



San Diego Unified School District
Science Department

Grade 4 – Environments
Life Science
Unit of Study



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**Science Vision for
San Diego Unified School District**
Science is an integral part of the intellectual development of a child. Interest in science begins with attitudes and values established in the earliest years through daily experiences. Students graduating from high school must have a foundation in scientific knowledge and evidence based reasoning.

Updated versions of this unit of study can be found online at www.sandi.net/science.



**Grade 4 – Environments
Module Overview**



Overview of the Unit

The Environments Module consists of five investigations that focus on the concepts that all organisms need energy and matter to live and grow and living organisms depend on one another and on their environment for their survival.

Grade 4 Life Science Conceptual Flow

Concept #2				
Living organisms depend on one another and on their environment for survival.				
Subconcepts Investigation #1: Terrestrial Environments	Subconcepts Investigation # 2: Isopods and Beetles	Subconcepts Investigation #3: Aquatic Environments	Subconcepts Investigation #4: Brine Shrimp Hatching	Subconcepts Investigation #5: Range of Tolerance
An environment is everything that surrounds and influences an organism.	Every organism has a set of preferred environmental conditions.	Aquatic environments include living and nonliving factors.	Brine shrimp eggs can hatch in a range of salt concentrations, but more hatch in environments with optimum salt concentration.	Every organism has a range of tolerance for each factor in its environment.
An environmental factor is one part of an environment. It can be living or nonliving.	Isopods prefer moist environments; beetles prefer dry environments.	The interaction of organisms with one another and with the nonliving environment is an ecosystem.	Most microorganisms do not cause disease, and many are beneficial.	Organisms have specific requirements for successful growth, development, and reproduction.
A relationship exists between environmental factors and how well organisms grow.	Isopods and beetles prefer dark environments.	Concept #1		Optimum conditions are those most favorable to an organism.
Environments change over time.	Flowering plants produce seeds to make new plants.	All organisms need energy and matter to live and grow		
	Pollination and seed dispersal are examples of how plants depend on animals.	Organisms interact in feeding relationships in ecosystems. Producers (plants) make their own food; consumers eat plants and animals. Decomposers eat dead plants and animals and recycle the raw materials.	Organisms interact in feeding relationships in ecosystems. Producers (plants) make their own food; consumers eat plants and animals. Decomposers eat dead plants and animals and recycle the raw materials.	
	Animals depend on plants for food and shelter.	Organisms may compete for resources.		

4th Grade Science Content Standards Addressed in this Module

Life Sciences

- LS2 All organisms need energy and matter to live and grow. As a basis for understanding this concept:
 - LS2a Students know plants are the primary source of matter and energy entering most food chains.
 - LS2b Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs, and may compete with each other for resources in an ecosystem.
 - LS2c Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.
- LS3 Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:
 - LS3a Students know ecosystems can be characterized in terms of their living and nonliving components.
 - LS3b Students know for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
 - LS3c Students know many plants depend on animals for pollination and seed dispersal, while animals depend on plants for food and shelter.
 - LS3d Students know most microorganisms do not cause disease and that many are beneficial.

Investigation and Experimentation

- I&E4 Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
 - I&E4a Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
 - I&E4b Measure and estimate the weight, length, or volume of objects.
 - I&E4c Formulate and justify predictions based on cause-and-effect relationships.
 - I&E4d Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
 - I&E4e Construct and interpret graphs from measurements.
 - I&E4f Follow a set of written instructions for a scientific investigation.

Pacing the Unit as a Whole

Pre-Test (Optional)				
Day 1 Start Inv. 1 Part 1 A/W	Day 2 R	Day 3 Start Inv. 1 Part 2 A/W	Day 4 R	Day 5 R Review
Day 6 Start Inv. 2 Part 1 A/W	Day 7 R	Day 8 Start Inv. 2 Part 2 A	Day 9 A	Day 10 A/W
Day 11 R	Day 12 Start Inv. 2 Part 3 A	Day 13 A/W	Day 14 R	Day 15 Start Inv. 2 Part 4 A/W
Day 16 R I-Check 1-2	Day 17 Review	Day 18 Start Inv. 3 Part 1 A/W	Day 19 R	Day 20 Start Inv. 3. Part 2 A/W
Day 21 R	Day 22 Start Inv. 3. Part 3 A/W	Day 23 R	Day 24 Start Inv. 3. Part 4 A/W	Day 25 R
Day 26 I-Check 3	Day 27 Review	Day 28 Start Inv. 4 Part 1 A/W	Day 29 Start Inv. 4 Part 2 A	Day 30 A/W
Day 31 R	Day 32 Start Inv. 4 Part 3 A	Day 33 A/W	Day 34 R	Day 35 I-Check 4
Day 36 Review	Day 37 Start Inv. 5. Part 1 A	Day 38 A	Day 39 A/W	Day 40 R
Day 41 Start Inv. 5. Part 2 A	Day 42 A	Day 43 A/W	Day 44 R I-Check 5	Day 45 Inv. 5. Part 3 R
Day 46 R	Day 47 Benchmark Assessment			

A – Active Investigation sessions include hands-on work with materials, making observations of terrariums/aquariums or tolerance experiments, active thinking about the concrete experiences, small-group discussion, writing in science notebooks, learning new vocabulary in context, and completing written embedded assessments to inform instruction. (Approximately 60 minutes)

W – Wrap-up sessions are teacher-directed vocabulary reinforcement and science content review. (Approximately 30 minutes)

R – Reading sessions (*Science Resources* book) include individual and interactive reading, answering review questions, and discussing the reading to ensure that students integrate the information. (Approximately 30 minutes)

I-Checks are short summative assessments. Students respond to written prompts. (Approximately 30 minutes)



Grade 4 – Environments
Pacing Guide – Investigation 1: Terrestrial Environments

Investigation Overview

<p>Investigation 1: Terrestrial Environments Concept: Living organisms depend on one another and on their environment for survival. Students set up terrariums, observe them for 2 weeks, and describe the living and nonliving components (biotic and abiotic factors) that contribute to the terrarium environment.</p>		
Part 1: Setting Up Terrariums	Part 2: Recording Changes	
<p><u>Summary</u> Students plant terrariums, mapping where they put pea, corn, barley, radish, and clover seeds. They decide how much water the plants need. Students read about terrariums.</p>	<p><u>Summary</u> Every 2-3 days students record observations about the changes taking place in the terrariums. Students read an article that introduces terrestrial environments around the world and focuses on two of them – the rain forest and the desert. The living and nonliving components of each are compared. The reading provides examples of interactions that will be used later in the module to develop key concepts as outlined by the California Science Content Standards.</p>	
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ An environment is everything that surrounds and influences an organism. ▪ An environmental factor is one part of an environment. It can be living or nonliving. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ A relationship exists between environmental factors (such as how much water plants get) and how well organisms grow. ▪ Environments change over time. 	
<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 4 days (short observations) Reading: 2 days</p>	
<p><u>CA Science Standards</u> LS3a, I&E6b</p>	<p><u>CA Science Standards</u> LS3a, I&E6b</p>	



Grade 4 – Environments
Pacing Guide – Investigation 1: Terrestrial Environments

Pacing Guide – Investigation 1: Terrestrial Environments

Day 1		Day 2		Day 3	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “Science Background” <i>TG p. 6 – 11</i> <input type="checkbox"/> Read “At a Glance” <i>TG p. 44-45</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 46-47</i> <input type="checkbox"/> Read “Teaching Children About Environments” <i>TG p. 48-49</i> <input type="checkbox"/> Watch Video demo of Inv. 1, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 50-53</i> <input type="checkbox"/> Administer FOSS Grade 4 Life Science Benchmark Pretest	Guiding the Investigation <input type="checkbox"/> “Part 1: Setting Up Terrariums” Wrapping up Part 1 Steps 1-21 <i>TG p. 54-57</i>		Reading in Science Resources <input type="checkbox"/> Steps 22-23 <i>TG p. 58</i> Student Reading: Science Resources p. 77-79	<input type="checkbox"/> Watch Video demo of Inv. 1, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 59-60</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Recording Changes; Wrapping up Part 2” Steps 1-6 <i>TG p. 61-62</i> <input type="checkbox"/> Body of Evidence Prompt #1 <i>TG p. 230 or 248</i>

Pacing Guide – Investigation 1: Terrestrial Environments (continued)

Day 4		Day 5	
Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 7-8 <i>TG p. 63-64</i> Student Reading: Science Resources p. 80-89		Concluding Investigation 1 <input type="checkbox"/> Student Reading Science Resources p. 90-92 Steps 9-10 <i>TG p. 65</i> <input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 67-72</i>



Grade 4 – Environments
Pacing Guide – Investigation 2: Isopods and Beetles



Investigation Overview

<p>Investigation 2: Isopods and Beetles Concept: Living organisms depend on one another and on their environment for survival. Students investigate how isopods and beetles respond to environmental factors such as water and light. They study how plants depend on animals for survival (pollination and seed dispersal) and how animals depend on plants for food shelter.</p>	
<p>Part 1: Observing Organisms</p>	<p>Part 2: Organisms and the Nonliving Environment</p>
<p><u>Summary</u> Students observe isopods and darkling beetles. Students construct aluminum-foil runways in order to conduct investigations of these organisms' environmental preferences. They read about the natural history of isopods and beetles.</p>	<p><u>Summary</u> Students conduct two investigations to find out how isopods and darkling beetles respond to the environmental factors of water and light. Students read a journal about a trip to the Amazon rain forest. It describes the components of the environment and examples of how the plants and animals depend on each other.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Designing an investigation involves controlling the variables, so that the effect of one factor can be observed. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a set of preferred environmental conditions. ▪ Isopods prefer moist environments; beetles prefer dry environments. <ul style="list-style-type: none"> ▪ Isopods and beetles prefer dark environments.
<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 4 days Reading: 2 days</p>
<p><u>CA Science Standards</u> LS3b, I&E6b</p>	<p><u>CA Science Standards</u> LS3a, LS3b, I&E6a, I&E6f</p>

Investigation Overview (continued)

<p>Investigation 2: Isopods and Beetles Concept: Living organisms depend on one another and on their environment for survival. Students investigate how isopods and beetles respond to environmental factors such as water and light. They study how plants depend on animals for survival (pollination and seed dispersal) and how animals depend on plants for food shelter.</p>	
<p>Part 3: Organisms and the Living Environments</p>	<p>Part 4: Designing an Animal Investigation</p>
<p><u>Summary</u> Students observe and study through videos and readings how plants and animals depend on each other for survival. They observe birds and insects getting food from plants and pollinating flowers in the process. They observe how seeds travel away from the parent plant on and in animals.</p>	<p><u>Summary</u> Students design an animal investigation focusing on an environmental factor not yet tested. They make and record experimental observations and interpret the observations to develop explanations.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a set of preferred environmental conditions. ▪ Flowering plants produce seeds to make new plants. ▪ Pollination and seed dispersal are examples of how plants depend on animals. ▪ Animals depend on plants for food and shelter. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a set of preferred environmental conditions. ▪ Designing an investigation involves keeping all factors the same except the one being tested, so that the effect of one factor can be observed.
<p><u>Time Allocation</u> Active Investigation: 2 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 2 days Reading: 1 day Assessment: 2 days</p>
<p><u>CA Science Standards</u> LS3c</p>	<p><u>CA Science Standards</u> LS3b, I&E6a, I&E6f</p>



Grade 4 – Environments
Pacing Guide – Investigation 2: Isopods and Beetles

Pacing Guide – Investigation 2: Isopods and Beetles

Day 6		Day 7		Day 8	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<ul style="list-style-type: none"> <input type="checkbox"/> Read “At a Glance” <i>TG p. 74-75</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 76-82</i> <input type="checkbox"/> Read “Teaching Children About Animal Preferences and Organism Interdependence” <i>TG p. 83-84</i> <input type="checkbox"/> Watch Video demo of Inv. 2, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 85-87</i> 	Guiding the Investigation <input type="checkbox"/> “Part 1: Observing Organisms” Wrapping Up Part 1” Steps 1-12 <i>TG p. 88-90</i>		Reading in Science Resources <input type="checkbox"/> Steps 13-14 <i>TG p. 91</i> Student Reading: Science Resources p. 93-97	<ul style="list-style-type: none"> <input type="checkbox"/> Watch Video demo of Inv. 2, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 92-93</i> 	Guiding the Investigation <input type="checkbox"/> “Part 2: Organisms and the Nonliving Environment” Steps 1-10 <i>TG p. 94-96</i>
Day 9		Day 10		Day 11	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Guiding the Investigation <input type="checkbox"/> “Part 2: Organisms and the Nonliving Environment” Steps 11-13 <i>TG p. 96</i>		Guiding the Investigation <input type="checkbox"/> “Part 2: Organisms and the Nonliving Environment” Wrapping up Part 2 Steps 14-25 <i>TG p. 97-99</i> <input type="checkbox"/> Body of Evidence Prompt #2 <i>TG p. 231 or 249; 232 or 250</i>		Reading in Science Resources <input type="checkbox"/> Steps 26-27 <i>TG p. 100-101</i> Student Reading: Science Resources p. 98-106

Pacing Guide – Investigation 2: Isopods and Beetles (continued)

Day 12		Day 13		Day 14	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 102-103</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Organisms and the Living Environment” Steps 1-4 <i>TG p. 104</i>		Guiding the Investigation <input type="checkbox"/> “Part 3: Organisms and the Living Environment; Wrapping up Part 3” Steps 5-10 <i>TG p. 105-106</i>		Reading in Science Resources <input type="checkbox"/> Steps 11-12 <i>TG p. 107</i> Student Reading: Science Resources p. 107-110 <input type="checkbox"/> Body of Evidence Prompt #3 <i>TG p. 233 or 251</i>
Day 15		Day 16		Day 17	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 4 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 108-109</i>	Guiding the Investigation <input type="checkbox"/> “Part 4: Designing An Animal Investigation” Wrapping up Part 4 Steps 1-10 <i>TG p. 110-111</i>		Concluding Investigation 2 <input type="checkbox"/> Read Summary Steps 10-11 <i>TG p. 112</i> Student Reading: Science Resources p. 111-114 <input type="checkbox"/> I-Check 1-2 Step 12 <i>TG p. 112, 338-343, 365-367</i>		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 113-116</i>



Grade 4 – Environments
Pacing Guide – Investigation 3: Aquatic Environments



Investigation Overview

<p>Investigation 3: Aquatic Environments Concepts: All organisms need energy and matter to live and grow. Living organisms depend on one another and on their environment for survival. Students set up freshwater aquariums with fish and plants. They monitor the environmental factors in the systems and look for feeding interactions. They learn about the role of producers, consumers, and decomposers in food chains and webs.</p>	
<p>Part 1: Goldfish Aquariums</p>	<p>Part 2: New Organisms</p>
<p><u>Summary</u> Students assemble freshwater aquariums and observe them over a period of time. In this part they observe goldfish and monitor the environmental factors of water and temperature. Students read about a variety of different freshwater environments.</p>	<p><u>Summary</u> Students create a more diverse aquarium by introducing snails, scuds, and plants into the goldfish aquarium. They are introduced to the term <i>ecosystem</i> and discuss the interactions of the living and nonliving components of the system.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Aquatic environments include living and nonliving factors. ▪ Water and temperature are two nonliving factors. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ An aquatic environment can contain many different kinds of organisms that interact. ▪ The interactions of organisms with one another and with the nonliving environment is an ecosystem.
<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 1 day</p>
<p><u>CA Science Standards</u> LS3a, LS3b</p>	<p><u>CA Science Standards</u> LS3b, I&E6c</p>

Investigation Overview (continued)

<p>Investigation 3: Aquatic Environments Concepts: All organisms need energy and matter to live and grow. Living organisms depend on one another and on their environment for survival. Students set up freshwater aquariums with fish and plants. They monitor the environmental factors in the systems and look for feeding interactions. They learn about the role of producers, consumers, and decomposers in food chains and webs.</p>	
<p>Part 3: Food Chains and Food Webs</p>	<p>Part 4: Kelp Forest Food Web</p>
<p><u>Summary</u> Students work with organism card to create food chains and food webs in a forest ecosystem that includes terrestrial and aquatic environments. Students learn the plants and algae are the primary source of matter and energy entering most food chains and food webs. Students are introduced to the terms for different functional roles that organisms play in food chains. These terms are reinforced in the reading.</p>	<p><u>Summary</u> Students work with organism cards to create food webs in a kelp forest and are introduced to a marine ecosystem. Feeding relationships and competition for resources are discussed in the reading.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Organisms interact in feeding relationships in ecosystems. ▪ Producers (plants, algae) make their own food, which is also used by animals (consumers). ▪ Organisms may compete for resources in an ecosystem. ▪ Consumers may eat plants or other animals. ▪ Decomposers eat dead plant and animal materials and recycle the nutrients in the system. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ A kelp forest has similarities to a rain forest (vertical layering). ▪ Phytoplankton are the major producers in most aquatic systems. ▪ Food webs and competition for resources exist in marine systems.
<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 1 day Reading: 2 days Assessment: 2 days</p>
<p><u>CA Science Standards</u> LS2a, LS2b, LS2c</p>	<p><u>CA Science Standards</u> LS2a, LS2b, LS2c</p>



Grade 4 – Environments
Pacing Guide – Investigation 3: Aquatic Environments



Pacing Guide – Investigation 3: Aquatic Environments

Day 18		Day 19		Day 20	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 118-119</i> <input type="checkbox"/> Read “Background for teacher” <i>TG p. 120-121</i> <input type="checkbox"/> Read “Teaching Children About Aquatic Ecosystems and Food Chains” <i>TG p. 122</i> <input type="checkbox"/> Watch Video demo of Inv. 3, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 123-125</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Goldfish Aquariums” Wrapping up Part 1 Steps 1-10 <i>TG p. 126-128</i>		Reading in Science Resources <input type="checkbox"/> Steps 11-12 <i>TG p. 129</i> <input type="checkbox"/> Student Reading: Science Resources p. 115-119	<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 130-131</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: New Organisms” Wrapping up Part 2 Steps 1-9 <i>TG p. 132-134</i>

Pacing Guide – Investigation 3: Aquatic Environments (continued)

Day 21		Day 22		Day 23	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 10-11 <i>TG p. 135</i> Student Reading: Science Resources p. 120-122	<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 136-137</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Food Chains and Food Webs” Wrapping up Part 3 Steps 1-16 <i>TG p. 138-142</i>		Reading in Science Resources <input type="checkbox"/> Steps 17-19 <i>TG p. 143</i> Student Reading: Science Resources p. 123-127 <input type="checkbox"/> Body of Evidence Prompt #4 <i>TG p. 235 or 253</i> <input type="checkbox"/> Body of Evidence Prompt #5 <i>TG p. 265 or 254</i>
Day 24		Day 25		Day 26	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 4 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 144-145</i>	Guiding the Investigation <input type="checkbox"/> “Part 4: Kelp Forest Food Web” Wrapping up Part 4 Steps 1-13 <i>TG p. 146-148</i>		Reading in Science Resources <input type="checkbox"/> Steps 14-15 <i>TG p. 149</i> <input type="checkbox"/> Student Reading: Science Resources p. 128-131		Concluding Investigation 3 <input type="checkbox"/> Read Summary Steps 16-17 <i>TG p. 150</i> Student Reading: Science Resources p. 132-135 <input type="checkbox"/> I Check 3 Step 18 <i>TG p. 150, 344-349, 368-370</i>
Day 27					
Prep	Instruction				
	<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 151-156</i>				



Grade 4 – Environments
Pacing Guide – Investigation 4: Brine Shrimp Hatching



Investigation Overview

Investigation 4: Brine Shrimp Hatching		
<p>Concepts: All organisms need energy and matter to live and grow. Living organisms depend on one another and on their environment for survival. Students conduct a controlled experiment to determine which of four salt concentrations allow brine shrimp eggs to hatch. They determine range of tolerance and optimum conditions. They learn about a marine food web.</p>		
Part 1: Setting Up the Environment	Part 2: Determining Range of Tolerance	Part 3: Determining Viability
<p><u>Summary</u> Students investigate the environmental factor of salinity in hatching brine shrimp eggs. They conduct a controlled experiment to determine which of four salt concentrations allow brine shrimp eggs to hatch.</p>	<p><u>Summary</u> Students monitor saltwater environments. They determine which environments are conducive to hatching brine shrimp eggs. Students analyze the results of a multiple-trial experiment conducted by the class and draw conclusions. They read about the Mono Lake ecosystem and create food webs using the information in the article.</p>	<p><u>Summary</u> Students are challenged to manipulate the environment to see if they can get the dormant eggs to hatch and grow. They formulate and justify predictions and design an investigation to test their predictions. Students read about the important role of microorganisms in a number of ecosystems. They learn that many microorganisms are beneficial to the ecosystem and that most do not cause disease.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Brine shrimp are crustaceans that live in marine or salt-pond environments. ▪ An environmental factor is one part of an environment. It can be living or nonliving. ▪ Organisms have ranges of tolerance for environmental factors. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Within a range of tolerance, there are optimum conditions that produce maximum growth. ▪ Brine shrimp eggs can hatch in a range of salt concentrations, but more hatch in environments with optimum salt concentration. ▪ Organisms interact in feeding relationships in ecosystems. ▪ Producers make their own food, which they use and which is used by consumers. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ By altering the environment to optimum salt concentration, brine shrimp eggs that were once dormant can hatch. ▪ Most organisms do not cause disease, and many are beneficial. ▪ Microorganisms recycle matter from dead plants and animals to play an important role in food webs.
<p><u>Time Allocation</u> Active Investigation: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 2 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 2 days Reading: 2 days Assessment: 2 days</p>
<p><u>CA Science Standards</u> LS3b, I&E6a, I&E6b, I&E6d, I&E6f</p>	<p><u>CA Science Standards</u> LS3b, LS2b, I&E6d</p>	<p><u>CA Science Standards</u> LS2c, LS3d, I&E6c</p>



Grade 4 – Environments
Pacing Guide – Investigation 4: Brine Shrimp Hatching

Pacing Guide – Investigation 4: Brine Shrimp Hatching

Day 28		Day 29		Day 30	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 158-159</i> <input type="checkbox"/> Read “Background for Teacher” <i>TG p. 160-163</i> <input type="checkbox"/> Read “Teaching Children About Electromagnetism” <i>TG p. 164-165</i> <input type="checkbox"/> Watch Video demo of Inv. 4, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 166-168</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Setting Up the Experiment” Wrapping Up Part 1 Steps 1-12 <i>TG p. 169-172</i>	<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 173-174</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Determining Range of Tolerance” Steps 1-4 <i>TG p. 175</i>		Guiding the Investigation <input type="checkbox"/> “Part 2: Determining Range of Tolerance” Wrapping Up Part 2 Steps 5-15 <i>TG p. 176-178</i> <input type="checkbox"/> Body of Evidence Prompt #6 <i>TG p. 239 or 257; 240 or 258</i>

Pacing Guide – Investigation 4: Brine Shrimp Hatching (continued)

Day 31		Day 32		Day 33	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 16-18 <i>TG p. 179</i> Student Reading: Science Resources p. 136-142	<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 180-182</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Determining Viability” Steps 1-4 <i>TG p. 183</i>		Guiding the Investigation <input type="checkbox"/> “Part 3: Determining Viability” Wrapping Up Part 3 Steps 5-9 <i>TG p. 184</i>
Day 34		Day 35		Day 36	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 10-11 <i>TG p. 185</i> Student Reading: Science Resources p. 143-146		Concluding Investigation 4 <input type="checkbox"/> Read Summary Step 12-13 <i>TG p. 186</i> Student Reading: Science Resources p. 147-149 <input type="checkbox"/> I Check 4 Step 14 <i>TG p. 186, 350-355, 371-373</i>		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 187-192</i>



Grade 4 – Environments
Pacing Guide – Investigation 5: Range of Tolerance



Investigation Overview

Investigation 5: Range of Tolerance		
<p>Concept: Living organisms depend on one another and on their environment for survival.</p> <p>Students set up and monitor experiments to determine the range of tolerance of water for germination of four kinds of seeds: corn, pea, barley, and radish. In a second experiment they test the effect of salinity on these seeds.</p>		
Part 1: Water Tolerance	Part 2: Salt Tolerance and Plants	Part 3: Concluding the Module
<p><u>Summary</u> Students isolate one factor, water, in the environment of plants, and set up an experiment to determine the range of water tolerance for the early growth of four different plants. Students make observations after 5 and 9 days of growth. Students disassemble their planters and compare the growth of each plant in the different environments. Students read about the Lake Erie pollution problem and actions taken to restore the ecosystem.</p>	<p><u>Summary</u> Students set up a controlled experiment to test the effect of salinity on four kinds of plants. They plant four containers with identical arrays of seeds: barley, corn, peas, and radishes. They water each container with a different concentration of salt water. Students monitor growth of their plants at 5, 9, and 13 days after planting. They determine the salt tolerance of the four plants. Students read about what happens to the living components of an ecosystem when the nonliving components change.</p>	<p><u>Summary</u> Students read about four environmental scientists and their contributions to science and society.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a range of tolerance for each factor in its environment. ▪ Organisms have specific requirements for successful growth, development, and reproduction. ▪ Optimum conditions are those most favorable to an organism. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a range of tolerance for each factor in its environment. ▪ Organisms have specific requirements for successful growth, development, and reproduction. ▪ Optimum conditions are those most favorable to an organism. 	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> ▪ Every organism has a range of tolerance for each factor in its environment. ▪ Organisms have specific requirements for successful growth, development, and reproduction. ▪ Optimum conditions are those most favorable to an organism.
<p><u>Time Allocation</u> Active Investigation: 4 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 3 days Reading: 1 day Assessment: 1 day</p>	<p><u>Time Allocation</u> Reading: 1 day Assessment: 1 day</p>
<p><u>CA Science Standards</u> LS3a, LS3b, I&E6b, I&E6d, I&E6e, I&E6f</p>	<p><u>CA Science Standards</u> LS3a, LS3b, I&E6b, I&E6d, I&E6e, I&E6f</p>	<p><u>CA Science Standards</u> LS3b</p>



Grade 4 – Environments
Pacing Guide – Investigation 5: Range of Tolerance

Pacing Guide – Investigation 5: Range of Tolerance

Day 37		Day 38		Day 39	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 194-195</i> <input type="checkbox"/> Read “Background For Teacher” <i>TG p. 196-198</i> <input type="checkbox"/> Read “Teaching Children About Range of Tolerance” <i>TG p. 199</i> <input type="checkbox"/> Watch Video demo of Inv. 5, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 200-202</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Water Tolerance and Plants” Steps 1-11 <i>TG p. 203-205</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: Water Tolerance and Plants” Steps 12-15 <i>TG p. 205-206</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: Water Tolerance and Plants” Wrapping Up Part 1 Steps 16-26 <i>TG p. 206-208</i>
Day 40		Day 41		Day 42	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 27-28 <i>TG p. 209</i> Student Reading: Science Resources p. 150-152	<input type="checkbox"/> Watch Video demo of Inv. 5, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 210-213</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Salt Tolerance and Plants” Steps 1-13 <i>TG p. 214-216</i> <input type="checkbox"/> Body of Evidence Prompt #7 <i>TG p. 246 or 264</i>		Guiding the Investigation <input type="checkbox"/> “Part 2: Salt Tolerance and Plants” Steps 14-16 <i>TG p. 216-217</i>

Pacing Guide – Investigation 5: Range of Tolerance (continued)

Day 43		Day 44		Day 45	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Guiding the Investigation <input type="checkbox"/> “Part 2: salt Tolerance and Plants” Wrapping Up Part 2 Steps 17-25 <i>TG p. 217-218</i>		Reading in Science Resources <input type="checkbox"/> Steps 26-27 <i>TG p. 219</i> Student Reading: Science Resources p. 153-157 <input type="checkbox"/> I Check 5 Step 28 <i>TG p. 219, 356-359, 374-375</i>	<input type="checkbox"/> Watch Video demo of Inv. 5, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 220-221</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Concluding the Module” Reading Summary Steps 1-2 <i>TG p. 222</i> Student Reading: Science Resources p. 158-165
Day 46		Day 47			
Prep	Instruction	Prep	Instruction		
	<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 224-227</i>		<input type="checkbox"/> Administer DISTRICT Life Science Benchmark Assessment		



**Grade 4 – Environments
Recommended Body of Evidence**



Overview

This guide is intended to support the collection of a Body of Evidence. A student’s Body of Evidence should, at a minimum, include work from the listed prompts and in-class investigations that demonstrate a student’s level of proficiency. The FOSS pre-assessment given at the beginning of the unit, the I-checks given after each investigation, and Grade 4 DISTRICT Life Science Benchmark Assessment given at the end of the unit (post-assessment) may also be included in the body of evidence. Download samples of proficient work at <https://eteams.sandi.net/sites/sbrc>

Recommended Body of Evidence – Grade 4 Life Science

Concept #1

All organisms need energy and matter to live and grow. (LS2a, LS2b, LS2c)

**Prompt 4: FOSS: Environments: Investigation 3: Aquatic Environments Part 3: Food Chains and Food Webs
(TG p. 235 or 253 Food Chains and Food Webs – No. 7 – Science Notebook)**

1. What is food? Why is it important? 2. Do plants need food? Why or why not? 3. What happens to hawks when they die? 4. What is the role of producers in an ecosystem? 5. Look at the food web for California river on page 126 of the *Science Resources* book. Give three examples of animals that compete for a food source. 6. What is the role of decomposers in an ecosystem?

**Prompt 5: FOSS: Environments: Investigation 3: Aquatic Environments Part 3: Food Chains and Food Webs
(TG p. 236 or 254 – Response Sheet – Aquatic Environments – No. 8 – Science Notebook)**

Write comments about Yolanda’s food web. You can draw a new food web if you would like to. Write comments and draw here.

**Prompt 6: FOSS: Environments: Investigation 4: Brine Shrimp Hatching Part 2: Determining Range of Tolerance
(TG p. 239 or 257 – Brine Shrimp – Hatching Observations – No. 11 – Science Notebook AND TG p. 240 or 258 – Brine Shrimp – Hatching Conclusions – No. 12 – Science Notebook)**

What day of your experiment did you first notice hatching? In which container did you observe hatching? What additional observations did you make? Record the number of eggs that hatched in each salt solution. Write a report answering Dr. Bryan’s question. Is salinity an environmental factor that affects brine shrimp egg hatching?

Concept #2

Living organisms depend on one another and on their environment for survival. (LS3a, LS3b, LS3c, LS3d)

**Prompt 1: FOSS: Environments: Investigation 1: Terrestrial Environments Part 2: Recording Changes
(TG p. 230 or 248 – Response Sheet – Terrestrial Environments – No. 2 – Science Notebook)**

Do you agree that all factors Sara marked with an L are living? If not, tell which ones you don’t agree with and explain why you don’t agree. Describe how two of the nonliving factors might influence the living factors in this terrarium.

**Prompt 2: FOSS: Environments: Investigation 2: Isopods and Beetles Part 2: Organisms and the Nonliving Environment
(TG p. 231 or 249 – Animal Investigations – No. 3 – Science Notebook AND TG p. 232 or 250 – Response Sheet – Isopods and Beetles – No. 4 – Science Notebook)**

Describe how you set up your runway. Record where each animal was and what it was doing (on surface, buried, moving). From your observations, what can you say about the animals’ environmental preferences? Do you agree that Bret’s investigation supports his conclusion? Why or why not? What would you do differently to improve his investigation?

**Prompt 3: FOSS: Environments: Investigation 2: Isopods and Beetles Part 3: Organisms and The Living Environment
(TG p. 233 or 251 – How Organisms Depend On One Another - No. 5 – Science Notebook)**

1. Describe three examples of how animals depend on plants for survival. 2. Describe three examples of how plants depend on animals for survival. 3. Do you think animals pollinate flowers and disperse seeds on purpose or by accident? Explain why so think so.

**Prompt 7: FOSS: Environments: Investigation 5: Range of Tolerance Part 2: Salt Tolerance and Plants
(TG p. 246 or 264 – Response Sheet – Range of Tolerance – No. 18 – Science Notebook)**

Do you agree with his conclusion? What might Carlos do to improve it? How would Carlos improve his recordings?



Grade 4 - Environments
Module Materials and Equipment



Materials Provided

The FOSS kit comes with most of the supplies that are needed to teach the unit. The kits will be delivered to the school site prior to the start of the 12-week unit of instruction. At the end of the 12-weeks, the kit will be returned to the Science Resource Center where it will be refurbished and prepared for its next use. Please review the refurbishment calendar for kit drop-off and return dates. Kits must be returned according to the refurbishment calendar to ensure that all kits are checked and restocked with consumable materials.

Materials Supplied by the Teacher or School Site

Be aware that the classroom teacher or school site must supply a few items. These are indicated in the materials list for each part of the investigation with an asterisk (*). Here is a summary of those items.

Investigation 1: Terrestrial Environments	Investigation 2: Isopods and Beetles	Investigation 3: Aquatic Environments	Investigation 4: Brine Shrimp Hatching	Investigation 5: Range of Tolerance
<ul style="list-style-type: none"> ▪ 1 Flip Chart ▪ Newspaper ▪ Paper Towels ▪ Plastic Wrap ▪ Potting Soil 8 Liters 	<ul style="list-style-type: none"> ▪ Apple, Carrot, or Potato ▪ Bran or chick starter mash ▪ Bus trays or other flat containers ▪ Sheet of chart paper ▪ Flowers ▪ Hot-water bottle ▪ Ice ▪ Newspaper ▪ Stiff paper or old file folders ▪ Paper towels ▪ Plant Matter ▪ Plastic wrap ▪ Potting Soil 3 liters ▪ VCR and Monitor 	<ul style="list-style-type: none"> ▪ Map of California ▪ Marking Pens ▪ Paper Cutter ▪ Aged tap water or bottle water ▪ White Paper 	<ul style="list-style-type: none"> ▪ 8 Marking Pens ▪ 1 overhead projector (optional) ▪ Paper Cutter ▪ Aged tap water or bottle water ▪ White Paper 	<ul style="list-style-type: none"> ▪ Newspaper ▪ Paper Towels ▪ Potting Soil, 16 liters



San Diego Unified School District
Science Department

Grade 4 - Environments Caring for Live Materials



Live Materials Used in This Module

Pillbugs and Sow Bugs
Beetles (Tenebrio)
Goldfish
Aquatic Snails
Amphipods
Elodea
Lemna (Duckweed)
Brine Shrimp

Introduction to Life in the Classroom

In several of the FOSS modules and courses, living organisms are brought into the classroom to be cared for and observed by K-5 students. Through the direct experience with organisms provided by these modules, we hope to engender in students a sense of respect for all life and to spark a desire to understand the complex systems that support life on Earth.

The FOSS program endorses the National Science Teachers Association Guidelines for Responsible Use of Animals in the Classroom as they apply to elementary and middle school classrooms.

The FOSS program provides detailed information on how to obtain organisms, how to prepare for their arrival, how to care for them in the classroom, and how to instruct students to properly handle each animal. The animals in the modules were selected because they are abundant, safe for students, easy to care for, and hardy and well-adapted to classroom environments. FOSS selected organisms that were nonexotic, commonly available from local and regional suppliers, and, in some cases, found in the natural environments in many regions. When investigations are carried out as described in the FOSS teacher guide, the insects, worms, crustaceans, snails, and fish are not harmed in any way.

PILL BUGS AND SOW BUGS

Iso is Greek for "similar or equal." Pod means "foot." Put them together and you have the isopod, an organism that has an equal number of feet or legs on both sides with all legs similar to one another. Isopods have 14 legs that all function the same. This distinguishes them from closely related organisms that have legs that are modified to perform different functions, such as walking, feeding, feeling, grasping, and so on.

What to do when they arrive. The shipping container contains damp paper to provide moisture. Upon arrival, mist paper slightly. Food should be removed if it shows any sign of mold and replaced with sliced carrot, potato, or apple. Pill bugs and sow bugs can be kept in the shipping container for a few days until ready to use in class. Moisten the paper towels as necessary.

If you are keeping them for a longer period of time, place them in a terrarium with rich, moist soil. Place moist paper towels in the container to provide humidity. Continue to add vegetables, replacing them as necessary to control mold. Keep container at room temperature in low light.

Classroom habitat. Isopods are excellent classroom animals—they exhibit interesting behaviors, they are small but not tiny, they don't bite, smell, fly, or jump, and they are easy to care for. Isopods can live in just about any vessel, from a recycled margarine tub to a 50-liter aquarium. If the container is smooth-sided, it doesn't even have to be covered, because isopods can't climb smooth surfaces at all. A layer of soil covered with some dead leaves, twigs, and bark is great, but isopods will be comfortable with some paper towels or newspaper laid on the soil. They do like to have some structure to crawl under.

Food and water. The most important thing to remember is that the soil must be kept moist at all times—not wet, but moist—so that the isopods don't dry out. A chunk of raw potato in the container with the isopods serves as a source of both food and moisture. Otherwise they will eat the decomposing leaves and twigs or the paper towels and newspaper.

MEALWORMS AND DARKLING BEETLES (Tenebrio beetle)

The mealworm is not a worm; it is a larva. Any similarity to a true worm is incidental. mealworm larvae are golden yellow and have 13 segments—a head, three thoracic segments, and nine abdominal segments. Mealworm larvae are the counterpart of the familiar caterpillar in the butterfly story. They pull themselves around on six stubby legs, one pair on each thoracic segment.

What to do when they arrive. Mealworm beetles are shipped in a container with a "breathing" cap to provide air. They need no special care but should be used as soon as possible, as they have a rather short life span. Keep beetles at normal room temperatures in low light. Store in a cool place at 45 to 65° F out of direct sunlight. At warmer room temperatures, larvae will soon pupate. Cover loosely with a paper towel to provide crawling space. Add slices of potato or carrot for moisture and add a substrate of bran for food. Replace as necessary or if it becomes moldy.

GOLDFISH AND GUPPIES

Plants and animals that live in water make up the majority of biomass. They have so much more space in which to live. Life undoubtedly originated in the water, and many life-forms have never left it. Living in a dense fluid like water provides a lot of support for organisms, and the free-swimming forms have three-dimensional mobility. And, of course, they never have to worry about where their next drink is coming from.

For many of us a goldfish bowl was our introduction to aquatic animals. The beautiful orange fish are hardy and forgiving in terms of their living requirements. They are good classroom animals, requiring a minimum amount of care to keep them in good shape.

Guppies are small fish that bear live young. The feeder-guppy females are larger and usually a uniform beige or silver gray. Their abdomens become quite large when they are gravid (carrying young). The males are smaller and have longer, flowing tails. Males are the ones with spots of multiple colors. Fancy guppies that have been bred for showy colors can be dazzling.

Guppies are quite prolific and will probably give birth during their stay in your classroom. In fact, you may observe the arrival of baby guppies a day or two after the adults are put in their basin aquarium. The stress of transportation may induce a gravid female to release the babies. Adult guppies will eat the young, so you should supply the aquarium with plenty of Elodea in which the babies can hide, or move the adults to a separate tank. Students will enjoy watching the baby guppies grow.

What to do when the fish arrive. Float the unopened bag in aquarium of dechlorinated or spring water for about 15 minutes to equalize the temperature. When temperatures are equal, pour contents of bag through a dip net into another container and transfer fish from net to the aquarium. Discard shipping water. **DO NOT USE CHLORINATED TAP WATER!!!**

Maintain aquarium at room temperature out of direct sunlight, adding and/or changing water with treated water as necessary to reduce the concentration of nitrogen-containing chemicals naturally occurring in the water.

AQUATIC SNAILS

Many kinds of aquatic snails make excellent additions to an aquarium. All snails have spiral shells that get bigger toward the opening as the snail grows. The snail secretes new shell around the opening and moves in, abandoning the narrow reaches at the tip of the spiral in which it lived as a youth.

What to do when they arrive. Immediately upon arrival, open bag and place in cup or similar upright container to prevent tipping. Rinse snails with dechlorinated or spring water prior to transferring to aquarium. Snails will feed on algae or decaying plant matter naturally found in the aquarium.

For snails that are not collected locally, release into the environment is never an option. If no other option is possible, the most humane thing to do is euthanize the snails by collecting them in a bag and placing them in the freezer. Then dispose of them in the trash.

Amphipods

Gammarus, also called scuds and side-swimmers, are amphipods. Most amphipods are marine, but there are 50 American species living in fresh water. They live in unpolluted lakes, ponds, streams, brooks, springs, and subterranean waters.

What to do when they arrive. Upon arrival, transfer into a larger container of dechlorinated or spring water, using a large baster or by pouring contents directly from the shipping jar. Keep container at room temperature out of direct sunlight. Gammarus are scavengers and feed on microscopic algae and protozoans normally found in pond water. If keeping for longer periods of time, introduce aquatic plants into the aquarium which, as they break down, will provide food.

ELODEA (ANACHARIS)

Plants occupy the base of the food pyramid in aquatic systems just as they do in terrestrial systems. Inconspicuous single-celled algae that turn your aquarium green capture the sun's energy and provide food for countless minute animals in the water. If you want to stimulate an algae bloom (population explosion), put a goldfish in an aquarium, place it where it will get direct sun several hours a day, and provide the fish with plenty of food. When you see the water turn green, it's a sign that your aquatic plants are growing beautifully.

FOSS activities also use vascular aquatic plants. The popular goldfish-bowl plant that looks like a green feather boa is Elodea (or sometimes Anacharis). In nature it is usually rooted to the bottom of a stream or pond, but in your aquarium it can just float around. It is a good food source for amphipods, fish, and crayfish and will contribute to the oxygen in the water as it photosynthesizes. It also provides crannies where small animals can hide from predators.

What to do when the plants arrive. Open bag and rinse plants in dechlorinated or spring water. Keep Elodea floating in bowl of dechlorinated or spring water to avoid drying out until it's ready to use.

FOSS does not advocate the release of organisms (plant or animal) into the environment if they were not collected from that environment. In some states, it is illegal to release organisms, even those indigenous to the area, without a permit. For the most humane disposal of the live organisms it is suggested that you place this organism into a paper bag and into the freezer over night, and then discarded into the trash.

DUCKWEED

Lemna, also known as duckweed, is a tiny floating green plant that looks superficially like a bunch of diminutive lily pads. An individual plant never gets any larger than a few millimeters, but they can proliferate to cover huge areas of water completely. Ducks are fond of it and do their part to keep waterways open, along with many other animals that find it a good food source. Lemna is a good plant for population studies because of the rate at which it multiplies by division of the fleshy leaves. Lemna is the smallest of the flowering plants, but it rarely blooms.

What to do when the duckweed arrives. Transfer contents of shipping container to small sieve or dip net. Rinse in dechlorinated or spring water. Introduce duckweed to aquarium where it will float and provide food for other organisms.

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BRINE SHRIMP

Brine is a salt solution—usually a saturated salt solution. And we have all seen a shrimp or two, even if only in cocktail sauce. Brine shrimp might therefore sound like some kind of pickled seafood delicacy, but that's not the case. Brine shrimp, also called fairy shrimp and sea monkeys in some contexts, are tiny but important organisms found in salt ponds and saline lakes.

What to do when they arrive. We strongly recommend that you test the suitability of your local tap water and the viability of your brine shrimp eggs a week or so before you plan to do the investigation. Put 150 ml of aged tap water in two cups. Add two 5-ml spoons of salt to one cup and label it "2 spoons," and four 5-ml spoons of salt to the other cup and label it "4 spoons." Transfer 1 level minispoon of brine shrimp eggs to each cup. Put the lids on and gently swirl the cups to wet the eggs.

If all goes well, in 24 to 48 hours, at room temperature, you should see the tiny brine shrimp swimming about. You must look closely: Any movement of the water will interfere with your ability to see hatched shrimp, so leave the cup on the table and look into it from the side and down from the top (take the lid off). Eggs float, but larvae swim about.

If no eggs have hatched after 72 hours, purchase bottled spring water and try again. If you still have no success, the viability of the eggs is suspect. Viability is certain for a year or two, so if your eggs are old, replace them. Eggs can be purchased from Delta Education (go to Environments) or from tropical fish stores.