

Located under the roof structure

Grass Roots

Human interaction with grasses has a long and rich history, and now lawns are hottest issue in the ongoing environmental stewardship debate. This Grass Roots Exhibit will help you weed through the controversy and learn how science has allowed us to make the best use of these wonderfully adaptable and resilient plants in enhancing and protecting the environment. This is the first exhibit exploring the science, history, and environmental benefits of grasses. Look for signs like this throughout the exhibit to discover the science in your lawn, and use the Find the Facts section to explore our Grass Roots web site.

Green Roof vs. Conventional Roof

The Better Half

Half of the roof above you is cloaked in poverty oat grass. Grasses have an extensive fibrous root system and are well adapted to extremes of temperature and drought, qualities that make them a good choice for green roofs. In the average rain event of 1.2 inches, only half an inch of rain will run off the grassy part of the roof. All 1.2 inches will immediately run off the conventional half of the roof in the same rainstorm. Look at the rain barrels and the thermometers to compare the environmental profile of both types of roofs.

Find the Facts: How much cooler is a grass green roof than a conventional roof on a hot summer day?

Sign on Rain Barrel—

Is the barrel empty? If it is, it probably hasn't rained recently!

Danthonia

Lawn of the Future

Do you struggle to grow grass in difficult growing conditions? In the future, more regionally adapted species may be grown in lawns to overcome some of these tough conditions. Buffalo grass and sideoats grama are already being used in dry regions, and U.S. National Arboretum scientists are working to develop poverty oat grass, *Danthonia spicata*, for use in dry, shady

locations with acidic soil. Developing grasses that are well adapted to specific conditions prevalent in a specific region will greatly improve the sustainability of lawns.

Find the Facts: What grasses with lawn potential are native in your part of the country?

Grass Wanted

Wanted—tough grass for tough situations. Must grow in compacted acidic soils with low fertility. Must withstand drought and extreme heat. Must grow in deep shade and succeed in full sun. Symbiotic relationship with a fungus a plus, will help in getting through the tough times. Must not have a previous record of growing too quickly and should possess remarkable resistance to pests and diseases.

Without realizing it, you've probably already seen poverty oat grass, *Danthonia spicata*. It may even be in your lawn since it is native over a broad portion of the United States and is frequently found in established lawns where soils are acidic, heavy, and compacted and where conditions are shady. It's a good example of a sustainable grass species because it persists without fertilizer, water, pesticides, or frequent mowing.

Find the Facts: How could the survival strategies found in poverty oat grass be applied to other grass species?

USGA

Green Golf

The golf industry has always been at the forefront in promoting turfgrass research, beginning in 1920 with the first collaboration with the USDA in developing better turfgrass. Today, golf courses are making environmental innovations by using species that require less mowing in rough areas, developing buffers for water hazards, and planting grasses for wildlife habitat. In heavily developed areas, golf courses serve an important function in providing green space.

Putting Green

2% of the area of the average golf course

Every aspect of this putting green is carefully engineered. The soil under this green is mostly sand so water drains through it rapidly. The water that runs through it is filtered before it is directed by underground pipes to the pond. Our green is bentgrass, the predominant species for

greens in our area. National Arboretum scientists are working to develop genetics that make bentgrass more tolerant of heat and drought and more resistant to pests and diseases.

Find the Facts: What would you have to do to have grass like this in your yard?

Fairway

20% of the area of the average golf course

Fairways aim to provide uniform turf for golfers. Glenn Burton, as USDA Agricultural Research Service scientist, developed bermudagrass varieties that are commonly used in fairways in our region. Bermudagrass is tolerant of drought, and heat but is dormant in winter.

Find the Facts: What species of grass is used in fairways in your region?

Rough

34% of the area of the average golf course

This rough is mowed less frequently than the fairway. Some golf courses are using regionally adapted grasses for roughs, since they require fewer inputs of water, fertilizer, and pest and disease control. Our rough is planted with mixture of fine fescues that don't need to be mowed frequently.

Find the Facts: How does choice of grass species used in the rough impact the difficulty of your golf game?

Buffer

>1% of the area of the average golf course

Buffers use grasses and sedges adapted to wet environments to filter runoff before it enters the pond. These plants can also provide homes and food for wildlife.

Find the Facts: What kinds of insects, animals, and birds might be found at a golf course in your area?

Pond

7% of the area of the average golf course

This pond stores runoff that may be recycled for irrigation. Water from the pond may cycle back to the green. The pond may also serve as habitat for waterfowl, amphibians, turtles, and fish.

Find the Facts: What percentage of golf courses recycle water?

Turf Diseases and Pests

What's Troubling My Turf?

Look at the pictures below and guess the cause of each turf problem. Lift the door for the answer.

Diseases

Spots are often caused by diseases, and may appear in warm, humid weather.

Insects

Patches of dead grass might be caused by insects, such as grubs.

Weeds

A healthy, well maintained lawn that is never cut too short or too infrequently is the best defense against weeds.

Dogs

Dog urine can be toxic to turf, causing dead spots.

People

Heavy foot traffic can compact the soil and cause grass to die. Improper management of water, fertilizer, or mowing can injure turf.

Find the Facts: What steps can you take to protect your lawn from diseases, weeds, and pests?

Fertilization

Feed Me!

Turfgrass may require fertilizer to grow thick and healthy so it can function well as an environmental asset, cleansing water and preventing erosion. Allowing clippings to remain in your lawn can provide some of the fertilizer it needs.

Find the Facts: What percentage of nutrient loading in the Chesapeake Bay comes from lawns and turf?

Interactives:

What is the most important factor in success with managing nutrients in your lawn?

(mirror)

You are! When and how you fertilize is up to you. Do your homework so you can do it right.

How much fertilizer would you apply to this turf to make it thick, green, and healthy?

Visitor can choose pounds of nitrogen per 1000 square feet level and once the rate is set, they can open a door:

For suboptimal amounts, the wheel behind the door will display Red with text “Not enough, except for some grasses like poverty oat grass and zoysia. Try again.”

For appropriate amount, the wheel behind the door will display Green with text “Good job! Just the dose the doctor ordered!”

For superoptimal amounts the wheel behind the door will display Red with text “Whoa! Too much. Try again.”

When do you think you should apply fertilizer?

Similar door and wheel with Red, Yellow, and Green to indicate when cool season lawns are best fertilized, with this text written on plexiglass between the wheel and the door: “Most lawns in this part of the country should be fertilized in the fall.”

Be Careful!

Lawn, sidewalk, and driveway interactive to show that fertilizer should be carefully directed to lawn only.

What kind should you buy?

Interactive doors with scenarios on each:

Preparing a New Seedbed for Grass Seed, Small Lawn in Urban Setting, Large Lawn in the Country, Sensitive Area near A Stream or Pond

Corresponding appropriate fertilizer types under each door.

Fertilizer Time Line

New technology has changed lawn fertilizer over the years. The first fertilizer products released nutrients over a short time. New fertilizers are being formulated to slowly release nutrients over a long time.

Bat guano, ammonium nitrate, sulfur coated urea, advanced coating fertilizer, biosolids with a graphic indicating time for nutrients to be released for each, along with timeline for era of predominant use in lawns.

History of Lawns

7 banners—the underlined title will not be included by text, but an image evoking it will be the background for the banner.

Savannah

35 Million Years Ago

Grasses evolved in response to drier climate conditions, and people found grasslands with scattered trees known as savannas to be good places to live. Studies show we still prefer savanna-like landscapes.

Crops

11,000 Years Ago

Domestication of grasses led to people settling in permanent communities. Rye was first domesticated at least 11,050 years ago, according to archeological evidence found in Syria.

Scotland

1457

People found that grassy areas were perfect for games. Golf was first mentioned in 1457 when King James II of Scotland issued an edict that soldiers were not to play golf because it distracted them from archery practice.

England

1600

Lawns as we know them today were first grown on the estates of the wealthy in 17th century England. Animals such as sheep were allowed to graze early lawns.

Lawns by Design

1840

In the United States, architect Andrew Jackson Downing pioneered the use of lawns around homes. Frederick Law Olmstead promoted lawns by including them in the designs for public spaces. Americans embraced lawns at home and in communities.

Invention of the Lawn Mower

1870

The invention of the lawn mower in the 1870s made it possible for the average homeowner to have a lawn.

Future

2100

In the future, highly specialized turf will be developed for a variety of different conditions so it can flourish with minimal water and fertilizer and require less frequent mowing.

Grass Structure and Mowing

Bottoms Up!

Unlike the leaves of most plants, grass leaves grow from the bottom up. The cells that divide to make the leaves grow are found at the base of the leaves. When you mow your grass, only the tips of the leaves are removed. The dividing cells are found at the base of the leaf where it is protected and can continue to divide and grow. Grasses can tolerate foot traffic, fire, and grazing because of this unusual growth pattern.

Find the Facts: What is the largest grass plant in the world?

Remarkable Roots

Grasses have an extensive system of small roots that allow them to hold soil and dust and survive drought. One single grass plant can have 387 miles of roots, and they may grow as deep as seven feet below the soil surface. Grasses helped create our most fertile agricultural soils. They can also help with global warming since vast quantities of carbon in the form of dead roots is stored in grassland soils. As much as one ton of carbon per acre per year can be removed from the atmosphere where grasses are growing.

Irrigation

Liquid Assets

Water is needed to keep grass green throughout the growing season in much of the country. With greater pressure on water resources and the energy consumption associated with delivering irrigation water, scientists and engineers have been working hard to develop irrigation technologies that make the most of every drop. One of the keys to saving water is applying it at low pressure so the ground can absorb the water that is applied without it running off. Test the irrigation heads in front of you. Each is designed to save water.

Visitors can push buttons to actuate a series of pop up irrigation heads. A sign pops up with each head to explain how it helps to conserve water.

Find the Facts: What is the most drought resistant grass species?

Rain Garden

Grasses Grab Pollutants

Lawns and rain gardens work together to keep storm water on site and remove pollutants from it before it enters storm drains or streams. The lawn portion of our rain garden slows runoff, intercepts sediment, and holds the soil to prevent erosion. The rest of the rain garden is composed of ornamental grasses and sedges adapted to thrive in soils that are sometimes saturated. In this part of the garden, storm water can slowly percolate into the soil instead of going into the storm drain.

Find the Facts: How big should a grassy rain garden be to remove pollutants from an acre of parking lot?

Cool Season vs. Warm Season

Happy with Heat

Some grasses are dormant in cold weather and grow during the warmest part of the year. These grasses are best suited for lawns in areas that are warm for most of the year with a short cool season. Warm season grasses are generally drought tolerant but aren't hardy in the North.

Find the Facts: Which grass species is most tolerant of heat?

Content with Cold

Some grasses are dormant in hot, dry weather and grow rapidly in spring and fall when conditions are cool and wet. These grasses are best suited for lawns in areas with short summers that aren't too hot. Cool season grasses can withstand bitter cold, but may suffer in hot, humid weather.

Find the Facts: Which grass species is most tolerant of cold?

Sports and Games

Game Winning Grass

We expect as much out of our sports turf as we do from our athletes. Sports fields are the most highly engineered segment of the turf industry—we expect them to meet stringent requirements for uniformity, safety, and aesthetic quality. Artificial turf, while often considered a low-maintenance playing surface, requires copious amounts of water for cooling and disinfection with chemicals to control harmful microorganisms.

Cut away section of artificial turf and conventional sports turf to show layers and infrastructure below surface.

Find the Facts: How does the rate of injury on artificial turf compare to the rate of injury on living turfgrass?

Agricultural Grasses

Waves of Grain

Of the top five crops (sugar cane, corn, wheat, rice, and potatoes), four are grasses. The Agricultural Research Service plays a key role in keeping the grasses that sustain our lives secure by addressing threats from disease, insect pests, and climate change. This grass genetic resource is a safety net for our food supply.

QR Codes and temporary signs highlighting ARS problem solving stories for crops that are present at any given time.

Find the Facts: Which grass provides more food to people than any other crop?

Equipment Display

Size Matters!

There's a mower for every size of lawn. Lawn equipment engineers are constantly developing machines that are more fuel efficient and get the job done quickly. Take a look at the variety of mowing equipment here. Which would you like to own?

Find the Facts: What is being done to make mowing equipment more fuel efficient?

Why Do We Mow?

Mowing creates a uniform surface that is pleasing to the eye, but it also provides a safe play surface free of trip hazards, serves as a defensible area where wildfire is a threat, and thwarts ticks that may carry Lyme disease.

Find the Facts: What health benefits come from inhaling the scent of a freshly cut lawn?