



CONSERVATION PRACTICES

Learning Objectives

The learner will...

Understand the importance of conservation practices

Learn about common effective conservation practices

Acquire knowledge about conservation practice installation



Terminology

Conservation: refers to the wise use, improvement, and protection of our natural resources.

USDA: United States Department of Agriculture

NRCS : Natural Resources Conservation Service. A division of the USDA that helps farmers with conservation projects

Permaculture: the development of agricultural ecosystems intended to be sustainable and self-sufficient. (See also Permaculture module)

Ecosystem: interconnected system of living organisms (plants, animals, & fungi/bacteria) in their environment

No-till: planting seeds without disturbing the soil



Organic Farming + Permaculture

The ultimate in conservation and sustainability

The heart and soul of organic farming is caring for and maintaining the soil. Organic farming minimizes soil disruption and uses nature for pest, disease, and nutrient management. Improving soil health results in greater water infiltration, which leads to less runoff & erosion. However, organic farming for single crop annuals alone is not sustainable in the long run.

An agricultural system based on permaculture design closely mimics nature emphasizing perennial crops and native plantings. We will discuss the specific conservation practices that are most applicable in a permaculture designed farm; yet allowing for harvest of annuals to support farm income.

Conservation practices on farms are the specific tools for improving the health of the soil, water, & air. Cost sharing is available through the NRCS on qualified farms to offset some of the farmer's upfront costs.



Permaculture practices visible here include mulching, cover crops, drip irrigation, wind power, wind breaks/forest, prairie, & pasture. Most of these elements are Conservation Practices as defined by the NRCS.

Conservation practices common in Permaculture

- Water conservation Methods
 - Irrigation Scheduling
 - Soil Management
 - Water Harvesting
- Soil Conservation Methods
 - Contour Buffer Strips & Filter Strips
 - Mulching
 - Nutrient Management
 - Cover Crops
 - Heavy Use Area Protection
- Environmental Conservation Methods
 - Windbreak
 - Hedgerow Planting
 - Integrated Pest Management
 - Prescribed Burning
 - Forest Stand Improvement
 - Pollinator Habitats



no-till soybeans in rye cover crop



oak savannah

Water Conservation

Water is the source of life for any farm. Some direct uses for water include drinking, irrigation for farming, and livestock watering.



- Water conservation is of utmost importance, especially during times of drought.
- Collecting and storing water through an efficient water capture system can save time, money, and effort.
- Water capture systems can include rainbarrels, ponds, ditches, and swales (see also Permaculture module)
- Overuse of groundwater – such that it is not recharging as fast as it is being withdrawn- is not considered a sustainable practice.

Water Conservation Methods

Irrigation Scheduling
Soil Management
Water Harvesting

Photo credit: gharainwater.org



Irrigation Scheduling

The most sustainable irrigation systems use captured rainwater. This supply will necessarily be limited; therefore deciding when and how much water to apply to a field will conserve water for when plants really need it. Pay attention to the amount of water that each individual crop needs to survive and thrive.



***Black eyed
peas need less
water than
cucumbers***



Pay attention to the weather.

Whatever water supply you are using, don't put your watering system on a timer and let it go everyday. If rain isn't providing enough moisture, your drip irrigation system will keep your plants happy during the time when water is less available. For a detailed study of installation procedures into raised beds see [Part 1 Reaganite](#); [Part 2](#); [Part 3](#). (See also Irrigation module)

Soil Management

Properly managing your soil can be an extremely effective way to reduce losses of water. If the soil is healthy & contains organic matter it be able to **hold**, **absorb**, and **transmit** large amounts of water.

There are several ways to **manipulate** and improve the nature of your soil to work towards your benefit. These practices help to increase organic matter in the soil in an integrated system.

Composting

Create your own fertilizer



Cover Crops

Legumes take nitrogen from the air and put it in the soil



Conservation Tillage

Includes no-till & reduced tillage

Weed the Soil Not the Crop, plant a mix of crops, and Rotate!

See corresponding modules for more detail on these topics.

Water Harvesting

Water harvesting can 1) collect rain for direct use in garden areas & to water livestock, and 2) direct runoff into areas where it can be stored and then slowly released for larger planted areas, pastures, fish, & wildlife.

If you want to catch and store rainwater from a roof, storage tanks are a reliable method of water conservation. A storage tank is a relatively easy system to install.

Tank

Gutters

Slanted roof



Rainwater that falls onto a catchment surface (such as a roof) is allowed to drain into a distribution system (the gutters) which leads into a tank that stores and maintains the water for later usage. You can install above or below ground tanks.

Options for storing runoff water

Inter plot water harvesting: This method manages uncultivated areas in such a way that runoff is directed toward crops that need water

Inter row water harvesting: This method looks to store water in furrows or to plant crops in furrows specifically with the idea of catching runoff water

Water harvesting in farm ponds: With this method, a pond is located in the lower patches of a field in order to facilitate better storage and reduce seepage losses. The size of the pond will be determined based on the annual rainfall amount in your specific area, and the anticipated water needs.



Soil Conservation Methods

Contour Buffer Strips & Filter Strips

Mulching

Nutrient Management

Cover Crops

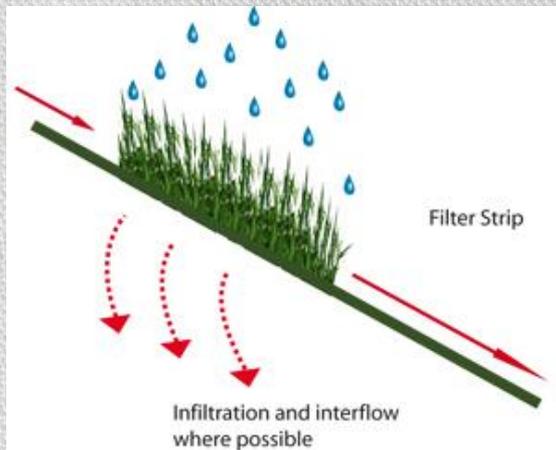
Heavy Use Area Protection



Contour Buffer Strips & Filter Strips

Filter Strips

- Also called grassed waterways
- Slow runoff allowing sediments, organic matter, and other pollutants that are being conveyed by the water to be removed by settling out in an area of herbaceous vegetation
- Allows water to infiltrate instead of being removed from the site



Contour Buffer Strips
Filter strips established around a hill or slope.



If working with a larger area of land that is losing soil via erosion, renovation may be needed to stop erosion processes yet still allow farming.

Mulching

This is the practice of applying plant residues or other suitable materials produced off site to the land surface.

- **Natural weed-prevention method**
- **Keeps soil moist and aerated**
- **Reduces airborne particulates**
- **Improves soil quality as it decomposes**
- **Reduces energy use associated with irrigation**
- **BUILDS ORGANIC MATTER!**

Use: *grass clippings, leaves, pine needles, bark, wood chips, newspaper, and stone/gravel.*



Nutrient Management

Nutrient management is managing the amount, source, placement, and timing of plant nutrients and soil amendments. A soil test is the best way to determine your starting point. The most important thing to keep in mind is to ONLY add what you need. You don't want to waste time & money applying an excess of minerals to your soil.

Managing crop fertility inputs and other production practices for efficient crop growth and water quality protection. Put more simply:

**Knowing
what you
have**

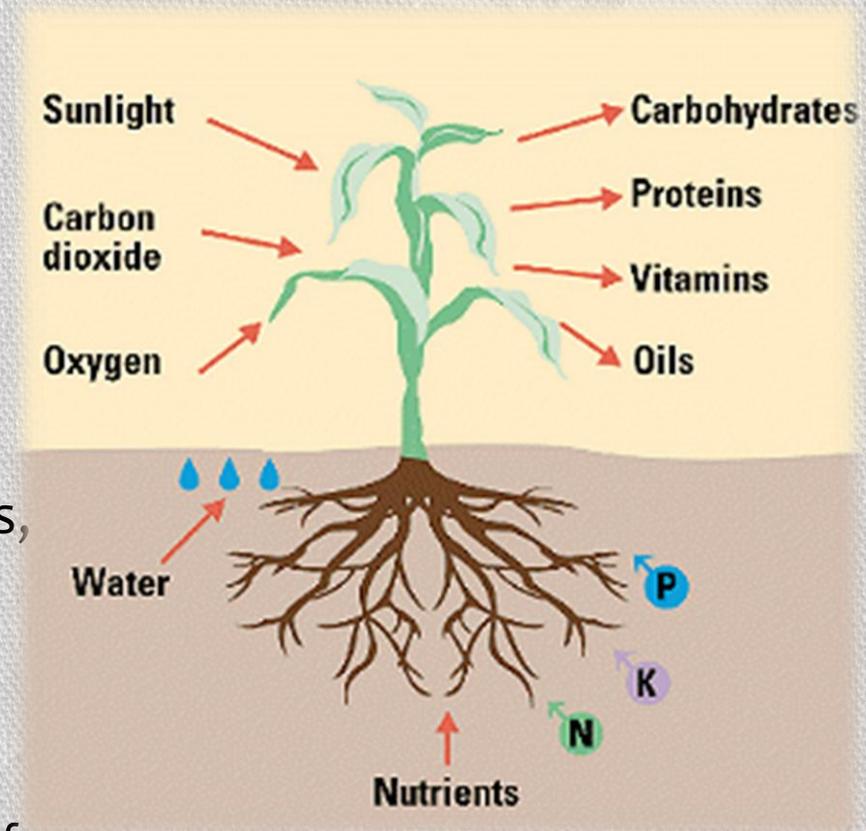
**Knowing
what you
need**

**Managing it
wisely**

**Documenting
your
management**

Proper nutrient management lets you:

- Budget, supply, and conserve nutrients for plant production
- Minimize agricultural nonpoint source pollution of surface and groundwater resources
- Properly utilize manure or organic byproducts
- Protect air quality by reducing odors, nitrogen emissions, and the formation of atmospheric particulates
- Maintain and improve the physical, chemical, and biological condition of soil



These steps should be taken to practice effective nutrient management

- Obtain soil information for each field or unit
- Estimate yield potential for each field based on soil productivity and intended management
- Calculate plant nutrients required to reach the yield potential
- Determine plant-available nutrients in any livestock byproduct
- Estimate residual nutrient contributions from fertilizer or manures applied in previous seasons
- Apply animal manures and/or other forms of fertilizer using only what soil is deficient in
- Keep accurate records! (nutrient sources, application dates, rates, and methods)
- Make sure applications comply with any certifications

More info [Here](#)

mixing minerals



applying minerals



Cover Cropping

The use of cover crops is a way to improve and maintain soil health. They can include a wide variety of vegetation, including: *Grasses, legumes, forbs*, and other plants that place beneficial nutrients into the soil.

Conservation Cropping Systems Initiative

Some goals when using cover crops include:

- Producing nitrogen fixation and reducing energy use
- Increasing active soil organic matter content
- Increasing biodiversity
- Managing soil moisture
- Minimizing soil compaction
- Reducing surface crusting
- Suppressing weeds
- Reducing soil erosion





Cover crop mix

Research before choosing which cover crops you want to use and when. The type of plants you'll want to grow can vary based on your objective. Some factors you'll want to consider include:

- management goals (why you need cover crop)
- season (when you want to plant)
- duration (how long it will stay until you need to plant the next crop)



white clover



cow peas and dutch clover



buckwheat



oats

See Cover Crop module for more details

Heavy Use Area Protection

Stabilization of areas frequently and intensively used by people, animals, or vehicles is best achieved by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures.

This conservation practice provides a stable surface that fights erosion.

Example: Here is one method of installing heavy use area protection on a farm, specifically for the area surrounding a watering station.



Environmental Conservation Methods

Windbreaks & Hedgerows

Integrated Pest Management

Prescribed Burning

Forest Stand Improvement

Pollinator Habitats



Windbreak

Windbreaks (or shelterbelts) are single or multiple rows of trees or shrubs in linear configurations. They are implemented to reduce wind speeds which will slow soil erosion & protect plants.

Planting windbreaks involves planting several rows with shorter ones on the outside getting progressively larger to direct the wind away from things you'd like to protect such as fruit trees, livestock, driveways, or buildings.



Windbreaks can also:

- Alter the microenvironment for enhancing plant growth
- Manage snow deposition
- Provide shelter for structures, animals, and people
- Provide noise screens
- Improve air quality
- Improve irrigation efficiency
- Reduce energy use
- Produce edible nuts & fruits



chestnut

Include oaks & cherries to attract caterpillars that birds like; the birds in turn will eat the insect pests from your vegetables & fruit trees. Acorns & cherries are food for wildlife . Nut trees can be in the wind break and fruit trees downwind of it where the windbreak will provide winter protection.

Hedgerows

Lower growing species than a windbreak.
Edge species create barriers between farm elements.



hazelnuts



Purposes:

- Create a habitat (food, cover, and corridors) for wildlife
- Enhance pollen, nectar, and nesting habitat for pollinators
- Provide substrate for predaceous and beneficial insects as a component of integrated pest management
- Intercept airborne particulate matter
- Provide a screen and barrier to dust and noise
- Increase carbon storage in biomass and soils
- Create an integrated “living fence” with edible fruits/nuts such as [hazelnuts](#)
- Outline boundaries and contours



Avoid plant species that could be hosts for pests or diseases that threaten nearby crops; or could be poisonous if ingested by livestock.

Integrated Pest Management (IPM)

IPM involves a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. The goal is to obtain the lowest possible level of pests and pest damage while avoiding practices that would cause hazards to people, property, or the environment.

Some practices include regularly inspecting and monitoring crops for damage, using mechanical trapping devices, natural predators (other insects), insect growth regulators, and mating disruption substances (pheromones).

This environmentally sensitive approach provides benefits such as:

- Prevention or mitigation of off-site or on-site pesticide risks to water quality from runoff, absorbed water, soil, air, plants, animals, and humans.
- Prevention or mitigation of on-site pesticide risks to pollinators and other beneficial species through direct contact.

IPM implies the use of sprays as a last resort, and only on heavily infested trouble spots that are a small fraction of the total area. Of course in an organic operation only approved sprays (not pesticides) would be permitted.

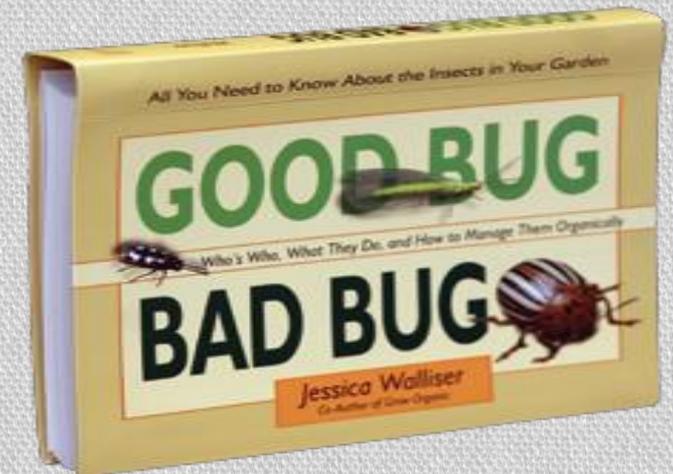
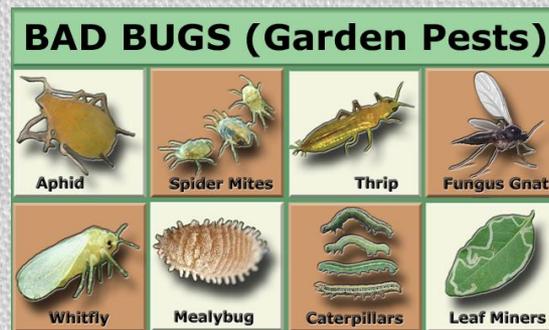
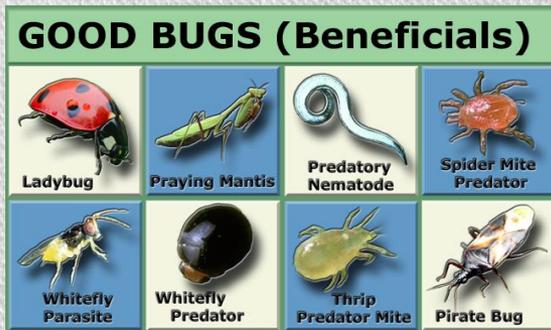
Harmful aphids



Good Bug or Bad Bug??

Monitor plants to know when action needs to be taken to prevent an unacceptable level of pests. It is important to target only harmful or disruptive insects. **Even organic sprays can kill the beneficial insects along with the harmful ones.**

Charts illustrating bad bugs and good ones



Lacewings know how to foil the ants

Syrphid flies, predatory wasps, and ladybugs all eat garden pests!

good bugs! Juvenile praying mantis



Prescribed Burning

Controlled fire applied to a predetermined area can be effective as a conservation and restoration tool.



Prairie Burn

Prescribed burning uses:

- Control of undesirable vegetation
- Preparation of sites for planting
- Control of plant diseases
- Reduction of wildfire hazards
- Enhancement of seed production
- Restoration and maintenance of ecological sites



The burn leader should be trained in fire suppression and be in contact with local fire departments. Agricultural land is often exempted from local restrictions on burning.

U.S Fish and Wildlife Service: Detailed information on their [website](#) provides information on prescribed burning

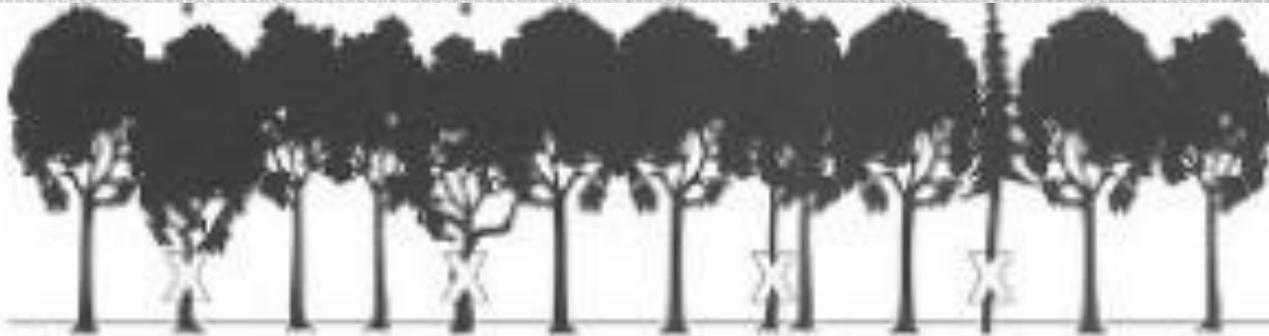
Forest Stand Improvement

Forest Stand improvement includes manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and surrounding vegetation.

Possible benefits:

- Increase the quantity and quality of forest products by manipulating stand density and structure
- Develop renewable energy systems
- Initiate forest stand regeneration
- Reduce wildlife hazards
- Alter water yield
- Increase carbon storage in selected trees
- Achieve and maintain a desired native understory plant community for special forest products or grazing/browsing by livestock.

Forest Stand Improvement



**Undesirable trees are removed to realize the full benefits in this conservation method.*

Precise management should be used when grazing livestock to avoid damage!

Pollinator Habitats

Pollination is critical to farming. North America has around 4,000 native bee species and countless other pollinators including wasps, butterflies, moths, flies, beetles, hummingbirds, and bats as well as the European honey bee. They pollinate our plants and in the case of honeybees, give us delicious (and marketable!) honey. (See Beekeeping module)



Pollinator Habitats

As natural habitats around the globe are threatened, it is especially important that farmers create pollinator habitats whenever possible.

Considerations:

1. Field layout: pollinator strips need to be near crops.

2. Invasive potential: research new plantings to be careful you're not introducing potentially invasive species (see Grazing module for more info).

Some species, if properly controlled, can have many uses in addition to being a source of nectar & pollen, eg black locust.



Pollinator Habitats

Two thirds of all native bee species nest underground. Ground disturbance should be minimized as much as possible to protect nests.

pollinator conservation

Avoid excessive tillage, plastic mulch use, and soil fumigation.

Nature's amazing food chain: bees serve as food for larger animals like birds and amphibians, and of course, the fruits that come from the pollinated plants feed larger animals and us.





Spotlight on Permaculture: Restoration Agriculture

The term Permaculture can be described as a method of thinking which conserves resources and applies knowledge of the biological system in a holistic way. Restoration Agriculture interconnects conservation practices and works them into designs that can sustainably grow perennial food crops on land at many different scales. Alley cropping allows alternation of tree crops and pastures or crops. Nature is the model and in the Midwest the model ecosystems include oak savannah, prairie, and woodland. “An oak savannah mimic will produce more than twice the number of edible human calories per acre as an average acre of corn” * plus reduce the amount of waste generated, use less energy, be prepared for and better respond to change, and enjoy more profit for the farm. Silvopasture methods combine livestock pastures & trees. Integration of these practices will protect current resources and ensure that they are around for future generations.

*as quoted in “Restoration Agriculture” by Mark Shepard

References

Natural Resources Conservation Services Website

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/cp/>

Weed the Soil Not the Crop : A Whole Farm Approach to Weed Management, by Anne & Eric Nordell

Restoration Agriculture by Mark Shepard

Bringing Nature Home by Douglas Tallamy

Assessment and Review

1. What is the intention of conservation practices?
2. Name and describe two effective conservation practices
3. Recall three materials that can be used for mulching
4. Describe two benefits of nutrient management.