

Berry Bulletin

www.ag.uidaho.edu/sandpoint/

The University of Idaho College of Agricultural and Life Sciences, Sandpoint Research & Extension Center

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Welcome to *Berry Bulletin*! This newsletter discusses topics relevant to commercial small fruit production, processing, and marketing in Idaho and surrounding regions.

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If you received this newsletter by postal service but have an email address, please let us know. Sending an electronic version greatly reduces our costs and allows us to better serve our clients.

This issue of *Berry Bulletin* is devoted to huckleberries and bilberries. The University of Idaho is also active in research and extension activities relating to blueberries, lingonberries, currants, gooseberries, jostaberries, saskatoons, raspberries, blackberries, strawberries, and blue honeysuckle. Future issues will address these crops, as well as huckleberries and bilberries.

Weippe Huckleberry Conference

April 21, 2004 marked a landmark in the western huckleberry industry. Ninety processors, researchers, and prospective growers from Idaho and Washington came together in Weippe, Idaho for a one-day conference devoted entirely to the commercial management and production of huckleberries and bilberries in the northwestern United States. Some traveled from as far away as Boise, Yakima, and Priest Lake to attend. Many thanks to those who participated in the conference.

Thanks also to Dan Pierce, Sarah McCullough, Malcolm Dell, and the Clearwater Resource and Development Council, Inc.; Dan Barney and the University of Idaho; Terri Summerfield and the Weippe Discovery Center; Theresa Beaver and Rural Roots; Chris Kuykendall and the Clearwater Economic Development Association; the Idaho Small Business Development Center; Clearwater County Cooperative Extension Service; Clearwater Soil & Water Conservation District; USDA Natural Resources Conservation Service; Clearwater County Economic Development; Tastes of Idaho;

and the Idaho Department of Lands for organizing, sponsoring, and conducting the conference.

Conference topics included:

- Huckleberries and Bilberries of the Pacific Northwest and Intermountain West
- Selecting, Propagating, and Growing Huckleberries
- Management Strategies for Western Foresters
- Prospects for Commercially Cultivating Huckleberries

Some of the information presented is in this newsletter and on the following websites. These sites will be significantly expanded by early 2005.

www.ag.uidaho.edu/sandpoint/research.htm
<http://berrygrape.oregonstate.edu/fruitgrowing/>

A printed or downloadable guide entitled *Growing Western Huckleberries* is available at <http://info.ag.uidaho.edu/Catalog/catalog.html>.



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Western Huckleberry and Bilberry Association

An effort is underway to form a huckleberry and bilberry association. The purpose in establishing an association is to protect, support, and expand the Northwest's commercial huckleberry and bilberry industries. Proposed activities include **improved communication and interaction** between fruit suppliers, brokers, processors, and marketers; **educational programs** such as conferences, workshops, website, and newsletters; **research** on production, processing, and marketing; and **representation** on legislation and policies impacting the industry.

Support for an association was strong at the Weippe conference and plans to organize the Western Huckleberry and Bilberry Association were made. A meeting to formally organize the WHBA will be held in Moscow, Idaho in early October.

For more information on the WHBA organizational meeting, contact Malcolm Dell at giftmarketing@idaho.net or subscribe to the E-mail discussion group described below. If you do not have email access, write to Sara McCullough, Administrative Assistant, Clearwater RC&D Council, P.O. Box 9576, Orofino, ID 83544.

Huckleberry Email Discussion Group

A huckleberry Email discussion group has been formed to serve people interested in managing, cultivating, harvesting, brokering, processing, or marketing huckleberries and huckleberry products. There is no charge for subscribing to the listserv. To subscribe, contact Malcolm Dell at

giftmarketing@idaho.net or send an email with the address you wish to use to huckleberries-subscribe@yahoogroups.com.

The email discussion group is not associated with the University of Idaho.

Prospects for Commercial Production of Huckleberries and Bilberries

Commercial harvests of huckleberries and bilberries from the wild predate the nineteenth-century European settlers when these fruits were traded and bartered by Native Americans. By the late twentieth century, wildcrafted huckleberries had developed into a significant industry in the northwestern United States. Mountain huckleberry (*Vaccinium membranaceum*) is the primary source of fruit for today's culinary market, with Cascade huckleberry (*V. deliciosum*) and oval-leaved bilberry (*V. ovalifolium*) occasionally being harvested for their fruit. Along the Pacific Coast, evergreen huckleberry (*V. ovatum*) is often harvested from the wild and occasionally grown in cultivation - not for its fruit, but for its attractive foliage that is sold for use in floral arrangements. Northwest natives that are seldom used commercially in North America but are popular in Europe and parts of Asia include bilberry or dwarf huckleberry (*V. myrtillus*) and alpine bilberry (*V. uliginosum*).

Huckleberries and bilberries are popular for many reasons. Some, like the mountain and Cascade huckleberries, have outstanding flavors and aromas and lend themselves to the production of a vast array of culinary and cosmetic products. Restaurants throughout North America, from mom-and-pop diners to upscale resorts, feature huckleberries in specialty sauces, desserts, and salad dressings.

In today's society, people are intensely interested in foods and other natural products that can help prevent cancer, heart disease, and other health problems. Research in Europe and North America have shown that huckleberries and bilberries are rich in anthocyanins, antioxidants, and other compounds that may be beneficial to human health. In recent years, some brokers have begun exporting huckleberry and bilberry fruits and products to overseas health food markets.

Besides their practical uses, huckleberries epitomize wilderness and nature. With a large, growing, and affluent population in western North America, combined with an expanding tourist trade, high-value huckleberry products targeting the gift and tourist markets are enjoying great popularity.

Could the huckleberry and bilberry industries expand? Absolutely! Unfortunately, demand for the fruits often far outstrips available supplies. Also, as demand has increased and wild crops have dwindled or become less accessible, prices have risen to the point that they are becoming prohibitive, especially for small-scale processors. The obvious solution, at least for some product lines, is to grow huckleberries and bilberries in cultivation as we do blueberries and raspberries.

With the exception of a few, small evergreen huckleberry farms near the coast, huckleberries and bilberries have not been cultivated. Attempts to cultivate these species have been made, but most ended in failure. These failures can usually be attributed to a lack of knowledge about the crops and their growing requirements, growing the crops in areas where they were poorly adapted, trying to transplant plants from the wild, and lack of improved cultivars.

Many of those barriers still exist today, but we have made great progress. Past research by the U.S. Forest Service and University of Montana laid the groundwork for current programs at the University of Idaho and Montana State University. We are learning much about the soil and climatic requirements for huckleberries and bilberries and are developing and testing cultural practices for managing these crops in forest stands and cultivating them in fields. The University of Idaho, aided by the U.S. Department of Agriculture and Agricultural Research Service, has an active program to develop improved cultivated varieties. Promising selections of mountain huckleberry, bilberry, and oval-leaved bilberry will be provided to cooperating researchers and nurseries for testing throughout the Northwestern U.S. beginning in 2005. We should see the first named cultivars between 2008 and 2020.

So, what are the prospects for commercial production of huckleberries and bilberries? The

reality is, field cultivation of these crops is unproven. Without more development and testing, large-scale attempts to grow these crops would be very risky. We are, however, at a point where growers can begin small-scale trials to evaluate which crops and practices might be appropriate for their particular sites. Seedlings are commercially available to prospective growers and the University of Idaho can provide guidelines on propagating and growing these crops.

Whereas large-scale field cultivation is still at least several years away, we have the knowledge needed to commercially manage huckleberries and bilberries in naturally occurring forest stands. Typical strategies include controlling competing vegetation, water management, and managing shade through tree density. Improving stands with the addition of high-yielding or otherwise superior plants is feasible on some sites. Similar strategies were applied to "North American wild blueberries," formerly known as lowbush blueberries (*V. angustifolium* and *V. myrtilloides*). Combined with effective marketing, wild stand management propelled the wild blueberry industry to great success in the late twentieth century. Although risks remain, management of "wild" stands will almost certainly represent the first step in expanding the production and marketing of western huckleberries and bilberries.

Will cultivation and managed production destroy the huckleberry mystique and ruin the market? Some processors and marketers have expressed this fear. A century ago, blueberries were wild crops, not considered suitable for cultivation. Efforts to domesticate them probably met with many of the same fears. Instead of destroying the mystique and market, highbush, lowbush, and rabbiteye blueberry production became large and profitable industries in North America and abroad.

Also, the goal in the huckleberry and bilberry development program is to expand opportunities and profitability in the industry while protecting valuable natural resources. It seems likely that wildcrafted berries will remain a valuable part of the industry, particularly for high-value, niche products. Large-scale processors, restaurateurs, nutritional supplement and pharmaceutical companies, and export brokers who require large

volumes of fruit and leaves should welcome the uniform, reliable crops cultivation and stand management are likely to provide.

The bottom line? There are certainly opportunities. There are also risks, particularly with field cultivation.

If you are interested in producing cultivated or managed huckleberries or bilberries, start small. For field cultivation, 100 to 1000 plants will help you evaluate your site and develop your skills and appropriate production practices. For trial purposes,

an area of one-tenth to one-quarter acre is sufficient.

The same caution applies to managing a forest stand. Most private forest landowners will probably find that managing one to ten acres of huckleberries will provide all of the work they can handle at first. As your skills and experience grow, you can decide whether a huckleberry enterprise is really desirable on your site. If so, you will be in a good position to expand your enterprise successfully. If not, you can close the enterprise without a serious financial loss.

Huckleberries and Bilberries of the Northwestern United States

Because of the wide and overlapping use of common names, much confusion exists as to what huckleberries and bilberries are. The names huckleberry and bilberry have been applied to many different species in at least two taxonomic families and three genera in North America and Europe.

"Garden huckleberries" are closely related to tomatoes and nightshade. *Solanum melanocerasium* is most commonly called garden huckleberry, but other species are, as well. These annuals or short-lived perennials grow quickly from seed, producing abundant crops of blue berries in a few months. The flavor is often described as less than palatable and commercial prospects are poor.

Many eastern "huckleberries" are found in the genus *Gaylussacia*, belonging to the heath family. The fruits resemble blueberries and western huckleberries, but the flavor is typically poor to fair and the fruits contain ten large, hard seeds. Although widespread in eastern North America, the fruits have not proven commercially important, with commercial emphasis being on highbush, rabbiteye, and lowbush blueberries.

Western huckleberries and bilberries (also often called whortleberries) are close relatives of blueberries and cranberries, belonging to the genus *Vaccinium*. Like their *Gaylussacia* cousins, western species belong to the heath family.

Evergreen, shot, or blackwinter huckleberry (*Vaccinium ovatum*) is native along the Pacific coast from southern California to Central British Columbia. This species is found in coniferous forests along roadsides and the edges of clearings. The bushes grow one to twelve feet tall and form dense stands. The stiff, serrated leaves make the plant commercially valuable for floral arrangements and foliage is harvested from wild stands. Evergreen huckleberry is occasionally grown on small farms along the Pacific coast. The black berries ripen late in the fall and contain very high concentrations of anthocyanins and antioxidants. Fruit yields are low. Adaptation to areas away from the coast remains to be determined.

Red huckleberry or red bilberry (*V. parvifolium*) is native to western Oregon, Washington, California, and British Columbia. Scattered populations have also been reported in interior and eastern British Columbia. This species grows from sea level to 3,500 feet elevation in and around clearings. The bushes grow from three to more than twenty feet tall. The red, waxy fruits were popular in jams and preserves with all coastal Indian tribes, although the flavor tends to be sour. Berries can hang on the branches until early winter. The fruit contains low concentrations of anthocyanins and low antioxidant capacity, although it is rich in p-hydroxybenzoic acid. Red huckleberries would probably be among the easiest of the western species to grow, but appear to be of limited commercial value, at this time. Given product

development and creative marketing, however, commercially viable red huckleberry products may be possible.

Grouse whortleberry, small-leaved huckleberry, dwarf red whortleberry, or red alpine blueberry (*Vaccinium scoparium*) is native throughout western North America in alpine and subalpine meadows and at edges of coniferous woods from 3,000 to 11,000 feet elevation. The rhizomatous plants grow three to eighteen inches tall, forming dense, extensive colonies. The berries are tiny with fair to good flavor. Not harvested commercially due to small fruit size and soft berries.

Dwarf huckleberry, dwarf blueberry, dwarf bilberry, or dwarf whortleberry (*V. caespitosum*) is native throughout North America. The plants grow three to twenty-four inches tall and bear bright blue berries with excellent flavor. This species is adaptable and is found on dry or wet acidic sites from sea level to 10,000 feet. It can form extensive colonies. Although used for food and trade by Native Americans, commercial pickers do not presently target it due to small berry size.

Bilberry, dwarf bilberry, dwarf huckleberry, or whortleberry (*V. myrtillus*) is native to North America, Europe, and Asia. It is found in open, moist, coniferous woods, usually above 2,000 feet elevation in North America. In Europe, this species grows to near sea level and often forms large, dominant colonies. Plants grow six to twenty-four inches tall. The berries contain antioxidants and compounds beneficial to human health and are popular in Europe for culinary and medicinal use. Not presently harvested commercially in North America, although it is harvested commercially from the wild in Finland and other European countries. Limited attempts have been made to grow the crop in cultivation. Commercial prospects for medicinal and nutritional supplement products may be promising.

Alpine bilberry, bilberry, bog bilberry or tundra bilberry (*V. uliginosum*) is native to North America, Europe, and Asia from 38° to 78° north latitudes and from sea level to 9,000 + feet elevation. This species grows on wet or dry, acidic, organic or mineral soils and is often found at the edges of lakes and streams. The plants grow from

several inches to about 36 inches tall, bearing single berries or clusters of two or three glaucous, blue berries one-fourth inch in diameter. Flavor is good, but yields are often low. Alpine bilberry is harvested from the wild for domestic and commercial use in Asia and northern Europe. Some attempts have been made in Europe to cultivate the crop. Not presently a commercially important crop in North America.

Cascade huckleberry, Cascade bilberry, or blue huckleberry (*V. deliciosum*) is native to California, Oregon, Washington, and British Columbia in alpine meadows and subalpine coniferous woods at elevations from 2,000 to 6,000 feet. The plants grow six to thirty-six inches tall, although the procumbent canes can be six feet long or longer). The large, bright blue, glaucous berries have outstanding flavor and aroma due to high concentrations of esters and ketones. Yield potential may be low due to the fruit being borne only at the ends of the canes. Adapted to wet soils and often found at edges of ponds, Cascade huckleberry also grows on drier upland soils and can form dense heaths covering hundreds to thousands of square feet. The berries are very popular for commercial use, but the small, scattered populations limit available volumes.

Oval-leaved bilberry, oval-leaved blueberry, Alaska blueberry, or highbush blueberry (*V. ovalifolium*) is native across the northern United States, southern Canada, and parts of Asia and Europe from sea level to 6,500 feet elevation at the edges of forest clearings and under light to moderate canopies. The plants grow 1.5 to 12 feet tall. The berries are glaucous blue and rich in anthocyanins and antioxidant capacity. The flavor is mild to sour due to low esters and ketones, but the crop may have commercial potential for botanical extracts and nutritional supplements.

Mountain huckleberry, mountain bilberry, black huckleberry, tall huckleberry, big huckleberry, thin-leaved huckleberry, globe huckleberry, or Montana huckleberry (*V. membranaceum*) is native to the northwestern U.S. and western Canada, with outcroppings in Arizona and Minnesota. The plants are usually found in coniferous woods from 2,000 to 11,000 feet elevation, primarily in or around clearings. Canes

grow one to nine feet tall. The bushes are rhizomatous and transplant poorly from the wild. The berries are red, blue, purple, black, or rarely white and have good to excellent flavor and aroma.

Named Idaho's state fruit in 2000. The berries are harvested from the wild for commercial processors and represent the most widely harvested western huckleberry.

Collaborative Huckleberry Grower Program

As part of the huckleberry development program, the University of Idaho has begun a collaborative program with a small number of huckleberry and bilberry growers and managers in Idaho and Washington. The purpose of the program is to evaluate experimental plantings and production methods on a variety of diverse sites.

At this time, collaborative growers bear the costs of establishing their plantings and agree to keep detailed records of the results and provide this information to the University of Idaho for distribution to other established and prospective growers. In return for these services, the University provides consultation on site assessment, evaluating soil tests, planting design, and the selection, establishment, and management of crops.

Most growers will find they can obtain all the information they need from University of Idaho newsletters, bulletins, websites, and workshops. Only those growers who are serious about commercial huckleberry production and who are able and willing to invest significant amounts of time and money to the project should consider applying to the Collaborative Huckleberry Grower program.

There are a few openings left for collaborative growers. If you are interested in participating in this program, please contact Professor Dan Barney at the University of Idaho. Contact information is given at the end of this newsletter.

Research Updates

University of Idaho receives grant to study western huckleberries

The University of Idaho has received a renewal for year two of a three-year project to study the physiology and culture of western huckleberries and bilberries. Grant funds were provided by the Northwest Center for Small Fruit Research, a collaborative of growers, processors, and scientists funded through a special project of the U.S. Department of Agriculture. Activities under the **Domestication of Western Huckleberries** project include trials to determine optimum shade density and adaptability to various soil types. Also included are germplasm evaluation, breeding, and cultivar development, as well as refining tissue culture and seed propagation techniques for *Vaccinium* species native to the northwestern United States. Shade and soil trials are just beginning and will require several more seasons to draw conclusions. Propagation

trials are underway and should be completed by the end of 2005.

Based on preliminary results, the best sites for huckleberries and bilberries appear to include acidic, moist, well-drained loams, sandy loams, and silt loams. Irrigated loamy sands can be suitable for *V. membranaceum* and *V. uliginosum* is naturally found on a range of soils from sandy clay loams to loamy sands. Soil pH is important and should lie between pH 3.5 and 5.5. Open north-facing slopes are ideal and partially shaded sites with other orientations can be acceptable. These species bloom in early spring, so avoid planting in frost pockets. In areas where temperatures drop to 0°F or below, consistent 2-3 feet of snow cover during the winter appears beneficial or necessary. Huckleberries and bilberries are easy to grow in containers and raised beds.

Developing huckleberry and bilberry cultivars

Much progress has been made in developing cultivated varieties (cultivars) of huckleberries and bilberries. The program began with an on-going evaluation of plant materials from a wide area of western North America and northern Europe. During 2003, eight mountain huckleberry and four oval-leaved bilberry plants were selected for testing by cooperating nurseries and scientists in Washington and Idaho. Eighteen more mountain huckleberry, twelve oval-leaved bilberry, and one bilberry were selected for advanced testing at the University of Idaho. Selections for 2004 are not yet complete, but several more plants appear promising. The cultivar development program also includes Cascade huckleberry and alpine bilberry.

Plants are initially grown in containers from seed collected from the wild or harvested from crosses made in the breeding program. Three to five years from sowing, the plants begin bearing fruit and are evaluated for many characteristics. Plants that rank high in a range of desirable traits are propagated for expanded testing at the University of Idaho and cooperator sites. Selections that continue to perform well will eventually be named, patented by the University of Idaho Research Foundation, and released to the public through commercial nurseries. The University of Idaho does not distribute huckleberry planting materials to the public.

Some of the traits we select for include:

- **Canes:** Numerous, vigorous, stiff, erect, and bearing many fruiting laterals.
 - **Physiology:** Late-blooming, self-fruitful, with a short, concentrated ripening period.
 - **Leaves:** Thick, tough, and leathery.
- Fruit:** Numerous and large with total soluble solid (sugar) concentration greater than 7%, pH ranging from 2.6 to 2.8, pleasant flavor, and either dark pigmentation or distinct red or white colors.

Bioactive chemicals in blueberries, huckleberries, and bilberries

University of Idaho scientists Todd Taruscio, Jerry Exon, and Dan Barney recently characterized some of the bioactive compounds found in blueberries, huckleberries, and bilberries as part of a grant funded by the U.S. Department of Agriculture's Initiative for Future Agricultural and Food Systems. Seven *Vaccinium* species native to western North America were compared to highbush blueberries and half-high blueberries (hybrids between highbush and lowbush blueberries). Traits of interest included antioxidant capacity, total phenolics, total anthocyanins, flavanols, phenolic acids, and anthocyanidins.

As expected, blue-fruited species ranked higher in antioxidant capacities than the red fruited wild cranberry (*V. oxycoccus*) and red huckleberry (*V. parvifolium*). Mountain and Cascade huckleberries were similar in antioxidant capacities to half-high and highbush blueberry cultivars. Oval-leaved bilberry and evergreen huckleberry fruits had the highest levels of antioxidant capacities. The latter two species also contained the greatest concentrations of total phenolics and total anthocyanins.

Highbush and half-high blueberries had profiles dominated by phenolic acids, with lesser amounts of anthocyanidins, flavonols, and flavan-3-ols, in that order. Mountain huckleberry, Cascade huckleberry, oval-leaved bilberry, evergreen huckleberry, and alpine bilberry contained large concentrations of anthocyanidins, with lesser and varying amounts of phenolic acids, flavonols, and flavan-3-ols. Wild cranberry contained almost equal concentrations of these four groups of compounds, while phenolic acids, with small amounts of anthocyanidins and flavan-3-ols, dominated red huckleberry's profile. The article entitled *Content and Profile of Flavanoid and Phenolic Acid Compounds in Conjunction with the Antioxidant Capacity for a Variety of Northwest Vaccinium Berries* was published in Volume 52 of the Journal of Agricultural and Food Chemistry, 2004, pages 3169-3176.

