



# THE MOSAIC *Express*

A SUMMARY OF THE EXHIBITS INSIDE OUR INTERACTIVE, 42-FOOT MOBILE EDUCATION EXPERIENCE

[www.mosaicco.com/florida](http://www.mosaicco.com/florida)





SABER TOOTH  
TIGER SKULL

## FLORIDA FOSSILS

Samples of prehistoric fossils from land and sea creatures discovered during mining in the Bone Valley are shown here.



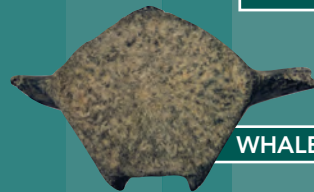
DUGONG (MANATEE) RIB



GIANT SLOTH  
HAND BONE



GREAT WHITE  
SHARK TOOTH



WHALE VERTEBRA

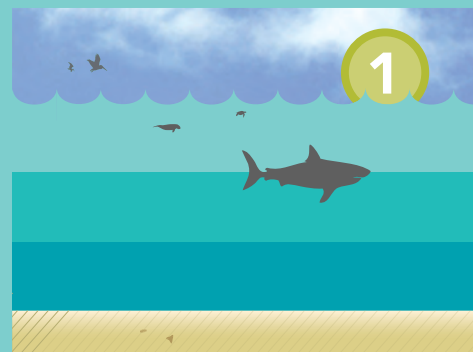
## WHAT IS PHOSPHATE?

Phosphate is a strategic natural resource that is essential for plant growth and crop production. It must be mined from nature and cannot be artificially produced. Mined phosphate minerals are manufactured into fertilizer, animal feed supplements and a variety of consumer products. In fact, phosphorous is essential to all living matter and is found in every cell of every living thing.

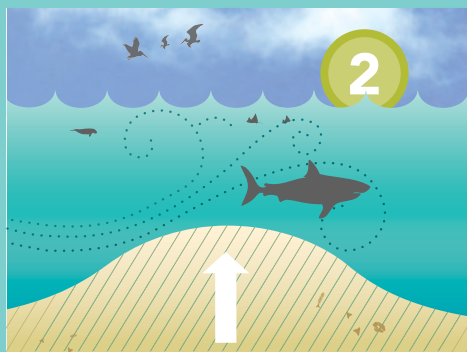
## CENTRAL FLORIDA'S BONE VALLEY REGION

CENTRAL FLORIDA'S BONE VALLEY REGION, INCLUDING PARTS OF HILLSBOROUGH, POLK, HARDEE, MANATEE AND DESOTO COUNTIES, HAS THE RICHEST DEPOSITS OF PHOSPHATE MINERALS IN THE UNITED STATES. IN 1881, J. FRANCIS LEBARON, AN ENGINEER FOR THE U.S. ARMY CORPS OF ENGINEERS, DISCOVERED PHOSPHATE PEBBLES WHILE SURVEYING THE PEACE RIVER.

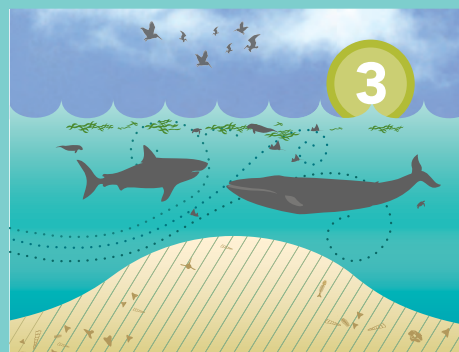
A dipper dredge and washer, shown below in 1892, was one of the earliest forms of phosphate mining and processing in central Florida.



More than 15 million years ago Florida was under water. Water currents flowed across the sea floor. The colder waters closest to the sea floor were rich in phosphate and other vital nutrients.



10-15 million years ago the sea floor rose up, forming the "Ocala arch." Water currents were deflected upwards. The deeper water came to the surface, called an "upwelling."



The upwelling brought the phosphate and other nutrients to the surface. This nutrient-rich water encouraged major biologic growth of plant and marine life.



Phosphorous-rich water, bones, teeth and animal waste settled onto the sea floor and mixed with deposits of sand and clay.

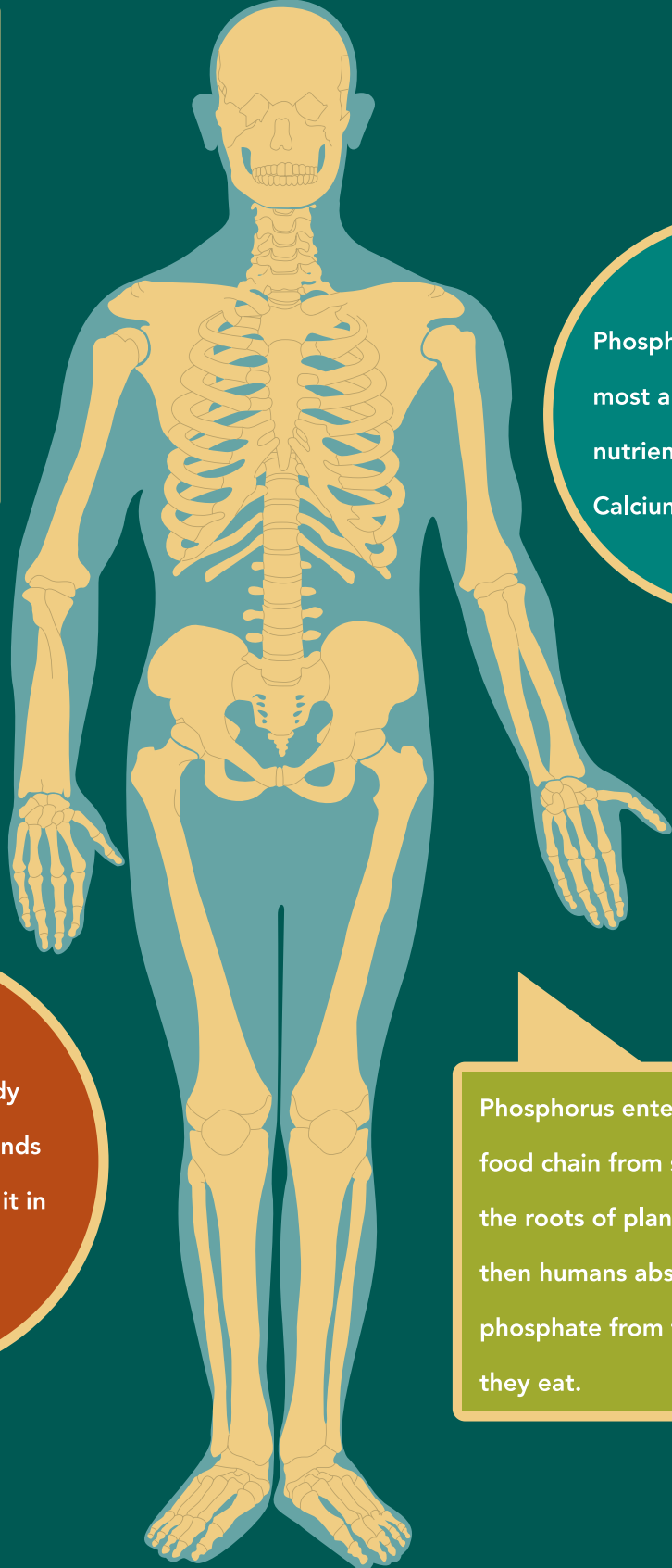


Over time, the sea level dropped and sandy sediment covered the mix of phosphate, sand and clay deposited below. Today, there is approximately 15-50 feet of sandy soil covering this three-part "matrix."



# PHOSPHATE IN THE HUMAN BODY

Phosphorus is a component of all plant and animal cell tissues; it is necessary for the structure, growth, and propagation of living organisms. A sugar-phosphate backbone forms the helical structure of every DNA molecule.



Phosphorus is the second most abundant mineral nutrient in the human body. Calcium is #1.

The average human body contains about two pounds of phosphorus, most of it in our bones and teeth.


Phosphorus enters the food chain from soil into the roots of plants, and then humans absorb phosphate from the foods they eat.

# PHOSPHATE IN EVERYDAY LIFE

It is estimated that, in a lifetime, every American will use or consume 21,848 pounds of phosphate in some form.




In addition to our food, phosphate is in shaving cream, baking powder, cleansers, toothpaste, cola, ranch dressing, flame-resistant fabrics, film and many, many other products.



### CFL BULB

THE ELECTRICITY GOING THROUGH A COMPACT FLUORESCENT BULB CAUSES MERCURY VAPOR TO GIVE OFF ULTRAVIOLET (UV) LIGHT. THE UV LIGHT EXCITES THE PHOSPHORUS AND CAUSES IT TO EMIT VISIBLE LIGHT.



### EYE GLASSES

PHOSPHATE GLASS CAN BE USED FOR EYEGLASSES, AS WELL AS A VARIETY OF INDUSTRIAL AND BIOMEDICAL PRODUCTS.

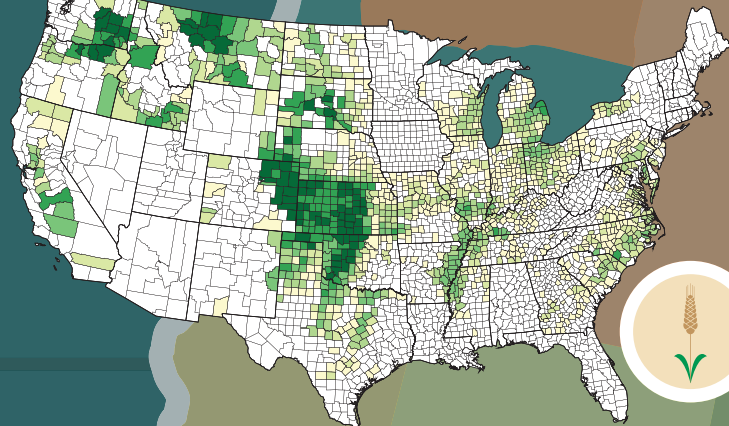


### FERTILIZER

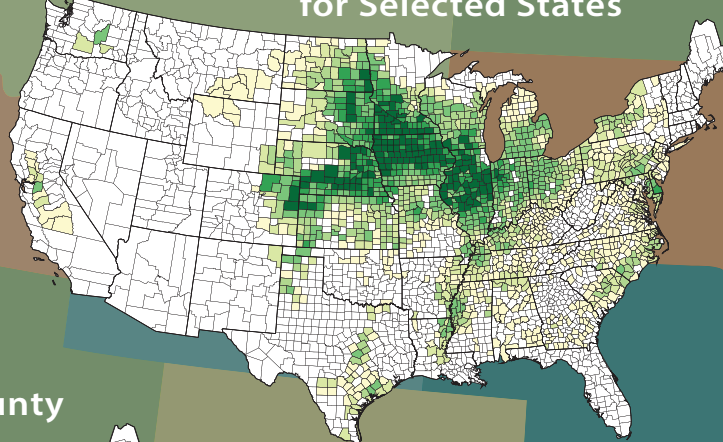
5	NITROGEN (N)
10	PHOSPHATE (P)
5	POTASH (K)

# FLORIDA PHOSPHATE: NURTURING FLORIDA, NOURISHING AMERICA

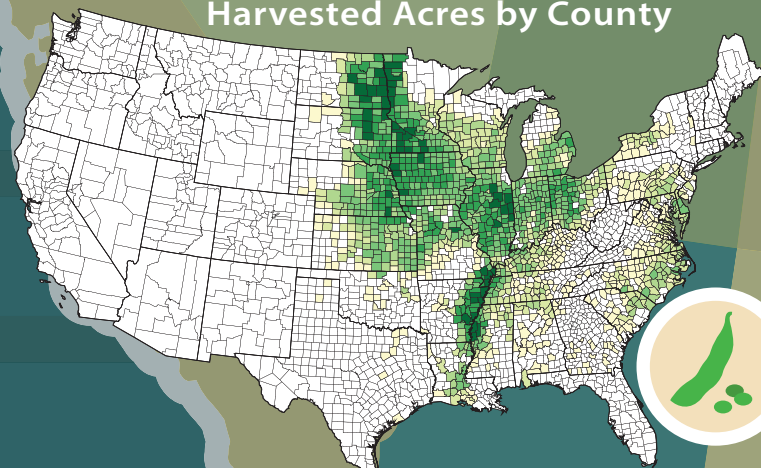
Winter Wheat 2011  
Harvested Acres by County



Corn for Grain 2011  
Harvested Acres by County  
for Selected States



Soybeans 2011  
Harvested Acres by County



#### Acres

Not Estimated
< 10,000
10,000 - 24,999
25,000 - 49,999
50,000 - 99,999
100,000 - 149,999
150,000 +

## A STRATEGIC RESOURCE

"I cannot over-emphasize the importance of phosphorus not only to agriculture and soil conservation, but also the physical health and economic security of the people of the nation."

President Franklin D. Roosevelt, 1938



## FRESH CITRUS FROM FLORIDA!

Florida citrus growers — like so many American farmers — rely on phosphate nutrients to produce more abundant crops.

You can enjoy the fruits of their labor in a glass of orange juice or a slice of grapefruit — and also nourish your body with Vitamin C.

Dried citrus pulp is also a source of calcium in feed nutrients for cattle and sheep.



The "4Rs" of nutrient stewardship provide a framework to achieve cropping system goals — increased production, increased farmer profitability, enhanced environmental protection and improved sustainability. To achieve those goals, the 4Rs are about applying the:

**Right** fertilizer source at the **Right** rate, at the **Right** time and in the **Right** place.

## IMPORTANT TO FLORIDA'S ECONOMY

The phosphate industry is one of Florida's oldest and most important businesses, contributing billions of dollars to the state's economy each year in the form of jobs, taxes, purchases of goods and services, and capital investments.

Florida's phosphate producers employ thousands of Floridians directly, and tens of thousands more work for companies that support the phosphate industry.



Countries around the world rely on fertilizer from Mosaic to nourish their crops.

Mosaic also provides assistance to many hunger-stricken countries with low-producing farming. The company donates fertilizer and hands-on education to help farmers improve crop yields and efficiency.



# PHOSPHATE MINING

## FROM FOSSILS TO FERTILIZER

Extracting ancient phosphate deposits safely from the earth and processing them into crop nutrients for farmers is a big job. Protecting wildlife, land and water resources is an essential part of it.

Before mining can begin, phosphate producers like Mosaic must submit detailed mining and reclamation plans for review and approval by federal, state and local authorities. And throughout the mining process, operations must continue to meet strict environmental standards.



Any water released from a mining site into a nearby stream or river must go through a state-permitted discharge point and meet stringent water quality standards.

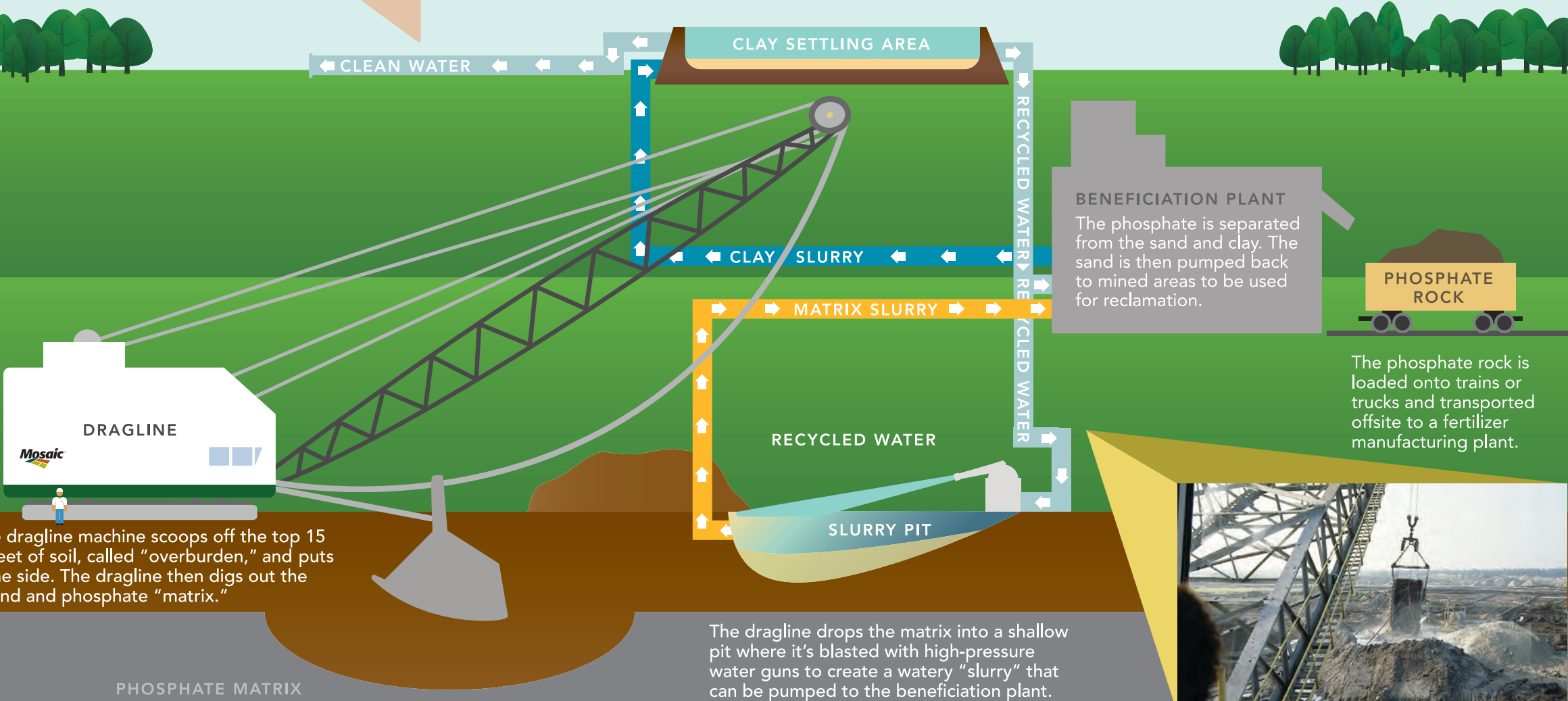
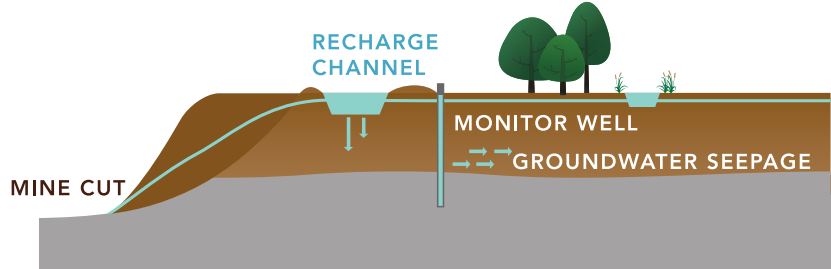


The phosphate industry has greatly reduced its water consumption in recent decades and now recycles or reuses approximately 95 percent of the water needed for its operations.

The clay slurry is pumped to an engineered "clay settling area," which acts as a kind of reservoir for recycling water required in the mining operations. These clay settling areas are maintained and regularly inspected for environmental safety, too.

## PRESERVATION AREAS

Mining activities are separated from preserved wetlands, rivers and streams. Water "recharge" systems help keep the areas in a natural state. This includes a channel for water recirculation and groundwater seepage, and a berm, or dirt wall, to physically separate the mining activity from the preserved area. Preserved areas are monitored to ensure they remain hydrated and healthy.



A huge dragline machine scoops off the top 15 to 50 feet of soil, called "overburden," and puts it to one side. The dragline then digs out the clay, sand and phosphate "matrix."

The dragline drops the matrix into a shallow pit where it's blasted with high-pressure water guns to create a watery "slurry" that can be pumped to the beneficiation plant.



The phosphate rock is loaded onto trains or trucks and transported offsite to a fertilizer manufacturing plant.

# FERTILIZER MANUFACTURING



SULFURIC ACID PLANT

AIR / O<sub>2</sub>

AIR

## SULFURIC ACID PLANT

In the first stage of the manufacturing process, the sulfur is mixed with air to produce sulfuric acid (H<sub>2</sub>SO<sub>4</sub>). Heat is released and produces large quantities of steam (H<sub>2</sub>O). (The "smoke" you see coming from a fertilizer plant isn't really smoke at all — it's just steam!)

STEAM

EXPORTED ELECTRIC POWER

## COGENERATION PLANT

A cogeneration process harnesses the steam to rotate massive turbines that generate electricity.

## PHOSPHOGYPSUM

The phosphoric acid-making process creates a by-product, calcium sulfate (CaSO<sub>4</sub>), more commonly known as phosphogypsum.

Because it contains trace levels of radioactivity due to the radium that occurs naturally in Florida soils, phosphogypsum must be stored in giant mounds, or "stacks." The tops of the stacks are lined to allow for recycling of water used in the fertilizer manufacturing process. Eventually, these giant stacks are "closed" and become covered with vegetation. Scientists are currently researching safe and productive uses for phosphogypsum, such as an underlayment for road beds, as an alternative to just stacking it.

## CLEAN ENERGY

There's more to the manufacturing story than just fertilizer and animal feed...

- Cogeneration is "clean" because it doesn't use fossil fuels and has zero emissions.
- The state of Florida has designated "co-gen" as a "renewable energy" source.
- Co-gen produces enough power to run Mosaic's fertilizer manufacturing facilities in Florida and then some. Excess electricity is used at our mining sites or sold back to local power companies to help provide power to homes and businesses.

MOSAIC IS ONE OF THE LARGEST RENEWABLE ENERGY PRODUCERS IN FLORIDA, GENERATING ENOUGH "CLEAN AND GREEN" ENERGY TO POWER MORE THAN 100,000 HOMES.

Natural phosphate "rock" is not water soluble, which means it can't be absorbed by plants or animals. It takes a unique chemical process to transform the phosphate rock into the water soluble granules that will be used to nourish farm crops and livestock.

## PHOSPHATE ROCK

(Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>) travels by open rail cars from our mines to our fertilizer manufacturing plants.

A KEY INGREDIENT

## PHOSPHORIC ACID PLANT

The phosphate rock and sulfuric acid are then combined to create phosphoric acid (H<sub>3</sub>PO<sub>4</sub>).

EXPORTED ELECTRIC POWER

EXPORTED ELECTRIC POWER

## ANHYDROUS AMMONIA

Ammonia (NH<sub>3</sub>) is transported by pipeline to our plants from port storage facilities for immediate use in the manufacturing process. Small amounts of ammonia are stored safely onsite to introduce another essential nutrient, nitrogen, into the process.

A KEY INGREDIENT

## GRANULATION PLANT

At the granulation plant, the phosphoric acid and ammonia are combined to form the water soluble granules that farmers will use to fertilize their crops.

## ANIMAL FEED PLANT

Nearby at the animal feed plant, phosphoric acid is mixed with limestone to produce dietary supplements for cattle and other livestock.

## WATER RECYCLING FACTS

- Approximately 95 percent of the water used in our Florida operations is recycled or reused.
- Any water released from a manufacturing site must go through a specific point and meet stringent water quality standards.

## SULFUR

Most of the molten sulfur (S) used is a byproduct of oil refining and is delivered by barge, rail or truck.

A KEY INGREDIENT



# RECLAMATION: MINED LANDS RETURNED TO NATURAL HABITATS

Reclamation teams comprised of biologists, engineers and ecologists design fully functioning post-mining landscapes.

GREAT BLUE HERON



OSPREY



Reclamation planning occurs long before any phosphate mining begins. Plans are thoroughly scrutinized by federal, state and local regulators before permits for mining are granted.

ALLIGATOR



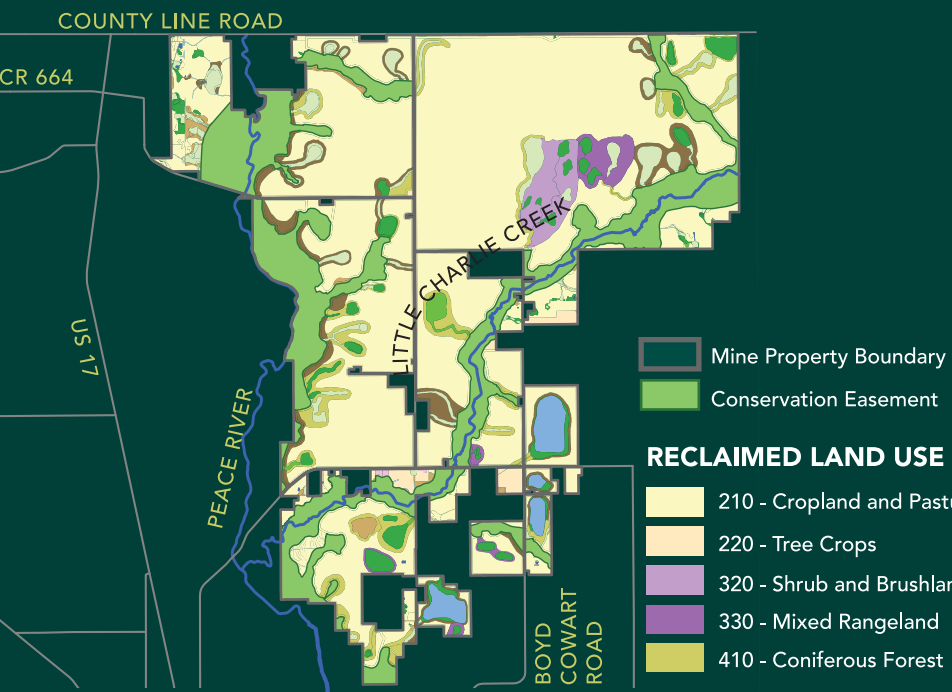
Reclaimed land is monitored to ensure it meets criteria for vegetative cover, “invasive” plant control, hydrology, drainage, function and water quality.

**PHOTO**  
Once the Payne Creek Mine, this hardwood swamp known as a “cypress dome” was reclaimed in the mid 1980’s.

## WETLANDS

### POST RECLAMATION MAP

The property in northern Hardee County, Fla, shown here was largely impacted by agricultural activities. Mosaic will mine and reclaim 71 percent of the property, while leaving important wetlands and floodplains undisturbed. Two-thirds of the preserved areas will remain in perpetual conservation easements.



**FUNCTION:**  
Reclaimed wetlands, just like natural wetlands, control the quality of water by filtering out impurities before they reach nearby waterways. Long before phosphate mining begins, environmental experts use computer models to design the hydrology of reclaimed wetlands and streams, in order to mimic the natural system. Through reclamation, Mosaic returns every acre of wetland mined back into the same type of wetland.

**WILDLIFE:**  
Many varieties of waterfowl and non-game birds, mammals, amphibians and reptiles, depend on reclaimed wetlands for feeding and resting — including the alligator, great blue heron and osprey shown here.

**PHOTO**  
Noralyn Scrub is a 462-acre xeric (dry) reclamation project that was initiated in 1985.

**PROCESS:**  
Once the designs are approved and mining is completed, sand is pumped in and the soil is graded and contoured. Organic mulch — complete with roots, sprouts, and seeds of other wetland plant species intact — is often used to promote desirable species. Dozens of species of native water-loving plants and trees are then hand planted — such as cypress, sawgrass, pickerelweed, arrowhead, fire flag and bulrush.

Habitat management plans for “listed” species (i.e. endangered, threatened or “of special concern”) are approved by wildlife agencies during the planning process.

GOPHER TORTOISE



INDIGO SNAKE



Florida’s phosphate companies plant approximately one million trees each year.

BURROWING OWLS



Only after it is approved by regulatory authorities can the reclaimed land be reconnected with the surrounding natural environment and waterways.

## XERIC COMMUNITIES

**FUNCTION:**  
Reclaimed xeric (dry) communities like oak scrub, pine flatwoods and palmetto prairies are essential wildlife habitats and important to Florida’s ecosystem.

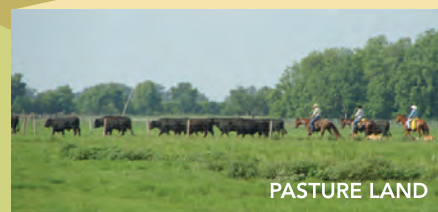
**PROCESS:**  
Once the designs are approved and mining is completed, sand is pumped in and the soil is graded and contoured. It is often capped with native top soils recycled from future mining area that contain desirable roots, sprouts and seeds of scrub species. Dozens of species of plants and trees are then hand planted – including longleaf pine, sand pine, cabbage palms, saw palmetto bushes and several species of oak trees.

**WILDLIFE:**  
Working with wildlife agencies, Mosaic successfully relocates species that are endangered, threatened or “of special concern” from minig areas to reclaimed lands. Burrows inhabited by gopher tortoises are often shared with other animals or reptiles like the Indigo snake, shown above. Tortoise burrows also offer shelter from predators and serve as nesting grounds for the Florida mouse, lizards, gopher frog, gopher scarab beetle, gopher cricket and gopher moth.



# RECLAMATION

ALL MINED LANDS ARE RETURNED TO PRODUCTIVE USES



## NOURISHING SOIL TO INCREASE CROP YIELDS: THE N-P-K WAY

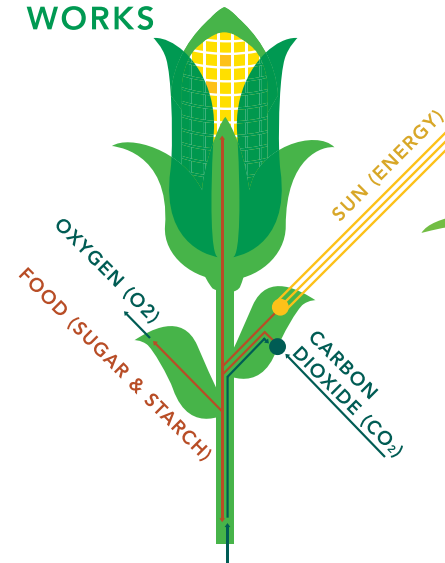
Farmers know it's important to choose just the right mix of plant nutrients to produce healthier soil and more abundant crops. At harvest time, that translates into lots more fruits and vegetables for all of us. In fact, The Fertilizer Institute estimates that the three main crop nutrients — nitrogen, phosphorus and potassium — are essential for 40 to 60 percent of world food production.

Nitrogen (N) helps plants grow taller and be as green as they can be. A plant uses nitrogen to help make protein. Without enough N, a plant becomes weak and simply won't grow very fast.

Phosphorus (P) helps the plant trap and use the sun's energy for photosynthesis and other important growth functions. Plants also need P for healthy roots and to help fight off diseases. P is also an important nutrient in animal feed because it helps livestock grow strong bones.

Potassium (K) helps crops withstand stress conditions like drought, cold, flooding, insects and diseases. K is also referred to as the "straw" nutrient, helping the plant "drink" water.

## HOW PHOTOSYNTHESIS WORKS



### FERTILIZE

Most annual crops need a lot of P early in their growth because they have a small root system.

Crop nutrients are the "foods" that plants require to manufacture (through photosynthesis) the food we eat.

Since plants can't eat food like people, they have to make their own food. Carbon dioxide, light and water are needed in order for photosynthesis to occur.

Farmers test the soil, and if nutrients are needed, fertilizer is applied in a concentrated band near the young plant's roots.

### WATER

Leaves (which are green from a special pigment called chlorophyll) capture the sunlight. Carbon dioxide enters the leaves from the air.

The water and carbon dioxide react in the presence of sunlight to produce sugar and starches, which is food for the plants.

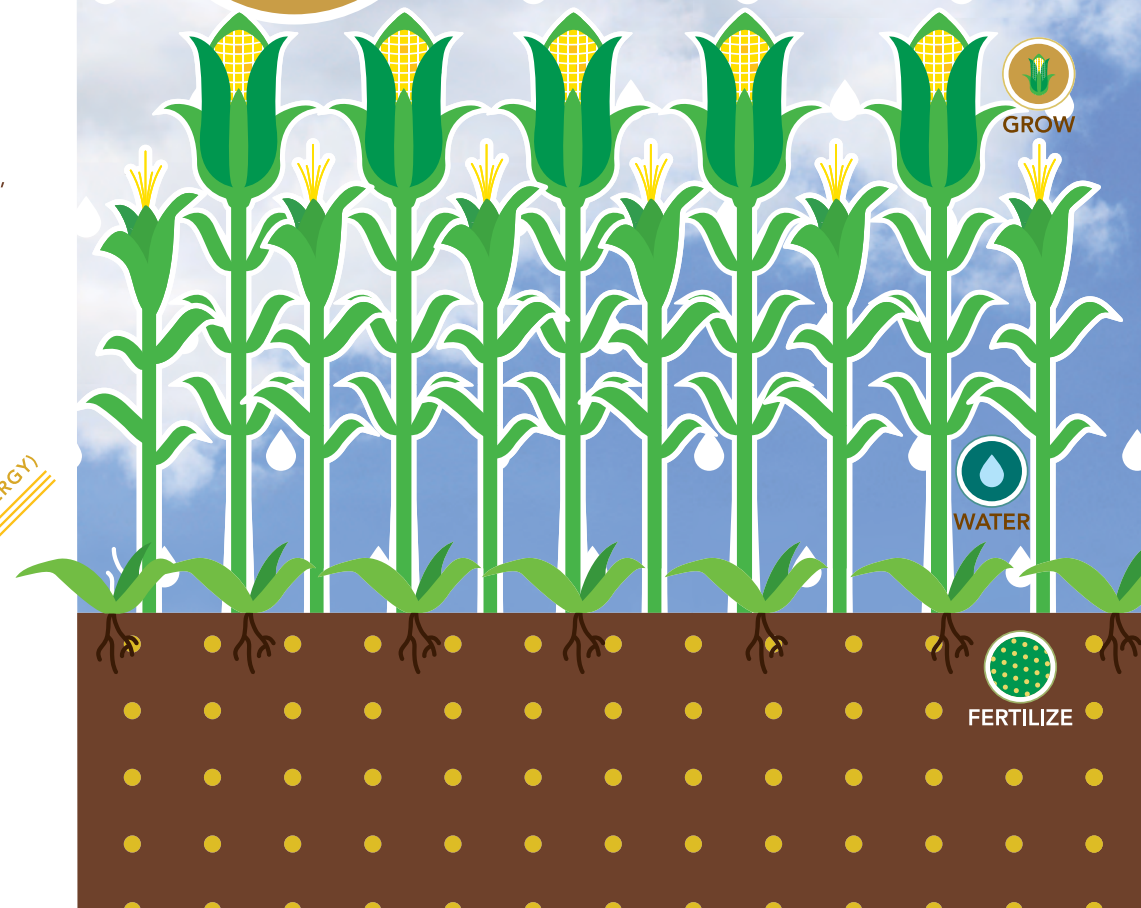
The crops are watered and the fertilizer is absorbed into the soil. The water and nutrients from the soil enter the plant through the roots.

### GROW

With the sun's energy, the water is changed into hydrogen and oxygen, and the leaves release oxygen into the air for all people and animals to breathe.

The corn silk (tassels) will form, and then a few weeks later, will turn brown and dry. Farmers pull down the husk to test if the kernels are fully formed and juicy. If so, it's time to harvest!

Plants nourished with P help reduce soil erosion and produce abundant crops.





# CROPS TO TABLE TOPS

Crops nourished and grown with the help of phosphate are harvested and delivered to your local grocery store or market. Phosphate is an essential nutrient for plants, animals and humans. Discover how much phosphorus is in your breakfast, lunch and dinner.

The recommended daily intake of phosphorus is 700 milligrams.



TWO FRIED EGGS: 192 MG OF PHOSPHORUS



CUP OF FRESH ORANGE JUICE: 42 MG OF PHOSPHORUS

## BREAKFAST



SLICE OF WHOLE WHEAT TOAST: 5 MG OF PHOSPHORUS



HAMBURGER: 201 MG OF PHOSPHORUS



CUP OF APPLE JUICE: 17 MG OF PHOSPHORUS

## LUNCH



TEN FRENCH FRIES: 41 MG OF PHOSPHORUS



ROASTED CHICKEN BREAST: 196 MG OF PHOSPHORUS



CUP OF LOWFAT MILK: 232 MG OF PHOSPHORUS

## DINNER



CUP OF BROCCOLI: 105 MG OF PHOSPHORUS

\*MG=MILLIGRAMS

### SAFETY & STEWARDSHIP

At Mosaic, we are dedicated to safety, innovation and continuous progress. Our people are always seeking new ways to improve environmental practices and safeguards, and to work safely as we produce the crop nutrients farmers need to meet the world's growing population and food requirements.

### EDUCATION & ENRICHMENT

Mosaic supports human service, agricultural and environmental organizations and programs with funding and employee volunteers. We recognize the value of education for our youth and adults, which is why we created **THE MOSAIC Express** and why we support numerous educational initiatives and local foundations throughout our operating region.



### ABOUT MOSAIC

Mosaic is the world's leading producer and marketer of concentrated phosphate and potash, two of the primary nutrients essential to help the world grow the food it needs. Our principal phosphate production facilities are located in Florida and Louisiana. Our potash production facilities are located in New Mexico, Michigan and Saskatchewan, Canada. We have widespread distribution facilities that serve customers around the world. Our company is headquartered in Plymouth, Minnesota, and its shares trade on the New York Stock Exchange under the stock symbol MOS.