

MATERIALS

STRUCTURES OF LIFE



NOTE: Plan ahead and order animals now. See page 4.

THE STRUCTURES OF LIFE KIT CONTAINS

- 1 Teacher Guide
- 1 Teacher Preparation Video
 - Equipment for 32 students working in 8 collaborative groups of 4 students
 - *FOSS Science Stories Structures of Life*

A new kit contains enough consumable items for at least two classroom uses before you need to restock.

FOSS modules use central materials distribution. You organize all the materials for an investigation on a single table called the **materials station**. As the investigation progresses, one member of each group gets materials as they are needed, and another returns the materials when the investigation is completed. You place items at the station—students do the rest.

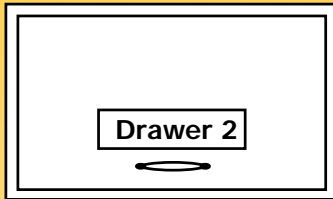
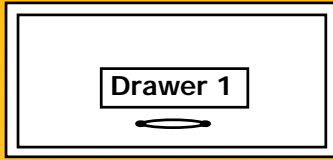
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MATERIALS CONTENTS

Introduction to the Kit	1
Kit Inventory List	2
Materials Supplied by the Teacher	3
Materials from the Measurement Kit	3
Storing Equipment	3
Planning for Live Organisms	4
Preparing the Kit for Your Classroom	6
Ordering Replacement Parts	8



KIT INVENTORY LIST



NOTE: The kit also includes two large bus trays in a separate box.

★ These items may need occasional replacement.

EQUIPMENT

DRAWER 1—PERMANENT EQUIPMENT

20	Container lids, plastic, 1/4-liter ★	
20	Containers, plastic, 1/4-liter	
1	Container, plastic, 1/2-liter	
2	Sets of crayfish houses, plastic, 4/set	
10	Cup lids, plastic, for 250-ml cup	
25	Cups, plastic, 250-ml	
1	Meter tape	
1	Box of paper clips, large, 100/box	
1	Set of 5 metric spoons	
1	Water mister	
1	Teacher Guide	
1	Teacher Preparation Video	
•	FOSS Science Stories Structures of Life	

DRAWER 2—PERMANENT EQUIPMENT

2	Basin covers, plastic, for 6-liter	
4	Basins, clear plastic, 6-liter	
2	Basins, 8-liter	
1	Brush	
2	Bags of gravel, mixed, 1 kg ★	
4	Hydroponic plant holders	
8	Knives, plastic ★	
10	Spoons, plastic ★	
1	Sprouter	
4	Bags of washers, large, 20/bag	

DRAWER 2—CONSUMABLE ITEMS (for 2 classes)

1	Bag of cat food, dry	
1	Set of dots, adhesive, white, 1000/set	
1	Roll of duct tape, 10 m/roll	
50	Filter papers, round	
1	Pad of sticky notes, 100/pad	
1	Bag of nutrient powder for hydroponics	
4	Packages of seeds, bush bean, 80/pkg	
1	Package of seeds, lima bean, 1/4 lb./pkg	
2	Packages of seeds, pea, 100/pkg	
2	Packages of seeds, popcorn, 150/pkg	
2	Packages of seeds, sunflower, 100/pkg	
50	Straws, jumbo	
1	Set of yarn, 30 cm, 4 colors/set	

MATERIALS SECTION

Each part of each investigation has a Materials section that describes the materials required for that part. It lists materials needed for each collaborative group and for the class.

MATERIALS SUPPLIED BY THE TEACHER

Be aware that you 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 list of those items.

Investigation 1: Origin of Seeds <ul style="list-style-type: none"> • Fruit, including bean pods 16 Paper or plastic plates <ul style="list-style-type: none"> • Paper towels • Newspaper 1 Marking pen <ul style="list-style-type: none"> • White glue • Bleach, 50 ml • Transparent tape 1 Flip chart	Investigation 2: Growing Further <ul style="list-style-type: none"> • Paper towels 32 Scissors <ul style="list-style-type: none"> • White glue • Paper, unlined • Transparent tape • Masking tape 	Investigation 3: Meet the Crayfish 12 Crayfish <ul style="list-style-type: none"> • <i>Elodea</i> (water plant) 1 Marking pen, permanent <ul style="list-style-type: none"> • Paper towels • Aged water 1 Overhead projector (optional)	
Investigation 4: Meet the Land Snail 18 Land snails (See information on pages 5–6 and 8–9.) <ul style="list-style-type: none"> • Carrots or spinach (snail food) • Paper, unlined • Rubber bands • Chalk • Flashlights • Paper towels • Thread 1 Knife <ul style="list-style-type: none"> • Poster board (optional) 		Investigation 5: Bess Beetles 12 Bess beetles <ul style="list-style-type: none"> • Rotting hardwood • Paper towels • Scissors • Dental floss • Masking tape • Flashlights (optional) • Jump rope (optional) 	
MATERIALS FROM THE MEASUREMENT KIT <p>You must have access to FOSS measurement tools. Items preceded by a delta (Δ) in the materials list for each part of the investigation are in the Measurement kit.</p>			End-of-Module Assessment <ul style="list-style-type: none"> • Dry soup mix, 15-bean • Transparent tape • Isopods • Paper towels • Paper plate or sheet of paper

STORING EQUIPMENT

1. Clean all the containers, lids, crayfish houses, and bus trays with water only (no soap) and dry them thoroughly.
2. Make sure the gravel is dry before returning it to the kit.
3. Store the hydroponic plant holders between paper so they won't stick together.
4. Repackage any remaining seeds and label the package with the date they were resealed.
5. Make sure this kit is stored in a location free from critters that might enjoy a meal of dry cat food.

MEASUREMENT KIT ITEMS

- 8 *FOSS balances*
- 8 *Basins*
- 16 *Hand lenses*
- 8 *Mass sets*
- 2 *Pitchers (1 optional)*



NOTE: *This module needs no first-time preparation.*



SAFETY NOTE: *If students want to collect crayfish from a local creek or pond, they should be supervised by an adult and cautioned about any harmful organisms (snakes, poison oak, ivy, or sumac) that might be around local aquatic areas.*

NOTE: *Delta Education sells coupons for most of the FOSS live organisms (but not land snails). Call Delta at 1-800-258-1302 for the latest information on purchasing organisms for FOSS.*

PLANNING FOR LIVE ORGANISMS

Some organisms come in the module kit (seeds of peas, beans, popcorn, and sunflowers). Other organisms you will need to provide. Plan ahead so that you have healthy, viable organisms in your classroom when students are ready to start the investigations.

1. SEEDS (INVESTIGATIONS 1 AND 2)

There are more than enough seeds in a new kit for two classes of 32 students to conduct all the investigations.

Check the package date on the seeds; if the seeds are more than 2 years old, consider ordering new ones. Fresh seeds will increase the chances of successful seed germination.

We recommend that you order most seeds from Delta Education to make sure that you have the best variety for classroom use. If you need the seeds immediately and want to buy them at a local store, be sure to get untreated seeds. Seeds, particularly corn, are sometimes powdered with fungicide (you can tell because they will be pink instead of yellow). Provide only untreated seeds for classroom use. Grocery stores carry the large lima bean seeds used in Investigation 1.

2. FRUIT

You will need to get fruit for Part 1 of Investigation 1. Refer to Step 6 of Getting Ready for information on selecting the fruit.

3. CRAYFISH (INVESTIGATION 3)

There are a number of ways to get crayfish. Have students catch crayfish from a local creek or pond; buy them from a bait shop; or order them from a biological supply company. In any case, you will need 10–12 healthy crayfish that are accustomed to still, relatively warm water (as opposed to cold, fast-running streams).

If you purchase the crayfish from a biological supply company, place your order for one dozen medium-size crayfish well before the investigation. Let the company know on what date you plan to introduce the crayfish to your class. Use a local vendor if possible.

4. PREPARE FOR THE CRAYFISH'S ARRIVAL

A day or two before you expect the crayfish to arrive, prepare their habitat. Fill two bus trays about one-third full of cold tap water (3–4 cm deep). Keep the trays out of sight in a cool, dark place. Let the water sit for a day or more to release chlorine from the water.

The crayfish will arrive in a cardboard box packed with damp paper or moss. Alert the school secretary to notify you as soon as they come. Open the box and immediately transfer the crayfish to the two bus trays. Refer to page 10 of Investigation 3 for helpful hints on the care and feeding of crayfish.

5. PROVIDE AQUATIC PLANTS (INVESTIGATION 3)

Buy or collect from a local pond some small aquatic plants for the crayfish. We recommend getting 6–12 sprigs of *Elodea*, also known as *Anacharis*. (It looks like a little green feather boa.) You can order it from a biological supply company when you order your crayfish, or you can pick it up locally at a pet store that deals with fish. If *Elodea* is not available, try another inexpensive aquatic plant.

6. LAND SNAILS (INVESTIGATION 4)

You will need one land snail for each pair of students, with four to six additional snails to replace any that arrive damaged.

The largest and friendliest land snail for the classroom is the escargot snail that is naturalized in the West, *Helix aspersa*. If you live in a region where *Helix* has become established in local gardens, collect them locally. If you cannot collect them locally, there are several options listed below for getting land snails. If you encounter any problems, skip Investigation 4 and go on to Investigation 5, Bess Beetles, which has been added to the **Structures of Life Module** as an alternative to the land-snail investigation.

- Check with a biological supply company *within your state* to see if they carry *Helix* or another large, active land snail similar to *Helix*. Order the land snails from the supplier within your state.
- If you cannot get *Helix* from within your own state, you may be able to order them from a national supplier. At the time of this printing, the only states that the U.S. Department of Agriculture (USDA) will authorize to receive *Helix* from another state are Arizona, California, New Mexico, Texas, Utah, and Washington. If you live in one of these states and cannot find a supplier for *Helix* within your state, you can get a USDA permit to purchase them from a national supplier outside your state. See the section called GETTING A USDA PERMIT FOR LAND SNAILS on pages 8–9.

NOTE: *Delta Education does not sell coupons for land snails.*



NOTE: On FOSSweb.com go to

- Grades 3–6
- Structures of Life Module
- Teacher/Parent Info
- Plant and Animal Care

NOTE: You can order bess beetles (part number 270-4420) by calling Delta Education at 1-800-258-1302 Monday through Friday, 8 a.m. to 6 p.m. Eastern Standard Time.

NOTE: If you obtained snails with a USDA permit, be sure to follow the regulations. The option of maintaining land snails in your classroom or district is subject to USDA permit regulations.

- At the time of this printing, the FOSS project is working with the USDA to develop information for teachers about native or naturalized land snails appropriate for use in different regions of the country. This information will be posted on our website, FOSSweb.com, in the **Structures of Life Module** section (see navigation in sidebar) as soon as it becomes available.

7. PREPARE FOR THE SNAILS' ARRIVAL

Land snails are quite hardy and can survive for many days with little food or water. In your classroom they will live in two clear terrariums with covers (the same type of basins used for the hydroponics). Once the snails arrive, place moist paper towels on the floor of each terrarium and spray the interior walls with water. Distribute the snails into the terrariums and provide a few small pieces of carrot or leafy vegetable for them to eat. Use tape or a rubber band to secure the covers.

8. BESS BEETLES (INVESTIGATION 5)

You will need one bess beetle for each group of four students, with at least two additional beetles to replace any that arrive damaged. If you can, provide one beetle for every pair of students. You can order bess beetles from Delta Education. Otherwise, check your regional biological supplier for bess beetles, also known as passalid beetles or *Odontotaenius disjunctus*. They are fairly common throughout the eastern United States, inhabiting decayed hardwood stumps and logs.

9. PREPARE FOR THE BESS BEETLES ARRIVAL

Bess beetles are almost as hardy as land snails. They will live in the classroom in two clear terrariums with covers. Decayed hardwood supplies the beetles' food and shelter. Oak, elm, and many other deciduous trees are good choices, while conifers are *not* their favorites. Gather enough rotting wood (you should be able to pull it apart by hand) to fill each basin about 5–8 cm (2–3") deep. Once the bess beetles arrive, add them to the two basins of wood. Give them a good spray of water and put on the basin covers. Plan to spray the basin daily. The beetles will be fine over the weekends without water.

10. DISPOSING OF ORGANISMS AT THE END OF THE MODULE

There are a number of options for dealing with the snails, beetles, and crayfish at the end of the module. The organisms might find a permanent home in your classroom. You will need to provide

containers for permanent habitats if the kit will be used by another teacher. Or check with your district to see if there is a plan for reuse of FOSS living organisms. If the organisms were not collected locally, they *cannot* be released into the local environment. There is always a chance that an introduced species might displace a native species in the environment, so releasing such organisms is not an option.

11. A FINAL NOTE FROM THE FOSS PROJECT STAFF

We believe that studying live organisms is a critical part of any life science curriculum—it is especially important to support the philosophy that children learn best through direct, hands-on experiences. We are committed to including the study of live organisms as part of the FOSS curriculum.

We know that the use of organisms comes with a unique set of challenges, but like you, we think it's well worth the effort. We continue to support and abide by federal regulations and NSTA guidelines for the responsible treatment of animals in the classroom while taking steps to ensure that children have hands-on life science experiences, and teachers and school districts have a variety of options to obtain organisms.

GETTING A USDA PERMIT FOR LAND SNAILS (*Helix aspersa*)

The *Helix aspersa* is currently on the USDA list of plant pests. The transport of this snail across state lines is controlled by the USDA working with the 50 State Departments of Agriculture.

At the time of this printing, the only states that will be authorized by the USDA to receive *Helix* from another state include Arizona, California, New Mexico, Texas, Utah, and Washington. If you live in other states or are having difficulty obtaining snails, you should do Investigation 5 (Bess Beetles) in lieu of Investigation 4.

USDA permit regulations may change. For updated information, visit USDA's website at www.aphis.usda.gov/ppq/permits/plantpest/snails_slugs.html.

NOTE: If you need assistance with your USDA permit application, please contact Delta Education at 1-800-258-1302 Monday through Friday, 8 a.m. to 6 p.m. Eastern Standard Time.

If your school is in one of the six states currently authorized to receive *Helix*, a USDA snail permit is still required in order to have the *Helix* shipped to your school from outside the state. Plan an extra 3–4 weeks for USDA permit approval before you can order your snails. Here's what to do:

Go to the USDA website at www.aphis.usda.gov/ppq/permits/plantpest/snails_slugs.html and download a copy of the permit application (PPQ 526). Here's some of the information you will be required to provide on the application.

1. Applicant's name, title, and address. (This is the person whose name will be on the permit and will be responsible for upholding the conditions on the permit, which includes safeguarding the snails from being removed from the classroom.)
2. Applicant's telephone number and fax
3. Type of pest to be moved. Check "other" and write "Mollusk."
- 4a. Scientific name of pest to be moved: *Helix aspersa*
- 4d. Number of specimens or units (put the number of snails your school or district will be ordering over a 6-month period of time for all the classes).
- 4e. Shipped from: You will need to know the state in which the supplier is located to complete this information. Contact the supplier before you apply for the permit to make sure they can provide you with *Helix aspersa*.

12. Supplier. This is the name of the company from which you are ordering the snails.
14. Intended use: “educational use in elementary classroom.”
15. Method to prevent escape: “keep in container with secure lid.”
16. Method of final disposition: “freezing (rendered dead).”

Fax the completed application to the USDA office in Maryland at 301-734-8700. By signing the form, the applicant agrees to comply with the USDA “Standard Safeguards of Permit” (see below for a listing of those safeguards).

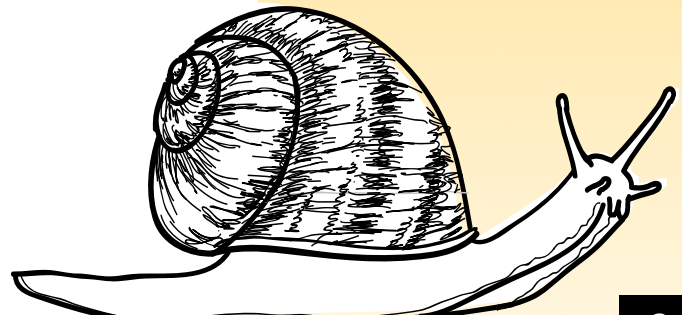
If approved, you should receive the USDA permit by fax in a few weeks. You can check the status of your permit by visiting the USDA website at www.aphis.usda.gov/ppq/permits/plantpest/snails_slugs.html.

The permit number will be needed to order snails. The permit allows you to place orders for snails for at least one semester.

TYPICAL USDA STANDARD SAFEGUARDS OF PERMIT

- All snails must be shipped in sturdy, escape-proof containers.
- Packing material, substrate, or soil that was shipped with the snails can be used in the snail terrarium, but should be destroyed when the snails are gone.
- Snails must be housed in closed containers. All necessary precautions must be taken to prevent escape of snails. In the event that a snail escapes, notify USDA.
- Without prior notice and during reasonable hours, authorized USDA and State regulatory officials shall be allowed to inspect the conditions under which snails are kept.
- All snails kept under this permit shall be euthanized at the completion of intended use, and not later than the expiration date, unless you renew the permit.

NOTE: *Check the USDA website regularly for any updates to this information.*



PREPARING THE KIT FOR YOUR CLASSROOM

1. CARE AND REUSE OF MATERIALS

All of the containers in the module are to be rinsed and reused. The sprouter and 1/4-liter containers used for the minisprouters should be cleaned with soap and rinsed thoroughly with water. A final rinse with a dilute bleach solution will help prevent mold from interfering with the seed investigations. It is a good idea to rinse the containers before use.

The containers used with crayfish and snails should be rinsed thoroughly, but don't use soap and bleach on these containers.

2. BASINS

Familiarize yourself with the different basins used in this module.

- Two clear, 6-liter basins are used for the hydroponic setup.
- Two clear, 6-liter basins with covers are used as the snail habitat.
- Two 8-liter basins are used as the feeding corrals for the crayfish.
- Eight 8-liter basins from the Measurement kit are used in group investigations of individual crayfish.

3. BUS TRAYS

The two large, gray, bus trays come in a separate shipping box. Be sure they are with the two kit drawers when the module arrives in your classroom. The bus trays serve as the habitats for the crayfish in Investigation 3. The trays are deep enough to prevent medium-size crayfish from crawling out to explore your room.

4. GRAVEL

The crayfish gravel should be rinsed, dried, and reused. Check the supply of gravel. There should be enough to sprinkle on the bottom of the two bus trays.

5. SHARING EQUIPMENT

These investigations continually use the equipment for a long time. The sprouters are used for 7–10 days, the hydroponic containers for 2 months, and the crayfish bus trays and snail basins and covers for as long as you and your class are interested in the organisms. You will need to plan carefully if you are sharing this kit with another teacher or if you are on a specific schedule to return the equipment.

6. STUDENT SHEETS

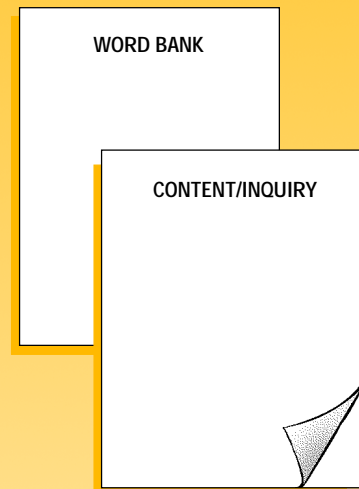
You will need to make copies of student sheets before each investigation. If you use an overhead projector, you may want to make transparencies of a few sheets to help students get oriented to them.

7. WORD BANK AND CONTENT/INQUIRY CHARTS

Throughout the module, you will be adding new vocabulary words to a word bank and summarizing content learned and questions still to be answered on a content/inquiry chart. Use large pieces of paper for each chart.

8. THINK ABOUT EXTRA MATERIALS FOR PROJECTS

You can limit student projects to the materials available in the kit; there are plenty of materials for interesting projects. However, you may want to gather a few extra materials for student projects at the end of the module. When students turn in their project proposals, let them know what materials you can provide. You may need to suggest substitute materials for hard-to-get items.





STRUCTURES OF LIFE MATERIALS

FOR FOSS REPLACEMENT PARTS CONTACT DELTA EDUCATION, INC.,
THE AUTHORIZED FOSS MATERIALS SUPPLIER
1-800-258-1302 PHONE 1-603-886-4632 FAX

STRUCTURES OF LIFE EQUIPMENT

- 2 Basin covers, plastic, 6-liter
- 4 Basins, clear plastic, 6-liter
- 2 Basins, 8-liter
- 1 Brush
- 2 Bus trays, 18 cm X 38 cm X 51 cm
- 1 bag Cat food, dry, 16g/bag
- 20 Container lids, plastic, 1/4-liter
- 20 Containers, plastic, 1/4-liter
- 1 Container, plastic, 1/2-liter
- 2 set Crayfish houses, plastic, 4/set
- 10 Cup lids, plastic, 250-ml
- 25 Cups, plastic, 250-ml
- 1 set Dots, adhesive, white, 1/2" diameter, 1000/set
- 1 roll Duct tape, 10 m/roll
- 50 Filter papers, round, coffee, 20-cm diameter
- 2 bag Gravel, mixed, 1 kg
- 4 Hydroponic plant holders
- 8 Knives, plastic
- 1 Meter tape
- 1 bag Nutrient powder for hydroponics, 19g/bag
- 1 box Paper clips, large, 100/box
- 4 pkg Seeds, bush bean, 80/pkg
- 1 pkg Seeds, lima bean, 1/4 lb./pkg
- 2 pkg Seeds, pea, 100/pkg
- 2 pkg Seeds, popcorn, 150/pkg
- 2 pkg Seeds, sunflower, 100/pkg
- 1 set Spoons, metric, 5/set
- 10 Spoons, plastic
- 1 Sprouter
- 1 pad Sticky notes, 100/pad
- 50 Straws, jumbo
- 4 bag Washers, large, 20/bag
- 1 Water mister
- 1 set Yarn, 30 cm, 4 colors/set

MEASUREMENT ITEMS

Each module for grades 3–4 requires measuring tools from the FOSS Measurement kit. FOSS module kits can be upgraded to stand-alone kits by ordering the specific **measurement tool kit** to accompany that module.

Measurement kit items used in the **Structures of Life Module:**

- 8 FOSS balances
- 8 Basins
- 16 Hand lenses
- 8 Mass sets
- 2 Pitchers (1 optional)

REFILL PACKAGES

Standard **Refill Packages** of consumable items are available. A Refill Package for a module includes sufficient quantities of all consumable materials to use the kit with two classes of 32 students.

Published and distributed by



Delta Education
...because children learn by doing.®

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The FOSS program was developed with the support of National Science Foundation grants nos. MDR-8751727 and MDR-9150097. However, any opinions, findings, conclusions, statements, and recommendations expressed herein are those of the authors and do not necessarily reflect the views of NSF.

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