Gardening Merit Badge  
Session 2  
Requirements 4-8  
Scouting at Home  
Bucktail Council BSA
Review of Session I

• Any questions on protocol as to how the Gardening Merit Badge will be managed? Email your work to me, copying an adult, at hw1@psu.edu

• Any questions on Requirement 1?
• Any questions on Requirement 2?
• Any questions on Requirement 3?
• Are you ready to proceed with Requirements 4-8?
Requirement 4

• Test 100 seeds for germination.
  • You may decide to use leftover seeds from Requirement 2
  • You may want to try seeds left from last year.
  • Discard any seed that is obviously deformed or damaged

• Determine the percentage of seeds that germinate.
  • Seeds will swell when moistened but that is not germination
  • Germination has occurred if the emerging root has reached at least the diameter of the seed.

• Explain why you think some did not germinate.
How to Conduct a Germination Test

• To learn more about seed germination you may want to consult https://extension.psu.edu/understanding-seeds-and-seedling-biology
• https://www.southernexposure.com/how-to-test-germination/
• https://growagoodlife.com/simple-seed-germination-test/
• https://www.youtube.com/watch?v=MOphmTH-WIA

• Steps
  • Layout a sheet of paper towels and dampen the towel
  • Place 100 seeds in a row about 1/3 from the base
  • Loosely roll the towel into a cylinder
  • Twist the ends or wrap a rubber band around each end
  • Place the bottom of the towel into a bowl of water so the water wicks up the towel but the water does not cover the seeds.
  • Alternatively fold the towel and place in a plastic bag
  • Every 2-3 days unroll the towel and count the number of germinations. Remove germinated seeds and roll the towel again. Continue until no more germinations occur.
  • Tabulate your results.
Requirement 5: Select **ONE** of the following

- Visit your county extension agent’s office, local university agricultural college, nursery, or a botanical garden or arboretum.
- Know what you want to learn before visiting. They are busy persons.
  - Formal botanical gardens or arboretums are not close to our council
  - Penn State College of Agricultural Sciences is Pennsylvania’s Land Grant agricultural college but research what you want to visit
  - Each Pennsylvania county has a Penn State Extension Office but may have limited office hours and staff.
  - Commercial nurseries can be found. Large stores sell plants and gardening supplies but sales personnel often have limited technical knowledge. Seek out local greenhouses.
  - Community garden clubs often have knowledgeable members
- Report on what you learned.
Requirement 6: Getting Down to “Bees-ness”

• A. Explain to your counselor how and why honey bees are used in pollinating food crops.
Requirement 6: Getting Down to “Bees-ness”

B. Discuss the problems facing the bee population today,
   - Varroa mites: feed on bee blood, weakening and even killing the bees
   - Tracheal mites: microscopic, block trachea or breathing tubes of bees
   - Colony Collapse Disorder (CCD): cause not known, rapid loss of mature bees
   - Bears (plus mice, skunks, opossums, wax moths, hive beetles)
Murder Hornets

- Asian giant hornet recently reported in state of Washington (*Vespa mandarinia*)
- Invade bee hives and decapitate bees to get to the honey and brood
- Large (2 inches)
- Potent venom in long stinger
- Immune sensitive persons
- Multiple stings can kill
Requirement 6c

• C. Tell what you think would be the impact to humanity if there were no pollinators. Consult https://www.vafb.com/membershipwork/news-resources/honeybees

• Trivia: about 35 percent of the world's food crops depend on animal pollinators to reproduce
• More than 3,500 species of native bees help increase crop yields.
• Honey bees perform more than 80 percent of all pollination of cultivated crops.
• More than 100 important crops are pollinated by honey bees.
Weeds

• Weed definition: A plant growing where humans don’t want it
• Control: Manual removal (pulling/digging) vs. Chemical (herbicides)
• Examples:
  • Pigweed or Red Root (*Amaranthus retroflexus*)
    (https://en.wikipedia.org/wiki/Amaranthus_palmeri)
  • Lamb’s Quarter (*Chenopodium album*)
    https://www.canr.msu.edu/weeds/extension/common-lambsquarters
  • Purslane (*Portulaca oleracea*)
    https://www.gardeningknowhow.com/plant-problems/weeds/purslane-control.htm
  • Quackgrass or Couch Grass (*Elymus repens*)
    https://plantscience.psu.edu/research/centers/turf/extension/plant-id/grasses/quackgrass
Requirement 7: Pests

• Identify five garden pests (insects, diseased plants).
  • Make a quick list of pests of which you are aware.
  • Perhaps ask people for suggestions and what they do
  • Most efficient search is by the internet.
  • Rely on government or research universities for the most reliable information.
  • Pest control companies are likely trying to acquire customers or sell products.
Requirement 7: Pests

• Recommend two solutions for each pest.
  • At least one of the two solutions must be an organic method.
  • Organic means a control method that does not utilize chemical pesticides.
    • Cultural Controls: healthy plants, plant spacing, remove dead and diseased plants
    • Biological Controls: Use other organisms for control
    • Physical Controls: Remove by hand, use barriers
    • Organic Chemicals: Natural chemicals, fewer environmental effects
• Modern chemical pesticides need users to follow directions and may require that the user is a trained pesticide applicator.
Pest Control: Japanese beetle

- Japanese beetle (*Popillia japonica*) is an invasive insect that is widespread in the eastern U.S.

https://extension.umd.edu/hgic/topics/japanese-beetles
https://extension.psu.edu/programs/master-gardener/counties/susquehanna/penn-state-master-gardener-articles/japanese-beetles

Controls:

- Pheromone traps
- Milky Spore Bacterium
- Manual Removal
Pest Control: Tomato Blight

• Tomato and potato late blight is caused by a fungus *Phytophthora infestans*

• [https://extension.psu.edu/tomato-potato-late-blight-in-the-home-garden](https://extension.psu.edu/tomato-potato-late-blight-in-the-home-garden)

• Controls
  • Environmental control: plant spacing, remove weeds
  • Manual control: Check plants daily and remove infected plant parts
  • Fungicide application: Chlorothalonil
Pest Control: Yellow Jackets

• **Eastern Yellowjacket** (*Vespula maculifrons*) is a common stinging insect

  - [https://ento.psu.edu/extension/factsheets/eastern-yellowjacket](https://ento.psu.edu/extension/factsheets/eastern-yellowjacket)

• Typically ground nesting but also in structures
• Painful sting can be health issue for allergic individuals
• Controls:
  • Chemical pesticide with 5% carbaryl dust
  • Do not use flammable fluids especially around structures
  • Difficult to remove manually without personal protection coverings
Requirement 8: Do ONE of the following:

• a. Build a compost bin and maintain it for 90 days.

• b. Build a vermipost bin (worm compost bin) and maintain it for 90 days.

• c. Build a hydroponic garden containing three vegetables or herbs, or three ornamental plants. Maintain this garden through harvest or flowering, or for 90 days.

• d. Build one water garden, either in a container (at least 12 by 6 inches and 6 inches deep), or in the ground as a small, decorative pond no larger than 6 by 3 feet and 24 inches deep. Maintain the water garden for 90 days.

• e. Prepare a honey super for use on a hive or colony. Remove a filled honey super from the hive or colony and prepare the honey for sale.
Requirement 8a: Compost Pile

• Online articles are helpful
  • https://www.goodhousekeeping.com/home/gardening/advice/a23945/start-composting/
  • https://www.planetnatural.com/composting-101/making/compost-pile/

• There are various U-Tube videos on composting
  • https://www.diynetwork.com/how-to/outdoors/gardening/compost-101
  • https://www.youtube.com/watch?v=ZqWTYB_XLwE
What is composting?

Using the natural process of decay to change organic wastes into a valuable humus-like material called compost.
Composting -
Speeding up the natural decay process

A compost pile or bin allows you to control
• Air (oxygen)
• Water
• Food, and
• Temperature

By managing these factors you can speed up the otherwise slow natural decay process
Bin/pile construction

• Ideal size is approximately a 3 foot cube
  • Promotes sufficient aeration
  • Retains sufficient heat to maintain warm temperatures
  • Piles larger than 5 x 5 x 5 feet are difficult to turn and tend to become anaerobic in the center
Where should I put my compost pile?

• Shaded area will help prevent drying out in summer
• Avoid areas that will interfere with lawn and garden activities
• Adequate work area around the pile
• Area for storage
• Water available
Requirement 8b: Vermipost

• Build a vermipost bin (worm compost bin) and maintain it for 90 days
  • Somewhat expensive to establish
  • Requires attention for success.
  • [https://en.wikipedia.org/wiki/Vermicompost](https://en.wikipedia.org/wiki/Vermicompost)
• Try this internet document
  • [https://hortintl.cals.ncsu.edu/articles/vermicasting-or-vermicomposting-processing-organic-wastes-through-earthworms](https://hortintl.cals.ncsu.edu/articles/vermicasting-or-vermicomposting-processing-organic-wastes-through-earthworms)
Requirement 8c: Hydroponics

• Build a hydroponic garden containing three vegetables or herbs, or three ornamental plants. Maintain this garden through harvest or flowering, or for 90 days.
• Requires careful setup
• Internet articles
  • https://www.diynetwork.com/how-to/outdoors/gardening/how-to-assemble-a-homemade-hydroponic-system
  • https://www.youtube.com/watch?v=mcKSpwROvX8
Gardening MB Suggestion: Needed Materials

• 2 plastic foam coolers
• Heavy-duty trash can liners
• Duct Tape
• Seed-starting trays and seeds
• Utility knife and scissors
• 3-watt aquarium pump with hosing and air stones
• Optimal high intensity lamp
• Growing medium: 2 parts perlite, 1 parts vermiculite
• Hydroponic nutrients: commercial mix
Home Hydroponic Garden: Steps

• Line coolers with plastic bags
• Cut 6 small holes in each lid to hold plants
• Start seeds in growing mix
• Transfer young plants to lids so roots are in nutrient solution
• Bubble air into nutrient solution
• Turn on light for 12 hour photoperiod
• For lettuce, start picking leaves in about 1 month.
Requirement 8d: Water Garden

- Build one water garden,
  - either in a container (at least 12 by 6 inches and 6 inches deep), or
  - in the ground as a small, decorative pond no larger than 6 by 3 feet and 24 inches deep.
- Maintain the water garden for 90 days.

By Nowis - Own work, CC BY 2.5,
https://commons.wikimedia.org/w/index.php?curid=831150
Requirement 8e: Honey Super

- Prepare a honey super for use on a hive or colony.
  - Do you know a local beekeeper?
- PSU extension courses are free for a short time [https://extension.psu.edu/beekeeping-101](https://extension.psu.edu/beekeeping-101)
  - [https://extension.psu.edu/beekeeping-honey-bees](https://extension.psu.edu/beekeeping-honey-bees)
  - Locate a local beekeeper and seek assistance, call your county extension office.
  - A honey super is a specialized box for bee raising [https://en.wikipedia.org/wiki/Honey_super](https://en.wikipedia.org/wiki/Honey_super)
- Remove a filled honey super from the hive or colony and prepare the honey for sale.
  - Best done under the supervision of an experienced beekeeper
Beekeeping Basics

- In 2013 Penn State estimated $5000 in costs to start bee hives
- Honey bee colony has three castes
  - Queen: egg-laying machine, 1 per hive
  - Drones: nonworker males, mate with queens
  - Workers: infertile females, protect hive and forage for nectar
- Pollination of many crops are essential for humankind
- Honey made from nectar mixed with invertase enzyme from saliva
  - Nectar mix evaporated into thick honey
  - Honey placed into beewax cells and capped
Hive Maintenance

Modern Beehive: some different styles


Position: Move as necessary to be near a crop in flower (consult other beekeepers for timing)

Super: Put on your super when the bees start to make honey.
Harvesting Honey and Wax

- Place removed super into a warm room
- Use an extractor as directed
- Use a knife to cut off the cell caps to release the honey
- Clean and filter the honey before bottling
- Melt wax for use or sale
- Freeze emptied super to kill wax moth eggs
Tips for Starting Beekeeping

• Have everything ready before getting bees
• Transport bees carefully to hive to avoid high temperatures
• Wear protective gear and introduce bees to hive
• Spray bees with sugar syrup and thump shipping box to knock bees to bottom
• Dump bees into hive with frames removed, add sugar syrup to feeder
• Slowly add frames, then add queen cage
• After 4-5 days add sugar syrup to feeder as needed
• Using smoke, open queen cage
• Check in a week to see if queen is laying eggs, comb is being built and honey is being made
Closing Comments

• Remember that the gardening merit badge will require dedicated work but is very worthwhile, perhaps a lifelong activity.

• If questions or issues develop, contact me by email hw1@psu.edu.

• If emailing me, please copy another adult such as a parent/guardian or scout leader to follow BSA Youth Protection protocols.

• A third or follow-up session will be scheduled in late summer or early fall to share our progress and to cheer our success.

• Completed blue merit badge cards will be sent to your Scoutmaster.