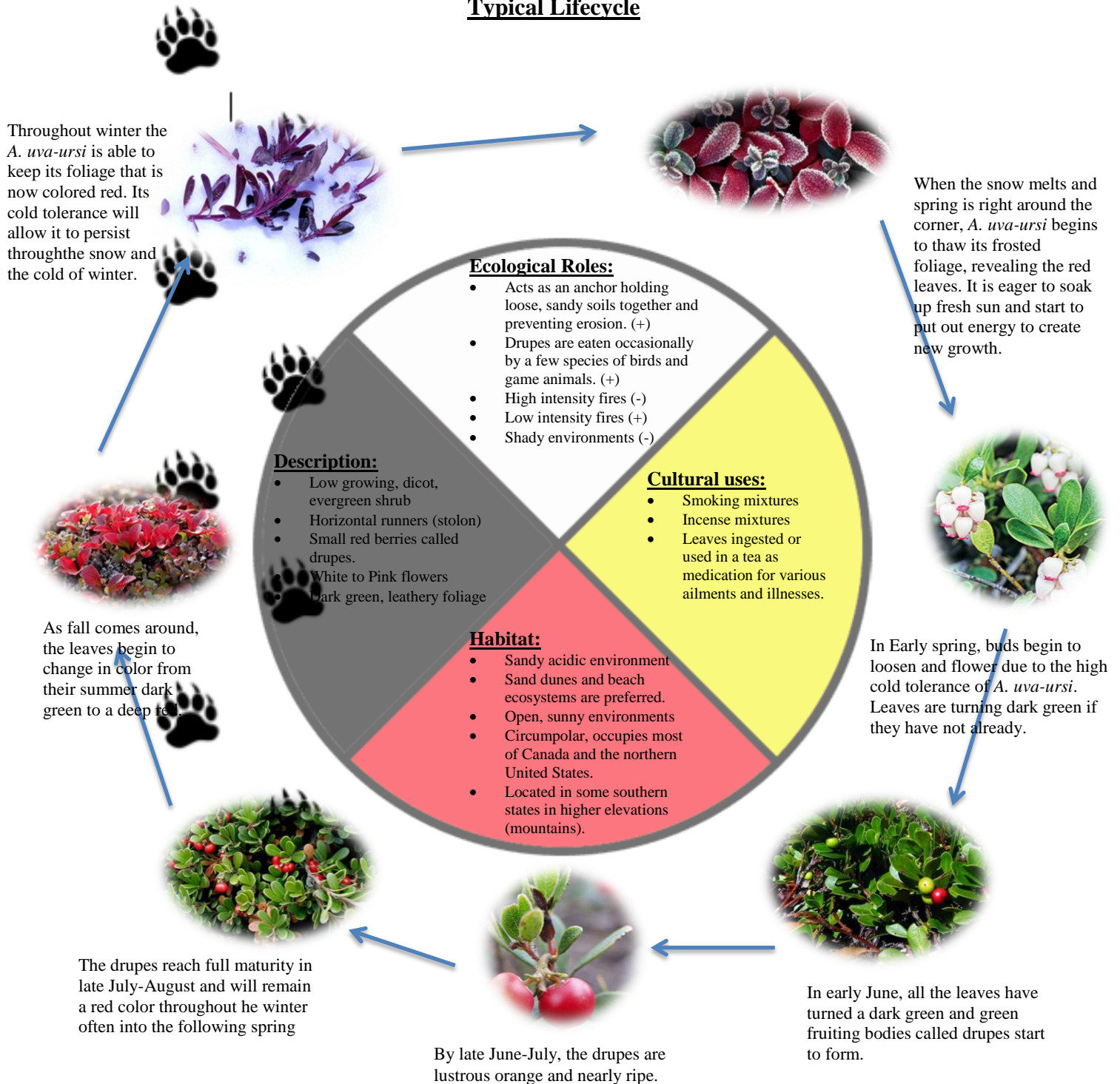


Species Productivity Schedule for:
Arctostaphylos uva-ursi

Common: Bearberry or Kinnikinnik
 Anishinaabe: Apaakozigan



Typical Lifecycle



Species Productivity Schedule for the *Arctostaphylos uva-ursi*

Nomenclature:
Family: Ericaceae
Scientific Latin Name: *Arctostaphylos uva-ursi*
Common Name(s): Bearberry, Kinnikinnik
Anishinaabe Name: Apaakozigan or Assemabama (“Big Tobacco”)
Plant Symbol: ARUV

Description:

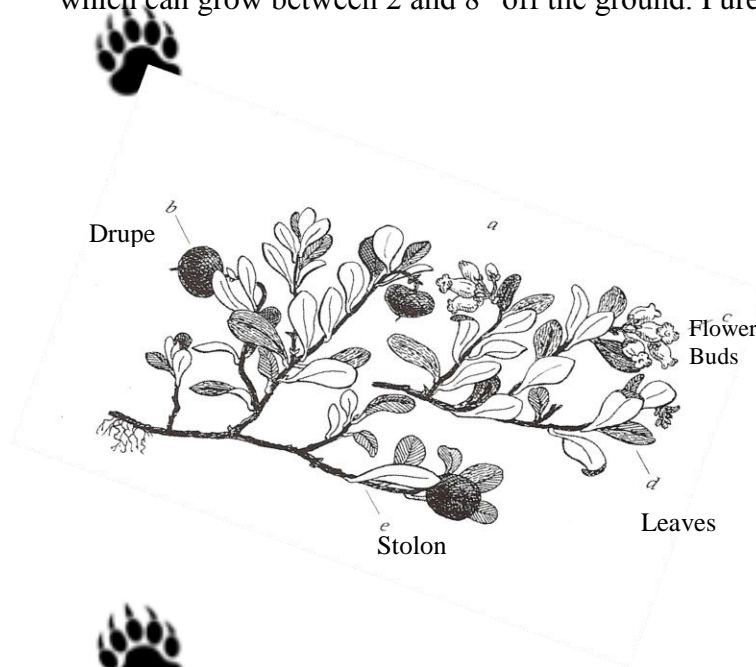
Arctostaphylos uva-ursi, or bearberry, is a low growing, dicot, evergreen shrub, which can grow between 2 and 8” off the ground. Pure stands of bearberry can be


extremely dense, and manifests as erect branching twigs emerging from long flexible horizontal stems, which are produced by a single root. The trailing stems will layer, sending out small roots periodically. The branches, which are finely textured, are initially white or pale green, becoming smooth and red-brown as it matures (USDA,2012).

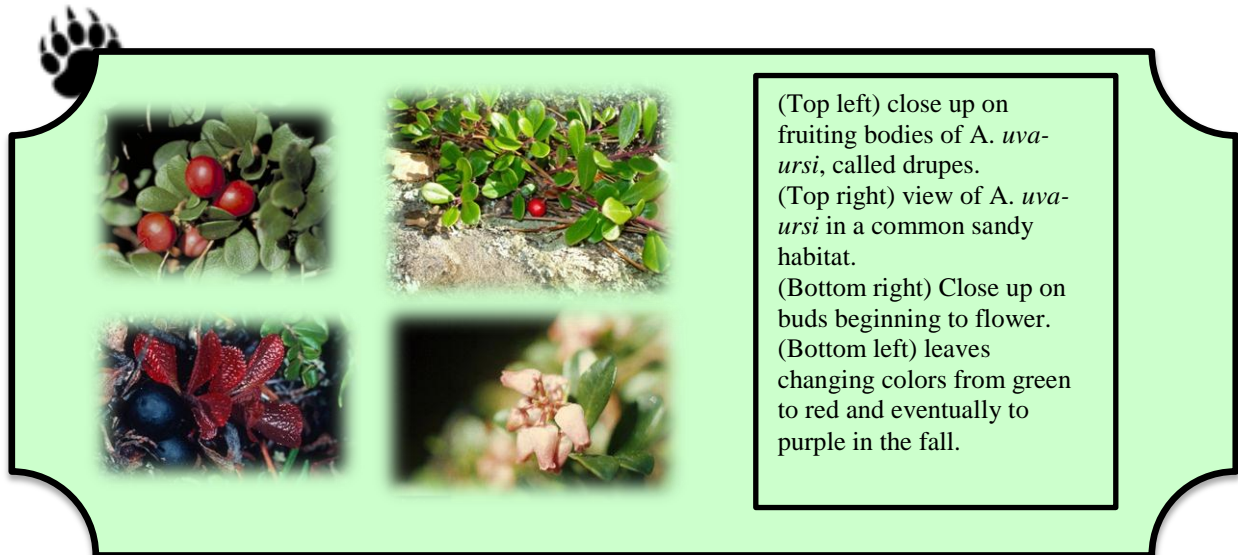
The simple leaves of this broadleaf evergreen are alternately arranged on branches and each leaf is held vertically by a twisted leaf stalk. The dark green leaves are

an inch long and have rounded tips tapering back to the base. The leaves are leathery, flat margined and indistinctly veined. In fall, the leaves begin changing from dark green to a reddish-green to purple (USDA, 2012).


Terminal clusters of small urn-shaped flowers bloom from May to June. The flowers are white to pink, and will bear round, fleshy, bright red to pink fruits called drupes. This smooth and glossy skinned fruit will range from ¼ to ½ inch in diameter. The fruit will persist on the plant into early winter and sometimes into the following spring. Each drupe contains up to 5 hard seeds, which need to be scarified and stratified, or thinned and weakened, prior to germination to reduce the seed coat and break embryo dormancy. There is an average of 40,900 cleaned seeds per pound of fruit (USDA, 2012).



 Mysteriously, it is the official scientific names that commemorate the native origin tales. Both the Greek (generic) name and the Latin (species) name say “Bear’s uvula”. Native peoples, regardless of their own tribal language or dialect, right across the North American continent, appear to have called this plant by a name associated with its most popular usage. Kinnickinnick. Of obvious Algonkian origin, the word may derive from the root “Kinikinig-“ (to mix) referring to the herb’s use as a base for sacred incense mixtures, smoking mixtures, and medicinal mixtures” (Keewaydinoquay, 1977).



Life Cycle:


 *Arctostaphylos uva-ursi* is a perennial shrub that reproduces primarily asexually. After the second year, the stems (stolons) produce adventitious, feeding roots at the nodes, which seldom grow deeper than the duff layer. If a stem is severed from the original plant, roots develop which penetrate into mineral soil. When plants are growing in sandy soil or loose duff, the creeping stems often grow under the surface. The resulting clonal pattern is generally manifested in compact clusters that spread outward enlarging these clusters and forming satellite clusters, which do the same (Rook, 1999).

The berrylike red drupes persist on the plants through winter and are dispersed by animals and gravity. Seeds have hard seedcoats and dormant embryos, and may be stored in the soil. Seedling growth is slow for the first 3 years, then increases. During the first year, root growth exceeds shoot growth. Bearberry plants, which originated naturally as seedlings appear to be rare (Rook, 1999).

Flowers are waxy-looking, in small, closely-crowded, drooping clusters, of 3-15 flowers, at the ends of the preceding year’s branches will appear in early summer, May-June, before the young leaves. The corolla, about 2/3” across, is urn-shaped, reddish white or white with a red lip, transparent at the base, contracted at the mouth, which is divided into four to five short reflexed, blunt teeth, which are hairy within. There are ten stamens, with chocolate-brown, awned anthers (Rook, 1999).



The berry, which ripens in autumn, is about the size of a small currant, very bright red, smooth and glossy, with a tough skin enclosing an insipid mealy pulp, with five one-seeded stones. It is largely wind pollinated.

Scarification and stratification are required for seed propagation. The embryos are dormant and surrounded by a hard seed coat. They can remain viable for 3 years.





Scarification with acid is usually necessary. Stem cuttings taken in fall are described as the best method of establishment (Rook, 1999).



Habitat:




Bearberry, one of the few species of Ericaceae not characteristic of acid habitats, has a native range from Labrador to Alaska, south to Virginia, Illinois, Nebraska, and in the Mountains from New Mexico north through California to Alaska (Voss and Reznicek, 2012). This long-lived, low growing shrub is extremely cold tolerant and prefers coarse, well to excessively drained soils of forests, sand dunes and barren areas. Although bearberry is most often found growing on sand dunes where sunshine is abundant, it grows well under partial shade of forest canopies as well (USDA, 2012).




Bearberry will grow best under the aforementioned conditions, however, it is nowhere near as selective about substrate as its xerophytic exhibits would indicate. In the glaciated upland it will anchor its trailing mat in sandy or gravelly loam. Where the friction of the Great Lakes exposes the limestone layers of our Paleozoic past *A. uva-ursi* is imbedded in the cracks of alkaline rocks. One may also see *A. uva-ursi* densely clinging toward coniferous swales, roots fastened into acidic black soil atop old sand ridges. Many dunes are protected from erosion by *A. uva-ursi* or a relative *Arctostaphylos*. “There, on the open dune, the species dares to thrive under conditions that nothing else but dune grass will tolerate” (Keewaydinoquay, 1977).



On the shore dunes and island peripheries of the Great Lakes, the greatest bearberry population is found between the edge of the indigenous forest and the secondary levels of the beach. Here it coincides with *Juniperus communis*, *Juniperus horizontalis*, a few dwarfed and twisted cedars, occasional bluebells (*Campanula rotundifolia*), sad, paucifoliate attempts of *Erigeron strigosus* and *Hypericum perforatum*, and xerophytic lichens (Keewaydinoquay, 1977).



Bearberry is a somewhat fire tolerant, suited best for short fire cycles with low fuel buildup and low fire intensity. Its main defense against fires are its latent buds on horizontal stems and dormant buds on the stembase or root crown, allowing the sprouting of surviving plants following fires. Regeneration is rapid and reintegration into burned sites will occur by spreading runners or by seed dispersal (Rook 1999).



As shown in the figures below, *A. uva-ursi* has a fairly large range across the United States and Canada. It is circumboreal and therefore is distributed quite heavily across the Northern United States and most of Canada. However, its distribution is quite sparse in the southern U.S., with samples seen almost exclusively in mountainous habitats (Rook, 1999).





Figure 1: Distribution of *A. uva-ursi* within the United States and Canada (USDA, 2012).

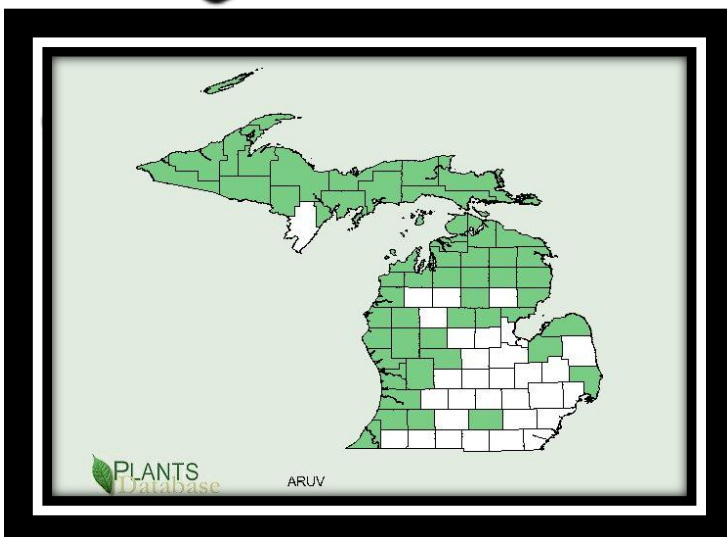


Figure 2: Distribution of *A. uva-ursi* within the state of Michigan (USDA, 2012).

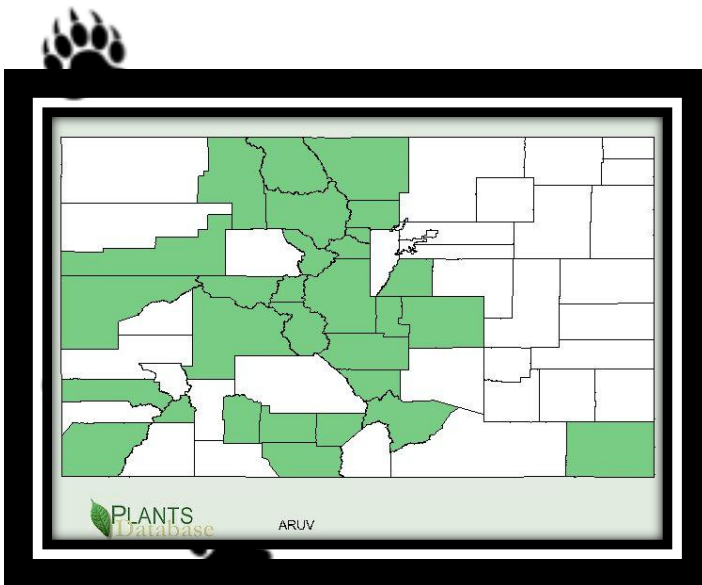


Figure 3: Distribution of *A. uva-ursi* in the state of Colorado. The majority of bearberry shows up at higher elevations, mostly in mountainous regions (USDA, 2012).

Time of Harvest:

Due to its extreme cold tolerance, the bright white and pink lanterns of its urceolate corolla bloom in early spring, contrary to most other ephemerals. As a result of its early fertilization, the berries of *A. uva-ursi* are found to be lustrous green in June, lustrous orange in June-July, and dull red and mealy in July-December (USDA, 2012).


“In the exclusive botanicals, the bearberry is listed as inedible” (Keewaydinoquay, 1977). It is true that the five nutlets of the ovule are bony and usually wholly concreted and held together by a tough, thin skin devoid of all fleshiness and attractively flavored oils. Even the young of the woodland’s most voracious foragers, the chipmunks and the grouse, circumvent the bearberry bushes once they have sampled the red drupes. Despite the bearberry’s high nutritional level, both woodland foragers and ethnobotanists alike deem the drupes to be inedible (Keewaydinoquay, 1977).

In desperate situations, bearberry can be ground into something similar to a cornmeal with a much more unfavorable flavor. Although this type of use is avoided normally, using this technique for food and the leaves for medicine could support someone in an emergency situation (Keewaydinoquay, 1977).


The Story of Bearberry:

There is a story among the native peoples of Turtle Island of Kinnikinnik, or “gift of Bear”, that is told and kept alive by Keewaydinoquay, who has since past on. The story starts with the first council of the Midè spirits held in the center of the Earth. This gathering was called by the Upper-Air-Spirits to ask assistance of the Under-Earth-Spirits in saving a strange, unfurred group of animals called “the people” or the Anishinaabe.


Two of the most famous dodemog, or totems, Bear and Otter, were chosen to aid the spirits in this task, and asked to push the first Tree of Life, the Nokomis Giishik (Grandmother Cedar), from the center of the Earth through to the surface. This tree would represent the first channel of communication between Above and Below.




Bahmbetah-Benaysee, the Rhythm-beater or Proto-flicker, was said to be the main communicator of the on-surface world utilizing anything available to communicate messages by creating a rhythm that would echo vast distances. Bahmbetah-Benaysee stood witness to the first Tree of Life and the first bearberry breaking through the earthen surface.




As Otter's fur began to dry out from the lack of water, Bear gave one last mighty thrust of the Nokomis Giishik. The Earth trembled and quaked and the first Tree of Life emerged in the sunlight, immediately followed by Bear. Otter was eager to return to Below after completing their task, but Bear's curiosity compelled him to get a better look at the strange unfurred animals they were asked to protect.



When the two animals came across a group of these unfurred creatures pounding bark, all but one small infant fled in terror. As Bear examined the creature he understood why they needed protecting. "No claws, no fangs, no fur, no chew-teeth, not even a berry!" Bear explained to the confused Otter that these creatures did not have a "Gaween Kagagee, no safety berry", dangling from the back of their throats like Bear. Bear's berry held all the other berries he had eaten before down inside and so he would never starve.




Bear scrunched down on his great buttocks and slid down the sand dune onto the beach. In the trail behind him "grew a long vine with shining green leaves and little round red berries just like the one hanging in Bear's throat." Bear plucked one of the berries and popped it into the infant's mouth. "The astonished infant lay still, trying to keep his bear berry down." As the warm sunlight from Above shone down on the Tree of Life, the new bear berry vine, and the ripples in the water, Bear and Otter returned to Below.




"Bahmbetah-benaysee, who had closely watched everything that happened, flew to the Tree of Life. Carefully he positioned his grabbing toes into the oily bark. Then he threw back his handsome hammer head and wapped out the first rhythmic beat ever sounded on cedar" (Keewaydinoquay, 1977).

Cultural Uses:




"Bearberry was in use during prehistoric times in the Great Lakes area, as evidenced by parts of the plant having been found archeologically at four locations in the Juntunen site and also growing there. It was also found archeologically on Isle Royale (Minong) carefully preserved in the live-in barrows of the ancient float copper miners" (Keewaydinoquay, 1977).



From the Aleuts and Eskimos and the far-off Tubatulabel of the Kamchatka we have learned of the many valuable uses for *A. uva-ursi*. This includes using the charcoal of the wood for use in making black dyes, as well as, the dried leaves and berries for medicinal and cooking purposes" (Keewaydinoquay, 1977). These uses seem to be very consistent across the North American continent and indisputable evidence has been uncovered for each of these uses in the Assiniboine, Blackfoot, Cheyenne, Chippewa, Forest Cree, Plains Cree, Mandan, Menominee, Ottawa, Pawnee, Potawatomi, Sioux, Teton Dakota, and Yavapai Tribes.

Male herb doctors, shamans, or female herbalists prepare medicines with the bearberry, which included a lengthy process of gathering the plant accompanied by song and prayer, followed by the drying of the plant material and taken as is, or occasionally powdered and administered (Keewaydinoquay, 1977).



Plants used as the base for sacred smoking materials will have been “talked over” from their budding out in early spring right up to the time of harvesting. These chosen plants will have known from the very beginning of their vernal efforts that their products of that season are marked for spiritual purposes” (Keewaydinoquay, 1977). Tribes like the Potawatomi mix the ground up leaves of the bearberry with tobacco to create a smoking mixture. Despite bearberry’s evergreen presence year round, the Potawatomi will only smoke this mixture during the summer months (Smith, 1933). The most common smoking mixture used by all the Tribes of the Great Lakes region would be referred to as “Kinnikinnik” and usually consisted of some combination of tobacco, *Nicotiana rustica*, willow, *Salix*, dogwood bark, *Cornus*, sumac leaves, *Rhus*, and the ever important and versatile bearberry leaves, *Arctostaphylos uva-ursi* (Herron, 2002). If the residues of pipes and other containers used for smoking and smudging were analyzed, it is most likely that these plants would be the main constituents (Herron, 2002).

It is also noted in Frances Densmore’s book, *How Indians use Wild Plants for Food, Medicine & Crafts*, that the roots of *A. uva-ursi* can and were used to attract game wild hunting by smoking it in a pipe (Densmore, 1974). Additionally, although it was not mentioned as one of the common or prominent plants used in dying, the inner bark of the more mature plants can be used to make a dye that is greyish blue.

There are four medicinal forms in popular use, including decoction, infusions, tinctures, and smoking. “Smoking for the relief of illness is an innovative idea to many people. Nevertheless, medicinal smoking, inhaling, and steaming in medicinal vapors, all have been common among Native Americans” (Keewaydinoquay, 1977).

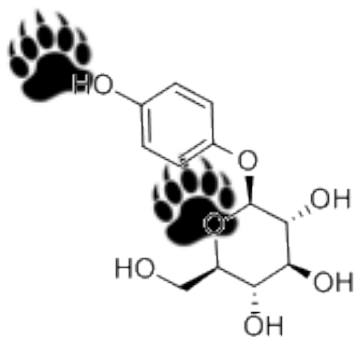
A liquid preparation of bearberry is claimed to effectively heal inflammations of the urinary tract, especially cystitis, in chronic infections of the kidneys, when there are mucous discharges from the bladder, and any imbalance or disorder of the water passage. Other uses noted include fighting the *E. coli* bacterial infection, as a diuretic to treat high blood pressure, a treatment for wounds or infections, specifically cold sores and other related sores, and an anti-diarrheal (Hallnet Ltd., 2012). In some tribes it is noted that a tea made from the leaves is useful for female issue remedy and sometimes is also used as a seasoning to make those female remedies taste better (Smith, 1933). The combination of diuretic, tonic, and astringent properties allows it to be used in cases of chronic bronchitis, diarrhea, leucorrhea, amenorrhea, and uterine hemorrhages (Smith, 1933). It was also noted in some tribes to be used as an antiseptic wash when a strong decoction of the leaves was used (Keewaydinoquay, 1977).

Homer Pinkley also mentioned some uses of the bearberry in a tea form, noting its prominent use as a general tonic, anti-diarrheal, and to even treat diabetes (Pinkley, 1961).

Significant Chemical Constituents:

- Volatile oil – constituents not given. Volatile oils are often aromatic.
- Arbutin – a glycoside – diuretic, urinary antiseptic. Crude extracts of the plant have been found to be more effective due to the presence of Gallotannin (tannin in the leaves) which prevents enzymes (glycosides) from splitting arbutin.

The chemical formula for Arbutin is $C_{12}H_{16}O_7$ (Chemical Book, 2010).



(Chemical Book, 2010).

- Quercetin – a pentahydroxyflavone. Has been used to decrease capillary fragility.
- Ericolin – a glucoside or a mixture of substances (possibly impure arbutin). A bitter resinous amorphous mass. (no doubt the gums & resin seen by the unaided eye when the dried material is used in smoking).
- Methylarbutin – a glycoside. Found along with arbutin in *A. uva-ursi*. The chemical structure is very similar to Arbutin.
- Myricetin – a hexahydroflavone.
- Malic acid – Same as apple acid. Found in many fruits; the main acid in grapes.
- Gallic acid – a precursor of tannin. Used as an astringent and styptic. Low toxicity.
- Tannin – astringent, styptic. Used formerly in gastric hemorrhage and diarrhea. Low toxicity. (Tannin is tannic acid or gallotannin).
- Ursolic acid (ursolurson) – found in leaves of *A. uva-ursi* and the wax coating of apples and other fruit. Has been used as an emulsifying agent in the pharmaceutical and food industries. (Keewaydinoquay, 1977).

Ecological Significance:

Bearberry serves two purposes on sandy soils; both as a beautification plant as well as a critical area stabilizer. The thick, horizontally running, vegetative mat and evergreen character are what make bearberry a very popular ground cover. It is often planted in residential sites, sand dunes, sandy banks, and commercial sites. The fruit it produces is eaten by a few species of songbirds and game animals but in sparse quantities and deer occasionally browse the foliage lightly (USDA, 2012).

Management and Commercial Use/Availability:

Bearberry can be propagated from seeds, softwood cuttings or pre-rooted stems cuttings. It is difficult to root this plant from bare cutting in the greenhouse. Scarified seed sown in early summer will improve germination the following spring, but this technique is not as reliable as cuttings. Softwood cuttings should be harvested in late summer, and rooted stem cuttings are most successful when harvested during the dormant season. Successfully grown seedlings or cuttings should be handled carefully in containers; bare root plantings are rarely effective.

This shrub species requires very little maintenance once it has been established. Annual spring applications of 10-10-10 N-P-K will increase the growth rate of bearberry, but will also increase weed growth. Weed growth must be controlled to sustain healthy stands of bearberry (USDA, 2012).



Bibliography:

- "Arbutin." *ChemicalBook---Chemical Search Engine*. Chemical Book, 2010. Web. 10 June 2012. <http://www.chemicalbook.com/ChemicalProductProperty_EN_CB6670456.htm>.
- Densmore, Frances. *How Indians Use Wild Plants for Food, Medicine, and Crafts*. New York: Dover Publications, 1974.
- Herton, Scott M. *Ethnobotany of the Anishinaabek Northern Great Lakes Indians*. Diss. Southern Illinois University, 2002.
- Keewaydinoquay. "Mukwak Miskomin or Kinnickinnick 'Gift of Bear'." *Miniss Kitigan Drum*. 8th printing. 1977.
- P., Ben. "Bearberry - *Arctostaphylos Uva-ursi*." *Bearberry - Arctostaphylos Uva-ursi*. 2001. Web. 07 June 2012. <http://www.blueplanetbiomes.org/bear_berry.htm>.
- Pinkley, Homer. "Medicinal plants and other plant uses of the local Indians." National Science Foundation. Summer 1961.
- Rook, Earl. "Arctostaphylos Uva-ursi." *Bearberry*. Pacific Northwest Networks, 1 Aug. 1999. Web. 07 June 2012. <<http://www.rook.org/earl/bwca/nature/shrubs/arctouvaursi.html>>.
- Smith, Huron H. *Ethnobotany of the Forest Potawatomi Indians*. Milwaukee, WI: Published by Order of the Board of Trustees, 1933.
- Smith, Huron H. *Ethnobotany of the Menomini Indians*. Milwaukee, WI: Board of Trustees, 1923.
- USDA. "PLANTS Profile for *Arctostaphylos Uva-ursi* (kinnikinnick) | USDA PLANTS." *PLANTS Profile for Arctostaphylos Uva-ursi (kinnikinnick) | USDA PLANTS*. USDA Natural Resources Conservation Service. Web. 07 June 2012. <<http://plants.usda.gov/java/profile?symbol=ARUV>>.
- "Uva Ursi (*Arctostaphylos Uva-ursi*)." *Uva Ursi Benefits & Information*. Hallnet Ltd., 2012. Web. 10 June 2012. <<http://www.herbwisdom.com/herb-uva-ursi.html>>.
- Voss, Edward C., and Anton Reznicek. *Field Manual of Michigan Flora*. Ann Arbor: University of Michigan, 2012.

