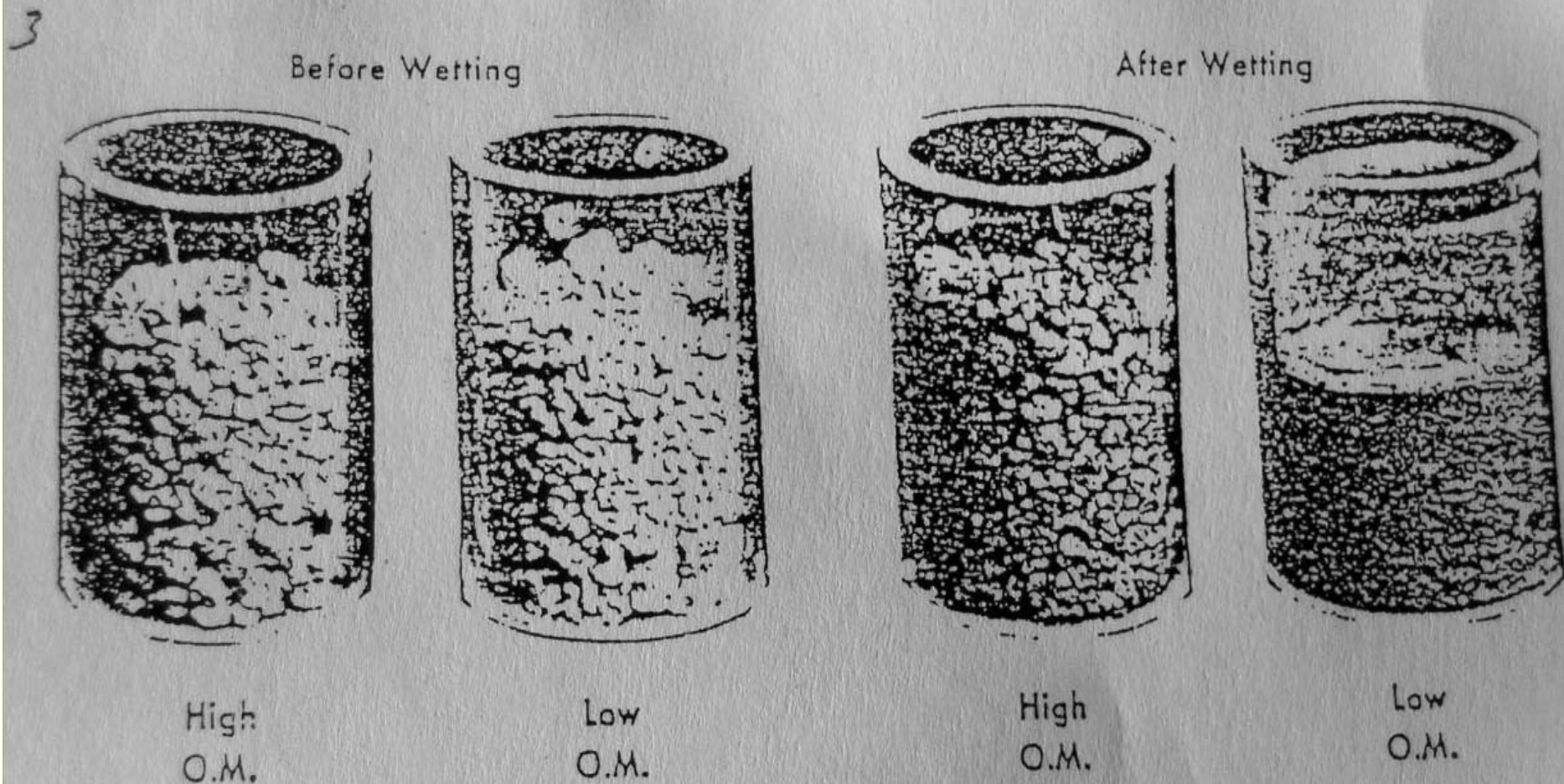


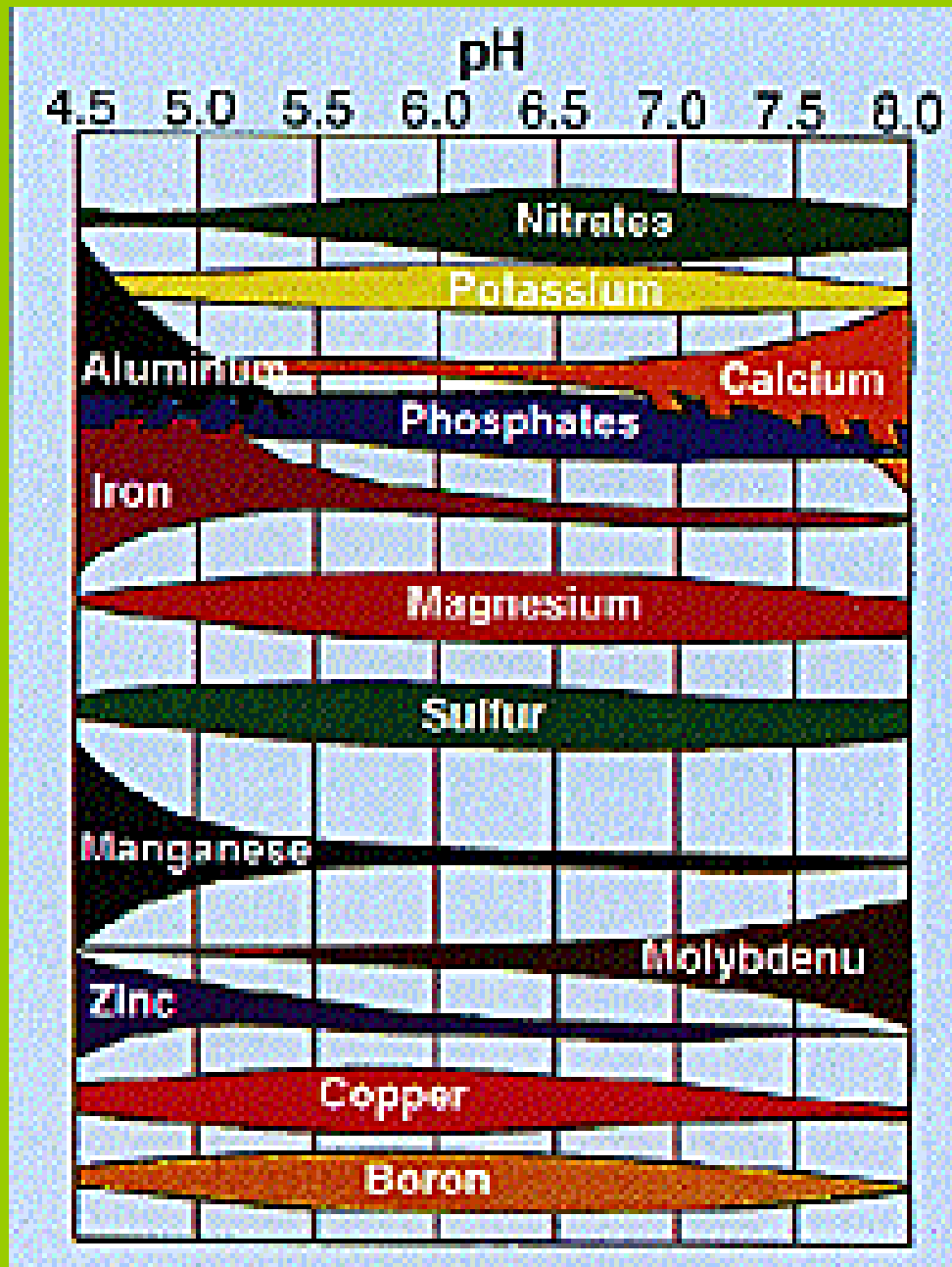
Figure 3:10. The aggregates of soils high in organic matter are much more stable than are those low in this constituent. The low organic matter soil aggregates fall apart when they are wetted while those high in organic matter maintain their stability.

What makes Soil Fertile?

- Presence and Availability of Plant Nutrients (high Cation Exchange Capacity)
- pH
- Structure -- “mellow soil,” “good tilth”
- Biological activity



Relationship of pH to nutrient availability



Building Structure and Fertility Organically: 2 areas to focus on

- Adding Organic matters
 - Living
 - Dead
 - Very Dead (humus)
- Maintaining mineral content with Rock Powders

Key Organic Strategies

- Crop Rotation -- for fertility, weed control, to break pest & disease cycles
- Cover Crops/Green Manures -- for fertility, to prevent erosion
- Diversity -- to encourage ecological interactions, let nature work for you
- Compost -- to recycle organic wastes, provide food for soil organisms
- Observation!!

Crop Rotation: 3 objectives

- Control Insects and Disease
- Manage Weeds
- Manage Nutrients and Build Soil

Crop Rotation to Manage Nutrients

Rotate Crops w/ Crops

Heavy Feeders:

Corn

Spinach

Squash

Tomatoes

Light Feeders

Peas

Peppers

Radish

Beans

Crop Rotation for Insect and Disease Control

- Rotating crop families breaks up pest and disease cycles by removing host plant from the system

depends upon:

- Dispersal Ability of Pest or Disease (can it fly?)
- Host Specificity (can it survive on another plant family?)
- Ability of Pest to Persist w/o Host (does it have a dormancy period?)

Cover Crops & Crop Rotation for Weed Control

- To out-compete weeds (shade, smother, allelopathy)
- Fallow “Stale seedbed”-- let weeds sprout, then kill them (hoeing, flaming, shallow tillage)
- Encourage weed seed predation (cover for mice)

Cover Crops and Green Manures

Rotate Crops w/ Cover Crops to:

- Replenish/Add Organic Matter
- “Mop up” Soluble Nutrients in fall
- Tap Leached Nutrients w/ Deep Roots
- Scavenge nutrients
- Fix nitrogen with leguminous green manures
- Control weeds

Examples of useful cover crops and green manures



Hairy vetch with rye



Hairy vetch



Red clover



Japanese millet

Examples of useful cover crops and green manures



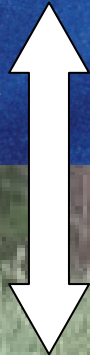
buckwheat



sudex



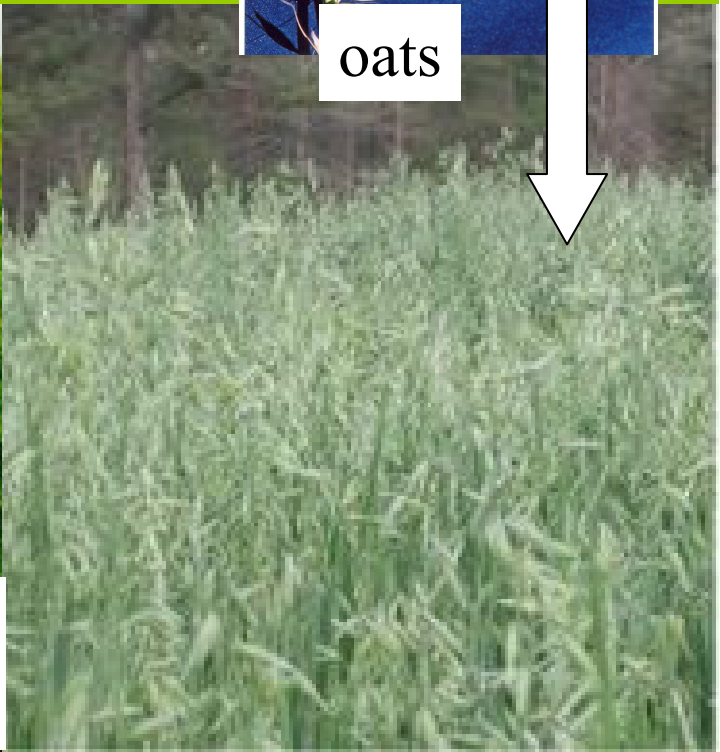
oats



field peas



yellow blossom
sweet clover



Compost

- great source of organic matter!
- the best way to build stable organic matter levels in soil
- a good source of nutrients that do not risk burning or shocking the microbes in the soil
- harbors a very diverse community of microorganisms, many of which have been proven to combat plant disease organisms
- the easiest way to use compost in a garden is to spread about an inch thick layer on the soil surface and till it in before planting

Composting = Aerobic Decomposition of organic material



Plus oxygen and
water



Microbial
Decomposition

CO₂



The Key to Successful Composting:

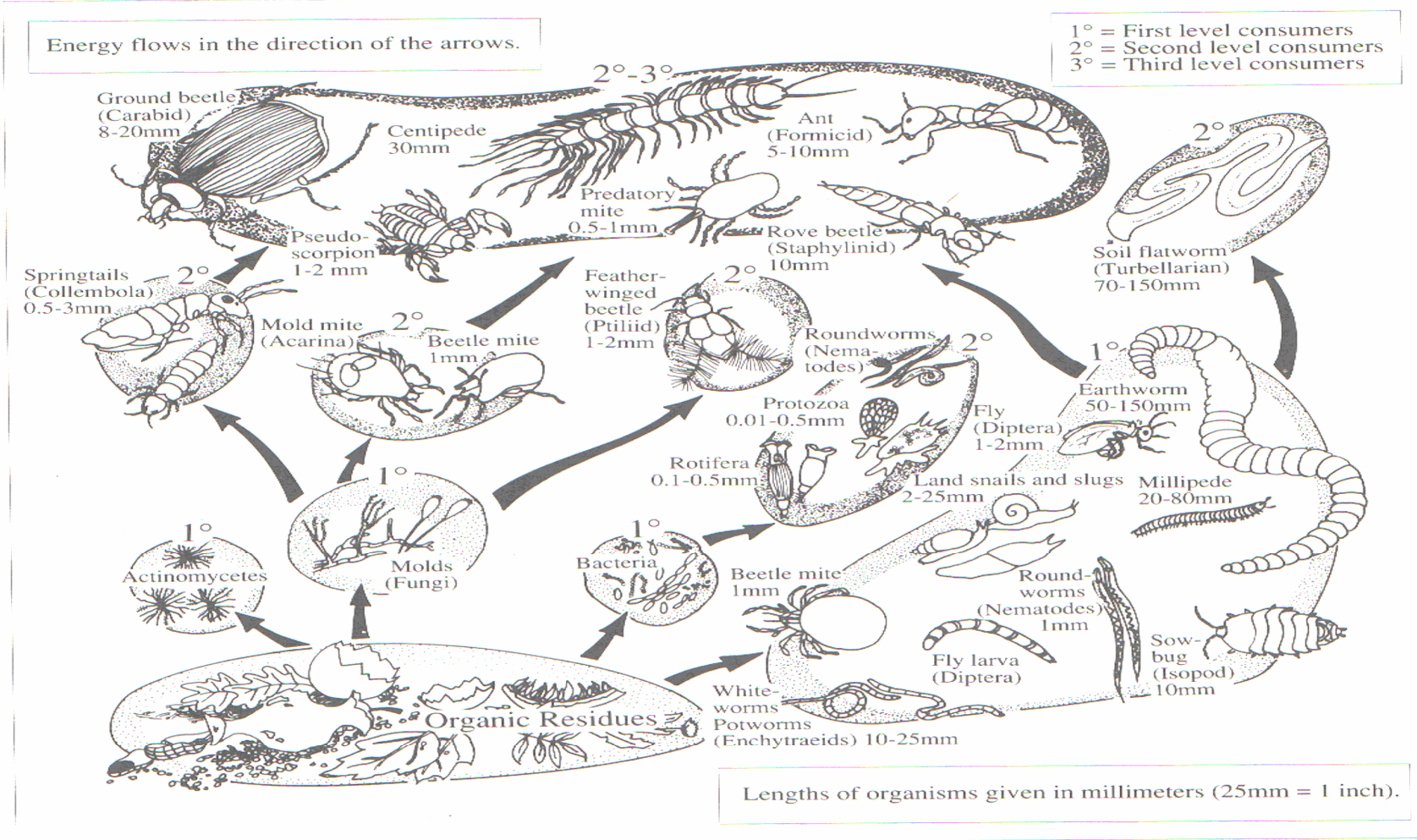


Fig. 3. The organisms in the food web of the compost pile.

Redrawn, by permission, from D.L. Dindal, *Ecology of Compost*, 1971.

Cater to the Critters!! Give them OXYGEN, WATER & FOOD
And let them do the work

Necessities for Successful Composting

- **Feedstocks** - any organic waste, mixed in the proper proportions
- **Oxygen**- above 5% needed to support microorganisms (air = 21% Oxygen)
- **Moisture**- 40% to 65% needed for healthy environment (below 15%, all activity ceases)
- **pH around 7** - too high pH increases ammonia production, too low pH reduces microbial activity

Feedstock C:N ratio -- between 20:1 and 40:1

20-40 parts

to

1 part

Carbonaceous Feedstock

- Usually Dry
- Low Odor
- Low Bulk Density

Examples:

Hay

Sawdust

Wood Chips

Dead, Dry Leaves

Nitrogenous Feedstock

- Generally Wet
- Stinky!
- High Bulk Density
- High in Plant Nutrients

Examples:

Manure

Fish Waste

Food Waste

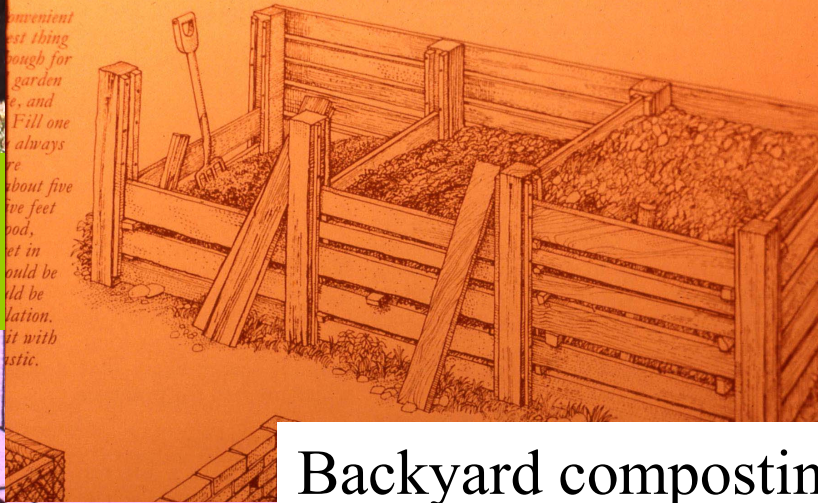
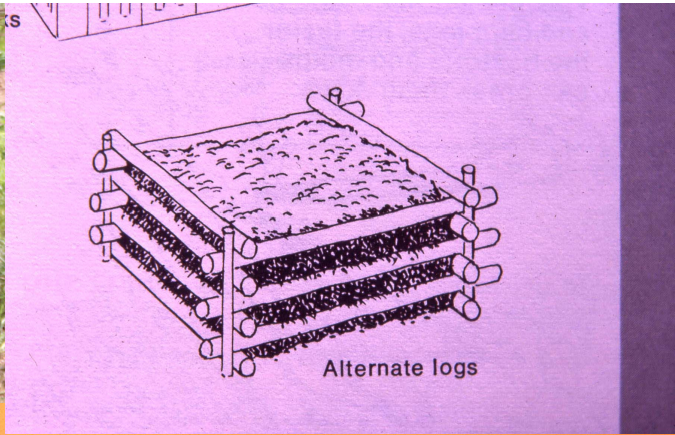
Grass Clippings

Carbon:Nitrogen ratios for Common Compost Feedstocks

| | |
|-------------------------|-------|
| Corn stalks | 60-70 |
| Coffee grounds | 20 |
| Fish waste | 2-5 |
| Food Scraps | 11-13 |
| Grass clippings (green) | 9-25 |
| Hay (w/legume) | 15-30 |
| Leaves (fallen) | 40-80 |
| Manures: | |
| -Chicken | 3-10 |
| -Cow | 13-18 |
| -Horse | 20-50 |
| -Sheep | 13-20 |
| Sawdust | 500 |
| Soybean meal | 4-6 |
| Straw | 80 |

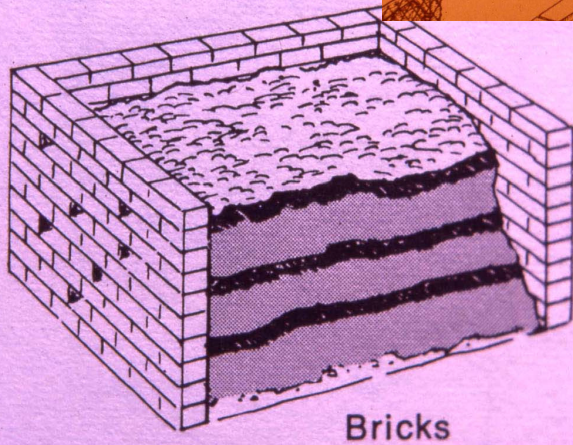
Managing the Compost Pile

- piles can be left to be, but they will usually compost slowly because bacteria will use up the oxygen, water and/or food in their immediate vicinity, and parts of the pile near the edges will never get a chance to heat up and kill the weed seeds or pathogens.
- turning the pile will mix it up and get oxygen into it.
- monitoring the temperature is the best way to determine when to turn the pile. If the pile has the proper moisture, oxygen and C:N ratio it will heat up in just a day or two. It should heat to about 140 - 160 degrees. After five days or so the pile will start to cool and that is the time to turn it. Repeat the heating and turnings at least a few times to make sure all of the material has a turn to heat up.
- Once the pile does not heat much after a turning, let it cure for one to six months to allow the natural flora to recolonize the pile

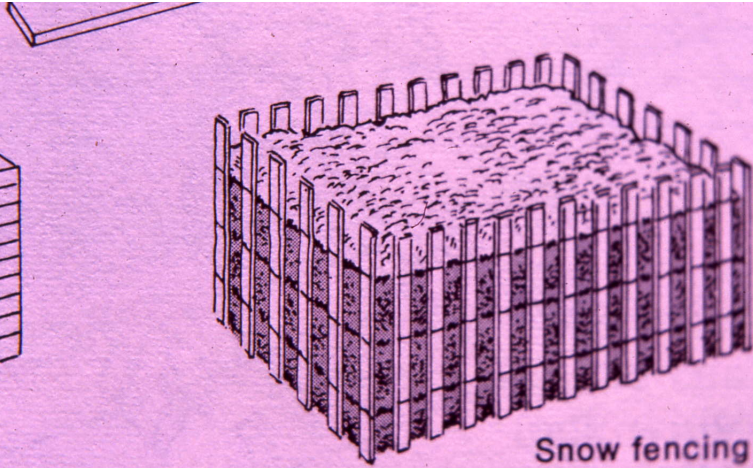


convenient
best thing
ough for
garden
e, and
Fill one
always
re
about five
ve feet
ood,
et in
ould be
ld be
lation.
it with
astic.

2x6 boards



Backyard composting containers



Trouble-Shooting the Compost Pile

Temperature- Does not heat

C:N ratio wrong?

Too wet or dry? (Squeeze Test)

improper texture (too coarse or fine?)

Odor- Smells Bad instead of earthy

Ammonia (C:N too low)

Pungent (too wet)

Ingredient smell (should be gone in 1 week)

Meeting Plant Needs with Specific Organic Amendments

pH: adjusted by adding ground limestone

Phosphorous: rock phosphate, bone meal

Potassium: wood ash (also has a liming effect), sul-
po-mag

Nitrogen: compost, manure and mulches, legume
green manures, blood meal, alfalfa meal

(see handouts for specific application rates)

Organic approaches to pest control



The organic approach to pest management is a **systems-based approach**

Hierarchy of approaches:

1. design the system to avoid the problems
2. manage problems as they arise with *cultural practices*
3. turn to (organic) pesticides only as a last resort

Weed Control

- Rotation & green manures
- Mulch (natural or plastic)



- Cultivation!

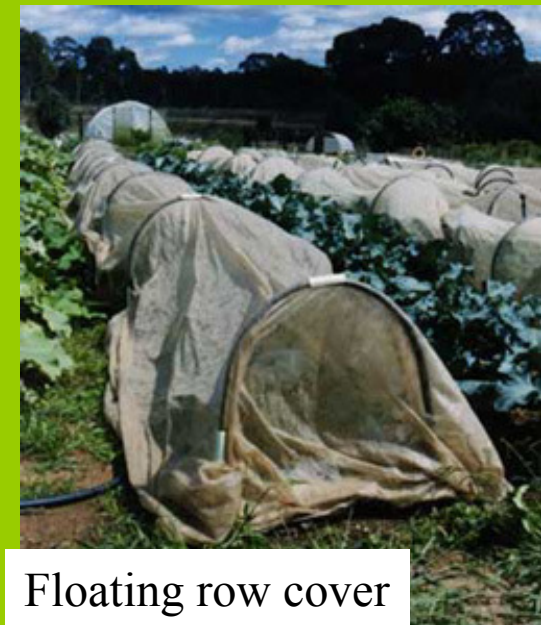
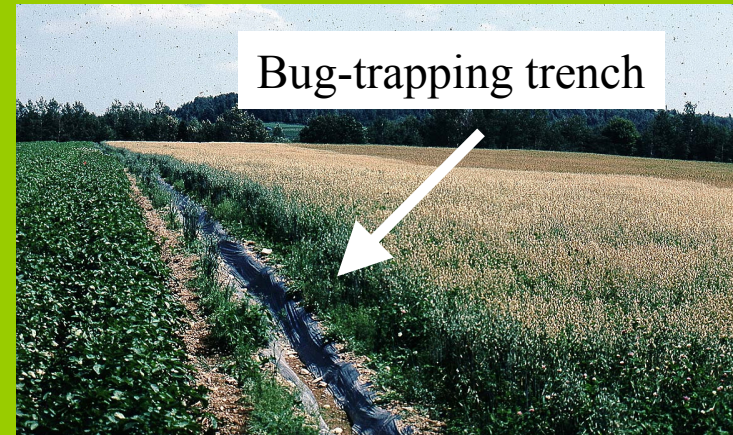


- Flame weeding



Dealing with Insects and Diseases

- Rotation
- Sanitation (remove and compost debris where pests could overwinter)
- Physical Barriers (floating row covers, kaolin clay, collars for cutworms)
- Predators and parasites (biological control)



Parasitic wasp eggs on
Tomato hornworm



Dealing with Insects and Diseases

- Trap crops
(blue hubbard squash for cucumber beetles)



- Refugia for beneficials
(flowering plants)



- Companion planting



Pest Control Materials

- Insecticidal Soaps (“Safer”)
- Microbial insecticides (Bt for Colorado Potato Beetle)
- Botanical insecticides (garlic, hot pepper spray, rotenone, pyrethrum, neem, nicotine)
- Copper and sulfur sprays as fungicides (potentially toxic - *use only as last resort*)



RESOURCE GUIDE FOR **ORGANIC** **INSECT AND** **DISEASE** MANAGEMENT

Brian Caldwell, NEON
Northeast Organic Farming Association NY

Emily Brown Rosen
Organic Materials Review Institute

Eric Sideman
Maine Organic Farmers and Gardeners Association

Anthony Shelton, Entomology
Cornell/NYSAES

Christine Smart, Plant Pathology
Cornell/NYSAES



- Co-authored by MOFGA's Eric Sideman
- Emphasis on cultural alternatives
- Efficacy analyses for many approved materials

Funded by NE SARE, USDA IFAFS, Cornell NYSAES, EPA

<http://www.nysaes.cornell.edu/pp/resourceguide/>

Happy Gardening



Time to start your seeds!!