NUTRIENTS FOR LIFE

FALL
2015

Celebrating 2015:
The Year of Soil

{ A BRIGHT YEAR FOR }
Helping Communities Grow

Fall Garden Checklist
2015

{ from the board }

Let's be honest, times have changed in the fertilizer business. Twenty years ago I was a proud fertilizer salesman selling his wares. Today, we are bombarded by messages questioning the safety and sustainability of our food supply, and I find myself explaining the benefits of crop nutrients at every introduction. We, as an industry, are proud of our role in providing a safe and healthy food supply. In addition, we are scientifically well-armed with facts that a healthy plant is a more nutritious one. I could rattle on and on about the misconceptions told by the media, the need to provide healthy nutrient rich foods around the world, or how balanced plant nutrition is the right answer. Rather, I want to discuss the merits of a unified voice to clarify fertilizer's critical role in feeding the world.

Our industry goes to work and tries to educate as many people as we can by helping them better understand the benefits of N-P-K (as well as other crop nutrients). Healthy, nutritious plants are the right answer. Today I'm convinced, more than ever before, that our efforts as an industry greatly impact people's view about crop production in our society.

How can we be even more effective? Supporting industry organizations like Nutrients for Life is a great start! It is an important part of our continued success in telling our story. In my mind, our industry has done a tremendous job in so many areas. We know how to get exceptional utilization of crop nutrients and maximize yields. We also have a better understanding of how to be the best stewards of the land that we can be. However, the first and absolutely most necessary step is having solidarity toward a common cause. Nutrients for Life offers the industry a cost-effective, credible voice that is far more effective than a fractured message coming from separate, individual organizations.

We need to continue to find ways to tell our story. We need to reach all agricultural stakeholders, whether they are producers, wholesalers, co-ops, retailers or farmers. This will ensure our army is well-versed on the issues so that we can properly and scientifically defend our role in feeding an ever-growing population. How many times have we heard the sports analogy: "a strong offense makes a good defense?" Let us all continue to proactively tell our story of our industry's continual improvement with a unified voice. It is the key to our long-term success!

Kelvin Feist
Senior Vice President Sales & Marketing, Intrepid Potash

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{from the editor}

New Resources, New School Year

Each summer, teachers spend time on the hunt for new resources. What can add value to my classroom and my student's learning environment? How can I take a more effective approach to help my students understand concepts better?

With school now in session all across the country, many of these questions have been answered with new Nutrients for Life Foundation (NFLF) resources. The plant and soil science resources developed by NFLF have found their way to classrooms by the tens of thousands over the summer. The basic premise for all of our resources is that plants require 17 nutrients to grow healthy, the three most critical being nitrogen, phosphorus and potassium. These nutrients found in soil and fertilizers are the foundation of much science classroom learning.

This fall, NFLF is introducing several resources supporting the 4R Nutrient Stewardship framework (Right Source, Right Place, Right Time, Right Rate) focused on responsible fertilizer use and protecting the environment. Fertilizers are essential to plants and crops, but so often it's their misuse and consequent environmental impact that makes the headlines. These resources offer a science-based approach to tackle fertilizers and the environment.

For Advanced Placement (AP) classes, "Feeding the World and Protecting the Environment" offers students the opportunity to examine the 4R Nutrient Stewardship framework, learn about essential plant nutrients, and study the fertilizer-manufacturing processes. Additionally, students consider various federal regulations, such as the Clean Water Act, in relation to fertilizer-manufacturing. Finally, the resource provides labs, reading excerpts, and classroom activities relating to the content. Teachers looking to take their class to the next level with rigorous and challenging content, this is for you!

For younger students, NFLF will be releasing a 4R and health reader. This resource uses the phrase, "right source, right rate, right time, and right place" relating to health, nutrition, and soil science and includes comic strips, fun activities, and a science experiment.

In the non-traditional class setting, NFLF developed a crop nutrient activity board, "Plant Nutrients on the Farm." This activity station offers a fun and interactive way to teach young children about crop nutrients and is popular with farms offering field trips and camps. See more on page 19.

Nutrients for Life has developed over 40 resources with scientific expertise from some of our nation's leading scientists. With respected input from the Smithsonian Institution and a strong partnership with Discovery Education, you can feel confident that NFLF resources in your classroom are science-based and well-vetted. Bring soil science and crop nutrients in your classroom with us today!

Harriet E. Wegmeyer

Harriet Wegmeyer
Executive Director, Nutrients for Life Foundation

Feeding the World & Protecting the Environment

A HIGH SCHOOL ENVIRONMENTAL SCIENCE TEACHER SUPPLEMENTAL RESOURCE






The Nutrients for Life Foundation (NFLF) educates about the importance of responsible fertilizer use in growing healthy crops, increasing food production, and feeding a growing population. NFLF is proud to present a supplementary resource for advanced placement classes in which students learn about the 4R Nutrient Stewardship framework, essential plant nutrients, and examine federal regulations relating to the fertilizer manufacturing process. The resource provides labs, reading excerpts, and classroom activities to offer an engaging and informative unit on fertilizer.

"Feeding the World & Protecting the Environment" has been a collaborative effort. While Nutrients for Life Foundation has spearheaded the effort, other stakeholders have contributed to the piece, such as the 4R Nutrient Stewardship staff, members of The Fertilizer Institute, Victory Productions, and AP Environmental Science teachers.

Content includes:

- 4R Nutrient Stewardship
- Air Quality (Clean Air Act)
- Climate Change
- Land Restoration
- Mining (Phosphate: Surface Mining; Potassium: Deep-down Mining)
- Natural Biogeochemical Cycles
- Nitrogen Production Facilities
- Nourishing Crops with Fertilizers
- Organic and Commercial Fertilizer
- Production Facility & Federal Regulation Case Study
- Roles in Sustainability (Gulf of Mexico; Chesapeake Bay)
- Water Quality and Quantity (Clean Water Act)

Feeding the World & Protecting the Environment will soon be available for free download on nutrientsforlife.org!

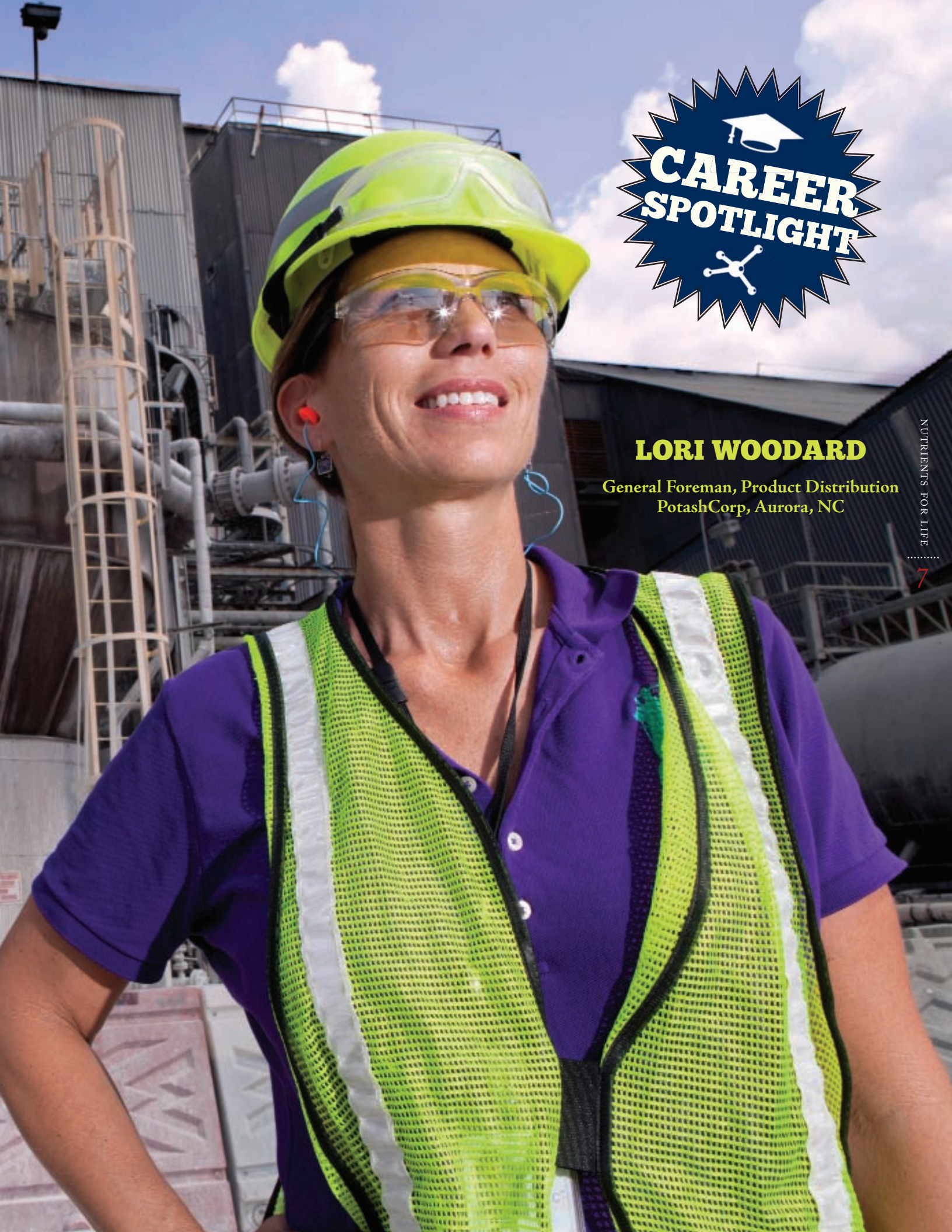
A Juggling Master

Imagine a police officer, stationed at one of the busiest intersections in the world. She stops traffic going in two directions, waves traffic forward in two other directions, and – at the same time – attends to a stalled car.

That scenario is a pretty fair description of Lori Woodard's job. What it takes is organization, problem-solving, good communication, and a healthy dose of unflappable calm.

Lori is in charge of distributing products at PotashCorp.'s operation in Aurora, N.C., where phosphate is open-mined for use in fertilizers. Phosphorus – along with nitrogen and potassium – is a major crop nutrient and the soil around Aurora, where paleontologists also collect and study fossils, is rich in the phosphate mineral.

Once it is mined, processed, and loaded onto trucks, rail cars, and barges, it is Lori's job to oversee its trip around the world and to terminals where it's available for agricultural use.



LORI WOODARD

General Foreman, Product Distribution
PotashCorp, Aurora, NC

For growers, it's just one option for getting the highest yields from their farms – whether they're growing soybeans, wheat, or other crops. Before each growing season, they take soil samples that show them what nutrients might be missing following an earlier crop's harvest. Working with local agricultural extension offices, they might decide that a parcel of land now needs more nitrogen or more phosphorus, Lori explains. They then choose fertilizers – liquid or solid – that combine the nutrients that are needed most.

"It makes the growing of large amounts of food possible," Lori says. "Along with education and technology," she adds, the customization of fertilizers has positioned growers to feed more people.

Each day, her goal is to get the product to multiple destinations - on time and on budget.

But first, it needs to get to them and at PotashCorp, Lori is tasked with the logistics of doing that. Each day, her goal is to get the product to multiple destinations – on time and on budget. For a lot of shipments, that means using rail cars. Lori ensures the continuous movement of the cars, oversees the contractor for on-site repairs and orders new cars from the railroad if they are needed. She then works with engineers loading them to make sure the entire order is accounted for. She applies the same process to deliveries going by truck and by barge down the nearby Pamlico River. Each one of the deliveries – and her decisions are tracked by computer, and safety, as it is throughout the fertilizer industry, is one of her major priorities.

"It is a lot of things at once," she laughs, but she enjoys the diversity of the people she works with – from rail engineers to tug-boat captains to executives in the Saskatchewan corporate office. She also enjoys the diversity of her responsibilities and the fact that she's always learning.

If Lori seems as if she was born to do her job, it actually took some time to find her niche. In high school, she enjoyed learning and took a wide variety of classes, but, "I had no idea what I wanted to do," she says. She took all of her school's college prep courses, "and I still didn't know." She did know she enjoyed being outside. She had grown up hunting and fishing with her father and spent weekends and summers on her grandfather's farm and she has always been active in sports.

"There's no telling what students will stumble across," she says, if they take advantage of both their own and acquired knowledge.

So, returning home after realizing she "was not prepared for college life," she looked for a job that would allow her to be outdoors at least part of the time. PotashCorp, Aurora's largest employer, hired her as a traffic coordinator helping to arrange the delivery of phosphate ore around the world.

That was six years ago. Lori has since moved up the ladder and is now a key link between PotashCorp operations and the chain of distributors that keeps it in business.

Based on her personal experience, Lori is a big believer in keeping an open mind when it comes to careers. She tells both middle- and high-school students that it's "OK not to know" exactly where they will fit. She advises taking a well-rounded course load and being open to a wide variety of opportunities. It also helps to know and appreciate your own innate skills. For Lori, that meant recognizing her math aptitude, as well as her skills in solving problems and juggling multiple priorities.

"There's no telling what students will stumble across," she says, if they take advantage of both their own and acquired knowledge. But, right now she says, "agriculture is a great field to go into!"

FALL Lawn & Garden CHECKLIST 2015

By Dee McKenna

There is a worn path in the grass that leads from the garden to the kitchen. After months of hard work, I am met with the excitement of enough vegetables to preserve. Green beans to can, sweet corn to freeze, and cucumbers to pickle; you get the idea! Fall is approaching quickly, and I feel the urgency to wrap up this garden season. Here is my fall lawn and garden check list.

About the Author: Dee manages the Helping Communities Grow program and contributes to the Nutrients for Life blog bi-monthly. Visit www.nutrientsforlife.org/blog for seasonal tips, tricks, and advice on growing a healthy garden and maintaining a beautiful lawn.

As always, I am happy to be gardening with you.

1. Harvest

Continue to harvest, eat and preserve garden produce. Time to reap all of the hard work you have put into this garden season.

2. Clean Up

Remove all of the plant debris from the garden. Removing it this fall will get you into the garden sooner next spring.

3. Amend the Soil

Add nutrients to the soil by adding the compost created throughout this season. Leave it on top of the soil or till it under.

4. Lawn

Fertilize now for a quick green up in the spring.

5. Think Spring Color

Plant tulips, daffodils, crocus and hyacinths for a burst of spring color. Add blood meal or a slow release fertilizer at planting.

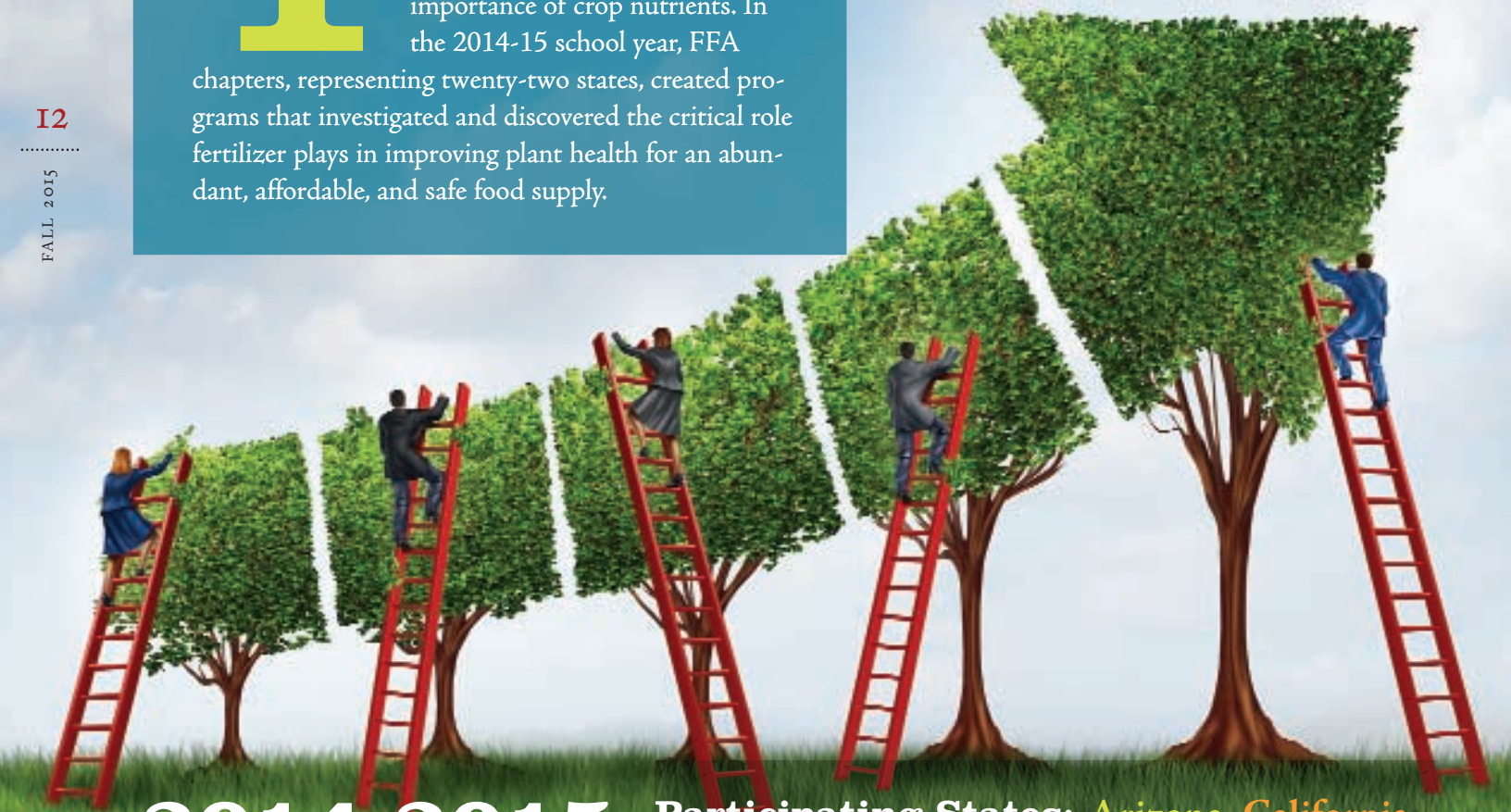
6. Plant Trees & Shrubs

The fall temperatures are great for planting new trees and shrubs.

A Bright

FOR THE HELPING COMMUNITIES GROW PROGRAM

The Nutrients for Life Foundation's Helping Communities Grow program challenges FFA chapters to educate their communities on the importance of crop nutrients. In the 2014-15 school year, FFA chapters, representing twenty-two states, created programs that investigated and discovered the critical role fertilizer plays in improving plant health for an abundant, affordable, and safe food supply.



2014-2015

Participating States: Arizona, California, Colorado, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, Texas, Washington and Wisconsin

Year

2014-2015 List of *Winners*

Arizona
Rio Rico FFA
Payson FFA
Douglas FFA

At Large:
New Auburn FFA, Wisconsin
Taylor-Katy FFA, Texas
Attala County FFA, Mississippi

California
Linden FFA
Hughson FFA
Sonora La Habra FFA

Colorado
Roosevelt FFA
Fort Morgan FFA
Eaton FFA

Florida
Fort White Junior FFA
Lincoln Middle FFA
Charlotte Senior FFA

Idaho
Salmon FFA
Cambridge FFA
Mackay FFA

Illinois
Prairie Central FFA
Maroa-Forsyth FFA
Galva FFA

Iowa
Westwood FFA
Roland Story FFA
Oelwein FFA

Kansas
Mission Valley FFA
WaKeeney FFA
Maize FFA

Louisiana
East Ascension FFA
Franklinton FFA
Northwest FFA

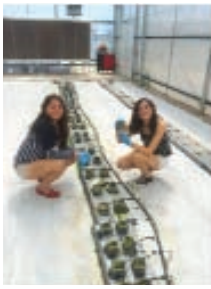
Nebraska
Lewiston FFA
Freeman FFA
Norfolk FFA

Ohio
Peebles FFA
Ridgemont FFA
Miami East FFA

Washington
Colton FFA
Kamiakin FFA
Waitsburg FFA

A change in perception toward crop nutrients has occurred as a result of the Nutrients for Life's programing. Most notably came from the Fort White FFA chapter in Florida. Within their *Helping Communities Grow* application they give witness to a significant curriculum change in their middle school science department.

"Over the past four years, we have participated in the *Helping Communities Grow* program. This year Mr. Oelfke, our FFA advisor, became part of a team that brought the Nutrients for Life Foundation concepts and materials into the Fort White middle school science curriculum. The science department had previously aligned itself with an environmental movement in which fertilizers were purported to be damaging to Florida springs and other waterways. After four years of petitioning the science department for a more balanced approached to teaching about nutrients and agriculture, Mr. Oelfke forged a new collaboration between the Fort White Middle School science department and the agriculture education department and FFA chapter. This achievement shares with their students that a healthy environment and agriculture can exist together in a highly sensitive land and water area."



Nutrients for Life Foundation Executive Director Harriet Wegmeyer said that "Successes such as this demonstrate the power of education, and the reason that Nutrients for Life is critical to our future in communities across this country."

Monetary awards of $3,000, $2,000 and $1,000 were awarded to the first, second and third place chapter programs, in each state category. Up to twelve chapters per state category were awarded $250.

The New Auburn FFA of **Wisconsin**

The New Auburn FFA has something to sing about! They won the 2014-15 *Helping Communities Grow* chapter recognition program in the at-large category by completing over twenty different community outreach activities about fertilizer that were unique and creative including a partnership with the school music department for a concert focusing on agriculture to experiments researching growing mediums and fertilizer impact.

"I am so impressed with these hard-working, knowledgeable and creative students," said Nutrients for Life Foundation Executive Director Harriet Wegmeyer. "Not only did the New Auburn FFA chapter submit a project that educated their community about the important role of fertilizer, they expanded their leadership ability, communications skills and knowledge base during the year-long project."

Garden of Notes
The "Garden of Notes" concert occurred as a result of the agriculture department teaming up with the music department to write an entire script sharing information about *Nourishing the Planet in the 21st Century*. Everyone was "in tune" with the importance of nutrients found in fertilizer.

University Connection
New Auburn FFA created three-fold display boards that traveled to the University of Wisconsin-River Falls, Iowa State University Aerospace Department, University of Wisconsin-Stout Menomonie and the University of Wisconsin-Eau Claire Nursing Department. Their goal was to reach a large crowd with the message that everyone needs to work together to grow more food.

Garden Starter Workshops
FFA members led garden starter workshop for fifth and sixth grade students. Students learned the importance of plant nutrients as they linked *Nourishing the Planet for the 21st Century* to planting of peas, beans and carrots.

Discovery Stations
New Auburn FFA members coordinated learning stations for the second grade students. Each learning station taught the second grade students about soil conservation, how to replenish depleted soil with fertilizer and how to grow plants.

Gift Bags
FFA members created seventy gift bags filled with oranges for all schools staff with the message, "Nourished for you from the ground up." The message included the nutrient content of an orange and the importance of soil nutrients.

School Skit

Seventh grade exploratory agricultural students created a Nutrient for Life skit and presented it to third and fourth grade students. The clever skit was educational and entertaining. N-P-K became fun and relevant to the elementary students.

T-Shirts
Using t-shirts as a conversation starter, FFA members wore their message, "I'm studying to help nourish the planet for the 21st century."

Grocery Bag Drop Slips
FFA members developed and printed grocery bag drop slips. Two grocery stores cooperated and allowed FFA members to distribute their message into the stores' grocery bags. The drop slips contained the message, "New Auburn FFA chapter would like to remind consumers that food begins with the nourishment of soil. Nitrogen, phosphorus and potassium are three key nutrients needed for best plant growth and nutrients need to be replenished when nutrients run short. It has been estimated that by 2050 our world population will be between 8 and 9 billion people. Our food system is important! Great groceries, great food and great soil depend on an adequate supply of nutrients. Together, we can all work to help nourish the planet in the 21st century."

2014-2015 CHAPTER**SPOTLIGHT!**

Discovery Year 3

Visit *From the Ground Up: The Science of Soil* at **www.thescienceofsoil.com!**

How time flies! It's hard to believe that the Nutrients for Life Foundation and Discovery Education have been partners for three years. In early 2014, Nutrients for Life Foundation expanded its reach into the digital world through a partnership with Discovery Education, creating *From the Ground Up: The Science of Soil* (FTGU). Together, the two organizations created a microsite with a collection of digital activities, interactive lesson plans, career spotlights and videos all about soil science and crop nutrients. FTGU is designed to extend the success of Nutrients for Life's *Nourishing the Planet in the 21st Century* curriculum by providing cutting-edge, educational and dynamic multimedia content designed to engage 21st century classrooms. **Last year alone, FTGU reached nearly one million students.** A second virtual field trip, hosting a contest, adding three new video segments, an interactive digital exploration activity, two additional fertilizer career spotlights, and two more at-home family learning activities are in store for year three.

Virtual Field Trip

This spring's first virtual field trip (VFT) to Bomke's Farm in Springfield, Ill., was a huge success. Nearly 2,400 classrooms from across the country, representing all 50 states and nearly 75,000 students, signed up to watch. During the 45-minute event, students and teachers submitted over 600 questions. The VFT featured Brian and Cathy Bomke and their farm in Springfield, Ill. The VFT took students from planting and fertilizer applications to harvest, highlighting the technology and science used in farming, including precise fertilizer application, soil maps and soil tests. The 2015 VFT trip is archived on www.thescienceofsoil.com/virtualfieldtrips.

Quiz Contest

FTGU will launch the nationwide *Let it Grow Contest* on www.thescienceofsoil.com this fall. The contest will inspire communities to rally for their school for the chance to win an agricultural grant to build a school garden. This new feature to the FTGU program will target middle schools and will drive participants to Nutrients for Life and FTGU resources. The entry process will require the participant to answer five multiple-choice questions about fertilizer. Prizes will include Nutrients for Life materials, a bag of fertilizer, and funds for gardening supplies. The celebratory winner event will occur around Earth Day and will connect educators to a local agronomist.

"With more than three million impressions expected in the next 12 months, FTGU will continue to provide a unique look into the fertilizer industry; promoting future careers in the fertilizer industry, inspiring action, and changing perception of what's below students' feet."

Building off the success of the first VFT, a trip to a specialty crop farm in Florida is scheduled for this winter. During the interactive trip, students will observe the fascinating technology involved in fertigation and applying fertilizer. Classrooms across the country will tune-in to learn how farmers integrate science and technology into fertigation farming today. Students will also have the opportunity to ask questions live. As middle school students explore concepts related to the future of agriculture and fertilizer's role in sustaining the world's growing population, there is sure to be more science-based understanding of the vital role of the fertilizer industry.

Discovery Education will continue to promote the site through their extensive teacher network. With more than three million impressions expected in the next 12 months, FTGU will continue to provide a unique look into the fertilizer industry; promoting future careers in the fertilizer industry, inspiring action, and changing perception of what's below students' feet. Timely content and resources designed to address key issues currently facing the agriculture industry make these videos, games, and lessons especially relevant for today's classrooms.

Discovery EDUCATION™

FROM THE GROUND UP
THE SCIENCE OF SOIL

Water Bead **Activity**

Teaching young people what a plant needs to grow is an important topic for students and teachers. If soils and plants are not your specialty, never fear, Nutrients for Life Foundation has found a way to make the topic fun and hands-on for any age. In this activity, the Foundation uses different colors of water beads to represent what a plant needs to grow. This water bead activity is sure to be a crowd-pleaser no matter the audience.

Supplies:

1. Seven separate colors of water beads (available online or in any craft store)
2. Seven containers for the water beads (with lids if available)
3. Seeds (beans or sweet corn work best)
4. Small jewelry plastic bag
5. Mailing labels (optional to explain what a plant needs on the bag)

Preparation:

Water beads are tiny beads that absorb water and grow to the size of a small marble. Before the activity, place ¼ teaspoon of water beads into the containers to make 100 beads, keeping the colors separate. Add a couple of cups of water and drain off any extra water after the beads swell. Prepare an example bag a week in advance to provide a preview for the seed germination.

Before the students make their water bead bags, quiz them on what a plant needs to grow and how those things affect the growth. Instruct the students to check their seed every day to see how it changes. When the seed and the water beads are stored in a bag in a warm place with some sunshine, like a windowsill, participants can watch the seed germinate and grow. Explain that each bead represents a variable that plants need to grow. Students should plant the germinated seed in soil if they want it to grow into a plant.

Remind students to take the bag out of their pockets when they get home so their parents do not find it in the washing machine later!

Share this activity with us!
@Nutrients4Life

Use water beads to symbolize what plants needs to grow!

Procedure:

1. Instruct each student to place a seed into a jewelry bag.
2. Water: Students place one blue water bead in bag. Explain that water helps move the nutrients in the soil to the roots.
3. Sun: Students place one yellow water bead into the bag. Explain how the plant uses the energy from the sun.
4. Air: Students place one clear water bead in the bag. Explain that plants use this in photosynthesis. Plants take in carbon dioxide and expel oxygen.
5. Soil: Students place one black bead in the bag. Explain that the soil holds the nutrients that our plants need to grow. If the nutrients are not available, the grower will need to fertilize.
6. Nitrogen: Students place one green bead in the bag. Explain that this nutrient helps the plant grow green and healthy.
7. Phosphorus: Students place one pink bead in the bag. Phosphorus will help their plant grow healthy roots.
8. Potassium: Students place one purple bead in the bag. Potassium will help the plant fight disease and reproduce.

2015 Meetings Calendar

Sept. 26-28	Nebraska Science Teachers Conference
Sept. 27-29	World Fertilizer Conference, Boston
Oct. 2-4	California Science Teachers Meeting
Oct. 22-24	National Science Teachers Association (NSTA) Conference, Reno
Oct. 28-31	National FFA Convention, Louisville
Nov. 9-11	Louisiana LSTA
Nov. 12-14	Texas CAST
Nov.12-14	NSTA Philadelphia
Nov. 18-20	National Association of Ag Educators
Nov. 19-21	Colorado Science Teachers Convention
Nov. 19-21	Virginia Association of Science Teachers Professional Development
Dec. 1-3	Agricultural Retailers Association
Dec. 3-5	NSTA Kansas City
Dec. 9-10	Colorado Ag Classic Convention

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
16	12	10	23	24	20	2	7	21	18	22	11	13	9	19	1	17	15	5	3	27	8	6	28	14	4

Potassium – Funny Word, Fun Game

Potassium is important to humans and plants. In humans, potassium is important for healthy circulation, which is why we are often encouraged to eat potassium-rich foods. What are some potassium rich foods? Solve this cryptogram to find out!

6	7	21	3	24		12	24	16	9	5															
5	1	21	9	16	10	7																			
12	16	22	24	23		1	19	3	16	3	19	24	5												
12	16	9	16	9	16	5																			
20	21	5	7																						

STEM-BASED Education Station

Farm Fieldtrip **Kit**

This school year, thousands of classrooms across the country will get to go on fun field trips! These classroom will attend museums, zoos and parks. A lucky few will get the opportunity to go to a farm and learn about agriculture first-hand. This year, Nutrients for Life introduced a fieldtrip kit available to help farms educate students about what nutrients plants need to be healthy. As kids adventure through the pumpkin field, they will discover the value of nitrogen, potassium and phosphorus to the farmer.

The activity is a station where students are presented with a pumpkin field that needs a little help from them, as farmers, to be healthier. The first thing they discover is that plants need water and sunshine. Students add magnetic raindrops and the sun to the field of pumpkins. The students find yellowing leaves on the plant and discuss that nitrogen can be added to the soil to help the plant grow healthy green leaves. The yellow leaves are then replaced with green ones. Some of the roots in the pumpkin field are not growing as large as others. Students add phosphorus to the soil to help the roots grow strong and healthy. The pumpkin field is looking better, but there are a couple of pumpkins that are showing signs of disease. There is one more macronutrient essential to health plants and students add potassium to the soil. The pumpkin field now looks healthy and happy! Students learn that advances in modern agriculture help farmers take care of their crops with new equipment and satellite technology. The students then add a tractor and satellite to the field. This completes the students experience as a farmer striving to grow healthy pumpkins.

Throughout the field trip, each student gets to take part in helping the farmer make the pumpkin field healthier. The interactive board brings excitement and keeps the students engaged in learning the value of nitrogen, phosphorus and potassium in growing healthy crops. Patterson Farm Inc. in China Grove, NC added this activity to their field trip tour last year. Michelle Patterson shares, "We are thrilled with the materials you offer. They definitely enhance our tour experience." Teachers find value in the fieldtrip when the students are learning the science behind growing crops.

The Plant Nutrients on the Farm field trip kit comes with a magnetic pumpkin farm scene that measures 8½ feet long, 30 magnets and two scripts. It includes all the tools needed to start an educational field trip on the farm. Teachers appreciate that the standards-based station is a STEM activity that students thoroughly enjoy.

To request your station, contact Debra Kearney, (641) 891-4182 or dkearney@nutrientsforlife.org.

THE KIT INCLUDES:

- First grade script
- Third grade script
- Large magnetized board
- Corresponding magnets
- 3 Child-sized hat props

A Year of **Soil**

BY EMILY VELISEK

The 68th United Nations (UN) General Assembly has declared 2015 as the International Year of Soil to celebrate the life-giving ground beneath our feet. The Nutrients for Life Foundation is proud to highlight soil and crop nutrients' roles in feeding the world.

Soil is the basis for food, fuel and fiber production and is a vital part of our lives. Soil is critical for numerous ecosystem services. As the world population continues to grow, soil preservation is essential for food security and sustainable future. The primary nutrients for plant growth are nitrogen (N), phosphorus (P), and potassium (K). These nutrients are depleted in the soil when used by plants that are harvested.

Nitrogen is the first of the three primary nutrients. Nitrogen is essential in the formation of protein, which make up most tissues in living things. All living things need nitrogen, including humans and plants. Nitrogen comes from the atmosphere, just like the nitrogen cycle will show. Unfortunately, nitrogen in the soil is not always available to the plants as a nutrient. Fertilizer is needed to provide plants with usable nitrogen so they can grow.

Phosphorus is important to many processes a plant goes through during development. One process is photosynthesis, in which plants convert sunlight into energy. Phosphorus is also important to respiration, cell enlargement, cell division, energy storage and energy transfer. If plants or crops are lacking phosphorus, most farmers can tell by examining the bottom parts of the plant for signs of poor health, such as rotting. Most commercial fertilizers containing phosphorus, use phosphate rock found in fossil remains originally laid beneath the oceans and later lifted up with land masses. Potassium found in nature is actually the salts of evaporated sea water.

Potassium, also known as "potash," is the third primary nutrient for soil and plants, and just like nitrogen, it helps produce protein as they grow. Potassium can be plentiful in some soils, but due to crop growth, it can be limited. Up to 98 percent of potassium in the soil is unavailable to plants in its existing form. Since such a large amount of potassium is not available fertilizer is used to provide the amounts and quality of potassium needed by the plants.

Calcium, magnesium, and sulfur are secondary macronutrients. Plants and soil may not need as much of these, but they still play an important role in the plant growth as the primary nutrients.

Calcium strengthens the overall plant structure. Calcium is usually plentiful in most soils, but is not always available to the plants. If calcium is deficient, it can be supplied in the form of lime (ground limestone) or can be mixed with a liquid carrier, such as Nutri-Cal.

Magnesium has many roles in plant growth, but the most important is that it is the central atom in chlorophyll, which is the molecule responsible for photosynthesis. Most of magnesium in plants is found within chlorophyll. Similar to phosphorus, magnesium will move from the older part of plants to the younger parts as the plant grows. An indicator of magnesium deficiency would be if a plant's older leaves are turning bronze or yellow but the veins in the leaf remain green. There are many fertilizers someone could use if they need magnesium including; limestone, magnesium oxide, magnesium sulfate, potassium-magnesium sulfate, and magnesium chloride.

Sulfur is essential to the production of amino acids, which are the building blocks of proteins found in all living things. It also gives certain crops such as onions, mustard, and radishes their odor. Sulfur is abundant in soil that is rich in organic matter, but like the other nutrients, it is not always available in a way plants can use. A few fertilizers containing sulfur include ammonium sulfate, ammonium thiosulfate, potassium sulfate, and magnesium sulfate.

Soil is a precious resource. Did you know it takes 500 years to form an inch of top soil on the ground? If we take care of the soil, it will take care of us. We encourage everyone to celebrate the International Year of Soil by learning something new about soil and passing it on!

The Nutrients for Life Foundation is excited and proud to provide science-based resources on soil science and crop nutrients. The Foundation's *Nourishing the Planet in the 21st Century* curriculum provides hands-on classroom activities to help tomorrow's generation realize the challenge of feeding our growing population can be solved with science.

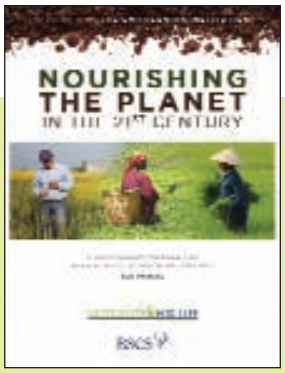
To request the complementary items featured, please visit the Nutrients for Life Foundation website's teacher section: **www.nutrientsforlife.org/for-teachers**.

1 Fertilizer Is Life's Main Ingredient Posters
AUDIENCE: GENERAL
A series of four educational campaign posters.

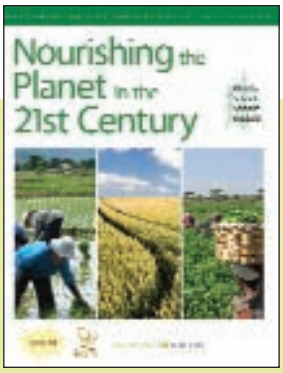
NUTRIENTS FOR LIFE FOUNDATION

Available **Resources**

2 Fun With the Plant Nutrient Team
AUDIENCE: K-3
An activity book to help children understand the basic of crop nutrition.



3 *Nourishing the Planet in the 21st Century* High School Curriculum
Now in the second edition, the supplement offers six lesson plans designed to teach students about soil science and crop nutrients' role in feeding a growing world.



4 *Nourishing the Planet in the 21st Century* Middle School Curriculum
A middle school supplemental curriculum with six science-based lessons about soil science. All three levels of curriculum were favorably reviewed by the Smithsonian Institution.

5 *Nourishing the Planet in the 21st Century* Elementary Curriculum
Smithsonian-approved, these five STEM-based, supplemental lessons teach plant and soil science, while using gardening to make the lessons fun, interactive, and educational.

6 Recipe Cards

AUDIENCE: GENERAL

A series of eight recipe cards. Recipes include ***pumpkin soup, chocolate chip cookies, raspberry crumb bars, moist carrot cake, apple cookies, baked spaghetti cakes, broccoli quiche,*** and ***vegetable soup.***

7 5 Key Message Cards

The wallet-sized card concisely states five of the top truths about fertilizers.

8 Cross-curricular Magnets

AUDIENCE: 5TH TO HIGH SCHOOL

Simultaneously promote language arts and science skills with this word magnet. Make sentence with soil science and agriculture buzz words color-coded by the part of speech.

9 Phosphate Mining Video

AUDIENCE: MIDDLE/HIGH SCHOOL

This lively video shows students the amazing process of mining phosphate and its relevance in global food security. Available to stream online!

10 Potash Video

AUDIENCE: MIDDLE/HIGH SCHOOL

Learn where potash fertilizer comes from and how it helps feed the world in this short video. Available to stream online!

11 Ruler

Six-inch ruler that publicizes the ***Nourishing the Planet in the 21st Century*** curriculum.

More Available **Resources**

12 NPK Soccer Poster

AUDIENCE: ELEMENTARY/MIDDLE SCHOOL
Plants, like humans, need nutrients. This resource poster is a great addition to your classroom showing the basics of primary nutrients.
(Also available in Spanish)

13 Curriculum and Virtual Classroom Videos USB Flash Drive

AUDIENCE: ELEMENTARY/MIDDLE/HIGH SCHOOL
Includes all three levels of curriculum, the virtual classroom videos, and pre- and post-test assessments. Introduce lessons from the *Nourishing the Planet in the 21st Century* curriculum with the short, interest grabbing Virtual Classroom videos, featuring spokesperson Dee McKenna. Also available online.

14 Apple Poster-New design!

AUDIENCE: MIDDLE/HIGH SCHOOL
Can a single apple slice feed the world? This resource poster for teachers provides a visual aid as they address the challenges of feeding a growing population. *(Also available in Spanish.)*

15 Nitrogen Cycle Poster

AUDIENCE: HIGH SCHOOL
So many of our planet's systems are cyclical, including one of the most recognizable cycles: nitrogen. Use this colorful visual to help teach about nitrogen's role in plant growth.

16 Phosphorous Cycle Poster

AUDIENCE: HIGH SCHOOL
Perfect for the science classroom, this poster focuses on the movement of phosphorus.

17 Potash Poster

AUDIENCE: HIGH SCHOOL
Enforce biogeochemical cycle concepts with this poster about the potassium cycle. A great visual aid for the high school classroom.

To request the complementary items featured, please visit the Nutrients for Life Foundation website's teacher section: **www.nutrientsforlife.org/for-teachers**.

20 Apple, Air and Ocean Postcards

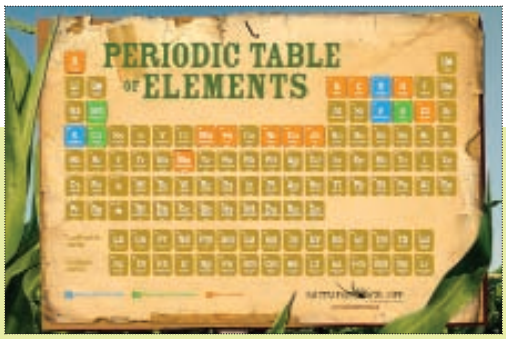
AUDIENCE: GENERAL

A series of three postcards highlighting the origins of nitrogen, potash, and phosphate.

21 Flashcards

AUDIENCE: MIDDLE/HIGH SCHOOL

Play fun games (Around the World, Beat the Clock, or Circle Up) and test your students' plant and soil science knowledge. Or use the set to review concepts from the middle and high school curriculum, *Nourishing the Planet in the 21st Century.*



18 Periodic Table of Elements Poster

AUDIENCE: MIDDLE/HIGH SCHOOL

Connect biology to chemistry with this colorful periodic table of elements poster. This piece highlights the primary macronutrients, secondary macronutrients, and micronutrients; all of which are essential for plants.

19 From the Ground Up: The Science of Soil website

AUDIENCE: MIDDLE SCHOOL

Through a partnership with Discovery Education, this microsite provides a collection of digital resources about soil science, including career spotlights, interactive lessons, digital exploration, and family activities.

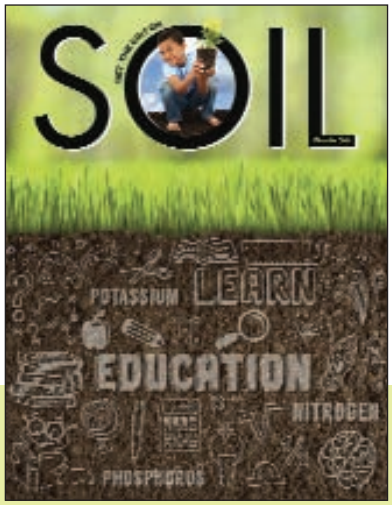
Visit www.thescienceofsoil.com.

More Available **Resources**

22

Interactive Lesson Plans

AUDIENCE: 3rd & 4th, 7th & 8th, 9-12th
Download ready-to-go PowerPoint slides that correspond with *Nourishing the Planet in the 21st Century* curriculum. Access the middle school slide deck on www.thescienceofsoil.com and download the elementary and high school slide decks on the teacher's section www.nutrientsforlife.org.



23

Under Your Feet reader

AUDIENCE: 1ST & 2ND
This activity reader introduces soil and its role in producing food. Written for grades 1 & 2.

Download from the teacher's section at www.nutrientsforlife.org.

24

SOIL reader

AUDIENCE: 5TH & 6TH
This 18 page booklet contains articles, like "Properties of Soil" and "Soil Testing Your Yard," and activities about soil science written specifically for grades 5 & 6.

Download from the teacher's section at www.nutrientsforlife.org.

25

#SoilScience reader

AUDIENCE: 7TH & 8TH
Introduce soil formation, the nitrogen cycle, and fertilizer basics with the activity booklet designed for grades 7 & 8.

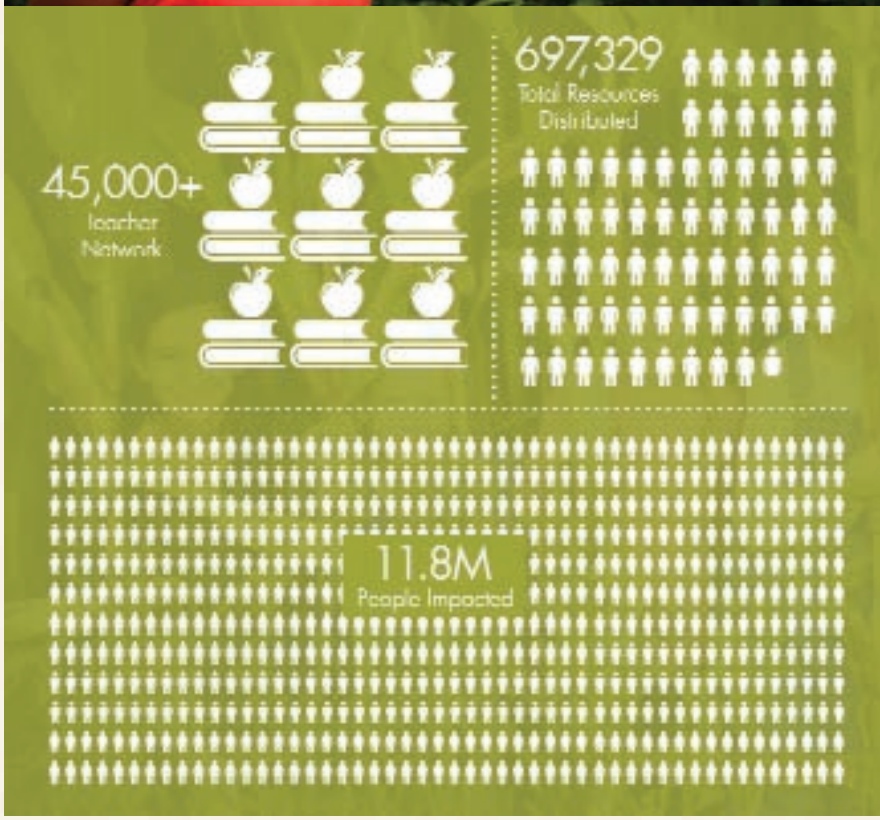
Download from the teacher's section at www.nutrientsforlife.org.

To request the complementary items featured, please visit the Nutrients for Life Foundation website's teacher section: **www.nutrientsforlife.org/for-teachers**.

Help us continue our mission, donate today!

More than ever, it is essential that the Nutrients for Life Foundation continues to develop and distribute science-based materials to improve plant nutrient literacy, soil health knowledge and promote fertilizer's role in sustaining a growing population. The resources provided to teachers and students at no cost address common misconceptions among consumers and educate the industry workforce to better understand how their work helps feed the world.

NFL has demonstrated remarkable progress since its inception. In the past 10 years, education outreach in schools has gone from zero to reaching over 11 million students. In 2014 alone, nearly 700,000 resources and outreach programs impacted nearly 12 million people, including: over 11 million students and over 450,000 teachers.



❒ I/we have enclosed a check payable to the **Nutrients For Life Foundation** in the amount of $_____

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NFL's continued success and ability to provide free resources to our nation's educators relies on your support.

NUTRIENTS FOR LIFE FOUNDATION

Phone: 800 962 9063 | Fax: 202 962 0577 | To receive news alerts via e-mail or if you have questions, contact Info@NutrientsForLife.org
Nutrients for Life Foundation | 425 Third Street, S.W. | Suite 950 | Washington, D.C. 20024

parting shot

Iowa Wild hockey team fans complete the water bead activity with Debra Kearney, Iowa Regional Representative, during half time at the game!