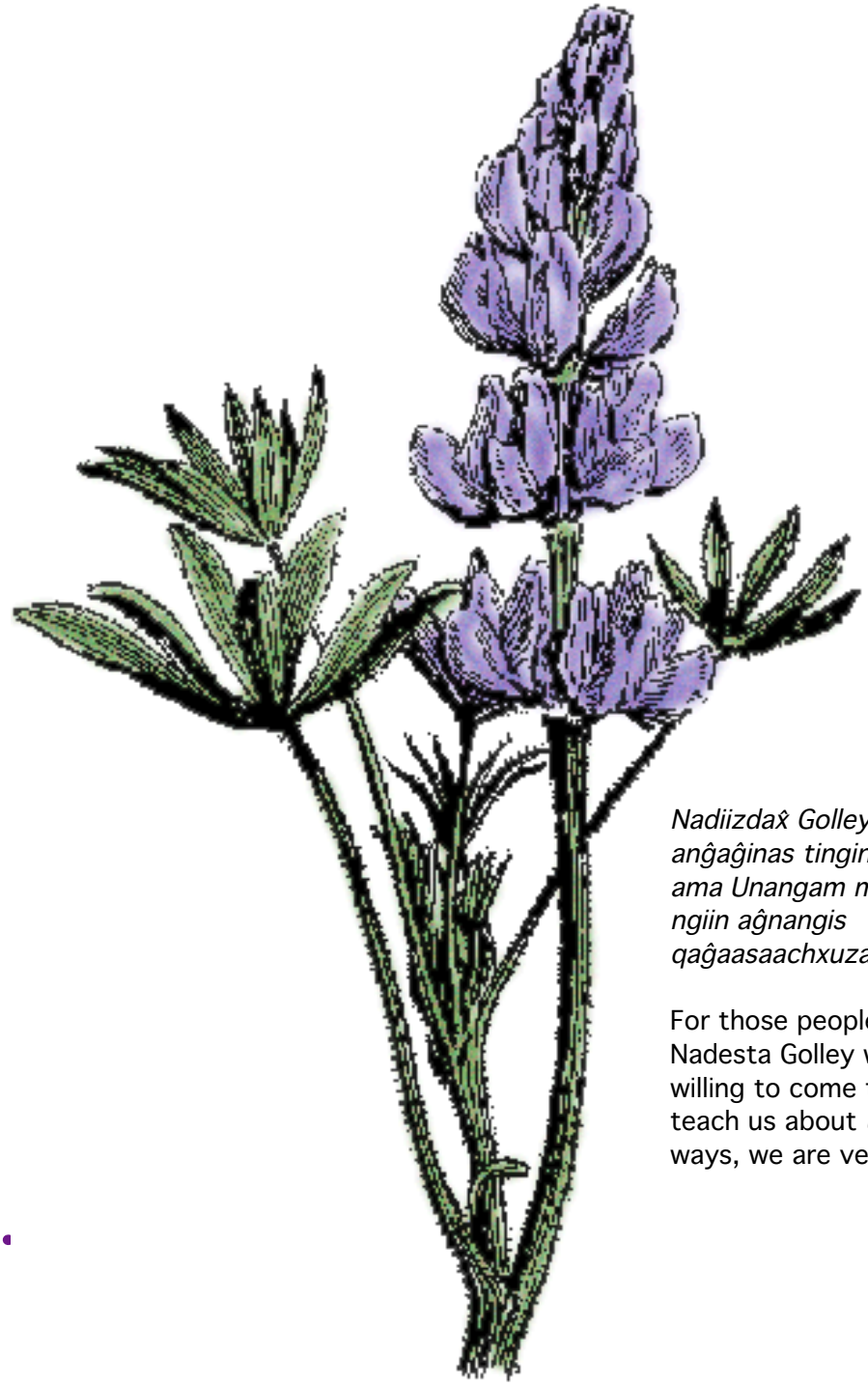
Unangam Hitnisanginl Unangam Hitnisangisl Aleut Plants



Nadiizdax̂ Golley ama hamaax anĝaĝinas tingin hnux̂tal kidul ama Unangam maqaxsingis ngiin aĝnangis qaĝaasaachxuzakus.

For those people like Nadesta Golley who were willing to come to us and teach us about *Unangax̂* ways, we are very thankful.

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Special thanks to Paula Elmes and the excellent staff at the Alaska Native Knowledge Network for their continual support and help with final changes and preparation for posting on the Internet.

The late Nadesta Golley of Atka wrote "*Atx̂am Hitnisangis/*Atkan Plants" as the fourteenth in a series of books in *Unangam tunuu* for Atkan Educational Materials published in 1973 through Alaska State Operated Schools.

"Nadesta was a true leader in that she was unselfish and very generous in her pursuit to disseminate *Unangan* indigenous knowledge concerning *Niigux̂* plantlore. There are many topics about which we would know nothing today had it not been for her diligence. This well educated woman in both Western and the Native world was an inspiration and hope for my being where I am today."

Moses L. Dirks, *Unangam tunuu* teacher and linguist

Unangam Hitnisangin/Unangam Hitnisangis/Aleut Plants: a Region-Based Plant Curriculum for Grades 4-6

(oo NUNG um • hit nee SUNG in / oo NUNG um • hit nee SUNG is)

Txichin qaĝaalakux̂txichin, we (3 or more) thank you (3 or more), Nick Galaktionoff [2001], Moses Dirks [1992, 2001] and Suzi Golodoff [2001], for gracious help with words that are known in *Unangam tunuu,* but are not necessarily in the *Aleut Dictionary/Unangam Tunudgusii.*

About this book:

The Association of *Unangan/Unangas* Educators and the *Unangam* Elders' Academy consider the contents of this work to be correct to the best of our knowledge as of July 2002. While we realize that additional traditional knowledge may come to light at a date past publication, we did our best with the time we had and the resources available to us. We hope that our sincere efforts will help others to expand this base exponentially.

Contact us:

To comment or query directly about the contents of the website e-mail Barbara Švarný Carlson @ fnblc@uaf.edu or write her at PO Box 220196, Anchorage, AK 99522-0196.

For other questions please write Jerah Chadwick at the Aleutian Pribilof Regional Center, PO Box 248, Unalaska, AK, 99685. He will reply or direct you to the appropriate person. This branch of the University of Alaska Fairbanks is closed mid-June through mid-August.

TABLE OF CONTENTS:

NOTES:

To the Teacher

Just six weeks from now, an earthquake will happen.

You and your students will survive the earthquake. Indeed, the only disaster in your area will be the complete destruction of all grocery stores. What will you do then? How will you and your students survive? How will you find food? Medicine? Fuel?

Fortunately you have six weeks to prepare (coincidentally the recommended length for this unit of study). With the guidance of Elders and community experts, you and your students can learn about your local plants and how to use them wisely. The Aleutian/Pribilof Islands are home to more than 500 of the half-million plant species in the world. (Hall, Hultén, Burnie) How many of them can you safely eat for food? Use for medicinal purposes? Harvest for fuel, shelter, utilitarian and decorative objects?

Unangam Hitnisangin . . . contains six weeks of culturally-relevant information and standards-based activities for you and your students. It relies on traditions of Elder involvement and guidance. Plan now to invite Elders and/or local experts to share their knowledge with your students several times during this unit of study. The unit contains recommendations for inviting, interviewing, and hosting these honored guests. Plan, too, for a community gathering at the conclusion of your plant study, so that your students may share what they have learned.

As a culturally appropriate study, development of the units has been guided by Elders in conjunction with the Association of *Unangan/Unangas* Educators. A vital element of the unit is learning through *Unangam Tunuu*, the first language of the people.

Intended as an interdisciplinary unit of study, suitable for grades four though six, *Unangam Hitnisangin . . .* provides six weeks of activities that may be expanded, shortened, or selectively used according to the needs of your classes. Early fall or late spring are the most productive times to use *Unangam Hitnisangin . . .* If begun in the fall, *Unangam Hitnisangin . . .* could be studied or repeated in the spring. It is estimated that each daily lesson will require about an hour, but some portions—fieldwork or interviewing—may take longer blocks of time. Completed unit projects include art, experiments, log books, written work, and a Class Herbarium and local plant guide.

Arranged with vocabulary, resources, and notes about meeting Alaska State Standards, the unit is designed for easy placement in a binder or file folder. Each of the topic sections contains special information for the teacher. The section begins with the summary and materials needed for the lesson. Objectives and skills are correlated with Standards. Suggestions for activity implementation and optional activities are included, also. Teacher pages are followed by student background and activity pages. Unit assessment is designed to be used weekly by teachers and students. A variety of embedded assessments are organized in the instructional activities as well.

An important recurring activity in *Unangam Hitnisangin . . .* is the direction to students to write daily in their log books. The log book is a tool used by all scientists to record observations, experiments and data. Writing on a regular basis in the log book provides discipline that will, over time, improve and sharpen writing skills. Students learn to be more discriminating observers and improve their ability to turn their observations into accurate phrases.

Special Additions:

GLOBE
Schools participating in the GLOBE program can incorporate plant phrenology and land cover survey within this unit. **G**lobal **L**earning and **O**bservations to **B**enefit the **E**nvironment maintains a Web page at "http://globe.fsl.noaa.gov/" where you can learn more about this exciting program.

Fast Plants
We also recommend that you consider Fast Plants which is a unit of study for elementary and middle school developed by the University of Wisconsin. It uses a rapidly-growing plant, *Brassica rapa*, that has a life cycle of 35-40 days (seed to seed) and can be grown in the classroom under continuous fluorescent light.

As a supplement to this unit or as a winter focus adjunct to this unit, Fast Plants offers your students a dramatic and well-developed study of the full life cycle of plants through an exciting and well-organized series of experiences. More information is available in the appendix and at the Fast Plants Web site, "http://www.fastplants.org".

Overview

by Barbara Švarný Carlson

As an *Unangax̂* educator and a person who grew up in Unalaska, the disaster scenario is one I could easily imagine. I recall waking to the sounds of crashing dishes, things falling off shelves with thuds in the dark, and a younger sister crying. I remember vigilant parents hustling us to put on our clothes over our pajamas so that we would have more layers and dress quickly. Then they fed us in the middle of the night so we would not be hungry if we had to head for the hills. Another time, my gentle father sternly swooped me off the beach much to my surprise. I had hurried with my chores to go down to my favorite place in the world—the beach at low tide. I did not know the extremely low tide was connected to an earlier earthquake and that townspeople were watching for a tsunami. Young people will have the chance to learn far more than I have learned in my lifetime about our local plants in this unit. The subject will connect them to this place and extend their curiosity to the worlds of botany, of science, and of technology.

Unangan/Unangas Elders tell us people should know about the survival foods and medicinal plants where they live. In efforts to adapt after contact, we lost some of the usual ways our young people learned these things. In our traditional education youth learned from their Elders, aunts, uncles, and parents. When laws forced the speaking of English and school attendance, relationships that gave the supportive environment for traditional teaching began to disappear. The collaborative writing of new curriculum is indicative of the spirit of reclamation in our decision to resume participation in the education of youth. Truly, to build strong communities we must take collective responsibility for all our young people. If we choose to make our lives in this place, then we have commitments to honor together in raising and educating tomorrow's citizens.

Indigenous peoples everywhere are reclaiming, revitalizing and perpetuating their cultures. They are reclaiming their names for themselves such as *Unangan* or *Unangas* in place of Aleut. We realize that while our languages have declined, there is value in them beyond communication. Traditional knowledge is contained in the structure, use and meaning of language. Exposure to elements of *Unangam tunuu* and familiarity with the phonetic sound system will help ready scholars for the rigors of further linguistic endeavors should they so desire. While it is not always feasible to become fluent in a new language, people can choose to learn how to say words and phrases that are commonly used where they live, thus allowing them to adapt and immerse themselves in the beauty, the poetry of a culture.

Learning *Unangam tunuu* is becoming difficult as few villages remain where parents teach it to their young as a first language. Armed with this information we are charged with supporting efforts to maintain existing fluency and exploring alternative ways of preventing further loss. Just as teachers will find different botanical resources in each village, so will there be different levels of Native language usage in each place. Places such as Atka, St. George and St. Paul have a number of youth who speak fluently, while in other places the youngest speakers are over 60. In the year 2000, only Unalaska had a certificated teacher who spoke *Unangam tunuu* as his first language. The majority of students' parents never had the opportunity to learn their own language. Consequently, with this guide a teacher is able to help students, some of whom will be *Unangan/Unangas*, and their peers learn some rudiments of the language or reinforce that to which they are being exposed.

Teachers new to the area should consider beginning slowly by using only the vocabulary within the lessons unless they are self-motivated learners or linguist enthusiasts. Available support will vary in each place. If speakers exist, only a few of those are literate in *Unangam tunuu*. Enthusiastic, energetic teachers will need to become more involved with the sound system, grammar, and etymologies. Use the new standardized spellings provided. A number of older sources contain nonstandard usage, which while historically valuable contributes to confusion. The section titled "*Unangam Tunuu* Sound System" provides a resource list, and the rudiments of the phonetic system. Teachers who encourage students to share language information at home as part of their assignments will likely be rewarded by increased interest and participation. Some of us have never had a chance to learn even a few words, and if we have, most likely have never been introduced to the standardized orthography or spelling.

"How to use the Aleut Dictionary" will be invaluable if you decide to use *The Aleut Dictionary/ Unangam Tunudgusii.* The section contains a brief history of the language and the work. It will help you avoid common pitfalls.

The Association of *Unangan/Unangas* Educators (AUE) coordinated this project. AUE is one of nine Alaska Native Educator Associations recently formed to address unique needs. This curriculum is posted on the Alaska Native Knowledge Network at http://www.ankn.uaf.edu/. The link for the Alaska Native Knowledge Network will give you an idea of what our networks are undertaking in the interest of integrating our traditional indigenous knowledge into the mainstream education systems and communities before they are lost to the world. While there are constraints to completing the work, the network allows us to benefit from one another's successes, failures, and opportunities.

INTRODUCTION

Most of our members live not only in different places, but on different islands. We have never been able to all meet face-to-face due to logistics. We are thrilled, however, with the things we are able to accomplish through audio-conference meetings, newsletters, and e-mail communication. Participation of Elders and local experts in your project will greatly enhance learning. Keep in mind that in some places the same resource people are called upon year after year, so it may not be convenient for them to be involved every time. Ask if they can suggest another person or books that they consider useful in the area.

The *Unangam* Elders' Academy decided which of several subjects should be done first. It was a difficult decision because many things are urgent as our tradition bearers pass away at an alarming rate. The decision to focus first on plants was made to reinforce the culture and stewardship camps where young people have been learning from generous mentors about our local plants. Elders instructed us to do this so that students are pulled into the world of science by becoming familiar with local plants associated with their names in *Unangam tunuu* and traditional knowledge. It is a small project, but we hope that by doing one small thing correctly we will see more clearly how to continue to document appropriate ways to share the traditional knowledge of the *Unangan/Unangas*.

The mission of AUE is to support the efforts of *Unangax̂* educators to integrate traditional knowledge and language into schools in a way that is accurate and long-lasting. Goals: 1) to help tradition bearers of *Unangax̂* knowledge find ways to participate that are comfortable for them and do not drain their resources and 2) to support educators who endeavor to integrate traditional *Unangax̂* knowledge and language into schools.

To contact current Association of *Unangan/Unangas* Educators representative, please check the following Web site: http://www.ankn.uaf.edu/Unangan/

Overwhelmed?

In discussions that followed the pilot testing, Unangax̂ Elder, Gertrude Švarný of Unalaska, made a recommendation. She suggests that if educators feel overwhelmed, either by their workload or the depth of the material itself, that they select one activity to try this year. Then, during following years it will be easier to do more, building upon knowledge gained the first year.

In meetings and directives prior to this project, Elders have told us to use our words in *Unangam tunuu* even if they sometimes forget, having become accustomed to using Russian loan words popularized the last two centuries. It is good policy to always teach the appropriate word in *Unangam tunuu* if one can be found, or they will be forgotten. Elders often use "Aleut" but want to hear us say "*Unangan*" (Eastern) or "*Unangas*" (Western). It is a matter of habit. They might say *bidarka* when they would be delighted for us to use *iqyax̂*. Most people only know our semi-subterranean sod homes as

Unangax̂

The time has come to reclaim our name for ourselves. The word we now make known again is "*Unangax̂*" *Unanga* means "seasiders" if you break it down in the language. [see p. 444, *Unangam Tunudgusii/Aleut Dictionary* compiled by Knut Bergsland and published through the Alaska Native Language Center @ UAF.] When outsiders came to these islands they got the mistaken idea that we should all be called Aleuts. Our Elders tell us that their Elders told them that we call ourselves *Unangax̂.* There are other words used in some places, but we Native people from all the Aleutian and Pribilof Islands use this word. We are grateful that they saved this knowledge and shared it with us. To honor our ancestors and "teach our children well" we take back our name in place of "Aleut" whenever possible. We might forget sometimes and it might feel awkward but we will all get used to it. When we describe ourselves as *Unangax̂* we feel strong, proud and truly know who we are. We invite you to join us and act on it daily.

To use this word right you will need to learn the following slight changes for specific situations:

1. *Unangax̂* **(oo NUNG ah)** = 1 of the people who call themselves Seasiders.
Example: Emil is *Unangax̂* or Emil is an *Unangax̂.*
Can also mean: the group of people who call themselves Seasiders
Example: The *Unangax̂* are famous for their seafaring skills.

2. *Unangax* **(oo NUNG eh) =** 2 of the people who call themselves Seasiders.
Example: The *Unangax*, Pat and Laresa, went berry picking.

3. *Unangan* **(oo NUNG an) =** 3 or more of the people who call themselves Seasiders in all dialects except Atkan.
Example: Example: In False Pass, Sand Point and Unalaska, the plural of *Unangax̂* is *Unangan.*

4. *Unangas* **(oo NUNG us) =** 3 or more of the people who call themselves Seasiders in Atkan.
Example: In *Atx̂ax̂,* the plural of *Unangax̂* is *Unangas.*

5. *Unangam* **(oo NUNG am)** = the word showing something belongs to us.
Unangam must be followed by the word related to its possession and cannot be used alone as the rest of the above may be used.
Example: *Unangam Tunuu* means *Unangam* Language. Not : They are *Unangam.*

Note: *Unangan* and *Unangas* mean the same thing; they just have different endings.

If this is new to you, use just the word *Unangax̂* at first. If you do not know what tribe some people are from and you see them holding their baby, you might say, "What a beautiful *Unangax̂* !" and be absolutely correct.

barabaras instead of *ulan* (E) or *ulasus* (W). The more we say the words the more the Elders will get to hear them again. They get lonely for someone to talk to in their own language. They long for the sounds of *Unangam tunuu*.

Welcome to this wild and beautiful place. *Qaĝaalakuƛ*, thank you, for helping us assure that the traditional plant knowledge and language of these islands will be lost neither to ourselves, nor to the world. Thank you for sharing your enthusiasm and excitement about learning. Thank you for choosing to teach here.

What does the color-coding mean?

Unangaƛ
None (no colors) for one.
Example: I am an *Unangaƛ.*

Unangax
Blue for two.
Example: The *Unangax* of whom we speak are Sally and Crystal.

Unangan
Green for Eastern (*Qawalangin,* etc.) and Attuan (*Sasignan*).
Example: Moses, Iliodor and Barbara are *Unangan.*

Unangas
Red for Western (*Niiĝuƛ*).
Example: Those three handsome people are *Unangas.*

Unangam
Purple for possessive.
Unangam Ungiikangin (Eastern)/*Unangam Ungiikangis* (Western), in the title of a popular text, means 'the old stories that belong to the *Unangan/Unangas.*'

ELDERS AND EXPERTS

Ludakiim axtax samtaaxtxin. E/*Ludaaĝis, tukusama uchiitilas sahngaŝtada.* W/Respect Elders (This includes parents, teachers and all people, young and old.)

Because it may take some time to arrange for Elders, experts or mentors to come into the classroom or into the field, you should begin early to plan for your visitors. You should also begin early to plan for the concluding activity, a community celebration where you will share all your work on plants.

Plan carefully for visits from Elders, experts or mentors.

Ask your class who to invite. You may wish to give students a homework assignment to talk with their families or friends to find names of Elders and experts. However, please do not assume that all Elders have expert knowledge of plants. Nor should you assume that an Elder automatically accepts designation as an "expert." If you have a Native Parent Advisory committee for the school, they might be able to suggest someone who would be good to ask. Ask at the grocery store, the Post Office, the Health Clinic, and your fellow staff members, "Who knows a lot about the plants in this area and might help us at the school?"

Brainstorm with your class how to contact Elders and experts—written invitation, posters, phone calls are some options—and where to conduct the interviews. While it is tempting to ask Elders and experts to walk about and show you information in the outdoors, it may not be always possible to do this in your community. Your Elders and experts may prefer to come into your classroom to share their knowledge with the students. Be flexible about the ways to accommodate this participation. Keeping a positive attitude and listening and watching how things can happen in rural Alaska are keys to success. Things do not always happen on a strict timeline.

After you have arranged for the invitations, take the time to show Elders and experts your interest in and concern for them. Perhaps offer to meet with them for tea before they meet with the students. Find out if they wish to have transportation arranged in order to come to a session with the students. They may also need transportation arranged to participate in the concluding community celebration. If you plan to invite several Elders, explore the possibility of welcoming them as a group and showing them the North Slope video, "Arctic Harvest" (28 minutes). This well-produced video shows Elders on the North Slope collecting, describing, and using their plants. (see Resources Appendix)

Be clear about what help you want.

One possible way to approach Elders and other experts initially is to explain that the students and teachers need some information so that they do not accidentally gather in the wrong place or touch or gather the wrong plants.

Explain that students and the teacher need to understand:

- when to gather;
- how to gather;
- what plant survival foods are important in this place;
- what plants to avoid; and
- where to gather and what places to avoid.

Take some time to prepare your students.

1. Work with students to develop awareness about courteous and appropriate behavior when they are with class visitors such as Elders. You may wish to construct a role-playing session with one student portraying the Elder and others being the class. What rules of behavior should they observe when they are with an Elder or other experts? These are a few suggestions. Can your class think of others?

- Don't talk when the Elder or expert is talking.
- If you see the Elders doing something, offer to help them.
- Don't interrupt.

As Barbara Švarný Carlson reminds us:

> "While it is especially important for the class to behave with courtesy for Elder visits, it is also 'the right way to live as a human being,' and should extend to other class visitors. As *Unangan* Elders pointed out, good manners count. Culturally this was especially important to us because we lived in close quarters and when we had to be indoors together, you did not want to get on someone's nerves and force them to go out in the weather to get away from you. It was a good idea to keep matters civil and to not talk too much so it would bother people (noise pollution)."

2. Brainstorm to develop appropriate interview protocol with your students. There are several resources on the Web that can help. For example, Robby Littlefield's "Elders in the Classroom," page 15, *Handbook for Culturally Responsive Science Curriculum*, located on the Alaska Native Knowledge Network site at "http://www.ankn.uaf.edu/UNITS/index.html" has a good description of the interview process. See additional suggestions in "Process of Interviewing" at "http://www.ankn.uaf.edu/interview.html".

Karen Yeager from King Cove recommends:

- When interviewing Elders, adhere to the protocol from your local Native Education Association.
- Record bibliographic information at the time of the interview.
- Make sure to arrange transportation for your guests as needed. Provide comfortable surroundings and a beverage to soothe the speaker's throat.
- If the Elder agrees, have video and audio recording equipment available. You should ask the Elder to sign a release form. (see Appendix for sample form) Practice using the equipment before interviews to insure that you have batteries, cords, film, lighting, etc. Record sound bites for later use.
- If you will record, make sure the location of that activity will be quiet enough to produce a good enough quality recording for the uses you plan.

Caution:

The instructor, Elders, and the local Native Education Association must first approve any information published on the World Wide Web or in other forms. This is particularly important if it appears that the specific information to be published has never before been made available to the general public.

NOTES on COLLECTING, PRESSING and the CLASS HERBARIUM

A Class Herbarium is the focus of many activities in this curriculum and a major class project throughout the unit of study.

Your Class Herbarium will be a collection of plant specimens from your area and a collection of the plant knowledge from your area's Elders and experts. It will contain all the information that your students have assembled from field collecting and observations, from published field guides, and from interviews. To make the Herbarium, it is essential that your students interview Elders and local experts about plant identification and plant uses. You will need to plan time for those interviews throughout the work weeks. Remember that the information the students collect about the plants will be their "survival" information when the "earthquake" strikes.

There may already be an Herbarium in your school; check with your school library before you begin. If there is an existing Herbarium, you will want to focus on providing additional specimens, updating or adding to information about the plants, or replacing damaged specimens. You may wish to develop a duplicate herbarium to exchange with another school or community.

To make the Herbarium, it is essential that your students interview Elders and local experts about plant identification and plant uses. You will need to plan time for those interviews throughout the work weeks.

What are the steps and principles guiding collecting and harvesting plants? For guidance on local behavior and expectations, you might wish to refer to the values described in "The Right Way to Live as an *Unangax̂*."

"Take care of the land and the waters."
"Don't do anything to excess."
"Don't be greedy."

Is there a difference between collecting and harvesting? For the purposes of this work with students, you may wish to differentiate between them. Collecting usually means that you find one or two plants that you will take as an example of all the other plants of its kind. That is your specimen. Harvesting usually means gathering plants in quantity for food, medicine, or objects. Harvesting and subsistence can mean the same thing in many areas. Even though you are learning about local plants so that you can use them, activities in this Unit are for the purpose of collecting specimens for identification and n*ot eating them or using them for medicine.* That should only happen at the discretion of parents or caregivers.

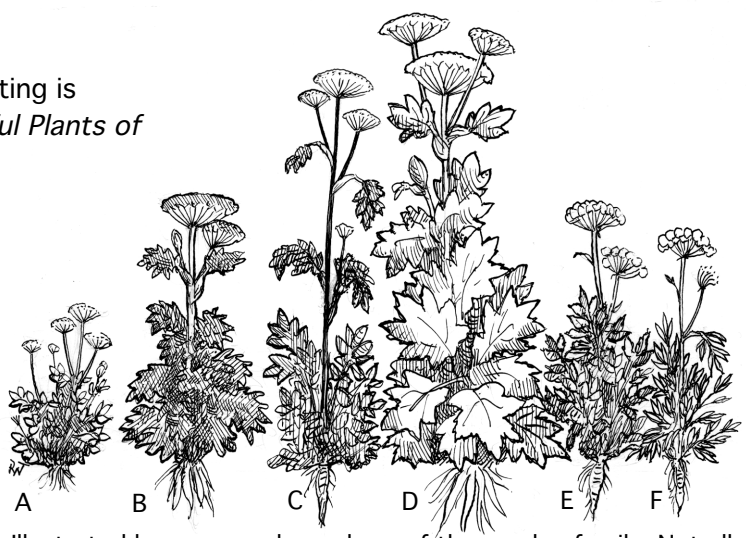
The most important step you can take to learn about your area's plants will be to consult with your Elders and local experts for information about your specific location. For general information, the following resources are helpful.

These techniques of "traditional conservation" are adapted from the Web site, "Medicinal Plants of the Kodiak Alutiiq Archipelago" at: "http://www.ankn.uaf.edu/UNITS/medplants.html":

- Learn the place and conditions under which each plant flourishes.
- Know where each plant can be abundantly found.
- Take time to ask Native Elders if the locale where you are planning to collect is not already a harvesting spot for people.

- If the plant seems not abundant in the area where it is found, wait to harvest until it can be found growing abundantly. If some harvesting is possible, then take only a few plants.
- Leave the roots of perennials intact, along with a portion of the leaves so the plant can regenerate. When you do take a root, Janice Schofield in *Discovering Wild Plants* recommends taking no more than one out of ten roots. If you take a whole root from a plant such as *Fritillaria*, you can put one of the little bulbs back into the hole you dug. (p. 323)
- Take only what can be processed and used.
- Enjoy the process and appreciate the surroundings. Schofield recommends "Sit and meditate with plants. Plants teach you a great deal about themselves." (P. 322)

Another good resource to guide collecting is *Alaska's Wilderness Medicines: Healthful Plants of the Far North* by Eleanor Viereck. Look on page two, or at the ANKN website, "http://www.ankn.uaf.edu/viereck/viereckcollect.html" for her collecting suggestions and cautions.



Illustrated here, several members of the parsley family. Not all of these plants will be found in your region. Some of these plants are toxic, even deadly. However, some of these plants are well-regarded subsistence and survival foods. Be certain of the plant's identity. Handling *Heracleum lanatum*, can cause severe skin rashes at some times of the year. *Cicuta Douglasii* and c. *mackenzieana* are deadly. (Open chambers in the roots are an important identifying signal.). For comparison:
A. *Ligusticum scoticum*; *Qanisan,* Petruuskax̂, Pitruuskin, Petruski [r]
B. *Angelica lucida*; *Saaqudiigamax* E, *Saaqudax̂* W, St. Paul Putchki [r]
C. *Angelica genuflexa*
D. *Heracleum lanatum; Saaqudax̂* E, *Taaĝan 'gix̂* W, Putchki [r]
E. *Cicuta Douglasii*
F. *Cicuta mackenzieana*

WHERE TO COLLECT:

Elders and local experts can give you important advice about **where** to collect.

Collect and harvest only in clean areas. Stay away from roads and sprayed places. Be aware of potentially polluted areas such as old tannery locations, power plants, old oil spills, former military sites. Watch out for other vestiges of World War II such as obscured fox holes, barbed wire, and spikes. In some communities you will want to go away from the school if there has been a lot of modernization such as lawn planting or gravel paving.

You will need to get a permit to go on "Village Corporation Lands," which are most of the lands in some places. Call the village corporation and ask. When permission is granted, you may be given a card to carry with you. This is to prevent damage from vandalism, shooting, poaching, or driving over tundra with 4-wheelers.

You may wish to select an area that you can use as a habitat in several lessons. These areas should contain flowering plants from representative habitats of beach, bog, meadow, sheltered valley, and exposed mountain.

WHAT TO COLLECT:

Elders and local experts can give you important advice about **what** to collect.

All plant experts caution you:
Be certain of the plant's identity! If in doubt, don't harvest. When a plant is in flower, it is easiest to identify. Some plants may be harmful to touch. Others contain toxic substances that can make you sick when ingested. A few are even deadly. Listening to local experts and keeping thorough notes are important. In some locations a plant may be poisonous because of minerals absorbed from the soil, but in other areas, it is considered edible. Some plants are more toxic at some times of the year.

Collect the entire plant. Include the stem and attached leaves, as well as roots. If the plant is in seed, collect those also.

Collect typical plants, not the largest or the smallest. Collect parts that show the full range of a plant's characteristics.

Collect duplicate specimens. One specimen will be labeled for the Class Herbarium and one can be left blank for further identifying and assessment activities. If you cannot identify a plant from the field guides and the advice of Elders and experts, then you may wish to send your duplicate specimen to a plant expert at the University of Alaska or some other location for identification.

Recommended guides for plant identification are listed in the Resources Appendix.

HOW TO COLLECT

A really good specimen is impossible to make from a wilted plant. If possible, collect your plants in dry weather. Wet plants take longer to press and dry, and may mold.

Unless the material is unusually fragile, collect your plants in plastic bags. Use zip-loc bags (gallon size or larger) or plastic waste basket bags with twisties. It is preferable to use bags larger than the specimens you are collecting. Place the plant parts for one kind of plant firmly but carefully in each plastic bag. Close the bag with air inside to make a protective buffer for the specimen as you carry it back to the class room.

Record a specimen identification on the bag with a waterproof marking pen, using the collector's initials and a collection number. Usually the collection numbers are in sequence in the order collected. Each collector records the same number in his/her log book along with details about location, size, date collected, aroma, color and texture. Include the plant name, if known. If accompanied by Elders or experts, record all their shared information as well.

PRESSING PLANTS:

Pressing is a method of preserving plants and flowers that has long been used by scientists. During the summer of 2000, a specimen of the plant *Rhododendron camtschaticum*, which was

collected almost 200 years ago in Unalaska, was exhibited at the Anchorage Museum of History and Art. It still had its bright magenta color and all its parts looked whole and fresh. With care, your specimens will also last for decades, perhaps for 200 years.

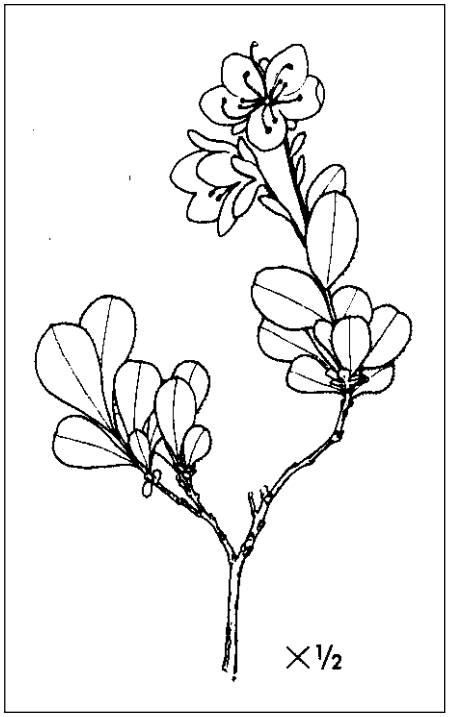
Put the plant in the press as soon as possible. Generally, the faster a plant dries, the better its color is preserved.

Don't press bulky parts such as woody stems or seeds. Attach parts such as these in plastic bags to the final specimen page.

Carefully arrange the plant parts so that they do not overlap or touch one another. Place plant parts so that they are as flat as possible. If you are drying a plant with thick parts or complex flower heads, you may wish to take the plant apart with tweezers, fine scissors, or an x-acto knife so that you can lay the plant flat. A large plant can be folded in a Z or W or N shape to fit your page.

Be sure none of the plant hangs outside the pressing paper.

Record the collection number and collector's initials with the plant. You may write directly on the smooth layer or lay a small piece of paper or other identifying tag with the plant.



Rhododendron camtschaticum
Kamchatka rhododendron,
moss rose

Depending on how much moisture your specimens hold, it will take one-to-two weeks to press a plant. You can shorten the time by combining traditional pressing and microwave methods as described below.

You can make a plant press.

A plant press is like a giant sandwich and usually has these parts:

- smooth absorbent layer placed next to the plant. The best separator is blotting paper. Blank newsprint can be substituted when used in many layers and changed daily. Any paper that bleeds ink well works because it will absorb the plant's moisture. This is the layer that directly touches the plants.
- Separators that absorb water and allow air to circulate, usually paper pages to put under, on and between the layers of plants. Typically this is a stack of pages about 1/8 to 1/4 inch thick. Newspaper can be used, but be sure your newspaper does not rub ink on the specimens. When drying several specimens simultaneously, divide them with sheets of corrugated cardboard.
- Stiff outer covers such as boards, large books. They make a stiff "sandwich" around the paper and specimens.
- Weights or tension devices. You can stack books on top to weight down the plants. You can

Plan ahead for compatible page sizes. If you propose to have your Class Herbarium pages be 11.5 X 16.5 inches, the standard size in North America, then set up your flower press also at that size. If smaller page sizes are more appropriate for your class, then prepare the press and the Herbarium pages in comparable sizes.

use rocks, or stone or concrete slabs. You can put two or more C clamps around a pair of boards. You can drill holes in the four corners of rectangular boards and insert long screws with wing nuts to adjust the tension.

You can press plants using your microwave.

This method works like other plant presses and will save you several days of drying time. You may also combine this method with traditional plant pressing, using your microwave for the beginning drying and then finishing with your traditional plant press methods.

Like most plant presses, the microwave press is a "sandwich" of materials that extracts the moisture from plants while putting pressure on the plants so that they remain smooth.

YOU WILL NEED (for each microwave press):

- Stiff outer layer: 4 pieces of sturdy corrugated cardboard (6 inches by 11 inches recommended, or a size to match your intended Class Herbarium). Do not exceed the interior dimensions of your microwave.
- 10 to 12 rubber bands (tension devices)

Adjust the dimensions of the following pressing materials to match the size of your stiff outer layer:

- smooth layer: cotton cloth such as pillowcase fabric—4 pieces cut to the size of the cardboard cover. (alternates: ink-free newsprint —12 or more pieces; blotting paper; or other smooth-surfaced materials to place next to the plant parts.) Cotton cloth is recommended because it contrasts with the newspaper layer when you are unstacking and checking the press, and the flower parts peel easily from the cotton cloth.
- moisture-absorbing layer such as newspaper—2 stacks, each about 1/8 to 1/4 inch thick and cut to the size of the cardboard cover (alternates: felt; old thick wool blankets; or other moisture absorbing materials to place next to the smooth layers of the press)
- Optional: tweezers, fine scissors, x-acto knife

MICROWAVE CAUTIONS:

Use no metal parts.

Do not look into the microwave while it is on—a recommendation from eye-care specialists.

Time your microwave carefully. You will work with settings timed for a few seconds. If your microwave cannot control by seconds, use a watch and turn the oven off manually. Watch for any signs of scorching or browning on your papers or cardboard. Be sure the press cools and dries between energy bursts. If any scorching or browning happens to your press pieces, replace the pieces with new ones.

Directions:
Some plants and plant parts will press better than others using this method. You may wish to test-press your plant if you have enough specimens. Generally, put only one kind of plant part or one kind of plant in the press at a time.

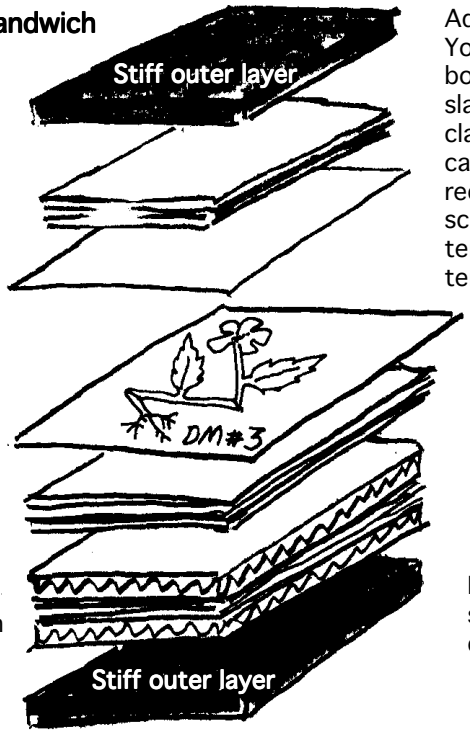
SET UP THE MICROWAVE PRESS

1. Lay down 2 cardboard pieces.
2. Place a 1/8 to 1/4 inch stack of newsprint on the cardboard.
3. Place the smooth layer—2 pieces of cotton cloth recommended—on the newsprint.
4. Carefully arrange the plant parts.
5. Place another smooth layer on top of the plant parts.
6. Stack another 1/8 to 1/4 inch stack of newsprint on the cotton (smooth layer).
7. Cover the newsprint with the remaining 2 pieces of cardboard.
8. Fasten the entire stack with rubber bands, twisting and doubling the bands where necessary to make as tight a stack as possible. Hold the press carefully when you put on the rubber bands so that the plant parts do not shift around.

DRY PLANTS with SEVERAL SHORT ENERGY BURSTS:
The time will vary depending on your microwave. Higher watt ovens take less time; lower watt ovens take more time. Each subsequent energy burst is shorter than the preceding ones:

1. 30 to 40 seconds on high to begin.
   Open press for a minute or so to let pieces dry slightly.
   Check plant and press pieces. Replace newsprint if wet, wrinkled or scorched.

A plant press is like a giant sandwich



Add weights or tension devices. You can weight down the press with books, rocks, or stone or concrete slabs. You can use two or more C clamps around a pair of boards. You can drill holes in the four corners of rectangular boards and insert long screws with wing nuts to adjust the tension. In the microwave press, tension is held with rubber bands.

Separators that absorb water and allow air to circulate.

Smooth absorbent layer placed over the plant.

Plant with long stem folded to fit. Note collector's initials and the collection number matching the log book record.

Smooth absorbent layer under the plant.

Separators that absorb water and allow air to circulate.

When drying several specimens simultaneously, divide them with sheets of corrugated cardboard.

In the microwave press, the stiff outer layer is corrugated cardboard.

2. 15 to 20 seconds on high, next.
   Open press for a minute or so or so to let pieces dry slightly.
   Check plant for dryness (see test below).
   Check press pieces. Replace newsprint if wet, wrinkled or scorched.

3. 10 to 15 seconds on high to finish.
   Open press and check plant.

TEST FOR DRYNESS. When cool, gently touch the plant parts between your fingers. The plant should feel like dry paper when touched. Thick plants may take longer to dry. Repeat with one or more short energy bursts, if necessary.

If your plant still seems damp, or if you are not certain that it is dry, you may want to continue pressing the plant under books or in a traditional press for a day or so. Remove the rubber bands before continuing with the traditional press.

When fully dried, it will be time to mount the specimens.

MOUNTING SPECIMENS FOR THE CLASS HERBARIUM:

Use heavy, white acid-free paper with one-hundred-percent rag content, but if not available, use any stiff white paper. The standard herbarium size in North America is about 11.5 X 16.5 inches, but smaller paper sizes may be used for your Class Herbarium. With a very large plant, certain representative parts can be selected and arranged on the specimen page.

Specimens should be arranged on the mounting paper before being glued and laminated. Mount only one specimen to a sheet. Leaves are best seen with some leaves mounted on one side and some on the other side. Labels are mounted on the lower right-hand area or, if the specimen is too large, on the reverse side. Because you will be laminating your pages, you will probably not need to also glue the specimens. If, however, you do need to glue the specimens, Elmer's white glue is recommended. Spread the glue on a piece of glass or plastic with a paint brush until it is evenly distributed. Carefully place the specimen on the glue with tweezers and then gently lift the specimen and place it on the mounting paper. Wait 24 hours for the glue to dry before laminating or stacking the specimen.

Most professional herbarium do not have laminated pages, but your class herbarium will be subject to handling and pages should be laminated after specimens have completely dried to protect the specimens during use by students and the community. The lamination will also protect your specimens from insect pests, one of the most destructive threats to the Herbarium. You may laminate with school equipment or with clear contact paper. Position the laminating sheet carefully and avoid any air gaps or bubbles.

Completed herbarium are assembled and stored in various forms. Many are stacked sets of specimen pages in boxes and files. Your Class Herbarium will be an important contribution to your community's knowledge, and you may wish to have students design and build a cover or special box to hold and protect the Herbarium pages.

NOTES:

Section One: Teacher Notes

Eight activities guide students as they learn plant collecting etiquette and examine leaf structure.

TEACHER NOTES: SECTION ONE

Summary:

Students begin a log book and explore what they already know about plants. They learn collecting etiquette and examine leaf structure. Some of the work in this part is done outdoors. If appropriate, you may wish to invite Elders and/or local experts into the class. Please see "ELDERS AND EXPERTS" in the Introduction for guidance and adjust your timeline, accordingly.

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: C. 1, 2
Mathematics: A. 5
Skills for a Healthy Life: B. 1, 3

To understand local cultural heritage and responsible conduct in the environment.

English: A. 1; C; D. 1; 2, 3; E. 1
Cultural: A. 3, 4, 5, 6; B. 2; C. 1, 3; E. 1, 2
History: B. 1
Arts: A. 3

Materials:

- log book
- pen, pencil
- large paper sheets to use for a class record
- plastic bags, either zip-loc or with twisties, one per student
- waterproof marking pen
- contact paper or laminating film
- manila file folder-style paper or similar paper
- plant press (see "NOTES on COLLECTING, PRESSING . . ." in the Introduction)
- Leaf and Flower Card from the Appendix * copied, cut apart, and laminated
- Plant Illustration Cards from the Appendix * copied, cut apart, and laminated
- field guides (see Resources in Appendix)
- hand lens
- wax paper, (optional)
- iron, (optional)

(*included with unit)

TEACHER NOTES: SECTION ONE Activities

WHAT DO STUDENTS KNOW ALREADY ABOUT PLANTS?

ACTIVITY ONE. Students make a log book to record their work.

Inside activity
Estimated duration: 20-30 minutes

The log book can be simple, folded sheets of paper that are stapled together, or an elegant hand-sewn set of pages. It can be a school test booklet or a purchased hard-cover journal. You may want to make a few samples so that you are satisfied with the potential outcome of the products the students will be making. A scientific log of botanical study could be a real keepsake. Students will make a cover for the log book in ACTIVITY FIVE.

ACTIVITY TWO. Students explore what they already know about plants while visiting an outside location. They write in their log books and assemble a class record of their individual writings. (pre-assessment)

Outside activity/Inside activity
Estimated duration: 40-60 minutes

Because you will need to locate and identify 5 habitat areas containing flowering plants for future lessons, you may wish to use one of them for this pre-assessment. Suggestions for habitats include: beach, bog, sheltered valley, exposed mountain, and meadow.

Form a circle with your students and look at and discuss the plants growing in that circle. Do they recognize any plants in the circle? If not, you may wish to shift the circle's location to another place.

LEAVES

If you are fortunate enough to work on this unit when the plants are in full flower, then you may wish to fast-forward to SECTION TWO so that you capture the plants in full bloom. You may return to SECTION ONE later.

ACTIVITY THREE. Students review collecting strategy and etiquette and collect 5 leaves each. Students discuss leaf collections in whole class group to model leaf descriptions discussion to follow.

Inside activity/Outside activity
Estimated duration: 60-80 minutes

Discuss collection cautions and strategies. Include advice from Elders and local experts, if available. As a guide to local behavior, you may wish to review "The Right Way to Live as an *Unangax̂*" in the Appendix. Look at "NOTES on COLLECTING, PRESSING . . ." in the Introduction for additional suggestions. If your class day ends here, label and store the leaves in plastic bags in a refrigerator for use in ACTIVITY FOUR.

ACTIVITY FOUR. Students closely examine leaves collected in ACTIVITY THREE and work in teams to describe them using observation language rather than opinion language. They match leaves to the plants from which they came. Students record leaf information in their log books and press the leaves.

Inside activity/Outside activity
Estimated duration: 60-80 minutes

TEACHER NOTES: SECTION ONE

ACTIVITY FIVE. Teacher models "Pick a Place" while students are outside for ACTIVITY FOUR.

Outside activity
Estimated duration: 15-20 minutes

Show students how you, personally, make observations in the outdoors. Describe what you see in your "Place." Hold a log book and write as your state your observations. Explain that student homework will be to "pick a place" that is their own and which they will observe every few weeks during the year (or for whatever time duration you select.) They will write their first description of their place in a few sentences. This activity is adapted from "Personal Plot Journals," *Science and Children,* September 1996, p. 22.

ACTIVITY SIX. Students make a cover for their log books using collected leaves.

Inside activity
Estimated duration: 30-40 minutes

Depending on pressing techniques, you may need to delay completion of the activity until the leaves are fully dried.

ACTIVITY SEVEN. Students complete work sheet on leaf vocabulary.

Inside activity
Estimated duration: 10-15 minutes

Depending on pressing techniques, you may need to delay completion of the activity until the leaves are fully dried.

ACTIVITY EIGHT. Students prepare questions to ask Elders or experts about how leaves were collected, preserved and used.

Inside activity
Estimated duration: 10-15 minutes

Assessment opportunity: When shown a leaf, randomly selected by the teacher, student describes 3or more leaf characteristics using appropriate vocabulary

Assessment rubric

Students and teacher complete-assessment rubrics.

Teacher Assessment Rubric, Section One Date:

Name of student: _____

	1 Always	2. Sometimes	3. Never
Student: Stays on task.			
Completes work.			
Asks questions.			
Works cooperatively with peers and gains insight from their activities.			
Respectful of values.			
Respectful of Elders. (if included in this section)			

NOTES:

Section One

Eight activities guide students as they learn plant collecting etiquette and examine leaf structure.

SECTION ONE

Qaqamiiĝux̂ qalgadam ukulganaa ngiin ugutaasakun. (E)
Qaqamiiĝux̂ qalgadax̂ anĝaĝix̂ ngiin ax̂tanaa akux̂. (W)
Subsistence is sustenance for the life.

How would you survive if you were lost in the mountains? What would you live on if you were fishing and your boat were suddenly dashed ashore? What if all the grocery stores and other modern conveniences disappeared tomorrow?

What kinds of plants would you use to feed yourself, to heal yourself, to keep yourself warm? Do you know how to use the natural stores of the land and the sea?

Some people think of the Aleutian/ Pribilof Islands as windy, barren, cold and uninviting. With their mild winters, generous rainfall, and volcanic soils, however, these islands have provided well for the people for thousands of years. In fact, these islands were the setting for an advanced and innovative culture whose members were expert at using resources in all parts of the environment.

What if all the grocery stores and other modern conveniences disappeared tomorrow?

Plants were among the most important resources the people used. Plants provided food that added variety and nutrients to the diet. The people gathered wild fruit, bulbs and roots. They harvested stems, leaves and sprouts for food. They treated their illnesses, wounds and pains with plant parts. On treeless islands, woody shrubs supplied fuel, and grasses supplied insulation and materials to make socks, containers, and wall and floor covering. Through decades of learning from their Elders, the people came to know how to survive from the resources of the land and the sea.

THE SITUATION:
A sudden and dramatic earthquake will strike your area in about six weeks. You and your family and all the people you know will survive, but all the grocery stores will be destroyed. Completely. Not even one Cheerio or soda will remain. The airport runways will be gone, too. Perhaps the boats will bring supplies before winter comes. Perhaps not. In the meantime, you will need to gather food from plants. Others will be responsible for gathering food from the sea. How will you find your food? Where will you find your food? How will you prepare it? Store it? Are there plants for medicine in the area?

You are fortunate to have time now to plan and prepare. In a few short weeks, you can learn a great deal about nature's store. Probably you will need help from Elders and mentors and other experts. But first you need to discover what you already know about plants.

SAAHMIKAADAX̂

Chiqim quganaalĝiĝigan qakagan ilan adas. Qayas kangan liisnadaĝulas, sakang atim hadan agach azas.

Siĝlingis hasinal txidix sux̂tazas. Siĝlingis iĝiĝidal adukus, ataqan siĝlix̂ atx̂ux̂ aduutaakadax̂. Ukuĝaa hakaĝinax̂ liidal chutxidigal hangax̂tazax̂. Chuniĝiim chuqigan ilagaan iladix axtal hangax̂tal hakaaĝax̂tazas.

Kangan talĝis akus talĝix̂ aahmaaĝim quhmagan siinimluzangis matazax̂. Talĝis alalakax̂ mal, aahmaaĝii angunazax̂.

Siĝligan chidĝingis aamgix̂ atxidax̂. Siisx̂il al kay chaĝugnax̂ matanas ngaan suĝazaqas.

Siĝligan qutangis unalgal uĝungis anĝaĝinam aamgix̂ qingdusanagan ngaan taangax̂tachx̂isxazaqax̂.

Written by Nadesta Golley
"*Atx̂am Hitnisangis/*Atkan Plants"
Page 42
Niiĝuĝix̂ dialect (Atka), in short form *Niiĝux̂*

×1/3

Achillea borealis
Chngaatudax̂ E (UT 148)
Saahmikaadax̂ W (UT 351)
(hairy, shaggy)
Northern yarrow

They are found in gravelly dry ground areas. They are hardly found on tops of hills. They like growing down in the low-lying areas. The leaves are all bunched up and look crowded. The leaves are thin and long. One leaf is as long as a finger. It looks like it is feathery, grows sharply and tapers off at the top. On top of the plant are branches with white flowers that look seedy as they grow on top of the plant. There at the top are lots of branches and the flower grows big. The green leaves are used for stopping blood. The plant was used for people with nosebleeds and for cuts to stop the bleeding. The leaves are dried and boiled in water and the juice was used for people to drink, those who spit up blood.

Translation by Moses L. Dirks

What do you know about plants?

ACTIVITY ONE. You can make a log book to record your work on plants.
Later, you will make a cover for the book. Scientists usually record their daily work and their experiment notations in a log book. The log book helps them understand the changes they may need to make in future work and gives them accurate records to compare with when continuing experiments. You can be a scientist, too, while you are learning about plants for subsistence and survival.

ACTIVITY TWO. You can discover what you already know about plants.
Go outside with your class. Form a circle with your teacher and look at all the plants growing in that circle.

1. Ask yourself:

A. What plants do I know about already? What are the names of the plants? Do I know *Unangam tunuu* (say oo NUNG um too noo) and/or scientific names and/or English names for the plants?

×1/2

Honckenya peploides
Isuĝim anungim E
(UT 77)
(hair seal's lupine root)
Beach greens, scurvy grass, seabeach sandwort

B. If I have gathered these plants before, where was I? When did I gather? Who was with me?

C. How could we use the plants? Food? Medicine? Baskets? Other objects?

D. What plants do I know I should avoid?

E. What do the plants look like? I can sketch a picture of the plant(s).

2. When you return to the classroom, write in your log book. Tell what you already know about the plants. Use the topics above to help you remember.

3. Then write a paragraph in your log book: "This is what I want to know about plants."

4. With your fellow students, write a class record that puts all of your individual writings together. Choose a recorder to write what each student says on large pieces of paper that you can all see.

Label one piece of paper:
"What we want to know."
Label another one:
"What we know already."
(and write the name of the student who already knows about that plant.)

When you have discovered what you do not yet know, it will be time to prepare to call upon your Elders, and other experts.

You can learn about leaves.

While it is the flowers that most readily capture our attention in the plant world, the flowering season is, alas, quite brief. Leaves, on the other hand, are visible and prominent in most plants throughout the entire growing season. They may, in many instances, provide the sole clues to a plant's identity. Thus, we begin with the leaves as we focus our observations on the plants of the Aleutian/Pribilof Islands.

If, however, you are working on this unit when the plants are in full flower, then your teacher may direct you to fast-forward to the "Flowers" section so that

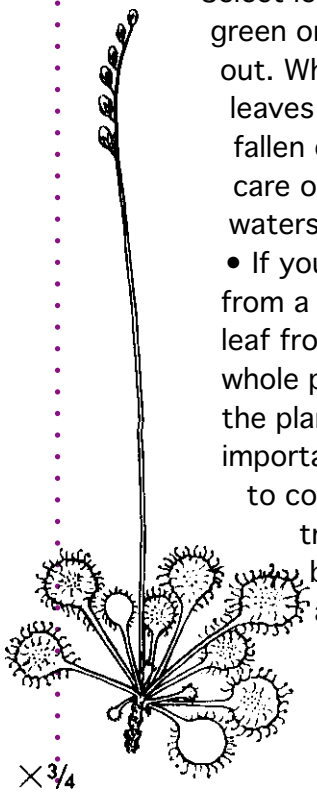
you capture the plants in full bloom. You may return to this section later.

ACTIVITY THREE. You can be a wise plant collector and learn about leaves.

1. Discuss the principles of collecting and using plants wisely.

2. Go outside with the teacher to a location near the school. You will need to be able to return to that location later in the class period, so the teacher will choose a place nearby. Collect 5 different-looking leaves, preferably from some that are already on the ground.

- Choose leaves that look healthy. Select leaves that are still green or that have not dried out. When possible, take leaves that have already fallen off the plants. "Take care of the land and the waters."
- If you need to pick leaves from a live plant, pick only one leaf from a plant, and not the whole plant. You want to keep the plant alive to do its important work. Be sure not to collect in an area traditionally harvested by others. "Don't do anything to excess."
- Select just a few leaves. You only need 5 different ones. "Don't be greedy."



×3/4

Drosera rotundifolia
Sundew
Don't touch the leaves if you are a bug! The sundew has some of the most amazing leaves in the plant kingdom. Its sticky leaves will catch insects. When the insect is stuck, the leaf curls up, trapping the insect inside to make itself a meal!

3. Come back into the classroom and look at the leaves. Beginning with one student's collection, talk about the following questions:

- What do the leaves have in common? Are they the same in any way? How are they different?
- What do the leaves feel like? Are the leaves hairy? Smooth? Sticky? Thick? Thin?
- Do the leaves have a scent?
- How are the edges (**margins**) of the leaves shaped?
- Which leaf is the biggest? Smallest? Longest?
- Are the leaves all the same color? How are they different?
- What designs are on the leaves? Can you see the **veins**? Hold the leaf up to the light to see the pattern of the veins.
- Have insects eaten on any of these leaves? How do you know?

Continue with 2 or 3 more student collections.

ACTIVITY FOUR. You can describe leaves.

1. Divide into teams of 3 or 4 individuals. Look at all the leaves your team collected. How will you group them? List the qualities in each leaf group. Select one student in your team to be a spokesperson and explain the leaf groups to the rest of the class.

2. Each person in your team needs to select one leaf from the group. You do not need to choose a leaf that you personally collected. Go outside with your log book, the leaf, and a "Leaf Arrangement" card. Try to find the kind of plant the leaf came from. When you find it, look carefully at the ways the leaves attach to the plant. Using the leaf arrangement card, determine how the leaves are arranged on the stem. How does the leaf connect to the stem? Are there many leaves on the stem? What pattern do the leaves make: **opposite, whorled, alternate**? Are they

at the top of the stem? Or are they at the bottom, **basal**? Record what your observations (use obervation words, not opinion words) in your log book.

3. Put the leaves in a flower press before leaving school.

ACTIVITY FIVE. You can "Pick a Place" to write about.
Twice a month during the school year, you will be visiting a personal place for 15-20 minutes. Your personal place should be approximately 9.8 feet (3 X 3 meters) in size. During your visit you will write what you observe there, or take photographs, or draw pictures of objects. When you go home today, go outdoors with your parents or caregivers and choose a special place in the yard or in a nearby area that will become your personal place. Tonight, you should write one paragraph describing your place.

ACTIVITY SIX. You can use your collected dried leaves to make a cover for your log book.
Cut pieces of manila file folder and contact paper or laminating film to match the size of your log book. Do one of the following (or explore with your own technique for using the pressed leaves on your log book cover):
A. Place the leaves between several layers of newspaper with heavy books on top for 3-4 days. Then arrange the leaves on a page cut from a manila file folder. Write each leaf's descriptive words beside it. Cover the leaves and manila paper with a layer of contact paper.
OR
B. Place the leaves with layers of paper towel on the bottom and a layer of wax

Saxifraga punctata
(= S. nelsonia D. Don)
Cordate-leaved saxifrage, brook saxifrage
Leaves are palmate, toothed, and basal.

Galium aparine
Bedstraw
Leaves are whorled, smooth.

Artemisia unalaskensis
Sixsiqax̂ (UT 358)
Wormwood
Leaves are lobed, alternating.

Menyanthes trifoliata
Buckbean, bogbean
Leaves are pinnate, smooth.

Vocabulary

For words in *Unangam tunuu,* E = Eastern dialect and W = Western dialect. If no designation is noted, the words are familiar in both.

aĝadax̂ E (UT 36) (uh RUH thuh): sun
aĝadgix̂ W (UT 36) (uh RUHTHE gegh): sun

chidĝix̂ E (UT 135) (CHIDTHE gegh): green
chidĝaayux̂ W (UT 135) (chidthe GUY yoh): green

chidĝaayux̂ E (UT 135) (chidthe GUY yoh): blue
chidĝix̂ W (UT 135) (CHIDTHE gegh): blue

chix̂tax̂ (UT 138) (CHIH tah): rain

chumnugim qaxchikluu E (Dirks, 1992)
(chum NUH gim • kagh chik LOO): brown
chumnugim qa(x)chikdaa W (Dirks, 2001)
(chum NUH gim• kah CHIK thaah): brown

hitnisangin E (UT 216) (hit nee SUNG in): plants
hitnisangis W (UT 216) (hit nee SUNG is): plants

inix̂ E (UT 201) (iH nyih): sky
inkax̂ W (UT 202) (iN kah): sky

inkamaaĝux̂ E (UT 202) (in kah MAAH roh): cloud
inkamiiĝux̂ W (UT 202) (in kah MEEH roh): cloud

qaxchiklux̂ E (UT 296) (kahk CHIK loh): black
qaxchikdax̂ W (UT 296) (kahk CHIK thah): black

quumhlaakdax̂ E (UT 336) (koom HLOCK thah): gray, silvery
quuhmliix W (Dirks, 2001) (koom LEEH): gray

yulix̂ E (UT 465) (YOO legh): leaf
siĝlix̂ W (UT 359) (SIHGH legh): leaf

taangax̂ (UT 292) (TAAHN gah): water

alternate
basal
compound
lobed
margins
opposite
palmate
parallel
pinnate
smooth or entire
toothed
veins
whorled

paper on the top. Press with an iron on low heat for a minute. See if the plant is fairly dry. Press again. Then arrange as in A above.
OR
C. Press your leaves. Using the school laminator, arrange your leaves on laminating film. Write each leaf's descriptive words beside it on small pieces of paper, and secure the specimen and the words with the laminator.
OR
D. Use a microwave plant drying method to quickly press your leaves. Then arrange them as in A, B, or C above.

ACTIVITY SEVEN. You can show what you know about leaves.
Complete the Leaf work sheet.

ACTIVITY EIGHT. You can learn about traditional ways to preserve and use leaves.
Prepare 4 questions that you would like to ask an Elder or expert about collecting, caring for, preserving and using leaves. As soon as you have the opportunity to interview an Elder or expert, ask these questions and record their responses in the log book.

EXTENSIONS
ACTIVITY A.:
With a partner, sort the Plant Illustration Cards into groups with similar leaves in each group. List the reasons why you have made these groups.

ACTIVITY B.
Leaf classification at GLOBE site: "http://globe.fsl.noaa.gov/sda-bin/wt/ghp/tg+L(en)+P(landcover/LeafClassification)"

To think about: Why do you suppose leaves are different sizes and shapes?

"We always had a string behind the wood and coal stove where plants were drying to last until spring. Then we put them in the attic to store. Upstairs was always warm and dry, and it always smelled good in our house. I never knew what perfume was when I was a girl."

Mary Bourdukofsky,
Unangan Elder from St. Paul

Student Assessment, ONE Name: _____
Date:

	1. Always	2. Sometimes	3. Never
I stayed on task.			
I completed my work.			
I asked questions.			
I worked cooperatively with my class members.			
I was respectful of values.			
I was respectful of others.			

ACTIVITY SEVEN

Leaf work sheet Name _____

Draw a line from the word to the picture:

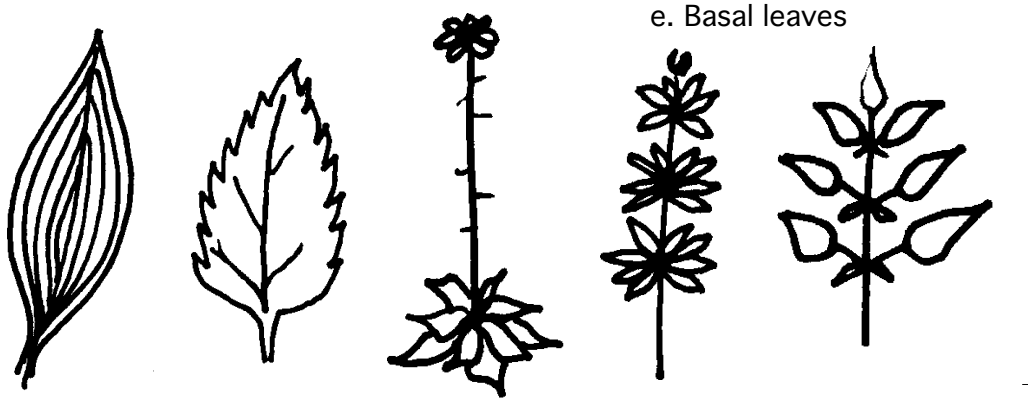
a. Toothed leaf

b. Parallel veins

c. Opposite leaves

d. Whorled leaves

e. Basal leaves



f. When the indentations on the leaf margin are deeply cut, they are _____.

g. When the leaf margin is not cut, it is _____ or _____.

h. When the leaf's veins come from a point near the base and fan out, they are

_____ .

i. Leaves arranged one above the other on opposite sides of the stem are

_____ .

j. An *Unangam tunuu* word for leaf is: _____ or

_____ .

ACTIVITY SEVEN
Leaf work sheet Answer Key

Draw a line from the word to the picture:

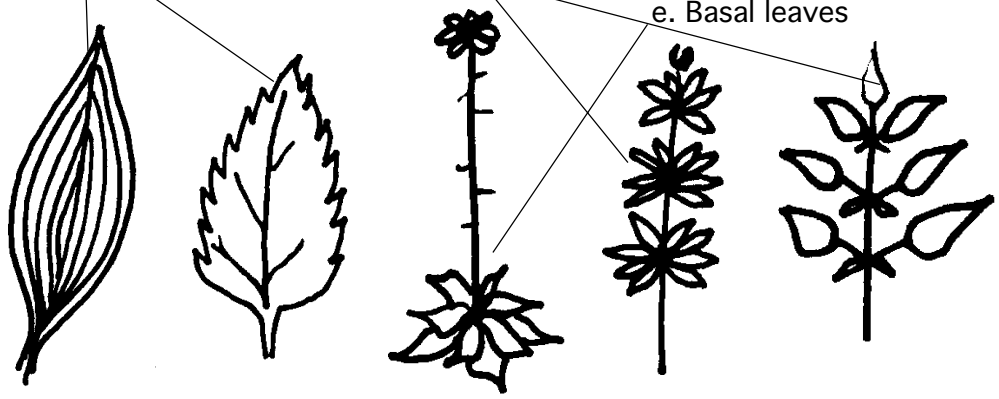
a. Toothed leaf

b. Parallel veins

c. Opposite leaves

d. Whorled leaves

e. Basal leaves



f. When the indentations on the leaf margin are deeply cut, they are lobed .

g. When the leaf margin is not cut, it is smooth or entire .

h. When the leaf's veins come from a point near the base and fan out, they are palmate .

i. Leaves arranged one above the other on opposite sides of the stem are alternate .

j. An *Unangam tunuu* word for leaf is: yuliŷ (E) or siĝliŷ (W) .

NOTES:

Section Two: Teacher Notes

Five habitat areas provide field collecting opportunities as students begin a Class Herbarium.

TEACHER NOTES: SECTION TWO

Summary:

Students continue to learn collecting etiquette as they begin a Class Herbarium. They examine 5 habitat areas to discover a particular area's characteristics affecting plant growth, and they identify the area's dominant plants. They look at literature with themes related to plants and/or the region.

If appropriate, you may wish to invite Elders and/or local experts into the class or on the outside field trips for these activities. Please see "ELDERS AND EXPERTS" in the Introduction for guidance and adjust your timeline, accordingly.

Please review the information in "NOTES on COLLECTING, PRESSING and the CLASS HERBARIUM" before beginning this section. Materials suppliers are listed in the Resources section of the Appendix.

Activities in this section involve collecting plant materials during the flowering season, although some seed activities are included. Select 5 outdoor locations for the class to visit. Suggestions are: beach, bog, meadow, sheltered valley, and exposed mountain.

Most of the activities in this section require time outdoors. If the weather does not permit these outdoor activities at this time, consider spreading the activities throughout other days. Alternately, you may wish to focus on the literature activity and reading time, and advance to Section Three, Activities 3, 5 and 6 before returning to this section.

Objectives:

Alaska Standards

To understand the varied growing conditions needed by different plants.
To learn indigenous plants' names and characteristics

Science: A. 11, 12, 14, 15; B. 1, 5; C. 1, 5; D.1
World Languages: B. 1
Geography: B. 1; C. 2; 4
Skills for a Healthy Life: B. 1, 3

To understand local cultural heritage and stewardship for the environment.

English: B. 3; C; D; 2, 3; E.
Cultural: A. 3, 4, 5, 6; B. 2; C. 1, 3; D. 1. 3. 4. 5; E. 1, 2
History: B. 1
Arts: A. 3

TEACHER NOTES: SECTION TWO

To use technology to express ideas and create projects
English: A. 2, 4, 5, 6, 7; C. 5
Technology: A. 1, 2, 3; D. 1

To document the dominant species in a given growing area and to predict dominant species for similar areas.
Math: A. 3, 6
Geography: B. 1

Materials:

- *Legend of the Bluebonne*t or similar story
- Literature about plants (see Resources in Appendix)
- log book
- pen, pencil
- large sheets of paper for whole class activity

Habitat and collection activities:

- "NOTES on COLLECTING, PRESSING and the CLASS HERBARIUM" in the Introduction *
- habitat frames: one per color team to outline a study area 3 feet (approx. one meter) square.
  Suggestions:
  hula hoops; or
  lengths of string 12-15 feet (4.5 meters) and pencils to hold the 4 corners
- camera, digital camera, video camera (optional)
- field guides (See Resources in Appendix for list)
- compass (directional)
- outdoor "weather" thermometer
- Habitat Record Sheet *
- hand lens
- masking tape for field labels
- waterproof marking pens
- plastic bags, in a variety of sizes to carry plant specimens: zip-loc or with twisties, 2-or 3 per student
- computers
- plant press (see "NOTES on COLLECTING, PRESSING . . ." in the Introduction)
- white herbarium paper or other sturdy white paper
- contact paper or laminating film and laminator
- Leaf and Flower Cards from the Appendix * copied, cut apart, and laminated
- Plant Illustration Cards from the Appendix * copied, cut apart, and laminated

Seed Activity:

- stuffed animal toy
- tweezers
- Seed Test Card * (see Appendix)

(*included with unit)

TEACHER NOTES: SECTION TWO

Activities:

WHAT DO STUDENTS KNOW ALREADY ABOUT PLANTS? (continued)

ACTIVITY ONE. Students read about plants in literature, beginning with *The Legend of the Bluebonnet* or similar plant story. They locate a story or book about plant use through research in the library, on the Internet, by interviews, or with teacher-provided list. (see "Readings About Plants" list in Resources section in the Appendix). Students read the story or book and retell it in oral reports or written reports.

Inside activity
Estimated duration: 20-30 minutes to begin, followed by reading sessions in class or as homework.

ACTIVITY TWO. Students review collecting strategy and etiquette

Inside activity
Estimated duration: 20-30 minutes

Include advice from Elders and local experts, if available. Look at "NOTES on COLLECTING, PRESSING . . ." in the Introduction for additional suggestions. Review values described in "The Right Way to Live as an *Unangax̂*" (see Appendix). Make a class record of collection guidelines on large paper that can remain displayed in the classroom for the duration of the unit.

HABITAT STUDY, SPECIMEN COLLECTING, AND CLASS HERBARIUM

ACTIVITY THREE A, B, and C. Students visit selected habitats and begin collections for a Class Herbarium. Students complete A, B, and C at each habitat location.

Outside activity
Estimated duration: one to 5, 80-90 minute sessions outside, plus travel time.

Begin a Class Herbarium. For detailed descriptions of collecting, pressing, and mounting specimens, please see "NOTES on COLLECTING, PRESSING and the Class Herbarium" in the Introduction. Materials suppliers are listed in the Resources section of the Appendix.

The Class Herbarium will be 2 collections of pressed plants with protective covers. One set will be identified and named. A second set will be without names so that it can be used in other activities including assessment.

Plan on taking an outdoor trip for the next one to 5 sessions to habitat areas that contain flowering plants. Suggestions for habitat areas include: beach, bog, meadow, sheltered valley, and exposed mountain. One or more of these habitats can be visited again during the seed activities in Section Three.

ACTIVITY THREE-A. Organize the class into teams by color: green, blue, yellow, red, and white. Student teams go to one of the pre-selected habitats with habitat frames —see materials above—and lay the frame on the ground. Within the frame, students record the characteristics of the habitat. They observe plants growing in the habitat and complete a Habitat Record Sheet.

ACTIVITY THREE-B. Students collect and observe seeds using Seed Test Cards. You may wish to limit this activity to one habitat location or repeat it at all habitats.

TEACHER NOTES: SECTION TWO

ACTIVITY THREE-C. Students collect specimens whose flowers match the color of their group name. Students may photograph the collection area and the plant before collection and may wish also to photograph the specimen later in the classroom. Students make preliminary field identifications using the Plant Illustration Cards.

ACTIVITY FOUR. Students identify plant specimens and prepare them for the Class Herbarium. They fill out identification tags and records on the computer using field guides and information from Elders or other experts. Arrange for one of the students or a helper to set up a template beforehand on the computer with the required Plant Information Card data.

Inside activity
Estimated duration: 20-30 minutes per plant collected

ACTIVITY FIVE. Students press their specimens. Based on your available materials, describe the appropriate pressing methods to your students. Review "NOTES on COLLECTING, PRESSING . . ." in the Introduction for guidelines.

Inside activity
Estimated duration: 10-15 minutes to set up per plant collected; 2 days to 2 weeks for drying time.

ACTIVITY SIX. Students mount and laminate their pressed plants to begin the herbarium collection. Students add final information about plants. (These may be as late as 2 days to 2 weeks later, depending on pressing technique.)

Inside activity
Estimated duration: 20-30 minutes per plant collected.

Assessment opportunity: Using completed Class Herbarium specimen pages that do not have labels, student identifies one or more plants and describes 4 facts about the plant.

Assessment rubric:
Students and teacher complete assessment rubrics.

Teacher Assessment Rubric, Section Two Date:

Name of student: _____

	1 Always	2. Sometimes	3. Never
Student: Stays on task.			
Completes work.			
Asks questions.			
Contributes to group's work.			
Is respectful of Elders and experts.			
Understands the information.			
Needs help with:			

Section Two

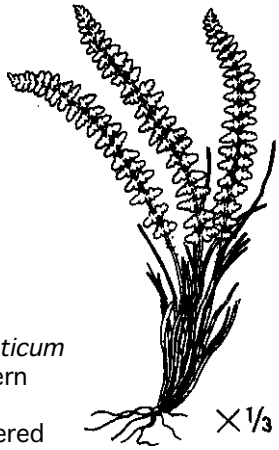
Five habitat areas provide field collecting opportunities as students begin a Class Herbarium.

Tanaĝnangin iĝayuusalix anĝaĝiimchin aĝnax̂txichin. (E)
Tanax̂, Alaĝux̂ ama slum imuunuu huzuu anaĝim anaĝinĝis sahngax̂tada. (W)
Live with and respect the land, sea, and all nature.

SECTION TWO

Scientists guess that there are more than 250,000 plant species in the world. If all plants could live everywhere, you could collect thousands of plants near your home. What a crowd!

However, you will not find a bamboo plant where you live. Nor will you find big trees. You will not find the insect-eating Venus flytraps, but you might find a relative, the sundew. You will not find coconut palms where you live (they make the some of the biggest seeds in the world). However, you will find many ferns (they don't make seeds). Ferns are like the tropical plants that grow next to the coconut palm. Indeed, many orchids grow throughout Alaska. They are not found only in the tropics!



Polystichum aleuticum
Aleutian shield fern
This is the only officially endangered plant species in Alaska. Originally found on Adak and Atka Islands, this plant has not been seen since 1932. There are other ferns in the region that look like *Polystichum aleuticum*.

Why do some plants live in one place and not another? Why do few big trees grow where you live? Scientists wonder about such questions. Perhaps you will gather some reasons before you complete this study.

Botanists guess that more than 500 species of plants live in the Aleutians/ Pribilofs. Many of those plants are not found anywhere else in the world! You have already looked at some of them. Now you will look at some places where they grow and why they grow there. You will be looking at their **habitats**. However, don't expect to find all 500 of those *species of plants everywhere in the Aleutians/Pribilofs.*

Each plant is adapted to a set of conditions. That means that some of plant species will be in one kind of habitat, and some in another. Plants that you can find near St. Paul may not be found near Unalaska. Some Unalaska plants may not be found near King Cove. King Cove plants may be different from the plants found on Atka.

Gentiana algida
Gentian
This beautiful flower grows on St. Paul but is not easily found in other parts of the region.

You will be looking at little communities in the habitat that give you clues about growing conditions. You will need to ask yourself questions about where you find these plants, and why!

ACTIVITY ONE. You can read about plants.

Do you know any stories about plants? Do you remember hearing about plants being used for food or as medicine? You can find a story or book about plant use. Look in the library, or on the Internet. You can talk to Elders, parents or caregivers. When you find the book, plan to spend several days reading it. Your teacher will ask you to retell the story when you are finished.

ACTIVITY TWO. You can collect wisely.

What are the important things to remember when you are collecting plants? These are some suggestions:

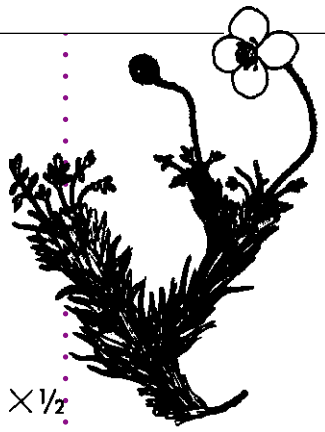
- A. Learn the place and conditions under which each plant grow best.
- B. Know where each plant can be abundantly found.
- C. Take only what can be used.
- D. Take time to appreciate the surroundings.

Can you think of other guidelines?

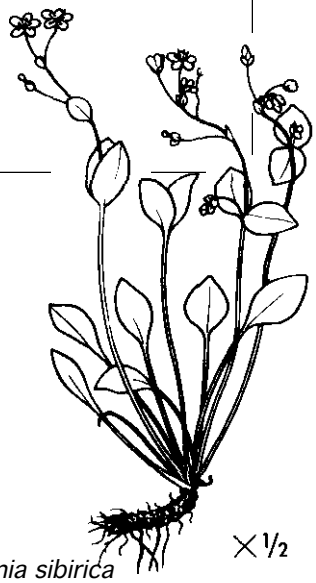
"Arctic poppy is the 'rain flower' on St. Paul Island. My mother said, 'Don't pick them, or walk on them, or it will rain. They don't smell good, anyway.' But it was a pretty flower. One time when we were picking berries, we picked the flower in spite of what mother had said, and then it sprinkled."

Mary Bourdukofsky,
Unangan Elder from St. Paul

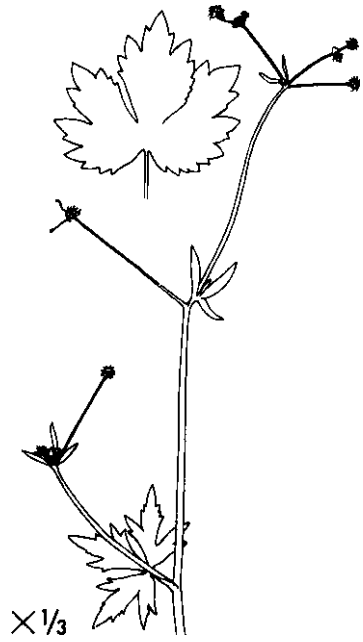
These are some of the plants known as "rain flower" in this region. Do you know any stories about how a flower got its name?



Papaver alaskanum
(rain flower in some places)
Alaska poppy



Claytonia sibirica
Chix̂tam chiĝududngii E (UT 138)
Chix̂tam aahmaaĝii W (UT 138)
(rain flower in some places)
Spring beauty



Ranunculus bongardi
Chix̂tam chinguudgii E (UT 138)
Chix̂tam aahmaaĝii W (UT 138)
(rain flower in some places)
Bongard buttercup

VOCABULARY

In *Unangam tunuu* words [r] = Russian loan word.

chiĝuudgnix̂ E (UT 139)
(chih GOOTHE ngeh): flower
aahmaax̂ W (UT 63) (AAH hmaah): flower

tugumax̂ E (UT 402)
(toogh OOM ah): beach
agux̂ W (UT 30) (AH ghoh): beach

chiimluudax̂ E (UT 142)
(cheem LOO thah): field (meadow)
chaamluudax̂ W (UT 142)
(chaahm LOO thah): field, meadow
tanasxax̂ (UT 390) (ton USK ah): field (meadow)

chaaskax̂ E (UT 132)
(CHAAHS kah): cup
chaasxix̂ W (UT 132)
(CHAAHS kheh): cup

changanax̂ (UT 131)
(chung AHN uh): valley

chidĝaayu(m) tuduu E (UT 401)
(chithe GUY yoo(m) • too THUU): purple
uluudam qaxchikdaa W (Dirks, 2001)
(oo LOO thum • kagh CHIK thaah): purple

chix̂ilĝix̂ E (UT138) (chih HIL gheh): bog
chiĝilĝix̂ W (UT 138)
(chig RIL gheh): bog

chuguulĝun E (UT 152)
(choo GHOOL ghun): gravel
quganaalĝis W (UT 332)
(kugan AHL ghis): gravel

chugux̂ (UT 151) (CHEUGH oh): sand

chumnugix̂ (UT 153)
(choom NUH gegh): yellow

kanuuyax̂ [r] (UT 230) (ka NOO yah): orange

listax̂ [r] (UT 256) (LEE stuh): petal

qiiĝuusix̂ E (UT 238) (keoh GHOO segh): mountain
kiiĝuusix̂ (UT 238) (kihg GHOO segh): mountain

qumax̂ E (UT 335) (KOO mah): white
quhmax W (UT 335 (KOO hmah) white

siriivrax̂ W [r] (UT 360) (sir EEV rah): silver

slux̂ (UT 368 #3) (SLOOH): habitat
tanax̂ (UT 388) (TA nah): habitat

suulutux̂ E [r] (UT 377) (SOO luh toh): gold
zuulutux̂ W [r] (UT 377) (ZOO luh toh): gold

talĝin E (UT 386) (TAHL ghin): branches
talĝis W (UT 386) (TAHL ghis): branches

uluudam tudagii W (UT 401) (oo LOO thum • too THAG ee): pink

uluudax̂ (UT 436) (oo LOO thah): red

botanist
dominant
habitat
herbarium
nectar
petal
pistil
pollen
seed
sepals
specimen
stamens

Why are many flowers brightly colored?

Brightly colored flowers are nature's advertisements to insects that some good food is here. Insects, attracted by the flower's color and aroma, land to get a meal. As the insect looks for the sweet ***nectar****, it also picks up the tiny* ***pollen*** *grains that are the flower's male reproductive cells. Then the insect flies on to another flower where some of these male grains stick to the female part of the flower, helping the plant make a new generation.*

Many flowers need insects as much as insects need flowers.

You can learn to collect and identify plants.

ACTIVITY THREE.
You can make a collection of plant **specimen**s that will help other people identify the plants in your area. This kind of collection is called a **herbarium**.

Before you visit the habitat area, make some guesses—predictions. Which plants do you think you will find in each of these habitats: a meadow (field), beach, bog, sheltered valley, and exposed mountain? Which plants will you find in the greatest quantity in any of these habitats? Which plants will be the fewest in quantity? Record these predictions with your class on large paper. After you visit each habitat, compare your predictions with what you actually found.

You will be organized into groups based on flower colors for these activities. What is the *Unangam Tunuu* word for your team's color?

ACTIVITY THREE-A. You can learn about plant communities called habitats.
You will need:

- something to make a frame on the ground such as a hula hoop, or a length of string and pencils to hold the corners
- Habitat Record Sheet
- outdoor weather thermometer
- directional compass
- log book
- pens, pencils
- camera (optional)

In the habitat area, organize into your color group teams. Working with your team, use a frame to outline an area approximately 3 feet (one meter) square. What plants are inside that area? With your team, complete a Habitat Record Sheet.

HABITAT RECORD SHEET, Page 1

Record this information for the plants you observe inside your habitat frame.

a. Circle the type of habitat: meadow (field), beach, bog, sheltered valley, exposed mountain, other (describe) _____

b. The date is: _____

c. Identify the plants you know already.

Plant name	Number of plants found
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(continue on additional page if necessary)

d. Give yourself identifying clues about the plants you do not know, and then include them also. Make notes about their characteristics so that you can research the plant name. Count how many of each plant you find inside your border.

Unknown plant description	Number of plants found
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(continue on additional page if necessary)

e. How many different species total do you find inside the habitat frame? _____

Which species has the most plants in this frame? _____
(This species is the observed dominant plant.)

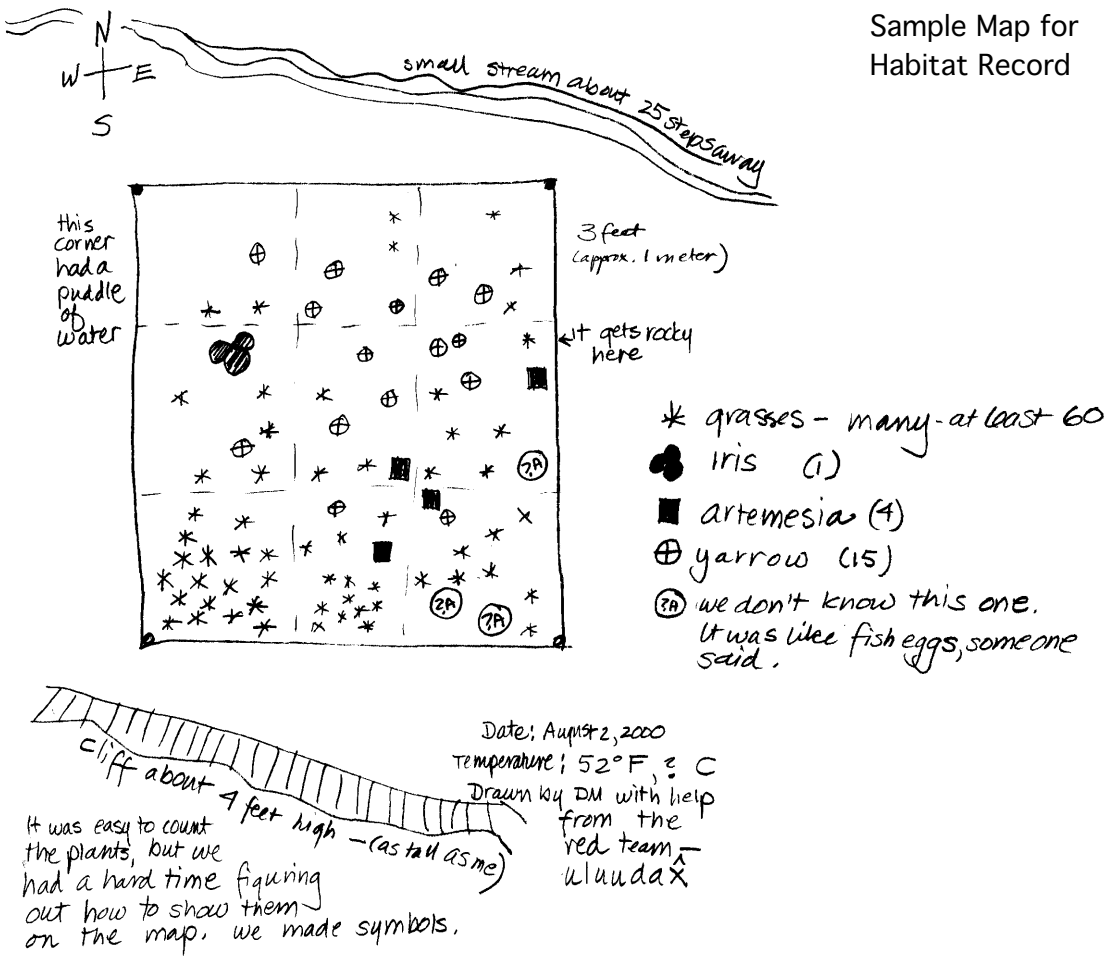
Which species has the second-most number of plants inside the frame?_____ _____

HABITAT RECORD SHEET, Page 2

f. Many ingredients create a plant's habitat. What are some of the characteristics of the small place where your plants live?
Ask yourself these HABITAT QUESTIONS and record the observation answers.
LOCATION:
Is this place high in the mountains? yes _____ no _____
Is this place in the lowlands? yes _____ no _____
Is this place level? yes _____ no _____
Is this place steep? yes _____ no _____
WATER:
How much fresh water is in this place? None _____
Pools of water nearby _____ Lake or pond nearby _____
Stream or river nearby _____
Estimated annual rainfall is _____ inches. (You may need to call the weather service or look on the Web for this information)
Is there salt water in this place? yes _____ no _____
LIGHT and WEATHER:
Is there usually strong wind in this place? yes _____ no _____
Is this place protected from the wind? yes _____ no _____
Is it usually warm in this place? yes _____ no _____
Is it usually cold in this place? yes _____ no _____
The temperature today is _____ ºF, _____ ºC in this place
On this date, plants have an estimated _____ hours of sunlight in this location.
SOIL: What made the soils here? (you may need to select several of these)
Volcanoes? yes _____ no _____
Flooded waterways? yes _____ no _____
Ancient glaciers? yes _____ no _____
Old plants and creatures? yes _____ no _____
If I pick up a handful of this plant's soil will I find mostly rocks? yes _____ no _____
Mostly dirt? yes _____ no _____
Mostly sand? yes _____ no _____
Other things? yes _____ no _____
Describe briefly: _____
_____
VARIETY:
Is this place filled with many other plants? yes _____ no _____
Less than 10 other species? _____ 10 - 25 other species? _____
More than 25 other species? _____

g. Draw a "map" of the area inside your frame showing the location of your plants. *(see the sample map for ideas)* Note any nearby landforms such as streams or cliffs. Using a compass, find the directions for north, south, east and west. Mark these directions on your map. Attach your map to the Record.

h. Photograph the plants and the habitat for comparison later in the season or school year. Mount your photographs on pages with this Record.



Sample Map for Habitat Record

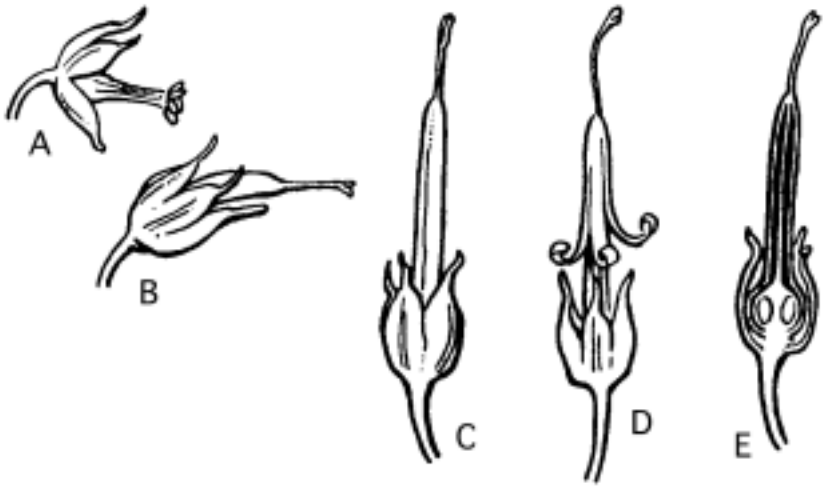
ACTIVITY Three-B: You can look at seeds.

You will need:

- log book
- pens, pencils
- tweezers
- cup of water
- stuffed animal toy
- Seed Test Card
- hand lens

It's time to look for some seeds in the habitat. Find a seed and pick it up with your tweezers. How do you know it is a seed? What is your evidence? Observe the seed with a hand lens and describe what you see. Hold the seed against a plain background if you need a better view. Sketch at least 3 different kinds of seeds in your log book. Using the Seed Test Card, look for the ways the seed travels. Describe these in your log book. Record any questions you have about the seeds.

Later, you will also collect seeds for an experiment and language/art project. Seeds are best collected in the fall. If you are collecting in the spring, don't be too disappointed if you find only a few samples.



Geranium erianthum
Chunusix̂ E (UT 154)
Chuhnusix̂ E & W (UT 154)
Wild geranium, cranesbill

The wild geranium has a seed pod like a bird beak that splits, curls, and "throws" the seeds of the plant.
A, B, C. The seed pod grows.
D. The pod splits and curls.
E. Cross-section of the seed pod at step C.

ACTIVITY THREE-C. You can collect specimens for the Class Herbarium.
You will need:

- plastic bags that close such as large zip-loc bags or bags with twisties.
- masking tape for field labels
- waterproof marking pen
- camera, video camera (optional)
- log book
- pens, pencils
- set of Plant Illustration Cards

What should your team remember while collecting specimens for the Class Herbarium?

- Limit your collection to 2 specimens each.
- Leave some plants behind to re-populate the species so that you and others may have the pleasure of seeing the plant again.
- Collect plants that match your color group.
- You may wish to photograph or video tape the plant in its habitat before you collect it. It will help you later if you make a key for your pictures now.
- The Plant Illustration Cards may help you make a field identification of the plant.

1. Carefully put each specimen in a plastic bag.
2. When you collect each specimen, record the basic collection information on a piece of masking tape. Write the same information in your log book:
   a. date
   b. collection number. If this is the first plant collected today, write down the numeral 1. For the second plant collected, write down 2. Continue numbering your specimens in order every time you collect so you can keep accurate records.
   c. team name
   d. collector's initials
   e. location
   f. plant name if known
3. Attach the masking tape label to the specimen bag.
4. Make the bag puffy with air to

protect the specimen.

5. Close the specimen bag.
6. Carefully carry your collected specimens back to the classroom in the closed plastic bags.

You will need to open the bags when you return to the classroom so that the specimens do not mold. Set each specimen in the plant press before you leave school for the day.

ACTIVITY FOUR. You can identify your plant specimens.

You will need:

- plant field guides
- hand lens
- log book
- pen, pencil
- specimens
- Plant Information Cards
- computer

1. Using one or more plant field guides, identify your specimens.
2. Fill out an identification card for each specimen. Record the information on the computer. You may also have information from Elders and other experts to include. You may want to add more information later about plant uses

Plant Information Card

Technical/scientific name: _____
Unangam Tunuu name(s) (UT page):
_____
Common name: _____
Family: _____
Where found: _____
Date found: _____
Collected by: _____
Identified by: _____
Collection number: _____
Field guide used for identification: _____
Height: _____
Leaves: _____
Flower colors and markings: _____
Number of petals, sepals: _____
Size of petals, sepals: _____
Grouping of flowers: _____
Number of stamens (seen with a hand lens) _____
Structure of the pistil (seen with a hand lens) _____
Qualities such as aroma, texture: _____
_____
Uses for this plant: _____
_____
_____
_____
_____
_____
as told by (name(s) of Elder(s) or expert(s)) _____
_____

after you interview Elders and experts.
3. Put the plant in the press if it still needs drying.

ACTIVITY FIVE. You can press your plants.

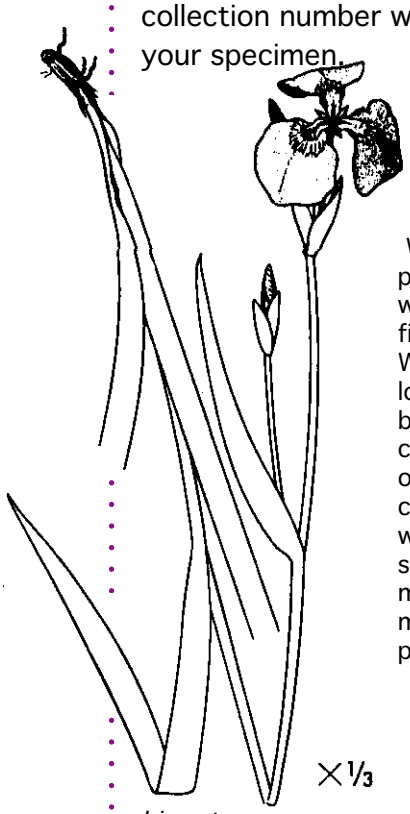
You will need:

- plant press
- specimens
- log book
- pen

Press your plant using the method your teacher describes.

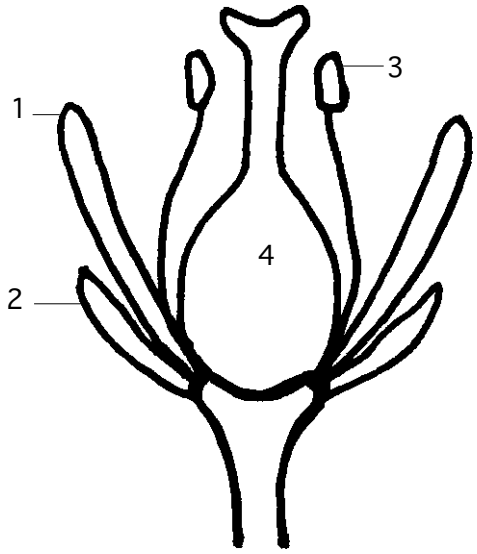
If a specimen is bigger than your press, don't let it hang out over the edges. Fold it into a W, N, Z, or V like the one shown for the *Iris Setosa*.

Write your initials and the collection number on a piece of paper by the drying plant. Sometimes plants change appearance as they dry. Your initials and collection number will help you know it's your specimen.



When this plant was pressed, its stem was bent into a V to fit into the press. When you press very long specimens, bend them in sharp corners like a V or W or N or Z. Gentle curves are not wanted for plant specimens. They make it hard to measure the dried plant.

Iris setosa s.
Nuusnuchuudan E (UT 285)
(small scissors)
Umsutuudax̂ W (UT 442)
Iris



Parts of a typical flower

When you are identifying your specimen, these are some of the important flower parts to examine with your hand lens.

1. Petals - delicate colored parts.
2. Sepals - protect the flower.
3. Stamen - the male part of the flower that produces pollen.
4. Pistil - the female part of the flower that produces seeds.

ACTIVITY SIX. You can make a Class Herbarium.

When your pressed plants are completely dry, it is time to mount them on herbarium pages. Touch your plant gently with your finger. If your plant is ready, it should feel like dry paper. Depending on the pressing technique you used, this activity may begin several days or weeks after you began pressing.

1. Mount pressed plants on white paper.
2. Mount one specimen per page.
3. Include your computer-printed label information with the specimen.

4. Laminate your specimen page to protect it while being handled in the future.

EXTENSIONS
ACTIVITY A.
With a partner, sort the Plant Illustration Cards into groups with similar flowers in each group. List the reasons why you have made these groups.

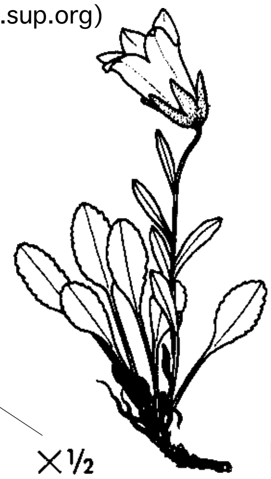
ACTIVITY B.
Using the Plant Illustration Cards, invent a game for your class.

ACTIVITY C.
The Plant Illustration Cards from *Flora of Alaska and Neighboring Territories,* by Eric Hultén, tell you how big the collected specimen was. For example, the drawing of this bluebell is X1/2. With a ruler, measure the drawing of the bluebell. It is about 2.5 inches (63.5 mm) To find the plant's actual size, multiply by 2. (That comes from the 2 in the 1/2). How big was the collected specimen? (Use a mirror to read the answer below.)

(5 inches or 127 mm.)

You can learn how big all the collected plants were on the Plant Illustration Cards.

If you have an enlarging copier, you can also calculate how much bigger you would need to make a copy of the card to have a full-size drawing of the plant.



X½

Campanula chamissonis
Kulukalax̂ E (UT 248) [r]
Kulukulix̂ W (UT 248) [r]
(little bells)
Bluebell, harebell

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:

NOTES:

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.

TEACHER NOTES: SECTION THREE

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.

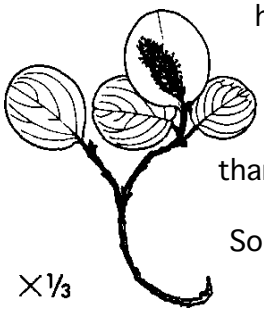
Wan alaĝum ilan anaĝim anĝaĝinangin usuu Aguuĝux̂ agach ngiin aĝiqaa. (E)
Algas ama anaĝim anĝaĝingis huzungis Aguuĝum agacha ngiin aĝiqaa haqataasada. (W)
Respect and be aware of the creator in all living things.

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.

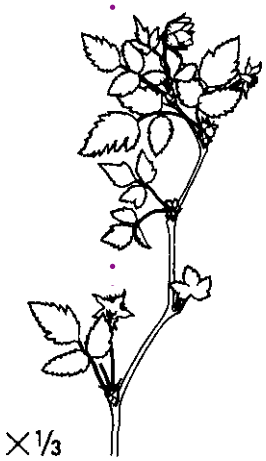
Some plants have seeds that blow away in installments. If all the seeds were blown away at the same time, they might end up in a place that was not welcoming for the plant to grow.

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.

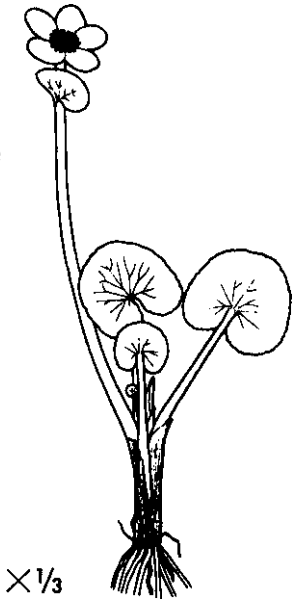


Rubus spectabilis
Alagnax̂ E (UT 49)
Salmonberry

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

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

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

angunax̂ (p 91) (ung OO nah): large

atxax̂ (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

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

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

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

dax̂sxix̂ W (UT 160) (THAH skegh): grain, seed
daax̂sxis W (UT 160) (THAH skis): grains, seeds

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

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

qaasax̂ E (UT 311) (KAAH sah): seed

qalax̂ (UT 302) (say KAH-lah): seed

qachx̂idigax̂ E (UT 292) (kach kidth IG gah): smooth
qachx̂izigax̂ W (UT 292) (kach kiz IG gah): smooth

qalaa (UT 301) (kah LAA): bottom

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

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

tngux̂ E (UT 400) (tng oh): hard
tungax̂ 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

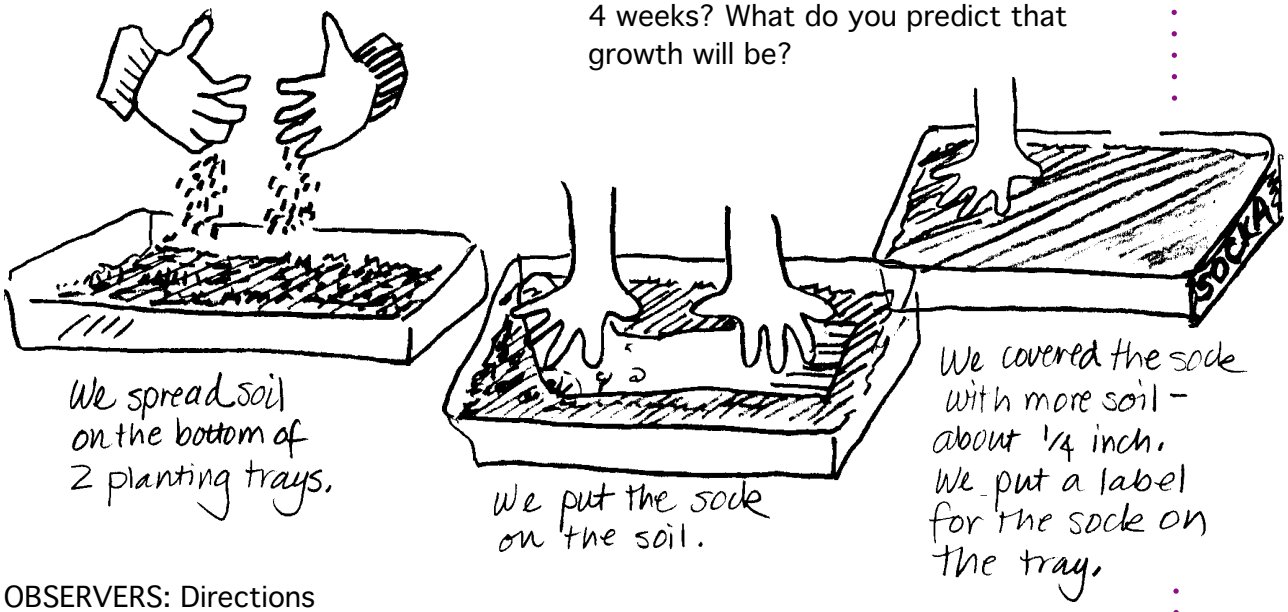
PLANTING COMMITTEE: Directions

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?



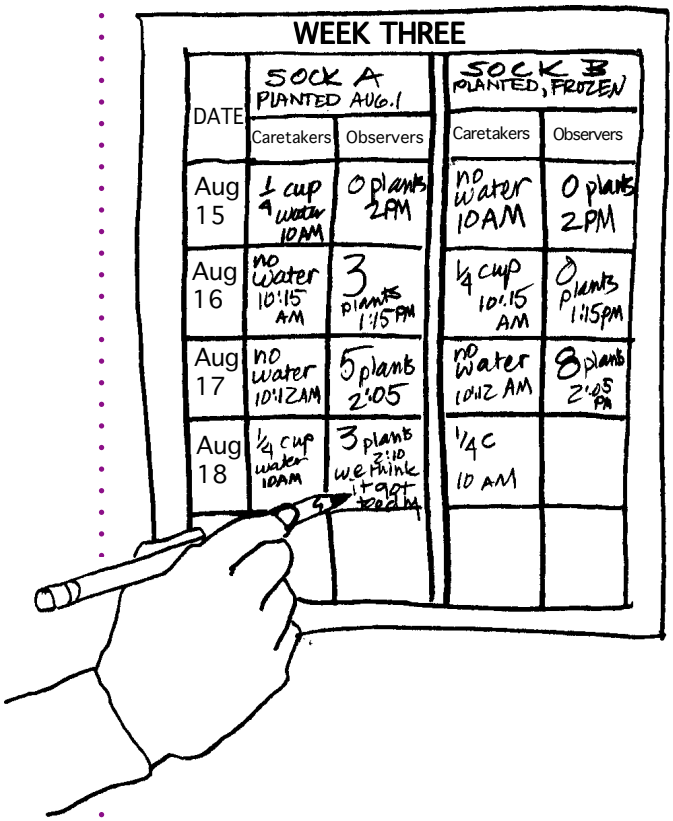
OBSERVERS: Directions

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.

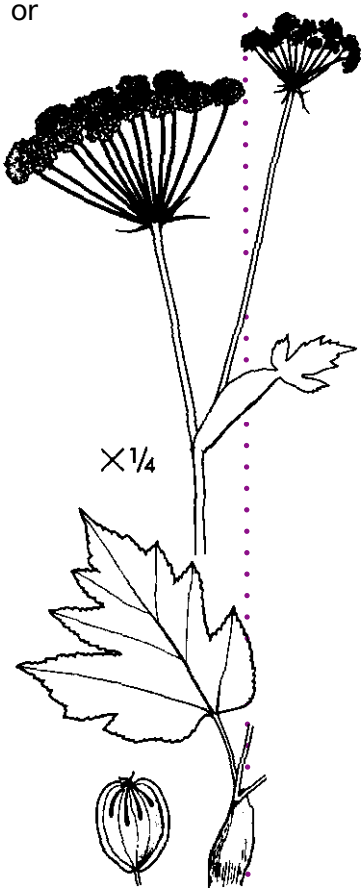
3. As you collect, take notes about your seeds in your log book. What kind of habitat were you in when you found the seeds? How tall was the plant? If you have Elders or other experts with you, write down all the information they tell you about your plant.

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.

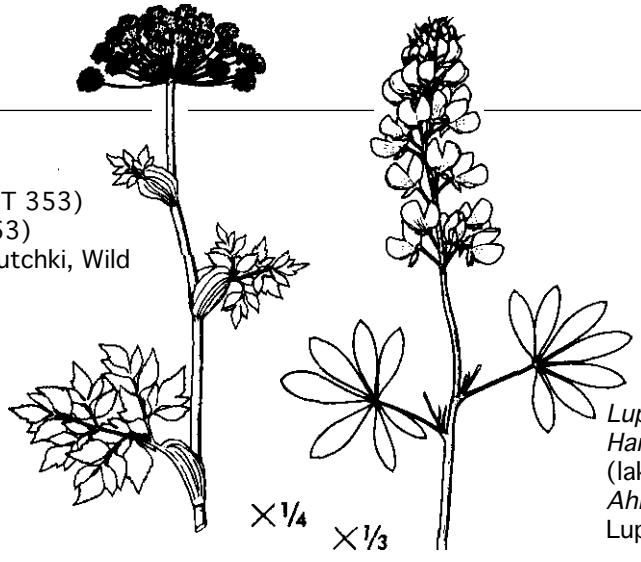
Active youth on St. Paul Island are doing something to make a difference where they live. During years of government operation of the fur seal harvest, pollution took its toll. Oil contaminated the earth. Refuse of the business littered the land. Ataqan Akun, We are One, Aleut dancers under the supervision 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.

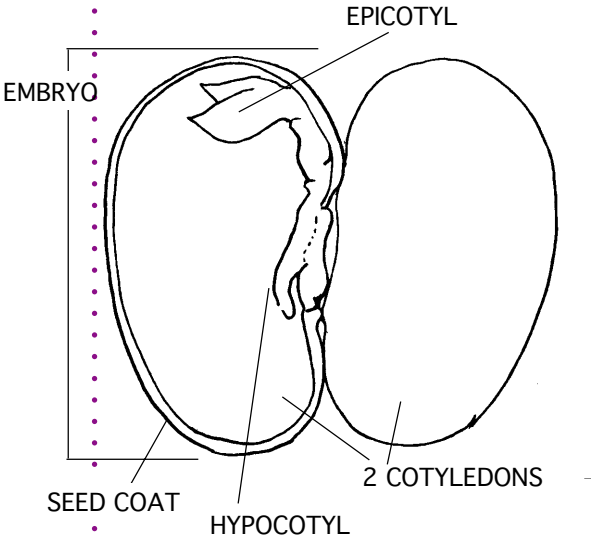
Alternate Activity: You can write and illustrate a seed book for the younger grades. Bind it for use in the school library.

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

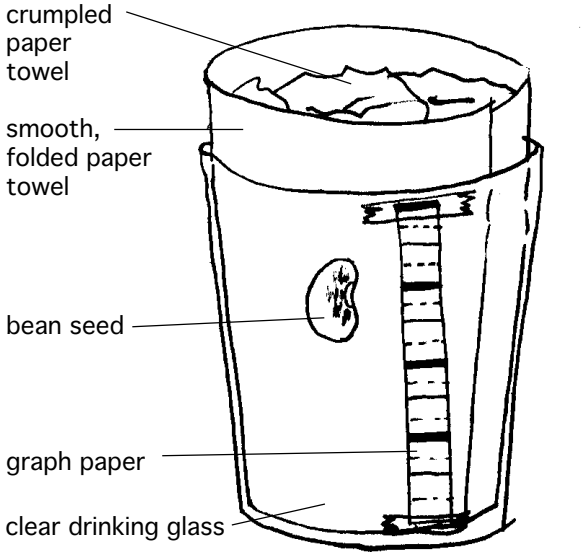
Draw and label the inside of the soaked bean seed using these words:

- 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:

Section Four: Teacher Notes

The energy cycle is the focus as students go inside a leaf to look at photosynthesis.

TEACHER NOTES: SECTION FOUR

Summary:

Students go inside a leaf to look at a photosynthesis process. They learn about the process through reading, demonstrations, experiments, and a board game. They continue their study of chlorophyll by making a printed fabric. As a conclusion, they go inside a plant cell and make a three-dimensional model of some of the plant cell's parts.

> Some activities in this and other sections suggest Web sites for you or your students. We hope you will find them rewarding additions to your study of plants. However, Web sites move or sometimes disappear altogether. If you cannot arrive at any of these suggested sites, use your preferred search engine to locate alternates. As with all work using the World Wide Web, please monitor your student's research.

Objectives:

Alaska Standards

To understand the varied growing conditions needed by different plants.

To learn indigenous plants' names and characteristics.

Science: A. 1, 2, 9, 10, 14; B. 1; D. 1
World Languages: B. 1
Skills for a Healthy life: B. 1, 3

To use problem-solving skills in planning experiments and using the scientific process.

Science: A. 9, 10; B. 1, 2, 3, 5; C
English: C; D
Mathematics: A. 2, 3, 6; C. 1; E. 2, 3
Technology: A. 1, 2, 3; B.1, 2

To understand local cultural heritage and stewardship for the environment.

English: A; B. 2, 3; C; D. 2, 3; E
Cultural: A. 3, 4, 5, 6; B. 1, 2; C. 1, 3; D. 1, 3, 4; E. 1, 2
History: B. 1
Arts: A. 3; B. 8

Materials:

- log book
- pencils, pens
- clear nail polish (optional)
- hand lens

Leaf Food Factory Game

- glue
- laminating supplies
- scissors
- dice
- game board * (Appendix)

TEACHER NOTES: SECTION FOUR

- playing pieces, one per student. Recommendations include coins, rings, nuts, small pebbles, small bottle caps. Students may provide their own. Each player at a game board should have a different playing piece.
- challenge cards* (Appendix)
- atoms and units of sunlight:

  You may wish to use the paper* versions supplied (Appendix). As an alternate, consider substituting multi-colored or multi-shaped food such as cereal or candy—wrapped or unwrapped (m&m's, skittles, star-bursts). You will need 4 different color or shape combinations to provide for every 4 students this amount of atoms and units of sunlight:

  30 for C, Carbon
  57-60 for H, hydrogen
  94-100 for O, Oxygen
  48-50 for units of sunlight

  If you use m&m's, you will need one 10 ounce (283.5 g.) package for every 3 students. Use the brown m&m's for the oxygen, yellow for the sun, red for carbon and blue for hydrogen. Students will discover after they make the simple sugar formula that there are many "O" leftover. These are the oxygen by-products of the photosynthesis process. You may wish to allow students to eat them as a reward! Or you may wish to offer the unused colors for the rewards.
- 3 small containers to hold 50 to 100 "atoms" each and units of sunlight (approximately fist-sized or larger depending on your choice of materials for atom and units of sunlight) labeled:

  light box
  air resources box
  water resources box
- paper towel or napkins for each student (optional)
- plastic baggies for "mittens" to help keep hand "bugs" away from ingredients (optional)
- prizes (optional). Suggestions include fruit, or m&m's or other candy; certificates; stickers

Hammered leaf print:

- 100% cotton fabric or unbleached muslin. You can select small pieces to produce as samples. Larger projects are also possible such as t-shirts, table cloths, or napkins. Any 100% cotton fabric can be used. Perhaps a class-finished project of napkins or a handkerchief as a thank you for an Elder or expert is the appropriate final product. You might also wish to produce a textile sample to include with the Class Herbarium or as a cover for the herbarium collection.
- natural soap such as ivory
- flat-headed hammer (1 for every 4-6 students)
- roll of masking tape
- sturdy flat surface
- ink-free newsprint
- wax paper
- water: increase or decrease water amount in the recipes shown below depending on the amount of fabric used.
- ferrous sulfate, alum, and/ or wood ashes (these are called mordants in the natural dye process) Increase or decrease the amounts in the recipes depending on the amount of fabric used.

- salt, baking soda, or washing soda (sodium carbonate)
- safety goggles or safety glasses (for each student who measures and stirs chemicals)
- measuring cup
- tablespoon
- leaves, fresh and in excellent condition. Include collections from the wild or from garden or house plants such as carrots, marigolds, or ivy. Thin, flat leaves will transfer color better than thick juicy ones.
- additional materials as described in activity Web sites

Activities:

ACTIVITY DISCUSSION
People traditionally hear about values many times during their lives. Whether they embrace them as their own depends on many factors, especially whether they are ready. Storytellers in *Unangan/Unangas* villages would watch the community carefully for signs of readiness for such a lesson. When they would sense that lessons should be brought up, they would tell a specific story woven with the lesson. Those who would learn the lessons would begin to memorize the stories and imagine how they might fit into the role of the storyteller later on.

The concept of balance having importance is a value for which your community of students may be ready. There is no right length or sequence for this discussion. However, It is important to have the discussion and explore what individuals are ready to express. The concept will be repeated many times during this study, the year, the lives of the young people with you.

The *Unangam* values statement about balance provides a springboard for an exploration of a number of subjects including ethics in science or life. Some introductory questions are included here:

1. What does it mean to eat a balanced diet?
2. If someone is interested in and pursues only one thing, can they have a balanced lifestyle?
3. Use the word balance in a sentence. Now, can someone else use it another way? Another?
4. Why should there be balance in the world?
5. What are some synonyms of balance? Antonyms?
6. What does excess mean?
7. What is a paucity?
8. What is the meaning of the word balance?
9. Describe what you think would be a good balance of activities for yourself?

ACTIVITY ONE. Students conduct experiments or prepare demonstrations about photosynthesis using text and Web resources. You can find questions and answers about photosynthesis at this Web site:

http://www.sciencenet.org.uk/database/Biology/Lists/photosynthtable.html

Inside activity
Estimated duration: 30-40 minutes to begin; follow-up times will vary.

ACTIVITY TWO. Students play a photosynthesis game “The Leaf Food Factory” (see game pages in Appendix)

Inside activity:
Estimated duration: 40-60 minutes

Copy the game board, atoms, units of sunlight, and challenge cards to make enough sets for each group of 4 students. (A set for 4 students is included in the Appendix.) If you are using

TEACHER NOTES: SECTION FOUR

the game as a learning station for fewer than the whole class, copy and laminate a set for each station. Laminate the atoms, units of sunlight, and challenge cards and cut them apart. Glue the pages of the game board together. Cut out the leaf shape of the game board. Laminate the game board. Collect 3 small boxes and label them.

light box
air resources box
water resources box

If you use m&m's as the atoms and units of sunlight, make sure students wash their hands before playing. You may prefer to have students use plastic bag "mittens" when handling unwrapped foods. Also, remind students that the refined sugars in candy or cereals are similar to, but not identical to, the simple sugars that plants make through photosynthesis. You may want to assign a student to research some of the different kinds of sugars and report to the class on nutritional comparisons.

Depending on the level of your class, you may wish to adjust some of the playing requirements. For example, students can begin the play with 4 sets of molecules instead of 3 sets of molecules.

Decide if you want to offer awards to the students as they finish. Suggestions include a fruit piece, or an m&m or other candy; a certificate; a sticker.

ACTIVITY THREE. Students show leaf chlorophyll on a fabric by making a hammered leaf print.

Inside activity
Estimated duration: set-up 20-30 minutes; completion 20-30 minutes plus drying time.

Students should try a small sample to get the feel of hammering the leaf so that they keep the pattern and shape of the leaf while transferring the color to the fabric.

A note about the chemicals you will use: although relatively safe, these and all chemicals should be used with adult supervision and with eye protection. Remind students to measure carefully.

Ferrous sulfate is a chemical used in water purification, fertilizers, pigments, photography and medicine. It is also called copperas, green coperas, green vitriol, iron vitriol and iron sulfate. In traditional times, the textile artist would not be able to go to the drugstore and ask the pharmacist if this substance was sold there. Nor would s/he have gone to the Web and contacted Carolina Chemical or a weaving/spinning supplier for the materials. Sometimes the chemical was found as a bluish-green crystal-like solid on the ground. Sometimes, especially after European contact the fabric was heated in water in an old rusting iron kettle whose surfaces would impart the final color fixing to the textile. You may wish to test this iron kettle technique with your textiles as an alternative to using the pure chemical.

Alum is also called aluminum potassium sulfate, potash alum, and potassium alum. It is a colorless, odorless crystalline chemical used in medicine, and in dyeing and tanning. Raw alum is an alkaline substance found naturally in washes or areas of recent water evaporation. It is chemically different than the alum you can buy in spice bottles at the grocery store.

To purchase mordant supplies, you may wish to contact a spinning and dyeing source on the Web.

http://www.joyofhandspinning.com/mordants.html
http://www.thewoolery.com/fibers.html

TEACHER NOTES: SECTION FOUR

If you decide to buy one or more of the mordant chemicals, you might want to continue the plant dyeing process by gathering wild blossoms, leaves, bark, or lichens and doing additional natural dyeing projects. Some of the dye descriptions for Alaska plants can be also be found in Schofield's *Discovering Wild Plants*. (see index for specific pages). Your local experts or Elders may also have suggestions about appropriate natural dye materials. Natural dye colors vary from area to area for any given plant, depending on the local growing conditions. A plant that results in one color in Anchorage may give a different result in Unalaska or St. Paul. Testing small samples is always a good idea if you are looking for specific results.

Dye recipes are available in a number of books. See Resources in the Appendix.

ACTIVITY FOUR. Students report on their "place" selected in Section One for "Pick a Place" and report on its changes.

Outside activity
Estimated duration: 30 minutes for homework

ACTIVITY FIVE. Students examine and dissect a virtual cell on the Web and make a 3-D plant cell model.

Inside activity
Estimated duration: 30-40 minutes in 2 sessions.

EXTENSIONS: See student pages.

Assessment opportunity: Student describes the photosynthesis process in simple terms to the teacher or makes a simple sketch of the process.

Teacher Assessment Rubric, Section Four Date:

Name of student: _____

	1 Always	2. Sometimes	3. Never
Student: Stays on task.			
Completes work.			
Asks questions.			
Works cooperatively with peers and gains insight from their activities.			
Is Respectful of values.			
Is Respectful of Elders.			
Understands the information.			

Needs help with:

NOTES:

Section Four

The energy cycle is the focus as students go inside a leaf to look at photosynthesis.

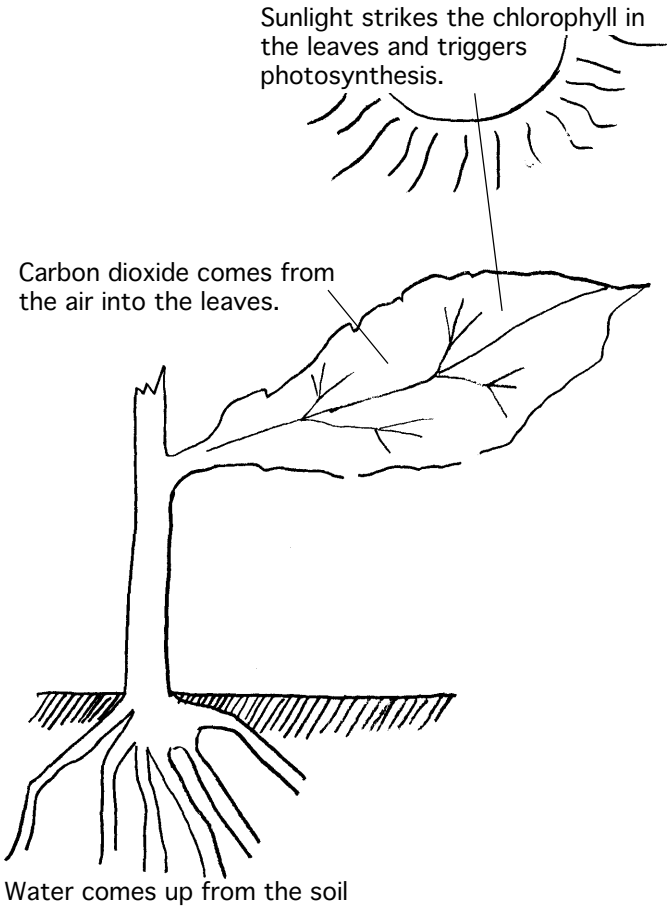
SECTION FOUR

Txin achigalix anĝaĝigumin anuxtanatxin ax̂saasaduukux̂txin. (E)
Huzugaan txin achigax̂ agacha mada ama txin sakaaĝatada. (W)
Always learn and maintain a balance.

HOW DO PLANTS MAKE FOOD?

Animals (humans included) cannot make their own food. They get their food by eating plants or by eating animals that have eaten plants. All plants can make their own food with help from the sun. *This is the most fundamental difference between plants and animals.* Almost all of the differences between plants and animals come from the ability of plants to make food from the sun.

- Animals cannot make their own food. They must be able to go from place to place to find their food. Plants do not need to go from place to place to find their food, although they are able to move to take advantage of the best light.
- Animals need to recognize food when they find it, so they have well-developed nervous systems. Plants do not have well-developed nervous systems because their food is all around them in the light, air and soil.
- To move from place to place, animals need flexible cells. Plants have stiff cells because they are **stationary**.



To make food, plants need sunlight, **carbon dioxide** and water. If you were a plant, you could stand in sunlight and with help from carbon dioxide (that you gather from the air through your leaves) and water (that you gather from the soil through your roots) you would satisfy your hunger.

How do light, water and carbon dioxide get into a plant?

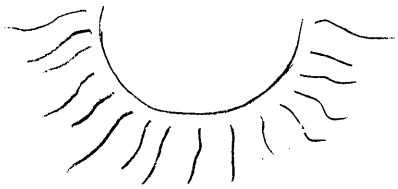
In most plants, the leaves are the main food factories. They capture the sun's energy with the help of **chlorophyll** in the leaf cells. The chlorophyll traps and

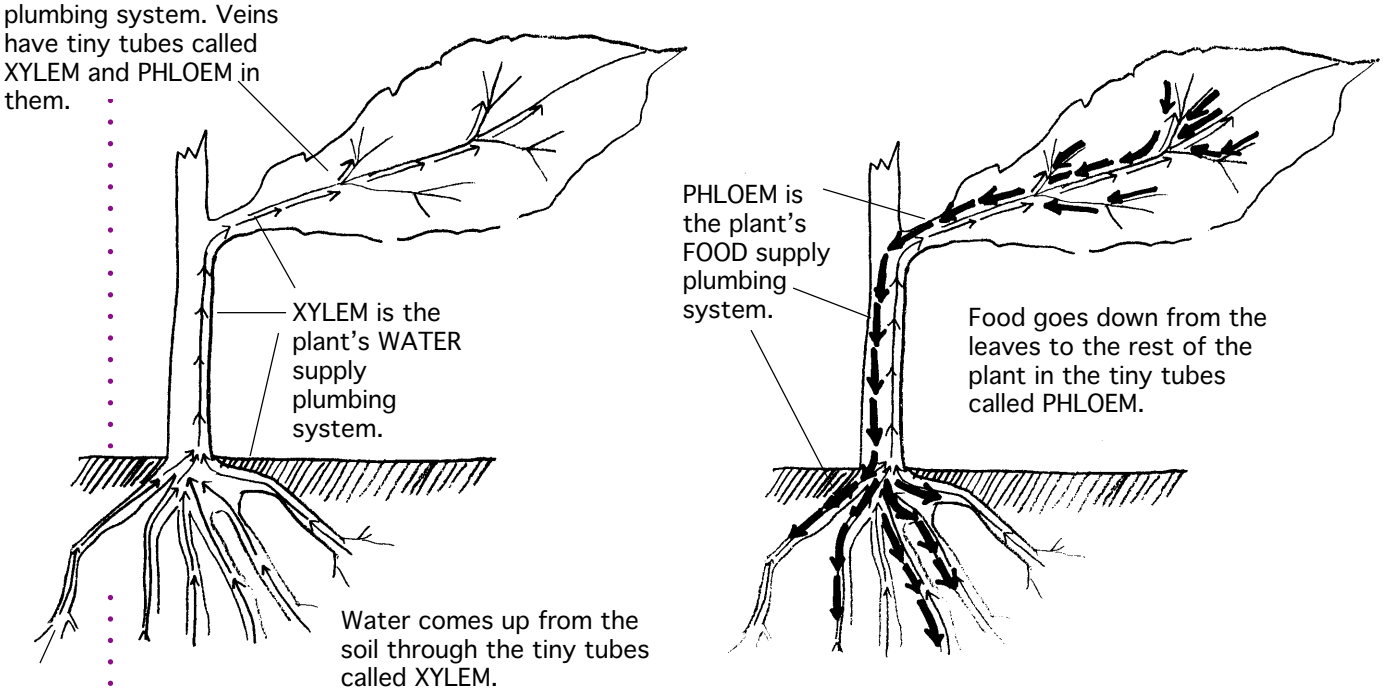
packages the energy from the light of the sun in a process called **photosynthesis**. Leaves usually have a large surface so they can collect the most sunlight. Many plants also have ways to change the leaf's position to capture the light.

Leaves contain veins—an important part of the plant's plumbing. If you hold a leaf up to a light, you can see the pattern of its veins. Veins help make the leaf a strong structure. They are also the pipelines that carry food and water in the leaf. The veins in the leaf are part of plant's main plumbing system, connecting with the stem and the roots. The main plumbing system has two sets of tiny tubes, the **xylem** and the **phloem**.

Xylem is the plant's water supply plumbing system.

Water travels from the soil through the roots, stem, and leaf veins in the tubes called xylem. The veins supply the water to the chlorophyll in the cells. When light strikes the chlorophyll, photosynthesis begins. The chlorophyll absorbs energy from the light. This energy splits the water **molecules** into **atoms** of hydrogen and oxygen. The hydrogen atom then combines with atoms of carbon and oxygen to produce a simple sugar. The process is actually many chemical changes with more steps than are described here.





Phloem is the plant's food supply plumbing system.

After the sun's energy is converted through photosynthesis into simple sugars, this food is carried in the veins through the phloem to the other parts of the plant where it can be used immediately or stored.

Stomata are the places where carbon dioxide enters the leaf and where left-over oxygen and water leave the plant.

Carbon dioxide from the air enters the plant leaves through tiny pores — mouth-like spaces that can open and close—called **stomata**. The oxygen left over from photosynthesis passes out of the leaves through the stomata and then into the air. Water also moves from the leaves into the air through the stomata. In the dark, the plant relies on its supplies of sugars and starches and reverses the process of photosynthesis to produce carbon dioxide that passes out of the leaf through the stomata. The opposite of photosynthesis in a plant is called **respiration**.

A leaf has many stomata. For example, a cottonwood leaf may have 1 million stomata, and a sunflower leaf nearly 2 million. In most plants that grow in full sun, the majority of the stomata are in the shaded lower side of the leaves. Being on the lower side also protects the stomata form dust and insects. In some plants, especially plants that grow in water, the stomata are on the upper side of the leaf. In other plants, the stomata are about equally divided between the upper and lower side.

If you were a plant, you could stand in sunlight, and with help from carbon dioxide *(that you gather from the air through your leaves)* ***and water*** *(that you gather from the soil through your roots),* ***you would satisfy your hunger****.*

Some leaves will show their stomata. Coat the underside of a large leaf such as a geranium with clear nail polish. Carefully peel the polish off when it is dry. Look at the print of the leaf with a hand lens or under a microscope. You should be able to see the shape of the stomata.

ACTIVITY ONE. You can do an experiment about plants and light using the World Wide Web and other resources.

1. Photosynthesis with Newton's Apple http://www.pbs.org/ktca/newtons/9/phytosy.html

2. "Do plants Need Sunlight?" from the University of Michigan's K-12 Math-Science Outreach Program http://www.eecs.umich.edu/~coalitn/sciedoutreach/funexperiments/agesubject/lessons/sunlight.html

3. What happens to a leaf if you interfere with its stomata?

UXCHUUDAX̂

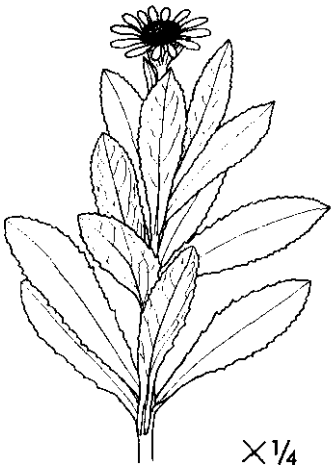
Alaĝum chidaĝan kingtingin ilan hitzas. Hitnisalĝus akus tabuunax̂ al qayal haang azas.

Chuniĝii tumtatul huuĝuzuuzal akux̂ sayulgal agumdix sixsazas.

Sakaax chuqigan ilagaan siĝlis chuniĝii imutal hangax̂tal hakaaĝax̂tazaa. Siĝlix alalakax̂, siglingis adul kay slagil akus, hangadingis tasx̂idal sitxuuĝingis angalingis uĝax̂tanax̂ liidal chngaĝinax̂ liidal huuĝuzuusadas.

Kangiiguzamdix kangan aahmaaĝis chumnugingis ax̂tazas. Aahmaaĝii angunaaĝutakux̂, alixcha atiim akux̂ aahmaaĝim siĝlingis chaglignas liidal chumnuxs imutazaa.

Written by Nadesta Golley,
Atx̂am Hitnisangis/Atkan Plants
Page 24
Niiĝuĝix̂ dialect (Atka), (in short form, *Niiĝux̂*)



Senecio pseudo-arnica
Alaĝum achidan alngaayuu
E (UT 55)
Uxchuĝaadax̂ E (UT 417)
Uxchuudax̂ W (UT 417)
Seabeach sunflower, ragwort

They are seen growing by the beach on banks. They are large plants that grow in bunches. The stem is thick and soft and when pulled they break easily. From the bottom there are leaves that grow up and around the stem to the top. It has lots of leaves. The leaves are large and the surface is shiny. The bottom side is light, worn out, hairy and soft. On the very top grows a yellow flower. The flower is large in size. The middle looks straight. The flower's leaves look like they are torn. They are yellow and grow around the stem.

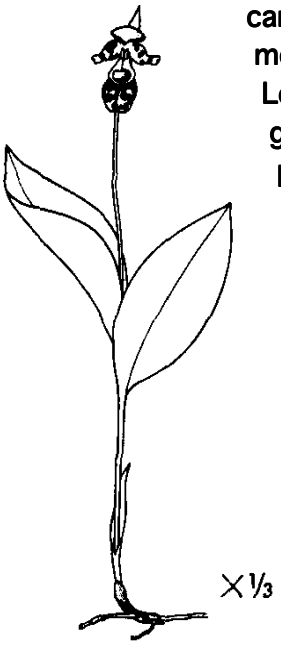
Translation by Moses L. Dirks

When asked about the plant above, Unangan Elder, Sophie Sherebernikoff of Unalaska said, "You don't see many of those plants around here anymore. They have extended the gravel for the road over the bank where they used to grow." She does not remember ever hearing a name in Unangam tunuu for her favorite flower, the lady's slipper (Cypripedium guttatum). She would appreciate it if anyone knows it and would share it with us. Sophie and an aachax̂, or special friend, lament the fact that the squirrels, brought in to provide food for the fox farms in the 1800s, love to eat lady's slippers.

Sophie Sherebernikoff, *Unangan* Elder, from Unalaska

"What's Stomata," pages 30-31 Janice Van Cleave. *Biology for Every Kid.*

4. OR the Web site:
http://www.eecs.umich.edu/mathscience/funexperiments/quickndirty/plantstomates.html



Cypripedium guttatum
Lady's slipper

ACTIVITY TWO. You can be a chemical messenger in the Leaf Food Factory, a game about photosynthesis
(See game pages and directions in the Appendix)

ACTIVITY THREE. You can show a leaf's chlorophyll on a fabric!
Make a hammered leaf print.

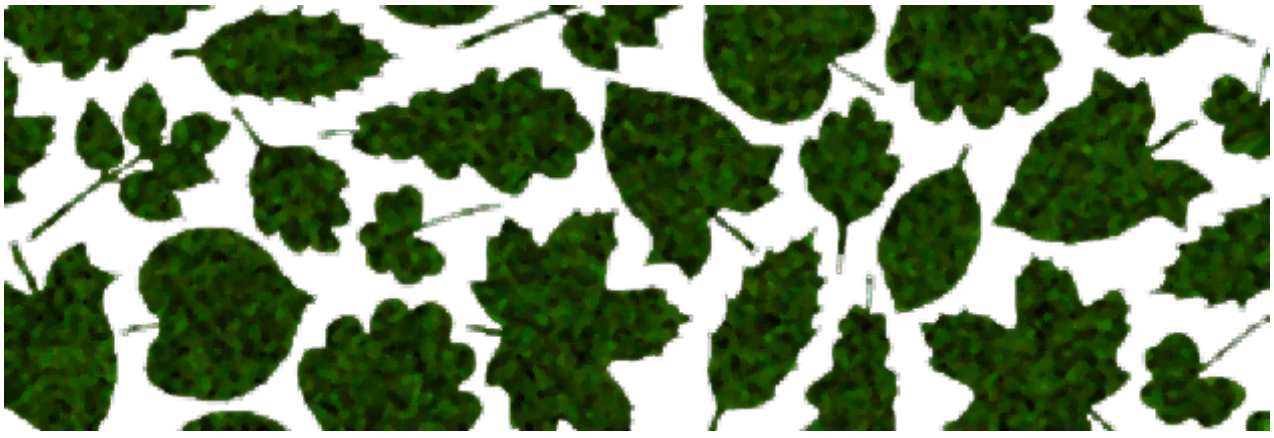
Sometimes attributed to the Cherokees, this is an age-old way to create a leaf print on fabric. You will transfer the natural color from the leaves to a fabric by beating the chlorophyll directly into the cloth fibers.

1. Wash your cotton fabric in water and a natural soap such as ivory. This wash removes a chemical that textile manufacturers put in the cloth to keep it looking fresh until it is sold. Do not use fabric softeners. Rinse thoroughly and dry.

2. Prepare the work surface: Lay 8-10 pieces of newsprint in a pile on a sturdy table or board. (Trying a small sample at this step with the following directions will help you get the feel of hammering the leaf so that you keep the pattern and shape of the leaf while transferring the color to the fabric)

3. Lay your cloth, right side up on the newsprint.

4. Lay your leaves on the cloth, top-side down, in a pattern of your choice.



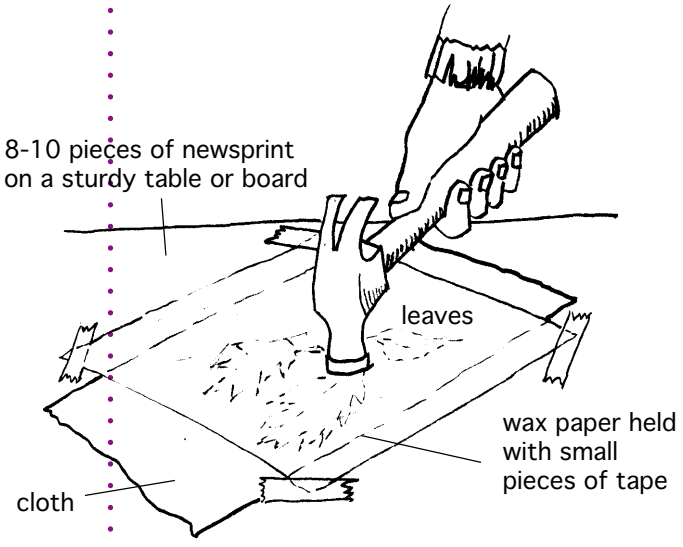
VOCABULARY

atoms
bonds
carbon
carbon dioxide
cell wall
chemical formula
chlorophyll
chloroplast
chromosomes
cytoplasm
hydrogen
mitochondria
molecules
mordants
nucleus
oxygen
oxygen
phloem
photosynthesis
respiration
stationary
stomata
stoma
transpiration
vacuole
xylem

5. Cover the leaves with a sheet of wax paper. Using small pieces of tape, fasten the wax paper around its edges.

6. Pound evenly with a hammer until the color transfers to the cloth.

7. "Fix" the color in the cloth using one of these chemicals: ferrous sulfate, alum, or wood ashes. These are called **mordants** in the natural dye process.



For bright color, soak the cloth for 1-2 minutes in a solution of one gallon (3.8 liter) of water in which 3 tablespoons (44 ml) of ferrous sulfate are dissolved.

For less bright color, soak the cloth for 1-2 minutes in a solution of one gallon (3.8 liter) of water in which 3 tablespoons (44 ml) of alum are dissolved.

For reddish hues, soak the cloth for 5 minutes in a solution of one gallon (3.75 liters) of cold water in which 1/3 cup (80 ml) of wood ashes is dissolved. (Note: different kinds of wood burned to make the ashes will affect the color differently.)

8. Rinse the fabric in cold water and air-dry away from direct sunlight.

9. You can soak the fabric for 10 minutes in one more fixing bath of:

1/4 cup salt (60 ml) per one gallon of water.

OR 3 tablespoons (44 ml) of baking soda to one gallon (3.8 l) of water.

OR 2 cups (1/2 l) washing soda to one gallon (3.8 l) of water.

ACTIVITY FOUR. You can visit your personal place.

It's time to return to the place you picked a few weeks ago when you started the plant studies. For homework tonight, visit your personal place again. What has changed in your personal place? Write one paragraph in your log book describing the changes. If there have been no changes, describe the reasons why.

INSIDE THE PLANT CELL

What is in a plant cell in addition to the chlorophyll?

Chlorophyll is an important part of plant's cell. Some of the other important parts of the plant cell are the **cell wall**, the **nucleus**, the **cytoplasm**, the **vacuole** and the **mitochondria**.

As you read this description and look at the illustration, think about objects you might find or make to represent each cell part. After you read the description, look at the virtual cell and its parts on the Web: "http://www.life.uiuc.edu/plantbio/cell/"

The plant's chlorophyll is in a small part of the plant cell called the **chloroplast**. There are many of these in each plant cell. The chloroplasts are in a liquid-like part of the cell called the cytoplasm.

Mitochondria are also found in the chloroplast. They are the power factories for the cell, changing the food in the cell into energy so that the cell can grow, divide and do its work.

The nucleus is the control center for the cell. This is where the **chromosomes** are that determine the next generation of this plant's reproduction.

The cytoplasm is all the material enclosed by the cell wall, except for the nucleus. Some of the space inside the cell is taken up with a fluid-filled vacuole that presses out and helps keep the cell rigid.

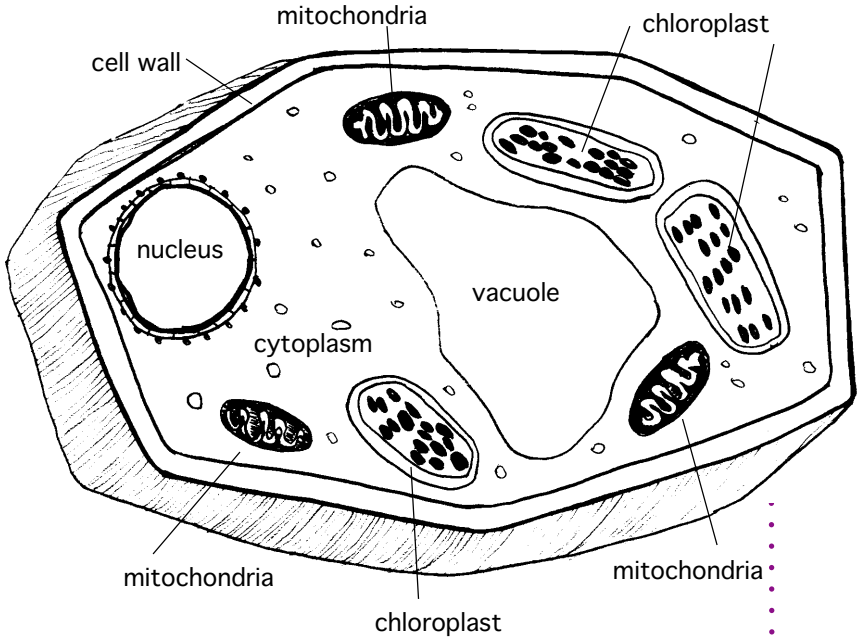
The outer cell wall of the plant cell is rigid, unlike animal cells which are flexible.

ACTIVITY FIVE. You can make a cell model.

Make a plant cell model, remembering that plant cells are different than animal cells. You can find some construction suggestions at:

Jello cell:
http://ericir.syr.edu/Virtual/Lessons/Science/Biological/BIO0035.html

3-D cell:
http://ericir.syr.edu/Virtual/Lessons/Science/Biological/BIO0039.html



Include all these parts in your cell model: cell wall, nucleus, cytoplasm, vacuole, mitochondria, and chloroplasts.

EXTENSIONS:

ACTIVITY A.
Use flower petals in addition to leaves to make a hammered plant print.

ACTIVITY B.
Collect plant materials and use them to dye fabrics or yarn or grasses.

ACTIVITY C.
Make an edible leaf and learn more about leaf structures in "Build a Tree, Make A Leaf," *Alaska's Forests & Wildlife, Alaska Wildlife Curriculum Teachers' Guide*, Alaska Department of Fish and Game. 1995

ACTIVITY D.
You have looked at the photosynthesis process of plants. There are other important steps in the food-producing work of plants. In your library or on the Web, research the **respiration** cycle of plants or the **transpiration** cycle of plants. Make an illustrated poster showing how photosynthesis, respiration and transpiration work.

ACTIVITY E.
Have you ever asked yourself why a leaf is green? The answer might surprise you. Research the light and colors in leaves. Explain how leaves use the blue and red parts of light to make their food. They reflect (do not use) the green light. Do a color experiment for the pigments in leaves such as "Leaf Colors" pages 38-39 in Janice Van Cleave's *Biology for Every Kid.* Make a display of your work and include a description of the differences between color in light and color in pigment.

http://photoscience.la.asu.edu/photosyn/education/colorchange.html

Student Assessment, Section Five 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 was respectful of Elders and values.			
I understand the information.			

I still have questions about:

Section Five: Teacher Notes

A community celebration concludes the unit with students sharing their projects and information.

TEACHER NOTES: SECTION FIVE

Summary:

Students prepare for a community celebration to share their plant work and information. Time permitting, students continue their plant studies, learning about plant foods from the sea, and food chains and webs.

Before planning the community celebration, read again "The Right Way to Live as an *Unangax̂*" in the Appendix and "Elders and Experts" in the Introduction.

Objectives:

Alaska Standards

To understand the varied growing conditions needed by different plants.
To learn indigenous plants' names and characteristics.
Science: A. 1, 9, 10, 14; B. 1; D. 1
World Languages: B. 1
Skills for a Healthy life: B. 1, 3
To understand local cultural heritage and stewardship for the environment.
English: A; B. 2, 3; C; D. 2, 3; E
Cultural: A. 3, 4, 5, 6; B. 1, 2; C. 1, 3; D. 1, 3, 4, 5; E. 1, 2
History: B. 1
Arts: A. 3; B. 8

Materials:

- log books
- invitation supplies such as paper, envelopes, poster board, pens, markers, pencils
- all projects from plant study, including Class Herbarium
- large paper to use for whole class project
- paper in 3 colors to make signs for each student to wear
- yarn or pins to hold signs on students
- yarn to make a web (several hundred feet wound into 3 or more balls)

Activities:

ACTIVITY ONE. Students prepare invitations for a community gathering to celebrate and share their work on their plant studies. They complete their projects and practice oral presentations. They review how to behave appropriately when they have guests.

Inside activity
Estimated duration: Invitations: 40-60 minutes in 2 sessions
Project completion: as needed.

Review ways to welcome and show respect for Elders, experts, and other honored guests. Develop suggestions for appropriate behavior. For example, it is the tradition to serve Elders and honored guests or have them go first when serving refreshments. Make sure they have a place to sit. After the Elders come younger guests & very young children. Young people honor the dignity of a celebration by helping out however they can and waiting their turn. These manners are part of learning how to live the right way as human beings.

TEACHER NOTES: SECTION FIVE

TIME PERMITTING:

ACTIVITY TWO. Students look at plants from the sea and discuss their uses with Elders and experts.

Inside/outside activity
Estimated duration: 40-60 minutes field observation plus travel time

ACTIVITY THREE. Students make a food web

Inside activity
Estimated duration: 30-40 minutes

For activities that explore food chains and food webs in Alaska, see these Alaska Wildlife Curriculum Teacher's Guides, Alaska Department of Fish and Game, 1995. *Alaska's Tundra & Wildlife* "Survival Links" and "Tundra Connections." pages 99-122. *Wildlife for the Future* has a variety of activities. *Alaska Ecology Cards* describe what 270 organisms eat and are eaten by, as well as other facts.

There are many activities and explanations of food chains and food webs on the World Wide Web. Turn your browser's search engine to "food chain" and "food web" to locate resources. These are a few:

http://www.si.edu/sites/educate/troprain/foodchai.htm

http://www.alienexplorer.com/ecology/topic4.html

http://www.geocities.com/Heartland/Ranch/2200/foodchains.htm
(includes interactive food web work sheet)

http://www.planetpals.com/foodchain.html

Assessment opportunity: Student describes 3 links in a simple food chain from the region to the teacher.

Teacher Assessment Rubric, Section Five Date:

Name of student: _____

	1 Always	2. Sometimes	3. Never
Student: Completes work.			
Is Respectful of values.			
Is Respectful of Elders.			
Understands the information.			

Section Five

A community celebration concludes the unit with students sharing their projects and information.

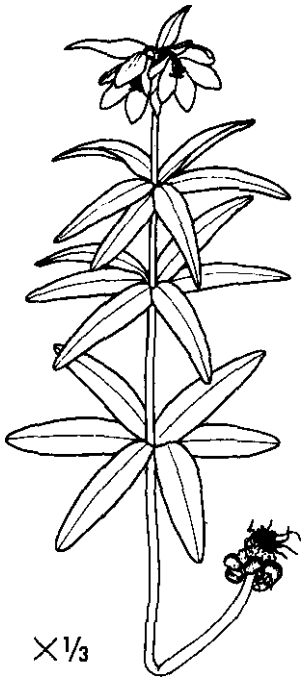
SECTION FIVE

Anĝaĝiisix̂ matanaan imin ix̂amnakux̂. Anaĝix̂ ukunachin imchin ugutaasaamchim aĝnax̂txichin. (E)
Anĝaĝiisiin sigax̂ imis akux̂ mal sigaan inixsiisada. (W)
Life is gifted to you. What you make of it is your gift in return.

ACTIVITY ONE. You can prepare for a community celebration.
It's time to invite the Elders and all who have helped you into the school for a celebration of your region's plants. You can share what you know with them and with others in your community who might learn from your work.

Make a list of everyone to invite and decide how you want to deliver the invitations: posters, banners, signs, letters, phone calls. Prepare and deliver your invitations.

Plan to show your guests your Class Herbarium. Arrange to display your log books, your hammered leaf projects,



Fritillaria camschatcensis
Alugam kangaa (UT 230)
(overground portion of)
Alugax̂ (UT 57)
(root bulb of)
Saranax̂ E (UT 353)[Russian loan]
Stinky flower, chocolate lily, black lily

"During sealing season we would dig the roots of stinky flower. The plants were in limited quantities on St. Paul Island, so we would have to dig a lot to make a meal. The roots were sandy and had to be washed over and over and then soaked for several days. When our mother boiled the seal meat, she would also boil the roots in a separate pot and mash them. The boiled roots would be divided into two pots, and one would be mixed with sweetened condensed milk for the children and one mixed with seal oil for the parents."
Mary Bourdukofsky, *Unangan* Elder from St. Paul

Sophie Sherebernikoff remembers not liking the taste of Saranax̂ (also known as Alugam kangaa, the Stinky flower, Fritillaria camschatcensis) because it was bitter. Her mother told her that while the ones that grow in Unalaska tasted bitter, the ones that grow in Nikolksi would taste sweet.
Sophie Sherebernikoff, *Unangan* Elder from Unalaska

VOCABULARY

Aagamagnax̂ W (UT 2) (aah gham AAG nah): Elder
Ludaaĝix̂ (UT 257) (loo THAAH ghih): Elder
Ukaanuxtax̂ E (UT 427 #3) (uk aahn NUHK tah): Elder

aĝaasax̂ E (UT 31) (ah GHAAS eh): gift
aĝaazax̂ W (UT 31) (ah GHAAZ eh): gift
sigax̂ W (UT 357) (segh ah): gift

anĝaĝiisix̂ (UT 75) (ang gha GHEES ih): life

kamxax̂ (UT 227) (KUM kah): celebration

udigasalix E (UT 416) (oothe igh (ah) SA lih): to share
udixs W (UT 416) (OOTHE ihs): to share
udigda W (UT 416) (oo THIG thah): share
udigdada E (UT 416) (oo thig THAH thah): share

Unangam Anĝaĝiisingin E (Galaktionoff: 2001)
(oo NUNG am • an ghah ghee SING in): traditional knowledge of *Unangan*

Unangam Anĝaĝiisingis W (Dirks: 2001) (oo NUNG am • an ghah ghee SING is): traditional knowledge of *Unangas*

carnivore
consumer
detritivore
food chain
food web
herbivore
lichen
pollution
primary consumer
producer
secondary consumer

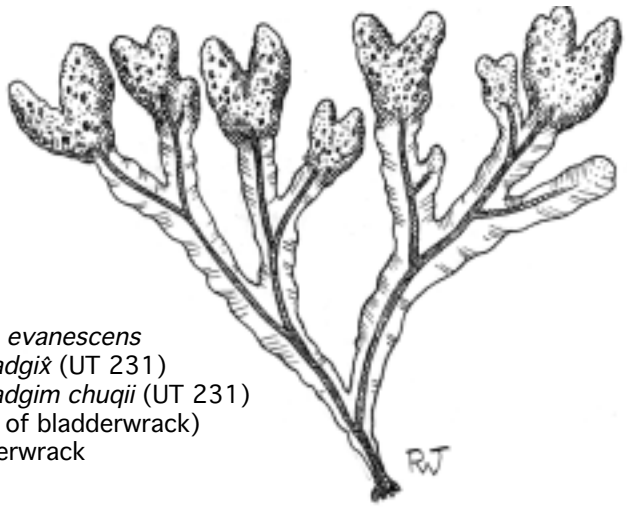
seed posters, and other activities. Complete any science fair entries. Do the final work on all your experiments and practice describing your results in brief oral presentations. Finish any other projects you have done with this plant study and rehearse explaining them to your guests.

Discuss the ways that you will welcome your honored guests into the classroom. What arrangement should you make for them? How should you show respect for your guests? If the season is appropriate, arrange to prepare special treats for your guests from local plant foods. Remember that you are survivors of an “earthquake” and you know how to use wisely the resources of your area.

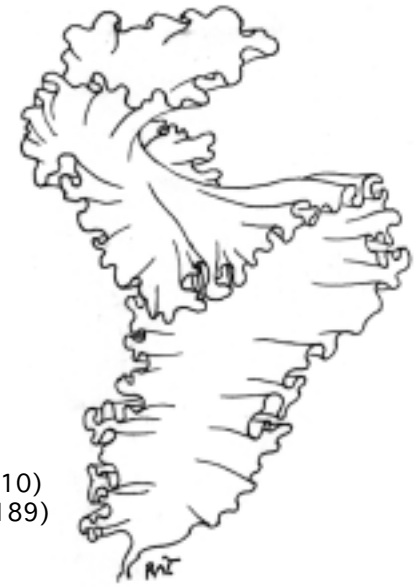
After all the invitations have been sent out and you are prepared for the community celebration, time permitting, begin these additional activities.

ACTIVITY TWO. You can learn about plant foods from the sea.
Plants from the sea provide many important foods also. Can you find these plants near your school? Ask your Elders and other experts what they know about using these plants from the sea. (illustrations) Record your information in your log books.

Nereocystis luetkeana
Tmagix̂ (UT 399)
bull kelp



Fucus evanescens
Kangadgix̂ (UT 231)
Kangadgim chuqii (UT 231)
(stalk of bladderwrack)
Bladderwrack



Ulva sp.
iiqux̂ E (UT 210)
iklux̂ W (UT 189)
Sea lettuce

Sea lettuce:
"We used this sea plant for a lot of things. We would gather it in the summer and dry in the attic on cardboard. Then when it was dry, we would put it in a clean cloth flour or sugar sack to store through the winter. Mom would sprinkle it on whenever she boiled rice or made stew. When dry, they are dark. When it gets wet, it turns green again."

When it was a nice day for a beach picnic, Mom used to boil a kettle or take one to boil outside to make tea. Then we would gather aĝugnan (UT 30) (uh WOOGH nun), sea eggs, (sea urchins) to have with crackers or bread. We ate them raw out of the shell and they tasted sweet. They were almost like a dessert. We also liked to eat chiim(i)kaayun (cheem KAYE yoon), E (UT 14), tiny snails, Litorina sitkana.

Mary Bourdukofsky, *Unangan* Elder from St. Paul

As you enjoy your region's foods with your community, think about the many ways these foods nourish all animals.

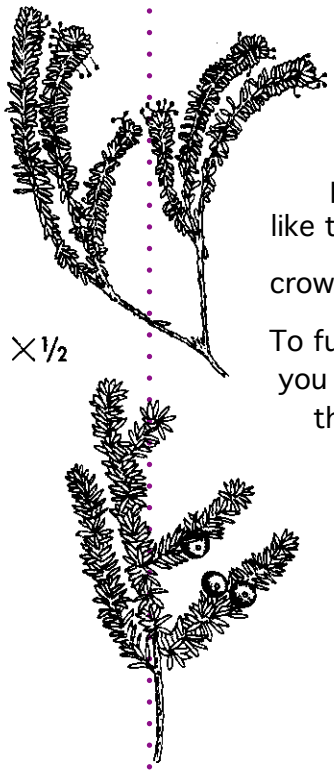
Remember, animals (humans included) cannot make their own food. They get their food by eating plants or animals that have eaten plants. Plants are known as **producers** in the **food chain**. Willow is an example of a producer. All others are known as **consumers** in the food chain. The **primary consumers** eat only plants; they are called **herbivores**. Ptarmigan are an example of herbivores. They eat the buds of willow and other plants. The consumers that eat the herbivores are called **carnivores**. Foxes are an example of carnivores. They eat ptarmigan, lemmings and small birds. A diagram of this three-part food chain would look like this:

crowberry ← vole ← fox

To further complete the chain, you could add the **detritivores**, those who eat dead plants and animals.

A food chain is just one part of a **food web**. Who or what eats the plants in your region? Have you seen insects eating the plants when you visited the habitats? Who or what eats the insects? Who or what eats the insect-eaters?

Are birds or hares or voles eating the plants in your region? Who or what eats the birds or hares or voles?



Empetrum nigrum
Qaayum qaxchikluu E (UT 314)
(blackberry)
Aangsux̂ W (UT 90)
Qaayux̂ (UT 314)
Kidnam qaayuu (UT 237)
(bush of moss)
Crowberry, mossberry, blackberry

ACTIVITY THREE. You can make a food web

With your class, list all the plants you can now name now on the left side of a large sheet of paper. leave space between each plant because your other lists might become long. Label this first list "producers." Then make a second list next to it. This list is "consumers: herbivores," the plant eaters. Write each eater's name by the plant or plants it eats. Write your list in the column going down so that you can connect it to the third list. Then make a third list of "consumers: carnivores." This is the list of the animals (include the insects and birds and sea life and humans) that eat the herbivores. Some names will be in both lists. Draw an arrow pointing from the "eater" to the "eaten."

You may need to take a short break from the class discussion and look in your library or on the World Wide Web to build your lists.

Make a sign for each producer and consumer on your lists. Color code the signs for each of the three categories: producer, herbivore, or carnivore. Each class member wears a sign, holding it on with yarn around the neck or by pinning the sign on clothes. One student should be designated the sun and begins the food web, holding onto one end of a ball of yarn. The sun passes the yarn to a student wearing a sign for the producer. Start with one producer at a time. The plant person (or persons) passes the yarn s/he has on to an eater of the plant, based on the class list you made. The yarn is passed from eaten to eater until all eaters and foods are connected. Look at all the places the yarn crosses

over. Look at the ways the yarn connects to many things or to only one thing. What happens if the yarn connection is broken because one of the foods disappears? You can show this by cutting the yarn with scissors and then consider what that animal will eat instead.

Each time you build a food web with another producer, change the roles around so that the same people are not always "eaten."

EXTENSIONS:
ACTIVITY A.

Before the community celebration, read again "The Right Way to Live as an *Unangax̂*" (Appendix). Choose one guideline to illustrate on a small poster that will be part of the welcoming display showing the way to the celebration.

ACTIVITY B.
You can find more information on the World Wide Web about food webs. Turn your browser's search engine to "food chain" and "food web" to locate resources.

ACTIVITY C.
How does pollution affect your

plant's region and your local wild food?

Although called a "moss" reindeer moss is actually a **lichen**. It is known to have many uses. Ask your Elders or local experts what they know about reindeer moss.

To understand more about lichens, you might want to look at this web site for lively illustrations

http://mgd.nacse.org/hyperSQL/lichenland/index.html

Lichens are also important in measuring the **pollution** in a region. For example, look at:

"Lichens and Acid Rain" in *Alaska's Tundra & Wildlife*: Alaska Wildlife Curriculum Teacher's Guide, Alaska Department of Fish and Game, 1995. page 133.

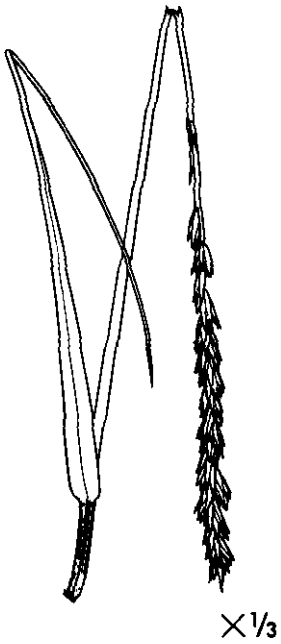
ACTIVITY D.

You can consult a Web site for information about nutrition in wild foods.

See: Alaska Traditional Knowledge and Native Foods database http://www.nativeknowledge.org/db/nutriout.asp

Cladina rangiferina
Huquqlux̂ W (UT 449)
Itx̂aygim kidngaa E (UT 237)
Kigyam aliĝa Attuan (UT 237)
Reindeer moss

Section Five Date: Name of student: _____	1 Always	2. Sometimes	3. Never
I completed all my work.			
I was respectful of Elders.			
I understood the information.			
The next time I study plants, I would like to do the following in a different way:			



Leymus mollis
formerly known as
Elymus mollis
Tix̂yux̂ E (UT 398)
Tiĝyux̂ W (UT 398)
(basket grass)
Wild rye, beach rye

Unangan Elder, Nick Galaktionoff, formerly of Makushin village on Unalaska Island said, "My grandmother and my mom used to make small grass baskets. They made grass rugs and window blinds too. No one does that anymore. My mom got good, long grass like they have at Eider Point and Little South America." They cut fresh grass and stored it in the warehouse to dry. Dry grass has the best smell inside. When they needed grass for the floor of the ulax̂ or sod home, they would bring it in from the warehouse and spread it on the floor. "It smelled like fresh air inside," Nick said. "I like that smell!" You would use it two or three times and then change it when you wanted it to be nice and fresh.

Nick Galaktionoff, *Unangan* Elder from Unalaska

YOU CAN HELP DOCUMENT *UNANGAM TUNUU* KNOWLEDGE OF THE LANGUAGE AND PLANTS:

This text gives an appropriate word when possible in Eastern and Western dialects. You may find that there is a sub-dialect word in your area for those listed. Write it down. If you can find the correct spelling, time period and place in *Aleut Dictionary/Unangam Tunudgusii*, include them with the page number.

If you find that an Elder or *Unangam tunuu* speaker can positively identify a plant with a name in the language that has not been recorded, write it down as well as you are able. Include the Latin name and whether it was identified from a real plant or a picture. If it is from a picture, specify the text source.

Please provide contact information for the speaker so that we can have a linguist or botanist contact him or her, if necessary. Include the speaker's full name, place of origin and the date. Send to: Barbara Carlson, AUE, PO Box 220196, Anchorage, AK 99522-0196 or contact us at fnblc@uaf.edu, so we can include it in future work such as sound bites for the Internet.

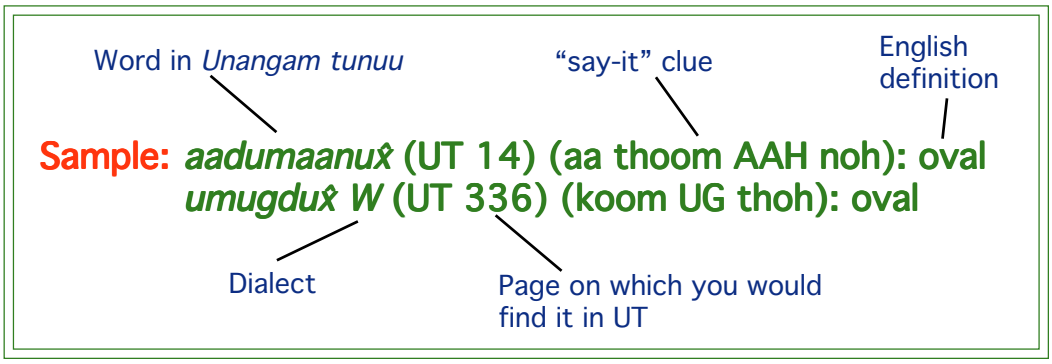
NOTES:

Appendix A

APPENDIX GLOSSARY

UNANGAM TUNUU / ENGLISH

For words in *Unangam tunuu* E = Eastern dialect and W = Western dialect.
If no designation is noted, the words are familiar in both.
[r] = Russian loan word.
UT refers to the page number on which the word is found in *Aleut Dictionary/Unangam Tunudgusii*.



Unangam tunuu **dialect (Dictionary page) (say-it) English**

aadumaanux̂ (UT 14) (aa thoom AAH noh): oval
qumugdux̂ W (UT 336) (koom UG thoh): oval

Aagamagnax̂ W (UT 2) (aah gham AAG nah): Elder
Ludaaĝix̂ (UT 257) (loo THAAH ghih): Elder
Ukaanuxtax̂ E (UT 427 #3) (uk aahn NUHK tah): Elder

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

aĝaasax̂ E (UT 31) (ah GHAAS eh): gift
aĝaazax̂ W (UT 31) (ah GHAAZ eh): gift
sigax̂ W (UT 357) (segh ah): gift

aĝadax̂ E (UT 36) (uh RUH thuh): sun
aĝadgix̂ W (UT 36) (uh RUHTHE gegh): sun

anĝaĝiisix̂ (UT 75) (ang gha GHEES ih): life

angunax̂ (UT 91) (ung OO nah): large

atxax̂ (UT 108) (ATK ah): smooth

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

chaaskax̂ E (UT 132) (CHAAHS kah): cup
chaasxix̂ W (UT 132) (CHAAHS kheh): cup

changanax̂ (UT 131) (chung AHN uh): valley

chidĝaayu(m) tuduu E (UT 401) (chithe GUY yoo(m) • too THUU): purple
uluudam qaxchikdaa W (Dirks, 2001) (oo LOO thum • kagh CHIK thaah): purple

APPENDIX GLOSSARY

chidĝaayux̂ E (UT 135) (chidthe GUY yoh): blue
chidĝix̂ W (UT 135) (CHIDTHE gegh): blue

chidĝix̂ E (UT 135) (CHIDTHE gegh): green
chidĝaayux̂ W (UT 135) (chidthe GUY yoh): green

chiĝuudngix̂ E (UT 139) (chih GOOTHE ngeh): flower
aahmaax̂ W (UT 63) (AAH hmaah): flower

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

chiimluudax̂ E (UT 142) (cheem LOO thah): field, meadow
chaamluudax̂ W (UT 142) (chaahm LOO thah): field, meadow
tanasxax̂ (UT 390) (ton USK ah): field, meadow

chix̂ilĝix̂ E (UT138) (chih HIL gheh): bog
chiĝilĝix̂ W (UT 138) (chig RIL gheh): bog

chix̂tax̂ (UT 138) (CHIH tah): rain

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

chuguulĝun E (UT 152) (choo GHOOL ghun): gravel
quganaalĝis W (UT 332) (kugan AHL ghis): gravel

chugux̂ (UT 151) (CHEUGH oh): sand

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

chumnugim qaxchikluu E (Dirks, 1992) (chum NUH gim • kagh chik LOO): brown
chumnugim qa(x)chikdaa W (Dirks, 2001) (chum NUH gim• kah CHIK thaah): brown

chumnugix̂ (UT 153) (choom NUH gegh): yellow

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

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

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

dax̂sxix̂ W grain (UT 160) (THAH skegh): grain, seed
daax̂sxis W (UT 160) (THAH skis): grains, seeds

hitnisangin E (UT 216) (hit nee SUNG in): plants
hitnisangis W (UT 216) (hit nee SUNG is): plants

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

inix̂ E (UT 201) (iH nyih): sky
inkax̂ W (UT 202) (iN kah): sky

inkamaaĝux̂ E (UT 202) (in kah MAAH roh): cloud
inkamiiĝux̂ W (UT 202) (in kah MEEH roh): cloud

APPENDIX GLOSSARY

kamxax̂ (UT 227) (KUM kah): celebration

kanuuyax̂ [r] (UT 230) (ka NOO yah): orange

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

listax̂ [r] (UT 256) (LEE stuh): petal

qiiĝuusix̂ E (UT 238) (keoh GHOO segh): mountain
kiiĝuusix̂ (UT 238) (kihg GHOO segh): mountain

qaasax̂ E (UT 311) (KAAH sah): seed
qalax̂ (UT 302) (say KAH-lah): seed

qachx̂idigax̂ E (UT 292) (kach kidth IG gah): smooth
qachx̂izigax̂ W (UT 292) (kach kiz IG gah): smooth

qalaa (UT 301) (kah LAA): bottom

qaxchiklux̂ E (UT 296) (kahk CHIK loh): black
qaxchikdax̂ W (UT 296) (kahk CHIK thah): black

qihmadgux̂ E (UT 43, 324) (kih MOTHE goh): round
akamudigax̂ W (UT 43) (aka moogh EE thah): round

qumax̂ E (UT 335) (KOO mah): white
quhmax̂ W (UT 335) (KOO hmah)

quumhlaakdax̂ E (UT 336) (koom HLOCK thah): gray, silvery
quuhmliix W (Dirks, 2001) (koom LEEH): gray

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

siriivrax̂ W [r] (UT 360) (sir EEV rah): silver

slux̂ (UT 368 #3) (SLOOH): habitat
tanax̂ (UT 388) (TA nah): habitat

suulutux̂ E [r] (UT 377) (SOO luh toh): gold
zuulutux̂ W [r] (UT 377) (ZOO luh toh): gold

taangax̂ (UT 292) (TAAHN gah): water

talĝin E (UT 386) (TAHL ghin): branches
talĝis W (UT 386) (TAHL ghis): branches

tngux̂ E (UT 400) (tng oh): hard
tungax̂ W (UT 409) (toong ah): hard

tugumax̂ E (UT 402) (toogh OOM ah): beach
agux̂ W (UT 30) (AH ghoh): beach

udigasalix E (UT 416) (oothe igh (ah) SA lih): to share
udixs W (UT 416) (OOTHE ihs): to share
udigda W (UT 416) (oo THIG thah): share
udigdada E (UT 416) (oo thig THAH thah): share

APPENDIX GLOSSARY

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

uluudam tudagii W (UT 401) (oo LOO thum • too THAG ee): pink

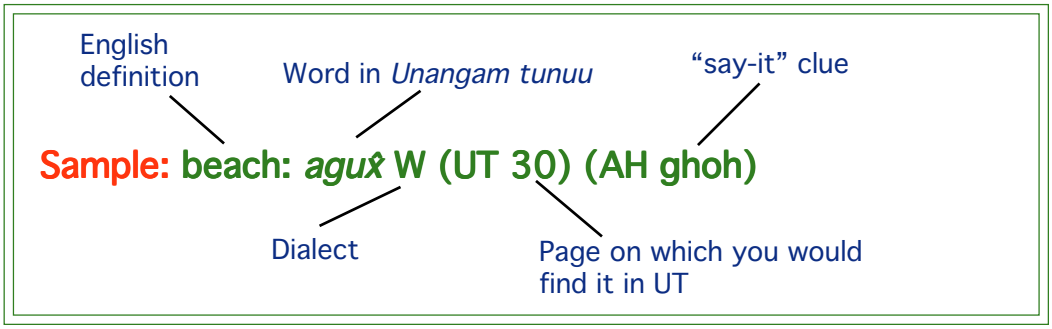
uluudax̂ (UT 436) (oo LOO thah): red

Unangam Anĝaĝiisingin E (Galaktionoff: 2001) (oo NUNG am • an ghah ghee SING in): traditional knowledge of Un*angan*

Unangam Anĝaĝiisingis W (Dirks: 2001) (oo NUNG am • an ghah ghee SING is): traditional knowledge of *Unangas*

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

yulix̂ E (UT 465) (YOO legh): leaf
siĝlix̂ W (UT 359) (SIHGH legh): leaf



ENGLISH / *UNANGAM TUNUU*

English ***Unangam tunuu*** **dialect** **(Dictionary page)** **(say-it)**

beach: *agux̂* W (UT 30) (AH ghoh)
beach: *tugumax̂* E (UT 402) (toogh OOM ah)

black: *qaxchikdax̂* W (UT 296) (kahk CHIK thah)
black: *qaxchiklux̂* E (UT 296) (kahk CHIK loh)

blue: *chidĝaayux̂* E (UT 135) (chidthe GUY yoh)
blue: *chidĝix̂* W (UT 135) (CHIDTHE gegh)

bog: *chix̂ilĝix̂* E (UT138) (chih HIL gheh)
bog:*chiĝilĝix̂* W (UT 138) (chig RIL gheh)

boots, two: *bruudnax* [r] (p 123) (BROOD neh)

bottom: *qalaa* (UT 301) (kah LAA)

branches: *talĝin* E (UT 386) (TAHL ghin)
branches: *talĝis* W (UT 386) (TAHL ghis)

APPENDIX GLOSSARY

brown: *chumnugim qaxchikluu* E (Dirks, 1992) (chum NUH gim • kagh chik LOO)
brown: *chumnugim qa(x)chikdaa* W (Dirks, 2001) (chum NUH gim• kah CHIK thaah)

celebration: *kamxax̂* (UT 227) (KUM kah)

cloud: *inkamaaĝux̂* E (UT 202) (in kah MAAH roh)
cloud: *inkamiiĝux̂* W (UT 202) (in kah MEEH roh)

cup: *chaaskax̂* E (UT 132) (CHAAHS kah)
cup: *chaasxix̂* W (UT 132) (CHAAHS kheh)

Elder: *Aagamagnax̂* W (UT 2) (aah gham AAG nah)
Elder: *Ludaaĝix̂* (UT 257) (loo THAAH ghih)
Elder: *Ukaanuxtax̂* E (UT 427 #3) (uk aahn NUHK tah)

field (meadow): *chiimluudax̂* E (UT 142) (cheem LOO thah)
field (meadow): *tanasxax̂* (UT 390) (ton USK ah)
field, meadow: *chaamluudax̂* W (UT 142) (chaahm LOO thah)

flat: *achiigusaadax̂* E (p 105) (a cheegh oo SAH thah)
flat: *ichaaqidax̂ W* (UT 170) (each aahk EE theh)

flower: *aahmaax̂* W (UT 63) (AAH hmaah)
flower: *chiĝuudngix̂* E (UT 139) (chih GOOTHE ngeh)

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

gift: *aĝaasax̂* E (UT 31) (ah GHAAS eh)
gift: *aĝaazax̂* W (UT 31) (ah GHAAZ eh)
gift: *sigax̂* W (UT 357) (segh ah)

gold: *suulutux̂* E [r] (UT 377) (SOO luh toh)
gold: *zuulutux̂* W [r] (UT 377) (ZOO luh toh)

grain, seed: *dax̂sxix̂* W grain (UT 160) (THAH skegh)
grains, seeds: *daax̂sxis* W (UT 160) (THAH skis)

gravel: *chuguulĝun* E (UT 152) (choo GHOOL ghun)
gravel: *quganaalĝis* W (UT 332) (kugan AHL ghis)

gray, silvery: *quumhlaakdax̂* E (UT 336) (koom HLOCK thah)
gray: *quuhmliix* W (Dirks, 2001) (koom LEEH)

green: *chidĝix̂* E (UT 135) (CHIDTHE gegh)
green: *chidĝaayux̂* W (UT 135) (chidthe GUY yoh)

habitat: *slux̂* (UT 368 #3) (SLOOH)
habitat: *tanax̂* (UT 388) (TA nah)

hard: *tngux̂* E (UT 400) (tng oh)
hard: *tungax̂* W (UT 409) (toong ah)

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

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

large: *angunax̂* (p 91) (ung OO nah)

APPENDIX GLOSSARY

leaf: *siĝlix̂* W (UT 359) (SIHGH legh)
leaf: *yulix̂* E (UT 465) (YOO legh)

life: *anĝaĝiisix̂* (UT 75) (ang gha GHEES ih)

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

mountain: *kiiĝuusix̂* (UT 238) (kihg GHOO segh)
mountain: *qiiĝuusix̂* E (UT 238) (keoh GHOO segh)

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

orange: *kanuuyax̂* [r] (UT 230) (ka NOO yah)

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

petal: *listax̂* [r] (UT 256) (LEE stuh)

pink :*uluudam tudagii* W (UT 401) (oo LOO thum • too THAG ee)

plants: *hitnisangin* E (UT 216) (hit nee SUNG in)
plants:*hitnisangis* W (UT 216) (hit nee SUNG is)

purple: *chidĝaayu(m) tuduu* E (UT 401) (chithe GUY yoo(m) • too THUU)
purple: *uluudam qaxchikdaa* W (Dirks, 2001) (oo LOO thum • kagh CHIK thaah)

rain: *chix̂tax̂* (UT 138) (CHIH tah)

red: *uluudax̂* (UT 436) (oo LOO thah)

round: *akamudigax̂* W (UT 43) (aka moothe EE gah)
round: *qihmadgux̂* E (UT 43, 324) (kih MOTHE goh)

sand: chu*gux̂* (UT 151) (CHEUGH oh)

seed, crumb: *hitxulix̂* (UT 215) (hit HOO legh)
seed: *qaasax̂* E (UT 311) (KAAH sah)
seed: *qalax̂* (UT 302) (say KAH-lah)
seed: *siimax̂* E [r] (UT 361) (SEE mah)
seed: *siiminax̂* W [r] (UT 361) (seom IN ah)
seeds, *lit.* flower scabs: *chiĝuudngim qadungin* E (UT 293) (chih ROOTHE ngim • kahthe OONG in)

share: *udigda* W (UT 416) (oo THIG thah)
share: *udigdada* E (UT 416) (oo thig THAH thah)

silver: *siriivrax̂* W [r] (UT 360) (sir EEV rah)

sky:*inix̂* E (UT 201) (iH nyih)
sky:*inkax̂* W (UT 202) (iN kah)

small: *chuqudax̂* W (UT156) (chuh KUH thah)
small: *daax̂sxituud(a)lakan* E (UT 160) (thah skit toothe LA kan)

smooth: *atxax̂* (UT 108) (ATK ah)
smooth: *qachx̂idigax̂* E (UT 292) (kach kidth IG gah)
smooth: *qachx̂izigax̂* W (UT 292) (kach kiz IG gah)

APPENDIX GLOSSARY

sock: *chuulkix̂* [r] (UT 153) (CHOOL kegh)

sun: *aĝadax̂* E (UT 36) (uh RUH thuh)
sun: *aĝadgix̂* W (UT 36) (uh RUHTHE gegh)

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

to share: *udigasalix* E (UT 416) (oothe igh (ah) SA lih)
to share: *udixs* W (UT 416) (OOTHE ihs)

traditional knowledge of *Unangan: Unangam Angagiisingin:* E (Galaktionoff: 2001)
(oo NUNG am • an ghah ghee SING in)
traditional knowledge of *Unangas: Unangam Angagiisingis* W (Dirks: 2001)
(oo NUNG am • an ghah ghee SING is)

valley: *changanax̂* (UT 131) (chung AHN uh)

water: *taangax̂* (UT 292) (TAAHN gah)

white: *qumax̂* E (UT 335) (KOO mah)
white: *quhmax̂* W (UT 335) (Koo hmah)

yellow: *chumnugix̂* (UT 153) (choom NUH gegh)

PLANT GLOSSARY:

alternate: Leaves that grow one above the other on opposite sides of a stem, not in pairs.
angiosperms: Plants that carry their seeds in fruits (cf. gymnosperm).
annuals: Plants that go through their whole life cycle in one growing season.
atom: One of the basic units of matter.
basal: Leaves at or near the bottom of the stem.
biennial: A plant that needs two growing seasons to complete its life cycle.
bonds: The links between atoms when they form molecules.
botanist: Plant scientist.
bulblet: A rounded part of a plant usually found underground.
carbon: a common element which occurs with other elements in all plants and animals. Its chemical symbol is C.
carbon dioxide: A gas in the air that is changed into food for the plant through photosynthesis. Its chemical formula is CO2.
carnivore: A consumer that eats other animals.
catkin: The flowering part of some plants such as willows.
cell wall: The stiff outer layer of a plant cell.
chemical formula: The sets of letters and numerals that scientists use to show the composition of molecules.
chlorophyll: The green pigment that helps plants make food from the energy in sunlight.
chloroplast: The green body in a plant cell that contains chlorophyll.
chromosomes: Found in the cell nucleus, they contain the instructions for the

APPENDIX GLOSSARY

development of the next generation.

constant: A condition that does not change, especially in an experiment.

consumer: In a food chain, the one who eats the producer.

cotyledon: Seed leaves that store food for the seed's first growth.

cytoplasm: The material enclosed by the cell wall except for the nucleus.

detritivore: In a food chain, those who eat dead or decaying matter.

dominant: In a plant community, the most numerous kind of plant.

dormant: Inactive.

embryo: The seed part that is the beginning of the new plant.

epicotyl: The part of the plant embryo that will become the stem, leaves, flowers and fruit.

food chain: Flow of energy from the sun to green plants to animals.

food web: Network of food chains.

fruit: The mature, ripe part of the plant that contains the seeds.

germination: Beginning of growth by a seed.

gymnosperms: Plants that carry their seeds in cones.

habitat: The environment need by a particular species for its survival.

herbarium: A collection of plant specimens.

herbivore: A consumer that eats only plants.

hydrogen: The most abundant element in the universe; a tasteless, odorless gas. The hydrogen atom is the smallest and simplest atom known. The chemical symbol is H.

hypocotyl: The part of the plant embryo that will become the lower stem and root.

hypothesis: In an experiment, the idea to be tested.

lichen: Plant-like combination of a fungus and algae.

lobed: Leaf edges that have deep indentations.

margins: In leaves, the edges.

mitochondria: The power factories for a plant cell that change food into energy so that the cell can grow, divide, and do its work.

molecule: One of the basic units of matter, made up of two or more linked atoms.

mordants: chemicals that help a dye keep from fading.

nectar: Sugary liquid produced by plants, usually in the flower.

node: Place where a leaf connects to a stem.

nucleus: The control center for a cell.

observation: Carefully looking at something; using facts to describe something.

opposite: Leaf arrangement in pairs on each side of the stem.

ovaries: The swollen part of the pistil that contains the seeds.

oxygen: A chemical element (atom) with the symbol O. A life-supporting gas with the chemical formula O_2.

palmate: Branching leaf vein pattern coming from the base of the leaf.

parallel: Leaf vein pattern from base to tip.

perennial: A plant that lives from year to year.

petal: A flower part that is usually colored.

phloem: The tube that carries food (sugars) made in the leaves to the rest of the

APPENDIX GLOSSARY

plant.

photosynthesis: The process of plants making their own food. “Putting together with light.”

pinnate: Branching leaf vein pattern coming from the mid-vein.

pistil: The female part of the flower that produces seeds.

pollen: The yellow powder found on the stamens.

pollution: Impure, contaminated.

primary consumer: In a food chain, the plant-eaters.

producer: In a food chain, those who make food out of non-living matter such as sunlight, minerals, and air.

respiration: In plants, the breakdown of food for energy.

secondary consumer: In a food chain, the meat eaters.

seed coat: The protective outer layer of a seed.

seed: The part of a flowering plant that will grow into a new plant under the right conditions.

sepals: The outermost flower structure that usually encloses and protects the other flower parts.

smooth or **entire**: Leaf edges that are not cut or toothed.

solar: From the sun.

specimen: One example of a whole group.

stamen: The male part of a flower that produces pollen.

stationary: Not moving.

stomata: Tiny pores on leaves through which oxygen, carbon dioxide and water pass. (s. stoma)

subjective: Opinion.

toothed: Leaf edges that have indentations.

transpiration: Water loss through the stomata.

vacuole: Fluid-filled part of plant cell that helps keep the cell rigid.

variable: A condition that changes, especially in an experiment.

vein: Branching parts in a leaf that carry water and food and help support the leaf.

whorled: Three or more leaves arranged wheel-like around the stem.

xylem: The tube that carries water and minerals from the roots throughout the plant.

APPENDIX RESOURCES

PLANT IDENTIFICATION GUIDES, FIELD GUIDES

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

Heller, Christine A. *Wild Edible and Poisonous Plants of Alaska*. Fairbanks: Cooperative Extension Service, UAF, 1993.

Heller, Christine A. *Wild Flowers of Alaska*. New York: Odyssey Press, 1964.

O'Clair, Rita M. and Sandra C. LIndstrom. *North Pacific Seaweeds*. Auke Bay AK: Plant Press, 2000.

Pratt, Verna E. *Field Guide to Alaskan Wildflowers*. Anchorage: Alaskakrafts Publishing, 1989.

Schofield, Janice J. *Alaska's Wild Plants*: *A Guide to Alaska's Edible Harvest.* Seattle: Alaska Northwest Books, 1995.

White, Helen, Editor. *Alaska Yukon Wild Flowers Guide*. Anchorage: Alaska Northwest Books, 1974.

Hultén, Eric. *Flora of Alaska and Neighboring Territories: A Manual of the Vascular Plants.* Stanford CA: Stanford University Press, 1968. This is the most authoritative plant identification reference for Alaska.

Alaska Rare Plant Field Guide http://www.uaa.alaska.edu/enri/rareguide/index.html

General:

Pielou, E. C. *A Naturalist's Guide to the Arctic*. Chicago: University of Chicago Press, 1994.

USING PLANTS

Garibaldi, Ann. *Medicinal Flora of the Alaska Natives*. Anchorage: Alaska Natural Heritage Program. University of Alaska Anchorage, 1999.

Kari, Priscilla Russell. *Tanaina Plantlore/Dena'ina K'et'una: An Ethnobotany of the Dena'ina Indians of Southcentral Alaska.* Fairbanks: Alaska Native Language Center with Alaska Natural History Association and National Park Service, 1991.

Schofield, Janice J. *Discovering Wild Plants*: *Alaska, Western Canada, the Northwest* Seattle: Alaska Northwest Books, 1989.

Viereck, Eleanor G. *Alaska's Wilderness Medicines.* Seattle: Alaska Northwest Books, 1994. This information is also available on the Web through the ANKN site: http://www.ankn.uaf.edu/viereck/index.html

Unalaska High School. *Cuttle-Fish One*. Unalaska, Alaska, 1977.

Kojee educator's ethnobotany web site with lesson plan: http://www.pressenter.com/~breck/index.htm

Video: "Arctic Harvest," may be purchased from the North Slope Borough, PO Box 69, Barrow, AK 99723. It is available in Inupiaq and English. You will need to specify which you want

Dyeing with Plants

Adrosko, Rita J. *Natural Dyes and Home Dyeing*. New York: Dover Publications, Inc., 1971.

Brooklyn Botanic Garden. *Dye Plants and Dyeing—a Handbook*. Brooklyn NY, 1964.

APPENDIX RESOURCES

Lesch, Alma. *Vegetable Dyeing*. New York: Watson Guptill Publications, 1970.

Supplies:
http://www.joyofhandspinning.com/mordants.html
http://www.thewoolery.com/fibers.html

Basket Weaving
Lynch, Kathy. *Aleut Basket Weaving.* Anchorage: University of Alaska Anchorage, 1977.

EXPERIMENTS, PROJECTS AND SCIENCE FAIR ACTIVITIES

Fast Plants™ materials may be ordered from:

Carolina Biological Supply company
2700 York Road
Burlington NC 27215
Call toll-free 800-334-5551
www:carolina.com
If you choose to use Fast Plants™, you will want to order *Brassica rapa* seeds WW-15-8804, pack of 50 and the manual, Exploring with Wisconsin Fast Plants, WW-15-8951

For more informtion about Fast Plants™:
http://www.fastplants.org/

Burnie, David. *How Nature Works. A Reader's Digest Book.* London: Dorling Kindersley, Ltd., 1991.

Pascoe, Elaine. *Seeds and Seedlings.* Woodbridge CT: Blackbirch Press, Inc., 1997.

Van Cleave, Janice. Publisher John Wiley & Sons, Inc, New York:
A+ Projects in Biology, 1996.
Biology for Every Kid, 1990.
Ecology for Every Kid, 1996.
Guide to More of the Best Science Fair Projects, 2000.
Guide to the Best Science Fair Projects, 1997.
Plants, 1997.

Alaska Department of Fish and Game, Division of Wildlife Conservation: Alaska Wildlife Curriculum Teacher's Guides, 1995.
Alaska's Tundra and Wildlife;
Wildlife for the Future;
Alaska's Forests & Wildlife;
and the *Alaska Ecology Cards.*

Science Fair, experiments and Janice Van Cleave site:
http://school.discovery.com/sciencefaircentral/scifairstudio/handbook/scientificmethod.html

http://www.ipl.org/youth/projectguide/

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PLANT PRESSES, HERBARIUM

DiNoto, Andrea, and David Winter. *The Pressed Plant*. New York. stewart, tabouri & chang, 1999.

Supplies:

Pacific Papers
15702 119th Ave. NE
Bothell WA
(800) 676-1151
http://www.pacific-papers.com/

Herbarium Supply Company
3483 Edison Way
Menlo Park CA 94025
(800) 348-2338
http://www.herbariumsupply.com

http://www.emilycompost.com/herbarium.htm

http://www.mobot.org/MOBOT/Research/Library/liesner/pressing.html

GREAT PICTURES, GOOD IDEAS

Caduto, Michael J. and Joseph Bruchac. *Keepers of Life. Discovering Plants Though Native American Stories and Earth Activities for Children*. Golden CO: Fulcrum Publishing, 1994.

Diehn, Gwen and Krautwurst, Terry. *Nature Crafts for Kids.* New York: Discovery Toys, 1992.

Koch, Maryjo. *Seed Leaf Flower Fruit*. San Francisco: Collins Publishers, 1995.

Prance, Chillean Tolmie and Kjell B Sandved. *Leaves*. New York: Crown Publishers, Inc. 1985.

The Visual Dictionary of Plants. Mary Lindsay, Project Director. London: Dorling Kindersley, 1992.

LITERATURE

Bierhorst, John, Editor. *Lightning Inside You and Other Native American Riddles.* A Scholastic Book, 1992.

de Paola, Tomie. Published by Putnam Pub. Group.
The Legend of the Bluebonnet, 1986.
The Legend of the Indian Paintbrush, 1988.

Finney, Gertrude E. *To Survive We Must Be Clever*. New York: David McKay Company, Inc., 1966.

Griese, Arnold A. *The Wind is Not a River*, New York: Thomas Y. Crowell, 1978.

Hudson, Ray. *Moments Rightly Placed: An Aleutian Memoir*. Fairbanks, Seattle: Epicenter Press, 1998.

Hudson, Ray. *Unugulux Tunusangin, Oldtime Stories.* Unalaska: Unalaska City School District, 1992.

Nutchuk, with Alden Hatch. *Son of the Smoky Sea*. New York: Julian Messner, In, 1941.

Oliver, Ethel Ross. *Aleutian Boy*. Portland OR: Binfords & Mort, 1959.

Oliver, Ethel Ross. *Journal of an Aleutian Year.* Seattle: University of Washington Press, 1988.

APPENDIX RESOURCES

CLASSIFICATION

Harrington, H. D. *How to Identify Plants*. Athens OH: Swallow Press, 1957.

Activity to learn basic classification techniques:
http://globe.fsl.noaa.gov/sda-bin/wt/ghp/tg+L(en)+P(landcover/LeafClassification)

FLOWER PARTS

http://netspace.org/MendelWeb/MWflower.html

CELL

Virtual Cell that can be dissected:
http://www.life.ucic.edu/plantbio/cell/

Jello cell:
http://askeric.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Science/Biological/BIO0035.html

PHOTOSYNTHESIS

Activity site:
http://www.pbs.org/ktca/newtons/9/phytosy.html

Center for the study of photosynthesis:
http://photoscience.la.asu.edu/photosyn/education/learn.html

Hinkle Creek Elementary School, 4th grade class wants to know about the plants in your area and has a Web site with excellent illustrations and sound:
http://tqjunior.thinkquest.org/3715/index.html

This site discusses photosynthesis, food chains and more:
http://www.alienexplorer.com/ecology/Ecology.html

Questions and answers about photosynthesis at this site:
http://www.sciencenet.org.uk/database/Biology/Lists/photosynthtable.html

FOOD CHAINS, FOOD WEBS

Interactive food web work sheet included here:
http://www.geocities.com/Heartland/Ranch/2200/foodchains.htm

http://www.planetpals.com/foodchain.html

LICHENS

Lichen information with lively illustrations:
http://mgd.nacse.org/hyperSQL/lichenland/index.html

LANGUAGE, CULTURE, THE REGION

Alaska Geographic Society. *Islands of the Seals: The Pribilofs*. Anchorage: Alaska Geographic Society, Volume 9, Number 3, 1982.

Alaska Geographic Society. *Native Cultures in Alaska.* Anchorage: Alaska Geographic Society. Volume 23, Number 2, 1996.

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Alaska Geographic Society. *The Aleutian Islands*. Anchorage: Alaska Geographic Society, Volume 22, Number 2, 1995.

Alaska Geographic Society. *Unalaska/Dutch Harbor.* Anchorage: Alaska Geographic Society, Volume 18, Number 4, 1991.

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

Bergsland, Knut. *Aleut Grammar/Unangam Tunuganaan Achixaasix̂*. Alaska Native Language Center, Research Paper Number 10. University of Alaska Fairbanks, 1997.

Chaussonenet, Valerie, Editor. *Crossroads Alaska: Native Cultures of Alaska and Siberia.* Washington, D.C: Arctic Studies Center of the National Museum of Natural History, Smithsonian Institution, 1995.

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

Spatz, Ronald, Executive Editor. *Alaska Native Writers, Storytellers & Orators: The Expanded Edition. Alaska Quarterly Review*. Anchorage: University of Alaska Anchorage, 1999.

Alaska Traditional Knowledge and Native Foods database:
http://www.nativeknowledge.org/db/nutriout.asp

Guidelines for how to interview an Elder:
http://www.ankn.uaf.edu/interview.html

INTERNET GENERAL

Alaska Native Knowledge Network. Use the searchable index to locate plants:
http://www.ankn.uaf.edu/

Ask Eric lessons:
http://ericir.syr.edu/Virtual/Lessons/

Eisenhower National Clearing House for curriculum resources:
http://www.enc.org/

University of Alaska Anchorage Alaskool project:
http://www.alaska.org

US Department of Education lesson site:
http://www.thegateway.org/

APPENDIX VALUES

This work is a draft to be shared for regional input.

Values of the *Unangan/Unangas*

These rules for living from the tradition of the people of the Aleutian and Pribilof Islands are presented to you by the *Unangam* Elders' Academy through the Association of *Unangan/Unangas* Educators and the Aleutian/Pribilof Islands Association. Volunteers asked for input from the communities of St. Paul, St. George, Atka, Nikolski, Unalaska, Akutan, King Cove, Sand Point, False Pass, Nelson Lagoon, and Anchorage about what was important to learn as an *Unangax̂* in each place, followed up on suggested research, then presented the data to the group who would like to share this with you.

Alaska Native educators have made a great effort to bring forward these enduring cultural values that have sustained them. Remember that these rules for living are part of our tradition and if we are mindful to teach them to our young people we can go forward as the successful people we are destined to be.

Please share your thoughts about what you have read in this brochure. If you have comments or questions about these values please send them to:

Association of *Unangan/Unangas* Educators
PO Box 220196
Anchorage, AK 99522-0196

APPENDIX VALUES

Qawalangin / *Niiĝuĝis*
Eastern dialect / Western dialect

Values of the *Unangan/Unangas*

Kudaliiĝin maqax̂takan txichin aguqangin / *Kadaangis maqax̂tal txichix aguqangis*
The way of our beginning, our ancestors

Udaadan tanangin kugan Unangan anangin / *Udaadan Unangam tanangin kugan anangis*
Our people's land and sea around here

Ix̂taqangin lulalix matalix anĝaĝiingin matakun / *Hix̂tanangis luulal ama matal anĝaĝiingin matakus*
Believe in them and keep them going through time

Aniqdun ngiin aqaaĝan aĝnangin qulingiin akux̂ gumalgakux̂. / *Kinguuĝingin wan slum kugan haqaaĝan aĝnangin qulaan akux̂ gumalgakux̂.*
For the coming generations that we don't see yet, for their time here.

Father Michael Lestenkoff

Anĝaĝiisix̂ matanaan imin ix̂amnakux̂. Anaĝix̂ ukunachin imchin ugutaasaamchim aĝnax̂txichin. / *Anĝaĝiisiin sigax̂ imis akux̂ mal sigaan inixsiisada.*
Life is gifted to you. What you make of it is your gift in return.

Tuman ilaanuĝitxin, Unangan maqax̂tadqangin mataaĝin matakun. / *Anĝaĝiisiin, ilaazat ama Ulamis anĝaĝinangis maqax̂singis idax̂talagadax̂.*
Know your family tree, relations and people's history.

Tanaĝnangin Iĝayuusalix anĝaĝiimchin aĝnax̂txichin. / *Tanax̂, Alaĝux̂ ama slum imuunuu huzuu anaĝim anaĝinĝis sahngax̂tada.*
Live with and respect the land, sea, and all nature.

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

Txin achigalix anĝaĝigumin anuxtanatxin ax̂saasaduukux̂txin. / *Huzugaan txin achigax̂ agacha mada ama txin sakaaĝatada.*
Always learn and maintain a balance.

Qaqamiiĝux̂ qalgadam ukulganaa ngiin ugutaasakun. / *Qaqamiiĝux̂ qalgadax̂*
Anĝaĝix̂ ngiin ax̂tanaa akux̂.
Subsistence is sustanance for the life.

Unangam tunuu unangqasining asix tunux̂talaaĝnaqing. Unangan anaan Ukux̂tachx̂ikux̂. / *Unangam tunuu Unangas alganaa ukuchxizax̂ ama huzux̂ ngiin tunux̂tachx̂izax̂.*
Our language defines who we are and lets us communicate with one another.

APPENDIX VALUES

The Right Way to Live as an *Unangax̂*
Simple Instructions with the Long List

1. *Udigdada.* E / *Udigida.* W / Share.
2. *Tutada.* E & W / Listen.
3. *Txin anguyniχtaĝulux.* E / *Txin manitalagada.* W / Don't be boastful.
4. *Agitaasitxin iχamnaasada.* E / *Anĝaĝinas iĝamanaasada.* W / Be kind to other people.
5. *Agitaasiin sismida.* E / *Anĝaĝinas kiduda.* W / Help others.
6. *Tuman tanax̂ agliisaax̂tan.* E / *Tanax̂ agliisada.* W / Take care of the land.
7. *Tuman alaĝux̂ agliisaax̂tan.* E / *Alaĝux̂ agliisada.* W / Take care of the sea/ocean.
8. *Tuman taangax̂ agliisaax̂txin.* E / *Taangax̂ haqayaasada.* W / Take care of the water.
9. *Manachin ilam axtalakan agliisaachin.* E / *Anaĝis mal agumis ilam axtalagada.* W / Do not do anything to excess.
10. *Txin ugutada.* E / *Qaĝatada.* W / Be happy.
11. *Iĝayuux̂txin, anaĝim atxaĝingin agachan madada.* E / *Txin sakaaĝatal anaĝis mada.* W / Behave yourself: Do the things you know are right.
12. *Chxadalagaax̂txin.* E / *Chxalagada.* W / Don't steal.
13. *Adluudaĝiĝulux* E / *Adalulagada.* W / Don't lie.
14. *Ludakiim axtax samtaaxtxin.* E / *Ludaaĝis, tukus ama uchiitilas sahngax̂tada.* W / Respect Elders (including parents, teachers, & community members).
15. *Agitaasiin samtasaax̂txin.* E / *Agitaadaan sahngax̂tada.* W / Respect your peers.
16. *Kayutuux̂txin.* E / *Kayutuda.* W / Be strong.
17. *Agitaasiin matanangin imin giduĝiisalagaax̂txin.* E / *Silaa txin gikuun alagada.* W / Don't be envious of what belongs to another.
18. *Anĝaĝix̂ iχamanax̂ iχtalix kayux iχamanax̂ atxax̂talix manaa imin ugutaasalix aax̂txin.* E / *Anĝaĝinax̂ iĝamanas manaa ngaan hiχtada.* W / Admire one who does well by honest means.
19. *Maamin iχtanatxin madada.* E / *Anaĝis maamis hiχtaqaan aguun mada.* W / Don't make promises quickly, but keep those you make.
20. *Anĝaĝiisanatxin anĝaĝim agitaasingin agachan liidalix anĝaĝiisada.* E / *Matal anĝaĝiikaan agacha anĝaĝisada.* W / Live like you want people to see you live.
21. *Igilnaax̂nax̂txin.* E / *Qaqatulagada.* W / Don't be greedy.
22. *Slax̂, aĝadax̂, tugidax̂, kayux sdan tunum manginulux kugan iĝadĝulux.* E / *Slax̂, aĝadgix̂, ama sdas hadangiin iĝamanax̂ agacha tunuχtaasada.* W / Don't talk bad about the weather or the sun, the moon, or the stars.
23. *Agitaasaan adaan tunum iχamnanginulux iĝadĝulux.* E / *Anĝaĝinax̂ adalus hadaan hilgadaĝulax.* W / Don't slander another person.
24. *Kadaan axtaaĝanax̂txin.* E / *Kadamis agalagada.* W / Don't get ahead of yourself.
25. *Aduχtanaan akidada.* E / *Adut akida.* W / Pay your debts.
26. *Qaqamiiĝux̂.* E / *Qaqamiiĝux̂.* W /Subsistence.
27. *Tunuun ugunuχtalakan anĝaĝiiχtxin.* E / *Unangam Tunuu ugunuχtalagada.* W / Don't forget your *Unangan* Language.

APPENDIX

Interview Release Form

I, _____, give my permission to the _____ School District to use information that has been gathered from me for educational purposes regarding traditional Culture, History, and Language.

I understand that this information may be put on the Internet after being cleared with the *Unangam* Elders' Academy and the Association of *Unangan/Unangas* Educators for appropriateness.

___ I would like a copy of written work containing information that has been supplied by myself.
___ I do not want a copy of written work containing information that has been supplied by myself.

Name _____

Address _____

_____

_____ _____

signature of contributor date

Phone # _____

Tribal affiliation _____

I have read and agree to abide by these statements also.

_____ _____

signature of teacher of student collector of information signature of student collector of information

The collectors adhere to the recommendations of the United Nations draft "Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples" (June 1993). To read this document visit the following Website.
http://www.ankn.uaf.edu/mataatua.html

The Association of *Unangan/Unangas* Educators recommends that if any monetary gain is made from the use of the educational materials, they be donated in part to the tribe of the contributor for the purpose of cultural reclamation, preservation and perpetuation.

If your budget allows and you would like to contribute in some way to the descendants of the people sharing this knowledge with the world here is an easy way to do so. Education is key to appreciating and sharing traditional knowledge before it is lost. Following are two excellent scholarship foundations, which serve the *Unangan/Unangas*:

1) The Aleut Foundation http://www.aleutcorp.com/found.html
2) The Edna P. McCurdy Scholarship Foundation http://www.ounalashka.com/
(Click on "Edna P. McCurdy Scholarship Foundation)

There may be new scholarship foundations, which were unknown at the time of this project. Sharon Lind at The Aleut Foundation will be able to tell you if any have become firmly established.

APPENDIX

A Quick Overview of the *Unangam Tunuu* Sound System

by Barbara Švarný Carlson

To learn more consult *Aleut Grammar/Unangam Tunuganaan Achixaasix̂* by Knut Bergsland, which contains detailed linguistic descriptions. If a class is ever offered in your area, take advantage of it, as they have been rare. Like many in my generation English was my first language. While I am by no means yet fluent in *Unangam tunuu*, I am deeply grateful to those who help me learn. It has been my extreme good fortune to study formally for one semester and informally for years with Moses Dirks. Additionally, I have been lucky to work with Nick Galaktionoff, Sophie Sherebernikoff, and Iliodor Philemonof. This introduction will get you started. The Association of *Unangan/ Unangas* Educators plans to have a Web site soon with links as they are developed and become available. URLs to visit to check if anything new is ready are the following:

Alaska Native Knowledge Network:
http://www.ankn.uaf.edu

Association of Unangan/Unangas Educators:
http://www.ankn.uaf.edu/Unangan

For a free downloadable font for Unangam tunuu:
http://www.alaskool.org/language/fonts/unangam/unangam_font.htm

Language resources from Alaskool:
http://www.alaskool.org/language/languageindex.htm

Check with your school to see if other resources are available such as audio tapes made by instructors who speak the language.

INTRODUCTION:

The Native language of the people of the Aleutian and Pribilof Islands is called *Unangam tunuu* (sometimes referred to as *Unangax̂*). To say words in Unangam tunuu, one must learn several sounds that are not produced in the English language. The "say it" cues in the plant curriculum text are a user-friendly way to help non-speakers pronounce the words in the units. You must learn the sound system to say words you find in the *Aleut Dictionary/UnangamTunudgusii* and the written language.

THIS IS EASY:

1. Unangam tunuu spelling is regular and easy to learn (as opposed to English, which is irregular and takes years to master).
2. There are 3 basic vowels, which can be long or short, referring to the length in time (having nothing to do with "long" or "short" vowels in English).
3. There are only five consonant sounds not present in English: q, x, g, x̂ and ĝ.

APPENDIX

Vowels:

The three basic vowels, a, i, and u, are each either short (in time) or long (in time). The long vowels are written double.

a aa i ii u uu

These correspond roughly to the following English vowel sounds:

- a — has a sound midway between the vowels of English father or hot and that of tub as in the *Unangam tunuu* word, *alax̂*
  The duration is short.
- aa — has a sound midway between the vowels of English rod and that of tub as in the *Unangam tunuu* words, *aang* and *aĝalaa*
  The duration is long.
- i — has a sound midway between the vowels of English hit and heat, as in the *Unangam tunuu* word, *hitnisangis*
  The duration is short.
- ii — has a sound midway between the vowels of English hid and bead, as in the *Unangam tunuu* word, *kiikax̂*
  The duration is long.
- u — has a sound midway between the vowels of English good and food as in the *Unangam tunuu* word, *chunusix̂*
  The duration is short.
- uu — has a sound midway between the vowels of English good and food as in the second syllable of the *Unangam tunuu* word, *uxchuudax̂*
  The duration is long.

The vowels e and o are used only in loanwords from Russian and English.

"Long vowels always have some degree of accent, and when in the last syllable of a word, tend to 'steal' the usual word-accent from the second-last syllable."

—Michael Krauss, Professor Emeritus, University of Alaska Fairbanks, Alaska Native Language Center, April 2002

APPENDIX

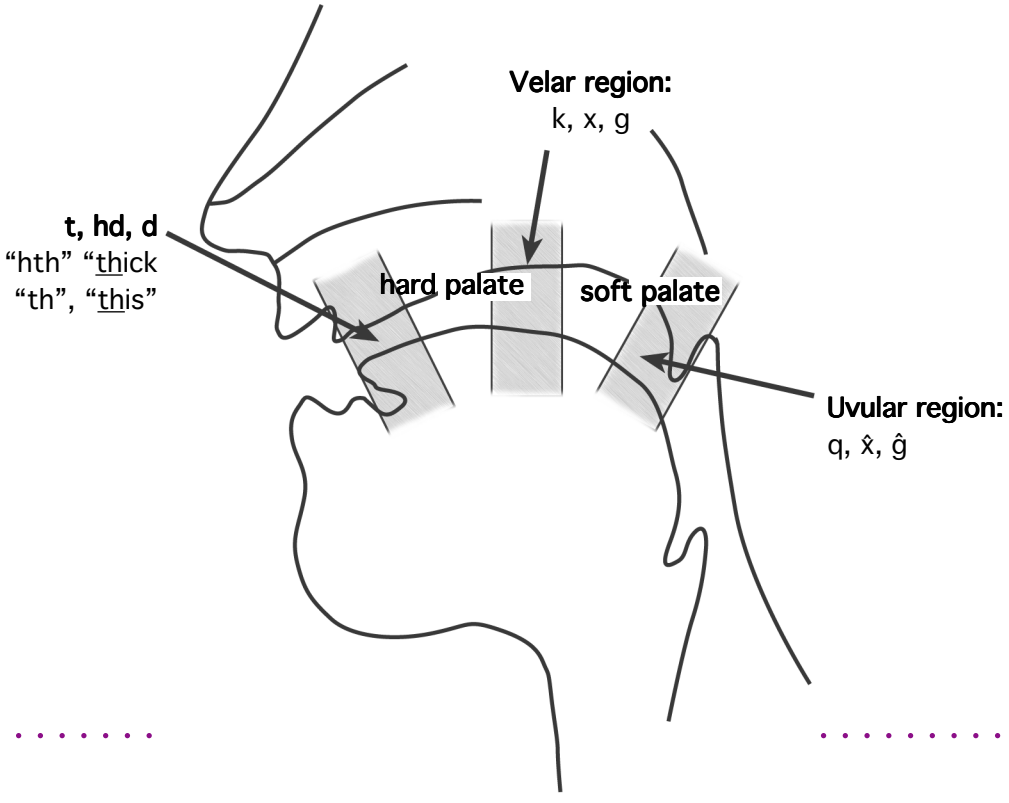
HOW THESE SOUNDS ARE MADE:

The five consonant sounds not present in English are shown inside the shaded boxes on the following chart. The additional consonants are to help you visualize the progression (left to right) in sound production from the front of the mouth to the back.

	TONGUE TIP	VELARS (mid-mouth)	UVULARS (back of mouth)
air flow voice not stopped sounding	t	k	**q**
air flow not stopped	hd "hth" "thick"	**x**	**x̂**
air flow not stopped voice	d "this"	**g**	**ĝ** sounding

Voice is the sounding, vibrating or buzzing of the vocal chords. Try pronouncing sequences like the following with no vowels in between: szszszsz..., fvfvfvfv..., and you will feel your voice turning on and off; on for z and v; and off for s and f. Likewise, for English th as in thick (Unangam tunuu hd) and th as in this (Unangam tunuu d). hd, d, hd, d, hd, d, hd, d.... So also for Unangam tunuu xgxgxgxg..., and x̂, ĝ, x̂, ĝ, x̂, ĝ, x̂, ĝ..., the x and x̂ with the voice off; and the g and ĝ with the voice on.

This diagram shows where the sounds are articulated in the mouth. Make each sound and see if it seems to be made in the correct spot. If not, try producing the sound in a way that will target the illustrated section of the mouth.



APPENDIX

Description of sounds:

Note that x and g have a noticeably smoother sound, with the tongue up against the hard (bony) palate, compared with x̂ and ĝ, with the tongue up against the soft palate, two soft surfaces together, which have a more gurgling, rough or flabby sound.

Note that d is pronounced as in English this and mother, not like English d (except in some people's pronunciation of loanwords from Russian and English). Likewise, g is pronounced as noted above, not like English g (with the airflow stopped, except in some people's pronunciation of loanwords from Russian and English).

Description of h sounds:

There are six combinations starting with h. They are not difficult; hy and hw are also in English, but the others are not. Say them fast.

hy as in English huge
hw as in the way some people pronounce English what
hm, hn, hng are like m, n, ng except that they begin with h, voicelessly, almost "snorted"
hl is like l except that it begins with h, voicelessly.

These are preserved mainly in Atkan, but exist to varying degrees in other dialects.

HOW TO GET A LOT OUT OF A FEW MINUTES OF PRACTICE:

Articulation Exercise #1:

In Unangam tunuu it is absolutely essential to learn to distinguish k , x, g, from q, x̂, ĝ. Pronounce the following consonant with its paired vowel listening to the sounds change:

ka	ki	ku	qa	qi	qu
xa	xi	xu	x̂a	x̂i	x̂u
ga	gi	gu	ĝa	ĝi	ĝu

Do this one every day or more. Remember from the table and diagram that these consonants form a very regular and orderly system. For example, k is to q as x is to x̂. K and x sounds are produced mid-mouth and made with the tongue against the hard palate so they are smooth sounds. Conversely, their paired letters, q and x̂, are produced at the back of the mouth and made with the tongue against the soft palate so they are rougher, more gurgling sounds. Likewise, x is to g as x̂ is to ĝ and so on. Try it: You'll hear the difference.

APPENDIX

Articulation Exercise #2:

kaga	kigi	kugu	qaga	qigi	qugu
xaga	xigi	xugu	x̂aga	x̂igi	x̂ugu
gaga	gigi	gugu	ĝaga	ĝigi	ĝugu

The practice will allow you to hear and say the different sounds. For some people this is simple; for others a little harder. Do not be discouraged. With time and practice your ears will hear the differences and your tongue will produce the correct sounds.

Articulation Exercise # 3:

kaqa	kiqi	kuqu	xax̂a	xix̂i	xux̂u
x̂aga	x̂igi	x̂ugu	x̂aka	x̂iki	x̂uku
gaĝa	giĝi	guĝu	ĝaxa	ĝixi	ĝuxu

Articulation Exercise # 4:

xaxaa	xixii	xuxuu	x̂axaa	x̂ixii	x̂uxuu
kaqaa	kiqii	kuquu	gaĝaa	giĝii	guĝuu
gagaa	gigii	guguu	kax̂aa	kax̂ii	kax̂uu

Articulation Exercise # 5: You can pronounce *Unangam tunuu*!

aang	*ting*	*hlax̂*	*sax̂*	*dax̂*	*amax̂*
(hello, yes)	(me)	(boy)	(duck)	(eye)	(fish eggs)

Unangan	*Unangax̂*	*Unangax*	*Unangam tunuu*
(plural form = 3+)	(singular form =1)	(dual form = 2)	(possessive)

Qilam ix̂amnaa.	*Qam aĝalaa.*	*Angalkingax̂.*	*Ix̂amnatakux̂!*
(The morning is good.)	(Good afternoon.)	(Evening.)	(Very good!)

Kumxax̂, congratulations!

APPENDIX DICTIONARY

As a girl in the 1950s, I tried to talk Grandma into helping me write an Aleut dictionary so I could learn the language. Despite my persistence, she refused to discuss my request, having been punished as a child for speaking the language. In Unalaska, she and many of her generation shielded their children from such mistreatment by speaking only English with them. One day in a moment of unexplained weakness, Grandma sat down at her kitchen table when she saw me come in with my little tablet and pencil. "Okay," she said, "I'll help you. What do you want to know?" Stunned, I opened the tablet and stammered, "uh, apple." Her eyes squinted up and she started to smile. Then, she laughed so hard she cried. When she stopped laughing she told me why we didn't have a real Aleut word for apple. I was unaware of many things at that age. (A Russian loan for apple is yaavlukax̂ E or, brilliantly, the lesser-known crafted word, hlyangam qaayungin E (tree berries). Grandma and I talked about it. It was a touching moment and the time I began to realize that we were losing more than words by not holding on to our language. Shortly after that Grandma had the first of several heart attacks and we all moved away from Alaska. We never made my dictionary. Grandma (Alice Merculieff Hope) died young. It was nearly two decades later before my mother and I learned that we call ourselves Unangan. Grandma would have delighted in this book.

You may not read the Aleut Dictionary/ Unangam Tunudgusii, as I do, with the feeling that it honors the discussions Grandma and I could have had. Once you begin to use it, however, you will realize that it is a valuable and unprecedented resource. Ugutada, enjoy!

How to Use the Aleut Dictionary/*Unangam Tunudgusii*

By Barbara Švarný Carlson

In the 1800s Ivan Veniaminov worked with *Unangam tunuu* speakers, Ivan Pan'kov, chief of Tigalda, and Iakov Netsvetov, priest of *Atx̂ax̂* collaboratively to produce the first instances of *Unangam tunuu* written as literature. *Unangam tunuu* was an oral language, so it was written down in the orthography of Veniaminov, a Russian Orthodox priest later canonized as Saint Innocent. He was an exceptional scholar and dedicated journal keeper who helped preserve history and cultural information that would otherwise not have been recorded. Netsvetov wrote a dictionary in the *Niiĝux̂* (Atkan) dialect. (*Niiĝux̂* is the short form of the singular *Niiĝuĝis.*) Read more about these greatly significant contributions in the history and introductory sections of this text.

In 1994 the Alaska Native Language Center (ANLC) at the University of Alaska Fairbanks published Knut Bergsland's eagerly anticipated *Aleut Dictionary/Unangam Tunudgusii*. Knut Bergsland of Oslo, Norway, developed the new standard orthography for *Unangam tunuu* after a vote in the early1970s to allow the people themselves to decide whether it was necessary to provide a version in the alphabet of this country. In the history and introductory sections of this book, Bergsland exegetically chronicled a detailed listing of the speakers of *Unangam tunuu* with careful descriptions of the fieldwork in which Native speakers participated.

To pronounce words in *Unangam tunuu*, the Native language of the people of the Aleutian and Pribilof Islands, one must learn several sounds that are not produced in the English language. Use the Sound System for *Unangam Tunuu* in the Appendix for help. In *Unangam tunuu* there are two

characters, x̂ and ĝ, that use a diacritical mark to distinguish them from x and g. The syntax or word order of the language is not the same as English. For information on that subject, one may refer to the definitive reference grammar of the language, *Aleut Grammar/Unangam Tunuganaan Achixaasix̂*, by Knut Bergsland.

A treasury of untapped information, this text pulls together several centuries of recorded language information by diverse scribners and decades of exegetical work done by Dr. Bergsland and his partners in the region and at ANLC. Knut Bergsland was a perfectionist in the best sense of the word and users will learn a number of linguistic tools with which they might not have otherwise become familiar. This is not an English/Aleut dictionary; that is, you do not simply look up the word in English and go straight to its corresponding word in *Unangam tunuu*. The reason for this is that to include as much information as possible, a different format was used.

WRITE IT RIGHT:
Entries are listed with the stem of the word followed by a hyphen and another letter(s). Many *Unangam tunuu* words are used as either nouns or verbs. If the word is used as a noun, the ending follows the pattern below:

-x̂ = 1	-x = 2	-n = 3 or more (Eastern dialect)
-x̂ = 1	-x = 2	-s = 3 or more (Western dialect)

So, if the entry looks like this: *quma-x̂* , one white thing, write *qumax̂, E; quhmax̂ W*. If you want to write two white things, write *qumax E; quhmax W*. To write three or more white things in Eastern, *quman*; in Western, quhmas.

If a word is used as a verb, it will look like this: *quma–lix* (to turn white), and should be written as *qumalix* E; *quhmalix* W.

Remember, write *qumax̂ E or quhmax̂ W*, not *quma-x̂,* and *qumalix E or quhmalix W,* and not *quma-lix.*

Note: While the word for white is basically the same in Eastern and Western dialects, the Western word *quhmax̂* retains the “h” that has been dropped in some words in Eastern.

HOW TO: The Dictionary is set up so that it is easiest to find what an Aleut word means in English.
1. To find the *Unangam tunuu*, or Aleut equivalent of an English word, look up each entry listed under it in the index. You need to find the most appropriate time period, place, and meaning for your desired use.

The format presents each attested word (in the English Index) that matches the desired listing, in any dialect and time. Some words are archaic and no longer in popular use an any dialect. You must, then, look up each entry under a heading and read it to find the word you want.

It will be easy if the word for which you search is in the index. If not, try to think of a synonym. For example, if you are looking for “respond” and find nothing, try “answer.” Often you will find many listed words for those you seek. You must then look each one up (the page number is conveniently listed right beside the *Unangam tunuu* word in the index listing).

APPENDIX DICTIONARY

If you do not look up each word, you might end up with a word that has not been used since 1772 when you want a current word. You might end up with a word for En, the Eastern dialect speakers of Nikolski, when you wanted one for A, the Western speakers of Atka. Or, you might find a word that means something entirely different where you live than the word under which it was found in the index. You have to look up each word and read the entry to find the word you need. (There may be times when you will want to seek out archaic words!)

When you look up a word, you will find where it was attested or recorded. See page vii of the Dictionary for how to read this information. You probably will not want to use a word that is shown as attested in Atka if you are in King Cove (formerly from Belkofski) if another word can be found for your place.

2. Learn the significance of the symbols in the front of the book. The more tools you use, the more you will understand.

a/ha/aa/haa b ch d/hd f g/x ĝ/x̂ i/hi/ii/hii k l/hl m/hm n/hn
ng/hng p q r s/z t t^r u/hu/uu/huu v w/hw y/hy

TIPS FROM A FREQUENT USER:
A. Use bookmarks and paper stickies to crosscheck similar words.
B. When you find a desired word, write it in a log and note the page number on which you found it. You will want to find it again and may forget how you found it as sometimes words can be located in a round-about way. You will not regret this method.
C. Double check spelling and the correct use of diacritical marks. The meanings and pronunciations of words change without the marks.

3. Refer to the following alphabetical order (Dictionary General introduction, p xii): This order allows for the different combinations of words that have h vs. the dropped h being listed in a systematic way. Similarly, it allows for an orderly way to find g and x as opposed to x̂ and ĝ.

WHAT TO READ IF YOU DON'T HAVE TIME TO READ THE WHOLE THING:
This is an interesting introduction, and you will find helpful background information in addition to numerous explanations. If you do not have time to read the whole thing right away, it is useful to scan the content pages so that you will be able to find information when you need it. Some examples of things you may find useful follow:

Abbreviations and Sample Entries: pp vi – vii,
This section references all abbreviations telegraphically. You can easily learn on page vi the following and much more:

E	Eastern Aleut
Eb	E of Belkofski (now moved to King Cove)
Ea	E of Akutan (formerly Akun and other of the Krenitzin Islands)
Eu	E of Unalaska
En	E of Nikolski, Umnak Island
A	Atkan Aleut
Au	Attuan Aleut
Ab	Atkan of Bering Island
Am	Attuan of Copper Island (Mednyy)

- This is important when you want to know the origin of a word. A word spoken in one location may vary or be totally different from its counterpart in another place.
- It tells you the Aleut word classes, such as noun, verb, and where to read more about them. (General Introduction 0.4)
- It tells what abbreviations in the entries mean, for example, *lit.* stands for the literal meaning of an Aleut word while *relig.* means that the word is found in religious text translations.
- It lists the sources of material cited so that you can sometimes determine in what circumstances and by whom information was documented.
- Page vii neatly shows sample entries with labels pointing to what they represent. You will find this extremely useful.

History: Describes the work of more than two centuries of contributing linguistic scholarship and documentation and chronicles events that led to this publication.

General Introduction: A complete description of format, order, academic linguistic devices employed. You might find this hard going, but it is replete with information necessary for the full utilization of all that is contained here.

Familiarizing yourself with the headings will enable you to locate specific help. These will be the most useful to new users. Get what you need and come back for the rest later.

- Dictionary format
- Alphabetical order
- Entries and subentries
- Attestation: locations and dates
- Historical Survey: An explanation of the distribution of the eight original sub-groups of *Unangan/Unangas*. These are the origins of some of the “federally recognized tribes” of which you may have heard.
- Aleut consonants and vowels
- Stress and related features of pronunciation
- Aleut treatment of Russian words
- Sources: It is amazing to think that the very words in this dictionary can be traced to specific collections and in some cases to individuals. It has been interesting for me to learn who attested words in certain places and then to discuss that with an Elder. On one occasion my Elder friend confirmed a recorded person’s knowledge of the language and told me it would have been good if I could have listened to him. It allowed us to have conversations that we otherwise would not have had and talk about subjects that might not have arisen. This text is full of touchstones.
- Main Entries and Subentries: The main section begins with an interjection of surprise in Attuan, “A!” and the heading on the first page is “A, HA, AA, HAA”.
- Appendices: 10 appendices contain rich materials from various sources that would otherwise be difficult to locate.

After you have become used to finding the basic information you need, re-read the history or introductory sections. Gradually, your understanding of this invaluable tool will increase and your mastery will help you unlock its treasures. *Ukudagada*, good luck!

NOTES

Appendix B

Plant Illustration Cards
- Leaf and Flower Card
- Seed Test Card

Setting Up Your Experiment

Photosynthesis Game, directions, board and pieces

The following illustrations show a sample of some of the plants you can find in the Aleutian/Pribilofs. Not all of these plants are found everywhere in this region. Nor are all plants in the region illustrated here.

The *FLORA OF ALASKA* illustrations (numbers 1-60) show a proportional scale. A 1/3 scale means, for example, that the drawing could be multiplied 3X and would show the plant at actual size.

Names are given in this order, alphabetized by species/genus:

Latin
Unangam Tunuu when available (UT page number from the *Aleut Dictionary/Unangam Tunudgusii*)
(common name, *Unangam Tunuu*)
Common name

This symbol, ☹ means the plant is considered very toxic. A range of toxic effects are known in some plants in this region. Never eat any unknown plant or berry. Be certain of the identity of a plant before you eat it. Taste a wild plant only under the supervision of a parent or a caregiver.

This symbol ❧ means this plant is recommended for use in ACTIVITY TWO, Section Three.

1

×1/3

Achillea borealis

Chngaatudax̂ E (UT 148)
Saahmikaadax̂ W (UT 351)
(hairy, shaggy)
Northern yarrow

2

×3/8

Aconitum maximum

Aanasnaadam ulaa E (UT 71)
Maamanuuĝidax̂ W (UT 273)
(bumblebee's house)
Monkshood

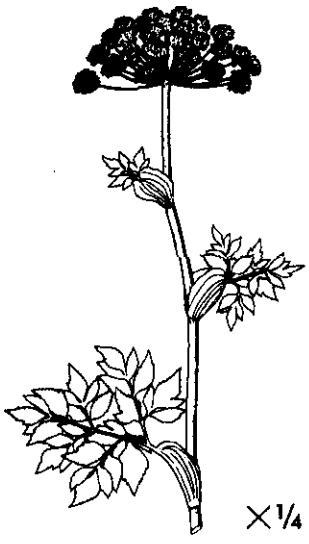
3

×1/3

Anemone narcissiflora

Chix̂udangix̂ (aahmaaĝii) E (Golodoff)
Slukam aahmaaĝa W (UT 369)
(seagull flower, white flower)
Narcissus-flowered anemone, May flower, white flower

4

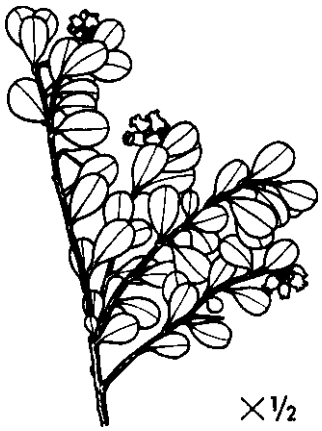


×1/4

Angelica lucida

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

5



×1/2

Arctostaphylos uva-ursi

Ulaĝin E (UT 434)
Winterberry, kinnikinnick, bearbery

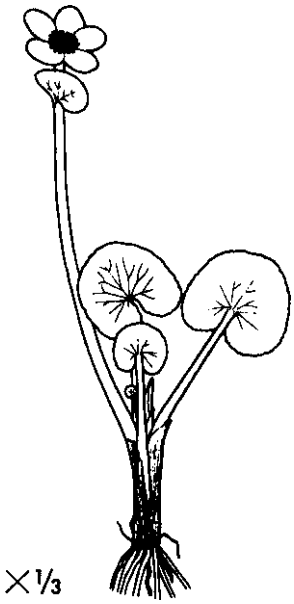
6

×1/3

Artemisia unalaskensis

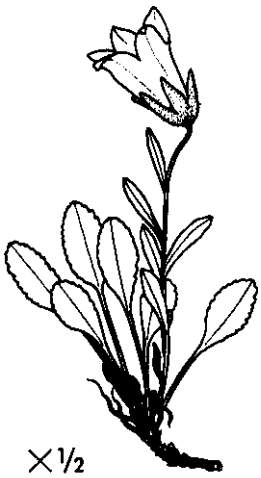
Sixsiqax̂ (UT 358)
Wormwood

7



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

8

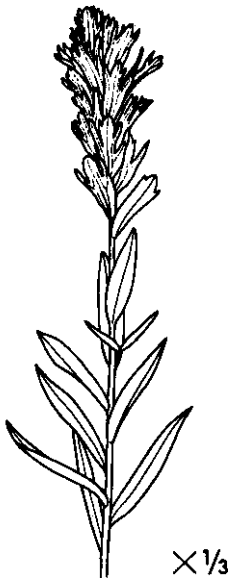


Campanula chamissonis
Kulukalax̂ E (UT 248) [r]
Kulukulix̂ W (UT 248) [r]
(little bells)
Bluebell, harebell

9

Campanula lasiocarpa
Kulukalax̂ E (UT 248) [r]
Kulukulix̂ W (UT 248) [r]
Bluebell, harebell

10

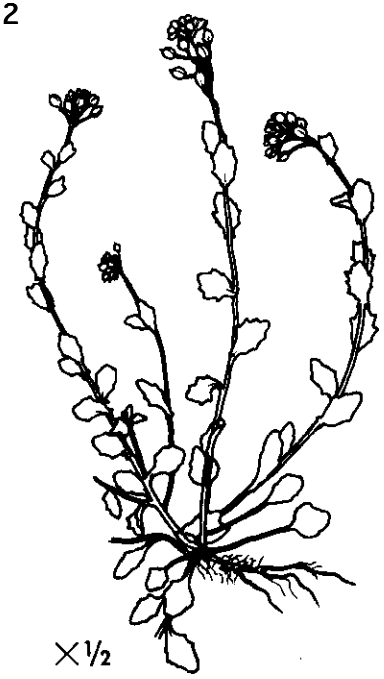


Castilleja unalaschcensis
Aanisnaadam qaatungin
E (UT 71)
(bumble bee's favorite food)
Coastal paintbrush, honey flower

11

Claytonia sibirica
Chix̂tam chiĝuudngii
E (UT 139)
Chix̂tam aahmaaĝii
W (UT 138)
(rain flower in some places)
Spring beauty

12



Cochlearia officinalis
Scurvy grass, spoonwort

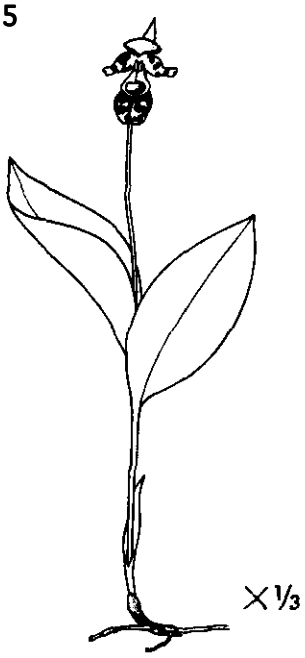
13

Conioselinum chinense
Chikigluŝ E (UT 141)
Chikilĝuŝ W (UT 141)
Qalngaaĝim saq(u)daa E (UT 353)
(raven's parsnip)
Hemlock parsley

14

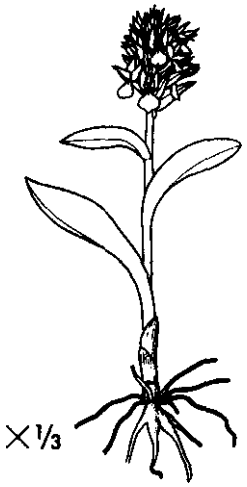
Cornus suecica
Aĝdiikam aahmaaĝii W (UT 37)
(Ptarmigan's flower)
Dwarf dogwood, bunchberry, Lapland or Swedish dwarf cornel

15



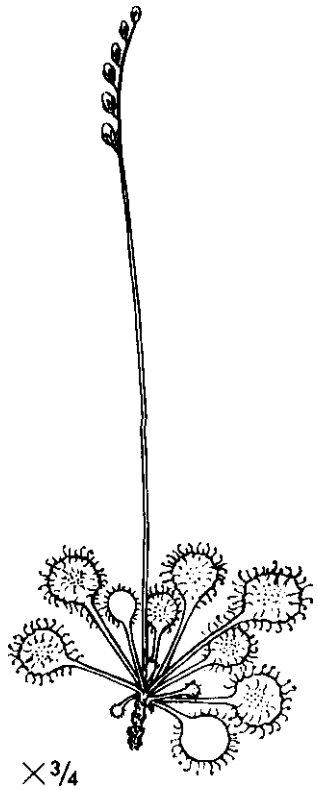
Cypripedium guttatum
Lady's slipper

16



Dactylorhiza aristata
Key flower, purple orchid

17



Drosera rotundifolia
Sundew

Empetrum nigrum
Qaayum qaxchikluu E (UT 314)
(blackberry)
Aangsuŝ ***W*** **(**UT 90)
Qaayuŝ (UT 314)
Kidnam qaayuu (UT 237)
(bush of moss)
Crowberry, mossberry, blackberry

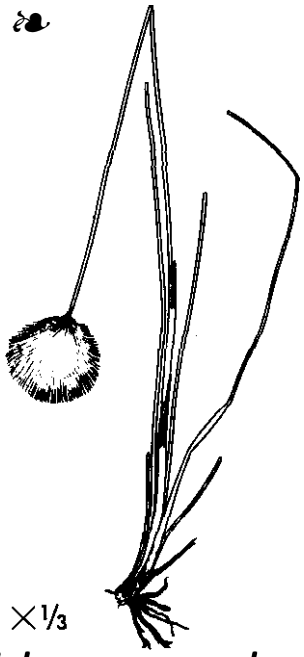
18

19

Epilobium angustifolium

Kimliiyax̂ E (UT 239)
Chikayaasix̂ W (UT 140)
Fireweek

20

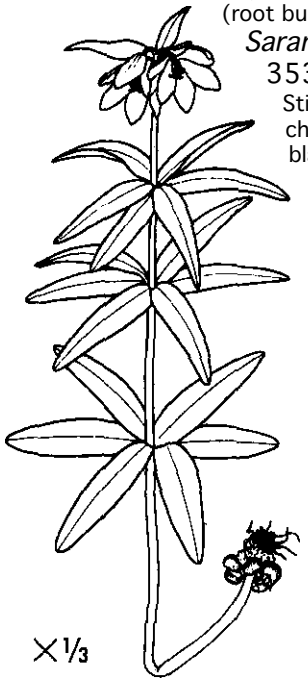


Eriphorum russeolum

Tumĝasix̂ E (UT 406)
Lagim ichx̂uusii W (UT 170)
(land goose's [Canada goose] toilet paper)
Cotton flowers, cotton grass

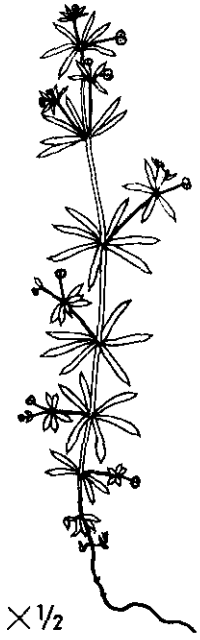
Fritillaria camschatcensis

Alugam kangaa (UT 230)
(overground portion of)
Alugax̂ (UT 57)
(root bulb of)
Saranax̂ E (UT 353)[r]
Stinky flower, chocolate lily, black lily



21

22



Galium aparine

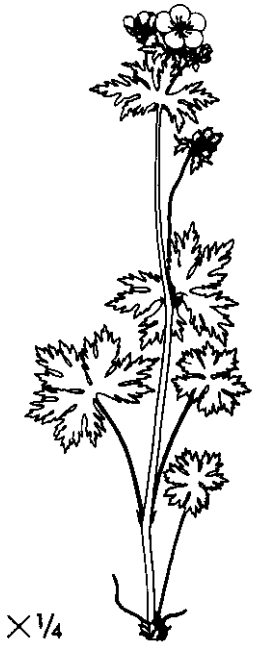
Bedstraw

23

Gentiana algida

Gentian

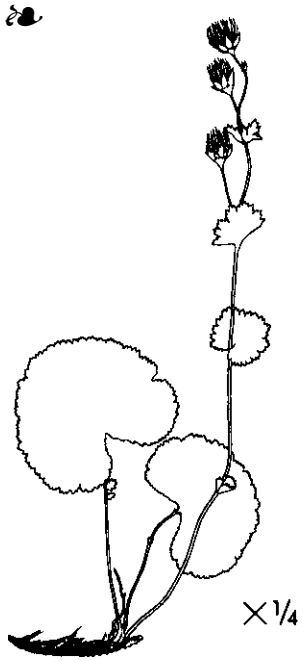
24



Geranium erianthum

Chunusix̂ E (UT 154)
Chuhnusix̂ E & W (UT 154)
Wild geranium, cranesbill

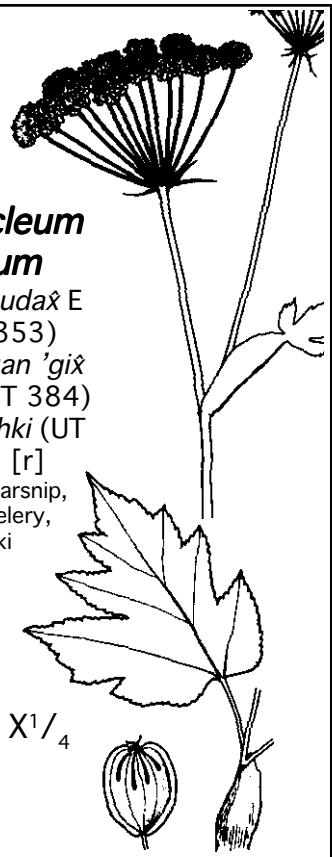
25



Geum calthifolium

Amidux̂ E (UT 59)
Hamidugîx̂ W (UT 59)
Avens

26



Heracleum lanatum

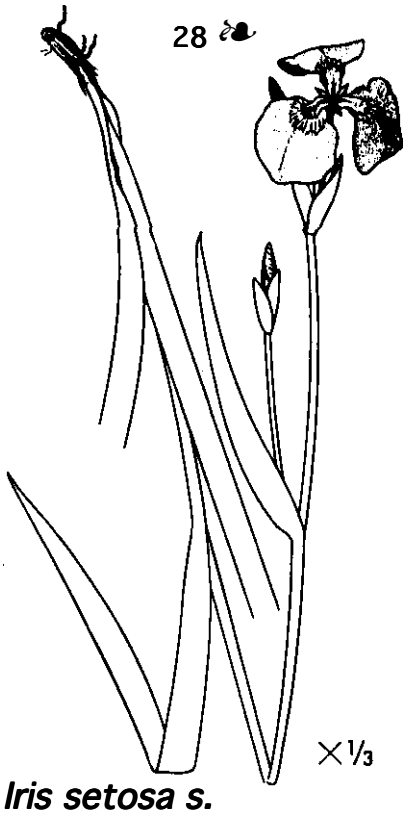
Saaqudax̂ E (UT 353)
Taagân 'gix̂ W (UT 384)
Putchki (UT 353) [r]
Cow parsnip, wild celery, putchki

27

Honckenya peploides

Isugîm aningin E (UT 77)
(hair seal's lupine root)
Beach greens, scurvy grass, seabeach sandwort

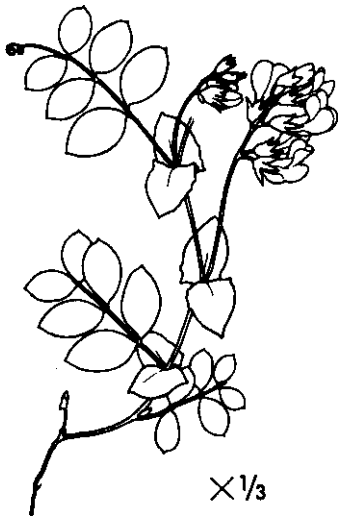
28



Iris setosa s.

Nuusnuchuudan E (UT 285)
(small scissors)
Umsutuudax̂ W (UT 442)
Iris

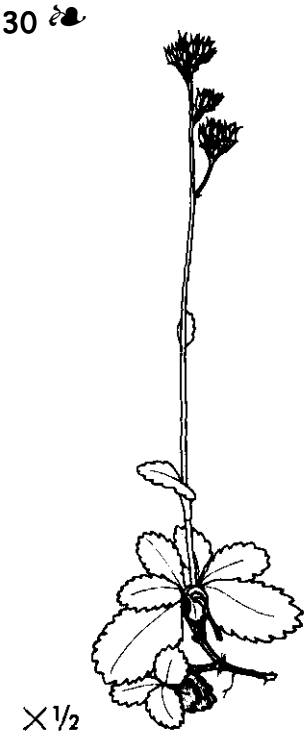
29



Lathyrus maritimus

Chugum aahmagîi W (UT 151)
(sand flower)
Purple beach pea, seaside pea

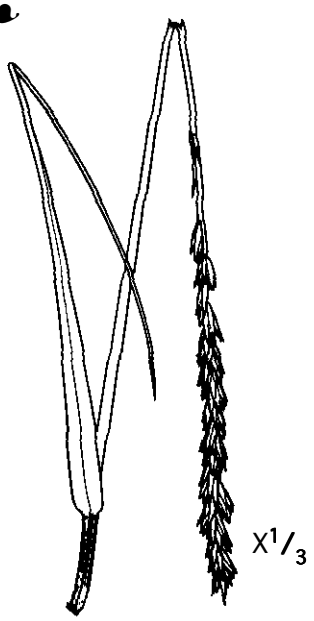
30



Leptarrhena pyrolifolia

Alix̂siisix̂ (UT 54)
Leather-leaved saxifrage

31

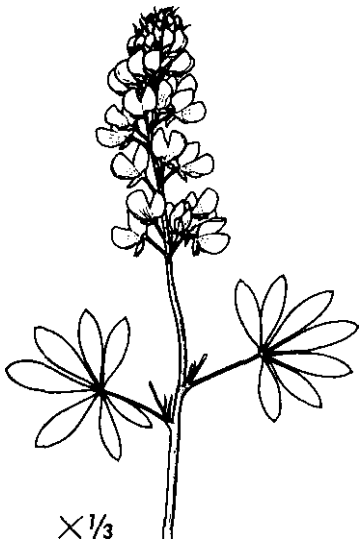


Leymus mollis, formerly known as *Elymus mollis*
Tix̂yux̂ E (UT 398)
Tiĝyux̂ W (UT 398)
(basket grass)
Wild rye, beach rye

32

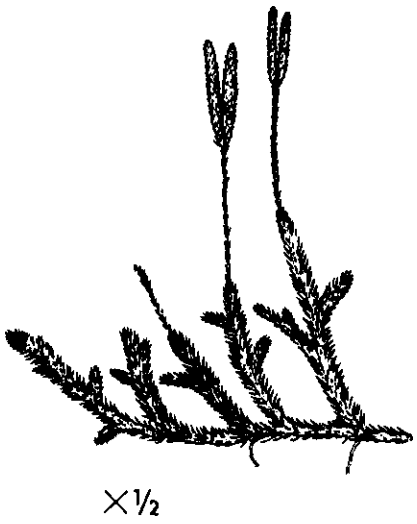
Ligusticum scoticum
Qanisan (UT 309, 737)
Pitruuskin (UT 287) [r]
Beach lovage, wild parsley

33



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

34

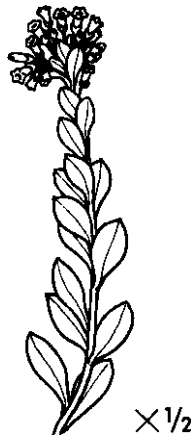


Lycopodium clavatum
Qugam chax̂chuu Attuan (UT 331)
Qugam chachx̂uu W (UT 331)
(demon's belt)
(devil's apron)
Common club moss

35

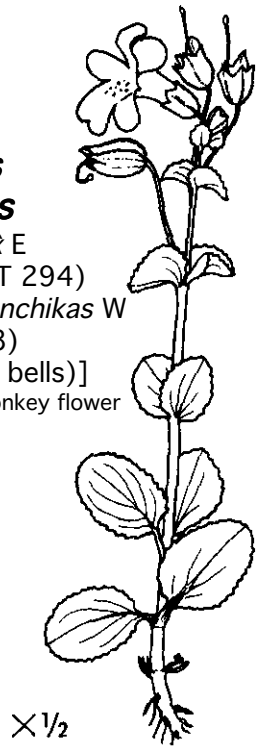
Menyanthes trifoliata
Buckbean, bogbean

36



Mertensia maritima
Oysterleaf

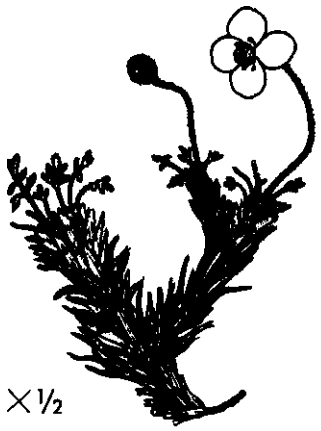
37



Mimulus guttatus

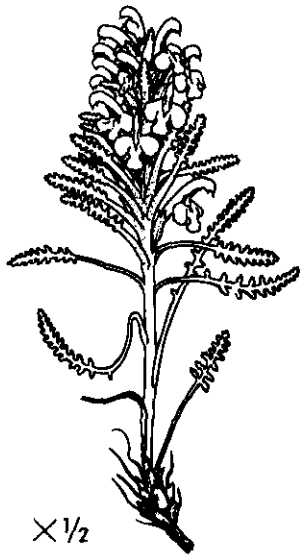
Qaxatux̂ E (UT 294)
Kulukuunchikas W (UT 248)
[r (little bells)]
Yellow monkey flower

38



Papaver alaskanum
Alaska poppy

39

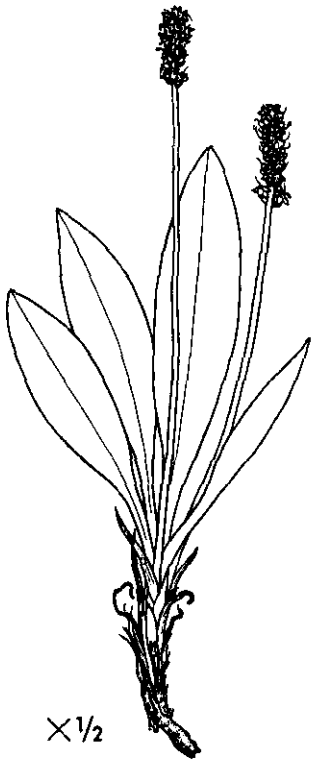


Pedicularis langsdorffii
Lousewort

40

Phyllodoce aleutica
Aleutian heather

41

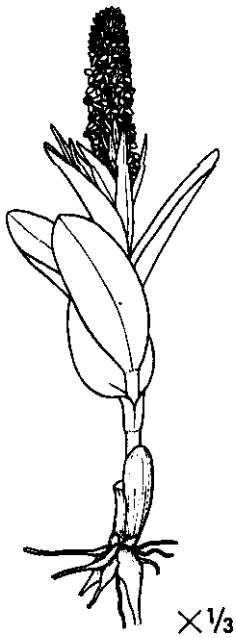


Plantago macrocarpa
Common plantain

42

Platanthera dilatata
Bog candle, White orchid

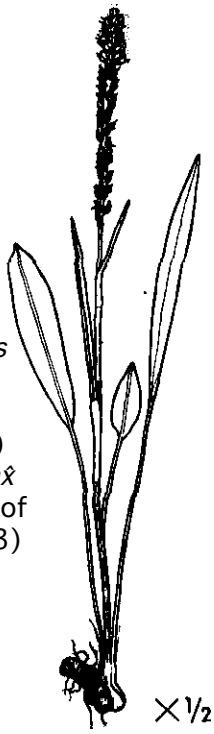
43



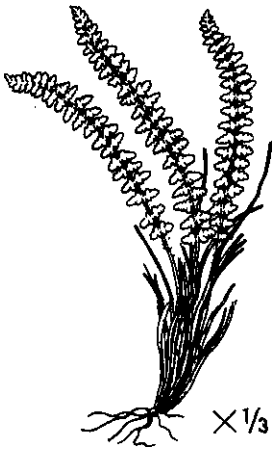
Platanthera convallariaefolia
Chagitxax̂ W (UT 126)
(white orchid)
Cornflower, green bog orchid

44

Polygonum viviparum
Chiisuudan
E (UT 146)
(resembling fish eggs(tops)
Qulunguchiisis
W (UT 335)
Makaarisax̂
[r] (UT 272)
Quguchuudax̂
(edible root of (E)) (UT 333)
Alpine bistort, knotweed

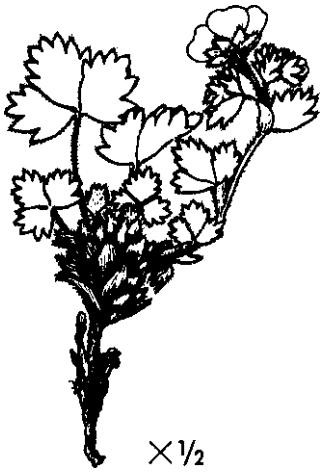


45



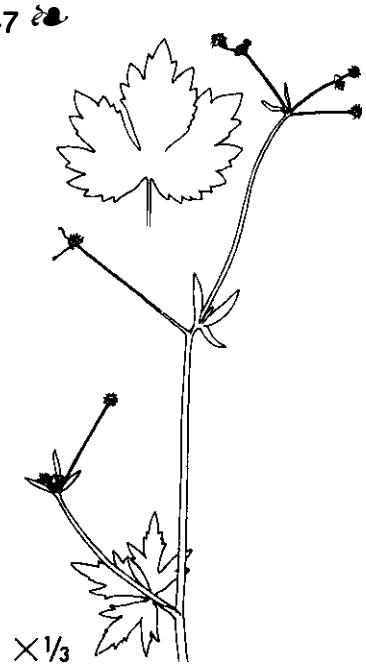
Polystichum aleuticum
Aleutian shield fern

46



Potentilla
Sagaadadax̂ E (UT 346)
Cinquefoil

47

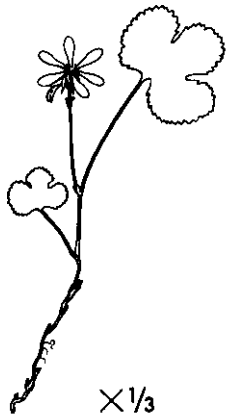


Ranunculus bongardi
Chix̂tam chinguudgii E (UT 138)
Chix̂tam aahmaaĝii W (UT 138)
(rain flower in some places)
Bongard buttercup

48

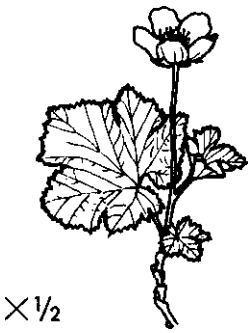
Rhododendron camtschaticum
Kamchatka rhododendron, moss rose

49



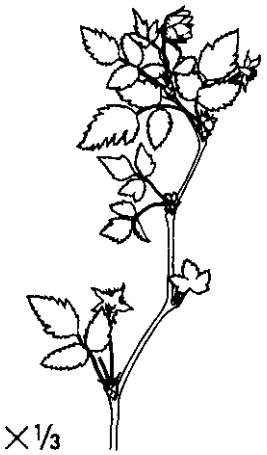
Rubus arcticus L. ssp.stellatus (Sm.)
Hamax̂ E (UT 61)
Haamachiiyan (E 1834)
Aamchiiyan (E 1909)
Aahmaadan (Golodoff:11/10/2000)
Nagoonberry

50



Rubus chamaemorus
Aqamdax̂ E (UT 95)
Quuniidas W (UT 337)
Cloudberry

51



Rubus spectabilis
Alagnax̂ E (UT 49)
Salmonberry

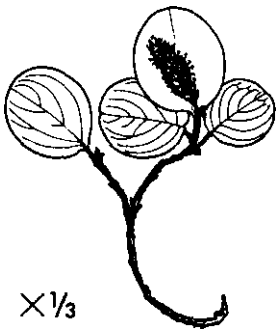
52

Rumex acetosella
Sheep sorrel

53

Rumex fenestratus
Aal(u)ngaayax̂ E (UT 58)
Aluungix̂ W (UT 58)
Rhubarb, sorrel, sour dock

54

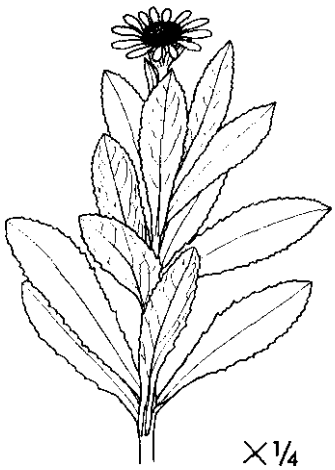


Salix arctica
Chuyax̂ E (UT 157)
Taguĝiix̂ W (UT 382)
Arctic willow

55

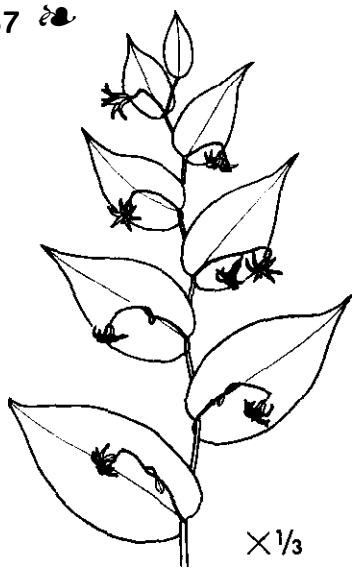
Saxifraga punctata (= S. nelsonia D. Don)
Cordate-leaved saxifrage, brook saxifrage

56



Senecio pseudo-arnica
Alaĝum achidan alngaayuu E (UT 55)
Uxchuĝaadax̂ E (UT 417)
Uxchuudax̂ W (UT 417)
Seabeach sunflower, ragwort

57

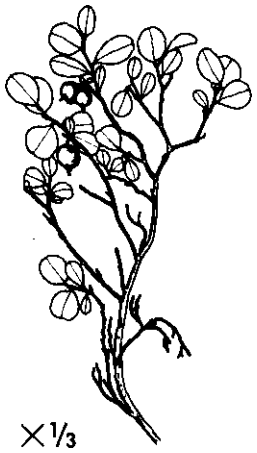


Streptopus amplexifolius
Taangadgusin E (UT 393)
Taangamchiizas W (UT 393)
(water container)
Watermelon berry, cucumber stalk, twisted stalk

58

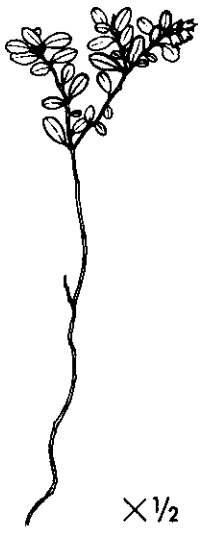
Vaccinium ovalifolium
Unignan E (UT 445)
also *Unigan* (Goldoff)
High bush blueberry

59



Vaccinium uliginosum
Uĝiidgin E (UT 424)
Muĝuzaalĝis W (UT 278) [r]
Alpine blueberry, lowbush blueberry

60



Vaccinium vitis-idaea
Kiikax̂ E (UT 238)
Tuyangis W (UT 412)
*Itim ulĝuu (*A also *Rubus stellatus* UT 218)
Mlusniikax̂ (UT 278) [r]
Lingonberry, low-bush cranberry, cowberry

61

Cladina rangiferina

(formerly *Cladonia rangiferina*)
Huquqlux̂ W (UT 449)
Itx̂aygim kidngaa E (UT 237)
Kigyam aliĝa Attuan (UT 237)
Reindeer moss

62

Fucus sp.

Kangadgix̂ (UT 231)
Kangadgim chuqii (UT 231)
(stalk of bladderwrack)
Bladderwrack, rockweed

63

Nereocystis luetkeana

Tmagix̂ (UT 399)
bull kelp

64

Porphyra sp.

Nori, laver, red laver,
teal nori

65

Alaria sp.

Qahngux̂ (UT 311)
Ribbon kelp

66

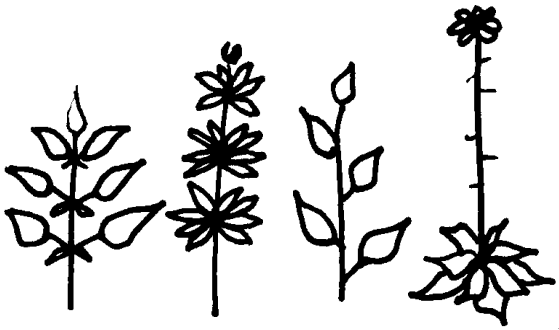
Ulva sp.

iiqux̂ E (UT 210)
iklux̂ W (UT 189)
Sea lettuce

Plant cards to cut apart and laminate

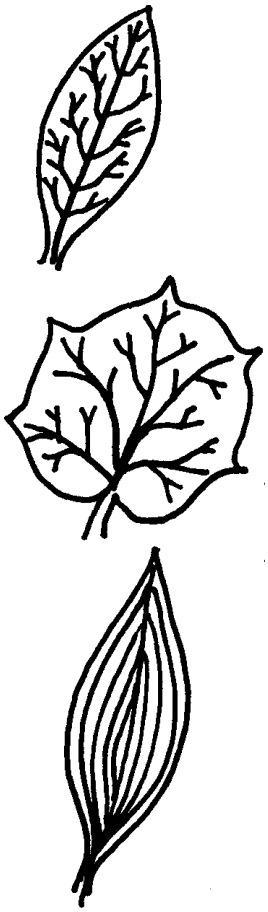
Leaf Arrangement:

1. Opposite: leaves in pairs at opposite sides of the stem.
2. Whorled: three or more leaves arranged wheel-like around the stem.
3. Alternate: leaves one above the other on opposite sides of the stem.
4. Basal: leaves at or near the bottom of the stem.



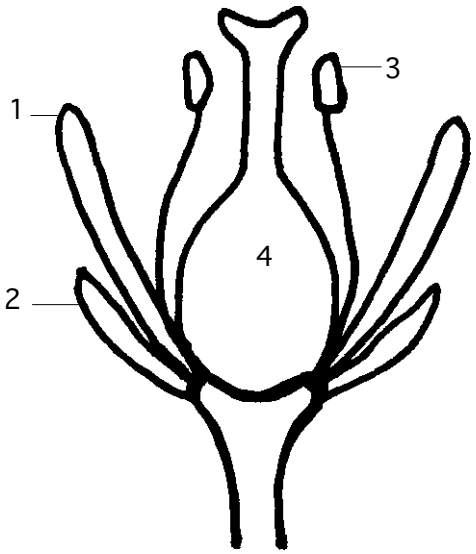
Leaf margins (edges)

1. Toothed: when the indentations on the margin look like a saw.
2. Lobed: when the indentations on the margin are deeply cut.
3. Smooth or entire: when the margin of the leaf is not cut or toothed.



Veins:

1. Pinnate: when the veins of about equal size lead off from the mid vein toward the margin.
2. Palmate: when the more prominent veins radiate from a point at or near the base of the leaf.
3. Parallel: when the veins of about equal size extend from the base to the tip.



Parts of a typical flower

1. Petals - delicate colored parts.
2. Sepals - protect the flower.
3. stamen - the male part of the flower that produces pollen.
4. pistil - the female part of the flower that produces seeds.

APPENDIX PLANT CARDS

SEED TEST CARD
Investigate one or more of your seeds using these tests:
Wind test: Hold the seed in the air and let it drop. If it drifts, it shows how a seed can travel by wind.

Water test: Drop seeds into a cup of water, and stir. The ones that float show how seeds can travel by water.

Hitchhiker test: Put a stuffed animal on top of each seed. Press down, then lift up the animal. The seeds that stick show how seeds can travel by sticking to an animal.

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EXPERIMENT FORM

SETTING UP YOUR EXPERIMENT

1. What do (did) you observe?

2. What are you asking about what you observe(d)?

3. Idea (hypothesis) you are testing: What is your idea about an answer for your question?

The Hypothesis is an educated guess based on background knowledge.

(will happen) (must have a reason)

4. a. What variable will you change in your experiment?

b. What will remain constant in your experiment?

5. Make a sketch of the set-up for your experiment. Label all materials and state all conditions. List the materials you need.

Materials needed:

APPENDIX: EXPERIMENT FORM

a. What specific things will you observe?

b. What measurements will you make?

c. What plan do you have for recording your data? (Data may be reported using various methods such as pictures, words, charts and graphs)

7. Sketch a sample data table for your experiment.
For example:

8. Do the results of the experiment support your idea (hypothesis)? Did you answer the question? Conclusions:
My hypothesis was _____ because _____.
(correct or incorrect) (reason relating to hypothesis)

Was this a FAIR TEST? (did only one thing get tested at a time?) Why or why not? (What, if anything, would you change to make your results more valid?)

Can you repeat this experiment at least 3X? Why or why not?

EXPERIMENT FORM

SETTING UP YOUR EXPERIMENT: *SAMPLE COMPLETED FORM BASED ON "DIRTY A SOCK."*

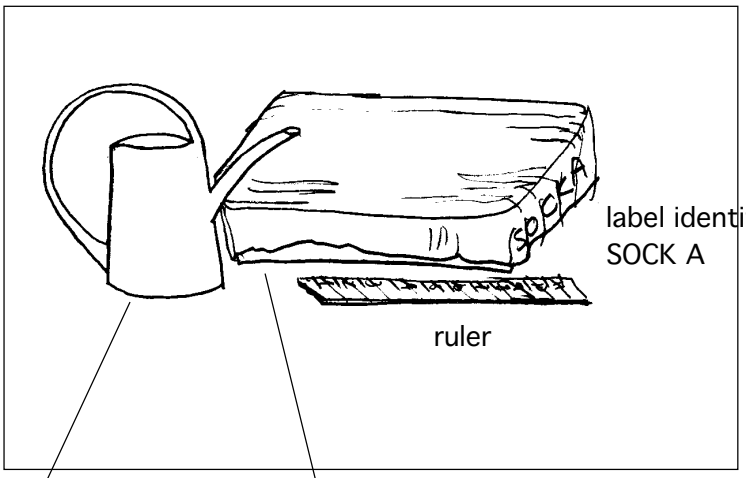
1. What do (did) you observe?
   We observed dirt and mud being collected on the socks/boots

2. What are you asking about what you observe(d)?
   Will the seeds we collected with our socks/boots grow when we plant them?

3. Idea (hypothesis) you are testing: What is your idea about an answer for your question?
   The seeds we collected will grow if they have a dormant period (have been frozen and thawed).
   The Hypothesis is an educated guess based on background knowledge.
   I think the frozen seeds will grow because they will have a dormant/inactive period.
   (will happen) (must have a reason)

4. a. What variable will you change in your experiment?
   Freezing and thawing: temperature
   b. What will remain constant in your experiment?
   Water and oxygen

5. Make a sketch of the set-up for your experiment. Label all materials and state all conditions. List the materials you need.



Materials needed:
- *wild seeds*
- *planting container*
- *water*
- *freezer*
- *ruler*
- *soil*
- *plastic food wrap*
- *measuring cup*

Water in watering can, used to keep soil moist for seed germination and growth. We measure it each time we put it in the watering can.

Planting container with soil and planted sock. The sock was used to collect wild seeds. The planting container is covered with clear plastic wrap to hold in moisture.

An identical container has been set up with another sock. It is labeled SOCK B. SOCK B was put in a freezer on the day it was planted and removed periodically. On the 8th day after planting, it was left outside the freezer.

APPENDIX: EXPERIMENT FORM

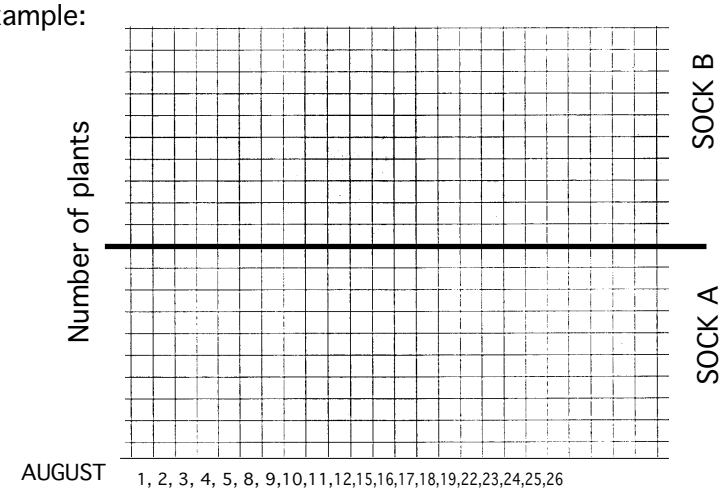
6. During the experiment (Procedure):

a. What specific things will you observe?
Germination and growth of the collected seeds

b. What measurements will you make?
Numbers of plants
Size of plants

c. What plan do you have for recording your data? (Data may be reported using various methods such as pictures, words, charts and graphs)
Graph of number of plants recorded daily
Chart of plant height

7. Sketch a sample data table for your experiment.
For example:



8. Do the results of the experiment support your idea (hypothesis)? Did you answer the question? Conclusions: *Too soon to know*
My hypothesis was _____ because _____.
(correct or incorrect) (reason relating to hypothesis)

9. Was this a FAIR TEST? (did only one thing get tested at a time?) Why or why not? (What, if anything, would you change to make your results more valid?)

10. Can you repeat this experiment at least 3X? Why or why not?

APPENDIX GAME

The Leaf Food Factory

You are the chemical messengers in a plant leaf.

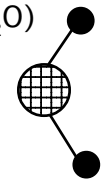
Your job is to collect the atoms needed to make food for the plant. The food for the plant is a simple sugar. To make the simple sugar,

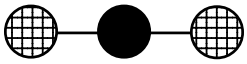
you need 6 carbon atoms (**C**)  carbon atom **C**

and 12 hydrogen atoms (**H**)  hydrogen atom **H**

and 6 oxygen atoms (**O**).  Oxygen atom **O**

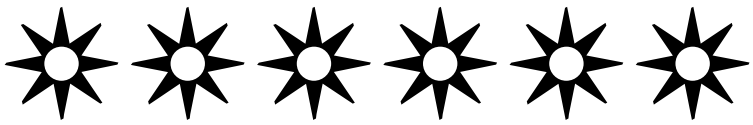
You collect these atoms of carbon, hydrogen and oxygen

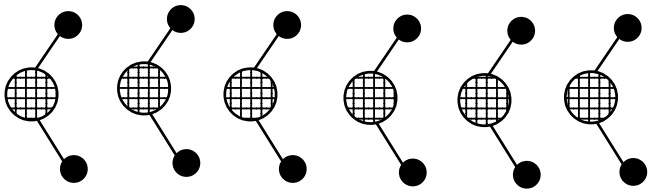
in water molecules (H_2O) 

and carbon dioxide molecules (CO_2). 

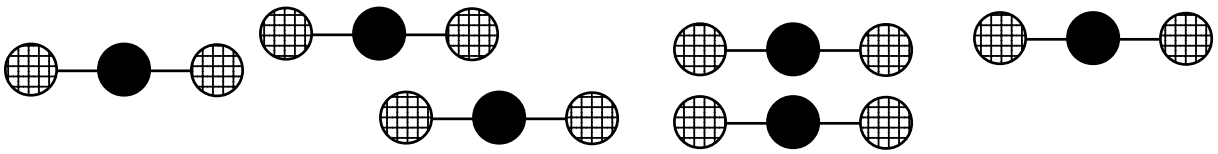
You also need 6 units of sunlight to complete the chemical change from water and carbon dioxide to sugar. 

TOTAL NEEDED TO COMPLETE THE GAME:

6 units of sunlight 

AND
6 molecules of water (H_2O)
WHICH = 12 atoms of hydrogen and 6 atoms of oxygen 

AND
6 molecules of carbon dioxide (CO_2)
WHICH = 6 atoms of carbon and 12 atoms of oxygen.



APPENDIX GAME

THE WINNING COMBINATION: $C_6H_{12}O_6$.

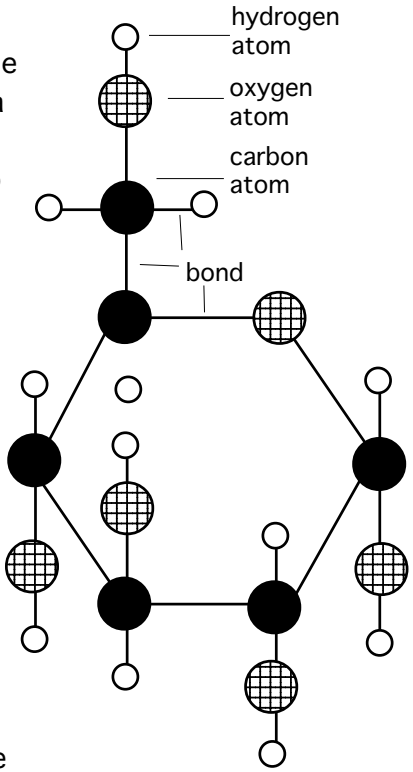
This is the chemical formula for the simple sugar molecule that is the basic food for the plant.

You cannot make a sugar molecule unless you also have one unit of sunlight for every water molecule and carbon dioxide molecule. That means you will need 6 water molecules and 6 carbon dioxide molecules and 6 sun units to make one sugar molecule. You must have sunlight to make the chlorophyll in the leaf excited about doing its photosynthesis. When you have all 6 units of sunlight, you can change the water and carbon dioxide molecules into the sugar you need for your food—and for the food for all the rest of the animal world.

Your job is critical to all animal life on the planet. You are the food producer. All the animals, including the humans, rely on you to survive. You must succeed.

Perhaps you already know about **molecules** and **atoms**. Just in case you have forgotten, here is a brief reminder.

The atom is one of the basic units of matter. Everything around us is made up of atoms. An atom is very tiny—more than a million times smaller than the thickness of a human hair! Atoms are the building blocks of the simplest elements, such as **hydrogen**, **oxygen**, and **carbon**.



Molecules are more complex than atoms and are made of two or more linked atoms. Water, for example, is a molecule made of two atoms of hydrogen linked to one atom of oxygen. Oxygen is an atom and it is also a molecule. The oxygen in the air we breathe is actually two oxygen atoms linked together. That is why it has the **chemical formula** O_2.

Scientists use chemical formulas to show atoms connected into molecules. For example, a water molecule is made from 2 hydrogen atoms and one oxygen atom. Its chemical formula is written H_2O. The chemical formula CO_2 represents carbon dioxide.

Atoms link together in molecules through strong attractive forces called **bonds**. For example, in this illustration, the lines stand for the bonds between the atoms. These atoms are combined to make a simple sugar called glucose. Count the atoms and see how this illustration compares to the chemical formula for the simple sugar in this game: $C_6H_{12}O_6$.

APPENDIX

RULES:

Each board can hold 4 players. Each player should provide a playing piece. Playing pieces can be coins, rings, nuts, small bottle caps, stones or other small objects. Put the playing pieces on the **START** space.

Arrange the atoms:
Each player begins with 3 molecules of water (H_2O) and 3 molecules of carbon dioxide (CO_2). How many atoms total is that?

6 **H**
9 **O**
3 **C**

Each player should organize his/her atoms into molecules of water (H_2O) and carbon dioxide (CO_2).

Put all the remaining H and 1/3 of the O in the water resources box.
Put all the remaining C and 2/3 of the O in the air resources box.
Put the units of sunlight in the light box.

Stack the challenge cards, question sides up, on the challenge space on the board.

Set the die by the board.
Roll a die to see who goes first. The highest number goes first. For each move, roll the die and move the number of spaces shown.

Each space on the board has directions. Some directions ask you to collect water molecules or carbon dioxide molecules, and some directions tell you to give up your water or carbon dioxide. Other directions tell you to select a challenge card or allow you to trade your molecules and units of sunlight.

CHALLENGE CARDS: When you land on a space that says "Time for a Challenge Card," you must draw a card from the Challenge Card stack. Read the question aloud and then answer the question. After you have answered, turn the card over and read the correct answer. If you answered correctly, you may collect one unit of sunlight. If you answered incorrectly, you must sacrifice one unit of sunlight or one set of atoms that make a water molecule AND one set of atoms that make a carbon dioxide molecule. (You will return the unit of sunlight to the light box OR put 2 Hydrogen atoms and one oxygen atom—H_2O—in the water resources box AND you will put one carbon atom and 2 oxygen atoms—CO_2—in the air resources box.) Put the used Challenge Card under card stack so it can be used again.

When you land on a **BALANCE SPACE**, you may trade your resources. You may trade as much as you want any time you land on a BALANCE SPACE, but you are NOT REQUIRED to make a trade. If you do make a trade:

one unit of sunlight = one H_2O AND one CO_2
one unit of sunlight = two H_2O
one unit of sunlight = two CO_2
one CO_2 = one H_2O

The first player who finishes receives a primary food-maker reward, and then helps the other players complete their collection. All players continue until all players have completed their collection and made a simple sugar.


BALANCE SPACE
CHLOROPHYLL COMMAND CENTER Collect 2 units of sunlight
Time for a CHALLENGE CARD
The water level is good in the xylem. Collect 2 molecules of water (H_2O)
AIR COMMAND CENTER Collect 2 molecules of carbon dioxide (CO_2).
CHLOROPHYLL COMMAND CENTER. Collect 2 units of sunlight
BALANCE SPACE
BALANCE SPACE
Night is coming. Low light levels. Go back 2 spaces.
It has rained. Hooray. Water is flowing up the xylem. Collect 2 molecules of water (H_2O).
OOPS. Some insects are eating on your leaf and have ruined many stomata. Return one molecule of carbon dioxide (CO_2) to the Air Resources Box.
Go directly to the CHLOROPHYLL COMMAND CENTER and collect 2 units of sunlight.
AIR COMMAND CENTER Collect 2 molecules of carbon dioxide (CO_2).
Time for a CHALLENGE CARD. If you answer correctly, you win double. If you answer incorrectly, you lose double.
Time for a CHALLENGE CARD

THE LEAF FOOD FACTORY GAME

A little creature took a bite out of your stem. You have lost some of the important xylem and phloem tubes. Go back 3 spaces.

There has been a volcanic eruption. Your leaf is covered in ash. Your stomata are closed tight. Return 2 molecules of CO_2 to the Air Resources Box.

BALANCE SPACE

Time for a CHALLENGE CARD. If you answer correctly, you win double. If you answer incorrectly, you lose double.

Each time you pass Start, collect one unit of sunlight

WATER COMMAND CENTER Collect 2 molecules of water (H_2O).

You have learned that there is no water coming from the roots. Return one molecule of H_2O to the Water Resources Box.

BALANCE SPACE

The xylem are clogged by insects. No water is getting through. Return one molecule of H_2O to the Water Resources Box.

APPENDIX

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O	O	O	O	O	O	O	O	O	O	H	H
H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	C	C	C	C	C
C	C	C	C	C	C	C	C	C	C	C	C
C	C	C	C	C	C	C	C	C	C	C	C

APPENDIX GAME

CHALLENGE CARD 1 QUESTION: What plant food ingredient comes into the leaf through the stomata?	**CHALLENGE CARD 7** QUESTION: What animals depend on the food the plants produce?
CHALLENGE CARD 2 QUESTION: What is the name of the tubes that carry water from the roots to the leaf?	**CHALLENGE CARD 8** QUESTION: What is the chemical formula for a simple sugar?
CHALLENGE CARD 3 QUESTION: What is the name of the tubes that carry food (simple sugars) from the leaves to the rest of the plant?	**CHALLENGE CARD 9** QUESTION: What is the name for the mouth-like pores that open to let in carbon dioxide (CO_2) and let out oxygen (O) and water (H_2O)?
CHALLENGE CARD 4 QUESTION: In addition to giving strength to the leaf's structure, what do the veins do in the leaf? (2-part answer)	**CHALLENGE CARD 10** QUESTION: What is the name of the food transportation tube of the plant's main plumbing system?
CHALLENGE CARD 5 QUESTION: What does chlorophyll do in the leaf?	**CHALLENGE CARD 11** QUESTION: What is left over when water and carbon dioxide are changed through photosynthesis into a simple sugar?
CHALLENGE CARD 6 QUESTION: What happens to the food the leaf produces? Fill in the blank. The plant uses the food or _____ it for later use.	**CHALLENGE CARD 12** QUESTION: What is the name for the chemical change of the sun's light energy into food in the plant?

APPENDIX GAME

7 ANSWER: **All animals** depend on the food the plants produce.	**1** ANSWER: **Carbon dioxide** is the plant food ingredient that comes into the leaf through the stomata.
8 ANSWER: The chemical formula for a simple sugar is **$C_6H_{12}O_6$.**	**2** ANSWER: The tubes that carry water from the roots to the leaf are named **Xylem**
9 ANSWER: the name for the mouth-like pores that open to let in carbon dioxide (CO_2) and let out oxygen (O) and water (H_2O) is **stomata**.	**3** ANSWER: The tubes that carry food (simple sugars) from the leaves to the rest of the plant are named **Phloem**
10 ANSWER: The name of the food transportation tube of the plant's main plumbing system is **phloem**	**4** ANSWER: The veins **(a.) carry food and (b.) carry water.**
11 ANSWER: **Oxygen** is leftover when water and carbon dioxide are changed through photosynthesis into a simple sugar.	**5** ANSWER: Chlorophyll **traps and packages the sun's energy**.
12 ANSWER: **Photosynthesis** is the name for the chemical change of the sun's light energy into food in the plant	**6** ANSWER: The plant uses the food or **stores** it for later use.

APPENDIX GAME

CHALLENGE CARD 13 QUESTION: What is the chemical formula for a water molecule?	**CHALLENGE CARD 19** QUESTION: Name one of the two main substances that come out of the leaf through the stomata.
CHALLENGE CARD 14 QUESTION: What is the chemical formula for carbon dioxide?	**CHALLENGE CARD 20** QUESTION: Animals cannot make their own food. True or false?
CHALLENGE CARD 15 QUESTION: What is the chemical formula for the oxygen in the air we breathe?	**CHALLENGE CARD 21** QUESTION: The main food factories in plants are the flowers. True or false?
CHALLENGE CARD 16 QUESTION: Oxygen is the name for a molecule and an atom. True or false?	**CHALLENGE CARD 22** QUESTION: The reverse of photosynthesis in a plant is respiration. True or false?
CHALLENGE CARD 17 QUESTION: Make up a question about photosynthesis to ask one other player. You can look at your background information on photosynthesis to help you. If s/he gives the correct answer, you both win. If s/he gives the incorrect answer, the other players win. No cheating!	**CHALLENGE CARD 23** QUESTION: A leaf has only a few stomata. True or false?
CHALLENGE CARD 18 QUESTION: Make up a question about photosynthesis to ask one other player. You can look at your background information on photosynthesis to help you. If s/he gives the correct answer, you lose. If s/he gives the incorrect answer, you win. No cheating!	**CHALLENGE CARD 24** Question: Plants cannot move at all! True or False?

APPENDIX GAME

19 ANSWER: One of the two main substances that comes out of the leaf through the stomata is **oxygen**. OR ANSWER: One of the two substances that comes out of the leaf through the stomata is **water**.	**13** ANSWER: the chemical formula for a water molecule is **H_2O.**
20 ANSWER: It is **true** that animals cannot make their own food	**14** ANSWER: The chemical formula for carbon dioxide is **CO_2.**
21 ANSWER: It is **false** that the main food factories in plants are the flowers. Leaves are the main food factories.	**15** ANSWER: The chemical formula for the oxygen in the air we breathe is **O_2**.
22 ANSWER: It is **true** that the reverse of photosynthesis in a plant is respiration.	**16** ANSWER: **True**: Oxygen is the name for a molecule and an atom.
23 ANSWER: It is **false** that a leaf has only a few stomata.	**17** DID YOU GIVE THE CORRECT ANSWER?
24 ANSWER: It is **false** that a leaf cannot move at all. Leaves move to take advantage of the best light.	**18** DID YOU GIVE THE CORRECT ANSWER?

APPENDIX

one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**
one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**
one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**
one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**
one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**
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one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**	one unit of **SUNLIGHT**

NOTES:

Appendix C

Meeting the Standards

APPENDIX STANDARDS

This curriculum meets and exceeds Alaska Content standards with rich and rigorous variety. The standards are noted at the beginning of each of the five sections of the curriculum (pages 15, 27-28, 42, 61, and 74). Intended as a multi-disciplinary unit, the direction for this curriculum was however, specifically focused. As stated in the Overview the emphasis is on traditional knowledge of the *Unangan/Unangas.* The curriculum is designed to pull students into the world of science by introducing them to local plants, associated with their names in *Unangam tunuu*.

The following written standards are some of the Alaska State Content standards covered in *Unangam Hitnisangin/Unangam Hitnisangis/Aleut Plants*: *a region-based plant curriculum for grades 4-6.*

The oral and written exercise embedded throughout the curriculum require the student to meet Standards for English/ Language Arts.

B. A student should be a competent and thoughtful reader, listener, and viewer of literature, technical materials and a variety of other information.

B - 3. relating what the student views, reads, and hears to practical purposes in the student's own life, to the world outside, and to other texts and experiences.

C. A student should be able to identify and select from multiple strategies in order to complete projects independently and cooperatively.

C - 1. make choices about a project after examining a range of possibilities;

C - 2. organize a project by

- understanding directions;
- making and keeping deadlines; and
- seeking, selecting, and using relevant resources;

C - 3. select and use appropriate decision-making processes;

C - 4. set high standards for project quality; and

C - 5. when working on a collaborative project,

- take responsibility for individual contributions to the project;
- share ideas and workloads;
- incorporate individual talents and perspectives;
- work effectively with others as an active participant and as a responsive audience; and
- evaluate the processes and work of self and others.

D. A student should be able to think logically and reflectively in order to present and explain positions based on relevant and reliable information.

D - 1. develop a position by

- reflecting on personal experiences, prior knowledge, and new information;
- formulating and refining questions;
- identifying a variety of pertinent sources of information;
- analyzing and synthesizing information;

D - 2. evaluate the validity, objectivity, reliability, and quality of information read, heard, and seen;

D - 3. give credit and cite references as appropriate; and

D - 4. explain and defend a position orally, in writing, and with visual aids as appropriate.

E - 1 A student should understand and respect the perspectives of others in order to communicate effectively. and should use information, both oral and written, and literature of many types and cultures to understand self and others;

APPENDIX STANDARDS

The many experiments and observations activities in this curriculum call on the student to: meet these standards in Mathematics:

A. A student should understand mathematical facts, concepts, principles, and theories.

A-2. select and use appropriate systems, units, and tools of measurement, including estimation;

A-3. perform basic arithmetic functions, make reasoned estimates, and select and use appropriate methods or tools for computations or estimation;

A-6. collect, organize, analyze, interpret, represent and formulate questions about data and make reasonable and useful predictions about the certainty, uncertainty, or impossibility of an event.

B. A student should understand and be able to select and use a variety of problem-solving strategies.

B - 1. use computational methods and appropriate technology as problem-solving tools.

E. A student should be able to apply mathematical concepts and processes to situations within and outside of school.

E - 2 Use mathematics in daily life;

E - 3 use mathematics in other curriculum areas.

With its emphasis on plants and the blend of traditional knowledge and western science, the curriculum emphasizes these science standards:

A - 1. understand models describing the nature of molecules, atoms and sub-atomic particles and the relation of the models to the structure and behaviors of matter;

A - 9. understand the transfers and transformations of matter and energy that link living things and their physical environment, or molecules to ecosystems (Flow of Matter and Energy);

A -10. understand that living things are made up mostly of cells and that all life processes occur in cells (Cells);

A-11. understand that similar features are passed on by genes through reproduction (Heredity);

A- 12. distinguish the patterns of similarity and differences in the living world in order to understand the diversity of life and understand the theories that describe the importance of diversity for species and ecosystems (Diversity);

A -14. understand

a. the interdependence between living things and their environments (Interdependence);

b. that the living environment consists of individuals, populations, and communities (Interdependence); and

c. that a small change in a portion of an environment may affect the entire environment (Interdependence);

A -15. use science to understand and describe the local environment (Local Knowledge).

B. A student should possess and understand the skills of scientific inquiry.

B -1. use the processes of science; these processes include observing, classifying, measuring, interpreting data, inferring, communicating, controlling variables, developing models and theories, hypothesizing, predicting, and experimenting;

APPENDIX STANDARDS

C. A student should understand the nature and history of science.
C - 1 Know how the words “fact,” “observation,” “concept,” “principle,” “law,” and “theory” are generally used in the scientific community;
C - 3. understand that society, culture, history, and environment affect the development of scientific knowledge;
C- 4. understand that some personal and societal beliefs accept non-scientific methods for validating knowledge;
C- 5. understand that sharing scientific discoveries is important to influencing individuals and society and in advancing scientific knowledge.
D -1 A student who meets the content standard should apply scientific knowledge and skills to understand issues and everyday events.

The use of the Unangam tunuu ties in these World Languages standards:
B. A student should expand the student’s knowledge of peoples and cultures through language study.
B- 1. A student who meets the content standard should: understand the relationship between language and culture;
B- 3. learn about and experience deep characteristics of the culture, including folkways, mores, laws, traditions, customs, and patterns of behavior;
B- 4. improve the student’s understanding of the student’s language and culture through experiences with other languages and cultures;
B- 6. recognize through language study that all cultures contribute to the global society.
C- 4. apply language skills and cultural knowledge to enhance the student’s intellectual and social growth and to promote life-long learning.

Students will be relying on technology throughout this study:
A. A student should be able to operate technology-based tools.
A - 1. use a computer to enter and retrieve information;
A - 3. use local and world-wide networks.

The focus on the traditional knowledge of the *Unangan/Unangas* meets and exceeds these Cultural Standards:
A. Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community.
A - 3. acquire and pass on the traditions of their community through oral and written history;
A - 4. practice their traditional responsibilities to the surrounding environment;
A - 5. reflect through their own actions the critical role that the local heritage plays in fostering a sense of who they are and how they understand the world around them;
A - 6. live in accordance with the cultural values and traditions of the local community and integrate them into their everyday behavior.
B. Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life.
B - 1. acquire insights from other cultures without diminishing the integrity of their own.

APPENDIX STANDARDS

B - 2. make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live.

C. Culturally-knowledgeable students are able to actively participate in various cultural environments. Students who meet this cultural standard are able to:

C -1. perform subsistence activities in ways that are appropriate to local cultural traditions.

C - 3. attain a healthy lifestyle through which they are able to maintain their social, emotional, physical, intellectual and spiritual well-being.

D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning:

D - 1. acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders;

D- 3. interact with Elders in a loving and respectful way that demonstrates an appreciation of their role as culture-bearers and educators in the community;

D - 4. gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance;

D- 5. identify and utilize appropriate sources of cultural knowledge to find solutions to everyday problems.

E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.

E- 1. recognize and build upon the inter-relationships that exist among the spiritual, natural, and human realms in the world around them, as reflected in their own cultural traditions and beliefs as well as those of others;

E- 2. understand the ecology and geography of the bioregion they inhabit.

E- 8. identify and appreciate who they are and their place in the world.

Appendix D

Addenda: Missing Plant Names

ADDENDA

The following materials were developed subsequent to the original document, but are included here for your educational use. If anyone has work of their own which they wish to contribute in support of this unit, please do contact us at carlson@mail.ankn.uaf.edu. While the original document will remain pretty much the way you find it today, the addenda may grow, so you will want to check back to this site on occasion.

Missing plant names in the Aleutian/Pribilof Region: Help us find one word

We need specific names in *Unangam tunuu* (Aleutian Aleut) for the following plants that grow in various parts of our region. The number on the left relates to a plant curriculum that the Association of *Unangan/ Unangas* Educators has produced which has been out for pilot testing since May 2001. Following the number in italics is the scientific (Latin) name, then a common name(s). In parenthesis is the page on which the plant may be found in the definitive guide, Flora of Alaska and Neighboring Territories by Eric Hultén. It can be found in most libraries. Also, note the websites with color photos or line drawings of the plants for whose *Unangam tunuu* names we search.

We need your help. A word we need may even be listed in the *Aleut Dictionary, Unangam Tunudgusii* and we missed it because it was not listed in the index and our reader did not find it when she read it page by page. Maybe your aunt, uncle, grandma or cousin knows one or more of these names so we can record it before it is lost forever. The person you ask may be the last person in the world who knows it.

I will work with the appropriate folks to be sure that the person who shares the information can have it documented. Also, any listings that can be confirmed will be added to the plant curriculum. Since this is a science curriculum we must be certain that the words we include can be positively correlated. If you know that the word is listed in a resource, please also cite that.

It is important to list the name of the person who gives you the information, the place the word is from (such as St. George or the original village that person learned the information, such as Akutan). Do not worry if you only know how the word is said in one place. If we learn that, we may prod someone else's memory. A botanist, linguist or myself will then try to get back to you with further questions if necessary. Be sure to include your contact information. (phone, snail mail, e-mail)

Each person knows something that others may not. Together we can fill these gaps. Every blank filled will enrich both our knowledge bank and that of the world.

Qaĝaasakung, I thank you, for your time and consideration!

Very truly yours,
Barbara Carlson
Association of *Unangan/Unangas* Educators
PO Box 220196
Anchorage, AK 99522-0196
fnblc@uaf.edu

ADDENDA

12. *Chochlearia officinalis* Scurvy grass, spoonwort (Hultén p. 500)
http://caliban.mpiz-koeln.mpg.de/~stueber/lindman/204.jpg

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

16. *Dactylorhiza aristata* Key flower, purple orchid (Hultén p. 318)

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

17. *Drosera rotundifolia* Sundew (Hultén p. 559)
http://www.csdl.tamu.edu/FLORA/imaxxdrs.htm

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

22. *Galium aparine* Bedstraw (Hultén p. 838)
http://www.csdl.tamu.edu/FLORA/cgi/gallery_query?q=Galium+aparine

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

23. *Gentiana algida Gentian* (Hultén p. 754)
http://www.csdl.tamu.edu/FLORA/cgi/gallery_query?q=Gentiana+algida
http://arnica.csustan.edu/jpeg/gent.jpg

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

35. *Menyanthes trifoliata* Buckbean, bogbean (Hultén p. 763)
http://ridgwaydb.mobot.org/mobot/rarebooks/
plantinfo.asp?relation=QK99A1K6318831914&identifier=0173#

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)
Note: There is reference to a word Trilliskan, by Hall and Hudson, but so far it cannot be corroborated satisfactorily. If anyone knows more about this word, we would love to hear from you!

36. *Mertensia maritima* Oysterleaf (Hultén p. 781)
http://caliban.mpiz-koeln.mpg.de/~stueber/lindman/580.jpg

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

ADDENDA

38. *Papaver alaskanum* Alaska poppy (Hultén p. 492)

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

39. *Pedicularis langsdorffii* Lousewort (Hultén p. 822)

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)
Note: One found word for this plant is Chinguudĝim qumilgii. It is from the Eastern dialect speakers of the Pribilofs. It is not specific, however, to this plant and means the edible root of any kind of flower.

40. *Phyllodoce aleutica* Aleutian heather (Hultén p. 723)
http://arnica.csustan.edu/jpeg/phyllale.jpg
http://www.asahi-net.or.jp/~vm5s-tjm/e/aonotug.htm

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

41. *Plantago macrocarpa* Common plantain (Hultén p. 832)

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

42. *Platanthera dilatata* Bog candle, White orchid (Hultén p. 322)
http://elib.cs.berkeley.edu/cgi/img_query?where-genre=Plant&where-taxon=Platanthera+dilatata

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

45. *Polystichum aleuticum* Aleutian shield fern (Hultén p. 53)
http://www.uaa.alaska.edu/enri/rareguide/rarelist.html

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

48. *Rhododendron camtschaticum* Kamchatka rhododendron, Moss rose (Hultén p. 719)
http://www.rosebay.org/chapterweb/spsurvey4.htm

plant name in Unangam tunuu _____ community _____
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

ADDENDA

52. *Rumex acetosella* Sheep sorrel (Hultén p. 375)
http://ridgwaydb.mobot.org/mobot/rarebooks/searchresults.asp?searchmethod=scientific&taxa=Rumex+acetosella

plant name in Unangam tunuu | community
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)
Note: Tangax uqux has been listed as a word from Atka, but we are not sure which plant it named. This plant is very difficult to distinguish between other similar plants, so we must have certainty about the scientific name correlation. Otherwise we might be talking about several different plants and think we are talking about one.

55. *Saxifraga punctata (= S. nelsonia D. Don)* Cordate-leaved saxifrage, brook saxifrage (Hultén p. 572)
http://www.cwnp.org/photopgs/sdoc/sapunctata.html

plant name in Unangam tunuu | community
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

Not numbered: Cypripedium guttatum Lady's slipper (Hultén p. 315)
http://saja.free.fr/Yunnan.htm

plant name in Unangam tunuu | community
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)

64. *Porphyra sp.* Nori, laver, red laver, teal nori (Schofield p. 261 & 262)

plant name in Unangam tunuu | community
(Atka, Unalaska, King Cove, St. Paul, St. George, Nikolski, Akutan, Sand Point or another place)
Note: This seaweed was not in the Hultén. It can be found in Janice Schofield's excellent *Discovering Wild Plants: Alaska, Western Canada, the Northwest.*)

ADDENDA

UNANGAM TUNUU COLOR WORDS

Unangam tunuu color words in **color:** Use this option in the pdf (printer document file) version. Otherwise the resolution will not be satisfactory. If you have not yet learned the sound system for *Unangam tunuu*, see the glossary in the appendix for "say-it" cues.

If you have a great color printer this method of showing the words will help students, young and old, remember the colors they represent. To do white one must have a dark background. Silvery and grey are represented by the same word. You can make one grey and one silver in both dialects if you have the available color source, such as paint.

These work great on bulletin boards, flash cards, posters or you can paint them on t-shirts or sweatshirts. Rearrange them however you like: This is but one way to accelerate comprehension.

Symbols: E = Eastern dialect; W= Western dialect; and (r) = Russian loanword

chidĝaayu(m) tuduu E

uluudam qaxchikdaa W

chidĝaayux̂ E

chidĝix̂ W

chidĝix̂ E

chidĝaayux̂ W

chumnugix̂

qaxchiklux̂ E

qaxchikdax̂ W

quumhlaakdax̂ E

quuhmliix W

uluudam tudagii W

uluudax̂

kanuuyax̂ (r)

chumnugim qaxchikluu E

chumnugim qa(x)chidaa W

quumhlaakdax̂ E

quuhmliix W

suulutux̂ E (r)

zuulutux̂ W (r)

chidĝaayu(m) tuduu E

chidĝaayux̂ W

uluudam qaxchikdaa W

chumnugix̂

chidĝaayux̂ E

qaxchiklux̂ E

chidĝix̂ W

qaxchikdax̂ W

chidĝix̂ E

quumhlaakdax̂ E

quuhmliix W

uluudam tudagii W

uluudax̂

kanuuyax̂ (r)

chumnugim qaxchikluu E

chumnugim qa(x)chidaa W

quumhlaakdax̂ E

quuhmliix W

suulutux̂ E (r)

zuulutux̂ W (r)

chidĝaayu(m) tuduu E

uluudam qaxchikdaa W

chidĝaayux̂ E

chidĝix̂ W

chidĝix̂ E

chidĝaayux̂ W

chumnugix̂

qaxchiklux̂ E

qaxchikdax̂ W

quumhlaakdax̂ E

quuhmliix W

uluudam tudagii W

uluudax̂

kanuuyax̂ (r)

chumnugim qaxchikluu E

chumnugim qa(x)chidaa W

quumhlaakdax̂ E

quuhmliix W

suulutux̂ E (r)

zuulutux̂ W (r)

NOTES