




# Soil Health for School Garden Workshop



**garden educator  
network**

an education program  
of the environmental center 

## Why Soil Health?

Soil is a living resource that should be prioritized, conserved, nurtured, and protected! It looks different and acts different depending on climate, microclimates, water, sun, parent material, plants, etc--because it's alive!

The school garden as a living laboratory to teach children about its importance (through investigation based learning), so that they can then apply it elsewhere in their lives.

Resource: [Unlock the Secrets of the Soil: Dig a Little, Learn a Lot \(USDA-NRCS\)](#)

One teaspoon of *healthy* soil contains



**100 million-  
1 billion** individual  
bacteria

Source: *Soil Biology Primer* page c-1 (Elaine Ingham, Andrew R. Moldenke, Clive Edwards)



United States  
Department of  
Agriculture

Want more soil secrets?  
Check out [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

USDA is an equal opportunity provider and employer.

# SOIL HEALTH

## Four Principles

- **MINIMIZE DISTURBANCE:**  
*Manage soils more by disturbing them less*
- **MAXIMIZE SOIL COVER:**  
*Keep the soil covered as much as possible*
- **MAXIMIZE CONTINUOUS LIVING ROOTS:**  
*Keep plants growing throughout the year to feed the soil*
- **MAXIMIZE BIODIVERSITY:**  
*Use plant diversity to increase diversity in soil*

Resource: [NRCS Fact Sheets](#) - See "Principles for High Functioning Soils for 1 pager



# 4 PRINCIPLES OF SOIL HEALTH

## 1 DO NOT DISTURB

MINIMIZE DISTURBANCE

## 2 DISCOVER THE COVER

KEEP THE SOIL COVERED

## 3 A RADICLE IDEA

KEEP A LIVE ROOT IN SOIL AS MANY DAYS AS POSSIBLE

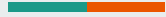
## 4 DIVERSITY IS KEY

FEED THE SOIL WITH DIVERSITY, DIVERSITY, DIVERSITY





# DO NOT DISTURB



## *MINIMIZE DISTURBANCE*



- Low till in spring
- Cut plants at base in fall (and mulch in place!)
- Leave perennials for the bugs (and winter interest)



# DO NOT DISTURB



## *MINIMIZE DISTURBANCE*





# DISCOVER THE COVER

## *MAXIMIZE SOIL COVER*



- Cover Crops
- Compost
- Leaves
- Mulch
- Straw (Hay is for Horses!)
- Manure



# DISCOVER THE COVER

## *MAXIMIZE SOIL COVER*





# A RADICLE IDEA

## *MAXIMIZE CONTINUOUS LIVING ROOTS*



- Crops Relay (1st planting, 2nd planting)
- Perennials
- Cover Crops



# A RADICLE IDEA

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**MAXIMIZE  
CONTINUOUS  
LIVING ROOTS**





# Cover Crops

- Conserve water
- Suppress weeds
- Increase nutrient cycling
- Prevent weathering



**Winter Rye**



**Hairy Vetch**



**Austrian Winter Pea**



**Fava Bean**

# DIVERSITY IS KEY

## *MAXIMIZE BIODIVERSITY*

- Crop rotation
- Perennials
- Native/Pollinator Plants





# DIVERSITY IS KEY

## *MAXIMIZE BIODIVERSITY*



# CROP ROTATION

Grow diverse crops and increase soil organic matter and biodiversity!



**Tomatoes**



**Spinach**



**Radishes**



**Peas**

## Legumes

Beans, peas, lentils, clover



## Roots

Carrots, onions, beets, garlic



## Fruits

Tomatoes, cucumbers, squash



## Leaves

Spinach, lettuce, corn, broccoli

# Soil Health Amendments

## Where to get Amendments:

- Green Leaf Garden Center (Bend)
- Moonfire and Sun (Bend)
- Eastside Nursery (Bend)
- Cascade Garden Center (Bend)
- Wintercreek (Bend)
- Landsystems Nursery (Bend)
- Aspen Ridge (Redmond)
- Clearwater Native Plant Nursery (Redmond)
- Earth's Art (Redmond)
- Schillings Garden Market (Tumalo)
- Sisters Rental (Sisters)
- Sisters Forest Products (Sisters)
- C & C Nursery & Landscape (Sisters)

## Organic Soil Amendments



Compost



Shredded tree bark



Sphagnum peat moss



Manure (cow/sheep/horse/rabbit)



Leaf mold



Wood ash

# Manure Exchange Program

## The Manure Exchange Program

- Connects farmers with excess manure to local gardeners
- Recycles nutrients to the soil
- Prevents eutrophication and ammonia toxicity in local water systems

## Manure Exchange Facebook Group





# Questions about soil health?

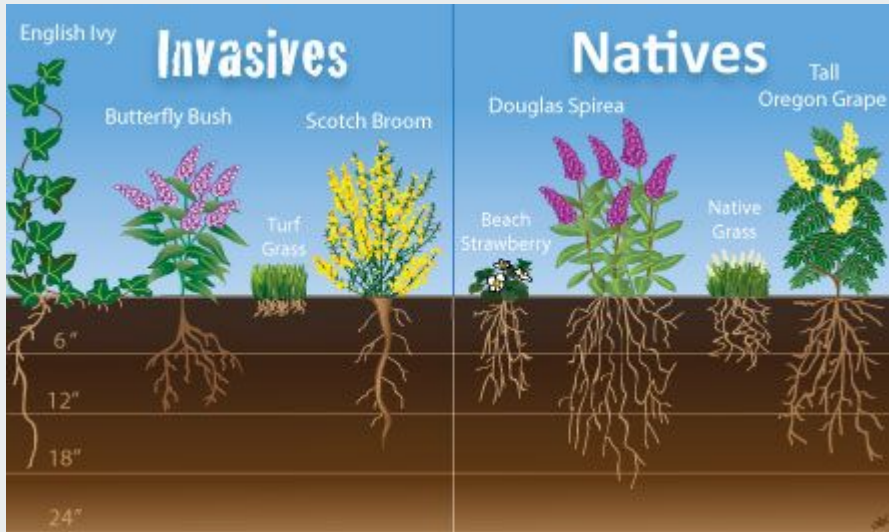
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Local mural painted by [Vivi Design Co.](#)

# Soil Health and Native Plants



## Benefits

**Clean, Cool Water**  
Plants filter pollution;  
provide shade

**Wildlife**  
Provide habitats and food to  
support diverse native species

**Erosion Control**  
Different root lengths  
reduce soil erosion

**Resilience**  
Adapted to our climate,  
pests, and diseases

# Imperiled Pollinators



## Issues Threatening Pollinators

- \*Habitat Loss
- \*Pesticide Use
- \*Invasive Species
- Climate Change
- Disease

Scientific American [article](#) on pesticide damage to soil

# Pollinator Habitat



## Plant Native Plants

- \*Continuous bloom
- \*Variety of colors and structures
- \*Blocks of similar species
- \*Add Keystone species

## Go Pesticide-Free

## Create Nesting Habitat

- \*Leave the Leaves
- \*Save the Stems
- \*Embrace Bare Ground

Suggested Plant List for Central Oregon Native Pollinators  
Further Reading: OSU - Enhancing Urban and Suburban Landscapes to Protect Pollinators





# Keystone Species

A species on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would change drastically.

Further Reading: [Nature's Best Hope](#) by Douglas Tallamy

## Central Oregon Keystone Species

Number of Butterfly  
& Moth species that  
use as host plants

<b>Willow</b> (Salix sp. - native species only)	312
<b>Chokecherry</b> (Prunus virginiana)	240
<b>Quaking Aspen</b> (Populus tremuloides)	227
<b>Alder</b> (Alnus incana)	210
<b>Ponderosa Pine</b> (Pinus ponderosa) and	199
<b>Lodgepole Pine</b> (Pinus contorta)	-
<b>Shinyleaf Ceanothus</b> (Ceanothus velutinus)	93
<b>Serviceberry</b> (Amelanchier alnifolia)	81
<b>Hawthorn</b> (Crataegus douglasii)	58
<b>Red-Osier Dogwood</b> (Cornus sericea)	51
<b>Greenleaf Manzanita</b> (Arctostaphylos patula)	33
<b>Bitterbrush</b> (Purshia tridentata)	24
<b>Mountain Mahogany</b> (Cercocarpus ledifolius)	1
<b>Rabbitbrush</b> (Chrysothamnus viscidiflorus)	

# Native Pollinator Plants for Your School

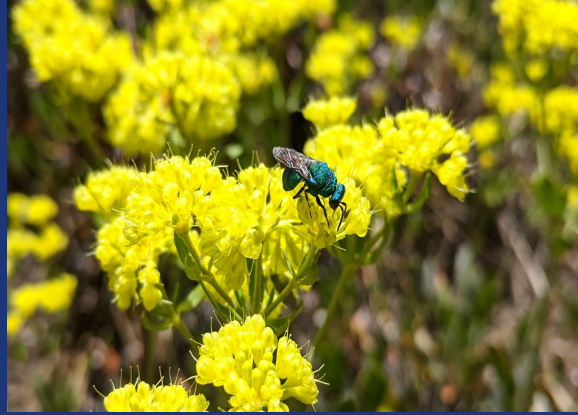


**Firecracker Penstemon**

(*Penstemon eatonii*)

Early season bloomer

Tubular flower structure



**Sulfur-flower Buckwheat**

(*Eriogonum umbellatum*)

Mid-season bloomer

Umbrella-like, cluster flowers



**Blanketflower**

(*Gaillardia aristata*)

Late-season bloomer

Composite flower structure

**How to plant these species:** Find a sunny spot. Dig a hole twice as wide as the pot and a bit deeper so that when you rest the pot in the hole, the soil level of the plant will be just a bit lower than the surface. This allows for moisture to drain towards the base of the plant and the roots. Refill the hole. Water. That's it! Kids love to plant!!



# Outdoor Classrooms





# Questions about Native Pollinator Plants?

**Email** Basey Klopp:

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# Engaging Students

## 1) Explore:

Soil Ecosystems, Worms, & Mycelium

## 2) Investigate:

Seeds, Roots, & Cycles

## 3) Experiment:

Soil Composition, Nutrients, & Plant Growth

## 4) Apply:

Amendments, Organic Matter, & Habitat

# Soil Health with Students looks like:

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Investigating  
soil  
ecosystems

Composting

Learning  
about plant  
roots

Cultivating  
plant  
diversity

Planting  
Perennial  
Plants

Amending the  
Soil

Rotating Crops



# Key Messages for Students

**Elementary:** Understanding “The What” by

- Building a personal connection to soil and understanding soil to be a living thing
- Hands-on practices in cultivating and valuing soil

**Middle School:** Understanding “The Why” by

- Having students start thinking about systems and interdependence.
- Learning about soil ecosystems and their intricate relationships.

**High School:** Understanding “The How” by

- Identifying local soil health issues and creating their own solutions
- Experimenting through comparative studies



# Educational Resources

## [Soils4Teachers \(Soil Science Society of America\)](#)

- K-12 Lesson Plans
- Videos
- Ask-A-Scientist
- Additional website just for students/kids
- Free classroom resources

## [Starting With Soil \(Center for Ecoliteracy\)](#)

- iPad App (ages 7-9)
- Interactive/simulated gardening
- Focus on soil as living system

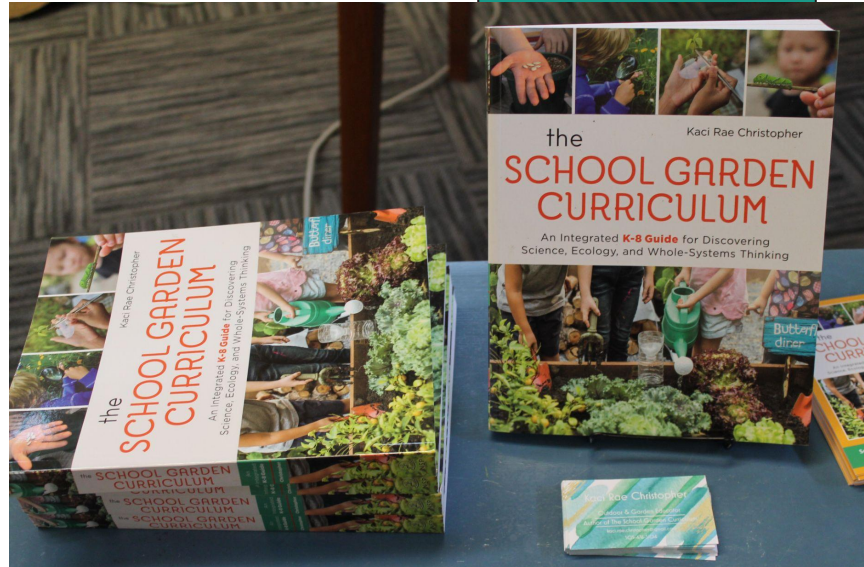
## [Digging Deep K-8](#)

- Soil Health Lesson Set for School Gardens
- K-8
- Tualition Soil & Water COnservation District



# Questions about engaging students?

Email Kaci Rae Christopher:  
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# Soil My Undies



 United States  
Department of  
Agriculture  
National Resources Conservation Service

## SOIL YOUR UNDIES Challenge

*How Healthy is your Soil?*

WHETHER YOU'RE  
ON CROP, RANGE, OR  
FORESTLAND, THE QUICK  
AND DIRTY WAY TO TEST  
YOUR SOIL HEALTH IS BY  
SOILING YOUR UNDIES!

- 

1. Plant\* a pair of new,  
cotton underwear in  
the site you're curious  
about. Don't forget to  
mark the spot you planted!
- 

2. Wait at least 60  
days. This gives your  
soil microbes time to  
do their magic!
- 

3. Send us a photo and  
a little info about  
your operation to  
orinfo@nrcs.usda.gov  
and we'll put your  
undies on the map!

 [bit.ly/soilundies](https://bit.ly/soilundies)  
USDA is an equal opportunity  
provider, employer and lender.

How Healthy is Your Soil?  
Take the Challenge to  
Find Out!



# Garden for Every School Garden Grants

\$500 - \$1500 grants available

[Application info online](#)

Application Due Friday December 10th





# Thank You!

## CONTACT INFO:

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