General Unit Information

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Title of Unit:	Population Changes in Ecosystems
Grade Level:	Middle School
Timeframe: [1	
Summary:	In this unit we will study the coral reef bleaching phenomenon to better understand how disruptions impact an ecosystem. We will also study how organisms interact with their environment, and what they need for survival. Additionally, we will study different types of interactions and the effects those interactions have within an ecosystem. The patterns, cause and effect relationships, and the stability and change concepts we explore will help us make connections across ecosystems.

Standards [2]

Science and Engineering Practices (SEPs)

featured?		*App. F. element(s)*
	1. Asking questions (for science) and defining problems (for engineering)	✔
	2. Developing and using models	✔
	3. Planning and carrying out investigations	
	4. Analyzing and interpreting data	✔
	5. Using mathematics and computational thinking	✔
	6. Constructing explanations (for science) and designing solutions (for engineering)	
	7. Engaging in argument from evidence	✔
	8. Obtaining, evaluating, and communicating information	✔

Crosscutting Concepts (CCCs)

featured?		*App. G. element(s)*
	1. Patterns	✔
	2. Cause and effect: Mechanism and explanation	✔
	3. Scale, proportion, and quantity	
	4. Systems and system models	
	5. Energy and matter: Flows, cycles, and conservation	
	6. Structure and function	
	7. Stability and change	✔

DCI Component Ideas

code	*title*	*NRC Framework Grade Band Endpoint language*

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Performance Expectation(s) (PEs)

PEs	*Which ones are fully addressed? ...partially addressed?*
MS-LS2-1.Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.] MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]	

Nature of Science Connections

featured?	*NOS Area*	*App. H. element(s)*
	Scientific Investigations Use a Variety of Methods	
	Scientific Knowledge is Based on Empirical Evidence	
	Scientific Knowledge is Open to Revision in Light of New Evidence	
	Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	
	Science is a Way of Knowing	
	Scientific Knowledge Assumes an Order and Consistency in Natural Systems	
	Science is a Human Endeavor	
	Science Addresses Questions About the Natural and Material World	

Links Among Engineering, Technology, Science, and Society:

featured?		*NRC Framework Grade Band Endpoint language*
	ETS2.A: Interdependence of Science, Engineering, and Technology	
	ETS2.B: Influence of Engineering, Tech., and Science on Society and the Natural World	

CCSS ELA Standards:

code	*title*	*language*

CCSS Math Content Standards:

code	*title*	*language*

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CCSS Standards for Mathematical Practice:

code	*title*	*language*

Other Standards (e.g., local competencies)

code	*title*	*language*

Lesson/Learning Sequence Summaries

Anchoring Unit Phenomenon or Problem:		Coral reef interactions--stablity and change
Lesson	*Length*	*Summary*
1	1 class period	Students will be introduced to the phenomenon and ask questions that will help guide the unit.
2		
3	1-2 class periods	Students will think about what impacts lionfish might have on the Florida Keys reefs. Students will also think broadly about how a small disruption can have a big impact on an ecosystem.
4	2 class periods	Students will begin to think about how one change can have an impact on the entire ecosystem. This disruption is not due to an invasive species so it will expand on students' prior learning. They will continue to think about changes happening to the coral reef ecosystem and what could happen as a result.
5	1-2 class periods	Students will have a better understanding of the specific interactions in the coral reef ecosystem.
6	1 class period	
7	1 day	
8		
9	5 days	Students will explore the phenomenon of Lyme Disease growing across the United States and the reasons why this disruption is a problem to the overall human ecosystem.
10	8-10 class periods	This lesson will be the last lesson before students complete their final model. Students should be able to make a correlation between temperature and coral bleaching.

Lesson/Learning Sequence 1

Goals	*Details*
Important Ideas	Populations in an ecoystem can be disrupted, and we don't always know why.
Essential Questions	What would cause a disruption? What kind of disruptions exist?

Standards	SEP: Asking Questions and Defining Problems Developing and using Models CCC: Cause & Effect Systems & Systems Models Stability & Change
Lesson-Level Performance Expectations	Students will ask questions and create an initial model based on observations to help them to figure out cause and effect relationships of a disruption/change in a coral reef ecosystem.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Coral reefs around the world have been changing drastically.
What Questions We Have About That Phenomenon (or Problem)	What are coral reefs? Where are coral reefs? Why are coral reefs changing? How are they changing? What causes these changes? How fast are these changes? Can they be reversed?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We observed what is happening to coral reefs in a video and photos. We then came up with a lot of questions that we will answer of the course of the week/unit
What Questions or Challenges We Still Have at the End of the Lesson	What are coral and/or reefs? Why are coral reefs changing? How are they changing? What causes these changes? How fast are these changes? Can they be reversed? Is there something that is happening in the environment?
Lesson Phase	*Description*
Engage	Students will view short videos about recent detrimental changes to coral reefs. Video of individual coral- https://www.youtube.com/watch?v=7bjamypAq9Y bleaching over a year- https://www.youtube.com/watch?v=hP70qch5dlM or choose from playlist: https://www.youtube.com/playlist?list=PLL6gLMB1TjY8fQS7bdvdwxiNvDl0pTSsL
Explore	Students will work in pairs, small groups and then in whole group to generate questions about coral, coral reefs and why they might be in trouble. Strategies might include "QFT" and "Think-Pair-Share".
Explain	Students will create an initial model that attempts to explain why coral reefs in many areas around the world are in decline.
Elaborate	(End of unit) students will come back to the phenomenon to complete their final model. They will add labels, appropriate definitions, and explanations to their final models.
Evaluate - Formative	Initial model
Evaluate - Summative	Final model

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Lesson/Learning Sequence 2	
Goals	*Details*
Important Ideas	Organisms interact with the living and nonliving factors in their environment
Essential Questions	What types of interactions are there between living things? What nonliving factors have an impact on organisms and populations? What if there is too much or too little of a factor?

Standards	SEP: Analyze and interpret data (to provide evidence for phenomena) Make and revise model(that describe phenomena and unobservable mechanisms) CCC: Cause & Effect (relationships may be used to predict phenomena in natural systems) CCSS-M: MP 4 Model with Mathematics, MP 3 Construct viable arguments
Lesson-Level Performance Expectations	Students will analyze data and use reasoning to make and revise a model that explains that different kinds of changes are correlated with changes in populations and that even small changes in an abiotic factor could cause large changes in a population.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	The population of Townsend Ground Squirrels dropped dramatically.
What Questions We Have About That Phenomenon (or Problem)	Did the falcons eat all of the ground squirrels? Was there some kind of disaster (exs: fire, drought, flood) that killed them?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We analyzed graphs of ground squirrel and falcon populations and some abiotic factors to figure out why the ground squirrel population plummeted.
What Questions or Challenges We Still Have at the End of the Lesson	Do corals change because of the seasons? How do seasons affect how animals can get food? Are all animals affected this much by changes in temperature?
Lesson Phase	*Description*
Engage	
Explore	
Explain	
Elaborate	
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 3	
Goals	*Details*
Important Ideas	Growth of organisms and population increases are limited by access to resources. Populations can grow when access to resources is not limited.
Essential Questions	What are some resources that organisms/populations need to survive and grow? Do organisms need different resources? In what amount are those resources needed? Do different populations increase or decrease at different rates?

Standards	SEP: Analyzing and Interpreting Data Asking questions and defining problems Constructing Explanations CCC: Patterns Cause & Effect Systems & System models Stability & Change
Lesson-Level Performance Expectations	1.Students will analyze and interpret migration pattern data to formulate questions about how access to resources have caused population changes within the system. 2.Students will construct explanations about cause and effect relationships regarding changes in population migration patterns.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Invasive Lionfish are moving north lionfish migration- now moving up Atlantic
What Questions We Have About That Phenomenon (or Problem)	Why have the migration patterns changed? How has this affected populations? What impact could this have on the reef?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We found out that lionfish are moving to new areas because of warmer temperatures. Due to an abundance of resources lionfish are increasing in population. Other animals in the reef are suffering.
What Questions or Challenges We Still Have at the End of the Lesson	What impacts will lionfish have on reefs? What will happen to the the animals they compete with?
Lesson Phase	*Description*
Engage	Students will watch a short video introducing them to the lionfish invasion. They will engage in questioning and discussion.
Explore	Students will work together to look at lionfish data maps and a timelapse map of lionfish population increasing and moving further north.
Explain	Students will attempt to explain what they are seeing in the data based on what they saw in the video (and/or additional research). Students will explain the following: "Are lionfish a problem? "What could be leading to such an increase in populations?" "Why are lionfish moving north, would we expect this to continue?"
Elaborate	Students will then learn a little bit about sea lamprey and asian carp. Students will apply what they learn from these new situations to the lionfish to make predictions and provide an argument. Students will finish their information gathering by reading the Newsela article : "A Deautiful but Deadly Predator Stalks the Gulf of Mexico". Lastly, students will present an argument on what they think should be done. They may also research what is already being done and if they think that is a reasonable course of action.
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 4

Goals	*Details*
Important Ideas	Organisms and populations with similar requirements for basic resources compete with each other, and this may limit their growth and reproduction.

Essential Questions	How do organisms compete for resources? What happens if there are not enough resources? Are some resources more important than others? Can an organism survive but not be able to successfully reproduce? Can an organism survive, but not grow? What happens with an abundance of resources? What happens if organisms don't have constraints on reproduction?
Standards	SEP: Analyzing and interpreting data Developing and using models Obtaining, evaluating, and communicating information CCC: Patterns Cause & Effect Stability & Change
Lesson-Level Performance Expectations	Students will be able to identify cause & effect relationships between competing populations of organisms at YNP. Students will begin to recognize patterns of interactions between organisms in different ecosystems.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Yellowstone wolves had been extirpated, and so elk were overpopulated causing major imbalance. Wolves were reintroduced, which restored balance. Even the water got cleaner!
What Questions We Have About That Phenomenon (or Problem)	Why did different animal population increase/decrease? Why did plant populations change? What animals competed for the same resources?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We analyzed data that showed the populations of many types of YNP plants and animals, and look for cause & effect relationships.
What Questions or Challenges We Still Have at the End of the Lesson	Do the predator-prey population interactions we studied happen in all ecosystem? Are there other types of interactions? Do all ecosystems have these same interactions?
Lesson Phase	*Description*
Engage	Students will learn that Yellowstone wolves were at one time completely removed from the park and then reintroduced in 1995. Students will generate questions about the phenomenon and discuss as a group.
Explore	Students will begin to explore population graphs regarding the yellowstone phenomenon. Students will duscuss their reasoning with classmates using evidence from the graphs.
Explain	Students will apply their initial understanding to the willow tree and beaver situation.
Elaborate	Students will take all their findings, as well as the information on bison to make a reasonable conclusion about the bison population change.
Evaluate - Formative	Bison argument
Evaluate - Summative	

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Lesson/Learning Sequence 5	
Goals	*Details*
Important Ideas	Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared

Essential Questions	What types of interactions are there between living things? How are interactions among living things the same in oceans and deserts? Do relationship roles change? (how or why?) Can mutually beneficial relationships change? What if one species doesn't need it? How do populations of organisms affect other lifing things in the environment? Why are patterns of interactions shared when species varies? How can interactions between living populations affect nonliving things?
Standards	SEP: Obtaining, evaluating, and communicating information Constructing explanations CCC: Patterns Cause & Effect Stability & Change
Lesson-Level Performance Expectations	Students will be able to obtain information and construct explanations about Coral Reefs using their observations from the online exploration to determine patterns of cause and effect and what types of interactions change the stability of the ecosystem.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Coral Reef Connections Organizer
What Questions We Have About That Phenomenon (or Problem)	What are some relationships in the coral reef? What are mutually beneficial relationships? How do the organisms interact with each other?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We used an online exploration of a coral reef to observe and learn about the relationships between organisms. We went back to revise our models.
What Questions or Challenges We Still Have at the End of the Lesson	What are the organisms that are mutualistic in a coral reef? What if one of the organisms dies? Does the other one die, too? Do all ecosystems have some mutualistic relationships?
Lesson Phase	*Description*
Engage	
Explore	
Explain	
Elaborate	
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 6	
Goals	*Details*
Important Ideas	Mutually beneficial interactions may become so interdependent that each organism requires the other for survival.
Essential Questions	What happens when an organism that requires another for survival dies? What kind of interactions are interdependent? How many different organisms may be involved in an interdependet interaction? How do mutually beneficial become some interdependent? What patterns are repeated between species?

Standards	SEP: Developing and using Models Obtaining, evaluating, and communicating information CCC: Patterns Cause & Effect Structure & Function Stability & Change
Lesson-Level Performance Expectations	Students will obtain and evaluate information to analyze the structure and function of the coral and zooxanthellae relationship. Students will use their learning to show cause & effect of change to revise their initial models.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Exploration of coral and zooxanthellae and model revision
What Questions We Have About That Phenomenon (or Problem)	Why does the coral need the zooxanthellae? Does the zooxanthellae need the coral? What happens if one dies?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We figured out that coral needs zooxanthellae and without it will eventually die.
What Questions or Challenges We Still Have at the End of the Lesson	Are there other relationships that coral is involved in?
Lesson Phase	*Description*
Engage	
Explore	
Explain	
Elaborate	
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 7	
Goals	*Details*
Important Ideas	Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms
Essential Questions	How do predator and prey populations affect each other? Can nonliving factors affect predator/prey relationships? What happens when whole populations are eliminated? What happens with over predation?

Standards	SEP: Developing and using Models Analyzing and Interpreting data CCC: Patterns Cause & Effect Systems & Systems models Stability & Change
Lesson-Level Performance Expectations	Students will use a simulation model and analyze data to understand how predatory interactions cause changes to other populations and impact the stability of the ecosystem.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	This is an interactive/simulation lab of predator and prey relationships in a population
What Questions We Have About That Phenomenon (or Problem)	What happens when you change the relationships in the simulation? Which configuration on the food web allows the most growth in population for each subset (plants, herbivores, omnivores, top predator)?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We used a simulation online that showed us the connections between organisms within an ecosystem. We were able to change different factors and relationships within the food web, and observe the different outcomes over time.
What Questions or Challenges We Still Have at the End of the Lesson	By the end of this lesson students should have a good understanding of interactions, and may begin to wonder about the entire ecosystem.
Lesson Phase	*Description*
Engage	Students will be presented with the simulation. The class will brainstorm how this simulation can be used. Students should be thinking, "What can I find out about this?"
Explore	Students will run the simulation manipulating the factors of their choice. They will run multiple simulations and record their observations and ideas along the way.
Explain	Students will finally share out their reasonable conclusions from the evidence they gathered. The class will come to a consensus of some of the patterns observed across groups.
Elaborate	Students will finally share out their reasonable conclusions from the evidence they gathered. The class will come to a consensus of some of the patterns observed across groups.
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 8	
Goals	*Details*
Important Ideas	Ecosystems are dynamic in nature; their characteristics can vary over time
Essential Questions	What are characteristics of ecosystem? Why do these characteristics change and how (what makes them dynanmic)? Can ecosystems crash?

Standards	SEP: Obtaining, evaluating, and communicating information Engaging in argument from evidence CCC: Patterns Cause & Effect Systems & System models Stability & Change
Lesson-Level Performance Expectations	1.Students will obtain and evaluate information to analyze the cause and effect relationship of otter populations in the California coast ecosystem. Students will look at the changes in the ecosystem over time due to otter populations. 2. Students will argue from evidence that otters should/should not be protected by looking at pattens within the ecosystem over time.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Sea Otters and Kelp forests
What Questions We Have About That Phenomenon (or Problem)	What is kelp? What does it do for the ocean? How do sea urchins eat the kelp? How much kelp can a sea urchins eat? Why do the invertebrates invade the sea bed? Do sea otters eat urchins? Why is there less kelp? Is kelp needed for the ocean? Is it good/bad for it to disappear? What happens if too much kelp is eaten?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We figured out that without sea otters the California coastline kelp forests suffer. This is because the invertabrates that graze on kelp increase in population because the otters are not there to eat them. This leads to kelp forests disappearing. The animals that rely on the kelp forests suffer as a result of this.
What Questions or Challenges We Still Have at the End of the Lesson	Can all ecosystems change? What else causes changes in ecosystems?
Lesson Phase	*Description*
Engage	
Explore	
Explain	
Elaborate	
Evaluate - Formative	
Evaluate - Summative	

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Lesson/Learning Sequence 9	
Goals	*Details*
Important Ideas	Disruptions to any biological or physical component of an ecosystem can lead to shifts in all its populations.

Essential Questions	How do populations shift? Do interactions change with environmental changes? what happens when an invasive species is introduced? How does population size affect ints environmental interactions? What can change access to these resources? What happens if a resource disappears? Does the size of the orgainsm affect its environmental interactions? What happens to a population if there are changes in other living things in the ecosystem?
Standards	SEP: Asking questions and defining problems Analyzing and interpreting data Constructing explanations (after the jigsaw) Obtaining, evaluating and communicating information CCC: Patterns Cause & Effect Scale, proportion & quantity Stability and change
Lesson-Level Performance Expectations	1. Students will be able to obtain information about the spread of Lyme disease through ticks by jigsawing 4 articles. 2. Students will analyze and interpret data presented from each of the 4 articles in order to construct explanations about the patterns and effects of the problem of Lyme disease cases growing across the United States over time.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	Sea Otters and Kelp forests
What Questions We Have About That Phenomenon (or Problem)	What is kelp? What does it do for the ocean? How do sea urchins eat the kelp? How much kelp can a sea urchins eat? Why do the invertebrates invade the sea bed? Do sea otters eat urchins? Why is there less kelp? Is kelp needed for the ocean? Is it good/bad for it to disappear? What happens if too much kelp is eaten?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We figured out that without sea otters the California coastline kelp forests suffer. This is because the invertabrates that graze on kelp increase in population because the otters are not there to eat them. This leads to kelp forests disappearing. The animals that rely on the kelp forests suffer as a result of this.
What Questions or Challenges We Still Have at the End of the Lesson	Can all ecosystems change? What else causes changes in ecosystems?
Lesson Phase	*Description*

Engage	The rise of Lyme disease and tick populations and their impact on the human population Listen to the audio clip as an initial engagement: https://www.yaleclimateconnections.org/2017/06/cases-of-lyme-disease-increasing-nationwide/ Students will generate questions...possible student questions include: Why have mild winters helped tick populations? What resources do ticks need to survive and thrive? Why have tick populations increased? Do ticks harm people and animals? What organisms eat ticks? Have the populations of those tick-eating organisms increased or decreased? (1 day)
Explore	Break kids into 4 groups to read articles: 1. http://www.cnn.com/2017/05/23/health/tick-explainer/index.html 2. https://www.wired.com/2017/05/lyme-isnt-disease-ticks-spreading-summer/ 3. https://www.cdc.gov/lyme/ (students will need to click on different sections to collect the pertinent information) 4. http://www.npr.org/sections/goatsandsoda/2017/03/06/518219485/forbidding-forecast-for-lyme-disease-in-the-northeast (2 days)
Explain	Using the notes that were gleaned from each article, each group will share out with the class the main points (jigsaw) Also, see if students can answer the questions they generated from the initial engagement. (1-2 days)
Elaborate	In same groups, students can discuss/attempt to answer the essential questions of this learning sequence (Certain questions could be assigned to particular groups, and jigsaw/discuss as a whole class after). Essential Questions: How do populations shift? Do interactions change with environmental changes? what happens when an invasive species is introduced? How does population size affect ints environmental interactions? What can change access to these resources? What happens if a resource disappears? Does the size of the orgainsm affect its environmental interactions? What happens to a population if there are changes in other living things in the ecosystem? Groups may find that further research is needed, and that Lyme disease and ticks phenomena needs another example of an environmental disruption. Research could be assigned for homework or take a class period if you have the computer time/resources in school. (2-3 days)
Evaluate - Formative	Class discussion on essential questions. Sharing additional research and jigsawed information. (half-1 day)

Evaluate - Summative	Entry in their Unit Summary Table. Use the following prompt & "Gotta Have Checklist": **Draft** Claim: Disruptions to any biological or physical component of an ecosystem can lead to shifts in all its populations. Construct an argument, and use the evidence you have collected about Lyme Disease, ticks and possibly other organisms or disruptions to support this claim. Make sure to reference at least 5 of the 8 Essential Questions (with answers) that we discussed as a class to help support your claim. (1-2 days)

Lesson/Learning Sequence 10	
Goals	*Details*
Important Ideas	Disruptions to any physical component of an ecosystem can lead to shifts in all of its populations.
Essential Questions	
Standards	SEP: Developing and using Models Constructing explanations CCC: Patterns Cause & Effect Systems & System models Stability & Change
Lesson-Level Performance Expectations	Students will be able to finalize their models based on the unit learning. Coral Reef model explanations should include patterns, changes and interactions within the ecosystem of populations.
Student Storyline Elements	*Details*
What Phenomenon We Are Wondering About (or Problem We're Addressing)	The rise of Lyme disease and tick populations and their impact on the human population start with the audio clip as an engagement: https://www.yaleclimateconnections.org/2017/06/cases-of-lyme-disease-increasing-nationwide/
What Questions We Have About That Phenomenon (or Problem)	Why have mild winters helped tick populations? What resources do ticks need? Why have tick populations increased? Do ticks harm people and animals? What eats ticks? Have those populations of tick-eating organisms increased or decreased?
How We Figure Out Science Ideas / How We Come to Better Understand Phenomena or Solve Problems	We learned that because of increased resources tick populations have been able to increase. This has lead to an increase in lyme disease.
What Questions or Challenges We Still Have at the End of the Lesson	Does temperature impact all ecosystems? Can populations also decrease because of temperature?
Lesson Phase	*Description*
Engage	Students will begin with the "Paradise in Peril" video and make connections to what they have previously seen in earlier lessons. They will engage in the problem presented in the video and raise new questions to explore.

Explore	After raising questions, students will work together to analyze satallite maps of degree heating weeks, and locations of coral reefs around the world. Students will record observations and ideas. Students will look for patterns in the data and make some initial claims regarding the connection between coral locations and ocean temperature.
Explain	Students will use information from the previous activities, and analyze a new graph to predict the occurence timing and severity of coral bleaching in the Florida Keys. Students will explain what they think is happening and why. Students will compare their explanations to classmates.
Elaborate	Students will design their own investigation based on the data they have and from what they learned from previous lessons. Students will share their investigations with other students and compare findings.
Evaluate - Formative	Throughout the lesson students will discuss their findings and answer questions based on their observations.
Students will complete a final model of the phenomenon and complete a written explanation of their phenmenon. Students will do a gallery walk of their final model and have the opportunity to give and receive feedback. Students will self-assess their final models/explanations after the gallery walk and feedback.	Students will complete a final model of the phenomenon and complete a written explanation of their phenmenon. Students will do a gallery walk of their final model and have the opportunity to give and receive feedback. Students will self-assess their final models/explanations after the gallery walk and feedback.

[1] e.g., "eighteen 45-minute class periods"

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[2] Put an "X" or other symbol next to SEPs and CCCs that are explicitly planned for instruction and that are in the foreground. Do *not* use the same symbol for incidental use of SEPs or CCCs -- for that, feel free to put a small 'x' or an asterisk.