Section 3: Teacher Notes

Seeds and experiments fill the activities of this section.

TEACHER NOTES: SECTION THREE

Summary:

Students collect seeds for an experiment and a language/art project. They begin class experiments in plant growth using beans. They develop independent experiments in plant growth.

There are many growing activities in this section, some of which need darkness.
Plan ahead for adequate space to set up:
- 2 experiments with outside collected seeds (2 pans for socks or 2 planter containers for boot scrapings).
- 12 containers for each of 4 teams in the class bean experiments.
- 4-12 containers for each of 4-12 teams in the independent growing experiments.

Objectives:

Alaska Standards

To understand the varied growing conditions needed by different plants.
To learn indigenous plants' names and characteristics.
- Science: A. 12, 14, 15; B. 1, 5; C. 1, 5; D. 1
- World Languages: B. 1
- Geography: A. 2, C. 1, 2;
- Mathematics: A. 5
- Skills for a Healthy life: B. 1, 3

To use problem-solving skills in planning an experiment and using the scientific process.
- Science: B. 1, 2, 3, 5; C
- English: C; D
- Mathematics: A. 2, 3, 6; C. 1

To understand local cultural heritage and stewardship for the environment.
- English: A; B. 2, 3; C; D. 1, 2, 4; E
- Cultural: A. 3, 4, 5, 6; B. 2; C. 1, 3; D. 1, 3, 4; E. 1, 4
- History: B. 1
- Arts: A. 3; B. 8

Materials:

- log book
- pencils, pens
- hand lens
- watering can with small spout (optional, but helpful for neatness during all Section Three activities)

Dirty a Sock/ Clean a Boot
- 2 large fuzzy socks (if seed collecting on a dry day). They should fit over student shoes. Socks will be buried in a planting container for this activity, so be sure they are socks that no one wants any more. Fuzzy socks will give you the best collection of seeds. They do not need to be a pair.
- 2 pairs of rubber boots (if seed collecting on a wet day)
- planting containers: for the socks, two shallow pans 2-3 inches deep (5-7.5 cm) and broad enough so that the socks can lay flat. For the boot scrapings, 2 flower pots or similar containers that will allow water drainage.
- plastic bags to carry socks or boot mud back to the classroom

TEACHER NOTES: SECTION THREE

- labels such as masking tape, or cut paper glued or taped to a straw or stick
- water
- measuring cup
- waterproof marking pen
- freezer
- soil
- clear plastic food wrap
- clipboard or stiff cardboard with recording paper
- paper
- ruler
- calendar labeled SEED CALENDAR and arranged for the 4 weeks of this activity

Bean Experiments:

- dried beans: select the largest variety of any or all of these: pinto, red kidney, lima. (You may wish to test these beans one week before students begin to use them to confirm the best germinating beans available in your area. Our experiments showed the greatest success with pinto beans.) Allow 20-25 beans per student for class experiments and independent experiments
- glass jars, one for every 2 students
- water
- paper towels
- clear drinking glasses or cups, a minimum of 3 inches (76 mm) tall. (48 for class bean experiments). These should be the same type and size within each of the 4 teams although they may vary from team to team.
- containers for planting independent experiments (as needed)
- trays or cookie sheets to hold each team's planted cups
- graph paper
- refrigerator
- large sheets of paper for whole class activity.

Seed illustrations

STEP ONE:

- Plant Illustration Cards from the Appendix marked with ❧ symbol. On the Cards, UT refers to the page number on which the plant is found in *Aleut Dictionary/Unangam Tunudgusii*.
- markers or pens for labeling seed bags
- field guides (See Resources in the Appendix for list)
- plastic bags, in a variety of sizes to carry plant specimens: zip-loc or with twisties, one per student
- sandwich-size zip-loc bags, one per student
- paper lunch sacks, quantity to equal number of students
- masking tape or white labels for each bag
- paper clips

STEPS TWO, THREE

- seeds collected during STEP ONE in a quantity so that each student has a different one

If locally gathered seeds are not found in sufficient quantity for each student to have a different one, try an alternate:

1. Divide student-collected seeds so that several students will study a similar seed.

2. Use purchased or readily available seeds. The following are listed in the *Aleut Dictionary /Unangam Tunudgusii*. Most of them are Russian loan words adapted to *Unangam tunuu* grammar: apple, orange, onion, corn, cranberry, mustard seed, oak, oats, potato.
3. If you use seeds that have no corresponding name in *Unangam tunuu*, students should select descriptive words from the Glossary for the Native language component.

- crayons and colored pencils
- paints (poster or watercolor) in primary, secondary colors and black
- black markers with fine or bold tips
- colored markers with fine and bold tips that match the paints for lettering, if possible
- paper for sketching and painting trials, including large unlined newsprint
- erasers
- poster board or similar large paper for final poster—the largest size available
- Dictionary: *Aleut Dictionary/Unangam Tunudgusii,* at least 2. If your school does not have a classroom set that teachers may check out, consider putting in a purchase request.
- *Unangam tunuu* vocabulary (see Glossary in the Appendix) enlarged and posted for whole class use

Optional: Fast Plants seeds, curriculum, and related materials. If you are using Fast Plants, you may wish to omit activities 3-6 because they cover similar material.

Activities:

ACTIVITY ONE. Students collect and plant seeds in Dirty a Sock or Clean a Boot.

Outside activity/inside activity (best conducted in the fall).
Estimated duration: collecting: 10-20 minutes plus travel time
follow-up: 5-10 minutes daily for selected students

Dirty a Sock: If the weather is dry. Select 2 students to wear an old sock over a shoe and walk through a habitat to collect seeds on the socks.
Clean a Boot: If the weather is wet. Select 2 students to wear boots and walk through a habitat to collect seeds on the boots.

After returning to class, organize the students to plant, observe and monitor the seed growth. Set up a PLANTING COMMITTEE and a CARETAKER COMMITTEE. Also set up a calendar for the next 4 weeks and have each student responsible for one day (or more) as an OBSERVER. Write each student's name by the date/day when s/he is to make observations. Display the calendar in a conspicuous location.

Results will vary in this activity. Seed growth may be wildly successful or few may sprout. Seeds prefer a dormant period in many Alaska habitats and replicating that time by placing the seed collection in a freezer may or may not succeed depending on your location, the time of the year, and other variables.

ACTIVITY TWO. In a 3-step project, students make a poster close-up illustration of one seed. In step one, students revisit habitat areas to collect seeds and related plant parts. Their collecting is guided by the Plant Illustration Cards from the Appendix. In step 2, students sketch and refine a drawing while carefully examining one seed. They add appropriate names and descriptive words in Latin, *Unangam Tunuu*, and English, while emphasizing the *Unangam Tunuu*. In step 3, they plan and produce a poster. *See language description at the end of this section.*

TEACHER NOTES: SECTION THREE

Outside activity/Inside activity
Estimated duration: Step one, 30-40 minutes plus travel time
Step two, 40-60 minutes
Step three, 40-60 minutes

STEP ONE: Seed Gathering and Identification
STEP TWO: Observation and Sketching
Give each student a single seed for observation and sketching. Students may not choose the seed themselves. Everyone will have a different seed if possible. Post the *Unangam Tunuu* Glossary words for the class to see. Other language resources are included at the end of the teacher pages.
STEP THREE: Plan and Produce the Poster
Students should plan to display the posters with their other work during the community celebration at the end of the plant study.

ACTIVITY THREE. Students begin observations and experiments with beans. Remind students to use senses in addition to sight for this activity. Plan to begin this activity on a Monday or Tuesday. The soaking beans will rot and ferment if left unattended for several days.

Inside activity
Estimated duration: day one, 10 minutes
day two, 40-50 minutes

ACTIVITY FOUR. Students review SETTING UP YOUR EXPERIMENT using the supplied form from the Appendix and the activities in Dirty a Sock or Clean a Boot Activity One. The whole class fills out the form. *Suggested Activity Four form completion example in the Appendix*

Inside activity
Estimated duration: 20-30 minutes

ACTIVITY FIVE. Students work in 4 teams to conduct 4 directed experiments in bean germination and growth.

Inside activity
Estimated duration: set-up, 15 minutes
experiment follow-up, 15 minutes daily for 14 days

Students complete the SETTING UP YOUR EXPERIMENT form for each experiment.
Caution: Before the students begin this activity, you will want to experiment with a glass to discover how many pieces of paper towel should be crumpled in each glass. When wedged in place, the bean seed will need oxygen, so it should not be too tight between the paper towel and the glass. Nor should the bean seed be too loose and able to slip down the side of the glass.

ACTIVITY SIX. Students work in partners or teams to design and conduct an independent experiment in bean germination and growth.

Inside activity
Estimated duration: set-up, 20-30 minutes
experiment follow-up, varies by experiment

Reference resources for experiments and science fair activities are located in the Resources section in the Appendix.

Assessment opportunity: Student names four parts of a seed and describes the term, hypothesis.
Students complete self-assessment rubrics, Three.
Teacher completes assessment rubric, Three, for each student.

TEACHER NOTES: SECTION THREE

For the *Unangam Tunuu* element of ACTIVITY TWO, the student uses attested words—plant names and descriptive words. Attested words are those recorded by an accepted linguist in a specific place and year. The *Aleut Dictionary/Unangam Tunudgusii* provides this information for each entry. Some words from the *Dictionary* have been included in vocabulary selections throughout the plant unit. These words are also listed in the Glossary in the Appendix.

If the student's word choice for *Unangam Tunuu* is not from the list in the Glossary, s/he should cite one of the recommended published sources, a tradition bearer (this can be an Elder or a local expert), or a linguist. The source should be written on the back of the final poster (e.g., UT p 353 *Saaqud(a)m iimkaaluu*—flower stem of cow parsnip). This methodology is to validate knowledge of the language which was recently standardized. People have just begun to use the *Dictionary*, published in 1994, the most complete and accurate for this language.

Recommended references:

Bergsland, Knut and Moses L. Dirks. *Aleut Dictionary/Unangam Tunudgusii*. 1994. Alaska Native Language Center. University of Alaska Fairbanks.

Golley, Nadesta. *Atx̂am Hitnisangis/Atkan Plants.* 1973. Alaska State Operated Schools. Book 14 of 1973 Atkan educational series.

Golodoff, Suzi. *Flowering Plants of Unalaska*. Forthcoming. University of Alaska Press.

For examples of word and illustration design similar to this project, see *Rain Makes Applesauce*, by Julian Scheer, and *Bird Egg Feather Nest* or *Seed Leaf Flower Fruit*, by Maryjo Koch.

Teacher Assessment Rubric, Section Three Date:

Name of student: _____

	1. Always	2. Sometimes	3. Never
Student: Stays on task.			
Completes work.			
Asks questions.			
Contributes to group's work.			
Understands the information.			

Needs help with:

NOTES:

Section 3

Seeds and experiments fill the activities of this section.

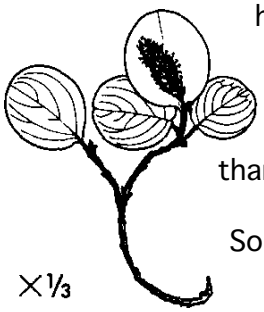
Wan alaĝum ilan anaĝim anĝaĝinangin usuu Aguuĝux̂ agach ngiin aĝiqaa. (E)
Algas ama anaĝim anĝaĝingis huzungis Aguuĝum agacha ngiin aĝiqaa haqataasada. (W)
Respect and be aware of the creator in all living things.

SECTION THREE

The growing season in this region is short as well as cool. Plants must use all warmth to survive and to mature enough to produce new plants. Cold is one the conditions of northern life for which plants must be adapted to survive. In the winter, plants save energy by becoming dormant or inactive through the long cold months.

Some flowering plants, especially those with bowl-shaped flowers act like solar catchers. They form warmer temperatures on their surfaces than that of the surrounding air. The *Papaver alaskanum* (Alaska poppy) is an example of this kind of plant.

The **catkins** of *Salix arctica*, a willow, warm up in the sun. Their dark color lets them absorb the sun's warmth. Scientists think that their hairs act like little greenhouse windows. Scientists have measured female catkins approximately 40° F (4-5° C) warmer than the surrounding air.



Salix arctica
Chuyax̂ E (UT 157)
Tagûiix̂ W (UT 382)
Arctic willow

Some plants adapt to the cold and short growing season by making leaves that are green all winter. These wintergreen leaves give the plant a jump-start on growth in the spring. Old leaves don't die until the plant makes new ones. Many members of the Heath Family have leaves that stay green all year. The plants use less energy because new leaf growth is not required every year. Some evergreens such as *Phyllodoce aleutica*, Aleutian heather, can survive even when another part of the plant freezes.

Phyllodoce aleutica
Aleutian heather

Annuals are the least adapted flowering plants for the short growing season. These plants go through their whole life cycle in one growing season. They die before winter sets in, and are not commonly found in the Aleutian/Pribilofs. Most flowering plants in this region are **perennials**. Perennials live for several years, flowering each summer.

Some perennials grow their flower buds in late summer. The buds winter-over. As soon as spring temperatures are warm enough, they will blossom. Some plants are **biennial**, growing for two years. In the first summer they grow leaves, They build up their roots, storing sugars before they rest for the winter.

With the second growing season, they are ready to grow early and make flowers and seeds.

Among the many adaptations to the cool, short growing season are the ways that plants reproduce.

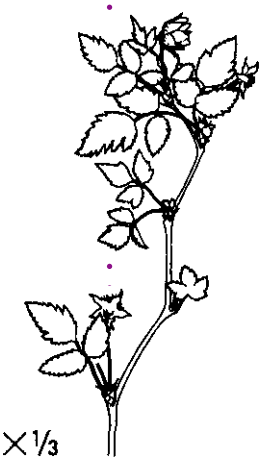
Some plants have seeds that blow away in installments. If all the seeds were blown away at the same time, they might end up in a place that was not welcoming for the plant to grow.

Seeds spread by strongest winds (gale-force) are usually round and smooth like tiny peas. They may end in a snowdrift along with dust blown by the wind. This little soil pocket gives a cozy home for the new plant to grow in after the snows melt.

Seeds spread by gentle winds are more likely to have fuzzy feather-like forms. Fireweed and cotton grass are examples of these.

Many seeds are spread by Arctic animals such as lemmings, voles, and birds. Berries are an example of this kind of seed spread.

Ranunculus bongardii, bongard buttercup, sometimes known as the rain flower, has long hooked beaks on its flattened seeds which stick to animal fur and our own socks and pant legs. Other plants with bristly seeds are *Geum macrophyllum*, large-leafed avens, and *Galium aparine*, bedstraw.

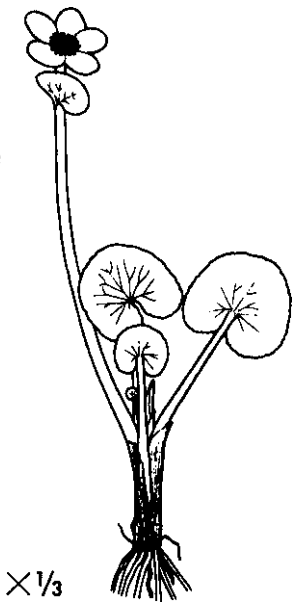


Rubus spectabilis
Alagnax̂ E (UT 49)
Salmonberry

Some plants do not depend on seeds to grow. Some plants spread by roots that break off and create a new plant. The chocolate Lily has rice-like **bulblets** that come apart and make new plants. Some plants have underground stems that make new plants. Examples are *Artemisia unalaskensis,* wormwood, and *Rubus spectabilis*, the salmonberry.

New plants grow at the ends of some plant branches. *Potentilla egedii,* silverweed, and *Fragaria chiloensis*, Pacific beach strawberry, are examples. Some form new plants at the **nodes** of the stems where the leaves connect. *Caltha palustris*, marsh marigold, reproduces this way.

Bistort and several saxifrages spread by little buds that become detached and sprout. The little buds have the advantage of traveling like a seed, but do not have the seed's advantage of being able to be **dormant** through the long cold.



Caltha palustris
Anim kangaa (Golodoff)
(lake top)
Marsh marigold, cowslip

Plants have many ways of reproducing, but seeds are the most common way in most of the world. The seeds of plants called **angiosperms** are contained in fruits. (Another group of plants with seeds are trees that carry their seeds in cones. They are known as **gymnosperms**. Are there any gymnosperms where you live?) Fruits come in many different forms. Speaking botanically, a "**fruit**" is the mature, ripe part of the plant that contains the seeds. A fruit is often brightly colored

VOCABULARY

*aadumaanuŝ (*UT 14)(aa thoom AAH noh): oval
*qumugduŝ W (*UT 336) (koom UG thoh): oval

achiigusaadaŝ E (UT 105) (a cheegh oo SAH thah): flat
ichaaqidaŝ W (UT 170) (each aahk EE theh): flat

angunaŝ (p 91) (ung OO nah): large

atxaŝ (UT 108) (ATK ah): smooth

bruudnax [r] (p 123) (BROOD neh): 2 boots

chiĝuudngim qadungin E (UT 293) (chih ROOTHE ngim • kahthe OONG in): seeds, *lit.* flower scabs

chuchxulalix E (UT 149) (chuchk oo LA lih): thorny

chuhnisas W (UT 154) (choon EES us): hooks
chuhnunsin E (UT 154) (chuh NUN sin): (instrument for stabbing) hooks

chuqudaachxuzaŝ W (UT 156) (chuh ku thawch KOO zah): microscopic

chuulkiŝ [r] (UT 153) (CHOOL kegh): sock

daaŝsxituud(a)lakan E (UT 160) (thah skit toothe LA kan): small
chuqudaŝ W (UT156) (chuh KUH thah): small

daŝsxiŝ W (UT 160) (THAH skegh): grain, seed
daaŝsxis W (UT 160) (THAH skis): grains, seeds

hitxuliŝ (UT 215) (hit HOO legh): seed, crumb

kumatxaŝ E (UT 248) (koo MAHT kah): fox skin sock

qaasaŝ E (UT 311) (KAAH sah): seed

qalaŝ (UT 302) (say KAH-lah): seed

qachŝidigaŝ E (UT 292) (kach kidth IG gah): smooth
qachŝizigaŝ W (UT 292) (kach kiz IG gah): smooth

qalaa (UT 301) (kah LAA): bottom

qihmadguŝ E (UT 43, 324) (kih MOTHE goh): round
akamudigaŝ W (UT 43) (aka moothe EE gah): round

siimaŝ E [r] (UT 361) (SEE mah): seed
siiminaŝ W [r] (UT 361) (seom IN ah): seed

tnguŝ E (UT 400) (tng oh): hard
tungaŝ W (UT 409) (toong ah): hard

uliigin (UT 436) (ool EEGH in): mukluks, skin boots

usxim inguqalaĝii E (UT 209) (oos kim • ing oo KAHLAH ghee): having many needles

angiosperm
annual
biennial
bulblet
catkin
constant
cotyledon
dormant
embryo
epicotyl
fruit
germination
gymnosperm
hypocotyl
hypothesis
node
perennial
seed coat
solar
variable

and sweet to taste. An apple is a fruit. But a fruit can also be a tomato, a green bean, a pea pod, a seed of *Geum macrophyllum* or *Galium aparine*.

Seeds need 3 things to grow:

1. proper temperature,
2. moisture, and
3. oxygen.

ACTIVITY ONE. You can find seeds with your socks or your boots. Dirty a Sock/ Clean a Boot

<u>If the weather is dry</u>, 2 students will be designated as sock walkers for the class and will be given directions to take a walk in the meadow with their socks on! Each color team gives a 2-sentence direction to the walker that includes no more than 10 steps in each direction. Example: "Turn right and walk 7 steps. Then turn right again and walk 4 steps." After walking in the meadow, their socks will be planted!

Put the socks in a plastic bag to carry them back to the classroom without losing any seeds.

<u>If the weather is wet</u>, 2 students will be designated as boot walkers for the class and will be given directions to take a walk in the meadow in a muddy place! Each color team gives a 2-sentence direction to the walker that includes no more than 10 steps in each direction. Example: "Turn right and walk 7 steps. Then turn right again and walk 4 steps." After walking in the meadow, the mud from their boots will scraped off and planted!

Put the boot mud in a plastic bag to carry it back to the classroom without losing any seeds.

After returning to class, you will be in organized into committees:
PLANTING COMMITTEE,
CARETAKER COMMITTEE,
and each student also works as an OBSERVER.

Each student will be responsible for one or more days of observation. You will know when you are an observer because your name will be on the Seed Calendar.

Each day's observations will be witnessed by a representative from the PLANTING COMMITTEE and the CARETAKER COMMITTEE. If the assigned OBSERVER is absent, the COMMITTEE representatives will do the observer's work.

ACTIVITY ONE, continued

SOCK AND BOOT DIRECTIONS ARE IDENTICAL EXCEPT FOR THE LABELS

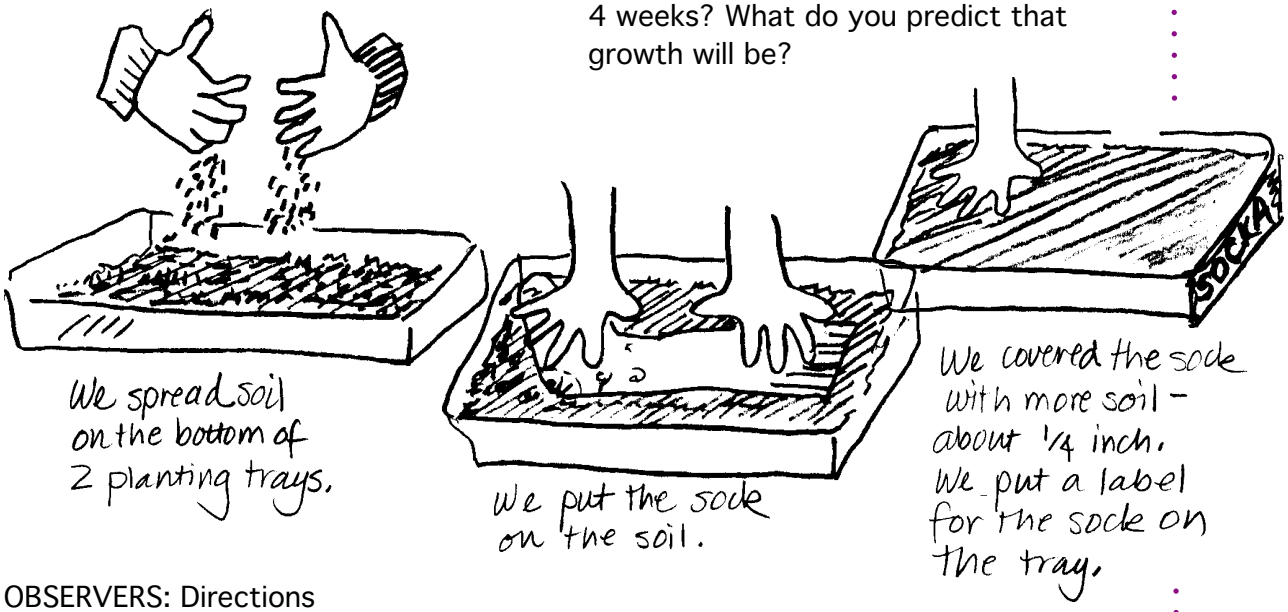
PLANTING COMMITTEE: Directions

a. Spread a layer of soil on the bottom of each of 2 planting containers. Lay each sock on the soil in a container. Cover each sock with more soil, approximately 1/4 inch (6 mm) deep. Fill a measuring cup with water and then water the soil so that it is damp, but not soaked. Note the amount of water you used so that you can record it in steps "b" and "c" below. Cover the top of the container with clear plastic food wrap to help hold in the moisture. Using a waterproof marking pen, write SOCK A or MUD A on a label that you fasten to one container and on another label write SOCK B or MUD B.

b. On a piece of paper, write SOCK A or MUD A and the date and time you planted the sock. Put the paper on a clipboard or staple it to a piece of cardboard. Set the container near a sunny window in a warm—not hot—place. Place your recording paper with the container.

c. On another piece of paper, write SOCK B or MUD B and the date and time you planted the sock. Then Put SOCK B or MUD B in a freezer and record the date and time you put the sock in the freezer. Put this recording paper near the freezer.

WHOLE CLASS:
Predict what you think will happen in container A. In 8 days you will remove B from the freezer. What will happen to it? Will there be a big difference in the growth in the 2 containers at the end of 4 weeks? What do you predict that growth will be?



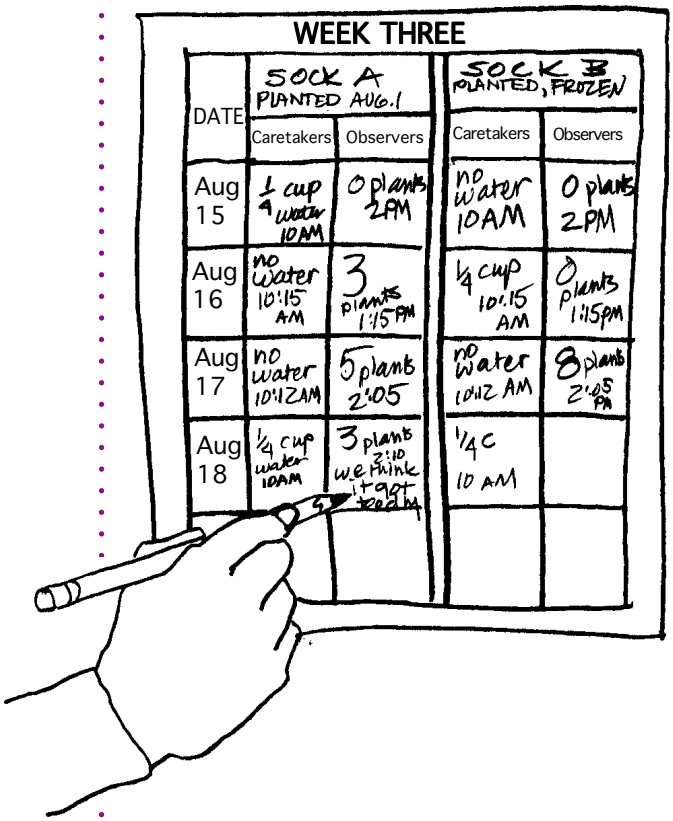
OBSERVERS: Directions

a. At the same time each day for 4 weeks, you should look at each container. Notice the rate of growth for container A and container B. How many plants are growing? How tall are the plants?

b. Record the growth on the recording papers for each container—how many plants and how tall each plant is. Write the date and the time of your observation.

CARETAKERS Directions

a. Every day, you will need to see if container A has damp soil. If the soil is not damp, use a measuring cup and add a little more water to keep the soil moist, not wet. On the recording paper, list the date and time when you added water to the container. List the amount of water you added. Be sure the container is also getting light, but is not becoming too hot.



b. Every other day, remove container B from the freezer. The next day, you need to return it to the freezer. Be sure to keep the container in the freezer during the weekends. At the end of 8 days, remove container B from the freezer and place it near container A. Record the date and time when you removed it permanently from the freezer. Continue caring for container B as you do for container A, checking to be sure the soil is damp and the container is getting adequate light.

c. After 2 weeks, the clear plastic food wrap can be permanently taken off container A. Record the date and time when you removed the plastic wrap. Two weeks after removing container B from the freezer, you can permanently take off the clear plastic food wrap. Record the date and time when you removed the plastic wrap.

WHOLE CLASS

At the end of the 4 weeks, what are the differences, if any, between SOCK A and SOCK B? Or between MUD A and MUD B? What signs of growth are there? Which has more sprouting plants? Why? How did the results match your prediction?

ACTIVITY TWO You can learn about seeds and *Unangam tunuu* words. During this project you will use 3 languages: Latin, *Unangam tunuu* and English. Latin is the language of Science. It is used to help people all over the world know that they are talking about the same plant or animal. A plant name is included in *Unangam tunuu*, if available, because that is the language native to these islands. Some common names in English are also included. Common names for plants are fun to learn, but can be confusing. Sometimes people in different places have the same name for different plants. (Remember the different rain flowers in your region?) This happens in all languages. When a plant is given its Latin name, care is taken to be sure of the plant's

identity. That is why the Plant Illustration Cards list a Latin name for all plants. You can learn to be sure of a plant's identity.

Scientists must be good observers. They must be careful with the living things that they study. If people are careless, many plants and animals could easily disappear. This is especially true on a small island. This activity gives you a chance to think about taking only what is needed. Take only what you need so that you will be able to complete the activity. An *Unangam* value reminds us to "live with and respect the land, sea and all nature." It shows great respect to learn about the living things around you.

STEP ONE Seed Gathering and Identification.

1. Using a Plant Illustration Card, look for that plant's seeds in a habitat area. Work with your team to find the seeds.

2. To help be sure of the seed's identity, collect other plant parts. Collect leaves, flowers—if still on the plant—,seed pods, and the stem with leaves attached. Suzi Golodoff, botanist, reminds us that if the plant is at seed stage, its flowers will be gone. Ask yourself, "Do I know this plant's flower?" Often plants go through amazing changes. You might not recognize the plant at seed stage. Coastal paintbrush is one example of this change. Wild geranium is another example. These plants look very different in seed stage.

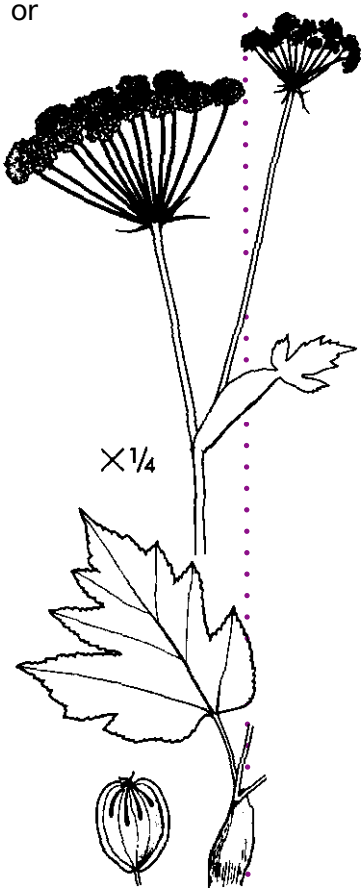
3. As you collect, take notes about your seeds in your log book. What kind of habitat were you in when you found the seeds? How tall was the plant? If you have Elders or other experts with you, write down all the information they tell you about your plant.

4. Put all samples from a plant in one bag, with seeds and seed pods in a smaller zip-loc inside. Make sure nothing falls out so that it is not wasted or mixed with other seeds.

5. Before you leave the habitat area, compare bags of seeds. Hopefully, there will be as many seeds as there are people in your class. No 2 bags should contain the same kind of seeds, unless you are given permission. However, there will be years or areas where it will be difficult to find 25 or more different seeds to collect at the same time. If your teacher gives you permission to collect seeds that are not on any Plant Illustration Card, plan to use all available resources to identify those plants.

6. When you return to the classroom, form a talking circle to share what you know and to decide how to find out what you still need to learn.

7. When you finish with the seeds for the day, open all zip-locs and undo any twisties so that plants will not mold. Print the name of your seed on a paper lunch bag, and put the plastic seed bag in it. Fold the top of the paper bag and



Heracleum lanatum with seed
Saaqudax̂ E (UT 353)
Taaĝan 'gix̂ W (UT 384)
Putchki (UT 353) [r]
Cow parsnip, wild celery, putchki

put a paper clip on top so that it won't spill. Put the paper bags where they will be safe.

STEP TWO. Observation and Sketching.

Your teacher has given you a single seed that you will get to know intimately. Everyone will have a different seed.

1. Quickly draw a sketch of your seed.

2. Examine your seed carefully. Use a hand lens to see details. Then make a second sketch showing all the details you see. Draw the details so accurately that no one could confuse your seed with another seed.

3. Write your seed's plant name on your sketch. Write it neatly in Latin, *Unangam tunuu* and, if you wish, English. If you cannot find a name for your plant in *Unangam tunuu,* use a descriptive word. You will find those words on the *Unangam tunuu* list posted in the classroom.

4. Record all the *Unangam Tunuu* words that describe your seed.

STEP THREE. Plan and Produce the Poster.

1. Plan your final poster. Your poster will contain:
   - A large, well-drawn representation of your seed; and
   - Words about your seed in 2 or 3 languages (Latin, *Unangam tunuu*, and English).

Use large, unlined newsprint, and crayons or colored pencils to make your plan.

Plan your design and spacing:
Use the paper well. Arrange the drawing and text on the page in a way that pleases your eye.

A. Practice the lettering you want to use. If you are not satisfied, figure out what you could do to improve the poster design, and try a second or third version.
B. Fill all the background with words and designs. There should not be much unused background showing.
C. Consider ways to contrast the seed and the text:
   - Outline your seed drawing on the poster in a color such as black so that it stands out.
   - Paint your seed in more than one color and let the text stand out in a bold color or black.
   - Paint your seed in unexpected colors. Your seed is not required to be the same colors as in nature.

D. Consider ways to place your words:
   - in straight horizontal lines, or
   - around the edges of the drawing, or
   - floating in wavy lines, or
   - swirling in a spiral around your painted or outlined seed drawing, or
   - in other ways you can imagine.

E. Make sure that all words in all languages are correctly spelled.

Test your colors: Use crayons or colored pencils. The colors will be similar to the pens and paints you will use for the final, but crayons and colored pencils will not bleed through the newsprint.

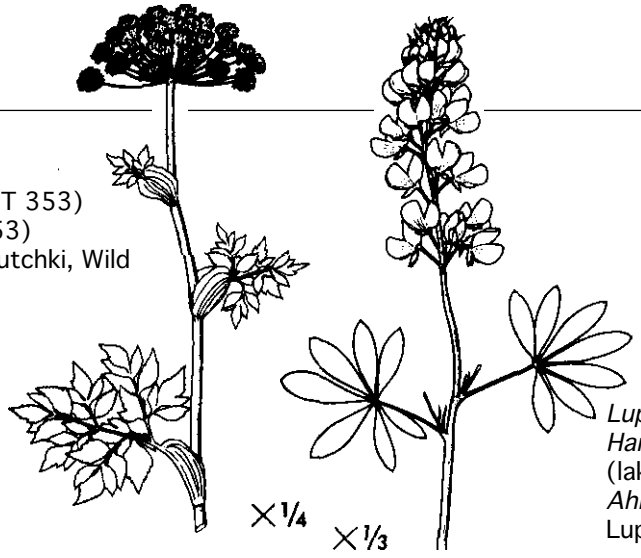
Use 3 colors for your poster design. One color may be black. Use primary or secondary colors, 2 of which contrast. You may need to do a Web search or look in art books to find a chart showing contrasting colors, if you are not familiar with this idea. One example is that blue and orange contrast, so that you could use blue, orange and black.

Active youth on St. Paul Island are doing something to make a difference where they live. During years of government operation of the fur seal harvest, pollution took its toll. Oil contaminated the earth. Refuse of the business littered the land. Ataqan Akun, We are One, Aleut dancers under the supervision of Unangan educator, Edna Floyd, were glad to help. The wrestling team and a class of fifth grade students joined the crew with vigor.

They took jobs to help gather seeds native to the island. The seeds they gathered will be sown over large areas. They will repair areas of land where oil contaminated soil was burned and are now devoid of plants. The young people made money to help with their activities by harvesting the seeds of wild grasses, lupines, and St. Paul putchkis. They were hired by Ecotech to do this because 1) it would help the environment and 2) it would allow youth to do real work of great value where they live.

Bering Sea Ecotech is a subsidiary company of the TDX. TDX stands for Tanadgusix̂, which is the Native village corporation. Ecotech is an environmental clean up company. They have been learning the business the last seven years. They now have jobs across the country. They could have just planted grass seed from the mainland. They did not want to do this because it could destroy the balance of plant and animal life. They made a decision about what should grow in those areas. They are proud to point out that they even used recycled burlap bags that were found in refuse piles to store the seeds for the winter. Qaĝaalakux̂, thank you, to everyone who worked towards this important goal.

Edna Floyd, Unangam Elders' Academy member, St. Paul Educator



Angelica lucida
Saaqudiigamax E (UT 353)
Saaqudax̂ W (UT 353)
Angelica, St. Paul Putchki, Wild parsnip

Lupinus nootkatensis
Hanix̂ E & Attuan (UT 77) (lake)
Ahnix̂ W (UT 77)
Lupine

Here are two Web sites about choosing colors and using contrasting colors.
http://www.sanford-artedventures.com/play/color1/color1.html
http://www.sanford-artedventures.com/study/g_complementary.html

2. Practice a few ideas with paint and markers before you use your best paper.

3. Make your final poster with the largest size poster paper available. Plan to display your posters during the community celebration at the end of the plant study.

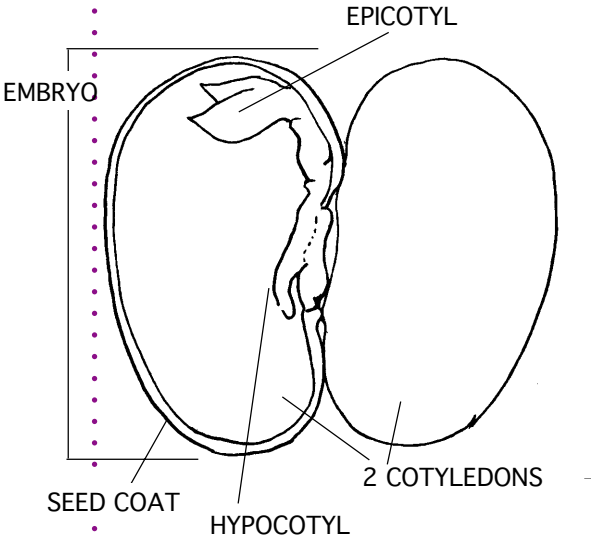
Alternate Activity: You can write and illustrate a seed book for the younger grades. Bind it for use in the school library.

ACTIVITY THREE. You can learn what is in a seed!

1. Working with a partner, put 20-25 beans in a cup and cover them with about 2 inches (5 cm. of water). Leave them soaking until the next day.

2. The next day, prepare an examination area. Lay down paper towel on which to place soaked beans. Remove 10-12 beans from the container where they were soaking. Lay 2-3 dry beans near the soaked ones so that you can compare their appearance.

3. Look at one bean (pinto bean or red kidney will most clearly show these details) with your hand lens. Use your other senses to examine the bean. Smell the bean. Feel its surfaces. *However, remember that you should never taste any ingredient during a science experiment.*



What do you see?

- a brown or grayish-white outer coating: the seed coat.
- a scar that is the place where the seed was once attached to the parent plant.

4. Repeat your observations with the rest of the beans

5. Carefully scrape away the outer seed coat with your fingernail.

You will see a white beak-like shape with 2 halves connected at the top. The white structure is the root part (the **hypocotyl**) of the seed **embryo**. The embryo is the part of the seed that actually develops into a plant. The 2 halves are the **cotyledons**; they are also known as the seed leaves and hold the stored food for the growing baby plant.

6. Repeat this observation with the hand lens and the rest of the beans.

7. Carefully pry apart the 2 halves (the cotyledons). Be careful not to break the hypocotyl. Look at each half with your hand lens. With the plant illustration, identify the part of the plant embryo that will become the plant's stem, leaves, flowers and fruit: the **epicotyl**.

What is inside the other beans? Repeat step 7, examining the other beans with your hand lens.

8. Fill out the bean report form. If you are looking at more than one kind of bean, fill out a report form for each kind of bean. Be sure to use observation language in this report. What are observation words that you can use to describe the bean? "white," "5 cm. long," "smells like old shoes." What are opinion, subjective words? "stinky," "tiny."

ACTIVITY FOUR. You can practice using the "Setting Up Your Experiment" form. Look at the activity you started for "Dirty a Sock/Clean a Boot." Using that project, work with your class to fill in the blanks for "Setting up your experiment" on a large sheet of paper that you can see in front of the room. There are forms in the Appendix for you to use.

BEAN REPORT FORM Date _____

Name _____

Write one or two accurate words to describe each seed you are observing:

	DRY BEAN	SOAKED BEAN
Color	_____	_____
Shape	_____	_____
Texture	_____	_____
Odor	_____	_____
Size	_____	_____

Draw the dry bean seed

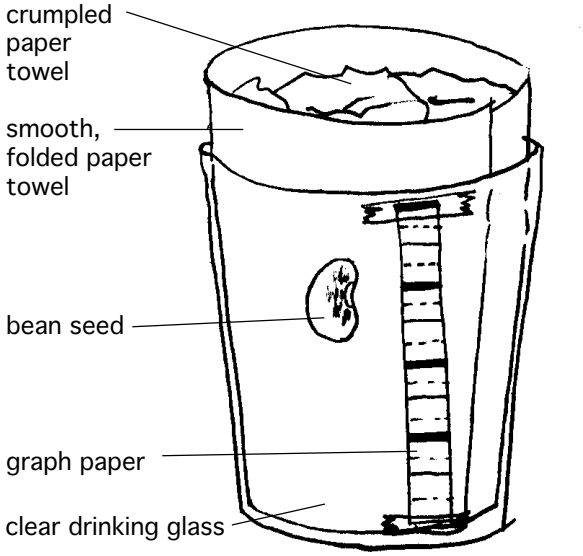
Draw and label the inside of the soaked bean seed using these words:

- cotyledon
- embryo
- epicotyl
- hypocotyl
- seed coat

ACTIVITY FIVE. You can do an experiment in plant germination and growth.

You will need:

- log book
- pens, pencils
- 12 soaked beans. Select 2 or all of these: pinto, red kidney, lima. Discard any that appear shriveled or rotten.
- water
- watering can with small spout (optional, but helpful for neatness during the activities)



- hand lens
- paper towels
- 12 clear drinking glasses or cups, a minimum of 3 inches tall (76 mm) and all the same type and size.
- one or 2 trays or cookie sheets to hold your team's planted cups
- graph paper
- refrigerator

Divide into 4 teams. Each team will be responsible for one of the following experiments:

A. Do different kinds of beans germinate in different ways?
B. Does it matter which direction a seed is planted?
C. Does light affect the germination of a bean?
D. Do heat and cold affect the germination of a bean?

ALL TEAMS:

1. Line the inside of each clear drinking glass with a paper towel that is folded smooth. Then crumple some more paper towel and put it in the glass, all the way to the top. When pushed in place, the bean seed will need oxygen. The seed should not be too tight between the paper towel and the glass. The bean seed be not be too loose, either, and able to slip down the side of the glass.

2. Place a soaked bean between the paper towel and the glass. The bean should be 1/3 to 1/4 of the distance from the top of the glass. Does it matter which way the bean is planted? One team should place the bean seeds in several directions. (See experiment B)

3. Add water to the glass so that the paper is wet, but do not cover the bean seed. Add water every few days to keep the paper moist.

4. Fasten a strip of graph paper on the outside of the glass next to each bean.

5. Teams proceed with differing experiments as follows:

A. Do different kinds of seeds germinate in different ways?

What is your hypothesis?
Place glasses with the several kinds of beans in a dark place. On the graph paper outside the glass, record each day's growth and change. What is the difference after 14 days?

B. Does it matter which direction a seed is planted?

What is your hypothesis?

Your beans should be planted in many different directions. Place the glasses with the several kinds of beans in a dark place. On the graph paper outside the glass, record each day's growth and change. What is the difference after 14 days? Is there a difference among the beans based on which way they were planted?

C. Does light affect the germination of a bean?

What is your hypothesis?
Place one-half of the glasses with the beans in a dark place. Place the other half in a light place. On the graph paper outside the glass, record each day's growth and change. What is the difference after 14 days?

D. Do heat and cold affect the germination of a bean?

What is your hypothesis?
Place one-half of the glasses with the beans in a dark place in the classroom. Place the other half in a refrigerator or other cold place. On the graph paper outside the glass, record each day's growth and change. What is the difference after 14 days?

6. All teams complete the "SETTING UP YOUR EXPERIMENT" pages (see Appendix) for each experiment.

ACTIVITY SIX. You can set up an experiment in plant germination and growth.

Continue working with a partner or in teams to develop an independent experiment. Suggestions follow.

1. Research experiment topics in reference sources (your teacher has a list) or on the Internet.
2. Select one experiment to complete. Have your teacher approve your choice so that all teams are not doing the same experiments.
3. Design your experiment using the "SETTING UP YOUR EXPERIMENT" pages (see Appendix).
4. Complete and report on your experiment during the community sharing event at the conclusion of the plant study.

Plant germination and growth experiment topics: (see Resources in the Appendix for help in designing these experiments)

- What is the effect of gravity on a plant root?
- Do seedlings grow better with fertilizer?
- Can plants grow around obstacles?
- Do plants always grow back if they are cut?
- What happens when seed leaves are removed?
- How much of a seed is needed for germination?
- What happens if beans are left covered in water?
- Which part of the embryo in a bean develops first?
- What are the growth rates of other seeds such as corn, sunflower, spinach?

OR

Any other germination, seedling growth experiment you wish to design. You can research experiment topics on the Internet, also.

Remember that seeds need 3 things to germinate:

1. the right temperature,
2. water, and
3. oxygen.

You can design other experiments by changing one of these variables.

EXTENSIONS

ACTIVITY A.
Select one of your experiments and develop it into a Science Fair entry.

ACTIVITY B.
Make a flip book of a germinating seed, and growing seedling. For an example of a flip book, see *Alaska's Tundra & Wildlife, Alaska Wildlife Curriculum Teacher's Guide*. Alaska Department of Fish and Game. 1995. pages 75-76

ACTIVITY C.
Make a seed collage. Find as many different kinds of seeds as you can. Do not use wild seeds. Find seeds around the home that you already have or ask your friends for some. Arrange them in a design on a flat surface and then glue them to the outside of a clean, empty can using a quick-setting glue such as a craft hot glue gun. Give the seed collage as a "thank you" to one of the Elders or experts who helps you with this plant study.

ACTIVITY D.
What are some other seeds in your home? Make a pictorial catalog of the kinds of seeds you find in your home.

ACTIVITY E.
Can plants grow in space? Experiments have been conducted aboard the Space Shuttle Columbia to see if plants will grow in space. Use the Internet to research and report on the success of these experiments.

ACTIVITY F.
The US Department of Agriculture supplies information about growing wild plants. One of the plants it describes is *Fragaria chiloensis*, Pacific Beach Strawberry. You can find information about this plant and directions for growing it at the PLANTS Web site "http://plants.usda.gov". In the search prompt box, type in "Pacific beach strawberry"; then choose the pdf. version of the plant guide. If the season is appropriate and you have sufficient specimens of this plant in your area, follow the directions for planting. What other wild plants can you transplant or move into your personal wild plant garden?

Student Assessment, Section Two Date:

Name _____

	1 Always	2. Sometimes	3. Never
I stayed on task.			
I completed my work.			
I asked questions.			
I contributed to my group's work.			
I understand the information.			
I am respectful of Elders and experts.			

I still have questions about: