



Naturescaping

INTRODUCTION

This lesson will explore landscaping with native plants – also known as naturescaping – and how this promotes a healthy environment including improved air and water quality and increased biodiversity. Students will create a site plan and carry out actual site improvements.

LESSON OVERVIEW

Grade Level and Subject: Grades 9-12: Science, Health, Social Studies

Length: In-class lessons and planning for site will take two to three classes (actual planting and naturescaping of site will vary – several days to several months).

Objectives:

After completing this lesson, students will be able to:

- Understand the terms used in naturescaping.
- Understand the difference between traditional landscaping and naturescaping.
- Understand the benefits of naturescaping for the health of the environment.
- Understand how to develop a plan.
- Understand how to do site preparation.
- Understand how to plant.
- Understand what is involved in doing maintenance.

National Standards Addressed:

This lesson address the following National Education Standards¹

- **Content Standard: [NPH-H.9-12.3 REDUCING HEALTH RISKS](#)**
As a result of their activities in grades 9-12, students will be able to:
 - Analyze the role of individual responsibility for enhancing health.
 - Evaluate a personal health assessment to determine strategies for health enhancement and risk reduction.
 - Develop strategies to improve or maintain personal, family and community health.
- **Content Standard: [NPH-H.9-12.1 HEALTH PROMOTION AND DISEASE PREVENTION](#)**
As a result of their activities in grades 9-12, students will be able to:
 - Analyze how behavior can impact health maintenance and disease prevention.

¹ <http://www.education-world.com/standards/>

- Analyze how the family, peers, and community influence the health of individuals.
- Analyze how the environment influences the health of the community.
- **Content Standard: [NS.9-12.6](#) PERSONAL AND SOCIAL PERSPECTIVES**
As a result of their activities in grades 9-12, students will be able to:
 - Personal and community health
 - Natural resources
 - Environmental quality
- **Content Standard: [NSS-G.K-12.5](#) ENVIRONMENT AND SOCIETY**
As a result of their activities in grades 9-12, students will be able to:
 - Understand how human actions modify the physical environment.
 - Understand how physical systems affect human systems.
 - Understand the changes that occur in the meaning, use, distribution, and importance of resources.

Materials Needed:

- Site to create naturescape.
- Measuring (tape, yardsticks) and sketching tools (pencil, paper, pad or clipboard).
- Gardening tools (shovels, rakes, tiller, etc.).
- Plants/seeds.
- Hose/sprinkler.

Assessment:

Students will be assessed through the following activities:

- Creating a naturescape plan.
- Implementing a naturescape plan.

LESSON BACKGROUND

Relevant Vocabulary:²

- **Alien species:** Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also invasive species.
- **Biodiversity:** The variety of life on earth in all its forms including genes, species and ecosystems and the natural processes that link and maintain them.
- **Bio-inventory:** A detailed site assessment that documents plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence (or likelihood of presence), sensitive ecosystems, rare ecosystems, rare species, adjacent land uses and threats, site stability and flood issues, other factors affecting lot layout, and

² Environmental Best Management Practices for Urban and Rural Land Development, http://wlapwww.gov.bc.ca/wld/documents/bmp/urban_ebmp/EBMP%20PDF%208.pdf

where appropriate, potential habitat enhancement/protection opportunities. Terms of reference for a bio-inventory are included in Appendix C: Terms of Reference for a Bio-Inventory.

- **Buffer:** An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.
- **Connectivity:** A qualitative term describing the degree to which natural ecosystems are linked to one another to form an interconnected network. The degree of interconnectedness and the characteristics of the linkages vary in natural landscapes based on topography and natural disturbance regime. Breaking of these linkages results in ecosystem fragmentation.
- **Contaminated Site:** An area of the land in which the soil or any groundwater lying beneath it, or the water or the underlying sediment contains: (a) a hazardous waste, or (b) another prescribed substance, in quantities or concentrations exceeding prescribed risk-based or numerical criteria or standards or conditions.
- **Critical habitat:** In conservation biology, critical habitat is defined as part or all of an ecosystem occupied by a species, or population of that species, that is recognized as essential for the maintenance and long-term survival of the population.
- **Ecological integrity:** A continuum of characteristics that a landscape should possess. These include ecosystem health, biodiversity, stability and sustainability through the maintenance of structural and functional components of the system in perpetuity.
- **Ecosystem:** The dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem, including physical, chemical and biological components are interconnected: that is, they affect and are affected by all other parts.
- **Ecosystem features:** The physical components of the ecosystem (such as snags and large woody debris) that help maintain the diversity and processes associated with a healthy ecosystem.
- **Ecosystem functions:** The physical, chemical and biological processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration and nutrient cycling.
- **Edge habitat:** The point at which dissimilar plant communities (different vegetation types, successional stages or vegetative conditions) meet. Many species have adapted to the interface between the two habitats.
- **Environmentally sensitive area:** A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals. Environmentally sensitive areas also include hazard lands.
- **Endangered:** A species facing imminent extinction.

- **Erosion:** A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.
- **Extinct:** A species that no longer exists anywhere in the world.
- **Feathering:** A method of partially trimming trees so that they are windfirm (better able to resist windthrow)
- **Greenways:** Networks of linked greenspace that provide wildlife habitat and recreational opportunities. They include trails in some areas and no public access in others. Greenways are created as part of an integrated approach to land planning, balancing the needs of human communities and natural systems.
- **Groundwater:** Water below the surface of the ground. This water may move through underground streams and seepages.
- **Habitat:** The natural home of a plant or animal within an ecosystem, which provides food and shelter and other elements critical to an organism's health and survival.
- **Habitat reservoir:** A large area of relatively natural habitat that has sufficient size and ecological integrity to support a range of native species, including species that need interior habitats. The size of habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.
- **Hydrology:** The science of water, its properties and movement (water cycle) over and under land surfaces.
- **Invasive species:** Plants, animals and micro-organisms that colonize and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept their populations in check in their native environment are not found in their new location.
- **Islandisation:** The process by which disturbance results in an ecosystem becoming isolated from surrounding ecosystems. The remnant ecosystem becomes an 'island' in a sea of development.
- **Monoculture:** the use of land for growing only one type of crop.
- **Naturescape:** A way of restoring, preserving and enhancing wildlife habitat in urban and rural landscapes by providing wildlife habitat in our homes and gardens.
- **Old fields:** Altered ecosystems, in places where agriculture once occurred but that have not been actively farmed for many years. Old fields provide important habitats for wildlife such as raptors (eagles, owls and hawks) that feed on their rich small mammal and bird populations (voles, mice, etc.). To maintain their importance as habitat, old fields may require some maintenance such as mowing, removal of invasive species, or brush cutting if succession to shrubs and trees is not desired.
- **Pesticide:** A micro-organism or material that is represented, sold, used or intended to be used to prevent, destroy, repel or mitigate a pest.
- **Sediment:** Material carried in suspension by a flowing body of water which will ultimately settle to the bottom as water velocity decreases.
- **Soil morphology:** The form and structure of the soil, including its mineral and biological (dead organic matter) content.

- **Stream:** A natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.
- **Threatened:** A species likely to become endangered if limiting factors are not reversed.
- **Wildlife:** Any wild organism including wild mammals, birds, reptiles, amphibians, fishes, invertebrates, plants, fungi, algae and bacteria.
- **Wildlife corridor:** A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.
- **Wildlife trees:** A standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity.

Information:

Commonly, landscaping is approached from a homogeneous perspective – with people changing the site in order to put in plants that they value, are familiar with, or simply find aesthetically pleasing, no matter where they live. This necessitates installing irrigation, bringing in new soil or soil additives, routinely applying chemical products including pesticides and fertilizers, and repeatedly cutting and trimming. The implications of traditional landscaping according to the Environmental Protection Agency are:

- Air, noise, water pollution
- Flood damage/erosion
- Harm to biodiversity
- Consumption of natural resources
- Impacts to public health and safety
- Cost and labor intensive
- Monotonous landscapes

Some nurseries are partly responsible for this phenomenon because they buy limited species of plants en masse and look to market over a broad area to maximize profit. Landscape designers play a role in this since they purchase their plants from nurseries. Home owners use the plants they know as a frame of reference no matter where they live. Naturescaping, in comparison, advocates choosing plants that have evolved in that particular environment because they will do well naturally, with the least amount of maintenance. The benefits of naturescaping according to the EPA and the Plant Native websites:

- Native plants enrich the environment and return it to a healthy ecosystem by promoting biodiversity.
- Native plants do not need synthetic pesticides or fertilizers. Some of these may cause serious health problems because people do not handle the chemicals properly or follow label directions. Overuse of pesticides may kill insects that are beneficial, as well as other wildlife. These chemicals runoff into our bays, rivers, streams, and lakes causing water pollution, which affects the aquatic life residing in those bodies of

water. Insect pests may be controlled using natural controls such as fish, frogs and snails. These animals will also reduce algae buildup.

- Native plants save you money on your water bill.
- Native plants have a positive affect on local, regional and global air quality. By eliminating lawn maintenance equipment (lawn mowers, edgers, leaf blowers, etc.) we are reducing the amount of pollutants, ozone-forming volatile organic compounds (VOCs), toxins, and particulates that go into the air from gasoline, electricity, and batteries. Regionally, the nitrous oxide (NO_x) and sulfur dioxide (SO₂) released from lawn equipment react with water in the atmosphere to form acid rain.
- On a global scale, native landscaping techniques cause global warming. Carbon dioxide (CO₂), a major greenhouse gas is reduced by eliminating the use of lawn maintenance equipment that emit this gas. Native plants lower the amount of CO₂ in the atmosphere by taking in CO₂ and storing the carbon in the body of the plants, roots, and soil. Native plants use their broadly reaching root systems and increased ability to retain and store water.
- Native plants increase habitat used by songbirds. The songbird population has been diminishing by 5 – 10% per year. By adopting naturescaping we may be able to stem this tide.
- Prevents introduction of exotic plants.
- Native plants provide “sense of place”.

Resources:

- Plant Native, plantnative.com/
- University of Minnesota, Sustainable Urban Landscape Information Series, www.sustland.umn.edu/design/gloss.htm
- Ladybird Johnson Wildflower Center, www.wildflower.org

LESSON STEPS

Warm-up: *What is Naturescaping?*

1. Students will work together in groups of two or three to discuss what they think the differences are between traditional landscaping and naturescaping. Each group will share their conclusions with the class.
2. Compare each group’s answers and write correct naturescaping concepts on the board to paint a fuller picture.
3. As words or concepts come up, go over relevant vocabulary.

Activity One: *Exploring your site*

1. Students begin by assessing their site by asking the following questions as part of the design phase:
 - a) Is your site sunny or shady?
 - b) What is the path of the sun across your site (in winter and summer)?
 - c) Is the site flat, sloped, or both?

- d) What is the soil like—a dense clay or a loose loam/sand?
 - e) How is the soil drainage—good, fair, or poor?
 - f) Where are buildings, power lines, and property lines located?
 - g) Would the building(s) benefit from a shade tree or trees, and if so, where would those trees be located?
 - h) Can you think of other questions or information to consider?
2. Have the students spend time at their site at different times during the day, and if possible during different times of the year or weather patterns. With pen, paper, and tape measure in hand, students should sketch or map out their site noting what will remain the same and what should be altered. Students should indicate on their diagram the layout of the land, wet/dry areas, sunny/shady areas, etc. If there are any downspouts, note if the water could be used to water the plants. This completed sketch/map is called the “baseline plan.”

Activity Two: *Evaluating Purposes of the Naturescape*

1. What do you want to do with your site? Begin by introducing the concept of an “outdoor living space.” You may compare it to “indoor living space” as a basis for defining the outdoor concept by asking how a specific room could be used, and how you would arrange the furniture. Then define aspects of an outdoor living space: structures, equipment, plants, movement and flow through the space, etc.
2. Ask the following questions if they are designing the space for themselves or someone else. These questions can be adjusted as needed:
 - a) Do you want to entertain people or groups? What space or structures would you like for that?
 - b) Do you want your space to be dynamic and stimulating or would you like to create a sanctuary?
 - c) What views do you want to maintain, create or block?
 - d) What areas will be used for structures? Examples of structures are: recreation/play structures, gazebo, doghouse, hot tub, swing, shade structures or pergolas, tables, fountain, or bench?
 - e) What areas will be used for a vegetable garden, compost pile, or shed?
 - f) Consider utility (storage, seating, shade) and aesthetics.
 - g) Do you need space for any other purposes?
3. With these answers in hand, consider creating a “bubble diagram” consisting of series of circles drawn on paper to show what the areas in the landscape will be used for. Next, have the students look at how people will move around the space. Movement corridors include pathways, lawn alternatives, patios, decks, porches, driveways, etc. They have now created a plan for their space as well as established the conditions of their living space. Now it is time to choose the plants (remind your students that as they proceed through the process that the goal is to have native plants and to minimize the amount of time, energy, and money working against natural systems).
4. What are the right native plants? Attain a list of common native plants and their characteristics to determine which plants will thrive on your site. Consider

categorizing your plants by growth characteristics: sun or shade, soil type etc. There are many ways to go about finding this information. (Note: This could be done as homework between class sessions.)

- a) You can contact or visit a local native plant nursery. You can locate one by using a search engine or look up in a telephone directory.
- b) Contact a government agency or an organization that is knowledgeable about native plants.
- c) Check out the library for fieldguides and books on native plants.
- d) Use the internet to locate descriptions of native plants for your region.
- e) When looking at various plants, encourage students to view them in terms of a “plant community,” which is defined as a collection of different plant species that naturally grow together.

Activity Three: *Creating a Plan*

1. A plan will help students determine the kind of plants to be planted and where to place them. The plan will also give you an idea of the size of the plants desired—for small plants you may want to make a notation as to the general placement, species and quantity. Begin the process by positioning the plants for your plan.
2. Create a Naturescape plan. Take your baseline plan and your local plant list and move through the following areas that you would like to naturescape:
 - a) Choose and position tree(s) first because they are the largest element and may determine what type of plants will be placed under them. Think about grouping your trees, since this is nature’s way.
 - b) Decide on the type of shrubs you are going to plant. Think about the aspects of your site that you want to bring out (habitat, color, food, etc.). You will also need to consider the relationship to the trees you have chosen. Using the “found in nature approach,” cluster the shrubs in small groups of 2-4 plants giving a natural look and creating less maintenance.
 - c) Next you will select the herbaceous plants to fill in the gaps between the trees and shrubs.
3. Other design considerations
 - a) Sunlight/shade: if you have a building on your site or plan to, watch the path of the sun in relationship to your structure. If you leave your building open to the sun, you can utilize the sun for “passive solar heating.” Placing a tree in an appropriate place will keep your building cooler in the summer. Choose a deciduous tree if you want to take advantage of the sun and the shade.
 - b) Cutting: if you are considering a specific species of trees in a mature naturescape, think about planting a number of trees and then selectively removing trees as they grow larger. This avoids maintaining that specific area until the trees mature and cover it.
 - c) Storm water: reduction of storm water run-off is beneficial to human health and allows for a healthy ecosystem by creating on-site bioswales, or other moisture-absorbing or distributing features. Bioswales can be arranged to accommodate water from disconnected gutters or other sources. The creation of these allows for a larger variety of plants, thereby diversifying the look and foster habitat diversity.

- d) Consider adding more organic matter on or in your soil. This helps to lessen storm water runoff. Leaf mulch is a good choice.
- e) Other thoughts: to help you visualize your design, you might want to think about using different color landscape flags to represent different plants.

Activity Four: *Site Preparation and Soil Layer Building*

Site preparation will depend on your site.

1. **Lawn to Naturescape** - by removing grass and planting natives, you are restoring the soil or soil layers.

a) Definitions:

mineral soil: refers to soil that has a low organic component. We often call this “dirt” and it tends to be rather hard when dry.

organic soil: refers to soil that is comprised largely of decomposing leaves, needles, and other organic material—it tends to be soft and moisture-absorbent.

b) If you take a walk through the woods you will notice that herbaceous plants are apt to grow in the organic soil layer, while the shrubs and trees may be found growing in the mineral soil layer.

2. Compare the soil in the woods to a site that has a turf lawn.

- a) What soil layers did you find there? (Answer: Mineral soil layer because before the installation of the lawn, the organic soil layer is stripped away).
- b) It is preferable to have a layer of organic soil unless you have a sand-based “desert-scape” or full sun meadow.
- c) The benefits of having an organic soil layer are that it provides weed-suppression and soil moisture retention.

3. If students have unwanted grass that has been previously planted on their site that they want to remove in order to restore the soil they can either dig it out by hand or use a rototiller.

4. Once the grass is removed, turn the soil over and rake away the grass. Till and rake the soil.

5. If you add any form of water to the soil you will get what is known as “insta-weeds”. To avoid this problem either plant your plants right away or cover the exposed dirt using leaf or needle mulch.

6. The other method for removing grass is called smothering:

- a) Cut the turf grass as close to the ground as your mower permits.
- b) Cover it with 10-16 sheets of newspaper making sure to overlap to avoid leaving spaces for weeds and grass to grow.
- c) Apply 4-6 inches of leaf mulch or 6-8 inches of leaves alone or combine the two.
- d) Wait two months before planting.
- e) Pierce the leaf layer and newspaper and plant your trees and shrubs.

- f) Make sure any mineral soil that ends up on top be covered.
 - g) Herbaceous plants can be planted through or in the leaf layer.
 - h) Ask the students to name the process that is being prevented by “smothering” the grass. (*Answer: photosynthesis*).
 - i) Ask the students what will become of the newspaper and what it contributes to. (*Answer: since newspaper is a wood product it will break down and contribute to the organic layer of the soil*).
9. **Removing Hard-to-Remove Invasives** - English Ivy, Himalayan Blackberry, Kudzu or Vinca may be difficult to get rid of. What you want to remember is by interrupting the process of photosynthesis the plant will eventually die. Follow these steps:
- a) Cut the plant low to the ground and continue to repeat this as soon as you see new shoots emerge interrupting the process of photosynthesis by weakening the roots.
 - b) If this proves difficult cut the plant to the ground and smother using cardboard or wood. Check from time to time if there are any new shoots.
 - c) If this is still not working, you may need to resort to a mildly toxic pesticide. This should be a last resort for the purpose of achieving a better long-term result.

Activity Five: *Planting*

1. Locate a nursery that carries native plants
2. Planting an Existing Plant
 - a) Plant during the plant’s dormant period.
 - b) Plants will come in containers or bare-root
 - i) Bare-root
 - Plant roots need to be kept moist. Place in saw dust, compost or mulch to hold water.
 - The hole should be at least the size of the root structure or 1.5 times its size.
 - Mix in some organic matter
 - ii) Containerized plants
 - You may want to apply root growth hormone if you are concerned about the plant becoming established.
 - For plants that are balled and burlapped dig a hole 1.5 – 2 times the width of the root ball.
 - Place the crown flush with the level of the soil.
 - If you are planting a tree, create a circular dam around the hole of the tree to hold water.
 - Consider staking the tree until established.
 - Since sowing directions vary from plant species to plant species, follow the directions on the packet.

Activity Six: *Maintenance*

Students will learn what is involved in maintaining their naturescaped site.

1. Watering new plants.

2. Weed removal - do this early and often to remove seed source.
3. Weeding is reduced as native plants fill in.
4. Keep areas unplanted areas covered with compost until plants go in.
5. You may also use a form of obstruction to prevent weed growth such as newspaper or cardboard.

CONCLUSION

After completing this lesson, students will understand the differences between traditional landscaping and naturescaping. Moreover, students will comprehend the numerous benefits naturescaping has on environment and human health. This lesson will hopefully encourage students to take an interest in naturescaping so that they ultimately implement techniques they learned in this lesson at their own personal site.