Lead Information Packet

Module 1: Soil Water Retention
2nd Grade

This document is not intended to give you all of the information you need to lead the module. It is only intended to be a reference during the module. You can find the complete instructions at scitrek.chem.ucsb.edu/module as well as the notebook and picture packet used during the module.

Note: We **highly recommend** teachers complete the initial and final observation assessments outside of SciTrek sessions.

Important Things to Remember During the Module

1. You are responsible for keeping track of time in the classroom and making sure **all** activities run smoothly. There will be a time card in the lead box with suggested times to start/stop each activity.
2. You are responsible for keeping volunteers and students on track.
3. Walk around, during times volunteers are working with students and help struggling groups.

Types of Documents:

Notebook:
: One given to every student and is filled out by the student. The lead will use a notebook to write in as an example for students. The notebook the lead uses is referred to as the class notebook in these instructions.

Notepad:
: One given to every group and is filled out by the volunteer. In these instructions, the examples are narrower and taller than the notebook pages.

Picture Packet:
: One per class that, if needed, the lead fills out. In these instructions, the examples are the same size as the notebook pages but are labeled.

In these instructions, all other example documents are labeled.

Day 1: Technique/Observation Activity/Observations

Note: We **highly recommend** teachers complete the observation assessment prior to Day 1 of the module. The suggested times in the lesson plan below are assuming the observation assessment was given prior to SciTrek's arrival.

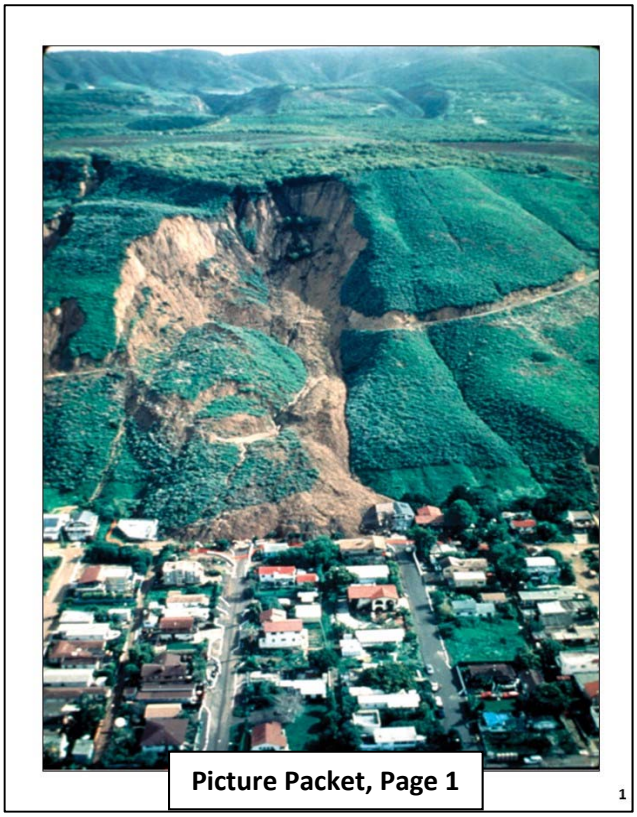
Schedule: *You are responsible for* ***BOLD*** *sections*

Times if teacher gave assessment prior to SciTrek:
Introduction (SciTrek Lead) – 2 minutes
Module Introduction (SciTrek Lead) – 5 minutes
Technique (SciTrek Lead) – 13 minutes
Observation Activity (SciTrek Lead) – 15 minutes
Observations (SciTrek Volunteers) – 20 minutes
Wrap-Up (SciTrek Lead) – 5 minutes

Times if SciTrek must give assessment:
Introduction (SciTrek Lead) – 2 minutes
Observation Assessment (SciTrek Lead) – 5 minutes
Module Introduction (SciTrek Lead) – 5 minutes
Technique (SciTrek Lead) – 10 minutes
Observation Activity (SciTrek Lead) – 13 minutes
Observations (SciTrek Volunteers) – 20 minutes
Wrap-Up (SciTrek Lead) – 5 minutes

Preparation:

1. Get the observation assessments and put them in the lead box.
2. Make sure volunteers are writing their names and group colors on the whiteboard.
3. Make sure volunteers are passing out nametags.
4. Make sure volunteers are setting up for the initial observation. Details of how to do this are on a picture in the volunteer boxes.
5. Set up the document camera for the Introduction (picture packet, page 1), technique activity (notebook, page 2), and the observation activity (picture packet, page 2; notebook, page 3).
6. Copy the chart from page 2 of the picture packet onto the board.



Introduction: *(2 minutes – Full Class – SciTrek Lead)*

- Allow volunteers to introduce themselves.

Observation Assessment: *(5 minutes – Full Class – Given By Classroom Teacher Prior to SciTrek)*

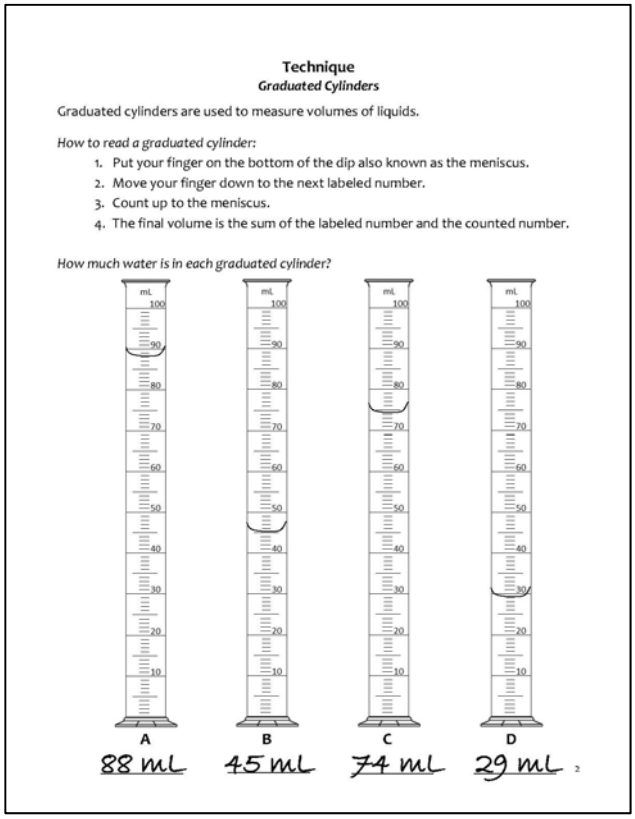
- Have students fill what they think the definition of an observation is.
- Read each statement and have students circle whether the statement is an observation/not an observation.

Module Introduction: *(5 minutes – Full Class – SciTrek Lead)*

- Show students the picture of the landslide (picture packet, page 1) and ask them, "What happened?"
- Discuss landslides and make sure students understand:
  - Landslides often happen when it rains.
  - The heavier the soil, the more likely a landslide in that area.
- Introduce the class question, "What variables affect how much liquid a soil can absorb?"

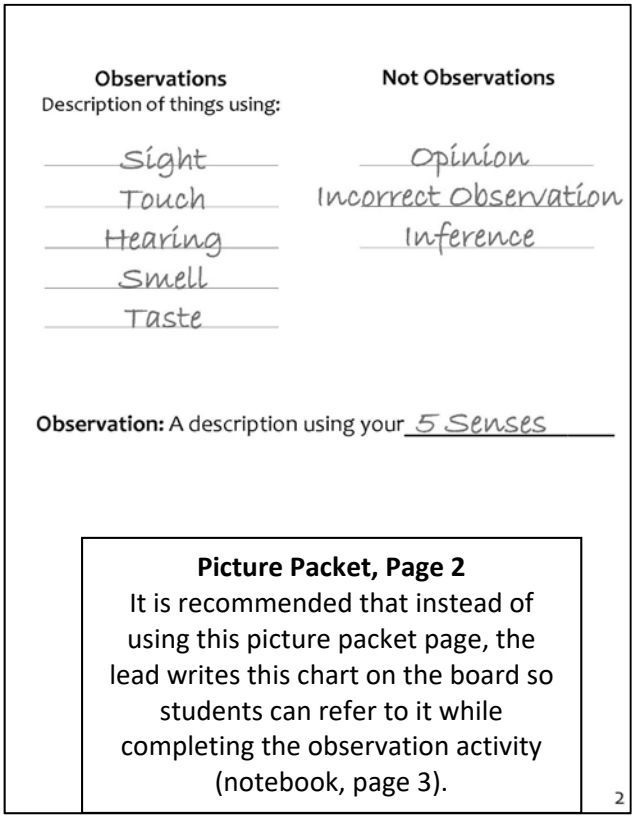
Technique: *(13 minutes – Full Class – SciTrek Lead)*

- Have volunteers pass out notebooks.
- Have students fill out the front covers of their notebooks.
- Show students the 500 mL graduated cylinder and explain what graduated cylinders are, and how to use them.
- Read the directions (notebook, page 2) and answer the first question as a class.
- Have students complete the other three questions individually.
- Review each question.



Observation Activity: *(15 minutes – Full Class – SciTrek Lead)*

- Use the chart on the board that is a copy of page 2 of the picture packet (recommended) or put page 2 of the picture packet under the document camera.
- Have students help you fill in the table with what senses they use to make observations, along with things that are not observations.
- Have students generate an observation about something in the classroom using each of their senses, except for taste.
- Have students generate one statement in each of the *Not Observations* categories.
- Have volunteers pass out bendy straws.
- Fill in the definition for observation (notebook, page 2, top).
- Read the directions (notebook, page 3).
- As a class, go over each statement and circle the correct answer. In addition:
    - For statements that are observations, have students identify which sense they used. Write the sense in the margins of the class notebook (students do not have to write these in their notebooks).
    - For statements that are not observations, have students identify why not, using the three categories on the list. Write why the statement is not an observation in the margins of the class notebook (students do not have to write these in their notebooks).
        - *1: The object is lighter than a bowling ball.*
            Observation – Sense: Touch
        - *2: The object is only one color.*
            Not an Observation – Incorrect
        - *3: The object is thicker than a broom handle.*
            Not an Observation – Incorrect
        - *4: The object is silly.*
            Not an Observation – Not Well Defined/Opinion
        - *5: The object has lines.*
            Observation – Sense: Sight
        - *6: The object can be bent so both ends touch.*
            Observation – Sense: Touch and Sight
            Note: If you have bent the straw so both ends touch, then the statement is an observation. If you have not tested it yet, then, the statement is not an observation, it is an inference. Make sure all students bend the object so that both ends touch making this statement an observation.
        - *7: The object came from the grocery store.*
            Not an Observation – Inference

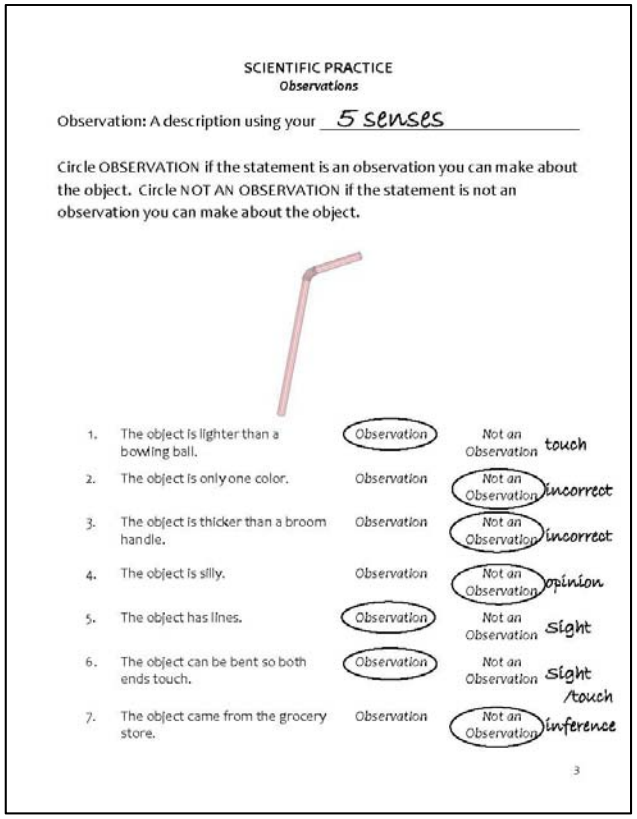


Observations Description of things using:	Not Observations
Sight	Opinion
Touch	Incorrect Observation
Hearing	Inference
Smell	
Taste	

Observation: A description using your 5 Senses

2

Picture Packet, Page 2
It is recommended that instead of using this picture packet page, the lead writes this chart on the board so students can refer to it while completing the observation activity (notebook, page 3).



SCIENTIFIC PRACTICE
Observations

Observation: A description using your 5 senses

Circle OBSERVATION if the statement is an observation you can make about the object. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the object.

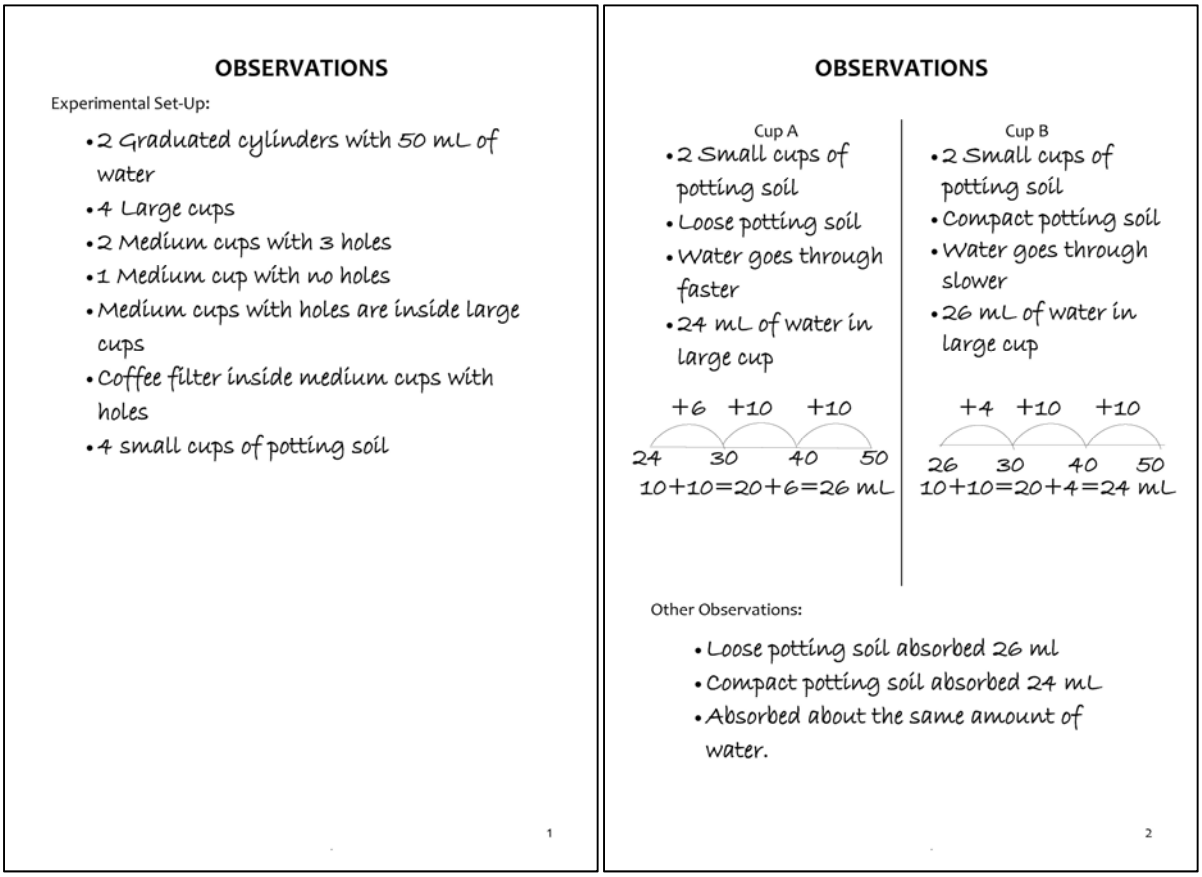
1.	The object is lighter than a bowling ball.	(Observation)	Not an Observation — touch
2.	The object is only one color.	Observation	(Not an Observation) — incorrect
3.	The object is thicker than a broom handle.	Observation	(Not an Observation) — incorrect
4.	The object is silly.	Observation	(Not an Observation) — opinion
5.	The object has lines.	(Observation)	Not an Observation — sight
6.	The object can be bent so both ends touch.	(Observation)	Not an Observation — sight /touch
7.	The object came from the grocery store.	Observation	(Not an Observation) — inference

3

- Have volunteers collect bendy straws
- Have students move to their groups.
    - If a student does not have a nametag, identify the group color with the least number of students in it and write the student's name on one of the extra nametags in the lead box using that color of marker.

Observations: *(20 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure when volunteers are compacting the soil in cup "B," they place the medium cup "B" on the table before compacting, in order to avoid spills.
- Make sure groups are moving along and only spending ~6 minutes on recording observations of the experimental set-up, and ~14 minutes recording observations of what happens when water was poured over the loose soil (cup "A") and the compacted soil (cup "B").



Wrap-Up: *(5 minutes – Full Class – SciTrek Lead)*

- Write "loose" and "compact" on the board and record each group's data under the correct label.
- Have groups share what they did and learned.
    - Groups poured water over both loose and compact soil. The water went through the loose soil faster than the compact soil. Both soils absorbed about the same amount of water.
- Discuss how soil compactness relates to soil absorption and to landslides when it rains on a hill.
    - If it rains for a short time, loose soils are more likely to have a landslide.
    - If it rains for a long time, both loose and compact soils are equally likely to have a landslide.

Day 2: Question/Materials Page/Experimental Set-Up/Procedure/Results Table

Schedule: *You are responsible for* ***BOLD*** *sections*

Introduction (SciTrek Lead) – 7 minutes
Question (SciTrek Volunteers) – 10 minutes
Materials Page (SciTrek Volunteers) – 5 minutes
Experimental Set-Up (SciTrek Volunteers) – 5 minutes
Procedure (SciTrek Volunteers) – 20 minutes
Results Table (SciTrek Volunteers) – 5 minutes
Wrap-Up (SciTrek Lead) – 8 minutes

Preparation:

1. Make sure volunteers are setting out notebooks.
2. Set up the document camera for the wrap-up discussion (picture packet, page 3).
3. Have a scale and the vermiculite available to show students during the Introduction.

Introduction: *(7 minutes – Full Class – SciTrek Lead)*

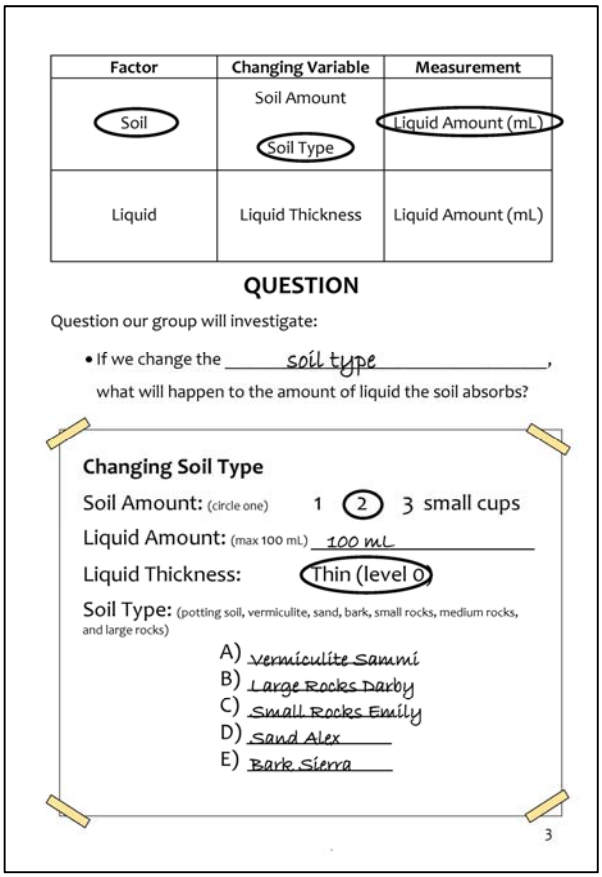
- Review the class question, as well as what students did and learned last session.
- Introduce the word "variable."
- Go over the options for variables that students can change: liquid thickness (only variable that does not get to choose soil type), soil amount (they will use a scale to measure soil amount), soil type (show vermiculite and tell them they get to pick from soils that no other groups can use).
    - Make sure to down play liquid thickness.
    - Explain that thick liquids can be snow, hail, mud, etc.

Question: *(10 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Encourage groups to pick different changing variables.

Materials Page: *(5 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure groups fill out the materials page correctly and completely, and then tape it onto the notepad.



Factor	Changing Variable	Measurement
Soil	Soil Amount Soil Type	Liquid Amount (mL)
Liquid	Liquid Thickness	Liquid Amount (mL)

QUESTION

Question our group will investigate:

- If we change the soil type,

what will happen to the amount of liquid the soil absorbs?

Changing Soil Type

Soil Amount: (circle one) 1 (2) 3 small cups

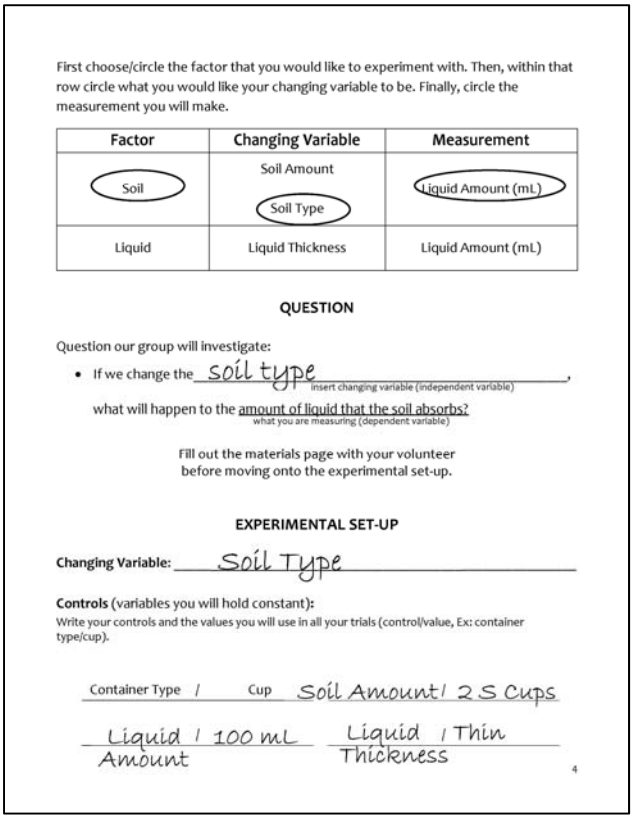
Liquid Amount: (max 100 mL) 100 mL

Liquid Thickness: Thin (level 0)

Soil Type: (potting soil, vermiculite, sand, bark, small rocks, medium rocks, and large rocks)

A) Vermiculite Sammi
B) Large Rocks Darby
C) Small Rocks Emily
D) Sand Alex
E) Bark Sierra

3



First choose/circle the factor that you would like to experiment with. Then, within that row circle what you would like your changing variable to be. Finally, circle the measurement you will make.

Factor	Changing Variable	Measurement
Soil	Soil Amount Soil Type	Liquid Amount (mL)
Liquid	Liquid Thickness	Liquid Amount (mL)

QUESTION

Question our group will investigate:

- If we change the soil type (insert changing variable (independent variable)),

what will happen to the amount of liquid that the soil absorbs? (what you are measuring (dependent variable))

Fill out the materials page with your volunteer
before moving onto the experimental set-up.

EXPERIMENTAL SET-UP

Changing Variable: Soil Type

Controls (variables you will hold constant):
Write your controls and the values you will use in all your trials (control/value, Ex: container type/cup).

Container Type / Cup Soil Amount / 2.5 Cups

Liquid / 100 mL Amount Liquid / Thin Thickness

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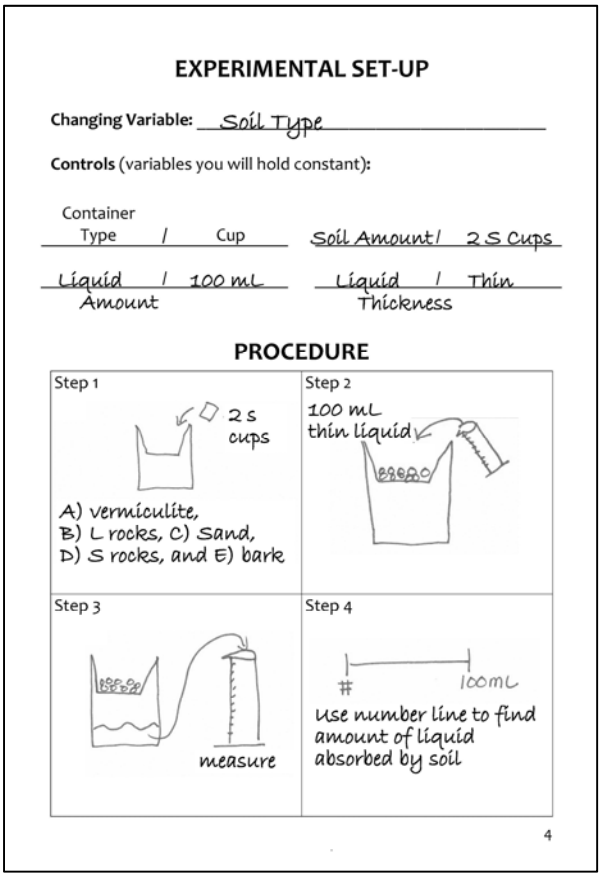
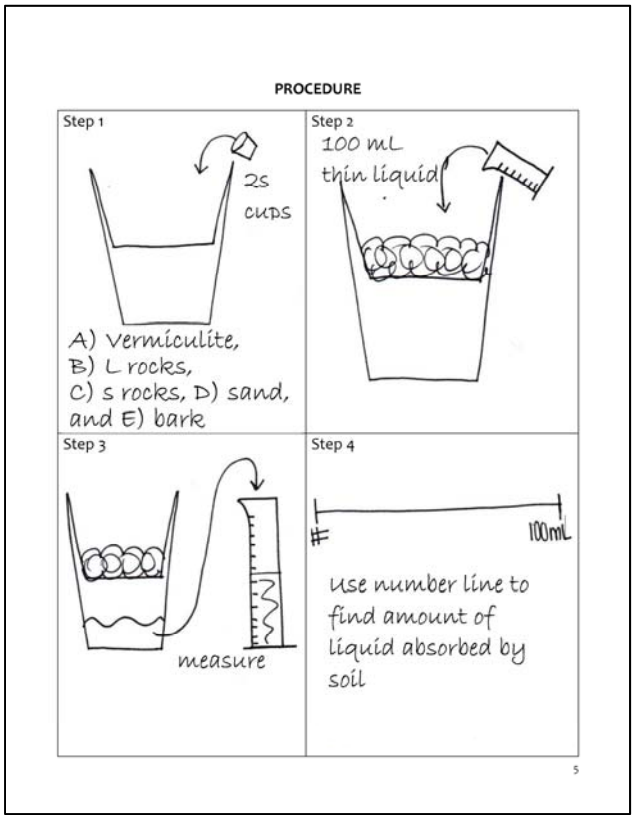
Experimental Set-Up: *(5 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure all control blanks are filled out.

Procedure: *(20 minutes – Groups – SciTrek Volunteers)*

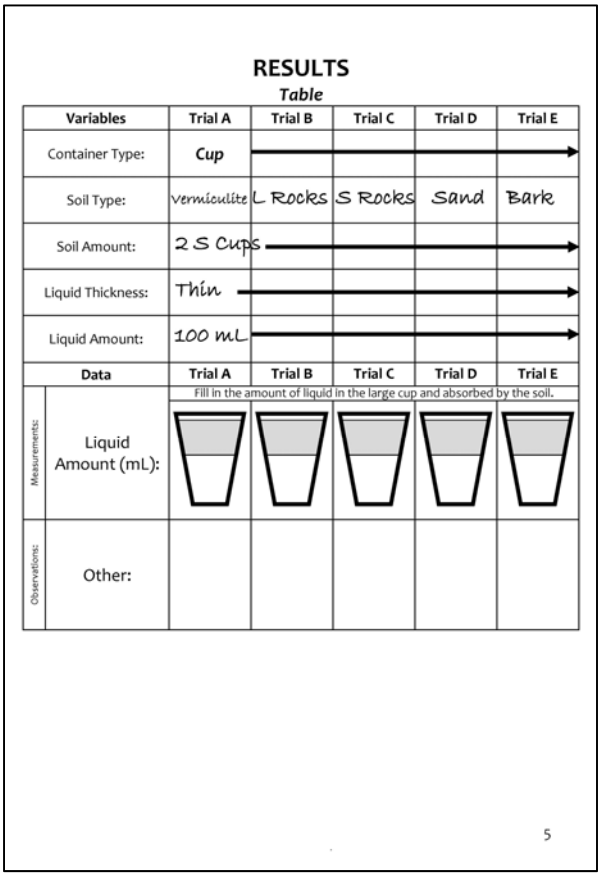
- Walk around and help groups who are struggling.
- Make sure procedure drawings have (in writing) all values of the controls and changing variable, as well as the data that will be collected and the calculation that will be done.
- Volunteers should be drawing one picture and having students copy that step before moving on to the next step.





Results Table: *(5 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure control values are written in the *Trial A* box with an arrow through the rest of the trials' boxes while changing variable values are written in each trial's box.
- Have groups who finish early work on the *Observations Extra Practice* (notebook, page 13).

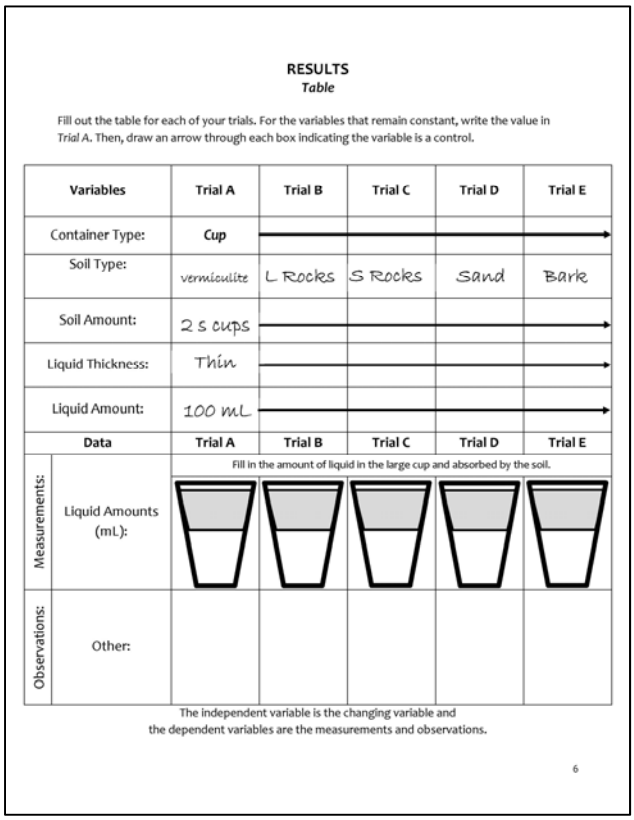


RESULTS

Table

Variables	Trial A	Trial B	Trial C	Trial D	Trial E
Container Type:	Cup	→	→	→	→
Soil Type:	vermiculite	L Rocks	S Rocks	Sand	Bark
Soil Amount:	2 S Cups	→	→	→	→
Liquid Thickness:	Thin	→	→	→	→
Liquid Amount:	100 mL	→	→	→	→
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**	**Trial E**
Measurements: Liquid Amount (mL):	Fill in the amount of liquid in the large cup and absorbed by the soil.				
Observations: Other:					

5



RESULTS

Table

Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

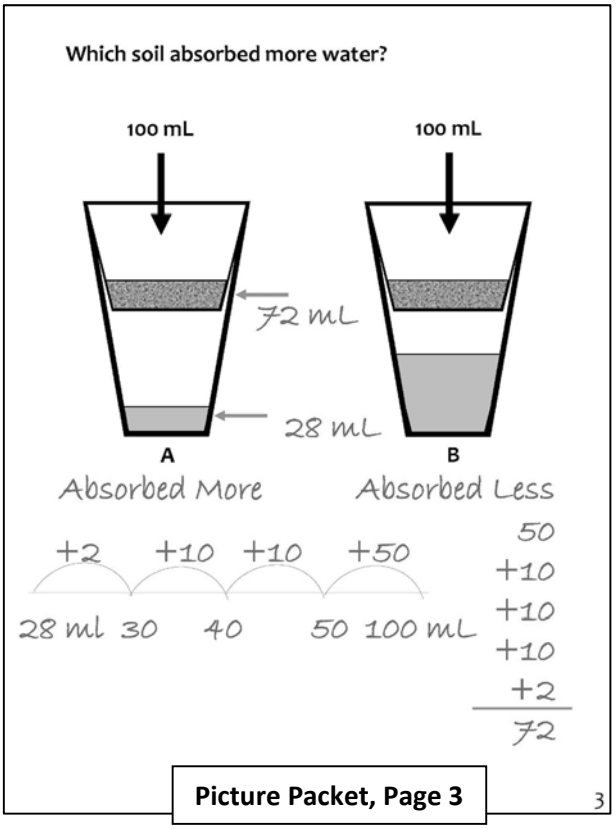
Variables	Trial A	Trial B	Trial C	Trial D	Trial E
Container Type:	Cup	→	→	→	→
Soil Type:	vermiculite	L Rocks	S Rocks	Sand	Bark
Soil Amount:	2 S cups	→	→	→	→
Liquid Thickness:	Thin	→	→	→	→
Liquid Amount:	100 mL	→	→	→	→
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**	**Trial E**
Measurements: Liquid Amounts (mL):	Fill in the amount of liquid in the large cup and absorbed by the soil.				
Observations: Other:					

The independent variable is the changing variable and the dependent variables are the measurements and observations.

6

Wrap-Up: *(8 minutes – Full Class – SciTrek Lead)*

- Have one student from each group share the question they will investigate.
- Have students identify which soil absorbed more liquid (picture packet, page 3) and pick a number for the amount of water in the large cup and practice calculating the amount of water absorbed by the soil.
- Pick numbers to show how to calculate the amount of liquid absorbed.
- If there is extra time, do the Observations Extra Practice (notebook, page 13) as a class.
- Go over what students will do next session.



Picture Packet, Page 3

3

Day 3: Experiment/Graph/Results Summary

Schedule: *You are responsible for* ***BOLD*** *sections*

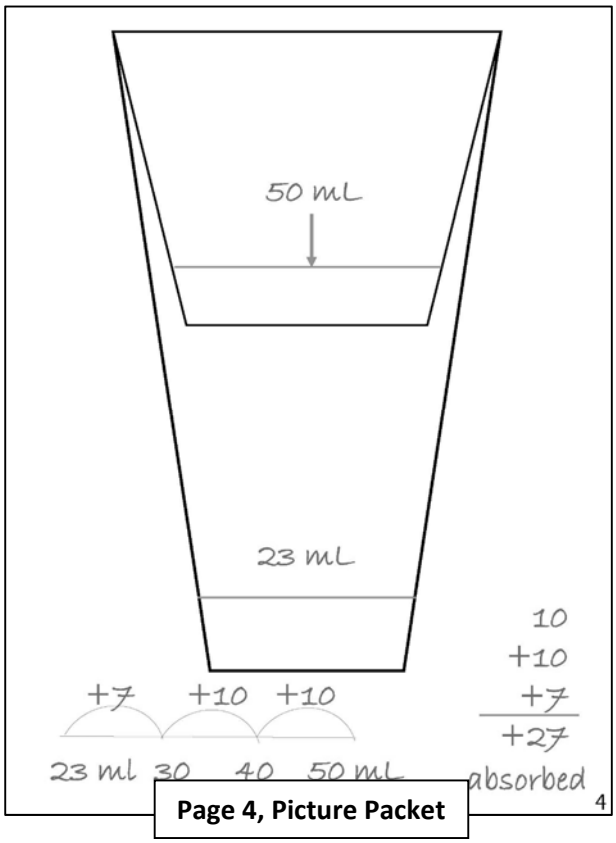
Introduction (SciTrek Lead) – 5 minutes
Experiment (SciTrek Volunteers) – 27 minutes
Graph (SciTrek Volunteers) – 10 minutes
Results Summary (SciTrek Volunteers) – 16 minutes
Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

1. Make sure volunteers are setting out notebooks.
2. Set up the document camera for the Introduction (picture packet, page 4).

Introduction: *(5 minutes – Full Class – SciTrek Lead)*

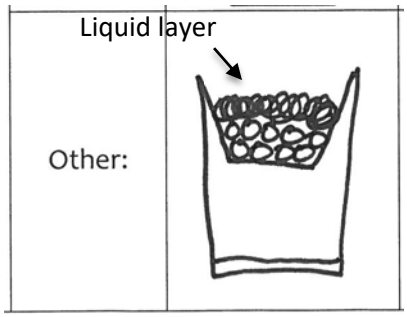
- Review the class question, as well as what students did and learned last session.
- Explain how to use a graduated cylinder.
- Use the example cup (picture packet, page 4), and have students explain what they will do in their experiment while you draw each step.
    - Use subtraction to determine how much water the soil absorbed.

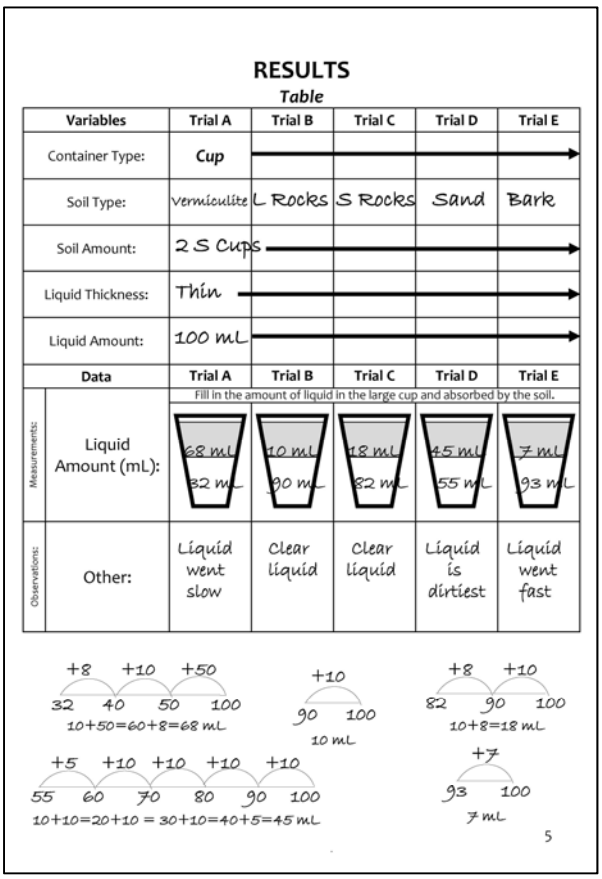


Page 4, Picture Packet

Experiment: *(27 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Volunteers can write the trial letters on the graduated cylinder with the wet erase pens.
- All measurements will be recorded in the notepad and subtraction will be done on the notepad. Students only need to record the amount in the large cup and the amount absorbed in their notebooks.
- Make sure, for groups changing liquid thickness, the volunteers are having the students draw pictures of their cups with the amount of liquid left on top of the medium rocks in the other observations section (similar to the picture below).





RESULTS

Table

Variables	Trial A	Trial B	Trial C	Trial D	Trial E
Container Type:	Cup →				
Soil Type:	Vermiculite	L Rocks	S Rocks	Sand	Bark
Soil Amount:	2 S Cups →				
Liquid Thickness:	Thin →				
Liquid Amount:	100 mL →				
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**	**Trial E**
Measurements: Liquid Amount (mL):	Fill in the amount of liquid in the large cup and absorbed by the soil.				
	68 mL / 32 mL	10 mL / 90 mL	18 mL / 82 mL	45 mL / 55 mL	7 mL / 93 mL
Observations: Other:	Liquid went slow	Clear liquid	Clear liquid	Liquid is dirtiest	Liquid went fast

+8 +10 +50: 32 40 50 100 — 10+50=60+8=68 mL

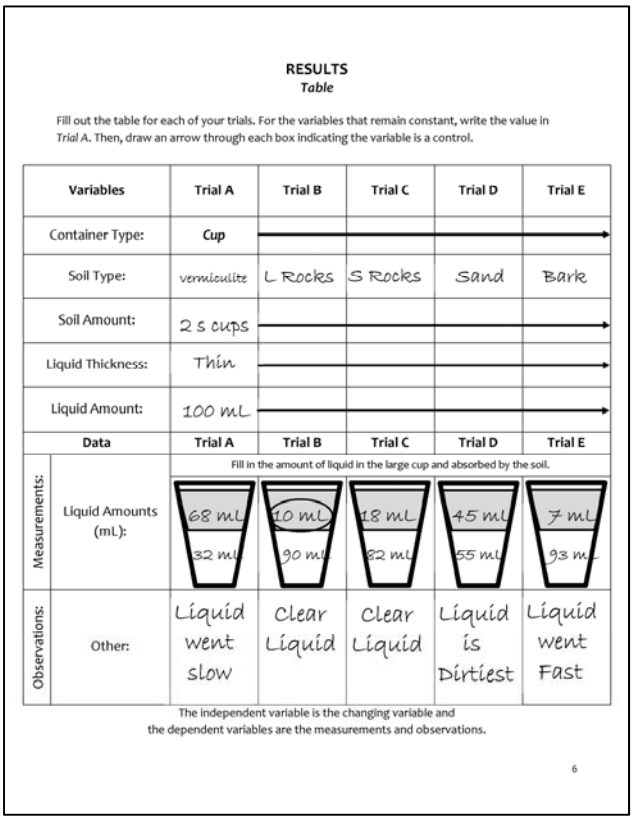
+10: 90 100 — 10 mL

+8 +10: 82 90 100 — 10+8=18 mL

+5 +10 +10 +10 +10: 55 60 70 80 90 100 — 10+10=20+10 = 30+10=40+5=45 mL

+7: 93 100 — 7 mL

5



RESULTS

Table

Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

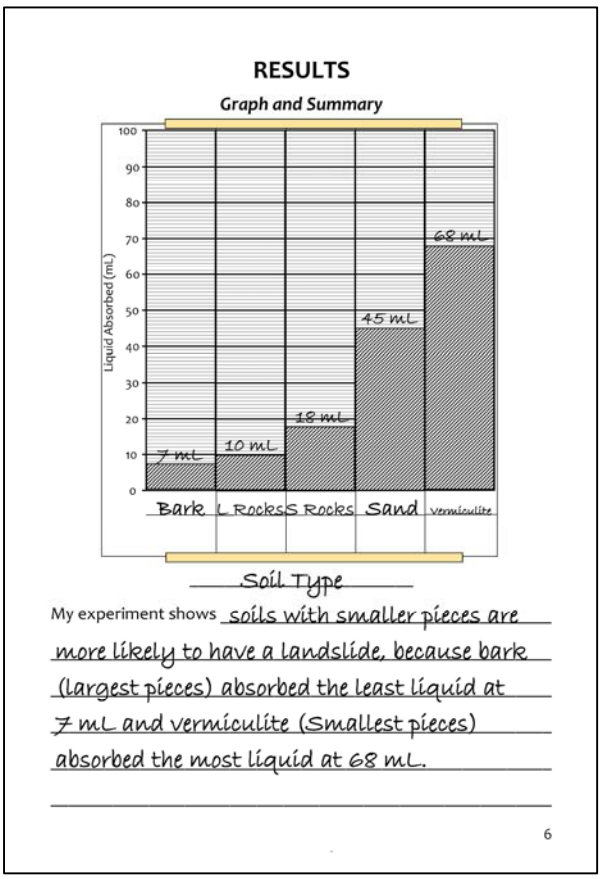
Variables	Trial A	Trial B	Trial C	Trial D	Trial E
Container Type:	Cup →				
Soil Type:	vermiculite	L Rocks	S Rocks	Sand	Bark
Soil Amount:	2 S cups →				
Liquid Thickness:	Thin →				
Liquid Amount:	100 mL →				
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**	**Trial E**
Measurements: Liquid Amounts (mL):	Fill in the amount of liquid in the large cup and absorbed by the soil.				
	68 mL / 32 mL	10 mL / 90 mL	18 mL / 82 mL	45 mL / 55 mL	7 mL / 93 mL
Observations: Other:	Liquid went slow	Clear Liquid	Clear Liquid	Liquid is Dirtiest	Liquid went Fast

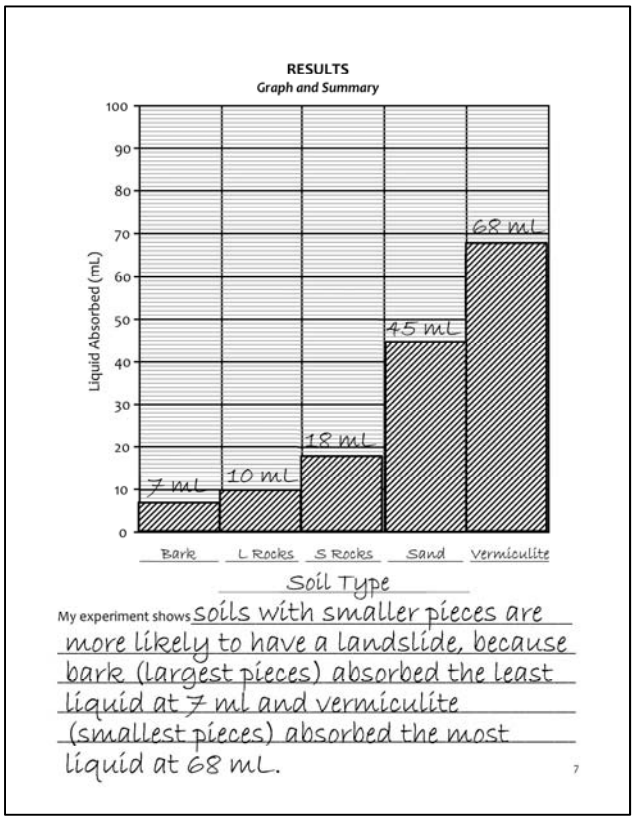
The independent variable is the changing variable and the dependent variables are the measurements and observations.

6

Graph: *(10 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure volunteers circle, in each student's notebook, the amount of liquid absorbed for the trial each student is in charge of, to prevent them from graphing the amount of water in the large cup.
- Make sure students are graphing their trial on the individual graph piece, with the value of the changing variable written underneath (Ex: bark), not the trial letter (Ex: E).
- Make sure volunteers are having students arrange the individual graph pieces in increasing order by amount of liquid absorbed, then taping them onto the notepad.
- Make sure students are labeling their x-axes and writing the numerical value of the liquid absorbed on top of each column.





Results Summary: *(16 minutes – Groups – SciTrek Volunteers)*

- Walk around and help groups who are struggling.
- Make sure groups are generating a claim about how their changing variable affects landslides (ideally the claim will allow them to make a prediction about future experiments) and using specific data points to support it.
    - Groups will be using measurements as their data, so make sure they are including numerical values in their data statement.
    - Do not let groups reference trial letters in their results summary.
- Volunteers struggle with results summaries, so you should check each group's results summary.
- Make sure students fill out the sentence frame (notebook, page 8), *I acted like a scientist when*.

Wrap-Up: *(2 minutes – Full Class – SciTrek Lead)*

- Go over what students will do next session.

Day 4: Poster Making

Schedule: *You are responsible for* ***BOLD*** *sections*

Introduction (SciTrek Lead) – 2 minutes
Experimental Discussion (SciTrek Volunteers) – 17 minutes
Poster Making (SciTrek Volunteers) – 36 minutes
Wrap-Up (SciTrek Lead) – 5 minutes

Preparation:

1. Make sure volunteers are setting out notebooks.
2. Find a place to leave student posters.

Introduction: *(2 minutes – Full Class – SciTrek Lead)*

- Review the class question, as well as what students did and learned last session.

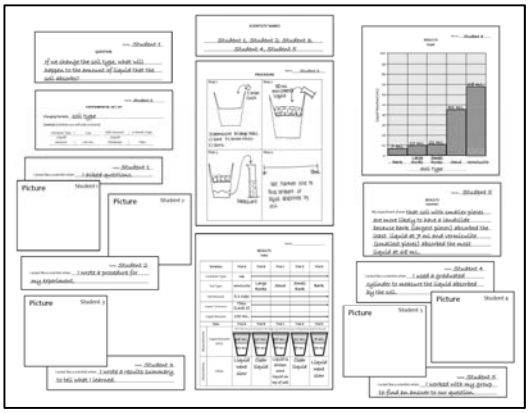
Experimental Discussion: *(17 minutes – Groups – SciTrek Volunteers)*

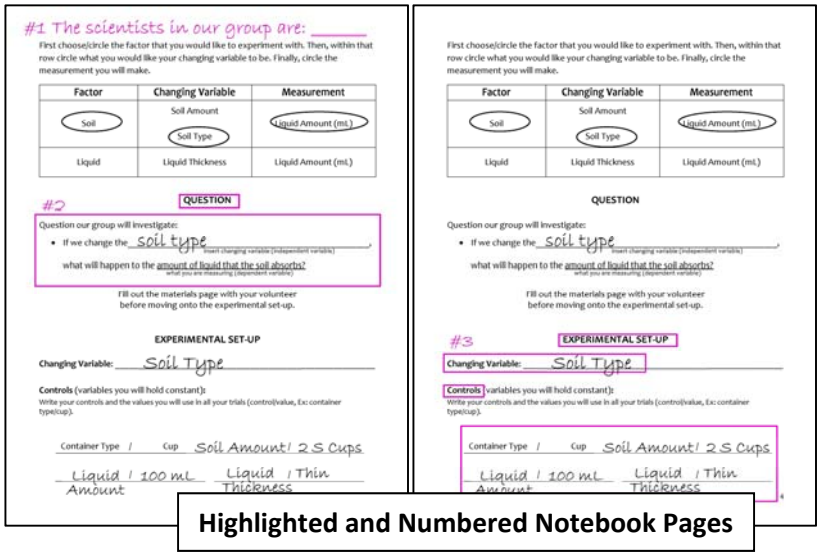
- Make sure each group is explaining their experiment, and their findings, to their volunteer.
- Make sure volunteers are asking students questions that have them generate predictions based on their data.

Poster Making: *(36 minutes – Groups – SciTrek Volunteers)*

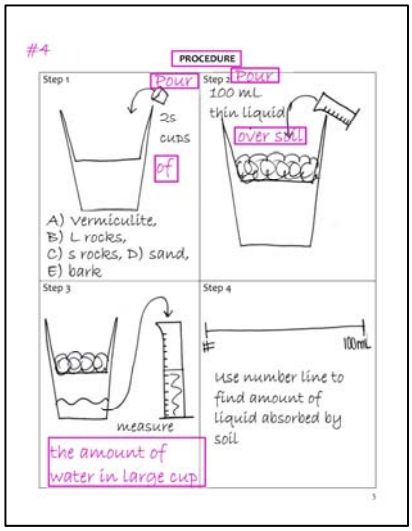
- Help volunteers glue poster pieces onto the posters. When gluing, make sure **you** or the **volunteers** (not the students) are gluing the poster in the **exact** order that is shown on the diagram and the poster has a landscape orientation.
- Make sure the student in each group who is presenting the results graph, has the appropriate sentence frame sticker in their notebook and the volunteer has gone over how to present the five sentences with the student several times.
- Make sure the volunteer is asking the student who is completing the procedure to tell them in their own words what they did in each step, and the volunteer is writing the student's words on each picture to form complete sentences. Students should not write these words on their poster pieces. Example possible written-in words are boxed in the procedure picture below.
- Each student should have the part(s) they are presenting highlighted and numbered in their notebook: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary (see pictures above).
    - Remind volunteers, if a student is presenting multiple parts, they should have multiple sections highlighted and numbered in their notebook, and the sections should paperclipped together.
- Volunteers often forget to highlight notebooks, so make sure this gets done before Day 5.

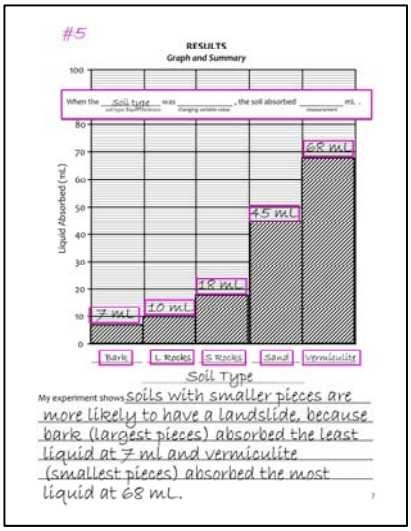
A larger version of this poster is in your lead box.

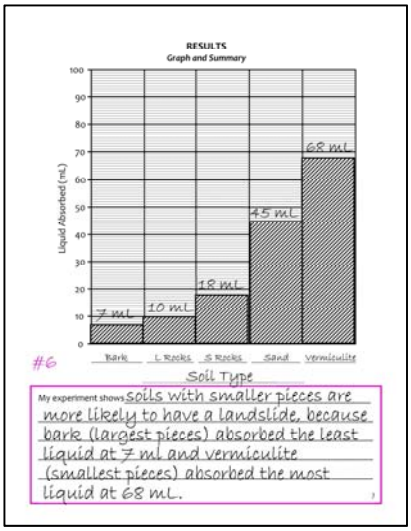




Highlighted and Numbered Notebook Pages







Wrap-Up: *(5 minutes – Full Class – SciTrek Lead)*

- Ask students the following questions:
  - How did you act like a scientist during this project?
  - What did you do, that scientists do?

Day 5: Poster Presentations

Schedule: *You are responsible for* ***BOLD*** *sections*

Introduction (SciTrek Lead) – 2 minutes
Practice Posters (SciTrek Volunteers) – 15 minutes
Poster Presentations (SciTrek Volunteers/SciTrek Lead) – 41 minutes
Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

1. Make sure volunteers are setting out notebooks.
2. Assign volunteers a new group to work with.
3. Set up the document camera for the *Notes on Presentations* (picture packet, page 5).
4. Organize posters so experiments featuring the same changing variable will be presented back-to-back, and posters are presented from simplest to understand to most difficult to understand (suggested order: soil amount, liquid thickness, soil type).

Introduction: *(2 minutes – Full Class – SciTrek Lead)*

- Review the class question, as well as what students did and learned last session.
- Explain to students they will work with a new volunteer today.

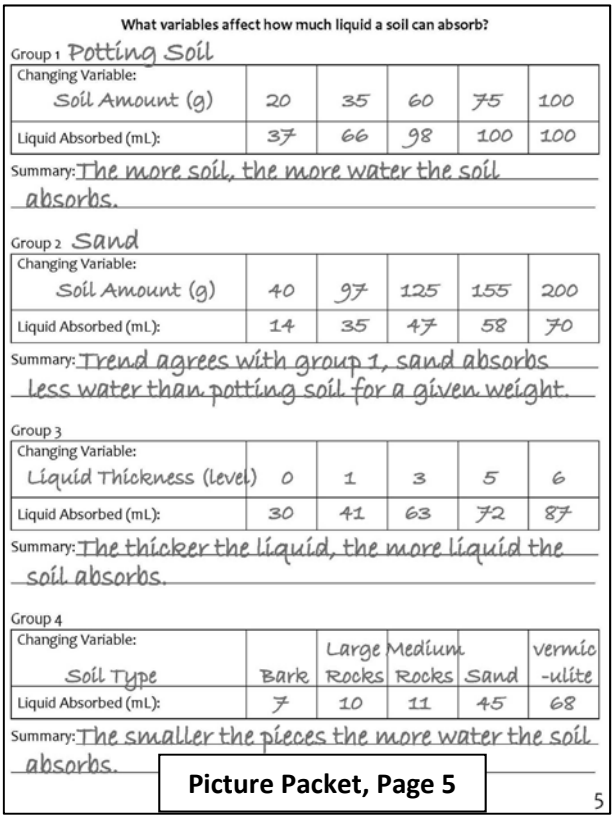
Practice Posters: *(15 minutes – Groups – SciTrek Volunteers)*

- **Do not give students more than 15 minutes to review their experiment and practice their poster, or you will run out of time for presentations.**
- Have volunteers rotate groups so each group can explain their experiment and practice their poster with a new volunteer.

- Make sure volunteers are having students explain their experiment and asking them questions that have them generate predictions based on their data.
- Make sure students are reading from their notebooks, and practicing the posters, in the following order: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary. They will **not** read the *I acted like a scientist when* or results table, from their posters.

Poster Presentations: *(41 minutes – Full Class – SciTrek Volunteers/SciTrek Lead)*

- Inform students, if they ask a scientific question (a question that helps summarize what the group did/learned or requires them to make a prediction based on their data) they will receive a SciTrek pencil after the presentations are done.
- Have students present their posters.
- While posters are being presented, record each group's changing variable values and their data (picture packet, page 5).
    - After a group reads their question, stop the presentation and have the class identify the changing variable. Then, record it in the picture packet.
    - When a group reads their results graph, record the values of the changing variable and their measurements.
- After each presentation, ask students:
    - What questions do you have for this group?
- Once students have asked their questions (make sure each student answers a question; you should ask at least one question per presentation), ask students:
    - What was the group's changing variable?
    - What patterns do you see in the (insert changing variable)?
    - What patterns do you see in the change in liquid absorbed?
    - What does this tell us about landslides?
    - Can someone put what we learned into a sentence?
- Record what students learned under the summary (picture packet, page 5).
- After all presentations are over, have students tell you the variable values they would select to cause the soil to absorb the most liquid.



What variables affect how much liquid a soil can absorb?

Group 1 Potting Soil

Changing Variable: Soil Amount (g)	20	35	60	75	100
Liquid Absorbed (mL):	37	66	98	100	100

Summary: The more soil, the more water the soil absorbs.

Group 2 Sand

Changing Variable: Soil Amount (g)	40	97	125	155	200
Liquid Absorbed (mL):	14	35	47	58	70

Summary: Trend agrees with group 1, sand absorbs less water than potting soil for a given weight.

Group 3

Changing Variable: Liquid Thickness (level)	0	1	3	5	6
Liquid Absorbed (mL):	30	41	63	72	87

Summary: The thicker the liquid, the more liquid the soil absorbs.

Group 4

Changing Variable: Soil Type	Bark	Large Rocks	Medium Rocks	Sand	vermic -ulite
Liquid Absorbed (mL):	7	10	11	45	68

Summary: The smaller the pieces the more water the soil absorbs.

Picture Packet, Page 5

5

Wrap-Up: *(2 minutes – Full Class – SciTrek Lead)*

- Tell students, "The mentors who have been working with you are undergraduate, and graduate, students who volunteer their time so you can do experiments. This is the last day you will see your volunteers, so we should say thank you and goodbye."
- Have volunteers give students SciTrek pencils.
- Have students remove the paper parts of their nametags (which they can keep) from the plastic holders and return the plastic holders to their volunteers.

Day 6: Tie to Standards

Note: We **highly recommend** teachers complete the observation assessment prior to Day 6 of the module. The suggested times in the lesson plan below are assuming the observation assessment was given prior to SciTrek arrival.

Schedule: *You are responsible for* ***BOLD*** *sections*

Times if teacher gave assessment prior to SciTrek:
Tie to Standards (SciTrek Lead) – 60 minutes

Times if SciTrek must give assessment:
Observation Assessment (SciTrek Lead) – 5 minutes
Tie to Standards (SciTrek Lead) – 55 minutes

Preparation:

1. Get the observation assessments and put them in the lead box.
2. If the teacher is not leading the tie to standards activity, do the following:
    a. Give the teacher an extra notebook and have them fill it out with their students, to follow along during the tie to standards activity.
    b. Collect the teacher's lab coat and put it in the lead box.
3. Pass out notebooks.
4. Set up the document camera for the tie to standards activity (notebook, pages 8-12; picture packet, pages 6-11).
5. Assemble the tie to standards set-up.
    a. Fill 4 graduated cylinders with 50 mL of water each.
    b. Place a pre-cut coffee filter circle inside each of the four medium (9 oz) cups with holes.
    c. Place the medium cups inside the large (20 oz) cups.
    d. Pour four small (1 oz) cups (completely full and level) of each of the following soil types into the four cups with coffee filters: sand, small rocks, large rocks, and vermiculite.
6. Tape the *Findings* poster to the front board. Making sure to cover up the findings.
7. Put your lab coat in the lead box, at the end of the day.

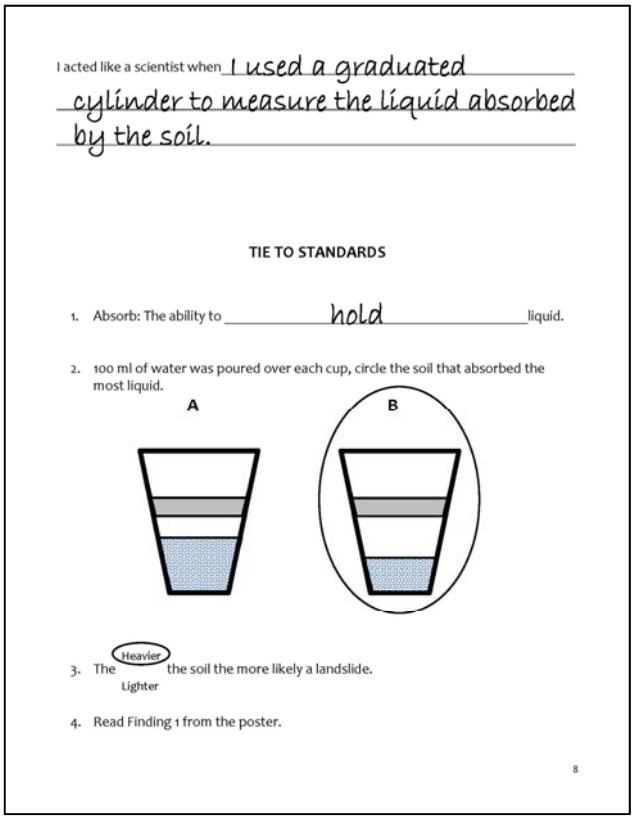
Observation Assessment: *(5 minutes – Full Class – Given By Classroom Teacher Prior to SciTrek)*

- Have students fill what they think the definition of an observation is.
- Read each statement and have students circle if the statement is an observation/not an observation.

Tie to Standards: *(55 minutes – Full Class – SciTrek Lead)*

Review: (7 minutes)

- Have students fill in the definition of absorb, question *1*.
- Have students circle the soil that absorbed the most liquid.
- Discuss what this has to do with landslides, and help students understand the heavier the soil, the more likely a landslide.
- Have students fill in question *3* and reveal *Finding 1*.
    - *The heavier the soil, the more likely a landslide.*



I acted like a scientist when I used a graduated cylinder to measure the liquid absorbed by the soil.

TIE TO STANDARDS

1. Absorb: The ability to hold liquid.

2. 100 ml of water was poured over each cup, circle the soil that absorbed the most liquid.

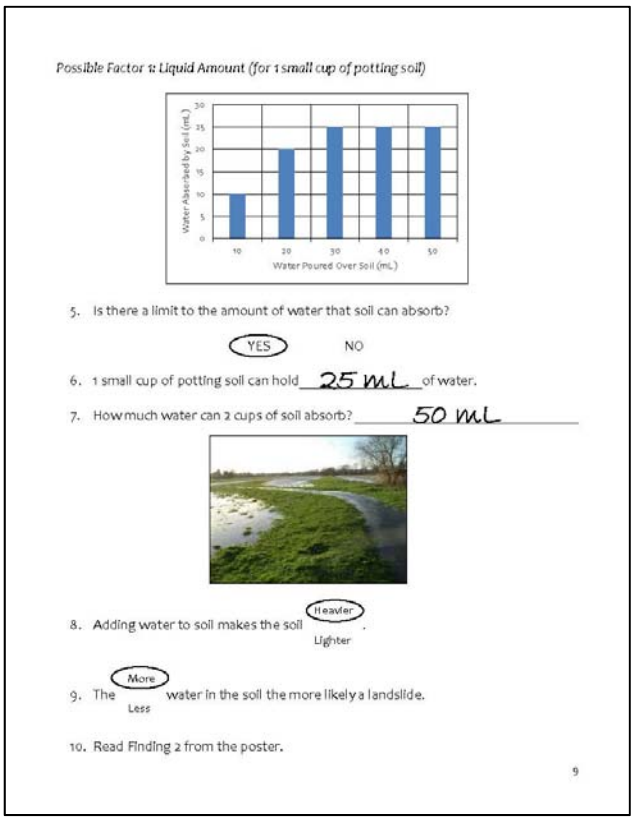
A B

3. The (Heavier / Lighter) the soil the more likely a landslide.

4. Read Finding 1 from the poster.

8

Possible Factor 1: Liquid Amount (20 minutes)


Possible Factor 1: Liquid Amount (for 1 small cup of potting soil)

Water Absorbed by Soil (mL)

Water Poured Over Soil (mL)

5. Is there a limit to the amount of water that soil can absorb?

YES NO

6. 1 small cup of potting soil can hold 25 mL of water.

7. How much water can 2 cups of soil absorb? 50 mL

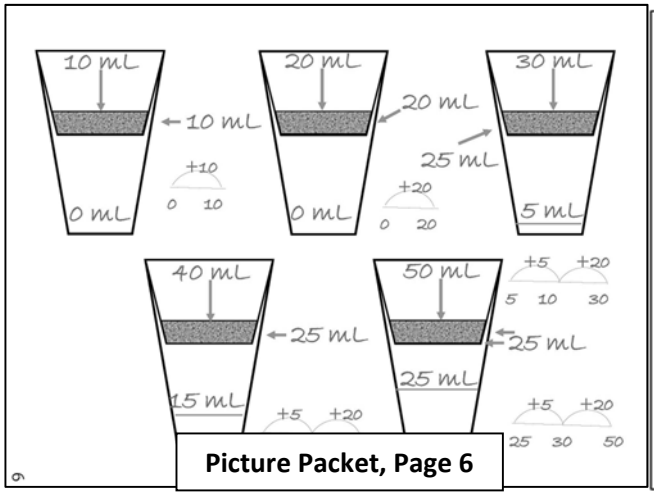
8. Adding water to soil makes the soil (Heavier / Lighter).

9. The (More / Less) water in the soil the more likely a landslide.

10. Read Finding 2 from the poster.

9

- Have students look at the graph (notebook, page 9), point to the x-axis and show students it records the amount of water poured over the potting soil.
- Ask students, "How much water was poured over trial 1?" Then, write the amount on the corresponding cup (page 6, picture packet).
- Point to the y-axis and show students it records the amount of water absorbed by the soil.
- Ask students, "How much water was absorbed in trial 1?" Then write the amount on the corresponding cup.
- Repeat the process for each trial, doing the necessary subtraction to find the amount of water that would be at the bottom of the large cup.
- Have students answer question *5* and *6*.
- As a class, discuss and fill out question *7*, predicting how much liquid 2-cups of soil could absorb.
- Show students the picture of the water sitting on top of the grass (notebook, page 9; picture packet, page 7) and discuss why water is sitting on top of the soil.
- Discuss how, the more water the soil absorbs, the more it weighs, and therefore the more likely a landslide, then, have students fill out questions *8* and *9*.
- Discuss how, if it rains for a long period of time, the soil will get saturated, and the soil will not take in any more water/mass.
- Show students *Finding 2*.
    - *Adding liquid to soil increases the chance of a landslide. There is a maximum amount of liquid that soil can absorb.*

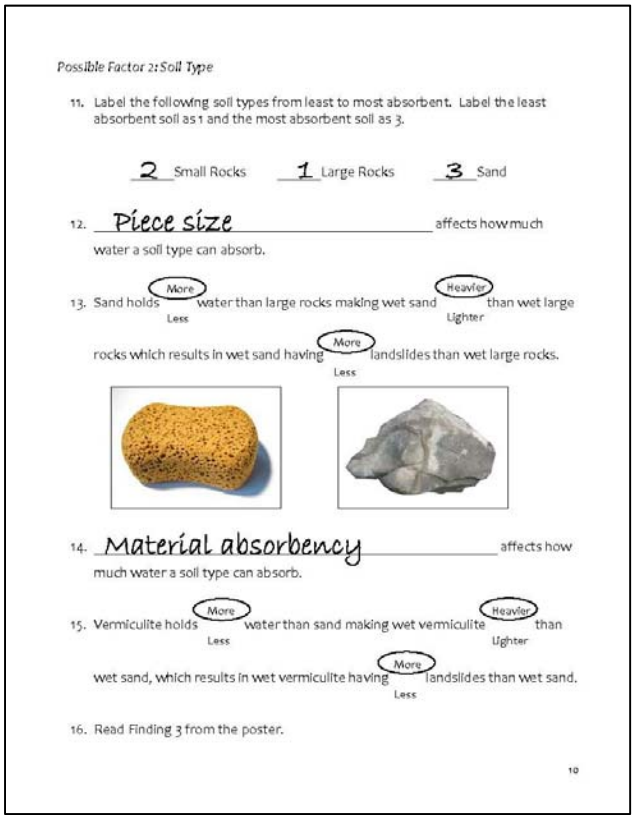


Picture Packet, Page 6


Picture Packet, Page 7

Possible Factor 2: Soil Type (13 minutes)

- If a group tested soil type, ask the students to predict which of the soil types (small rocks, large rock, or sand) will be the least absorbent, which will be the most absorbent and why. (If no group tested soil type, do not have students make a prediction)
- Have a SciTrek volunteer or classroom teacher help you pour 50 mL of water through each of the three soil types at the same time.
    - If needed, show students page 8 of the picture packet showing the water that went through each of the three soils in graduated cylinders.
- Have students observe what happens and identify the trend they see.
- Have students answer questions *11* and *12*.
- Discuss how this applies to landslides and answer question *13*.
- Show students the pictures of the rock and sponge (notebook, page 10; picture packet, page 9) and have them compare the objects.
    - Students should notice the objects are about the same size.
    - Students should realize if water was poured over the objects, they would absorb different amounts.
- Explain this shows us another factor that affects the amount of water a soil can absorb, material absorbency.
- Record material absorbency for question *14*.
- Have students identify which soil (sand, small rocks, or large rocks) is about the same size as vermiculite.
- Pour 50 mL of water over the vermiculite.
    - Discuss with students that sand and all sizes of rocks have low material absorbencies and vermiculite has a high material absorbency.
- Have students answer question *15*.
- Show Finding 3.
    - *The smaller the piece size, and the greater the materials absorbency, the more liquid the soil can absorb therefore, the more likely a landslide.*



Possible Factor 2: Soil Type

11. Label the following soil types from least to most absorbent. Label the least absorbent soil as 1 and the most absorbent soil as 3.

2 Small Rocks 1 Large Rocks 3 Sand

12. Piece size affects how much water a soil type can absorb.

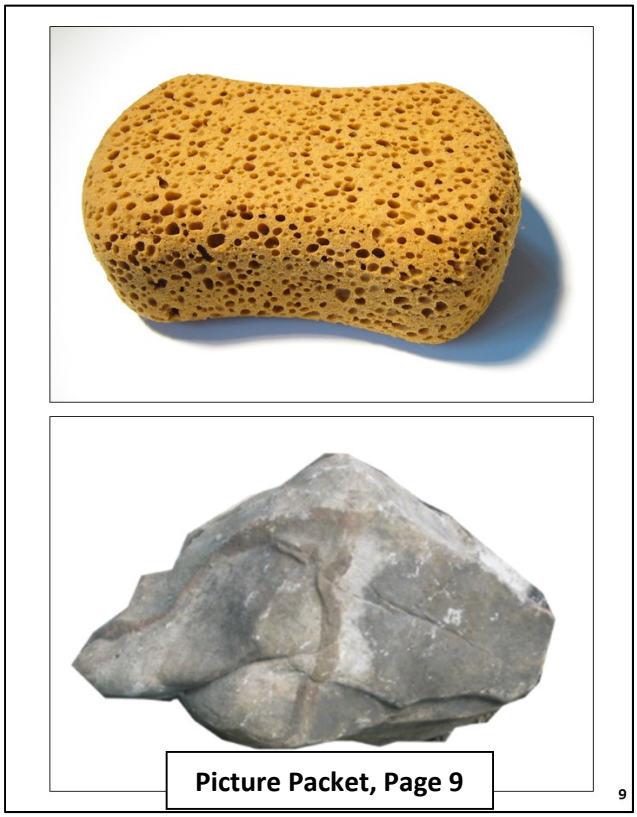
13. Sand holds More (Less) water than large rocks making wet sand Heavier (Lighter) than wet large rocks which results in wet sand having More (Less) landslides than wet large rocks.

14. Material absorbency affects how much water a soil type can absorb.

15. Vermiculite holds More (Less) water than sand making wet vermiculite Heavier (Lighter) than wet sand, which results in wet vermiculite having More (Less) landslides than wet sand.

16. Read Finding 3 from the poster.

10

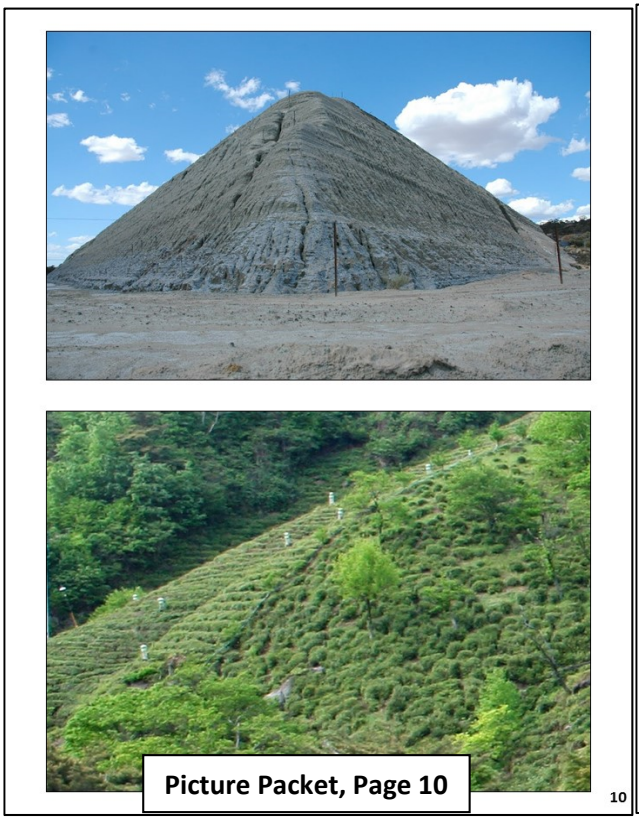


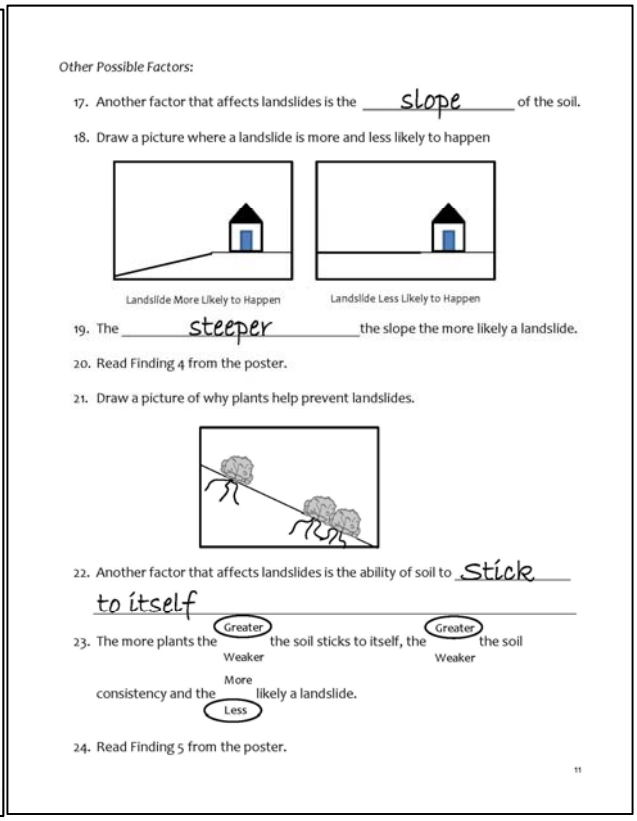
Picture Packet, Page 9

9

Other Possible Factors (14 minutes)

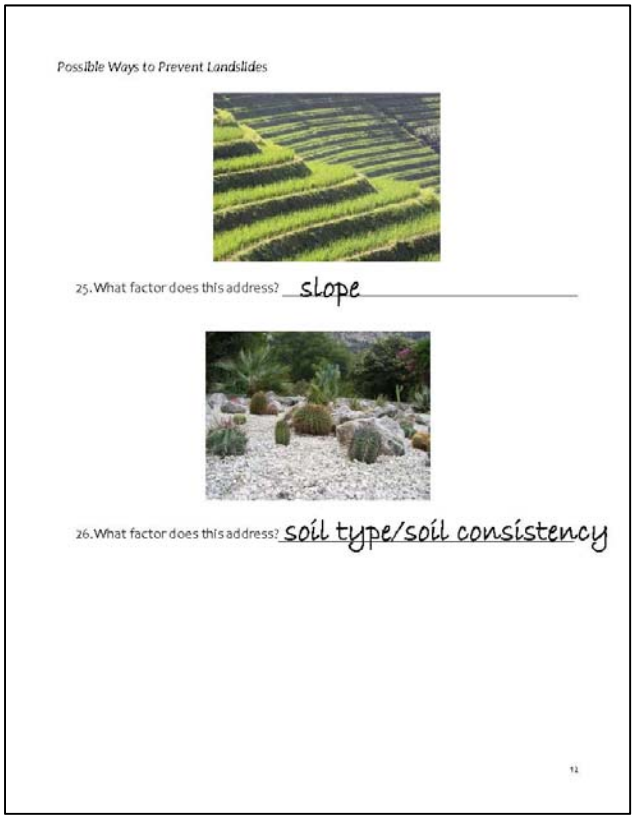
- Discuss with students why they would not worry about a landslide happening on their field. Make sure by the end of the conversation students know the word **slope**.
- Have students fill in question *17*.
- Have students draw a picture of a hill behind a house where it would be likely for a landslide to happen, as well as unlikely for a landslide to happen, for question *18*, then answer question *19*.
- Show *Finding 4*.
    - *The steeper the slope, the more likely a landslide.*
- Show students the picture of the hill with, and without, plants (page 10, picture packet).
- Ask students, "Do the two pictures have about the same slope?" Make sure students agree that they do.
- Ask students "Which picture do you think would be more likely to have a landslide and why?" Possible student response: the hill with no plants would be more likely to have a landslide, because the plants have roots that help the soil stick together.
    - If desired, you can talk to students about this being one of the factors behind why landslides often occur after fires.
- Have students draw in roots on the plants showing why plants help prevent landslides for question *21*.
- Tell student, "Scientists call the ability of a soil to stick to itself 'soil consistency.' The higher the soil consistency, the more the soil sticks together."
- Fill in "stick to itself (consistency)" for question *22*.
- Have students fill in question *23*.
- Show *Finding 5*.
    - *The weaker the soil consistency the more likely a landslide.*





Possible Ways to Prevent Landslides (6 minutes)

- Review that water amount, particle size, material absorbency, slope, and soil consistency are all factors that affect landslides.
- Tell students, "Engineers try to find ways to prevent landslides." Two ways they have come up with are shown on the picture (notebook, page 12; picture packet, page 11).
- Have students look at the first picture (picture packet, page 12, top) and discuss.
- Ask students, "What factor does this solution address?"
- Have students fill in "slope" for question *25*.
- Have students look at the second picture (picture packet, page 11, bottom) and discuss.
- Ask students, "What factor does this solution address?"
- Have students fill in "soil type/soil consistency" for question *26*.

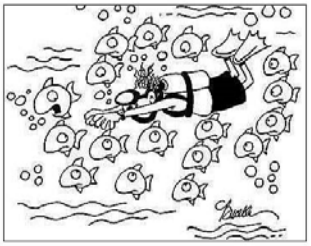


Extra Practice Solutions:

EXTRA PRACTICE
Observations

Observation: A description using your 5 senses

Circle OBSERVATION if the statement is an observation you can make about the picture. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the picture.



1.	The person is wearing a diving mask.	(Observation)	Not an Observation
2.	The fish only have one fin each.	Observation	(Not an Observation)
3.	The person is smaller than a fish.	Observation	(Not an Observation)
4.	Snorkeling is fun.	Observation	(Not an Observation)
5.	There are more fish than people.	(Observation)	Not an Observation
6.	The person's shorts are black.	(Observation)	Not an Observation
7.	The person and fish are in the ocean.	Observation	(Not an Observation)

13