Sowing the Seeds for Healthy Waterways:

How Your Gardening Choices Can Have a Positive Impact in Your Watershed

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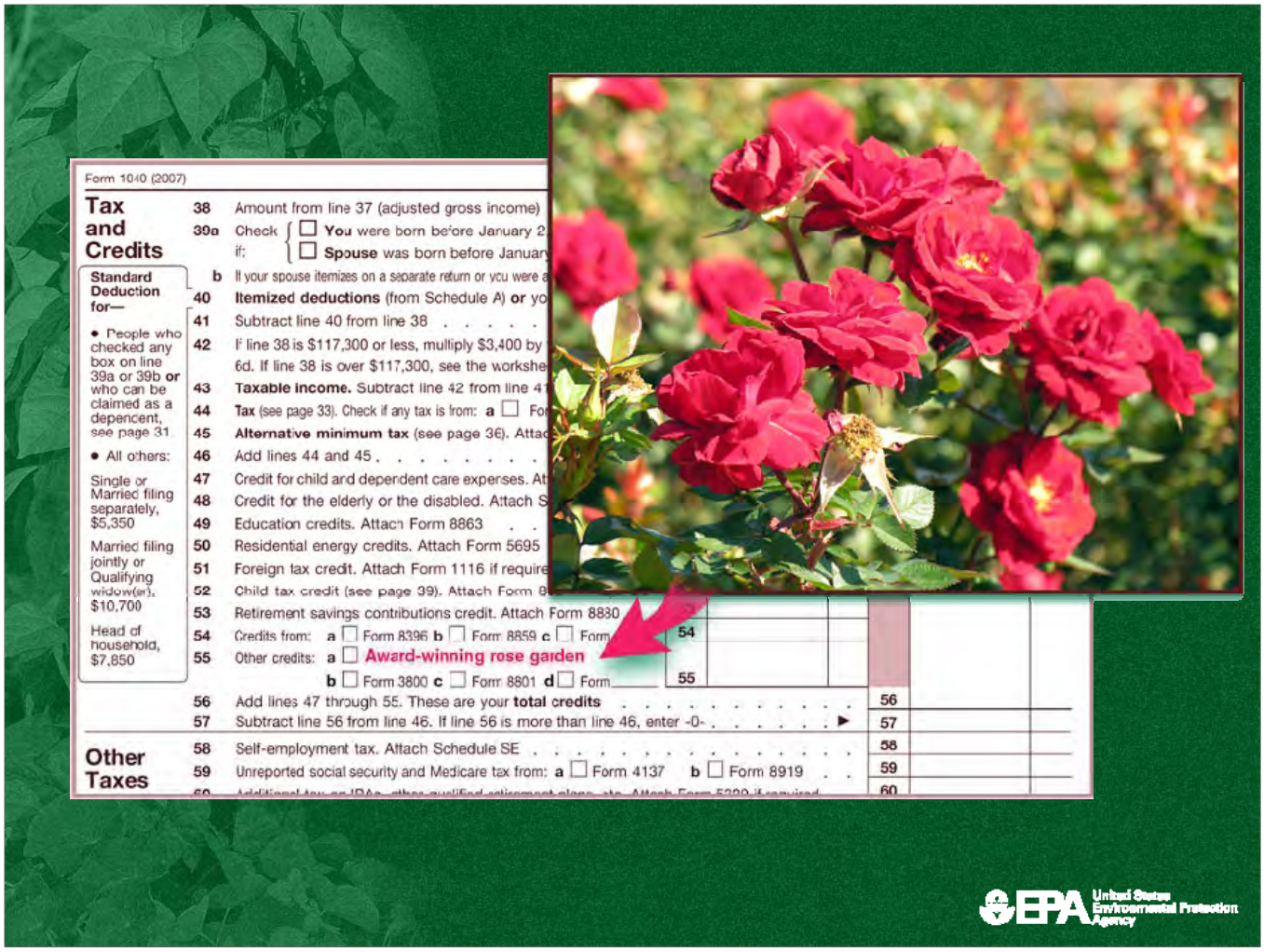
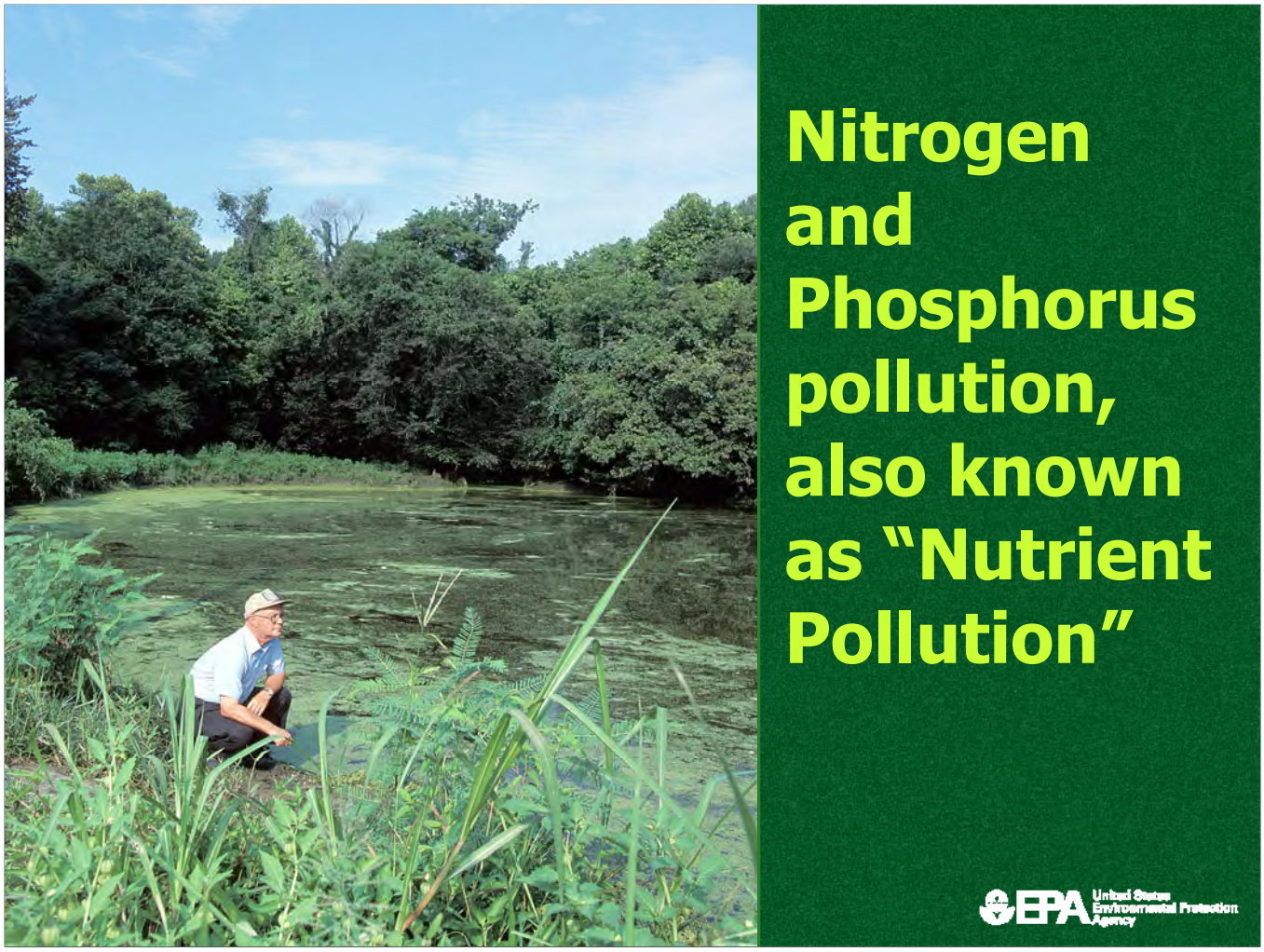
United States Environmental Protection Agency

If we lived in a perfect world….

Chocolate cake would have no calories…



…tax credits would be given for award-winning rose gardens…

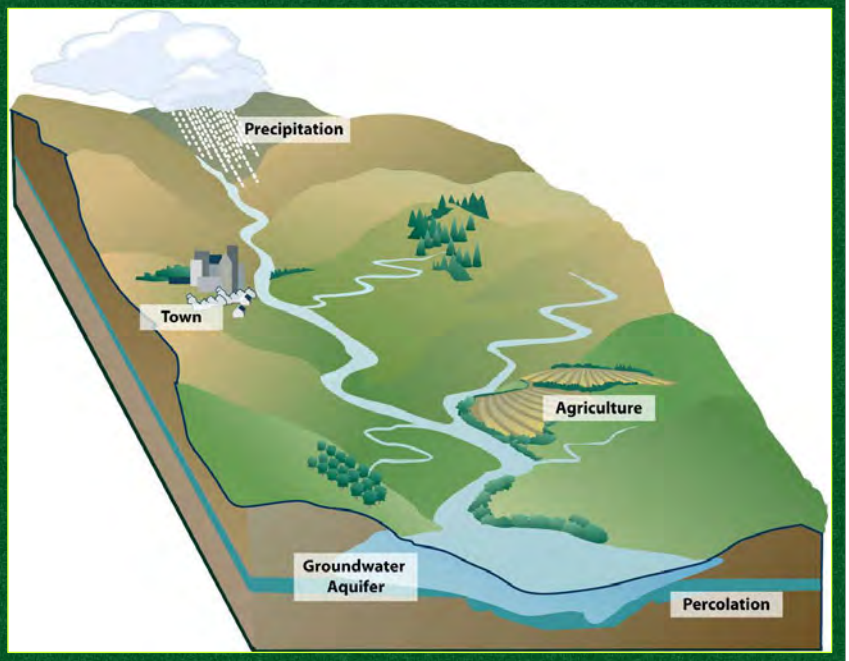


…and everyone would know about nutrient pollution and take steps to address it.

Unfortunately, I can't do anything about the first and second slides, but I'm here today to tell you about nutrient pollution, why you should be concerned about it, and what you as a gardener can do to reduce nutrient pollution in your community. The term "nutrients" generally refers to nitrogen and phosphorus, which are the specific pollutants of concern that we'll be discussing today.

Watershed

- A watershed is an area of land where all the water drains into a common body of water. Watersheds are also referred to as “drainage basins.”



To understand nutrient pollution and how you can help reduce it, you first need to understand watersheds.

A watershed is an area of land that drains into a common body of water. Within a watershed, each small body of water will flow into another, larger body of water, creating one, inter-connected system. You may have heard of the Chesapeake Bay Watershed or the Mississippi River Watershed – both are examples of large watersheds within the United States. But watersheds can also be small. There is a watershed for the creek or stream in your neighborhood. You are always in a watershed!

The path water takes as it flows downhill impacts water quality.

Water runs off the land, carrying fertilizer, dirt, pet waste and many other pollutants with it directly into the waterway.

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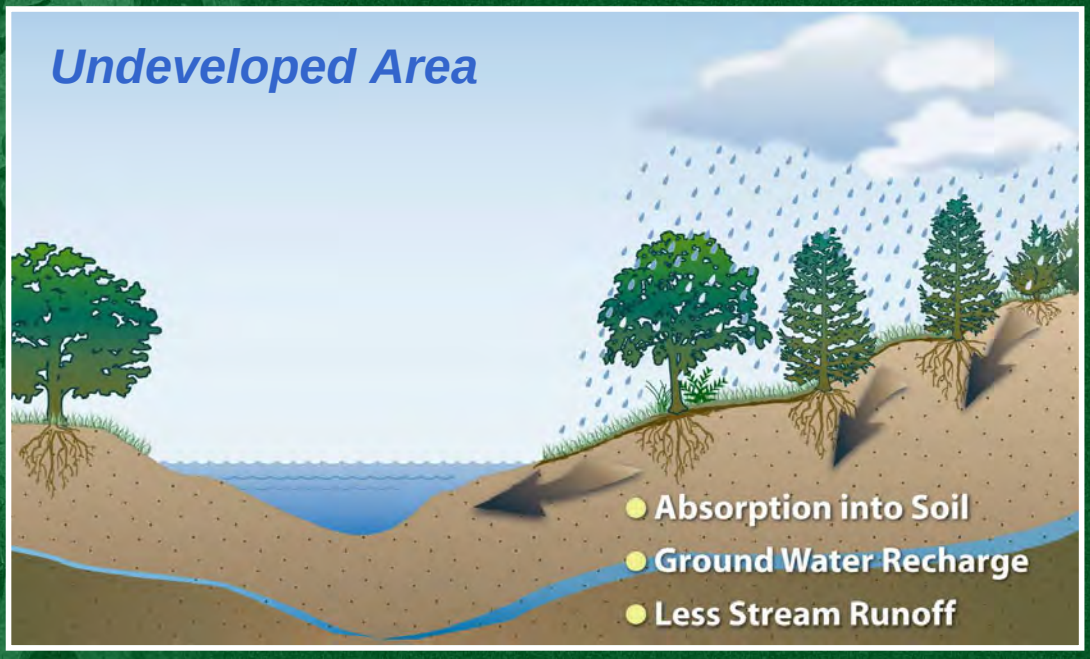
When precipitation falls within a watershed, the water eventually enters a waterbody as stormwater runoff or through groundwater recharge. In this example of a developed area, the rainwater washes over paved surfaces and does not have an opportunity to percolate through the ground. Pollutants are carried in the runoff water into our streams, lakes, groundwater, estuaries and oceans. Dirt, bacteria, nutrients, metals and pesticides are just a few of the pollutants that make their way into waterbodies through stormwater runoff. The focus of this presentation will be the nutrient pollutants.

The path water takes as it flows downhill impacts water quality.



Water percolates through the ground slowly.

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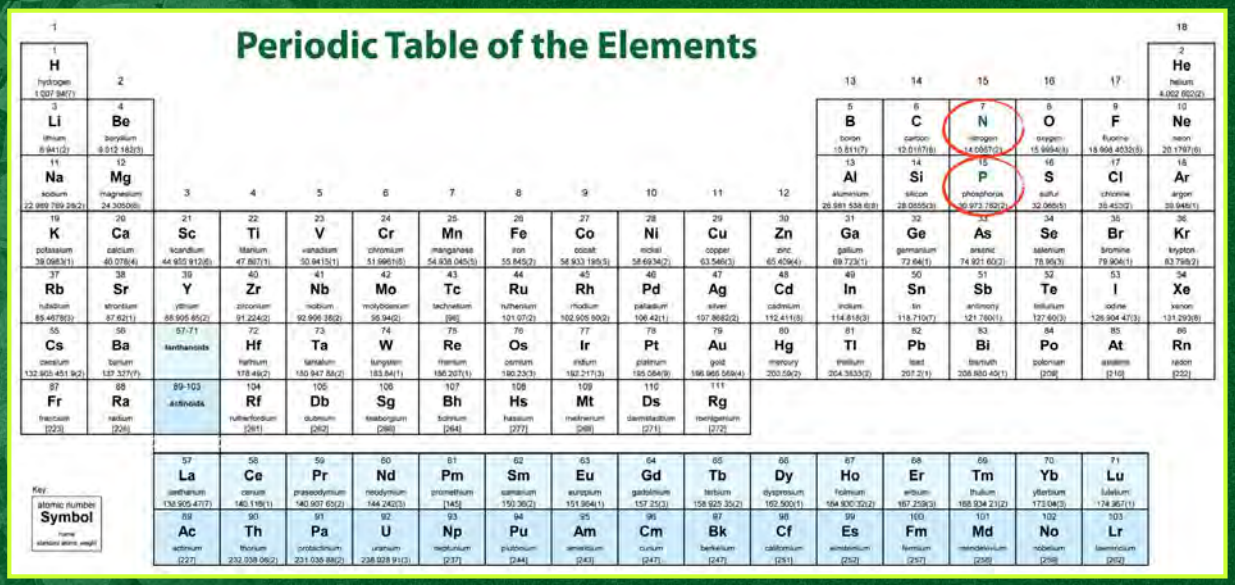
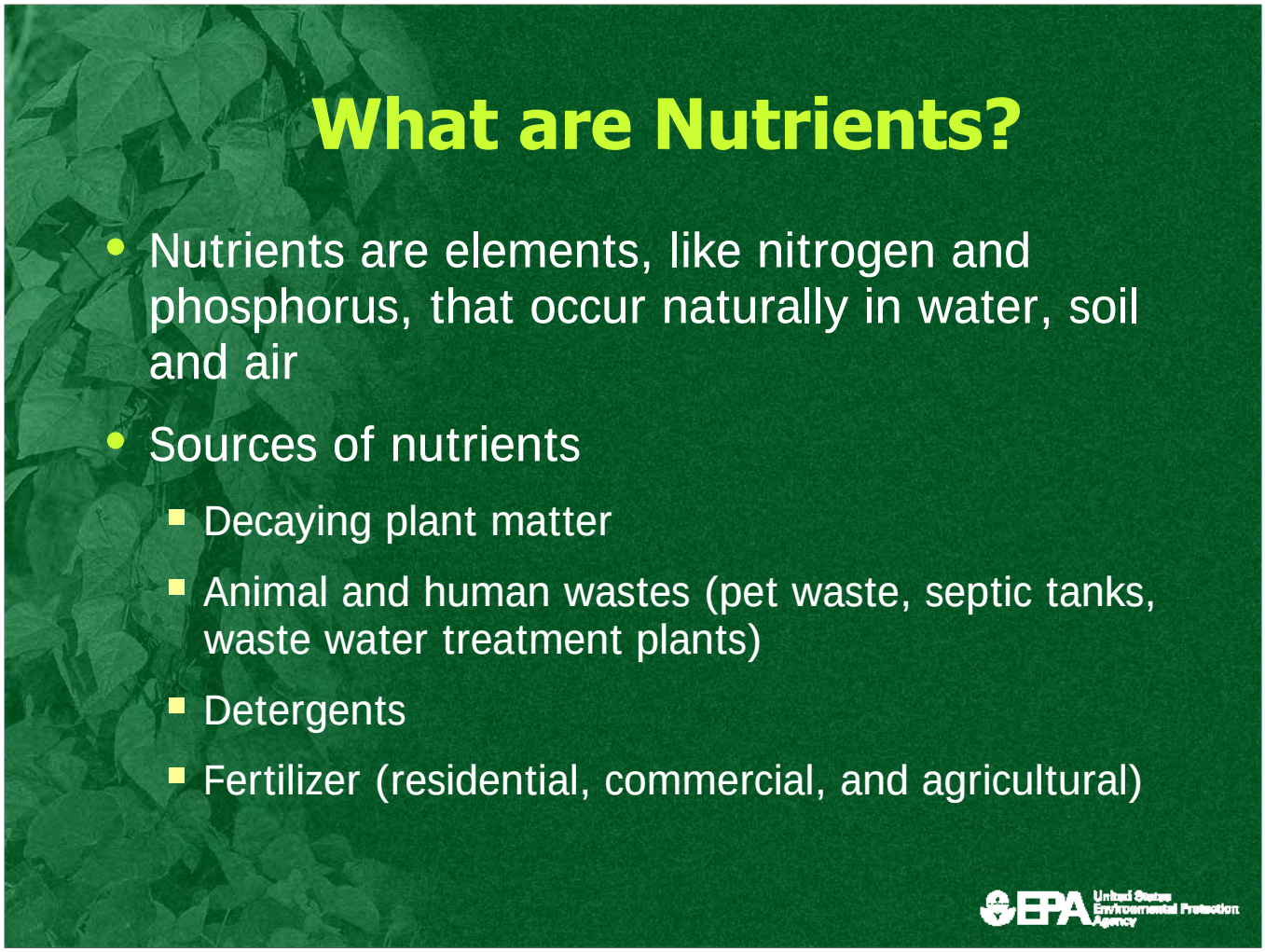
In this example of an undeveloped area, the ground is not paved so the runoff has an opportunity to flow over surfaces that allow the water to percolate into the soil. Plants and soil act as a natural filter by absorbing some of the water and nutrients as well as a physical means to slow the water's flow and allow it to saturate and percolate through the ground. From a water quality perspective, which is the preferred scenario of these two slides – the previous slide or this one? Answer – this slide.

Nitrogen and Phosphorus 101



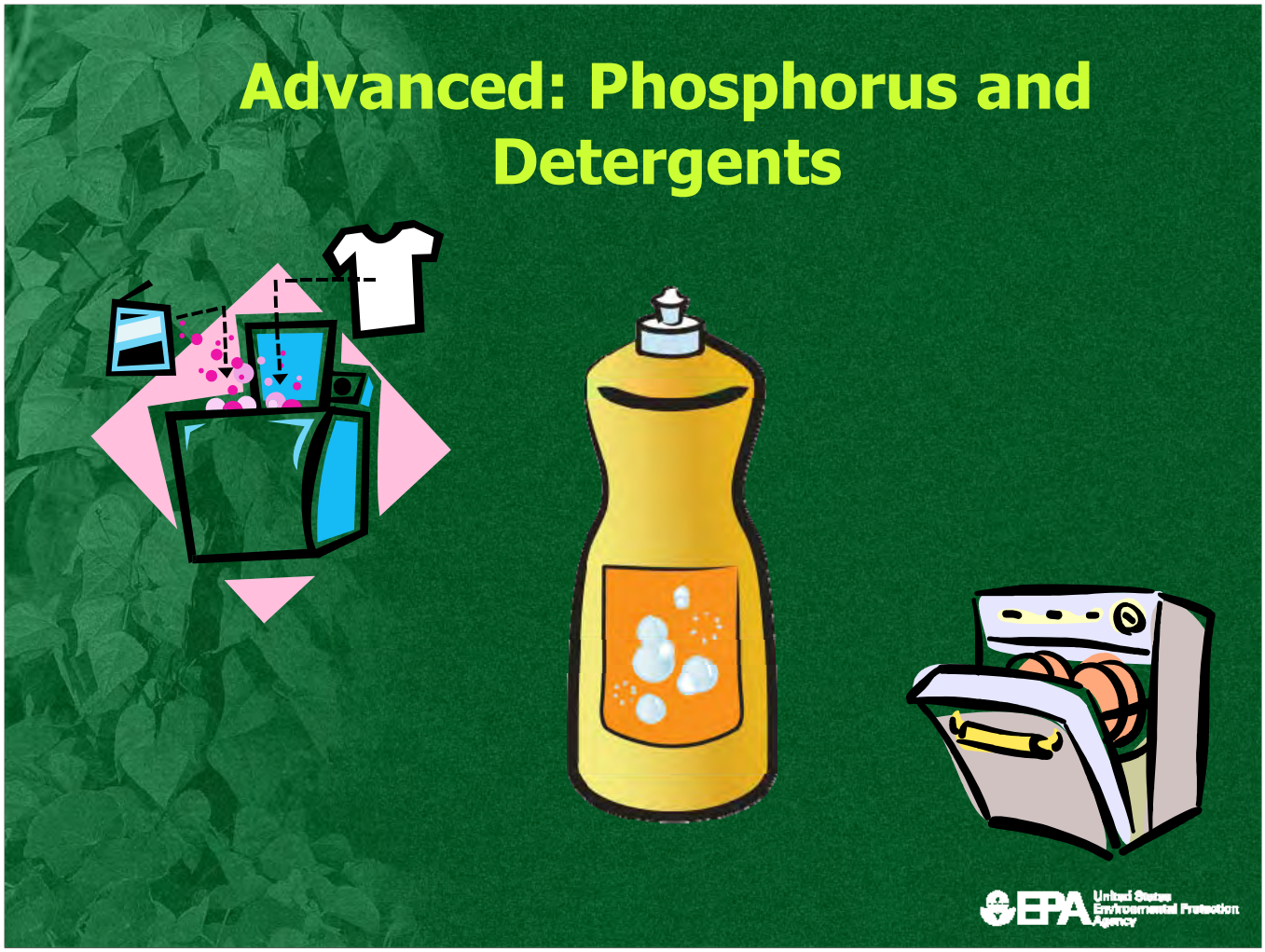
Before we talk about the problems that nutrients cause, let's first talk about some of the science behind nutrients.



Nutrients come from several different sources. For example, decaying plant matter, human and animal wastes are nutrient sources. Our ecosystems depend on nutrients to function properly, but too much nitrogen or phosphorus can cause problems in waterbodies.

Our common, everyday practices introduce nitrogen and phosphorus into the environment in larger quantities than would be naturally introduced. For example, some of the dish and laundry detergents we use every day contain phosphate, a form of phosphorus. The fertilizers we use on our gardens and lawns are a significant source of the nutrients that enter our waterways, and they are the focus of our discussion today.

Note to presenter: For detailed information on detergents and phosphate, see Advanced Slide 11.



ADVANCED SLIDE: For audiences that request greater detail.

Polyphosphates, a series of phosphorus compounds, can be found in detergents (dishwashing, laundry and commercial cleaning products). During the post-World War II era, two events changed the soap needs of the public: a shortage of ingredients to make soap and the advent of the washing machine. To meet these new needs, soap manufacturers added phosphates to improve the performance of detergents, particularly in hard water (water containing calcium and magnesium ions). Phosphate was very effective at improving the soap's performance.

Since then, concern over the impact of excessive amounts of nitrogen and phosphorus entering waterways has led many localities and states to institute phosphate bans in detergents. (Note that laundry and dish detergents are often addressed by separate pieces of legislation.) For example, Washington State passed a law in March 2006 limiting the amount of phosphates in household dishwasher detergent sold to 0.5%. There has not been federal action to ban the use of phosphates in detergents. I encourage you to select a laundry or dish detergent that is "phosphate free."

Note to presenter: Research your locality/state to see if there have been bans placed on phosphate in detergent. Visit http://water.usgs.gov/nawqa/nutrients/pubs/wri99-4007/ to download a copy of *Review of Phosphorus Control Measures in the United States and their effects on Water Quality* by the U.S. Geological Survey. Table 1: States with Phosphate Detergent Bans will be helpful.

Nitrogen

- Highly soluble in its common compound form, nitrate.
- Easily washed from the soil by rain or irrigation.
- Leached from the soil or absorbed by plants within weeks of application.
- Stimulates shoot growth in plants.
- Signs of deficiency can mimic other plant illnesses; yellowing leaves (with or without a reduction in size).

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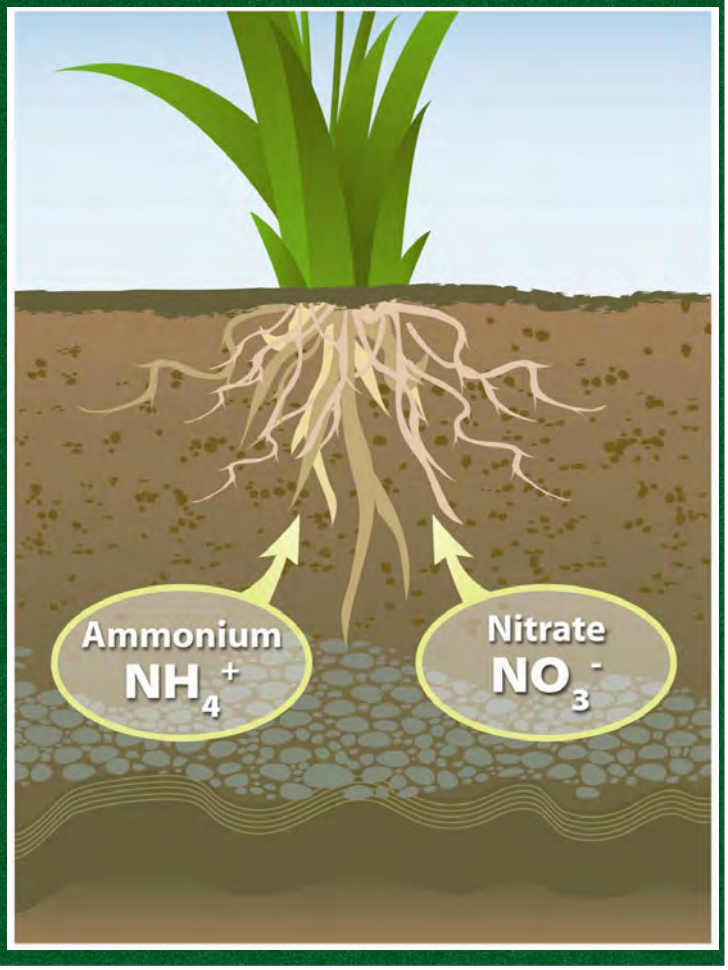
Nitrogen is very soluble. This property allows it to be absorbed by plants very quickly – within weeks of application. However, this property also makes it a threat to water quality because it can be washed out of soils easily by rain or irrigation water.

Fertilizers containing nitrogen promote shoot growth. Conversely, fertilizers that do not contain nitrogen promote the growth of flowers, fruits and roots.

Advanced: Nitrogen – How it Works

Most plants are able to absorb nitrogen when it is in an ammonium or nitrate form



ADVANCED SLIDE: For audiences requesting greater detail.

The element nitrogen (N) combines with other elements to form compounds. Some common nitrogen compounds that you may be familiar with include ammonium (NH_4^+), ammonia (NH_3), nitrite (NO_2^-) and nitrate (NO_3^-). In fact, 78% of our atmosphere is composed of the inert form of nitrogen (N_2).

Plants need nitrogen to grow, but they cannot easily use every form of nitrogen listed above. Although 78% of our atmosphere is composed of the inert form of nitrogen (N_2), plants are not able to directly access N_2 from the air. Plants are able to use the inorganic forms of nitrogen (nitrate, ammonium and ammonia). In the soil there are microorganisms (organisms that are visible with the use of a microscope) that convert nitrogen into forms that are usable by plants - ammonium (NH_4^+) and nitrate (NO_3^-).

Nitrogen "moves" among its different forms through the nitrogen cycle. To learn more about the nitrogen cycle, visit http://www.epa.gov/waterscience/criteria/nutrient/basic.htm to find a good description of the nitrogen cycle.

Nitrate is inorganic and is a commonly used form of nitrogen in fertilizers. Nitrate is very soluble in water and does not bind to soils. With excessive watering or runoff, nitrate is easily washed away from the plant and enters groundwater or surface water (rivers, lakes, streams). Ammonia, ammonium, nitrate and nitrite have the greatest impact on water quality because these forms are directly available (or are easily converted to a directly available form) for plant/algae use.

Total nitrogen, a summation of all of the forms of nitrogen (inorganic and organic), is often used to determine nitrogen levels in lakes and reservoirs.

Measurements of inorganic nitrogen forms (ammonia, ammonium, nitrite and nitrate) are often used to calculate nitrogen levels in rivers and streams.

Phosphorus

- Typically found in soil as an insoluble compound.
- Leaches from the soil very slowly.
- Deficiency appears first as slowed growth. The leaves will become dull and dark green or grayish green.

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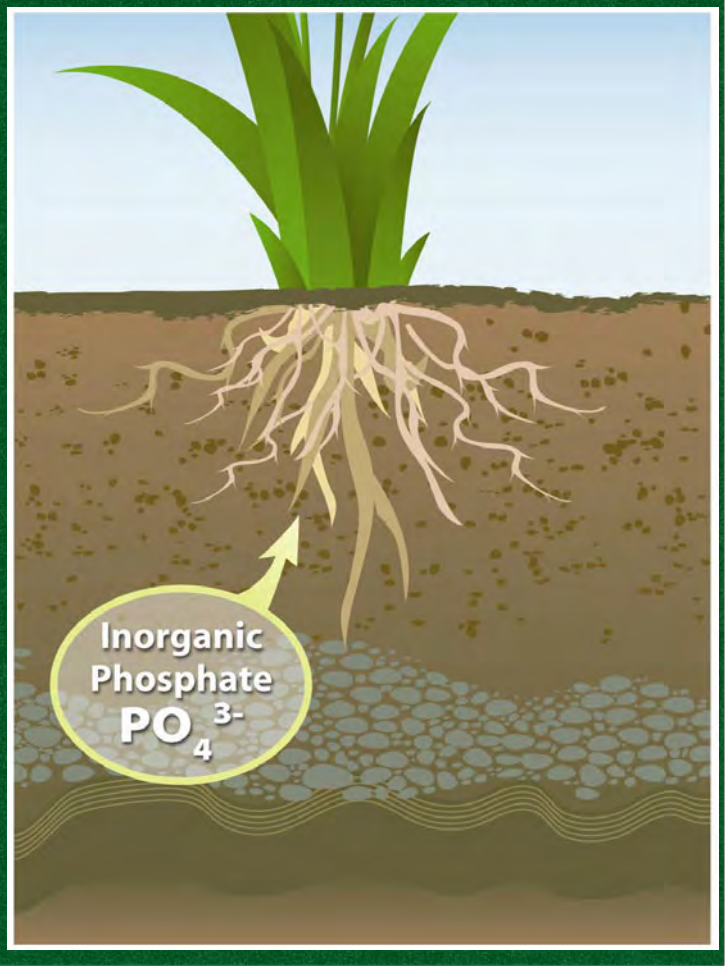
In some plants, like corn and tomatoes, a hallmark of a phosphorus deficiency is magenta areas on the leaves.

In a natural freshwater environment, phosphorus is found in very small quantities. However, in human-impacted aquatic environments, there are often larger quantities of the phosphorus compound, phosphate. Increased phosphate levels in aquatic environments are a threat to water quality because phosphate fuels the growth of algae and a phenomenon called “eutrophication,” which we will discuss further in Slide 17.

Advanced: Phosphorus – How it Works

Plants absorb the inorganic form of phosphorus

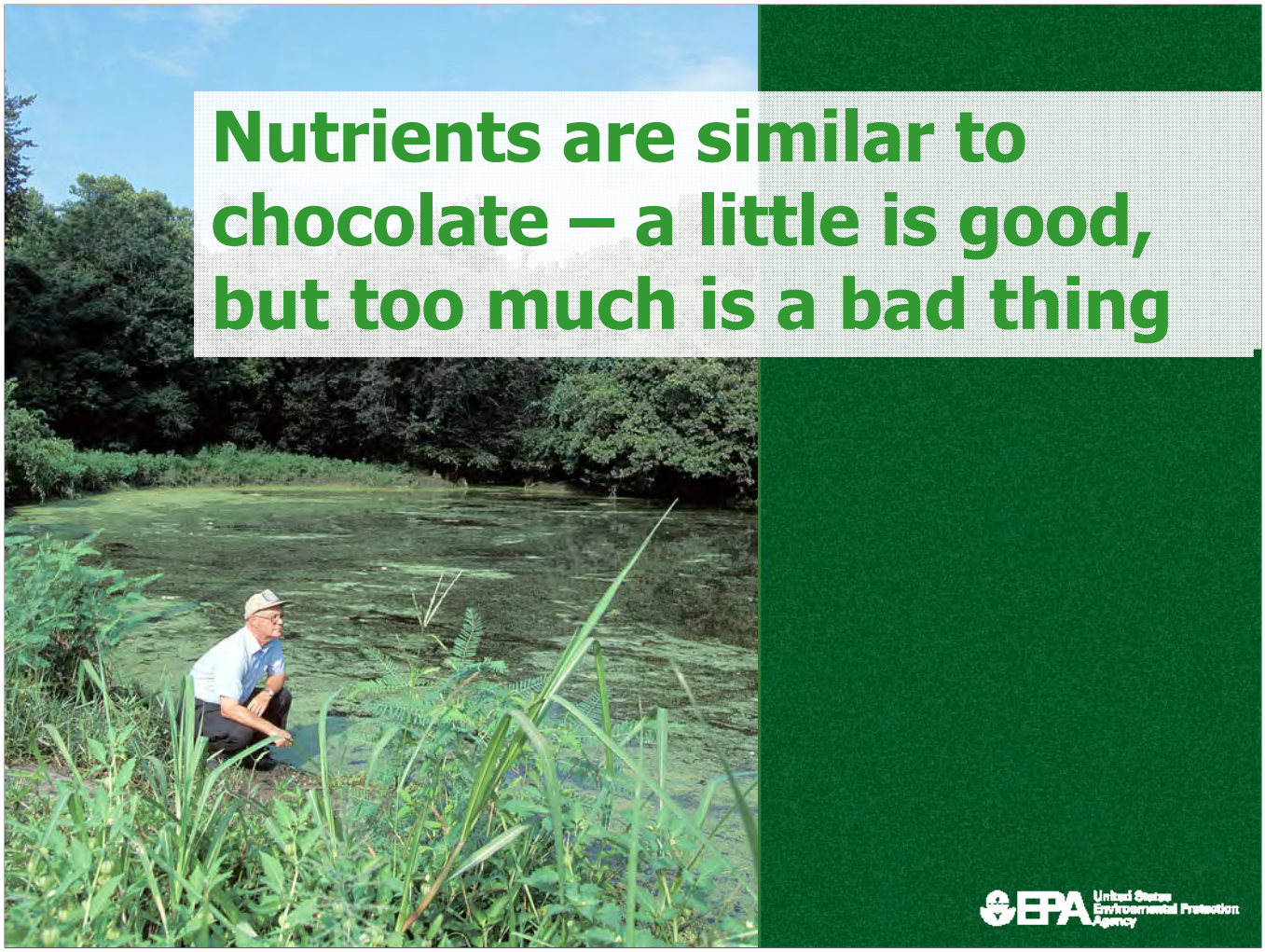


ADVANCED SLIDE: For audiences requesting greater detail.

Unlike nitrogen, phosphorus does not naturally exist as a gas in the atmosphere. Phosphorus can be found naturally in rocks and natural phosphate deposits. Natural processes like weathering and erosion release phosphorus into terrestrial environments. Phosphorus is always found in a compound state. In nature, you would not find a P or a P_2 compound. Instead, you would find phosphorus in its compound phosphate PO_4^{3-} or as phosphate bound with other elements.

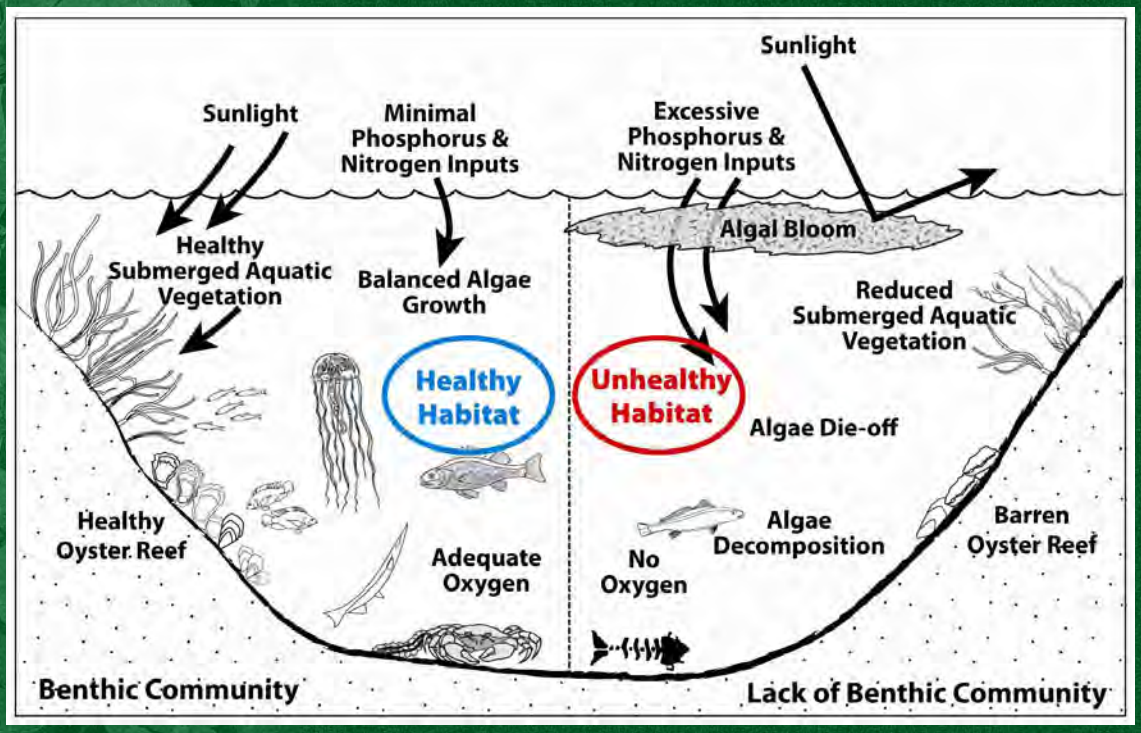
Phosphorus is found in organic and inorganic forms, and it is through the phosphorus cycle that it moves between these forms. In its organic form, phosphorus is bound to living or dead plant/animal tissue or is in the by-product of a biological process such as animal excretions. Organic phosphorus is not available to plants for use. Phosphorus is most stable in its inorganic form, and it is in this form that it is usable by plants and algae. Inorganic phosphorus occurs as an orthophosphate (PO_4^{3-}) (often referred to as "phosphate") or a polyphosphate ($H_2PO_4^-$ or HPO_4^{2-}). Scientists refer to this form of phosphorus as SRP – "Soluble Reactive Phosphorus."

For rivers and streams, SRP is often used to measure the phosphorus level in the waterway because this is the form that encourages algae growth. Total phosphorus levels are commonly used to measure the phosphorus levels of lakes and reservoirs – a total of the inorganic and organic sources of phosphorus. Why do lakes and reservoirs use total phosphorus instead of SRP to measure phosphorus levels? In lakes and reservoirs, phosphorus will remain in that location for a longer period than it would in a flowing stream or river, thus providing an opportunity for the organic forms to move through the phosphorus cycle in a lake or reservoir and eventually be transformed into the inorganic form and used by the plants/algae.



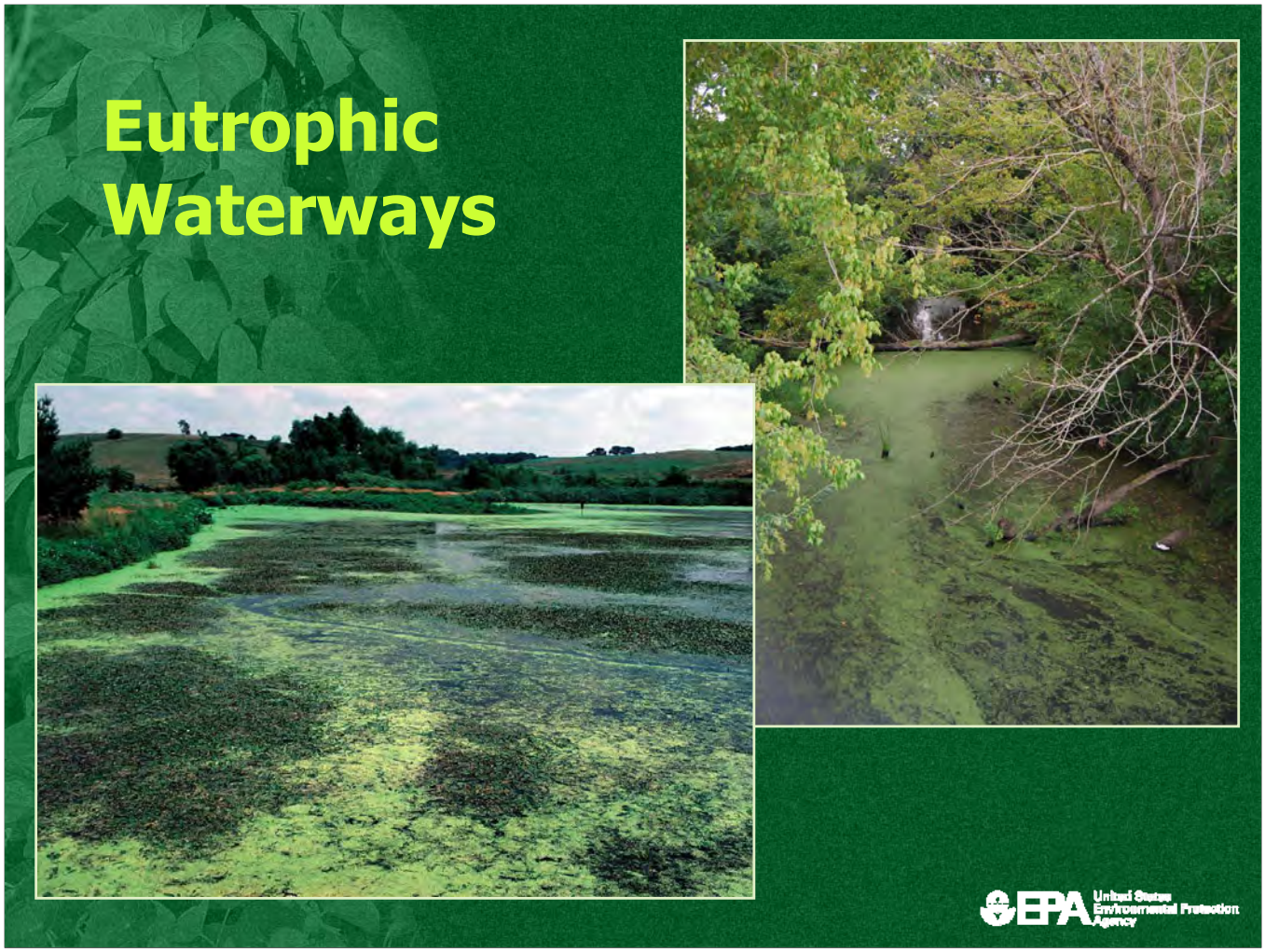
When nutrients enter a waterway, they fuel the growth of naturally occurring phytoplankton called algae. These photosynthetic organisms are the base of the aquatic food chain and produce oxygen. Nutrients fuel the algae, just as nutrients fuel lawns and flower beds. This picture shows an algae bloom in an Iowa lake.

Eutrophication: The process of excess nutrients (nitrogen and phosphorus) accelerating the growth of algae in a waterway, which often results in a decrease of oxygen in the waterbody.

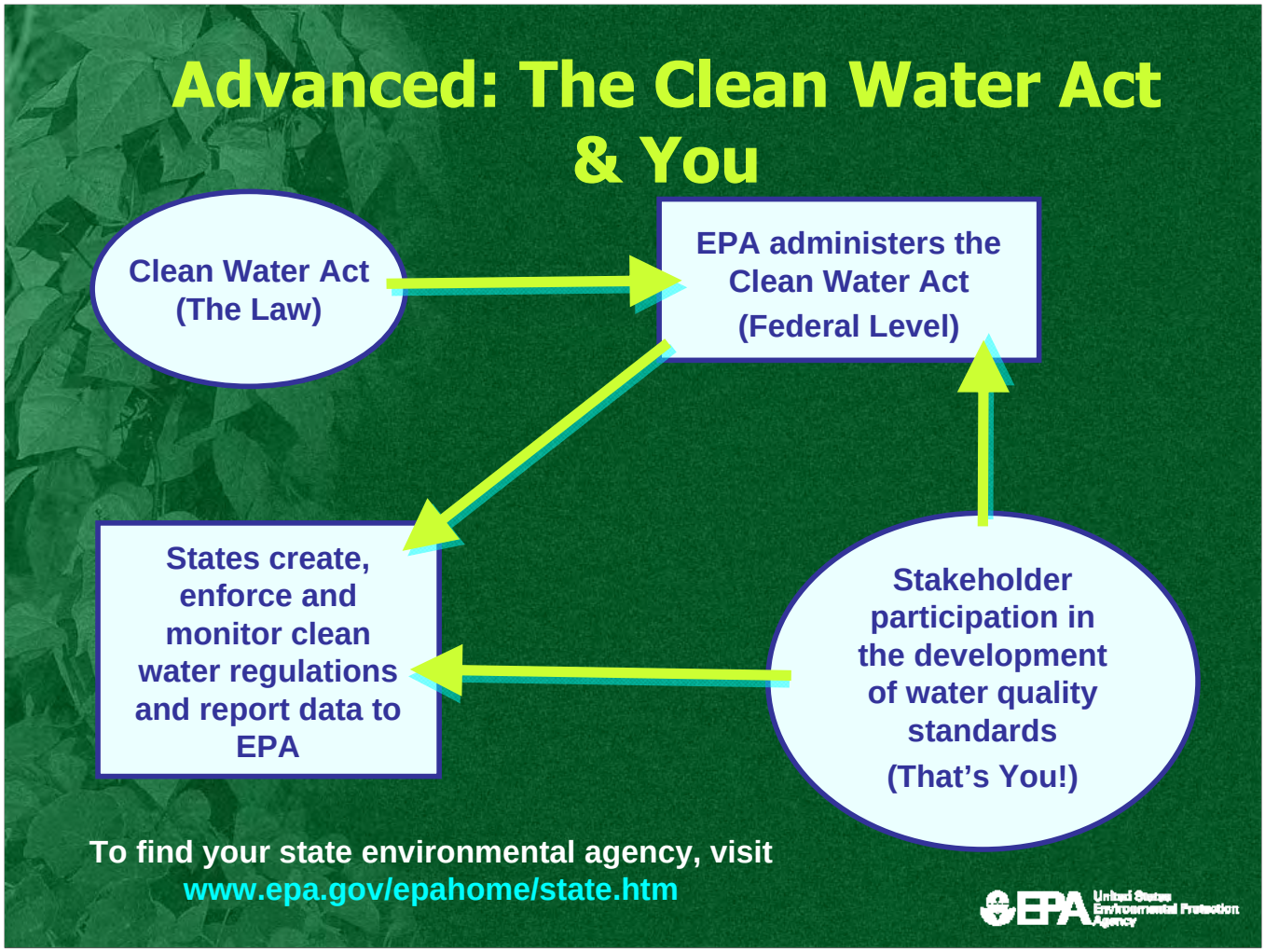


When too many nutrients enter a waterway, they fuel an “explosion” of phytoplankton – an occurrence that we refer to as an “algal bloom.” The process itself is called eutrophication. Thick algae mats block sunlight from reaching other underwater plants, causing the plants to die. Algae themselves have very short life spans. After they and other plants die, they sink to the bottom of the waterway. Bacteria consume oxygen while breaking down the algae, using up the limited oxygen resources that are available.

As a result of the algal blooms, dissolved oxygen levels drop in the waterway, and aquatic organisms like fish are unable to breathe. In some cases, the algal blooms produce toxins that make the water unsafe for human contact. While you may not see algal blooms in the stream or lake nearest your home, remember that downstream waters could be impacted as nutrient runoff increases and reaches unhealthy levels.



These pictures are examples of the “unhealthy habitat” from the graphic in the previous slide. The green scum in the water is algae and is the result of excessive amount of nutrients entering the water.



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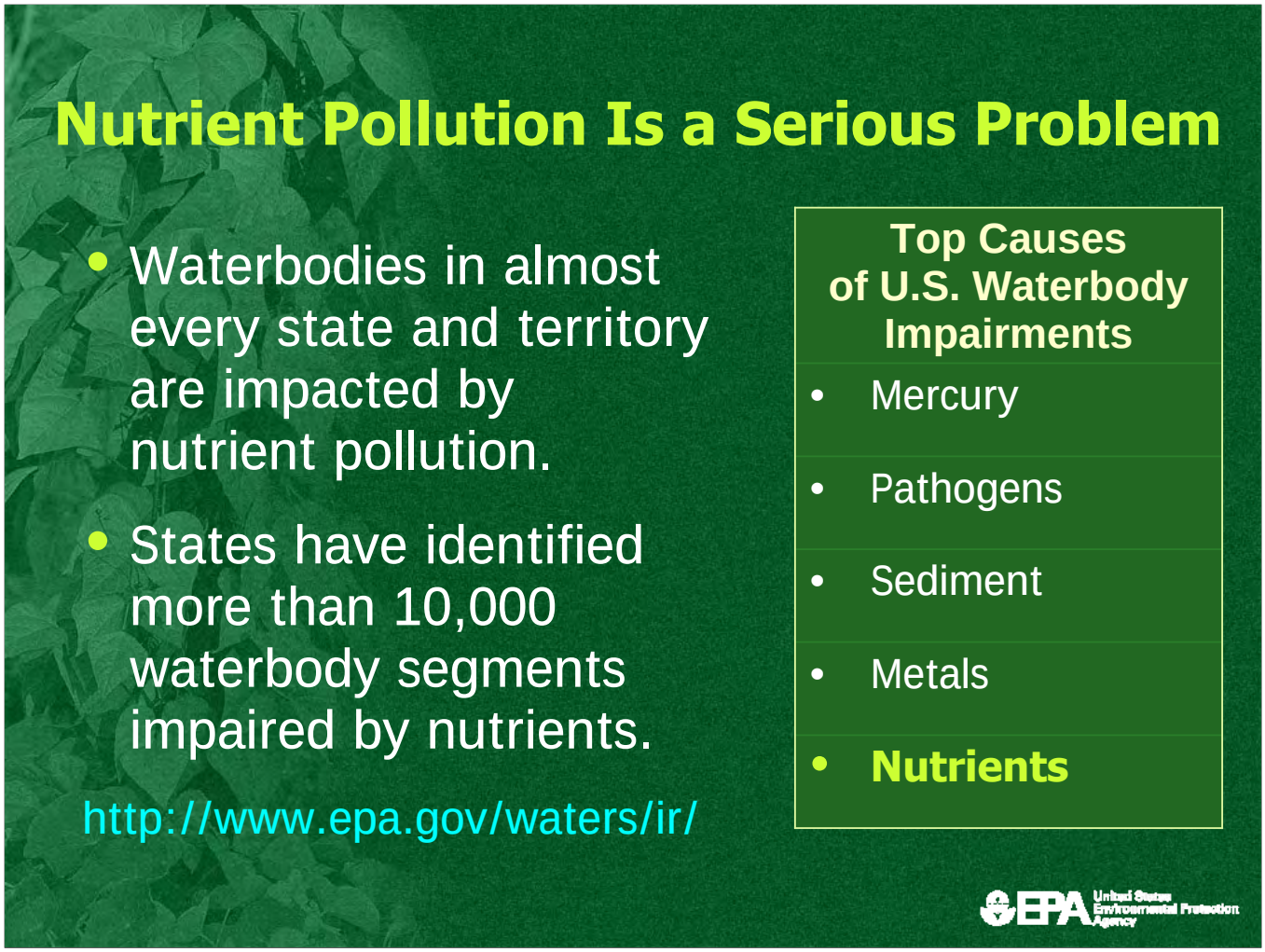
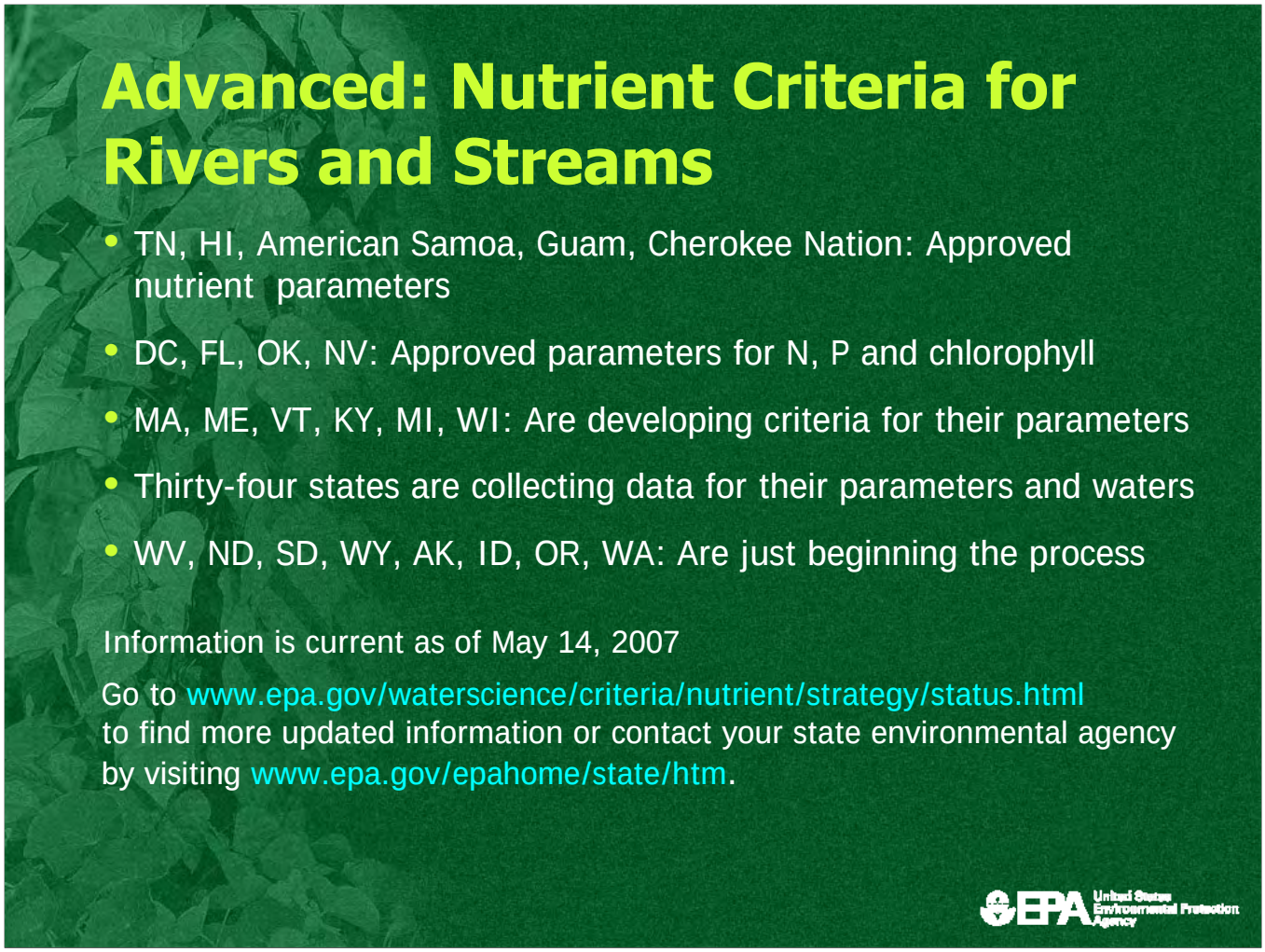
The goal of the Clean Water Act is to restore and maintain the chemical, physical and biological integrity of the nation's waters. In order to help achieve this goal, EPA works with all 50 states, U.S. territories and authorized Indian tribes to set and enforce water quality standards for each waterbody. Water quality standards designate the uses for each waterbody (i.e., the human or ecological activities that take place in the waterbody) and assign water quality criteria - the levels of nutrients, chemicals, temperature, sediment and other pollutants that support those uses.

Congress recognized that the public has a vested interest in the quality of our nation's surface waters. Therefore, the Clean Water Act requires states, territories and authorized Indian tribes to hold public hearings on their water quality standards at least once every three years. Citizens may make recommendations to public officials for improvements or modifications in the standards during the public hearing process.



Many of our nation's waters, including streams, rivers, wetlands, estuaries and coastal waters, are affected by nitrogen and phosphorus pollution. Every two years, states are required by Clean Water Act sections 305(b) and 303(d) to report which waterbodies within the state do not meet state-set water quality standards.

For information about the condition of surface waters in your state, visit http://www.epa.gov/waters/ir/.



ADVANCED SLIDE: For audiences that request greater detail.

Definitions:

Criteria – A minimum or maximum level of a water quality parameter that protects a given use in a waterbody. For example, a dissolved oxygen criteria may state that a waterway should contain five parts per million (ppm) of dissolved oxygen or more.

Parameter – The specific component of water quality that is being tested. For example, a water scientist would conduct a test to determine the specific level of the parameter pH or the parameter nitrogen in the water.

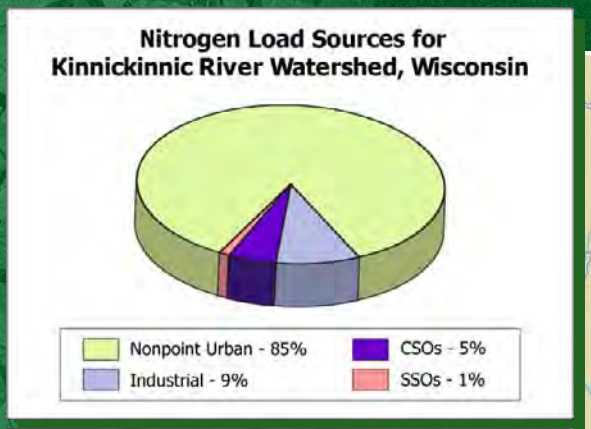
Because each state generates criteria specific to their waterways, there is some variation across the country with regard to state's water quality standards and where each state is in their legislative process of adopting new standards - as shown by this slide. To protect against excess nutrients in surface waters, EPA recommends that states create standards for nitrogen, phosphorus, chlorophyll *a* (a measure of the abundance of algae in the water) and transparency (the clarity of the water). As you can see, five states and U.S. territories have completed this task for rivers and streams in their jurisdictions. Some states are not as far along with this process. They may have criteria for some of the suggested parameters or are in the process of developing criteria or are monitoring their waterways to collect data to help develop the criteria. To get an update on your state's nutrient water quality criteria development progress, visit the EPA Web site listed on the slide or contact your state environmental agency.

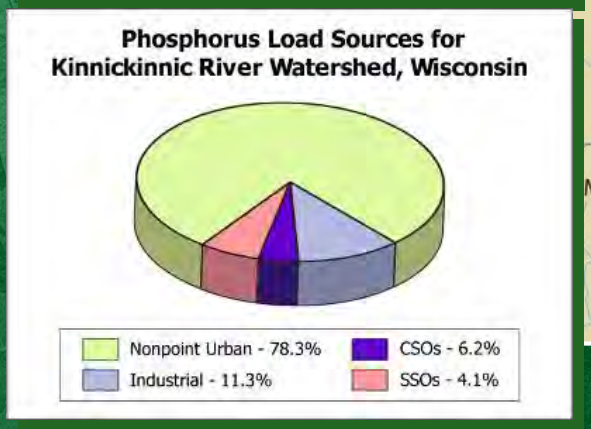
Note to presenter: To determine the status of nutrient criteria development in your state, check www.epa.gov/waterscience/criteria/nutrient/strategy/status.html.

I mentioned earlier that nutrients come from a variety of sources such as pet wastes, septic tanks and fertilizer. Let's look at data from specific regions of the country to see what sources of nutrients are plaguing certain watersheds. Although your region may not be represented in this presentation, these examples are somewhat representative of what is happening around the country. As we go through them, feel free to share your thoughts on other regions of the country where source contributions may be quite different.

Note to presenter: Try to find region-specific information for your area for comparison.

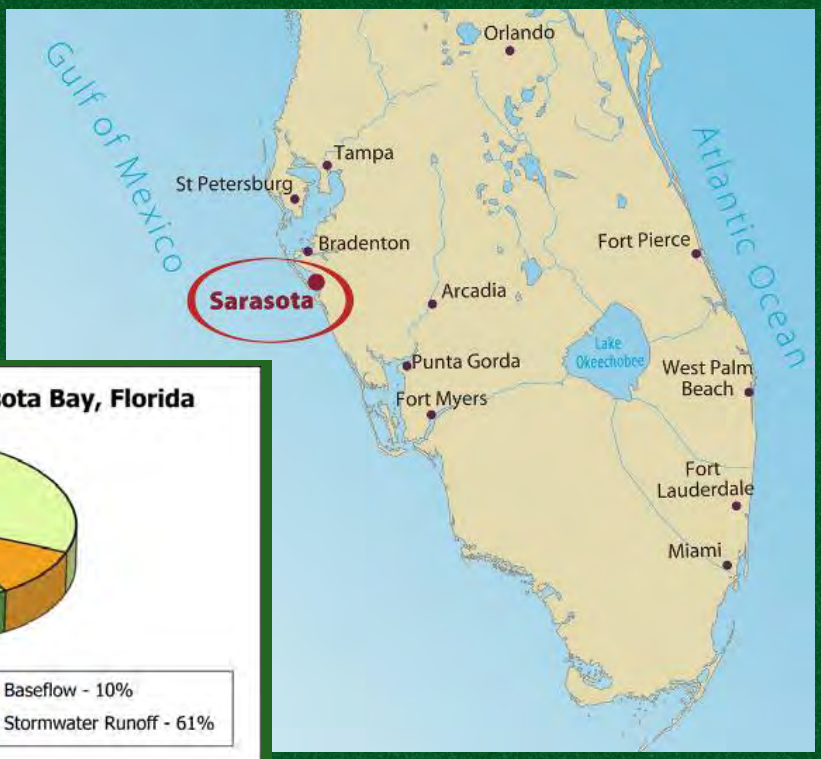
Kinnickinnic River, Wisconsin

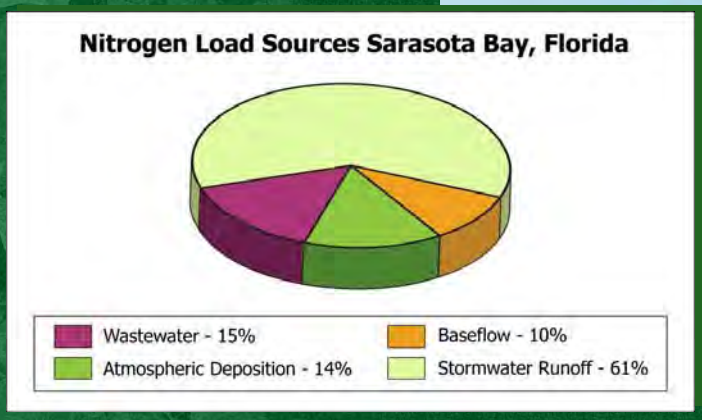




As we saw with the development of nutrient criteria, there is some variation across the country with the progress being made toward addressing our nutrient problems. Many localities have begun determining the sources of the nutrients that are entering their waterways – the first step in creating a plan to address the problem. Pictured here are pie charts depicting the total nitrogen and phosphorus loads in the Kinnickinnic River Watershed, located just south of Milwaukee in Wisconsin. Note that the majority of the nutrients entering this watershed come from “Nonpoint Urban Sources.” Nonpoint urban sources include runoff from land uses such as residential, industrial, commercial and so on.

Sarasota, Florida

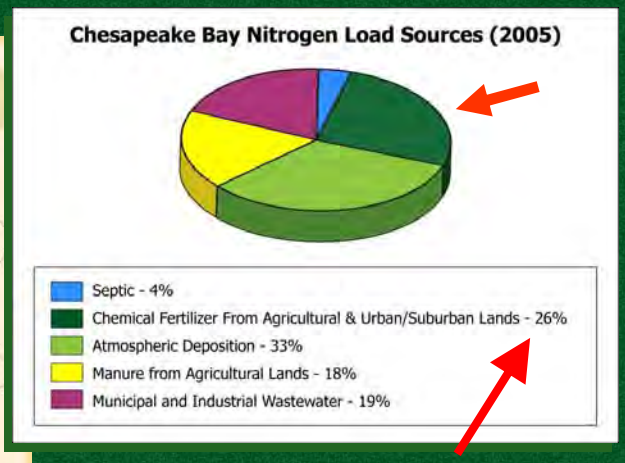




Note: Data taken from Sarasota Bay Estuary Program.
"*State of the Bay 2006*"

Sarasota, FL is south of Tampa and north of Fort Myers on the Gulf of Mexico Coast. As with the Wisconsin example on the previous slide, you'll note that in the Sarasota Bay's watershed, stormwater runoff is the primary source of nitrogen. For this locality's example, the contribution of nitrogen from stormwater runoff comes from sources such as fertilizers and pet wastes that are washed off of the ground and into storm drains that lead to local waterbodies.

The Chesapeake Bay



Note: Data taken from the Chesapeake Bay Program www.chesapeakebay.net

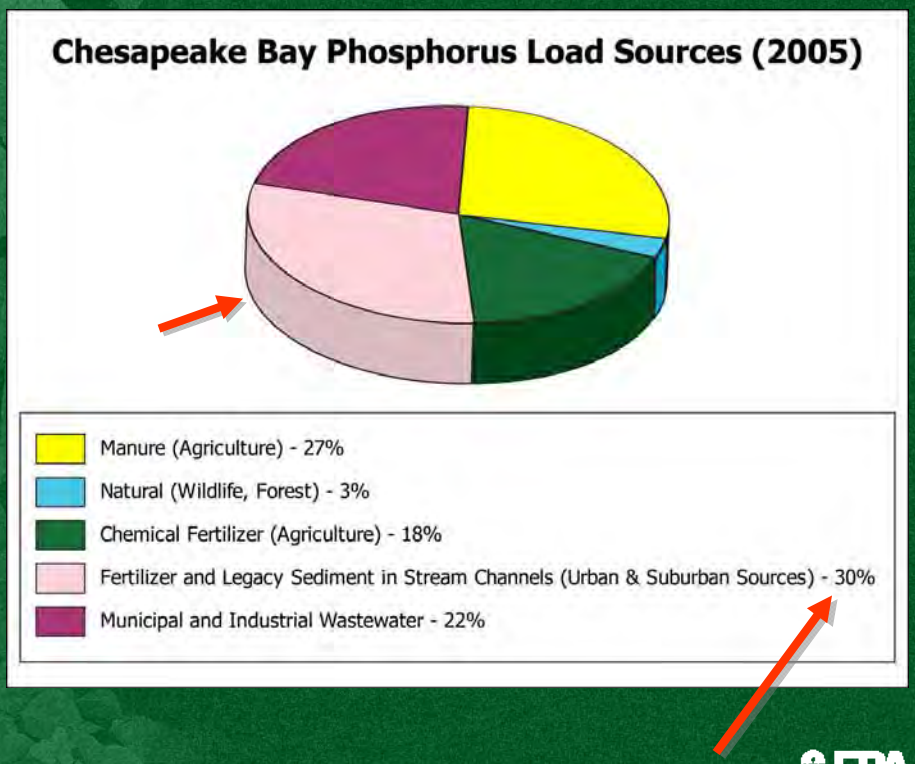
The restoration process for the Chesapeake Bay in the Mid-Atlantic portion of the country is one of the oldest, national-scale efforts to restore a watershed. Because of federal, state and local resources that have been appropriated to the Chesapeake Bay, the level of detailed data is greater and the identified nutrient sources impacting this watershed are more specific than in our Sarasota and Kinnickinnic examples. Ideally, this amount of data is what we would like to see for all localities. It not only helps identify the source of problems, but also helps states and EPA track improvements in water quality.

Where does the nitrogen come from that is deposited from the atmosphere? Sources such as vehicles, electric utilities, industry, livestock and fertilized soil.

What is of particular interest to us on this pie chart is the slice representing chemical fertilizer. Approximately 73 million pounds* or 26% of the total nitrogen load to the Bay in 2005 was due to fertilizer from agricultural and urban/suburban areas in the Bay watershed. Of this total, approximately 44 million pounds came from agricultural lands and 29 million pounds came from urban/suburban lands.

*Numbers were based on long-term average hydrology simulations.

Chesapeake Bay - Phosphorus



Note: Data taken from the Chesapeake Bay Program www.chesapeakebay.net

Note here that again, urban and suburban sources of phosphorus are a significant portion of the pie chart. You might be wondering what is meant by the term “legacy sediment in stream channels.” When this particular watershed was originally settled in the 1700s and 1800s, large swaths of trees were cut down to make room for settlers. This deforestation and later land-clearing practices resulted in a significant amount of erosion. Today, sediment resulting from land disturbances in years past is still being flushed through the watershed and is making its way to the Bay. But what does sediment have to do with phosphorus?

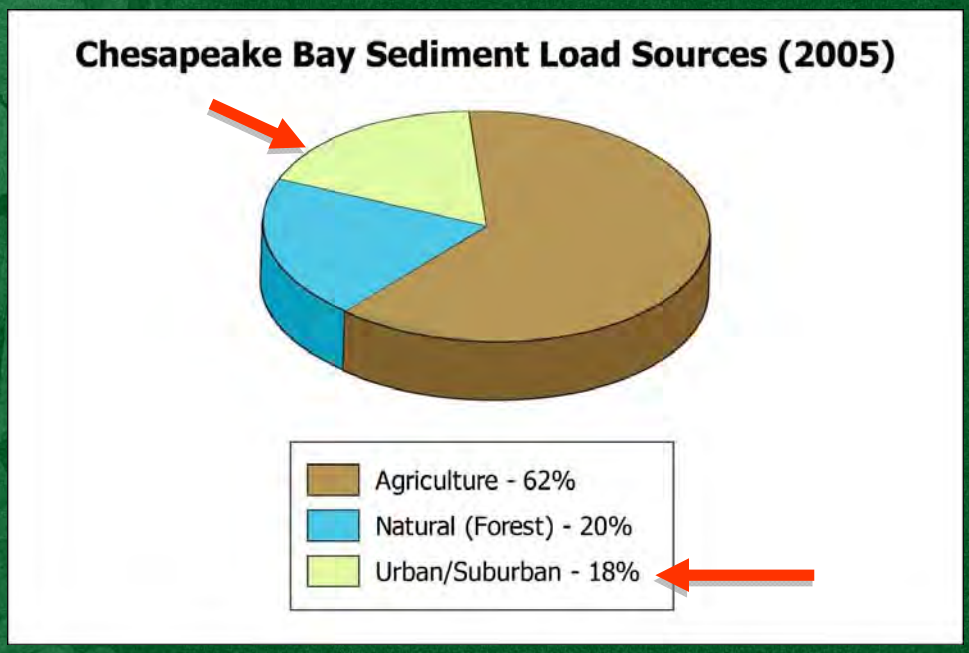
Soil Erosion Also Carries Nutrients to Waterways

Erosion not only washes away valuable soil but carries pollutants, including phosphorus, into waterways.

In addition to being washed directly from lawns and gardens, phosphorus is carried by sediment that is washed into our stormdrains and waterways. Earlier in the presentation, we discussed how phosphorus is not very soluble. In fact, it readily binds to soil. When sediment washes off of the land and into our waterways, it carries phosphorus with it.

By itself, sediment can smother bottom-dwelling plants and animals, such as macroinvertebrates, oysters and clams, and decrease the water's transparency, making the water cloudy so less light is available for underwater vegetation to grow and produce oxygen. Sediment-carrying nutrients presents an even greater problem…

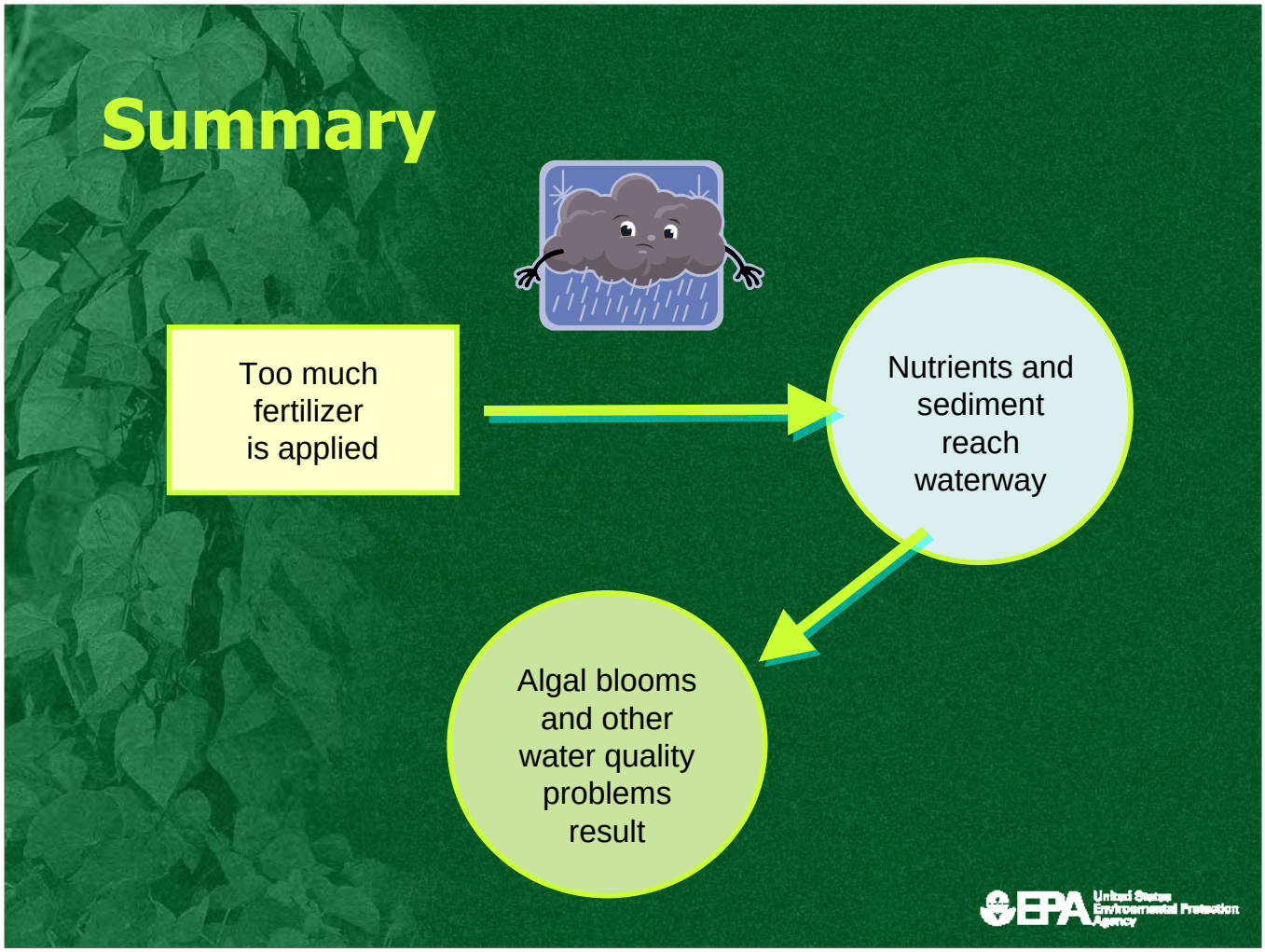
The Chesapeake Bay – Sediment



Note: Data taken from the Chesapeake Bay Program www.chesapeakebay.net

An estimated 18% of sediment loads entering the Bay comes from urban and suburban areas. Sediment erosion occurs in an urban/suburban setting when soil is exposed during a precipitation event or during times of high wind. The sediment is washed or blown down stormdrains or directly into a nearby waterway. Common areas where this occurs include construction sites, eroded non-tidal streambanks and spots in lawns and landscapes that are not vegetated.

Remember! Erosion is a natural process, hence the portion of the pie chart that represents natural/forest sources. But when erosion takes place at an accelerated pace and from unnatural causes (which represents 80% of this chart), there is a negative impact on water quality.



This slide provides a simple summary of the path of nutrients. The choices we make on land have a direct impact on water quality. When water runs off our property, nitrogen and phosphorus are carried away by the water. Algal growth is fueled by the addition of nitrogen and phosphorus. The waterway's health declines and the waterway becomes "impaired." So what can we do to stop this process from continuing?

So What Can You do About Nutrient Pollution?

It's simple! Follow these tips:

1. **Test Your Soil**
2. **Apply Fertilizer Sparingly**
3. **Adopt Sustainable Lawn Care Practices**
4. **Improve Soil Drainage**
5. **Use Water Wisely**
6. **Plant Natives**
7. **Plant Lawn Alternatives**
8. **Get Involved in Your State's Water Quality Standards!**

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As a gardener, you have the potential to contribute to nutrient pollution, but you also have the power to help prevent it. There are several easy things you can do to reduce nutrient pollution from your yards and gardens. The next several slides will take you through each of these recommendations.

Tip#1: Test Your Soil First!

- Soil test results provide specific nutrient levels and the pH of the soil.
- They allow you to make an informed fertilizer selection.
- Where do you get a test kit?
  - Over-the-Counter kits are available at garden centers
  - Tests run by skilled labs are available from local extension offices

60% of Tennessee residents use fertilizer regularly. Only 25% of those who report using fertilizer also used soil tests.

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Soil testing is a useful tool that can help ensure the efficient use of fertilizers. Soil tests provide a means for assessing the fertility status of a soil. They measure the quantity of a nutrient that is extractable from the soil by plants.

Soil testing can provide information about how to enhance the beauty and productivity of a lawn, landscape planting or vegetable garden. By knowing the plant nutrition needs of your lawn and gardens, you can choose the correct fertilizer to meet the needs of your plants, prevent the over-application of nutrients and help protect your local waterways.

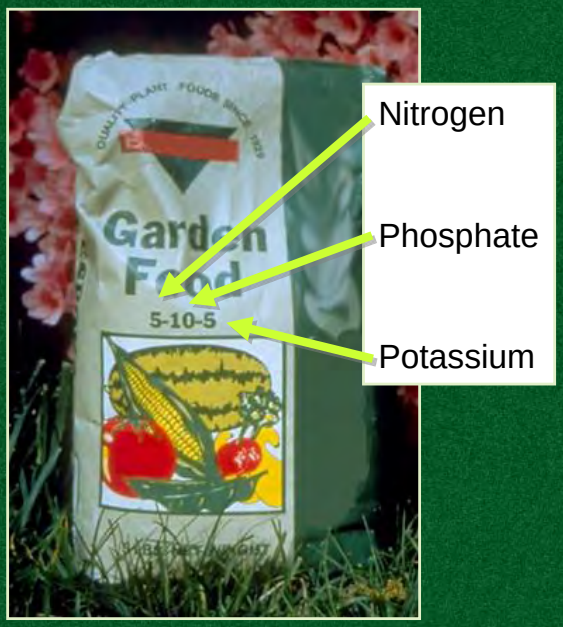
Soil test kits are available at most garden supply stores. These easy-to-use kits contain chemical reagents for the on-the-spot determination of pH, nitrogen, phosphorous and potassium. Small test tubes are filled with soil and mixing indicator dye into the soil. The resulting color is matched to a color chart to determine the levels of nutrients and pH in the soil. Keep in mind that some soil test kits are easier to use than others and that these kits don't always provide the most accurate results because of the sometimes complex relationships that occur between sediment and nutrients that we discussed earlier.

The best way to get an accurate soil test analysis is to have it sent to a laboratory for testing. Many state or county cooperative extension offices provide soil testing for free or for a nominal fee. These same offices have horticultural experts to consult regarding the soil types in your area and the needs of specific plants.

Note to presenter: Locate the nearest cooperative extension office that conducts soil tests by visiting http://www.csrees.usda.gov/Extension/.

Tip#2: Use Fertilizer Sparingly

- Fertilizer Basics
  - Fertilizer has three numbers on the label
    - 1st number: % nitrogen
    - 2nd number: % phosphorus (or its compound phosphate)
    - 3rd number: % potassium (also listed as potash)
- Your fertilizer selection should address the needs of your soil based on the results of the soil test.



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Fertilizers supplement the nutrients that are already naturally existing in the soil. Plants absorb nutrients that are essential for their growth through their roots. While many different nutrients are required for healthy plants, nitrogen, phosphorus and potassium are considered the three primary nutrients.

Potassium regulates numerous reactions that take place in plants and is associated with durability and disease resistance. Potassium plays a role in activating enzymes and photosynthesis, opening and closing stoma (which regulates water and air loss), sugar, water and nutrient transport within the plant, and protein and starch synthesis. A deficiency of potassium is marked by the yellowing of the outer margins of leaves, particularly the older leaves, but the signs of deficiency can differ among plant species. Potassium has not been shown to have a detrimental effect on the environment.

Fertilizer Application Best Practices

- Read the instructions – apply the correct amount at the correct time of year – more is NOT better.
- Match the fertilizer to your plants – the appropriate fertilizer for your roses might not be the correct one for your lawn.
- If there is a forecasted weather event, like high winds or rain, fertilize after the weather event.
- Spread fertilizer only to vegetated areas. Don't fertilize sidewalks, driveways and other paved surfaces! Sweep up spills.
- Leave an unfertilized buffer between a waterway and where fertilizer is applied.

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Each of the bullets on this slide are steps that you can take to eliminate fertilizer waste. You will save money by only using the amount that is necessary and will help protect your waterways from nutrient-contaminated runoff.

Contact your local cooperative extension agent or Master Gardener to learn more about which fertilizers are recommended for your area.

Tip#3: Adopt Sustainable Lawn Care Practices

Select the grass that fits your geographic region

	Cool Season Zone – Fertilize in the Fall	Warm Season Zone – Fertilize in the Late Spring/Early Summer	Transition Zone
Examples:	Fescue, Bluegrass, Ryegrass	Zoysia, Bermuda	Warm or cool season grasses can be selected
Ideal Height	2" – 4"	½" – 1"	
Typical Geographic Region	Throughout Northern United States	Southern United States: Texas to North Carolina and as far north as Tennessee	Between the Cool and Warm zones, running east to west – Virginia to Southern California

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It is important to make the right choices when planning and caring for a lawn. Choosing the wrong type of grass, over-watering, over-fertilization and cutting a lawn too short are all practices that can have a negative impact waterway health.

To help reduce the amount of fertilizer you use, plant grass that grows the best for your geographic region.

Note to presenter: Determine which zone you live in and highlight that column during your presentation. If possible, make specific recommendations for where you live.

Other Lawn Care Tips

"If grass were harvested as a crop, it would represent one of the United States' largest commodities (USDA, 1992)."

- Compost grass clippings and leaves.
- Aerate your lawn.
- Use a bagless lawn mower and allow the lawn and leaf clippings to decompose on the lawn.
- Never apply fertilizer, pesticides or herbicides within 10 feet of a stream, creek or other waterway.
- When mowing, only remove the top third of the grass height.
- Plant buffer strips along drainage ditches and waterways.
- Use mulch to reduce the need for fertilizers.

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One of the themes of this presentation is that too much of a good thing is harmful. While grass and leaf debris are natural, when they enter our waterways in large quantities, the resulting surplus of nutrients degrades the water quality. Keep your leaves and grass clippings out of the gutters and street.

Use of a bagless lawn mover allows fine leaf and grass clippings to settle in your lawn and act as a natural fertilizer.

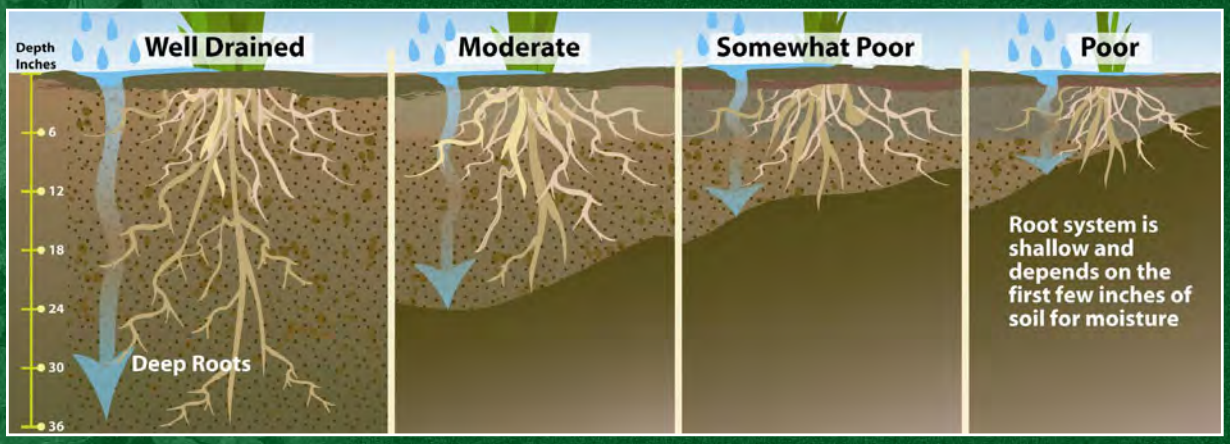
If you must use pesticides and herbicides, contact your local cooperative extension agent to assist you in selecting the most environmentally friendly option. Visit http://www.csrees.usda.gov/Extension/ to find your local cooperative extension agent.

Aerate your lawn! You will help the water penetrate the ground and reach the roots of the grass. Plant buffer strips to drastically reduce polluted runoff from your property. The additional vegetation in the buffer strip will slow down the runoff, allow the water to soak into the ground and keep pollutants from entering your waterways.

Want to Learn More? Contact your local cooperative extension agent or Master Gardeners. Florida's Lawn Care and Irrigation Web site is also very helpful- http://livinggreen.ifas.ufl.edu/water/lawn_care_and_irrigation.html

Tip #4: Improve Soil Drainage

- Evaluate the amount of impervious surface on your property. Can it be reduced?
- A well-drained soil creates a good environment for grass, plants and trees to set deep roots and take advantage of deep water and nutrients.



One way to stop water from running off your land is to decrease the amount of impervious surfaces on your property. Impervious surfaces, like roofs, driveways, patios (some types) and sidewalks, are surfaces that water cannot penetrate. Water flows over these surfaces, carrying with it any substances that are on the ground. Today there are many alternatives to using impervious surfaces. Many agencies and organizations are using the term “low impact development” (LID) to refer to these environmentally friendly alternatives for our homes and cities. Roof gardens, pervious pavers and permeable concrete are a few LID options for how we develop our properties and urban areas. To learn more about LID, visit:

•EPA’s Repository of Low Impact Development Fact Sheets:
http://www.epa.gov/owow/nps/lid/lidlit.html
•Low Impact Development Practices Implemented at EPA Headquarters – a Fact Sheet:
http://www.lowimpactdevelopment.org/lid%20articles/lid%20fact%20sheet%20050207.pdf
•Urban Design Tools – Low Impact Development: http://www.lid-stormwater.net/lid_techniques.htm
•EPA’s Green Infrastructure Web site – http://www.epa.gov/npdes/greeninfrastructure

Balanced growth in your plants is encouraged by well-drained soil. Deep roots make for healthy, steady growth with reduced fertilization and irrigation needs. It also reduces the need for pruning maintenance as well as disease and pest pressures. In the picture, the root system on the far left is ideal and a slow, deep soaking of your plants will encourage this type of root growth. The picture on the far right is the least desirable option and will cause your plants to be dependent on the first few inches of soil and your watering practices for moisture.

Improve Soil Drainage with Composted Material or Mulch

- The proper soil alterations can help a soil drain faster or slower and increase its nutrient content.
- Well-composted organic material acts as a source of slow release nutrients for plants.
- Thoroughly blend or till compost into the soil.

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You can improve soil drainage with composted materials or mulch. These alterations help plants absorb nutrients at the correct rate. Well-drained soil generally absorbs ½ an inch of water or more per hour.

Remember that soils can be too well-drained, such as a sandy soil. Adding composted material can address this concern as well.

Tip#5: Use Water Wisely

- Use water in moderation (if at all).
- Water only the places that require moisture.
- Use drip systems or micro-emitters to help keep water and fertilizers in place.
- Water plants “deeply”—encouraging the roots to grow deeper and lessening the need for future watering.
- Water in the early morning or evening and skip watering on windy days.
- Install a rain barrel to use in watering your plants.

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As excess water runs into the street and down storm drains (as shown in the picture above), it washes away sediment and nutrients with it. By watering minimally (if at all) and only on surfaces that allow the water to percolate through, the gardener is preventing sediment and nutrient pollution.

When too much water is used, it has to go somewhere. Often that somewhere is your nearest stormdrain or waterway in the form of runoff. Adopt water usage practices that minimize, and ideally eliminate, runoff from your property.

Why not water on windy days? The wind will encourage the water to evaporate, thus causing water to be wasted and not reach the roots of your plants.

Using Water Wisely

- Recycle household water for watering plants instead of pouring it down the drain.

  For example:
  - Old water in a dog/cat bowl
  - Left over water in a glass
  - Water used to boil vegetables and wash fruits and vegetables

Want More Tips for Water Conservation? Visit

- EPA Water Sense: www.epa.gov/WaterSense
- EPA Brochure *Make Your Home the Solution to Stormwater Pollution*: www.epa.gov/npdes/pubs/solution_to_pollution.pdf
- Rain Garden and Rain Barrel Information – www.stormwaterauthority.org/library/view_article.aspx?id=944

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Instead of sending your water down the drain and to a wastewater treatment plant or septic field, think about ways that it can be used around your home and garden! Recycle your water!

Tip#6: Plant Natives

- Reflect the local, natural history
- Provide food and habitat for local and migratory animals
- Reduce the need for chemical pesticides, herbicides and fertilizer
- Are adapted to local climate and soil types

Exotic plants that lack environmental stressors, like disease or pests, will out-compete native plants and will decrease the area's biodiversity.

Did you know that English Ivy is a non-native plant? It spreads aggressively, killing native plants and trees by covering and shading them out. English ivy also hosts bacterial leaf scorch, a plant pathogen that spreads to native elms, oaks, and maples.

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A native plant naturally occurs in a specific region without assistance from people. In addition to reflecting the local natural history of the area, native plants reduce the need for pesticides, herbicides and fertilizer because they are already well-adapted to the climate and soils of the area.

Exotic plants are those that have been introduced from a different region through human intervention. For example, Tree-of-heaven and multiflora rose are native to Asia and garlic mustard is native to Europe. All three species have been introduced to the United States where they have had a negative impact on the local ecosystems.

To learn more about which plant species are native to your area, visit:

National Park Service's Weeds Gone Wild, Alien Plant Invaders of Natural Areas: http://www.nps.gov/plants/alien/

U.S. Department of Agriculture, Natural Resources Conservation Service - Plants Database: http://plants.usda.gov/

Tip #7: Plant Lawn Alternatives
Create a Rain Garden or Bayscape

Bayscaping	Rain Garden
Located in dry or moist areas	Located near downspouts and other drainage areas where water collects following a storm
Visually more interesting than a lawn	
Reduces time and expense for mowing, watering, fertilizing and maintaining	
Addresses erosion, poor soil, steep slope or poor drainage problems	
Utilizes native plants	
Reduces stormwater runoff and allows water to slowly percolate through the soil; allows up to 30% more water to percolate through the soil	

Sample Bayscape

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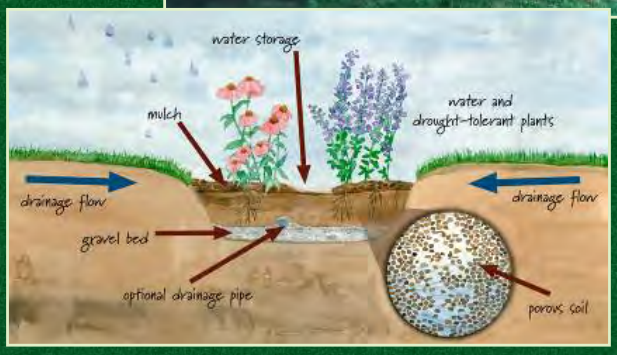
Bayscapes and Rain Gardens utilize native plants – plants that are naturally from your region and are adapted to the climate.

When designing your landscape, consider replacing or augmenting your grassed areas with native plants. More likely than not, the native plants that you will have to choose from will be taller and have a deeper, more extensive root system than a lawn. The deeper root system will allow water to penetrate deeper through the soil as it follows the path of the roots underground. These plants will absorb more nutrients and water, resulting in less runoff. Native plants are also adapted to your climate, reducing the need for supplemental watering, fertilizing and mowing. Depending on your selection of native plants, they can attract local wildlife such as butterflies or birds, too!

Bayscaping is also referred to as "beneficial landscaping" and "conservation landscaping."

Getting Your Rain Garden Started:

- Don't forget the soil test!
- Position the garden downhill of the water source.
- Remember – it is a garden, not a pool.
- Make it a community event!
- Post a sign explaining your rain garden.



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Whether you are creating a bayscape or a rain garden, each should be carefully designed and take into consideration the slope and soil composition, among other aspects, of your property. Before you start planting, do a little research and planning. Draw a map of your property. Where would be the best location for the garden? What type of soil do you have? Does the soil need to be augmented? Is the location for the garden in full or partial sun and which native plants thrive best in those conditions in your area? These are a few of the questions that you should consider when designing your rain garden.

Make note of the sources of water on your property when planning a rain garden and work with (not against) the flow of water. A properly functioning rain garden will hold water for a few **hours** following a normal storm event, not a few days.

You don't have to create your rain garden alone! Ask friends and neighbors to help install your rain garden. You are not only making less work for you, but providing others with a hands-on education in rain gardens! And don't forget to offer to help your neighbors when it comes time for them to create their own rain garden.

Many of your neighbors may not be familiar with rain gardens or other natural forms of landscape. If your garden is visible to the public, consider posting a sign describing what a rain garden is and how it benefits your watershed and its water quality! Take pictures and show off your work to your local garden club chapter!

Tip #8: Get Involved in Your State's Water Quality Standards!

- Visit EPA's Surf Your Watershed Web site http://cfpub.epa.gov/surf/locate/index.cfm

  Once you locate your watershed, click on *Citizen-based Groups in Your Watershed* to learn about local ways that you can get involved in water monitoring and other watershed-related activities.

There are so many different ways that you can become involved with water quality in your community!

- Participate in cleanup activities in your neighborhood.
- Write or call your elected representatives to inform them about your concerns and encourage legislation to protect water resources.
- Get involved in local planning and zoning decisions and encourage your local officials to develop erosion and sediment control ordinances.
- Promote environmental education. Help educate people in your community about ways in which they can help protect water quality. Get your community groups involved.

Get Involved in Your State's Water Quality Standards

- Participate in the public review process of your state's water quality standards

  http://www.epa.gov/waterscience/standards

To learn about your state's water quality standards and when the next opportunity will be to participate in the public review process, visit this site. Be sure to visit the following sections of this page:

•Basic Information – Provides background information on water quality standards and their purpose in water quality protection

•Where You Live – Provides links to EPA Regional pages pertaining to water quality standards

•State, Tribal and Territorial Standards – Provides links to water quality standard documents for each of the states, tribes and territories

Synopsis

1. When present in the proper quantities, nutrients and algae are important components of an ecosystem. In excessive amounts, the ecosystem becomes out of balance.
2. Your choice of plants impacts the need for supplemental watering and fertilization.
3. Keeping soil covered with plants or mulch is an important step to protecting water quality.
4. Soil test results will tell you the type of fertilizer that is needed. Always follow the fertilizer application directions.
5. Spread the word to your friends and neighbors!

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To Learn More, Visit:

Environmentally Friendly Landscaping:

- Backyard Conservation (Includes Fact Sheets): http://www.nrcs.usda.gov/feature/backyard
- EPA WaterSense Landscape Irrigation Services: http://www.epa.gov/WaterSense/pp/irrprof.htm
- Florida Friendly Landscaping: http://www.floridayards.org/
- Home and Garden Tips: http://www.nrcs.usda.gov/feature/highlights/homegarden/lawn.html

EPA Water Quality Standards and How to Get Involved:

- EPA – Locate Your State Environmental Agency: http://www.epa.gov/epahome/state.htm
- EPA – Water Quality Standards for Nitrogen and Phosphorus Pollution: http://www.epa.gov/waterscience/criteria/nutrient/
- EPA – Water Quality Standards Online Academy: http://www.epa.gov/waterscience/standards/academy
- EPA National Nutrient Strategy Current Status: http://www.epa.gov/waterscience/criteria/nutrient/strategy/status.html

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More Places to Visit:

Rain Gardens:

- The New Jersey Native Plant Society's Rain Garden Manual: http://www.npsnj.org/rain_garden_home.htm
- Wisconsin Department of Natural Resources – A How To Manual for Homeowners: http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf
- Virginia Department of Forestry Rain Gardens (includes Rain Garden Technical Guides): http://www.dof.virginia.gov/rfb/rain-gardens.shtml
- 10,000 Rain Gardens: http://www.rainkc.com