Environmental Side-by-Side

2021 Knowledge and Skill Statement/Student Expectation	2021 Text	2017 Knowledge and Skill Statement/Student Expectation	2017 Text	Notes from TEA Staff
SCIENCE.ENV.1	Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to explain phenomena or design solutions using appropriate tools and models. The student is expected to:	ENV.1	Scientific processes. The student, for at least 40% of instructional time, conducts ~~hands-on~~ laboratory and field investigations ~~using~~ safe, ~~environmentally appropriate, and ethical practices~~. The student is expected to:	
		ENV.2	Scientific processes. The student ~~uses scientific methods during~~ laboratory and field investigations. The student is expected to:	
		ENV.2.E	~~follow or~~ plan and ~~implement~~ investigative ~~procedures, including making observations,~~ asking questions, ~~formulating testable hypotheses, and selecting equipment and technology~~;	
SCIENCE.ENV.1.A	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;			
SCIENCE.ENV.1.B	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	ENV.2.E	~~follow or~~ plan and ~~implement~~ investigative ~~procedures, including making observations, asking questions, formulating testable hypotheses, and selecting equipment and technology~~;	
SCIENCE.ENV.1.C	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	ENV.1.A	~~demonstrate~~ safe practices during laboratory and field investigations, ~~including~~ appropriate ~~first aid responses to accidents that could occur in the field such as insect stings, animal bites, overheating, sprains, and breaks~~; and	
SCIENCE.ENV.1.D	use appropriate tools such as meter sticks, metric rulers, pipettes, graduated cylinders, standard laboratory glassware, balances, timing devices, pH meters or probes, various data collecting probes, thermometers, calculators, computers, internet access, turbidity testing devices, hand magnifiers, work and disposable gloves, compasses, first aid kits, binoculars, field guides, water quality test kits or probes, soil test kits or probes, 30 meter tape measures, tarps, shovels, trowels, screens, buckets, rock and mineral samples equipment, air quality testing devices, cameras, flow meters, Global Positioning System (GPS) units, Geographic Information System (GIS) software, computer models, densiometers, spectrophotometers, stereomicroscopes, compound microscopes, clinometers, field journals, various prepared slides, hand lenses, hot plates, Petri dishes, sampling nets, waders, leveling grade rods (Jason sticks), protractors, inclination and height distance calculators, samples of biological specimens or structures, core sampling equipment, and kick nets;	ENV.2.G	~~demonstrate the~~ use ~~of course apparatuses, equipment, techniques, and procedures, including~~ meter sticks, rulers, pipettes, graduated cylinders, triple beam balances, timing devices, pH meters or probes, thermometers, calculators, computers, Internet access, turbidity testing devices, hand magnifiers, work and disposable gloves, compasses, first aid kits, binoculars, field guides, water quality test kits or probes, soil test kits or probes, ~~100-foot appraiser's tapes~~, tarps, shovels, trowels, screens, buckets, and rock and mineral samples;	
		ENV.2.H	use ~~a wide variety of additional course apparatuses, equipment, techniques, materials, and procedures as~~ appropriate such as air quality testing devices, cameras, flow meters, Global Positioning System (GPS) units, Geographic Information System (GIS) software, computer models, densiometers, clinometers, and field journals;	
SCIENCE.ENV.1.E	collect quantitative data using the International System of Units (SI) and qualitative data as evidence;	ENV.2.F	collect data ~~individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range~~;	
SCIENCE.ENV.1.F	organize quantitative and qualitative data using scatter plots, line graphs, bar graphs, charts, data tables, digital tools, diagrams, scientific drawings, and student-prepared models;			
SCIENCE.ENV.1.G	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	ENV.2.I	~~organize, analyze, evaluate, build~~ models, ~~make inferences, and predict trends from data~~;	

SCIENCE.ENV.1.H	distinguish between scientific hypotheses, theories, and laws.	**ENV.2.B**	~~know that~~ scientific hypotheses ~~are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories~~;	
		ENV.2.C	~~know that~~ scientific theories ~~are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but may be subject to change as new areas of science and new technologies are developed~~;	
		ENV.2.D	distinguish between scientific hypotheses and scientific theories;	
		~~**ENV.1.B**~~	~~demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.~~	
		~~**ENV.2.B**~~	~~know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;~~	
SCIENCE.ENV.2	Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:			
SCIENCE.ENV.2.A	identify advantages and limitations of models such as their size, scale, properties, and materials;	**ENV.2.I**	~~organize, analyze, evaluate, build~~ models, ~~make inferences, and predict trends from data~~;	
SCIENCE.ENV.2.B	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	**ENV.2.F**	~~collect~~ data ~~individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range~~;	
SCIENCE.ENV.2.C	use mathematical calculations to assess quantitative relationships in data; and	**ENV.2.J**	~~perform~~ calculations ~~using dimensional analysis, significant digits, and scientific notation~~; and	
SCIENCE.ENV.2.D	evaluate experimental and engineering designs.			
SCIENCE.ENV.3	Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	~~**ENV.3**~~	~~Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:~~	
SCIENCE.ENV.3.A	develop explanations and propose solutions supported by data and models consistent with scientific ideas, principles, and theories;			
SCIENCE.ENV.3.B	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	**ENV.2.K**	communicate ~~valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports~~.	Students are now being asked to communicate not only as scientists but also as engineers.
SCIENCE.ENV.3.C	engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.			
SCIENCE.ENV.4	Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:			
SCIENCE.ENV.4.A	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;	**ENV.3.A**	~~in all fields of science~~, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, ~~including examining all sides of scientific evidence of those scientific explanations~~, so as to encourage critical thinking by the student;	

SCIENCE.ENV.4.B	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and	**ENV.3.D**	~~evaluate~~ the impact of research on scientific thought, society, ~~and the environment~~;	
		ENV.3.F	research ~~and describe the history of environmental science and contributions of~~ scientists.	
SCIENCE.ENV.4.C	research and explore resources such as museums, planetariums, observatories, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.	**ENV.3.E**	~~describe the connection between environmental science and future~~ careers; and	
		~~**ENV.3**~~	~~Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:~~	
		~~**ENV.3.B**~~	~~communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;~~	
		~~**ENV.3.C**~~	~~draw inferences based on data related to promotional materials for products and services;~~	
SCIENCE.ENV.5	Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:	**ENV.4**	Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:	
SCIENCE.ENV.5A	identify native plants and animals within a local ecosystem and compare their roles to those of plants and animals in other biomes, including aquatic, grassland, forest, desert, and tundra;	**ENV.4.A**	identify native plants and animals ~~using a dichotomous key~~;	
		ENV.4.B	~~assess~~ the role ~~of~~ native plants and animals within a local ecosystem and compare ~~them~~ to plants and animals in ~~ecosystems within four~~ other biomes;	
SCIENCE.ENV.5B	explain the cycling of water, phosphorus, carbon, silicon, and nitrogen through ecosystems, including sinks, and the human interactions that alter these cycles using tools such as models;	**ENV.4.C**	~~diagram abiotic~~ cycles, ~~including the rock, hydrologic,~~ carbon, and nitrogen cycles;	
SCIENCE.ENV.5C	evaluate the effects of fluctuations in abiotic factors on local ecosystems and local biomes;	**ENV.4.D**	~~make observations and compile data about~~ fluctuations in ~~abiotic cycles and evaluate the effects of~~ abiotic factors on local ecosystems and local biomes;	
SCIENCE.ENV.5D	measure the concentration of dissolved substances such as dissolved oxygen, chlorides, and nitrates and describe their impacts on an ecosystem;	**ENV.4.E**	measure the concentration of ~~solute, solvent, and solubility of~~ dissolved substances such as dissolved oxygen, chlorides, and nitrates and describe their impact on an ecosystem;	
SCIENCE.ENV.5E	use models to predict how the introduction of an invasive species may alter the food chain and affect existing populations in an ecosystem;	**ENV.4.F**	predict how the introduction ~~or removal~~ of an invasive species may alter the food chain and affect existing populations in an ecosystem;	
SCIENCE.ENV.5F	use models to predict how species extinction may alter the food chain and affect existing populations in an ecosystem; and	**ENV.4.G**	predict how species extinction may alter the food chain and affect existing populations in an ecosystem; and	
SCIENCE.ENV.5G	predict changes that may occur in an ecosystem if genetic diversity is increased or decreased.	**ENV.4.H**	~~research and explain the causes of species diversity and~~ predict changes that may occur in an ecosystem if ~~species and~~ genetic diversity is increased or ~~reduced~~.	
SCIENCE.ENV.6	Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:	**ENV.5**	Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:	
SCIENCE.ENV.6A	compare and contrast land use and management methods and how they affect land attributes such as fertility, productivity, economic value, and ecological stability;	**ENV.5.A**	~~summarize~~ methods ~~of~~ land use and management and ~~describe its~~ effects on land fertility;	

SCIENCE.ENV.6B	relate how water sources, management, and conservation affect water uses and quality;	**ENV.5.B**	~~identify~~ source, use, quality, management, and conservation of water;	
SCIENCE.ENV.6C	document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability;	**ENV.5.C**	document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability;	
SCIENCE.ENV.6D	identify how changes in limiting resources such as water, food, and energy affect local ecosystems;	**ENV.5.D**	identify ~~renewable and non-renewable resources that must come from outside an~~ ecosystem such as food, water, ~~lumber~~, and energy;	
SCIENCE.ENV.6E	analyze and evaluate the economic significance and interdependence of resources within the local environmental system; and	**ENV.5.E**	analyze and evaluate the economic significance and interdependence of resources within the environmental system; and	
SCIENCE.ENV.6F	evaluate the impact of waste management methods such as reduction, reuse, recycling, upcycling, and composting on resource availability in the local environment.	**ENV.5.F**	evaluate the impact of waste management methods such as reduction, reuse, recycling, and composting on resource availability.	
SCIENCE.ENV.7	Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:	**ENV.6**	Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:	
SCIENCE.ENV.7A	describe the interactions between the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere;	**ENV.6.A**	~~define and identify~~ the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions ~~among them;~~	
SCIENCE.ENV.7B	relate biogeochemical cycles to the flow of energy in ecosystems, including energy sinks, such as oil, natural gas, and coal deposits;			
SCIENCE.ENV.7C	explain the flow of heat energy in an ecosystem, including conduction, convection, and radiation; and	**ENV.6.C**	explain the flow of energy in an ecosystem, including conduction, convection, and radiation;	
SCIENCE.ENV.7D	identify and describe how energy is used, transformed, and conserved as it flows through ecosystems.	**ENV.6.D**	~~investigate and explain the effects of~~ energy transformations ~~in terms of the laws of thermodynamics within an~~ ecosystem; and	
		~~**ENV.6.B**~~	~~describe and compare renewable and non-renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind;~~	
		~~**ENV.6.E**~~	~~investigate and identify energy interactions in an ecosystem.~~	
SCIENCE.ENV.8	Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:	**ENV.7**	Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:	
SCIENCE.ENV.8A	compare exponential and logistical population growth using graphical representations;	**ENV.7.B**	~~calculate birth rates and~~ exponential growth of populations;	
SCIENCE.ENV.8B	identify factors that may alter carrying capacity such as disease; natural disaster; available food, water, and livable space; habitat fragmentation; and periodic changes in weather;	**ENV.7.A**	~~relate~~ carrying capacity ~~to population dynamics~~;	
SCIENCE.ENV.8C	calculate changes in population size in ecosystems; and	**ENV.7.B**	calculate ~~birth rates and exponential growth of~~ populations;	
SCIENCE.ENV.8D	analyze and make predictions about the impact on populations of geographic locales due to diseases, birth and death rates, urbanization, and natural events such as migration and seasonal changes.	**ENV.7.D**	analyze and make predictions about the impact on populations of geographic locales due to diseases, birth and death rates, urbanization, and natural events such as migration and seasonal changes.	
		~~**ENV.7.C**~~	~~analyze and predict the effects of non-renewable resource depletion; and~~	The effects of nonrenewable resource depletion are covered in Grade 6.
SCIENCE.ENV.9	Science concepts. The student knows that environments change naturally. The student is expected to:	**ENV.8**	Science concepts. The student knows that environments change naturally. The student is expected to:	

SCIENCE.ENV.9A	analyze and describe how natural events such as tectonic movement, volcanic events, fires, tornadoes, hurricanes, flooding, and tsunamis affect natural populations;	**ENV.8.A**	analyze and describe ~~the effects on areas impacted by~~ natural events such as tectonic movement, volcanic events, fires, tornadoes, hurricanes, flooding, tsunamis, and population ~~growth~~;	
SCIENCE.ENV.9B	explain how regional changes in the environment may have global effects;	**ENV.8.B**	explain how regional changes in the environment may have ~~a~~ global effect;	
SCIENCE.ENV.9C	examine how natural processes such as succession and feedback loops can restore habitats and ecosystems;	**ENV.8.C**	examine how natural processes such as succession and feedback loops restore habitats and ecosystems;	
SCIENCE.ENV.9D	describe how temperature inversions have short-term and long-term effects, including El Niño and La Niña oscillations, ice cap and glacial melting, and changes in ocean surface temperatures; and	**ENV.8.D**	describe how temperature inversions ~~impact weather conditions~~, including El Niño and La Niña oscillations; and	
SCIENCE.ENV.9E	analyze the impact of natural global climate change on ice caps, glaciers, ocean currents, and surface temperatures.	**ENV.8E**	analyze the impact of ~~temperature inversions~~ on global ~~warming~~, ice cap and glacial ~~melting, and changes in~~ ocean currents and surface temperatures.	
SCIENCE.ENV.10	Science concepts. The student knows how humans impact environmental systems through emissions and pollutants. The student is expected to:	**ENV.9**	Science concepts. The student knows ~~the~~ impact ~~of~~ human ~~activities on the~~ environment. The student is expected to:	
SCIENCE.ENV.10A	identify sources of emissions in air, soil, and water, including point and nonpoint sources;	**ENV.9.A**	identify ~~causes~~ of air, soil, and water ~~pollution~~, including point and nonpoint sources;	
SCIENCE.ENV.10B	distinguish how an emission becomes a pollutant based on its concentration, toxicity, reactivity, and location within the environment;	~~**ENV.9.C**~~	~~examine the~~ concentrations ~~of air, soil, and water~~ pollutants ~~using appropriate units;~~	
SCIENCE.ENV.10C	investigate the effects of pollutants such as chlorofluorocarbons, greenhouse gases, pesticide runoff, nuclear waste, aerosols, metallic ions, and heavy metals, as well as thermal, light, and noise pollution;	**ENV.9.B**	investigate the ~~types of air, soil, and water~~ pollution such as chlorofluorocarbons, ~~carbon dioxide, pH,~~ pesticide runoff, ~~thermal variations,~~ metallic ions, heavy metals, and nuclear waste;	
		ENV.9.D	~~describe~~ the effect of pollution ~~on global warming, glacial and ice cap melting,~~ greenhouse ~~effect, ozone layer, and aquatic viability~~;	
SCIENCE.ENV.10D	evaluate indicators of air, soil, and water quality against regulatory standards to determine the health of an ecosystem; and			
SCIENCE.ENV.10E	distinguish between the causes and effects of global warming and ozone depletion, including the causes, the chemicals involved, the atmospheric layer, the environmental effects, the human health effects, and the relevant wavelengths on the electromagnetic spectrum (IR and UV).	**ENV.9.H**	~~analyze and evaluate different views on the existence~~ of global warming;	
SCIENCE.ENV.11	Science concepts. The student understands how individual and collective actions impact environmental systems. The student is expected to:			
SCIENCE.ENV.11A	evaluate the negative effects of human activities on the environment, including overhunting, overfishing, ecotourism, all-terrain vehicles, and personal watercraft;	**ENV.9.E**	evaluate the effect of human activities, including habitat restoration projects, species preservation efforts, nature conservancy groups, hunting, fishing, ecotourism, all terrain vehicles, and ~~small~~ personal watercraft, on the environment;	
SCIENCE.ENV.11B	evaluate the positive effects of human activities on the environment, including habitat restoration projects, species preservation efforts, nature conservancy groups, game and wildlife management, and ecotourism; and			
SCIENCE.ENV.11C	research the advantages and disadvantages of "going green" such as organic gardening and farming, natural methods of pest control, hydroponics, xeriscaping, energy-efficient homes and appliances, and hybrid cars.	**ENV.9.J**	research the advantages and disadvantages of "going green" such as organic gardening and farming, natural methods of pest control, hydroponics, xeriscaping, energy-efficient homes and appliances, and hybrid cars;	
SCIENCE.ENV.12	Science concepts. The student understands how ethics and economic priorities influence environmental decisions. The student is expected to:			

SCIENCE.ENV.12A	evaluate cost-benefit trade-offs of commercial activities such as municipal development, food production, deforestation, over-harvesting, mining, and use of renewable and non-renewable energy sources;	**ENV.9.F**	evaluate cost-benefit trade-offs of commercial activities such as municipal development, ~~farming~~, deforestation, over-harvesting, and mining;	
SCIENCE.ENV.12B	evaluate the economic impacts of individual actions on the environment such as overbuilding, habitat destruction, poaching, and improper waste disposal;			
SCIENCE.ENV.12C	analyze how ethical beliefs influence environmental scientific and engineering practices such as methods for food production, water distribution, energy production, and the extraction of minerals;	**ENV.9.G**	analyze how ethical beliefs ~~can be used to~~ influence scientific practices such as methods for ~~increasing~~ food production;	
SCIENCE.ENV.12D	discuss the impact of research and technology on social ethics and legal practices in situations such as the design of new buildings, recycling, or emission standards; and	**ENV.9.I**	discuss the impact of research and technology on social ethics and legal practices in situations such as the design of new buildings, recycling, or emission standards;	
SCIENCE.ENV.12E	argue from evidence whether or not a healthy economy and a healthy environment are mutually exclusive.			
SCIENCE.ENV.13	Science concepts. The student knows how legislation mediates human impacts on the environment. The student is expected to:			
SCIENCE.ENV.13A	describe past and present state and national legislation, including Texas automobile emissions regulations, the National Park Service Act, the Clean Air Act, the Clean Water Act, the Soil and Water Resources Conservation Act, and the Endangered Species Act; and	**ENV.9.K**	~~analyze~~ past and present local, state, and national legislation, including Texas automobile emissions regulations, the National Park Service Act, the Clean Air Act, the Clean Water Act, the Soil and Water Resources Conservation Act, and the Endangered Species Act; and	
SCIENCE.ENV.13B	evaluate the goals and effectiveness of past and present international agreements such as the environmental Antarctic Treaty System, the Montreal Protocol, the Kyoto Protocol, and the Paris Climate Accord.	**ENV.9.L**	~~analyze~~ past and present international ~~treaties and protocols~~ such as the environmental Antarctic Treaty System, Montreal Protocol, and Kyoto Protocol.	
KEY	**Blue double underline: indicates content new to the grade level**		**~~Orange strike through: indicates content was deleted~~**	