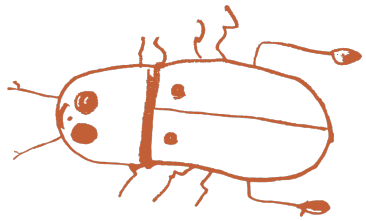
THE SCHOOL HOUSE
AMERICAN EMERGENT CURRICULUM



AEC Upper Elementary Pacing Guide

Cycle 1: Great Lessons, The Americas, The Judicial System Math, Probability, Bacteriology & Economics

February until Mid-March
Theme: Failure
Country of Focus: South America, Peru, Chile, State of Georgia, Cherokee Nation & Missouri
Stories: The Story of Bacteriology, The Story of South America, The Story of Chile, The Story of Peru, The Story of the Cherokee Cases, The Story of Decimals & Fractions

Subject	Standards (For Reference Only)	Lessons (What You Teach)
SCIENCE: Bacteriology Zoology and Botany: South American animal overview Birds and Amphibians	NGSS: 3-LS2-1. Construct an argument that some animals form groups that help members survive. NGSS: LS1.A: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts	**BACTERIOLOGY:** <u>Present The Story of Bacteriology</u> We will spend a considerable amount of time in this field. Time should be devoted every week BOTH in the regular work cycle and in Science Workshop. Bacteriology in many expert opinions will be the future of medicine. Here it serves us as the perfect science for botany, biology, mathematics, probability, geometry, nutrition and many others.

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Fruit and vegetables	(roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1) NGSS: LS1.B: Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2) NGSS: LS1.D: Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1) NGSS: LS3.A: Some young animals are similar to, but not exactly, like their parents. Some young plants are also similar to, but not exactly, like their parents. (1-LS3-1) NGSS: LS3.B: Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)	A. Introduce the Clock of Eras equating all of life on earth to a single year for demonstration. B. **Introduce the following accompanied by a 35-photo PICTURE TOUR of the relevant words and ideas below**. 1. Bacteria has been around since March: the MICROBIOCENE. And from March until October, they had the run of the planet. 2. They changed time and time again and now enrich our soil and break down pollutants. 3. **We are said to now be in the ANTHROPOCENE ERA. An era marked by the impact humans have on the planet**. 4. Microbes or Bacteria – two terms we will use interchangeably – live in the hottest places on earth, the deepest places in the sea and the coldest temperatures ever recorded. 5. They also live within us. There are twice as many microbes or bacteria in your body as there are cells. **We have 30 trillion human cells but there are probably 39 trillion bacteria living inside us as well (SHOW THIS MATHEMATICALLY – HOW MANY MILLION CUBES WOULD THIS BE, ETC.)** 6. Animals belong to a group called EUKARYOTES. This also includes every plant, fungus and alga. Eukaryotes are built from

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		cells. Cells have a central nucleus. The word Eukaryote comes from the Greek meaning "True Nut". 7. Eukaryotes also have mitochondria. These are bean-shaped and give cells their energy. 8. We all have these traits because we evolved from a single ancestor – whether created by God or by the Universe – 2 billion years ago. 9. Before that, life had only **Bacteria and Archaea** – just one cell organisms. 10. They lived separately for 2.5 billion years and then… BAM. THEY MERGED. 11. This created us: Eukaryotes. 12. This has never happened again or since as the PROBABILITY of it even happening just once was so small. It was so improbable that it has never been duplicated. 13. The Eukaryotes became big with lots of cells – like elephants and oak trees and us. 14. So big that they – we – could host the bacteria inside of us. 15. Bacteria is everywhere - on our skin, eyelashes and fingernails, but collectively all the bacteria in our body only weighs just a few pounds (show). 16. And bacteria come in all shapes and sizes (show).

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		17. Bacteria however are NOT PATHOGENS (define). The high majority DO NOT MAKE US SICK. **Many more bacteria help us than ever cause illness**. 18. They help digest food, give us vitamins, break down chemicals and destroy the bad microbes. C. **Bacteria (Microbes) is different in different parts of the body (EXPERIMENT)** ● We have come to fear microbes because of misinformation. What else do we fear due to misinformation? We might fear sharks. But seeing them is very rare. We might fear a plane crash, but the probability of a plane crash is very low. True information and SCIENCE in particular allow us to gain better information and make better choices. ● Educators should order petri/agar dishes as we will be doing 5 experiments throughout the session. This is a good resource: https://www.homesciencetools.com/biology/agar-petri-dishes/ 1. Each place on our bodies has its own microbial set. Scientists and many doctors believe that this bacterium helps that specific area of the body succeed.

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		2. CHOOSE ONE of TWO QUESTIONS BELOW and create your experiment: a. Take a bacteria sample from your right hand. Take a bacteria sample from your left hand. ALWAYS put the right-hand sample at the top of the dish to keep track. b. Take a bacteria sample from your tongue. Take a bacteria sample from plaque on your teeth. ALWAYS put the tongue sample at the top. c. Label and hang and watch over the next week. Add heat to the wall if not growing. 3. AGAR DISHES should be affixed to the WALL in Reggio Documentation form. This will allow us to monitor the transformation. 

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		4. After a week, RESEARCH why the bacteria is different, note what it looks like, note what type of bacteria it is. Write a paragraph about your hypothesis. 5. MAKE CERTAIN TO DISPOSE of the bacteria in a SAFE MANNER. **D. What do Microbes do?** 1. Microbes have MANY different functions. Keeping you healthy, keeping disease away and some microbes in your gut even tell you what to eat. Share this article and photos: https://www.scientificamerican.com/article/how-gut-bacteria-tell-their-hosts-what-to-eat/ 2. Bacteria help our skin as well: https://www.nih.gov/news-events/nih-research-matters/compound-produced-bacteria-protects-skin 3. Very cool bacteria living on the surface of our eyes: https://www.nih.gov/news-events/news-releases/eye-microbiome-trains-immune-cells-fend-pathogens-mice

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		4. There are many animals that share the same bacteria that perform certain functions. For instance, ant-eating mammals – pangolins, armadillos, anteaters, etc. – ALL have similar microbes even though they have evolved independently for 100 millions years! 5. BELLY BUTTON BACTERIA! a. Using new kits, we are going to collect belly button bacteria. https://www.amnh.org/explore/news-blogs/news-posts/microbiome-monday-the-ecosystem-in-your-belly-button b. Our hypothesis is: WILL ALL OF US HAVE THE SAME BELLY BUTTON BACTERIA? c. Collect and display the bacteria in a REGGIO display. d. AFTER the bacteria has formed, do some research using tools here: https://hudsonrobotics.com/bacterial-colony-morphology-101/ e. LEARNERS will have to identify the bacteria using INVESTIGATION. f. WRITE a small paragraph identifying the bacteria and post it with the documentation.

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		g. ALSO, identify the GEOMETRIC shapes of the bacteria. Is there any principle you've learned in geometry that you can apply to the bacteria you are seeing. **E. What Antibacterial agents kill bacteria? USE BACTERIA FROM NON-LIVING SOURCES (table, sink, etc.)** a. CREATE a list of antibacterial AGENTS: soap, garlic, iodine, alcohol, etc. How do antibacterial agents work? CREATE a KWL CHART and investigate this together. b. Follow EXPERIMENT #2 here: https://learning-center.homesciencetools.com/article/bacteria-experiment-guide/ c. DISPLAY ON THE WALL using Reggio style documentation to observe what is happening with different microbial agents. d. THIS IS PURELY OBSERVATIONAL. Observe in a SOCRATIC SESSION FOR DISCUSSION. **F. Plants and Bacteria: RHIZOSPHERE** a. The rhizosphere is the area between a plant root and the soil it grows in. It is the place where the reaction between the soil and root takes place connecting food and nutrients.

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		b. Plants are often destroyed by chemicals and stressors in the environment. For instance, chemicals meant to destroy weeds from invading a garden can also destroy the rhizosphere making it difficult for plants to take in the vitamins it needs. Rhizosphere can also be destroyed by extreme heat. c. This is evident in the Altiplano region of the Andes (SHOW ON MAP and GLOBE). Here there is a very high altitude and many plants would have difficulty growing there because of (SEE IF LEARNERS CAN FIGURE THIS OUT) colder temperatures and low water availability in addition to wind. d. HOWEVER, in the Andean Steppe in Chile, many plants including grasses survive here. e. SCIENTISTS found that there is a large presence of Alphaproteobacteria in these plants. What is Alphaproteobacteria? Where is it found on earth? Why might plants grow better if they are infused with Alphaproteobacteria **LEARNERS WILL WORK in GROUPS to conduct their final BACTERIA experiment.** 1. Choose two plant species native to Chile or Peru.

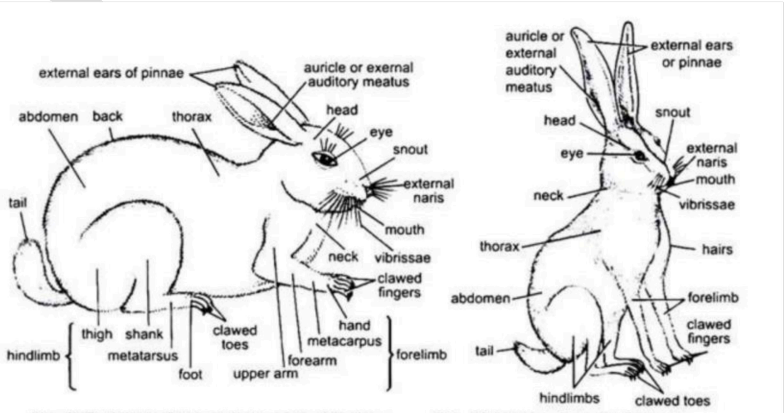
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		2. In one plant species, water and give sunlight (control). 3. In the second plant species, water, give sunlight and give Alphaproteobacteria (https://hardygro.com/products/ultrabio-1?variant=40606033379521&currency=USD&gad_source=1) **4. IF LEARNERS would like to further their experiment, DECREASE the water on both plants. OBSERVE IF THE BACTERIA in the the rhizosphere of the second plant** **helps it grow better than the control despite the lack of water.** **NOTE: Experiments C and E will take place** **during SCIENCE WORKSHOP.** **ZOOLOGY & BIOLOGY** **Here we will begin our study of South American Animals and in particular those of Chile and Peru.** **LEARNERS MAY CHOOSE any TWO ANIMALS of their choice the categories of: Birds, Amphibians, Fish, Arthropods.**

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		After the presentation of PHOTOS and FACTS below, Learners will DRAW using FINE INK PEN and THICK watercolor-style paper (4x6) their two animals. **THIS DRAWING SHOULD REPRESENT the zoological drawing of the species AS SEEN BELOW.** **<u>Please make certain that Animal Question Charts and Body Function Cards are available for these species.</u>**  **Fig. 29.2.** Rabbit. External features in side view. **Fig. 29.3.** Hare. External features. A. SOUTH AMERICAN ANIMALS:

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		1. South American animal life is particularly rich and well diversified as a result of the wide range of habitats. Moreover, because of its isolation from the rest of the world during Paleogene and Neogene times (about 66 to 2.6 million years ago), the South American landmass is characterized by considerable biological originality. Many animals belong to exclusive groups, and even at the family level the percentage of endemic forms is high. Speciation has reached a higher degree in South America than in other parts of the world. Nonetheless, there are some similarities between South America's fauna and that of other continents as a result of past geologic developments. Ancient groups of animals including mollusks, chilopods, some fishes, reptiles, and amphibians show affinities with the animal life of Africa, Australia, and New Zealand. More recent species, mostly vertebrates, migrated from North America. Animals such as armadillos, anteaters, porcupines, and opossums migrated in both directions. a. FISH: Freshwater fishes are numerous, with about 2,700 species, though they derive from only a few ancestral groups.

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		Amazonian fishes may approach 1,500 species in number. Among the dominant groups are characins (800 species), which include the flesh-eating piranha; gymnotids, South American cyprinoid fishes that include the electric eel; catfishes; cyprinodonts, a large family of small scaly-headed soft-finned fishes; and cichlids, a family consisting chiefly of fishes that somewhat resemble sunfish. b. BIRDS: Birds are represented by 89 families and some 3,000 species—a much higher figure than in Africa or Asia, which justifies the application of the name bird continent to South America. Some 25 families are endemic to the c. Neotropical region. Unique birds include rheas (large, tall, flightless birds that resemble ostriches), curassows (large arboreal birds distantly related to the domestic fowl), hoatzins (a brownish crested bird, having claws on the d. digits of the wing when young), oilbirds, motmots (bright-coloured birds related to kingfishers), jacamars (small, bright-coloured birds), toucans, manakins, and cotingas (related to manikins), and many passerine (perching) birds. Hummingbirds have evolved to fill a variety of habitat niches, with more than 120 species in Ecuador alone. Parrots, pigeons, cuckoos, tyrants (a kind of flycatcher),

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		wood hewers, and orioles are among the dominant groups. Remarkably, the proportion of non-passerine to passerine birds is greater in South America than in any other part of the world. Several species of penguins are native to southern South America, the coastal regions of Peru and Chile, and the Galapagos Islands. e. AMPHIBIANS AND REPTILES: Amphibians are well represented by caecilians (small wormlike, burrowing amphibians), salamanders, toads, and a number of varieties of frogs, including clawed frogs, the most aquatic of all. The tree frogs, arboreal amphibians, are particularly abundant through the Amazon basin and are very different from their African and Asian counterparts, although the frog faunas of Australia and South America often are strikingly alike. Reptiles include a great variety of turtles and tortoises, crocodiles, caimans (endemic crocodilians), geckos, many iguanas, teiids (a family of mostly tropical American lizards), Amphisbaena (a genus of harmless, limbless lizards), and many snakes, including boas, anacondas, colubrids (a very large family of nonvenomous snakes), coral snakes, and vipers. f. ARTHROPODS: Most South American insects, spiders, crabs, centipedes, and millipedes are found nowhere else in the world. Thousands of species, especially insects of the tropical

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		rainforest, have yet to be classified. South America has the richest array of butterflies of any continent, including the spectacularly coloured members of the Morphidae subfamily; the social insects—termites, ants, wasps, and bees—also g. are well represented. Many of the best-known arthropods (e.g., mosquitoes, sand flies, and kissing bugs) are responsible for the transmission of human diseases such as dengue and malaria. <u>Birds:</u> A. <u>Birds of Peru</u> ● Peru harbors a remarkable array of biodiversity, with particular emphasis on birds. Totaling 1,869 species, the birds of Peru represent 18.57 percent of Earth's avian species and 54.97 percent of South America's. The staggering diversity of Peru's natural environment is evident in the unique and specialized bird species that it supports. Scattered across Peru's costa (coast), sierra (highlands) and selva (jungle) are some of the world's most fascinating birds.

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		• Andean Condor: Possessing a wingspan of up to 10 feet 10 inches (3.3 m), the majestic Andean Condor (Vultur gryphus) is not only the biggest condor in the world but one of the largest • flying birds. Arguably one of the most important birds of Peru, the Andean Condor holds tremendous spiritual significance in Andean culture. Specifically, it represents the connection between the earth and the heavens. One of the South American birds of prey, the Andean Condor scavenges large pieces of carrion. You'll observe these regal Andean birds circling high above in search of their next meal. They even prefer to nest at high elevations (up to 16,000 feet, or 5,000 m, high)! Equally important, the Andean Condor is the only species of the condor family that exhibits sexual dimorphism. Both males and females are mostly black with a striking white neck ring and bald head. However, males are larger and have a red caruncle atop their heads. Due to their large size, these Peruvian birds of prey rely on strong winds to keep afloat. Therefore, they are found throughout the Andes Mountains as well as in windy coastal and desert areas. The best place to observe these massive birds in Peru is at the enchanting Colca Canyon, located three hours north of Arequipa. As the world's second-deepest canyon, the Colca Canyon is certainly worth a visit while birding Peru! • Humboldt Penguin: Seven penguin species are distributed throughout South America. However, only the Humboldt Penguin (Spheniscus humboldti) inhabits Peru. This medium-sized penguin

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		derives its name from Prussian explorer Alexander von Humboldt and the nutrient-rich Humboldt current that defines its range. The Humboldt Penguin is most closely related to the African, Galapagos and ● Magellanic penguins, the latter of whose range it overlaps in central coastal Chile. All four species exhibit similar rosy pink splotches above their eyes to varying degrees. However, this feature is most pronounced in the Humboldt Penguin. These pink patches of bare skin are also found beneath their wings and on their feet, an adaptation to their habitat's warm climate. B. <u>Birds of Chile:</u> ● Chile has an incredible diversity of birds. Did you know there are records of 3,466 DIFFERENT species here? ● Great Kiskadee (Pitangus sulphuratus): Great Kiskadees are one of the most common birds in Chile. Look for Great Kiskadees in the wild in tropical forests near clearings or bodies of water. They prefer semi-open habitats with some large trees. However, they also occur in human-altered habitats, including suburbs, orchards, and coffee plantations.The Great Kiskadee has an incredible evolutionary advantage of picking and choosing survival tactics from other species. The Kestrel, Vulture, Flycatcher, Thrush, and Kingfisher have all lent their habits to this amazing bird. For

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		example, they often hunt by catching insects in midair, but they also forage for plant material and fish. In addition, Great Kiskadees visit feeders and sometimes steal pet food, bread, bananas, and peanut butter. They make wonderful visitors to the backyard! • Saffron Finch: Look for Saffron Finches in dry, open lowlands, including towns, parks, and river valleys. They don't mind human-altered habitats, so you'll likely see them while out and about.They often visit bird feeders and are particularly fond of oats, but they also eat other seeds and insects. However, during breeding, males will aggressively defend their territory, chasing away other birds. They may even be aggressive with their mates and juveniles. • Unfortunately, due to their hostile behavior, they are also illegally used for bird fighting. • Southern Lapwing: The Southern Lapwing is a shorebird that occupies river banks, lake shores, and open grasslands. Cattle ranching has expanded grassland habitats which has benefited these birds in Chile. In fact, in recent years, their range appears to be spreading. They sometimes use human-altered habitats, including towns, soccer fields, and airports. It's not uncommon to see them in open areas in the heart of cities and suburbs! Interestingly, researchers have uncovered fossilized bones from Southern Lapwings that date to the Late Pleistocene period,

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		126,000 years ago. They've remained incredibly similar to their ancient ancestors! <u>Amphibians of South America</u> ● South America is home to a huge variety of amphibians, many of which are found in the continent's tropical rainforests. On this page we're going to meet some of South America's most amazing amphibian species. ● South America is particularly well-known for the number and diversity of its frogs. Caecilians are also well-represented on the continent. Salamanders, however, generally prefer temperate regions in the Northern Hemisphere; relatively few are found south of the Equator. None are found south of the Amazon basin. ● Among the amphibians on this list you'll find: frogs whose tadpoles develop in their parents' mouths; frogs whose internal organs can be seen through their transparent skin; and frogs whose bodies contain enough poison to kill up to twenty humans! ● The Argentine horned frog is a striking-looking amphibian, and not just because of its brightly-colored skin. It also has horn-like

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		projections above the eyes and a huge mouth, which accounts for around half of the animal's size. This South American amphibian is a voracious predator, and will eat almost anything that it can fit into that enormous mouth; even mammals and other frogs. Its huge mouth and big appetite has led to the frog's alternative name: the ornate pacman frog! • The cane toad is the world's largest 'true' toad. (True toads are members of the family Bufonidae.) Its body (not including its limbs) reaches lengths of up to 24 cm (9.4 in). The cane toad is native to Central and Northern South America. The species has also been introduced to many other parts of the world, usually as an attempt to control crop-damaging insects. This has proved to be incredibly harmful to many ecosystems; poisons secreted by the cane toad's skin can be fatal for native wildlife. • There is a third type of amphibian that isn't as widely known as either the frogs or the salamanders: caecilians. Caecilians are worm-like animals that are mostly blind. They usually live underground, but some South American caecilians live in water. • The Cayenne caecilian is an aquatic caecilian found in the Amazon rainforest. This eel-like predator emerges from its burrow at night in order to prey on insect larvae, crustaceans and small fish.

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		• Coquis are small frogs that are only found on Puerto Rico. The common coqui Eleutherodactylus coqui is a national symbol of the island. Coquis are named after the sound of their calls. There are several species of Coqui – all are of the genus Eleutherodactylus. • Darwin's frog is found in forest streams and marshes in Chile and Argentina. This South America amphibian has a fascinating life cycle. Once the larvae inside the eggs begin to move, the male takes the eggs into his mouth. The eggs then hatch and the tadpoles undergo metamorphosis in the vocal sacs of the male frog. They then exit their father's mouth as frogs! South American Fruits and Vegetables: **A. CREATE a timeline of fruits and vegetables from South American using real items.** **B. MAKE a traditional South American dish from the items you have collected. ALL should participate in cooking.** - Avocados: Centuries before they became trendy on toast, avocados were cultivated and highly regarded by people native to the region of Mexico and Central America. The Mayans even used a glyph of an avocado to represent the

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		14th month on their calendar. In modern days, California is now the largest producer of avocados in the country. - Peppers: Indigenous peoples of Mexico, Central America, and South America spiced up their meals thousands of years ago, cultivating chili peppers for both medicinal and culinary use. Peppers, both hot and sweet, are dated back to over 10,000 years ago in the Americas. The name “chili” or “chile” comes from the Nahuatl (Aztec) language. The name “pepper” was given to the crop after Christopher Columbus thought it tasted like the Asian spice known at that time as peppercorn. - Potatoes: Though potatoes are often mistaken as an Irish crop, “explorers” brought this starchy vegetable back to Europe from their expeditions. The origins of potatoes can be traced back to the Andes region of South America, where Incas cultivated the crop more than 1,800 years ago. More than a thousand cultivars of potatoes exist today, and over 99% of cultivated varieties originated from Chile. - Tomatoes: Often associated with Italian cuisine, tomatoes actually originated in South and Central America and were domesticated by the indigenous people of Mexico. The Aztecs used tomatoes in their cooking prior to the colonization by the Spanish (who subsequently exported the tomato to Europe). The Aztecs cultivated both green

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		tomatoes (tomatl in Nahuatl), aka tomatillos, and red tomatoes (xictomatl), and used them in a variety of sauces. - Tomatillos: Dating back to 800 BC, when the Aztecs domesticated them, tomatillos are considered a key ingredient in Mexican cuisine. Also called tomate verde in Mexico, the fruit of the tomatillo is generally firm, green, about the size of a large cherry, and meatier than a tomato. The fruit of the tomatillo can be used as a base for chili sauces, known generically as salsa verde (green sauce), and will help lessen the pepper's hot flavor as well as stimulate the appetite. - Blueberries: Believe it or not, this essential ingredient of muffins, pies, and pancake syrup hasn't been widely available for very long. Until the early 20th century, growing blueberries as a commercial crop was an elusive conundrum. But botanist Frank Coville and farmer/agriculture expert Elizabeth Coleman White decided to crack the code. And their research bore fruit…literally! Of course, Native Americans were well aware of the blueberry's charms, especially since it keeps longer in storage than other berries. They not only ate the berries, but they also used the roots, stems, leaves, and flowers for various medicinal purposes.

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		- Chokecherry: In real talk, a fruit with “choke” in its name doesn’t sound very appetizing. And in fact, the red or black berries of the chokecherry tree take their name from their astringent, even bitter flavor. Not only that, the leaves of the plant are poisonous to cattle and horses (though they have to eat a lot to get sick). Nevertheless, many indigenous people of North America counted on the chokecherry as a food staple and also used it in remedies for head colds, stomach pain, and many other ailments. Like other native berries, chokecherries were used by colonists to make jams, jellies, syrups, and wine. And those traditions continue to this day in some parts of the continent. Like North Dakota, where the chokecherry is the state fruit. - American persimmon: A plum-sized cousin to the larger Asian persimmon, the American persimmon has a soft, custard-like texture when ripe, and a sweet flavor with notes of honey. It’s said to be more flavorful than the Asian species. But its softness makes it difficult to ship, so Asian persimmons are far more commercially available. Which is a shame, because this American softie is also higher in vitamin C and calcium. With a growing range from New England to Florida and west to Texas, Louisiana, Oklahoma, and Kansas, the fruit was prized by many Native populations. In fact, the word persimmon is derived from

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		the Algonquian language. - Prickly pear: Abundant in Mexico (it's even on the Mexican flag), the prickly pear can also be found in the dryer regions of the southern and western U.S. We'll never know who first thought to brave the spiky spines of this native cactus. But we owe them a debt of gratitude for introducing the rest of us to the prickly pear's delicious flavor. Behind those spikes is a variable taste ranging from citrus, berry, or melon to fig or banana. Both the fruit and the fleshy pads of the cactus are edible. But getting them requires careful harvesting to avoid the plant's spines and barbed hairs. Heating the plant over an open flame before peeling is one method (that comes with cautions of its own). After that, the fruit can be peeled and sliced and eaten raw, or used in any number of ways, including for syrups, candies, jellies, salads, and beverages. Mexican cuisine is full of prickly pear recipes. According to legend, the future site of Mexico City was determined by an eagle that landed on a prickly pear.

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