Louisiana Believes

Distance Learning Support for OpenSciEd - Grade 7
Unit 7.5 Ecosystem Dynamics Field Test Unit

This resource is designed to support teachers in implementing distance learning for OpenSciEd Unit 7.5 Ecosystems Field Test Unit, Unit 6 on the Louisiana Guide to Piloting OpenSciEd Grade 7. It is intended as a supporting document and should be used in conjunction with the OpenSciEd Unit 7.5 Ecosystems Instructional Resources. The resources contained in this document have been adapted from OpenSciEd with permission under Creative Commons 4.0 licensing.

The OpenSciEd Remote Learning Resources linked below contain detailed information about adapting specific routines to a remote learning environment and a wide variety of options including those for students who do not have internet access:

- Fostering Productive Norms
- Anchor Phenomenon Routine
- Navigation Routine
- Supporting Discourse
- Problematizing Routine

This guidance document is considered a "living" document as we believe that teachers and other educators will find ways to improve the document as they use it. Please send feedback to STEM@la.gov so that we may use your input when updating this guide.

Updated April 13, 2021

DEPARTMENT of EDUCATION
Louisiana Believes

Lesson Set Overview: Lessons 1, 2, 3, 4, 5, 6, 7, 8, 9

Lesson Set 1: Lessons 1-9		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L1, L2, L3, L4, L5, L6, L7, L8, L9 **Thinking Deeper Documents for each lesson:** Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 4 TDD, Lesson 5 TDD, Lesson 6 TDD, Lesson 7 TDD, Lesson 8 TDD, Lesson 9 TDD **Additional Documents:** *(not already linked within slideshow)* Lesson 2: One of the following articles: Cotton Plantation, Sugar Plantation, Palm Plantation; One of the following articles: Soybean Farms in the Midwest, Canola Farms in Canada; Growing Oil Palm in Indonesia Lesson 3: Farmer's Almanac; Average Annual Surface Temperatures, Average Annual Precipitation, and Long-Term Average Annual Solar Radiation Lesson 9: Butterflies on the Shortgrass Prairie Assessment	Driving Question Board - Lessons 1, 2, 5 Optional: Progress Tracker Assignments - Lessons 2, 3, 6, 7, 8 Lesson 2: • Phenomenon Discussion Board Lesson 3: • Plant Needs Class Chart • Consensus Map Lesson 4: • Consensus Discussion Board Lesson 5: • Exit Ticket Discussion Board Lesson 6: • Optional: video tutorial for StoryMap Lesson 7: • Class Histogram Shared Documents for Investigations A, B, C Lesson 8: • Making Sense Discussion Board • Class Data Table Lesson 9: • Progress Trackers from previous lessons - *TDDs or assignments*	**Prior to Lesson**: Lesson 1: • BBC Orangutan Video, Orangutan Reference Card, Oil Palm Distribution, Orangutan Population Lesson 4: • Interview with Oil Palm Farmers video Lesson 5: • Before and After Photo Reference Lesson 6: • Orangutan StoryMap - *screencast* Lesson 7: • Orientation videos of Simulation (Interactions, Aesthetics), Orangutan Forest Model Simulation - *screencast* Lesson 8: • Orientation video of Simulation (Updates), Orangutan Forest Model Simulation - *screencast* **After Lesson Completion:** Driving Question Board - Lessons 1, 2, 4, 5 Plant Needs Class Chart, Consensus Map - Lesson 3 Discussion Board - Lessons 1, 4, 5, 8 Virtual Class recordings - Lessons 1, 2, 3, 5, 6, 7, 8, 9

Students should ideally join VIRTUAL CLASS on the following days:

Day 2 - Lesson 1	Day 5 - Lesson 2	Day 6 - Lesson 3	Days 8 & 10 - Lesson 5
Day 12 - Lesson 6	Day 14 - Lesson 7	Day 16 - Lesson 8	Day 17 - Lesson 9

Formative and Summative Assessment Opportunities:

Lesson 1: Initial Model and Consensus Discussion
Lesson 2: Progress Tracker (on TDD)
Lesson 3: Progress Tracker (on TDD)
Lesson 4: Consensus Discussion Board
Lesson 5: Building Understandings Discussion & Exit Ticket Day 1, Consensus Discussion Day 3
Lesson 6: Progress Tracker (on TDD)
Lesson 7: Progress Tracker (on TDD)
Lesson 8: Making Sense Discussion Board
Lesson 9: Butterflies on the Shortgrass Prairie Assessment

Lesson Set Overview: Lessons 10, 11, 12, 13, 14

Lesson Set 2: Lessons 10-14		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L10, L11, L12, L13, L14 **Thinking Deeper Documents for each lesson:** Lesson 10 TDD, Lesson 11 TDD, Lesson 12 TDD, Lesson 13 TDD *Note: No TDD for Lesson 14 **Additional Documents:**	Lesson 10: • Population Relationships Discussion Board • Shared Document for Models • Exit Ticket Assignment Lesson 11: • Exit Ticket Assignment	**Prior to Lesson**: Lesson 10: • Reference Cards: Rainforest, Oil Palm Farm Lesson 11: • Agroforestry in the Ivory Coast video at the bottom of this page (also found here) • Storymaps: Shade Grown Coffee, Prairie Strips **After Lesson Completion:** Discussion Board - Lessons 10, Virtual Class recordings – Lessons 10, 11
Students should ideally join VIRTUAL CLASS on the following days: Day 2 - Lesson 10 Day 4 - Lesson 11 Day 6 - Lesson 12 Day 7 – Lesson 13 Days 9, 10, 12, 13 – Lesson 14		
Formative and Summative Assessment Opportunities: Lesson 10: System Models & Feedback/Revisions, Exit Ticket Lesson 11: Building Understandings Discussion, Exit Ticket		

Lesson 1 (3 days) - Anchoring Phenomenon

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Driving Question Board
- Phenomenon Discussion Board - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Phenomenon Discussion Board - *teacher made*
- Discussion Board - *after completion*
- BBC Orangutan Video *(linked within slideshow)*
- Orangutan Reference Card *(linked within slideshow)*
- Oil Palm Distribution *(linked within slideshow)*
- Orangutan Population *(linked within slideshow)*
- Virtual Class recording - *after completion*
- Driving Question Board - *alternate way to submit questions and completed board*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 1 (3 days) - Anchoring Phenomenon

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (15 min) INTRODUCE THE PHENOMENON Slides A-E	1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Create DISCUSSION BOARD post posing the question "How could buying candy have an impact on orangutan populations in the wild?" 3. Ensure that students can access the links embedded within the slideshow.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Use a video and Orangutan Reference Card to collect information about orangutans. 2. Read a surprising headline and make predictions. 3. Using the DISCUSSION BOARD, brainstorm what could be happening to connect the two things (candy and orangutan) and record the initial model.
Part 2 (17 min) IDENTIFY WHAT CONNECTS CANDY TO ORANGUTANS Slides F-I		VIRTUAL CLASS PRE-WORK: 1. Examine a candy ingredient list and determine sources of main ingredients. 2. Examine the map showing where each candy ingredient is grown and make connections. 3. Record changes needed to initial models.
Part 3 (10 min) EXAMINE DATA ON PALM OIL TREES AND ORANGUTANS Slides J-K		VIRTUAL CLASS PRE-WORK: 1. Make predictions about relationships between orangutans and oil palm. 2. Analyze data sheets to confirm predictions.
Part 4 (3 min) NAVIGATION Slide L		VIRTUAL CLASS PRE-WORK: 1. Brainstorm about what more is needed to know about Indonesia.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 6 (10 min) GATHER ADDITIONAL INFORMATION THROUGH A SHORT READING Slide M	.	VIRTUAL CLASS PRE-WORK: 1. Gather additional information through a short reading: Growing Oil Palm in Indonesia (on TDD).
Part 5 (35 min) NAVIGATION IDENTIFY WHAT WE NEED TO INCLUDE IN OUR MODELS DEVELOP AN INITIAL MODEL DEVELOP AN INITIAL CONSENSUS MODEL NAVIGATION/SHARE RELATED PHENOMENA Slides N-R	Prior to the Virtual Class, the teacher should: 1. Prepare for generating the initial consensus model and collecting related phenomena on a poster or virtual platform during class. VIRTUAL CLASS: 1. Take stock of what we have already figured out about the relationship between the orangutans and the candy and what is happening in Indonesia. 2. Set the purpose of the model. 3. Identify what we already know about what leads to increases and decreases in the number of living things that are living in an area. Students will add this to the table in their TDD. 4. Identify which components and interactions that are important to include in the model. Students record the agreed-upon model components on the table in their TDD. 5. Independently develop initial models. 6. Develop an initial class consensus model to capture the ideas we agree and disagree on or are more uncertain. *(Teacher should illustrate the model on a poster or virtual illustration platform that can be shared with students when complete.)* 7. Consider related phenomena and share/discuss. *(Teacher should keep a class record of related phenomena on a poster or virtual platform.)*	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 12 (6 min) DEVELOP INITIAL QUESTIONS Slide S		VIRTUAL CLASS POST-WORK: 1. Create questions about the orangutans and palm oil case and related experiences.
Part 13 (10 min) BUILD THE DRIVING QUESTION BOARD Slide S	1. Create and share an assignment for students to post a question on the Driving Question Board. *(students can submit the question directly if using a shared platform like Jamboard or submit as an assignment for the teacher to compile).* 2. Compile and organize questions on DQB. 3. Share completed DQB with students.	VIRTUAL CLASS POST-WORK: 1. Submit questions for the Driving Question Board.
Part 14 (10 min) BRAINSTORM IDEAS FOR DATA AND INFORMATION WE NEED Slide T		VIRTUAL CLASS POST-WORK: 1. Identify the data and information that would help to answer each category of questions.
Part 15 (5 min) NAVIGATION Slide U		VIRTUAL CLASS POST-WORK: 1. Decide on next steps.

Return to Lesson Set Overview

Lesson 2 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- One of the following articles: Cotton Plantation, Sugar Plantation, Palm Plantation
- One of the following articles: Soybean Farms in the Midwest, Canola Farms in Canada
- Growing Oil Palm in Indonesia
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- One of the following articles: Cotton Plantation, Sugar Plantation, Palm Plantation
- One of the following articles: Soybean Farms in the Midwest, Canola Farms in Canada
- Growing Oil Palm in Indonesia
- Optional: Progress Tracker Assignment - *teacher made*
- Virtual Class recording - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 2 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students.	VIRTUAL CLASS PRE-WORK: 1. Record ways to remember that palm oil is the product or ingredient while oil palm in the plant. 2. Watch the video and record observations.
Part 2 (5 min) PLANTATION SYSTEM INTRODUCTION Slide B		VIRTUAL CLASS PRE-WORK: 1. Observe different images of oil palm plantations. 2. Record initial thoughts of what a plantation is.
Part 3 (10 min) PLANTATION READING Slide C	1. Assign one type of plantation for each student to research. (Cotton Plantation, Sugar Plantation, Palm Plantation)	VIRTUAL CLASS PRE-WORK: 1. Read an assigned article. 2. Answer reflection questions.
Part 4 (10 min) PRESENTATION AND TIMELINE CONSTRUCTION Slides D-E	1. Create and share an assignment for students to create a class timeline on a shared platform. - *may choose to assign each student with the same plantation type a specific question for the timeline*	VIRTUAL CLASS PRE-WORK: 1. Review background about the word plantation. 2. Add information about assigned plantation to the class timeline assignment.
Part 5 (10 min) DISCUSS BIOLOGICAL VERSUS SOCIAL MEANING Slide F		VIRTUAL CLASS PRE-WORK: 1. Review the biological and social meanings of the word plantation. 2. Decide on a word that we can use in place of plantation.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-10 (45 min) NAVIGATION EXAMINE SOYBEAN AND CANOLA OILS AS POSSIBLE SUBSTITUTES BUILDING UNDERSTANDINGS DISCUSSION ADD TO OUR PROGRESS TRACKER NAVIGATION Slides G-P	Prior to the Virtual Class, the teacher should: 1. Ensure students have access to the DQB, have articles ready to share with students, and prepare to display the word wall on a shared platform of choice. VIRTUAL CLASS: 1. Revisit Slide F, discuss questions, and decide on a word to use in place of plantation. 2. Visit DQB, decide if there is a substitution for palm oil, and identify information helpful to answering this question. 3. Introduce other types of oils and observe common vegetable oil ingredients. 4. Share articles with students: Soybean Farms in the Midwest, Canola Farms in Canada, and Growing Oil Palm in Indonesia. 5. Read one article about soybean oil or canola oil. Then read the article about growing oil palm. 6. Compare the similarities and differences of soybean/canola oil and oil palm and discuss as a class. 7. Unpack differences in land required to produce canola, soybean, and palm oils and discuss patterns across the cases. *(Purpose of the discussion: To realize that humans depend on the land and the biosphere to get what we need, specifically to grow crops that we use for food, as well as in other products.)* 8. Define and discuss “land use change” and add this term to your word wall. *(can be done virtually on a shared platform)* 9. Revisit the DQB question and answer the lesson question individually. 10. Complete Progress Tracker for an individual reflection of what we learned in this investigation. *(teacher may choose to have students turn in TDD or create a separate assignment for submitting Progress Tracker ideas for formative assessment purposes)* 11. Revisit the DQB to navigate to the next lesson.	

Return to Lesson Set Overview

Lesson 3 (1 day) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Farmer's Almanac
- Plant Needs Class Chart
- Maps: Average Annual Surface Temperatures, Average Annual Precipitation, and Long-Term Average Annual Solar Radiation
- Consensus Map
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Farmer's Almanac
- Plant Needs Class Chart - *after completion*
- Maps: Average Annual Surface Temperatures, Average Annual Precipitation, and Long-Term Average Annual Solar Radiation
- Consensus Map - *after completion*
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 3 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (45 min) NAVIGATION IDENTIFY OIL PALM PLANT NEEDS LOCATE PLACES TO GROW OIL PALM PLANTS FACILITATE A BUILDING UNDERSTANDINGS DISCUSSION NAVIGATION Slides A-G	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow and Thinking Deeper Document with students. 2. Have Average Annual Surface Temperatures, Average Annual Precipitation, and Long-Term Average Annual Solar Radiation maps ready to share with students during class. 3. Prepare for a plant needs class chart and consensus map on a shared platform. VIRTUAL CLASS: 1. Make a prediction of what palm oil plants need to grow. 2. Share Farmer's Almanac reading. Read more about palm oil needs using the Farmer's Almanac and list specific needs for the palm oil plant to grow. 3. Discuss oil palm needs to add specific plant needs to a class chart. 4. Share the following resources with students: Average Annual Surface Temperatures, Average Annual Precipitation, and Long-Term Average Annual Solar Radiation. *(Slides at the end of the slideshow also contain these maps.)* 5. Set the purpose of the map activity and scaffold the map overlay activity. 6. Compare and produce a group map. Project a blank map for the class. 7. Compare class consensus map to a rainforest map. 8. Facilitate a Building Understandings Discussion about what oil palm plants need and what rainforest plants need. 9. Answer the lesson question and update Progress Tracker. *(Option to create a separate assignment for students to submit their answers independently for formative assessment purposes.)* VIRTUAL CLASS POST-WORK: 1. Students complete the exit ticket on Thinking Deeper Document.	

Return to Lesson Set Overview

Lesson 4 (1 day) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Consensus Discussion Board - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Interview with Oil Palm Farmers video
- Consensus Discussion Board - *teacher made*
- Discussion Board - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- None

Lesson 4 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Ensure students can access video on Slide C.	VIRTUAL CLASS PRE-WORK: 1. Make predictions about why farmers are cutting down rainforests.
Part 2 (15 min) HEAR FROM OIL PALM FARMERS Slides B-D		VIRTUAL CLASS PRE-WORK: 1. Watch video of oil palm farmers. 2. Record observations in a notice and wonder chart. 3. Answer reflection questions.
Part 3 (14 min) FACILITATE A CONSENSUS DISCUSSION Slides E-F	1. Create and assign a DISCUSSION BOARD for students to respond to questions. 2. Review responses, facilitate discussion, and provide feedback as needed.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Read common facts about farmers. 2. Brainstorm discussion questions on TDD. 3. Share and discuss responses to questions on the class DISCUSSION BOARD.
Part 4 (6 min) ADD TO PROGRESS TRACKERS Slide G		VIRTUAL CLASS PRE-WORK: 1. Use DISCUSSION BOARD to assist in updating progress tracker.
Part 5 (5 min) NAVIGATION Slide H	1. Check for understanding and questions students may have to prepare for virtual class in next lesson.	VIRTUAL CLASS PRE-WORK: 1. Answer navigation questions on Thinking Deeper Document.

Return to Lesson Set Overview

Lesson 5 (3 days) - Problematizing

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Exit Ticket Discussion Board - *teacher made*
- Driving Question Board

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Exit Ticket Discussion Board - *teacher made*
- Discussion Board - *after completion*
- Before and After Photo Reference - *images also appear on slideshow*
- Virtual Class Recordings - *after completion*
- Driving Question Board - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Days 1 & 3

Lesson 5 (3 days) - Problematizing

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (45min) NAVIGATION FOCUS ON LAND USE CHANGE LOOK FOR PATTERNS ACROSS CASES BY USING A JIGSAW STRATEGY FACILITATE A BUILDING UNDERSTANDINGS DISCUSSION ABOUT PATTERNS ACROSS CASES Slides A-F	Prior to the Virtual Class, the teacher should: 1. Arrange for students to work with an **Expert Group** and a **Home Group** in break-out rooms for the jigsaw activity if the platform allows for each case. *(Option to have students read an assigned article and create their models independently then discuss/share as a whole class if this is not possible.)* 2. Create and share a Google Slides (or other program) for each case so students can share models within break-outs. 3. Make any adjustments to slideshow and TDD based on how you will conduct jigsaw activity. 4. Share Lesson Slideshow and Thinking Deeper Document with students. VIRTUAL CLASS: 1. Discuss new information about how candy is related to orangutans and how that complicates the problem. 2. Predict other reasons the land may change other than farming. 3. Review the model and discuss. 4. Students work in **Expert Groups** for each to conduct a case study, create and share models, and provide and implement feedback. • Case 1: Soybean Farms in the Midwest • Case 2: Canola Farms in Canada • Case 3: New Neighborhood, Washington, DC • Case 4: Create a Local Case (optional) 5. Students transition to **Home Groups** to share what they learned in their case study. 6. Facilitate a Building Understandings Discussion about patterns across cases.	

Part 5 (2 min) NAVIGATION Slide G	1. Teacher creates question/post for students on DISCUSSION BOARD to respond to exit ticket question. 2. Teacher reviews responses and provides feedback as needed.	VIRTUAL CLASS POST-WORK: 1. Respond to exit ticket and post on class DISCUSSION BOARD.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 6 (8 min) NAVIGATION Slide H		VIRTUAL CLASS POST-WORK: 1. Create a list of ideas about what we gain and lose when we change an ecosystem from the class DISCUSSION BOARD.
Part 7 (15 min) EXAMINE THE STRUCTURE BEFORE AND AFTER Slides I-K		VIRTUAL CLASS POST-WORK: 1. Examine before and after photos of the rainforest. 2. Identify structural changes that affect the function of each ecosystem.
Part 8 (12 min) ARTICULATE THE PROBLEM IN A CONSENSUS DISCUSSION	*Takes place during the next Virtual Class meeting.*	
Part 9 (10 min) ASSIGN HOME LEARNING: SELF-DOCUMENTATION Slide L		VIRTUAL CLASS POST-WORK: 1. Describe, draw, or take a picture of a place near your home with no, few, or many types of plants.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 10-13 (45 min) SHARE SELF-DOCUMENTATION AND BRAINSTORM RELATED PHENOMENA DESIGN CHALLENGE: BUILDING A BETTER PALM FARM REVISIT THE DRIVING QUESTION BOARD NAVIGATION Slides M-S	VIRTUAL CLASS: 1. Articulate consensus discussion from previous Virtual work. 2. Share responses from home-learning assignments and make connections. 3. Introduce design challenge. 4. Review the problem and set a goal for the palm farm design. 5. Generate a list of criteria to know if we have met this design goal. 6. Generate a list of constraints. 7. Generate and add new questions to the driving question board. 8. Generate next steps.	

Return to Lesson Set Overview

Lesson 6 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Optional: video tutorial for StoryMap - *teacher made*
- Optional: Progress Tracker Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Orangutan StoryMap - *teacher may choose to screencast exploration*
- Optional: Progress Tracker Assignment - *teacher made*
- Virtual Class recording - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 6 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (3 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Ensure that students can access the StoryMap (linked on Slide B), option to create a tutorial for students.	VIRTUAL CLASS PRE-WORK: 1. Reflect on how we know what a “healthy” number of orangutans are in an area?
Part 2 (15 min) INVESTIGATE ORANGUTANS IN PROTECTED AREAS Slide B		VIRTUAL CLASS PRE-WORK: 1. Explore the Story Map. 2. Read once to determine what information should be collected. 3. Read a second time and document important information.
Part 3 (15 min) INITIAL IDEAS DISCUSSION ABOUT THE STORYMAP Slides C-E	1. Create and assign a DISCUSSION BOARD for students to share their StoryMap observations.	VIRTUAL CLASS PRE-WORK: 1. Share observations about the number of orangutans in each area on the DISCUSSION BOARD. 2. Reflect on representing populations and answer Initial Ideas questions.
Part 4 (10 min) CALCULATE THE SPACE ONE ORANGUTAN NEEDS Slide F-K	*Teacher may consider creating a video to walk students through the example for calculating a ratio.*	VIRTUAL CLASS PRE-WORK: 1. Make predictions about a healthy orangutan population. 2. Review directions on how to calculate ratios. 3. Calculate the ratio of orangutans per area for each year and location.
Part 5 (2 min) NAVIGATION Slide L		VIRTUAL CLASS POST-WORK: 1. Predict a healthy population of orangutans based on new data.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 6-10 (45 min) NAVIGATION ANALYZE ORANGUTANS PER AREA DATA BUILDING UNDERSTANDINGS DISCUSSION ADD TO PROGRESS TRACKERS PREDICT WHY ORANGUTANS NEED SO MUCH FOREST AREA Slides L- R	Prior to the Virtual Class meeting, the teacher should: 1. Arrange to have students work in break-out rooms to discuss the Lesson Question if the platform allows. *(If this is not possible, allow students to reflect and answer the questions independently then share out whole-class.)* VIRTUAL CLASS: 1. Share and discuss the predictions students made about a healthy number of orangutans in an area. (Ensure that students all have the correct data for the next activity.) 1. Use the I^2 strategy to analyze population calculations. 2. Discuss to make sense of the patterns in the data. *(Option to use break-out groups then discuss as a whole class.)* 3. Discuss the lesson question in groups then share/discuss as a whole class. 4. Update progress trackers. *(Option to create a separate assignment for students to submit their answers independently rather than discussing as a class for formative assessment purposes.* 5. Predict why orangutans need so much forest area and discuss. 6. Determine next steps.	

Return to Lesson Set Overview

Lesson 7 (2 days) - Investigation

NOTE: If time for the Virtual Class meeting is limited, the students could perform all three investigations asynchronously and only analyze data and engage in Building Understandings Discussion during the synchronous Virtual Class meeting on Day 2. In this case, the lesson slideshow will need to be adjusted prior to sharing with students on Day 1 to accommodate the changes.

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Class Histogram Shared Documents for Investigations A, B, C - - *teacher made*
- Optional: Progress Tracker assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Orientation videos of Simulation (Interactions, Aesthetics)
- Orangutan Forest Model Simulation - *consider screencasting exploration and Investigations*
- Class Histogram Shared Documents for Investigations A, B, C - - *teacher made*
- Optional: Progress Tracker assignment - *teacher made*
- Virtual Class recording - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 7 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (3 min) NAVIGATION Slide A	1. Create the shared assignment for reporting results for Investigation A and provide the link on Slide K in the lesson slideshow. Adapt instructions as needed based on your choice of platform. 2. Share Lesson Slideshow and Thinking Deeper Document with students. 3. Ensure students can access the Orientation videos of Simulation (Interactions, Aesthetics) linked on Slides B & D.	VIRTUAL CLASS PRE-WORK: 1. Review our ideas about why orangutans need so much space and how we should test our ideas.
Part 2 (10 min) ORIENT TO THE COMPUTER SIMULATION Slides B-D		VIRTUAL CLASS PRE-WORK: 1. Watch the Orientation videos for the Simulation (Interactions, Aesthetics).
Part 3 (7 min) COMPARE THE SIMULATION TO A REAL ECOSYSTEM Slides E-G		VIRTUAL CLASS PRE-WORK: 1. Compare the components and interactions in the simulation to a real ecosystem. 2. List advantages and limitations of using simulation.
Part 4 (7 min) PREPARE FOR INVESTIGATION A Slides H-I		VIRTUAL CLASS PRE-WORK: 1. Choose an orangutan to follow. 2. Record the environmental conditions and make a prediction about the chosen orangutan.

Part 5 (18 min) CONDUCT INVESTIGATION A Slides J-K	1. Review class histogram submissions in preparation for facilitating discussion in the Virtual Class. *NOTE: Making sense of data will take place during virtual class.*	VIRTUAL CLASS PRE-WORK: 1. Run Investigation A, while monitoring the actions of the chosen orangutan. 2. Record individual results. 3. Post results on the class histogram.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (45 min) CONDUCT INVESTIGATION B CONDUCT INVESTIGATION C BUILDING UNDERSTANDINGS DISCUSSION NAVIGATION Slides L-T	Prior to the Virtual Class meeting, the teacher should: 1. Prepare shared platform for class histograms on Investigations B & C results. VIRTUAL: 1. Analyze data from Investigation A and discuss. 2. Record the environmental conditions and make a prediction about the chosen orangutan for Investigation B. 3. Run Investigation B, while monitoring the actions of the chosen orangutan and record individual results. 4. Share results on the class histogram. 5. Analyze data from Investigation B and discuss. 6. Record the environmental conditions and make a prediction about the chosen orangutan for Investigation C. 7. Run Investigation C, of the chosen orangutan and record individual results. 8. Share results on the class histogram. 9. Analyze data from Investigation C and discuss. 10. Make sense of the patterns in the data. 11. Update Progress Tracker. *(Option to create a separate assignment for students to submit their answers independently rather than discussing as a class for formative assessment purposes.)* 12. Predict how our results might change if we add births and deaths into the simulation.	

Return to Lesson Set Overview

Lesson 8 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Making Sense Discussion Board - *teacher made*
- Class Data Table - *teacher made*
- Optional: Progress Tracker assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Orientation video of Simulation (Updates)
- Orangutan Forest Model Simulation - *consider screencasting exploration and Investigations*
- Making Sense Discussion Board - *teacher made*
- Discussion Board - *after completion*
- Class Data Table - *alternative way of submitting data and after completion*
- Optional: Progress Tracker assignment - *teacher made*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 8 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Create a shared class data table for students to enter data for Investigations 2 & 3 and link it to Slide F. 2. Share Lesson Slideshow and Thinking Deeper Document with students. 3. Ensure students can access the Orientation video of Simulation (Updates) linked on Slide B.1.	VIRTUAL CLASS PRE-WORK: 1. Revisit design goal and consider ways they could increase orangutan populations.
Part 2 (5 min) ORIENT TO THE UPDATES IN THE SIMULATION Slides B-C		VIRTUAL CLASS PRE-WORK: 1. Watch the orientation video. 2. Read through key ideas. 3. Review Investigation Log.
Part 3 (15 min) CONDUCT INVESTIGATION 1 Slides D-E	1. Create and assign a discussion board for students to share ideas about Making Sense questions after conducting Investigation 1. 2. Review responses and facilitate discussion as needed.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Fill in the investigation plan & make predictions for Investigation 1. Then, conduct the investigation. 2. Answer “Making Sense” questions and share answers on the DISCUSSION BOARD.
Part 4 (15 min) CONDUCT INVESTIGATION 2 Slides F-G		VIRTUAL CLASS PRE-WORK: 1. Fill in the investigation plan & make predictions for Investigation. Then, conduct the investigation. 2. Add data to class data table and answer “Making Sense” questions.

Part 5 (20 min) CONDUCT INVESTIGATION 3 Slides H-I	1. Make sure to have the most updated version of the class chart in preparation for discussion in the Virtual Class.	VIRTUAL CLASS PRE-WORK: 1. Fill in the investigation plan & make predictions for Investigation 3. 2. Conduct Investigation 3. 3. Add data to class data table. 4. Answer "Making Sense" questions.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-7 (25 min) BUILDING UNDERSTANDING: CONNECTING OUR FINDINGS TO REAL ECOSYSTEMS NAVIGATION Slides J-M	VIRTUAL CLASS: 1. Discuss investigation results and "Making Sense" questions from each investigation. Students should record new ideas with a different text color as the class discusses the questions. 2. Assign each student one of the four ecosystems from Lesson 6 to draw conclusions about orangutan populations. 3. Share and discuss ideas. 4. Discuss the difference between "normal" fluctuations in healthy populations and fluctuations that are not normal. 5. Update Progress Tracker. *(Option to create a separate assignment for students to submit their answers independently rather than discussing as a class for formative assessment purposes.)*	

Return to Lesson Set Overview

Lesson 9 (2 days) - Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Progress Trackers from previous lessons - *TDDs or assignments*
- Butterflies on the Shortgrass Prairie Assessment.

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Progress Trackers from previous lessons - *TDDs or assignments*
- Butterflies on the Shortgrass Prairie Assessment.

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 9 (2 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (45 min) NAVIGATION BUILD THE GOTTA-HAVE-IT CHECKLIST DEVELOP A MODEL FOR WHY ORANGUTAN POPULATIONS ARE DECREASING FACILITATE A CONSENSUS DISCUSSION TO EXPLAIN WHY ORANGUTAN POPULATIONS ARE DECREASING Slides A-E	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. VIRTUAL CLASS: 1. Take stock of where we are in our thinking. 2. Look back at Lesson 1 model and establish class mission. 3. Preview the Gotta Have It Checklist. 4. Work together to develop their checklist. 5. Facilitate a sharing of ideas. 6. Set a purpose for model building. 7. Individually develop models. 8. Remind students of discussion norms. 9. Facilitate the Consensus Discussion and create a classroom consensus model. 10. Preview the post-work and assessment for Day 2.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (3 min) NAVIGATION Slide F	1. Assign the assessment to students. You will need to make a copy for each student if your platform allows or instructs students to make their own copy in order to edit.	VIRTUAL CLASS POST WORK: 1. Describe where else this model might explain changes in populations.
Part 6 (15 min) REVISE THE MODEL FOR THE MONARCH BUTTERFLY AND PRAIRIE Slides G-J		VIRTUAL CLASS POST WORK: 1. Read slides G-I to learn about the migration of the monarch butterfly. 2. Record a list of parallels between the orangutans and the butterflies. 3. Develop a model for how the butterflies interact with the prairie ecosystem.
Part 7 (23 min) INDIVIDUAL ASSESSMENT: BUTTERFLIES ON THE SHORTGRASS PRAIRIE Slides K-L		VIRTUAL CLASS POST WORK: 1. Complete the Butterflies on the Shortgrass Prairie Assessment.
Part 8 (4 min) NAVIGATION Slide M		VIRTUAL CLASS POST WORK: 1. Reflect on other rainforest animals.

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Lesson 10 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Population Relationships Discussion Board - *teacher made*
- Shared Document for Models - *teacher made*
- Exit Ticket Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Population Relationships Discussion Board - *teacher made*
- Shared Document for Models - *teacher made*
- Reference Cards: Rainforest, Oil Palm Farm
- Exit Ticket Assignment - *teacher made*
- Discussion Board – *after completion*
- Virtual Class Recording – *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 10 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slides A, B	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Ensure students have access to Lesson 1 Reading "*Growing Oil Palm in Indonesia".* 4. Create and assign a Discussion Board for students to share Cause & Effect examples & ideas for representing new relationships in the class model.	VIRTUAL CLASS PREWORK: 1. Reflect on how palm oil farms are affecting other populations 2. Generate ideas about Cause & Effect relationships and share them on the discussion board to complete the chart.
Part 2 (10 min) BRAINSTORM RELATIONSHIPS BETWEEN POPULATIONS Slide C	1. Review discussion board submissions and facilitate discussion as needed. 2. Suggest a class system for representing new relationships based on student ideas.	VIRTUAL CLASS PREWORK: 1. Reflect on new types of population interactions from the Cause and effect chart and share ideas of how to represent the new interactions on the class model.
Part 3 (22 min) DEVELOP RAINFOREST AND OIL PALM SYSTEM MODELS Slides D-E	1. Assign students one of the two systems to model—either the rainforest system or oil palm system. (reference cards linked on Slide D) 2. Create a shared document for students to upload a screenshot of the model for peer review.	VIRTUAL CLASS PREWORK: 1. Develop rainforest or palm oil system models that show components & interactions in these two systems. 2. Upload screenshot of model to platform assigned by the teacher for peer review.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 4 (45 Min) GIVE PEER FEEDBACK ON SYSTEM MODELS REFLECT ON FEEDBACK ABOUT THE MODELS COMPARE MODELS THROUGH A GALLERY WALK COMPARE SYSTEMS IN A BUILDING UNDERSTANDINGS DISCUSSION UPDATE PROGRESS TRACKER Slides E-I	Prior to the Virtual Class, the teacher should: 1. Ensure students have access to the shared document with models to create a Virtual Gallery Walk. 2. Decide how to ensure all models receive feedback and make necessary preparations. (ex. assign partners to review each other's models) VIRTUAL CLASS: 1. Give feedback to another student's model using the Sticky Note Peer Feedback protocol. 2. Review notes & comments on models and make changes OR write a comment and send it back to the student that gave feedback. 3. Engage in a virtual gallery walk of both the Rainforest System Models & the Oil Palm System Models and record observations. 4. Building understandings discussion about the two-system model to identify different kinds of interactions between populations and patterns of interactions across the systems. Students can record important ideas on the TDD. 5. Update Progress Tracker.	
Part 9 (3 Min) NAVIGATION Slide J	1. Create an assignment for students to complete and submit their Exit Ticket.	VIRTUAL CLASS POST WORK: 1. Complete the Exit Ticket assignment.

Return to Lesson Set Overview

Lesson 11 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Exit Ticket Assignment - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Agroforestry in the Ivory Coast video at the bottom of this page (also found here)
- Storymaps: Shade Grown Coffee Prairie Strips
- Exit Ticket Assignment - *teacher made*
- Virtual Class Recording – *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 11 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE WORK: 1. Reflect on the idea of making palm oil farms more like rainforests.
Part 2 (10 min) EXAMINE A CASE IN IVORY COAST Slide B		VIRTUAL CLASS PRE WORK: 1. Watch a video of a case in Ivory Coast and record noticings & wonderings.
Part 3 (15 min) READ ABOUT A CASE IN COSTA RICA Slides C-H		VIRTUAL CLASS PRE WORK: 1. Use the Close Reading Strategies to read about a case in Costa Rica.
Part 4 (10 min) COMPARE THE DIFFERENT SYSTEMS Slide I		VIRTUAL CLASS PRE WORK: 1. Compare diversified farming and monoculture farming with rainforests and revisit the idea of making palm oil farms more like rainforests.
Part 5 (5 min) NAVIGATION		VIRTUAL CLASS PRE WORK: 1. Reflect on experiences with diversified farming.

Slide J		

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-9 (40 min) NAVIGATION EXPLORE TWO ADDITIONAL DIVERSIFIED FARMING CASES BUILDING UNDERSTANDINGS DISCUSSION: FARMS AND PLANT BIODIVERSITY INDIVIDUAL PROGRESS TRACKERS Slides K-S	Prior to the Virtual Class, the teacher should: 1. Determine groups for storymaps and prepare accordingly for break-outs if your platform allows. (Group of four with partners assigned to each storymap if possible) VIRTUAL CLASS: 1. Discuss comparisons from the previous day comparing and contrasting the cases in Ivory Coast and Costa Rica. Add any new information and answer the navigation question on TDD. 2. Access an assigned a StoryMap with the links on Slide M and complete the chart on the assigned Storymap with a partner. 3. Share the assigned case within the group and record similarities and differences of the types of farming. 4. Discuss patterns noticed as a class and add biodiversity to the class word wall *(created in Lesson 2*). Record important ideas. 5. Building understandings discussion with a focus on identifying farming practices that make farming systems more like the native ecosystem. Record important ideas. 6. Record what we figured out on the Progress Tracker.	
Part 10 (5 min)	1. Create an assignment for the exit ticket to be submitted.	VIRTUAL CLASS POST WORK: 1. Complete exit ticket and submit.

NAVIGATION Slide T		

Return to Lesson Set Overview

Lesson 12 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 12 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students. 2. Share Thinking Deeper Document with students. 3. Create flipgrid or discussion board activity to answer: "Why might growing more kinds of plants be better for populations in ecosystems? For farmers?"	VIRTUAL CLASS PRE-WORK: 1. Reflect on criteria for farmers and plants/animals for a better palm oil farm. 2. Share ideas and listen to/read and reflect on other students' ideas.
Part 2 (10 min) CONSIDER DISRUPTIONS THAT CAN AFFECT FARMERS Slides B-D	1. Create a discussion thread for students to share cause and effect examples from the video. 2. Create a video to model filling out the cause-and-effect diagram using student ideas from the discussion board if available. Emphasize the cause (in this case, the rain event) and the effects on the crops, farmers, and other populations in the ecosystems. Link on Slide D or share with students.	VIRTUAL CLASS PRE-WORK/DISCUSSION BOARD: 1. Complete cause & effect charts on TDD based on Think About It questions on slide. 2. Watch the video, "Too Much Rain Can Hurt Farmers". Reflect on and share ideas about the effects of this event on cops, farmers, and populations/ecosystems.

		3. Watch the teacher video modeling the cause-and-effect diagram.
Part 3 (22 min) MODEL SCENARIOS ON OIL PALM FARMS INDIVIDUALLY Slides E- F	1. Assign each student one of the three scenarios and divide students with the same scenario into smaller groups for consensus discussions. 2. Prepare a document (ex. Shared slideshow) for each group where students will upload their individual cause and effect charts.	VIRTUAL CLASS PRE-WORK: 1. Students complete cause & effect charts on TDD individually using the scenario assigned to them.
Parts 4 & 5 (10 min) MODEL SCENARIOS ON OIL PALM FARMS IN SMALL GROUPS & PREPARE FOR GALLERY WALK Slides G-H	*Students begin this process during pre-work and continue in Virtual Class.*	VIRTUAL CLASS PRE-WORK: 1. Review cause and effect charts from group members to prepare for Virtual Class.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 4-9 (50 min) NAVIGATION *(changed order)* MODEL SCENARIOS ON OIL PALM FARMS IN SMALL GROUPS PREPARE FOR GALLERY WALK GALLERY WALK REVISE GROUP DISRUPTION MODELS	Prior to the Virtual Class, the teacher should: 1. Review groups models to prepare for discussion about modeling conventions and to facilitate small group consensus modeling. 2. Set up break-out rooms for small groups and prepare a platform for students to share consensus models from their groups (shared document, Jamboard, etc.) 3. Create an assignment for the exit ticket to share at the end of class. VIRTUAL CLASS: 1. Review the lesson question and discuss the purpose of the models related to the disruption events. 2. Discuss and agree on modeling conventions that students will use on their group consensus models. *(This was moved from Day 1 due to only asynchronous learning on that day.)* 3. Work in groups to create a consensus model for their scenario and upload onto a shared platform. 4. Prepare for the Virtual Gallery Walk by talking through the chart on Slide J. 5. Engage in the Virtual Gallery Walk to view other groups' models and record what happens to populations in ecosystems and farmers when there are disturbances on the monoculture and diversified farms.	

BUILDING UNDERSTANDINGS DISCUSSION ABOUT DISTURBANCES & FARMS Slides I-O	6. Take five minutes to revise models in groups based on what they observed during the gallery walk. 7. Compare the systems models and talk about the differences between the two systems (especially in biodiversity number of connections between populations). Discuss why biodiversity and links matter if there is a disturbance. 8. Introduce the idea of resilience and its relationship to biodiversity. Add "resilience" to the classroom word wall. 9. Answer the lesson question independently and share answers. (*Note: If you are short on time, this can be assigned as post-work and shared on a discussion board.*) 10. Assign exit ticket for post work.	
Part 10 (5 min) NAVIGATION Slide P		VIRTUAL CLASS POST WORK: 1. Record ideas for changes to ecosystems that affect what lives in the system.

Return to Lesson Set Overview

Lesson 13 (2 days) - Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 13 (2 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (50 min) REVISIT THE UNIT DRIVING QUESTION GENERALIZE OUR IDEAS TO MANY ECOSYSTEMS CO-CONSTRUCT EXPLANATIONS IN SMALL GROUPS	Prior to the Virtual Class, the teacher should: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Revisit the DQB and the unit driving question As a class, create an abbreviated "Gotta-Have-It Checklist". (record in a way that is visible to students and have them record on their TDD) 2. create a T-chart (on TDD) to map specific populations to general types of organisms and generate a list of specific populations we have encountered throughout the unit. Sort into a category or group, such as plant, consumer, and predator. 3. Brainstorm different ways that the system could be changed.	

Slides A-G	4. In groups, construct an explanation to answer the question "How does changing the ecosystem affect what lives there?". Record explanation and model in the space provided on the TDD as their group discusses. 5. Consensus Discussion where students share the change they explained in their groups. (Keep track of these changes on a list and organize the list by similar-type disruptions.) 6. Teacher models the disruptions using the Basic Ecosystem Model as students share ideas from their groups, explain their thinking and challenge each others' ideas based on evidence. 7. Discuss how this is alike or different from the palm oil or other farming or land use problems we have previously discussed. 8. Introduce the assessment and post work assignment to be completed asynchronously on the following day.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 6 (24 Min) INDIVIDUAL ASSESSMENT: CHANGING POPULATIONS IN RIPARIAN ECOSYSTEMS Slides H-I	1. Assign the individual assessment.	VIRTUAL CLASS POST-WORK: 1. Complete "Changing Riparians Ecosystems Assessment".
Part 7 (3 min) NAVIGATION Slide J		VIRTUAL CLASS POST-WORK: 1. Reflect on changes to the palm oil farm ecosystem that would support orangutans.

Return to Lesson Set Overview

Lesson 14 (6 days) - Investigation/Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Lesson 14: Palm Farm Design- 1-farm model
- Lesson 14: Palm Farm Design- 5-farm model
- Lesson 14: Crop Calculator Tool: Excel, Google Sheets

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Days 1, 2, 4, 5

Lesson 14 (6 days) - Investigation/Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-3 (45 min) NAVIGATION REVIEW THE DESIGN CHALLENGE	Prior to the Virtual Class, the teacher should: 1. Have the Lesson Slideshow and Palm Farm Design Task ready to share with students. VIRTUAL CLASS: 1. Class discussion about features that need to be included in the design for a better palm farm.	

MEET AND SELECT CROPS Slides A-D	1. Introduce the "Palm Farm Design Task"and the task sheet. Discuss any needed changes or revisions. 2. Revise the design goal. Review and revise the criteria for the design challenge, discuss constraints on the computer simulation and how we might use data on orangutans to gather information related to tiger populations. 3. Set the purpose for testing criterion 1, related to number of crops and review the information on the sheet about each group of crops. 4. Model how to complete the Gantt chart for oil palm then give students time to pick their crops from the other 4 options. 5. Have students total their columns to verify that they have crops to sell every year, other than years 0-5.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 4-7 (45 min) NAVIGATION	Prior to the Virtual Class, the teacher should: 1. Decide how students will test their design ideas and set up break-outs if they will test in partners. VIRTUAL CLASS:	

INTRODUCE THE CROP CALCULATOR TOOL CHECK DESIGNS WITH CROP TOOL CALCULATOR BUILDING UNDERSTANDINGS DISCUSSION ABOUT DESIGNS TO SUPPORT FARMERS Slides E-G	1. Whole class discussion to take stock of the crop selection process and brainstorm information needed to evaluate whether choices will lead to a stable income. 2. Acclimate to the Crop Calculator Tool and identify what looks familiar and what new features are there. 3. Teacher review the criterion and model the tool using several student designs. 4. Preview Part 4 on the handout and make sure all students can access the Crop Calculator Tool linked on Slide F. 5. Work independently or with partners if break-outs are available to access the Crop Calculator Tool and test design ideas adjusting ratios to stabilize income. 6. Building Understandings Discussion on how current designs support farmers and how farmers might handle one time period during which they make a lot of money and another time period during which their income goes down. (opportunity to talk about how farmers stagger their planting to help stabilize their income). 7. Preview post work - Part 5 of the design handout and looking at whether their farms can support orangutans with the 20% of forest they have set aside.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 8 (8 min) NAVIGATION		VIRTUAL CLASS POSTWORK: 1. Complete Part 5 of Palm Design Task Handout.

Slide H		
Part 9 (7 Min) FOCUS ON UTILIZING 20% OF FORESTS TO SUPPORT ORANGUTANS Slide I	1. Create a discussion board assignment for students to share their ideas.	VIRTUAL CLASS POSTWORK/DISCUSSION BOARD: 1. Generate a list of ideas for how to use the 20% of forest we set aside. Add ideas to the discussion board.
Part 10 (15 min) ORIENT STUDENTS TO THE 1-FARM DESIGN SOLUTION Slide I	1. Ensure students know how to access the video "*Palm Farm Design: 1- Farm Orientation Video"* with the link provided on the slide.	VIRTUAL CLASS POSTWORK: 1. Watch the video and answer the questions on Part 5C of Palm Farm Design Handout.
Part 11 (15 min) INDIVIDUAL PLANNING TIME Slide J-K		VIRTUAL CLASS POSTWORK: 1. Complete Part 6 on the design packet handout.

Day 4	
	Distance Learning Plan

Lesson Components	Teacher	Student
Part 12 (45 min) NAVIGATION ORIENT STUDENTS TO THE 5-FARM DESIGN SIMULATION SMALL GROUP WORK TO DESIGN AND TEST GROUP FARMS Slide K-N	Prior to the Virtual Class, the teachers should: 1. Prepare for students to work in groups in break-out rooms. They will continue to work in these groups for the next two virtual classes. VIRTUAL CLASS: 1. In Scientists Circle, discuss and reflect on initial results from Day 3 and the 1-farm simulation. 2. Acclimate to the Palm Farm Design simulation by sharing what we notice and reflecting on how this simulation will allow them to test their second design criteria focused on supporting a healthy orangutan population. 3. Work in small groups to plan a design for five farms to collaborate to support an orangutan population. (Give groups about 10 minutes for planning and discussing their design and then transition them to testing their design.) 4. Test designs, up to 5 trials in order to average the data. Use the two analysis questions to focus their group conversation as they test the design.	

Day 5

Lesson Components	Distance Learning Plan	
	Teacher	**Student**
Part 15 (45 min) NAVIGATION & FINISH TESTING WHOLE CLASS CONSENSUS DISCUSSION CONSTRUCT AN INDIVIDUAL EXPLANATION Slides N-Q	Prior to the Virtual Class, the teachers should: 1. Ensure that break-outs are set up such that students can work with their groups from the previous day. VIRTUAL CLASS: 1. Work with small groups to complete any testing, calculations, or small group discussion based on where they finished on day 4. 2. Teacher creates a digital class data chart as students work in groups and report out their data. 3. Examine the class results to determine which group's design was the best at supporting orangutans, and if there were any designs that did not support orangutans well. 4. Groups present their design to the class and share features of the design that seemed to help or not help orangutans. Class discussion to explain *why* each feature helped or did not help the orangutan population. 5. Develop an individual explanation supporting their ideas for a better designed palm farm that works for farmers and orangutans. 6. Preview Home Learning and Post-work.	

Day 6		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 18 (5 min) NAVIGATION/HOME LEARNING Slide Q		VIRTUAL CLASS POST-WORK: 1. Evaluate which questions the class has answered from the DQB and annotate with symbols.
Part 19 (25 Min) REVISIT OUR DRIVING QUESTION BOARD Slides R & S	1. Create and assign a discussion board for students to share observations from the DQB.	DISCUSSION BOARD: 1. Analyze patterns in annotations in DQB and share observations and celebrations on the class discussion board.
Part 20 (15 min) QUICK WRITE: REFLECT ON OUR EXPERIENCES Slide T	1. Create and assign a discussion board for students to share their ideas related to the reflection questions.	VIRTUAL CLASS POST-WORK: 1. Reflect on the unit and share ideas on the discussion board.

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