Permaculture in Higher Education

By Joshua Shultz
Permaculture Program Coordinator
Western Michigan University Office for Sustainability
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What is Permaculture

Permaculture is an **ecological design science** drawing inspiration from natural ecosystems and permanent cultures from around the world.

The term permaculture originated in Australia in 1978 – originally a combination of the words permanent & agriculture. It has since been expanded to mean permanent-culture and includes all aspects of what makes a human culture successful, from where we obtain food, fuel, fiber, medicine, energy, water, building materials and even expands into the connection between people and how we organize our social interactions and rely on one another.
Permanent Culture

- Permaculture = permanent-culture
- Bill Mollison wrote “Permaculture One” in 1978
- Everything that makes up a culture
  - Food, fuel, fiber, medicine, energy, buildings, water, people, nature, livestock
- Optimize rather than maximize
- Relationships between elements
- Observe before interacting
- Slow and steady
- Value the margin
Sustainability, when we arrive at the center where ethics inform actions in each of three spheres so that a decision in one considers and enhances the others.
Triple Bottom Line of Sustainable Businesses

The Triple Bottom Line

People
- Respect Human Rights
- Fulfill Social Responsibility

Sustainability

Planet
- Reduce Waste
- Go Green for a Safer and Better Environment

Profit
- Savor Financial Success
- Without Harming the Community
Non-sustainable Water Use

Current Water Culture:
Channel water off landscape as quickly as possible
Move polluted water away from area
Disregard communities downstream
Sustainable Water Use

A New Water Culture:
Landscape to collect and store precipitation
Minimize water pollution
Maximize Efficiency
Eliminate Waste
Maintain social and ecological integrity of the community
Changes in Our Water Budget

WMU 38% Impervious
Problems?
Contaminants

- Acid Rain
- Carbon Dioxide
- Pesticides
- Mercury
- Arsenic
- Carbon Tetrachloride
- Solvents
- Taste & Odor
- Phosphates
- Chlorine
- Fertilizers
- Insecticides
- Herbicides
- Nitrates
- PCBs
- Naptha
- Unknown Chemical Contaminants
- Benzene
- Long-Lasting Toxins
- Man-Made Water Problems
- Sulfur Dioxide
- Smoke & Exhausts
- Asbestos
- Oil & Gas Leaks & Spills
Organic Material and Soil Loss

Causes of Soil Degradation

- World:
  - 35% Deforestation
  - 28% Overexploitation for Fuelwood
  - 15% Overgrazing
  - 14% Agricultural Activities
  - 4% Industrialization

- Europe:
  - 23% Deforestation
  - 14% Overexploitation for Fuelwood
  - 13% Overgrazing
  - 9% Agricultural Activities
  - 2% Industrialization

- Africa:
  - 66% Deforestation
  - 49% Overexploitation for Fuelwood
  - 14% Overgrazing
  - 13% Agricultural Activities
  - 2% Industrialization

- North America:
  - 30% Deforestation
  - 24% Overexploitation for Fuelwood
  - 14% Overgrazing
  - 13% Agricultural Activities
  - 2% Industrialization

- Central America:
  - 45% Deforestation
  - 22% Overexploitation for Fuelwood
  - 18% Overgrazing
  - 15% Agricultural Activities
  - 4% Industrialization

- South America:
  - 41% Deforestation
  - 28% Overexploitation for Fuelwood
  - 15% Overgrazing
  - 14% Agricultural Activities
  - 4% Industrialization

- Asia:
  - 80% Deforestation
  - 26% Overexploitation for Fuelwood
  - 27% Overgrazing
  - 12% Agricultural Activities
  - 8% Industrialization

- Oceania:
  - 40% Deforestation
  - 26% Overexploitation for Fuelwood
  - 27% Overgrazing
  - 12% Agricultural Activities
  - 8% Industrialization

Note: Categories not shown in regions represent less than 1 percent.
1. **Sheet erosion**
Raindrops that hit the ground can loosen soil. These loose grains are easily washed away. Sheet erosion removes the loose grains. It may go unnoticed until most of the productive **topsoil** has been lost. The field is gradually eroded in a more or less uniform way.

2. **Rill erosion (channel)**
Water collects in small channels called rills. Each rill is like a mini-river. The rills carry soil down a slope. Rills can grow into gullies.

3. **Gully erosion (dongas)**
A gully is a deep trench with steep sides. In South Africa, a gully is called a donga. Dongas appear as deep scars on a slope. In some dongas all the soil and some of the loose bedrock have been washed away. Dongas usually occur near the bottom of slopes.
WHERE DOES CARBON GO?

CARBON STORAGE IN A GREAT LAKES FOREST

LEAVES 1%

TRUNK & BRANCHES 40%

WOODY DEBRIS 1%

CARBON STORED 0.7 tons of Carbon / acre yearly

TOTAL ECOSYSTEM CARBON 80 tons / acre

SOIL ORGANIC MATTER 45%
9 LAYERS IN A FOREST GARDEN

SMALL TREES
10-30’ HEIGHT
Plum, Apple, Apricot, Pear, Quince, Pawpaw, Hawthorn, Medlar, Chinquapin Chestnut, Jujube, Some Jujubeberries, Mountain Ash, Asian Persimmon, etc.

ROOTS/TUBERS
BELOW SOIL SURFACE
Sunchokes, Groundnuts, Potatoes, Scorzonera, Licorice, Horseradish, Salsify, etc.

SHRUBS
4-15’ HEIGHT
Currants, Most Hazelnuts, Viburnums, Seaberry, Aronia, Gooseberry, Rose, Elderberry, Some Juneberries, Eleagnus, Bush Cherries, Quince, etc.

FU NGI
UNDERGROUND, OR ON MUSHROOM LOGS IN SHADE

VINES
CLIMBING PLANTS
Groundnuts, Hops, Grapes, Hardy Kiwi, Mountain Yam, Schisandra, Squash, Maypop, Melons, Pole Beans, etc.

FORBS/HERBS
1-6’ HEIGHT
Asparagus, Perennial Greens, Brambles, Nettles, Mints, Indigos, Most Grasses, Daylilies, Rhubarb, etc.

GROUNDCOVERS
1’ OR LESS HEIGHT
Strawberries, Violets, Clover, Mints, Thymes, etc.

MEDIUM-TO-TALL TREES
30-50’ HEIGHT
Euro/Asian Chestnut, English Walnut, Wild Pear, Sassafrass, Heartnut

CANOPY/TALL TREES
50-100+ FT. HEIGHT
Most Oaks, Hickory, Pecan, Black Walnut, American Persimmon, American Chestnut, Hackberry, Most Locusts, etc.

Small yards may not have the room for some of these larger species, or you could prune for height control. Taller species should be placed toward the North, shorter to South, for optimal partitioning of sunlight.

NITROGEN-FIXERS
CAN GROW IN ANY LAYER–IMPORTANT TO OVERALL SYSTEM
Locust Trees, Kentucky Coffeetree, Alders, Autumnberry, Seaberry, Buffaloberry, Indigo, Leadplant, Licorice, Clovers, Peas, Beans, Groundnut, Acacia, etc.
Western Michigan University
Gibbs House
Property Master Plan

From Asylum
Lake Preserve

Parkview Ave.
Gibbs Hugelkultur 2014 & 2017
Gibbs Compost Hot Water Heater
Black Soldier Fly Larvae
Gibbs Food Forest

2017

2015
Gibbs Food Forest
Vegetable Garden
Prescribed Burn at Asylum Lake Preserve
Managing the turf on East and CEAS campuses requires keen observation as the team follows nature’s lead. Soil testing along with low impact practices such as aeration and topdressing using compost helps to return the soil back to a biologically active state.
WMU Campus Storm Water

1. Sangran Hall
   - Underground Detention
   - Porous Pavement
   - Green Roof
   - Solar PV Array

2. Chemistry Building
   - Surface Detention

3. S. Kohrman Hall
   - Underground Detention

4. Western Heights
   - Underground Detention

5. Goldworth Valley Dining Facility and Detention Pond
   - Underground Storm
   - Rain Gardens
   - Surface Detention
Native Planting

“Native Plantings aid in the restoration of the ecological systems on East campus”  May 31, 2018

Inventory: 45 Flats
- Columbine
- C. Cristata
- C. Lanceolata
- “Family Jewels” Milkweed
- Eupatorium Maculatum
- Tradescantia Pallida “Spiderwort”
- Asclepias Syriaca
- Cassia herbacarpa
- Smooth Penstemon
- Eupatorium
- Whorled Milkweed
- Veronica “Stricta”
- Elymus hystrix
- Helianthus
- Smooth Aster

- Rosin Weed
- Butterfly Weed
- Elymus “Canadian Wild Rye”
- Iron Weed
- Cup Plant

*Seeds were harvested from WMU prairies and landscapes. Plants were grown on at the WMU Finch greenhouse.
Heritage Hall No-Mow/Reforestation/Natives

2018

East Campus Heritage Hall Site
Little Theater No-Mow/Natives

Little Theater Hillside
Located within the beautiful grounds of CHHS, the Forest Garden provides a multitude of educational and passive recreation opportunities. Elderberries, Paw Paw, and Serviceberry are the beginnings of a dynamic forest garden that will provide food/medicine/habitat/ and many other ecological services.
CHHS Forest Garden
“WMU’s landscape services team, known for its out-of-the-box campus landscape ideas, envisioned remaking this “unproductive” site between Haenicke and Welborn halls into a biodiverse landscape by installing in spring 2017 a permaculture orchard—perhaps among the first of its kind at a university, according to Nick Gooch, WMU horticulturalist and one of the project’s managers.”

- www.wmich.edu/news/2018/04/46645
WMU Goats

This pilot project began with Nick Gooch, WMU horticulturist, who proposed bringing goats to campus to test their viability for helping to control invasive plant species infesting campus woodlots, particularly buckthorn, honeysuckle, oriental bittersweet and poison ivy.

"The current management practice to combat these species using labor, machinery and chemical herbicides is labor- and capital-intense and fails to improve the site to allow the native community to achieve balance and restore the ecosystem"

-https://www.wmich.edu/news/2017/06/40334
The Island School and Cape Eleuthera Institute
Tilapia Aquaponics
Black Water Waste Garden
University of Massachusetts

Facts and benefits of Umass Permaculture

- Converted a 12,000 s.f. grass lawn to permaculture garden
- Moved over 500,000 pounds of organic matter by hand, using 250 volunteers
- Hands-on education for campus and local community
- Involved Big Brothers Big Sisters organization, numerous schools and summer campus
- Producing food for Umass Dining Services
- Featured in dozens of print, TV, radio, online publications
- Receiving international media attention
- Nominated for a Real Food Challenge Award
University of Massachusetts Amherst Franklin Permaculture Garden
Franklin Garden
Want cool housemates?
We might want you, too!

Amherst House!
Permaculture.

9 month lease
9.1.13 - 5.31.14

E-mail: Ryan Harb
AmherstPermacultureHouse@Gmail.com

1 bedroom avail.. 3 already full @ $450 + util

APPLY IF YOU’RE ALL ABOUT:
* Growing your own food
* Living cooperatively
* Cooking / eating good food with cool folks
* Working to live, rather than living to work!
University of Michigan Permaculture Garden

Zone 1—North

Raised Keyhole Gardens:
A keyhole garden is a circular garden with a small central path that allows the gardener access to every inch of growing space without walking on the soil or trampling smaller plants. They are useful ways to illustrate the permaculture principles of “Using Edges” and “Obtaining a Yield”. A raised keyhole garden can be made simply using mulch materials and landscaping stones as a retaining wall. Raised beds offer their own advantages as well, such as making gardening more accessible to older gardeners that might not want to bend over for hours each day.

Keyhole beds often include a compost pile in the center which can be easily watered from the center path. This design adds “make no waste” and “integrate rather than segregate” to the list of permaculture principles illustrated.

Flower Tower:
A flower tower is simply a 6’ column of chicken wire, lined with burlap, with a 0.5’ PVC pipe running through the center. This column is filled with soil and holes are cut into the wire/burlap so that flowers can be planted within. This creates additional growing space and provides a trellis for climbing plants. The visual aesthetic of seeing trailing nasturtiums falling from the upper holes while lower-planted beans climb up is a compelling argument for why interplanting systems are preferable to monocultures. The PVC pipe has holes drilled into it, so that watering the tower is simple process of leaving a hose in the central PVC pipe for a couple minutes each day.

| Entrance Pergola
| Maypop—Passiflora incarnata
| Hardy Kiwi—Actinidia arguta
| Flower Tower
| Nasturtiums—Tropaeolum spp.
| Beans—Phaseolus vulgaris
| Raised Keyhole Gardens

Signage

Fruit Tree Guild (Paw Paw tree)
Net Tree Guild (Hickory tree)
Kitchen Garden
Swale (on contour)
Rose/Seaberry Hedge
Wildflower Buffer

Perennial N-Fixing Cover Crop
Mulch Paths
Annual N-Fixing Cover Crop
Fence Guild
UoM Permaculture Food Forest
Grand Valley State University Sustainable Agriculture Project (SAP)
Schools with PDC's - Intensive

THE INTENSIVE

Most common way to fit PDC into 1 academic course.

Span from 12 full days to 7 weeks in academia; 15 days over 2-3 weeks is most common
Historically how PDCs usually taught

On campus or involves travel/residential immersion on a farm

Prescott College
  Env. Studies
University of Vermont
  Env. Studies
Indiana University
  Collins Living-Learning Centre
Maharishi University
  Sustainable Living
University of British Columbia
  Land & Food Systems
CU Boulder
  Env. Studies
Paul Smith’s College
  Env. Studies
St. Michael’s College
  Env. Studies
Sterling College
  Applied Sciences

Schools with PDC's – One Semester

ONE SEMESTER-BASED COURSE

Full PDC fit into one course on campus

- Oregon State University
  Horticulture
- Pacific University
  Art & Env. Studies
- UC Santa Cruz
  Kresge College
- Cornell University
  Horticulture
- Colby-Sawyer College
  Env. Studies
- Greenfield Community College
  Science

Schools with PDC's – Two Semester

**TWO COURSE SERIES**

PDC spread over two semester-long courses on campus

- Naropa University
  - Env. Studies
- Santa Barbara City College
  - Env. Horticulture
- North Carolina State University
  - Horticulture
- University of Vermont
  - Env. Studies
- UMass Amherst
  - Agriculture

Schools with PDC's - Hybrid

**HYBRID**

Often involves a semester-long course plus a 5-7 day intensive course

**University of Victoria**
- Env. Studies

**Plymouth State University**
- Env. Planning

**Appalachian State University**
- Sustainable Development

Schools with PDC's - Certificate

**ACADEMIC CERTIFICATE**

PDC earned through accumulation of several courses

- **Bastyr University**
  - Holistic Landscape Design
- **Merritt College**
  - Landscape Horticulture
- **UMass Amherst**
  - Agriculture
- **Lorain County Community College**
  - Sustainable Agriculture

Schools with PDC's - Distance

DISTANCE COURSE

Courses taken at a distance, usually online
Often offered via Extension/Continuing Studies

Goddard College
Oregon State University
UMass Amherst
Prescott College
Cornell University
North Carolina State University
Gaia University (UK)

Permaculture Ideas for WMU

- Food waste recycling for compost for landscaping and food
- Rainwater cisterns for water management and freshwater security (PFAS, lead, PCB's)
- PDC for Landscape Services and students
- Edible landscaping near dormitories and main walking paths
- No/low mow landscaping with native flowers and grasses
- Goats and sheep for managing forested areas and sloping landscapes
- Gardens for students and staff
- Separation of gray water to biodigester to power plant
- Less energy intensive storm water management (swales, ponds, terraces)
- All slopes over 15 degrees returned to forest (goats) or terraced
Questions?

Go to wmnich.edu/maps for additional areas and access to an interactive map.