Unpacked Content
With
OCS Priority Objectives Identified

Grade 6
Science

Onslow County Schools 6th Grade Science Prioritized Objectives

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6th Grade Science
At – a – Glance

First Grading Period	Second Grading Period	Third Grading Period	Fourth Grading Period
6.P.1.1	**6.E.1.1**	**6.E.2.1**	**6.L.1.1**
6.P.1.2,6. P.1.3	6.E.1.2, 6. E.1.3	6.E.2.2,6. E.2.3,6. E.2.4	
6.P.2.2			**6.L.2.3**
6.P.2.1,6. P.2.3			6.L.1.2, 6.L.2.1, 6. L.2.2
6.P.3.1			
6.P.3.2,6. P.3.3			

**** Bold indicates Priority Standard****

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Forces and Motion Matter: Properties and Change Energy: Conservation and Transfer First Nine Weeks			
Standard	Prioritized Objective	Complementary Objectives	Unpacked Content
6.P.1 Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound	6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound.		6.P.1.1 All waves transmit energy not matter. Nearly all waves travel through matter. Waves are created when a source (force) creates a vibration. Vibrations in materials set up wavelike disturbances that spread away from the source. Wave behavior can be described in terms of how fast the disturbance spreads, and in terms of the distance between successive peaks of the disturbance (the wavelength). Sound and earthquake waves are examples. These and other waves move at different speeds in different materials. Waves are moving energy. Light waves are unique in their ability to travel through a vacuum (space). Sound is a form of energy that results when vibrating materials produce waves that move through matter. Earthquakes are vibrations in the earth that release the (potential) energy stored in rocks (due to their relative positions and consequent pressure). Earthquakes create seismic waves. Compare sound waves (longitudinal waves) to light waves (transverse waves). Energy will cause materials to vibrate. These vibrations are carried as “waves” and transfer energy. Identify the basic characteristics of a transverse wave: trough, crest, amplitude, and wavelength. Identify the basic characteristics of a longitudinal (compressional) wave: amplitude, rarefaction, and compression.
		6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight.	6.P.1.2 Something can be "seen" when light waves emitted or reflected by it enter the eye. Human eyes respond to only a narrow range of wavelengths of electromagnetic waves-visible light. Differences of wavelength within that range are perceived as differences of color. Light travels in transverse waves. Light is a form of energy emitted by the Sun as well as light-producing objects on Earth. Light can be absorbed or reflected by objects depending upon the properties of the object and the type and angle of light when it hits the object. Some materials scatter light and others allow light rays to pass through, but refract the light by

		6.P.1.3 Explain the relationship. among the rate of vibration, the medium through which vibrations travel, sound and hearing.	changing its speed. The structure of the human eye can detect many colors in visible light that are reflected by objects. Investigate how the eye works: structures within the eye, functions of these structures in the eye. Optical illusions. Investigate conditions that impair vision. 6.P.1.3 Something can be "heard" when sound waves from it enter the ear. Sound is a form of energy that is caused when vibrating materials produce waves that move through matter. These waves have different characteristics such as frequency and amplitude, which will determine the properties of sound such as pitch and loudness. The form of the human ear can receive sound waves as vibrations and convert them to signals that are processed by the brain. Investigate how sound travels through different solid materials. Compare how sound travels through different states of matter. Investigate how the vocal cords work to produce sound: structure of vocal cords, function of vocal cords and conditions that affect the sound vocal cords make. Investigate how the ear works: structures within the ear, functions of those structures, conditions that affect hearing.
6.P.2 Understand the structure, classifications and physical properties of matter.	6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase.		6.P.2.2 A substance in a: Solid phase is relatively rigid, has a definite volume and shape. The atoms that comprise a solid are packed close together and are not compressible. Because all solids have some thermal energy, its atoms do vibrate. However, this movement is very small and very rapid, and cannot be observed under ordinary conditions. When heat is added a solid can become a liquid. Liquids have a definite volume, but are able to change their shape by flowing. Liquids are similar to solids in that the particles touch. However the particles are able to move around. Since particles are able to touch the densities of liquid will be close to that of a solid (water is a special exception). Since the liquid molecules can move they will take the shape of their container. When heat is added a liquid can become a gas. Gases have no definite volume or shape. If unconstrained gases will spread out indefinitely. If confined they will take the shape of their container. This is because gas particles have enough energy to overcome attractive forces. Each of the particles are well separated resulting in a very low density. Energy appears in different forms. Heat energy is in the disorderly motion of molecules. Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion so most substances expand when heated. Most substances can exist as a solid, liquid or gas depending on temperature.

		6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements. 6.P.2.3 Compare the physical properties of pure substances that are independent of the amount of matter present including density, boiling point, melting point and solubility to properties that are dependent on the amount of matter present to include volume, mass and weight.	6.P.2.1 Recognize that there are more than 100 elements that combine in a multitude of ways that make up all of the living and nonliving things that we encounter. Recognize that matter is composed of extremely small particles, too small to be seen with a classroom microscope, called atoms. Atoms have all of the properties of matter in that all atoms have mass and occupy space. Atoms are the smallest part of an element that has the chemical properties of the element. Recognize that all atoms of the same element have the same properties; i.e. all iron atoms have the same mass and occupy the same amount of space; therefore, all matter made of iron has the same properties because of the iron atoms. Also, iron atoms are different from carbon atoms or from any other element. NOTE: It is not essential for students to know the subatomic particles, for example, protons, neutrons, and electrons, which compose atoms. Atomic models do not need to be constructed or drawn. 6.P.2.3 A substance has characteristic properties such as density, a boiling point, melting point and solubility, all of which are independent of the amount of the substance and can be used to identify it. Physical properties involve things that can be measured without changing the chemical properties. Matter can undergo physical changes which affect only physical properties. Physical changes can involve changes in energy. Solubility means the amount of solute that can be dissolved in a specific volume of solvent under certain conditions. A solute's solubility depends on the chemical nature of the solvent. Another important factor that influences solubility is the temperature of the system (the solute and the solvent). The most common solvent is water. Density is a property that describes the relationship between mass and volume. Investigate the physical properties of pure substances in terms of the unique temperatures at which each substance undergoes state changes. Investigate that melting and freezing of a pure substance takes place at the same temperature and the boiling temperature is the same as the maximum condensing temperature. The temperature remains constant during state changes of pure substances.
6.P.3 Understand characteristics of energy	6.P.3.1 Illustrate the transfer of heat energy from warmer objects to cooler		6.P.3.1 Energy can be transferred from one system to another (or from a system to its environment) in different ways: • thermally, when a warmer object is in contact with a cooler one • mechanically, when two objects push or pull on each other over a distance

transfer and interactions of matter and energy.	ones using examples of conduction, radiation and convection and the effects that may result.	6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.	• electrically, when an electrical source such as a battery or generator is connected in a complete circuit to an electrical device • by electromagnetic waves. Thermal energy is transferred through a material by the collisions of atoms within the material. Heat flows through materials or across space from warm objects to cooler objects, until both objects are at equilibrium. Heat travels through solids, primarily by conduction. Heat is circulated in fluids, both liquids and gases, through the process of convection. Radiation is energy that travels across distances in the form of electromagnetic waves. Over time, thermal energy tends to spread out through a material and from one material to another if they are in contact (conduction). Thermal energy can also be transferred by means of currents in air, water, or other fluids (convection). 6.P.3.2 Light and other electromagnetic waves can warm objects. How much an object's temperature increases depends on how intense the light striking its surface is, how long the light shines on the object, and how much of the light is absorbed. When light interacts with matter it is either absorbed, transmitted, refracted) and/or reflected (scattered). An example of scattering is when the sky is blue. The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of the light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of: Visible spectrum is the portion of the electromagnetic spectrum that is visible to (can be detected by) human eyes. Electromagnetic radiation in this range of wavelengths is called visible light or simply light. Infrared light has a longer wavelength than visible light and is detected most often by its heating effect. Infrared imaging has applications in space exploration and with satellite imaging. Ultraviolet light has shorter wavelengths than visible light. These waves lengths are responsible for causing our sunburns. Most of these waves are blocked from entering Earth's atmosphere by the ozone but some days, more ultraviolet waves get through our atmosphere. Scientists have developed a UV index to help people protect themselves from these harmful ultraviolet waves. These are the types of waves used in tanning beds.

		6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).	6.P.3.3 Thermal energy is transferred through a material by the collisions of atoms within the material. Over time, thermal energy tends to spread out through a material and from one material to another if they are in contact (conduction). Thermal energy can also be transferred by means of currents in air, water, or other fluids (convection). In addition, some thermal energy in all materials is transformed into light energy and radiated into the environment by electromagnetic waves; that light energy can be transformed back into thermal energy when the electromagnetic waves strike another material. As a result, a material tends to cool down unless some other form of energy is converted to thermal energy in the material. There are some things that we use daily that we want to conduct heat easily. Most of these items are made of materials that conduct heat readily: aluminum, steel, copper. We call these materials thermal conductors. Similarly, there are things that we do not want to conduct heat (pot handles, spatula, cooking utensils) and these items are generally made of materials that limit heat transfer. We call such materials thermal insulators. Expansion joint strips in bridges allow for the bridge to expand in hot weather and not break. These same joint strips allow for the bridge to contract in cold weather and not break. Electrical energy also passes through conductors. An electrical conductor is a material through which an electrical current can flow easily. An electrical insulator is a material through which electrical current does not readily flow. Electrical conductors include most metals, while most nonmetallic solids (rubber, glass, porcelain, ceramic) are insulators.

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Earth and Universe Second Nine Weeks			
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6.E.1 Understand the earth/moon/sun system, and the properties, structures, and predictable motions of celestial bodies in the Universe.	6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses.	6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and	6.E.1.1 The number of hours of daylight and the intensity of the sunlight both vary in a predictable pattern that depends on how far north or south of the equator the place is. This variation explains why temperatures vary over the course of the year and at different locations. The Earth's moon revolves around the Earth as both go through space and revolve around the Sun. From Earth, our moon appears in a series of phases that repeat in a regular cycle. Since the rotational period of the moon is the same as its period of revolution around the Earth, the same side of the moon is always viewed from Earth. The moon and the Sun each exert a gravitational pull on the Earth. These gravitational forces can be aligned or in opposition to one another. These forces as well as the Earth rotation have a major impact on the Earth's ocean tides. Ocean tides follow a predictable pattern. The alignment of the Sun, Earth and Moon can produce shadows on the Earth or Moon resulting in Lunar or Solar Eclipses. Eclipses are also predictable. The Earth's north- south axis is tilted at an angle, as compared with the plane of its revolution around the Sun. The rotation of the Earth causes all parts of the Earth to experience periods of daylight and darkness. The revolution of the Earth around the Sun on its tilted axis along with its daily rotation causes varying lengths of daylight on the Earth's surface as well as changes in the directness and intensity of sunlight. This results in a yearly cycle of seasons for much of the Earth's surface. The tilt of the Earth's axis also results in the seasons being 'reversed' in the Northern and Southern hemispheres. (e.g.: winter in North America corresponds to summer in South America.) 6.E.1.2 Eight planets of very different size, composition, and surface features move around the sun in nearly circular orbits. Some planets have a variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets and moon show evidence of geologic activity. The earth is orbited by one moon, many artificial satellites, and debris. The Solar System consists of the Sun, planets, moons, asteroids, meteors, comets, dust, gases and primarily empty space. The Sun is the major source of heat and light for the solar system.

		gravitational force) and location to the Sun.	Everything in the solar system is under the direct influence of the Sun's gravitational pull. Planets are the largest objects in the solar system and due to the Sun's gravitational pull, they revolve around the sun with known frequencies. Atmosphere is a layer of air, made up of many layers and gases that surround the Earth's surface keeping humans safe from the sun's radiation. The Earth formed in just the right place with just the right ingredients for life to flourish. Our planet has liquid water, a breathable atmosphere and a suitable amount of sunshine to sustain life.
		6.E.1.3 Summarize space exploration and the understandings gained from them.	6.E.1.3 Space exploration has allowed humans to learn much about the workings of the solar system, the composition of planets and moons, and the effects of many types of solar radiation on the Earth and its inhabitants. In preparing for the challenges of space exploration, people have developed tools and products that have become very important in enriching our lives. Humans have traveled to the moon, landed probes on Mars and Venus, and sent probes speeding past Jupiter, Saturn and Uranus. An International Space Station, through the joint effort of many countries, was built to allow space to be studied continually. We also had the Hubble Telescope built so scientists could learn much more about the uniqueness of Earth and its place in our solar system and universe. Scientists have also learned that there are millions of galaxies in space, each containing solar systems. Many of our modern conveniences such as microwaves and hand held calculators are the result of products developed for use in the space program. The Chandra X-ray Observatory is part of NASA's fleet of "Great Observatories" along with the Hubble Space Telescope, the Spitizer Space Telescope and the now de- orbited Compton Gamma Ray Observatory. Chandra allows scientists from around the world to obtain X-ray images of exotic environments to help understand the structure and evolution of the universe. Other telescopes, such as the Fermi- Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years and may be the remnant of an eruption from a supersized black hole at the center of our galaxy.

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Earth Systems, Structures and Processes Third Nine Weeks			
Standard	Prioritized Objective	Complementary Objectives	Unpacked Content
6.E.2 Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans.	6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density.	6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth.	6.E.2.1 The earth is composed – primarily- of rock. Three-fourths of the earth's surface is covered by a relatively thin layer of water (some of it frozen), and the entire planet is surrounded by a relatively thin layer of gas we call the atmosphere. The Earth has a solid inner core that is surrounded by a liquid outer core. The inner core is a solid section of the Earth and is unattached to the mantle, being suspended by the molten outer core. The inner core is predominantly iron metal with significant amounts of the element nickel. This inner layer in mutual combination with the rotational motion of the Earth creates a dynamo effect where a force field is generated. This field is also known as Earth's magnetic field. In terms of the physical aspects of the outer core, the layer is dense but not as dense as pure molten iron. Surrounding the entire dense, metallic core is a thick, hot, convective layer called the mantle. The crust consists of many continental and oceanic plates that have slowly moved and changed positions on the globe throughout geologic time. 6.E.2.2 The earth's plates sit on a dense, hot, somewhat melted layer of the earth. The plates move very slowly, pressing against one another in some places and pulling apart in other places, sometimes scraping alongside each other as they do. Mountains form as two continental plates, or an ocean plate and a continental plate, press together. There are worldwide patterns to major geological events (such as earthquakes, volcanic eruptions, and mountain building) that coincide with plate boundaries. Lithospheric plates on the scale of continents and oceans constantly move at rates of centimeters per year as a result of movements in the mantle coupled with characteristics of the plates themselves. Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from these plate motions. The crustal plates range in thickness from a few to more than 100 kilometers. Ocean floors are the tops of thin oceanic plates that spread outward from mid-ocean rift zones; land surfaces are the tops of thicker, less- dense continental plates. Earth is made up of 4 different layers: inner core, outer core, mantle, crust. Seismologists have studied how wave energy travels through

		6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops. 6.E.2.4 Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship.	the different layers of Earth. Waves have characteristics: frequency, wavelength, amplitude and speed. During an earthquake, energy is released into the Earth as: Primary waves, Secondary waves and Surface waves. 6.E.2.3 Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, rodents, and other organisms. The upper-most layer of the continental crust is covered by soil. The ingredients in soils can vary from place to place and around the Earth. Different soils have many properties such as texture, particle size, pH, fertility and ability to hold moisture. Depending upon the combination of properties, soils have great variability in their ability to support structures and plant growth. Forces deep inside Earth and at the surface produce a slow cycle that builds, destroys, and changes the rocks in the crust. Plate movements start the rock cycle by helping to form magma, the source of igneous rocks. Plate movements also cause faulting, folding and other motions of the crust that help to form sedimentary and metamorphic rock. Minerals form as hot magma cools inside the crust, or as lava hardens on the surface. When these liquids cool to a solid state, they form crystals. When elements and compounds that are dissolved in water leave a solution, crystallization of minerals occurs. Soil is a mixture of: rock particles, minerals, decayed organic matter, water and air. Soil forms as rock is broken down by weathering and mixes with other materials on the surface. 6.E.2.4 The environment may contain dangerous levels of substances that are harmful to human beings. Therefore, the good health of individuals requires monitoring the soil, air, and water and taking steps to make these factors safe for all organisms. Evaluate ways in which human activities have affected Earth's pedosphere and the measures taken to control the impact: vegetative cover, agriculture such as (contour plowing, conservation plowing), land use, nutrient balance (crop rotation), soil as a vector. Technology, such as remote sensing, has allowed humans to better study the human impact on soil quality and erosional processes so that the soil can be protected and preserved. Over time, remote sensing information can tell us how humans are constantly changing the surface of the Earth and what impact these changes are likely to produce. Technologies can also assist in finding ways to help prevent erosion. It is important that humans be stewards of the pedosphere.

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Structures and Functions of Living Organisms/Ecosystems Fourth Nine Weeks			
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6.L.1 Understand the structures, processes and behaviors of plants that enable them to survive and reproduce.	6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense.		6.L.1.1 Animals and plants have a great variety of body plans and internal structures that contribute to their being able to make or find food and reproduce. The process of sexual reproduction in flowering plants takes place in the flower, which is a complex structure made up of several parts. Some parts of the flower are directly involved in fertilization and seed production. Other flower parts have functions in pollination. A flower is made up of six parts: petals-are leaf like, usually colorful structures arranged in a circle around the top of a flower stem. Sepals are modified leaves that encase the developing flower. They are sterile floral parts and may be either green or leaf like or composed of petal like tissue. Inside the circle of petals are the stamens. A stamen is the male reproductive structure of a flower. At the tip of the stamen is the anther. The anther produces pollen that contains sperm. At the center of the flower, attached to the top of the flower stem lie one or more pistils. The pistil is the female structure of the flower. The bottom portion of the pistil enlarges to form the ovary, a structure with one or more ovules, each containing one egg. When fertilization occurs the ovary grows into the fruit or vegetable. The length of night or dark period controls flowering.
6.L.2 Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment	6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food		6.L.2.3 The world contains a wide diversity of physical conditions, which creates a wide variety of environments: freshwater, marine, forest, desert, grasslands, mountain, and others. In any particular environment, the growth and survival of organisms depend on the physical conditions. Environmental factors that affect an organism's ability to survive in its environment, such as food availability, predators, and temperature, are limiting factors. A limiting factor is any biotic or abiotic factor that restricts the existence, number, reproduction, or distribution of organisms. For example, at high elevations, temperatures are too low, winds too strong and the soil too thin to support the growth of large trees. Vegetation is limited to small, shallow-rooted plants, mosses, ferns and lichen. Factors that limit one population in a community may also have an indirect effect on another population. For example, a lack of water could limit the growth of grass in a grassland, reducing the number of seeds produced. The population of rabbits

	through photosynthesis.	6.L.1.2 Explain the significance of the processes of photosynthesis, respiration and transpiration to the survival of green plants and other organisms. .	dependent on those seeds for food will also be reduced and the hawks depending on the rabbits will be reduced too as a result of a decrease in their food supply. Another factor for survive is the ability of an organism to withstand fluctuations in biotic and abiotic environmental factors. The limits of an organism's tolerance are reached when the organism receives too much or too little of some environmental factor. Organisms become fewer as conditions move toward either extreme of the range of tolerance (too much or too little). 6.L.1.2 One of the most general distinctions among organisms is between plants, which use sunlight to make their own food (photosynthesis) and animals, which consume energy-rich foods. Photosynthesis and cellular respiration are complementary processes. Plants carry on photosynthesis and cellular respiration where food is broken down into energy. The requirements of one process are the products of the other. **Photosynthesis:** -food accumulated -Energy from sun stored in glucose -Carbon dioxide taken in -Oxygen given off -Produces glucose -Goes on only in light -Occurs only in the presence of chlorophyll Cellular Respiration: -Food broken down -Energy of glucose released -Carbon dioxide given off -Oxygen taken in -Producers carbon dioxide and water -Goes on day and night -occurs in all living cells Leaves have an epidermis with a waxy cuticle and stomata that help prevent water loss. Guard cells that surround and control the size of the opening in stomata. The loss of water through the stomata is called transpiration. The opening and closing of guard cells regulate transpiration.

		6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain or food web (terrestrial and aquatic) from producers to consumers to decomposers.	6.L.2.1 Food provides molecules that serve as fuel and building material for all organisms. Plants use the energy from light to make sugars from carbon dioxide and water. Green plants are the producers of food that is used directly or indirectly by consumers. Plants can use the food they make immediately or store it for later use. Energy flows through ecosystems in one direction, from the sun through producers to consumers to decomposers. Matter is transferred from one organism to another and between organisms and their environments. Water, nitrogen, carbon dioxide, and oxygen are substances cycled between the living and non-living environments. Investigate how decomposers return nutrients to the environment—such as fungi on fallen logs, mold on bread. Explore the importance and role of bacteria in the guts of animals and plant roots at it relates to the recycling of matter.
		6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment.	6.L.2.2 Changes in environmental conditions can affect the survival of individual organisms and entire species. Dormancy is a period of inactivity in a mature seed prior to germination; seed remains dormant until conditions are favorable for growth and development of the new plant. Plants have mechanisms that enable them to respond to their environment. Plants grow, reproduce, and shift the position of their roots, stems and leaves in response to environmental conditions such as gravity, sunlight, temperature and day length. Tropism is a plant's turning or bending movement of an organism toward or away from an external stimulus such as light, heat or gravity. If the tropism is positive, the plant grows toward the stimulus. If the tropism is negative, the plant grows away from the stimulus. This enhances the survival rate for that plant in a given environment.