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ALTERNATIVE CROPS

FOR THE

COLUMBIA BASIN



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penstemon, yarrow, asparagus, lupine, watermelon
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Preface

For several years, the profitability of farming in the Columbia Basin has been diminishing, as consistently low grain prices have not kept pace with increases in farming costs. The costs of labor, fuel, machinery, fertilizer, pesticides, transportation, accounting, and brokerage fees have combined to cause many small grain producers to look for new sources of income and ways to reduce input costs.

This publication explores possibilities for new crops in the Columbia Basin. Crops discussed include, but are not limited to, oilseeds, food, forage, seeds and stems for revegetation, and crops that enrich the soil and/or reduce the threat of disease to primary crops.

In researching these possibilities, we have considered both native species and crops grown in other parts of the world where soils and rainfall are similar to those in the Columbia Basin. (See “Acknowledgments, bibliography, and references,” page ii.)

This report classifies potential crops into three groups: grasses and cereal grains, broad-leafed herbs and forbs, and shrubs and trees. Each category is indexed by common name. A general index by common

name (page 26) and scientific name (page 27) also is included.

Although this list is not exhaustive, it should provide a considerable pool of possibilities for Columbia Basin farmers. Oregon State University Extension Service publications and research data are available on many of these subjects. Contact your county office of the OSU Extension Service for more information.

Keep in mind that while it might be tempting to abandon present use of land and plunge totally into promising new crops, this can be a risky choice. Unexpected problems might surface, especially if all aspects of the new crop are not thoroughly researched. For example, there might not be a processing plant for a new oilseed crop, or a species might be a controlled substance or noxious weed. Remembering that everything is connected to everything else, always consider all aspects of a new venture. These aspects include potential markets, storage, transportation, processing, pesticides, and the potential for introduced crops to become weeds. With that in mind, there are some promising possibilities on the horizon.

Grasses and cereal grains

Barley..... 1	Hesperaloe 2	Ricegrass, Indian..... 3	Timothy 5
Brome, Columbia 1	Junegrass..... 2	Rye..... 4	Triticale 5
Durum wheat..... 1	Kamut..... 3	Ryegrass 4	Wheatgrass, bluebunch... 5
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Emmer..... 2	Oat 3	Squirreltail 4	Wildrye, blue..... 6
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Barley (*Hordeum vulgare*)

Barley is an important cereal grain in the United States. It is used for livestock fodder, the brewing industry, and for some bread-making. In the Columbia Basin, it is best suited to follow winter wheat. Acreage currently is limited due to limited markets.



Durum wheat (*Triticum turgidum*)

Durum wheat is the plant from which semolina is derived. The flavor and cooking qualities of durum wheat are superior, and durum semolina is preferred in the production of pasta products such as spaghetti, macaroni, and couscous (the staple food of North Africa). Durum wheat is a high-value commodity and is suited to the Columbia Basin's climate.



Brome, Columbia (*Bromus vulgaris*)

Columbia brome is a native grass whose seed is used for revegetation after fire or other disturbance. It prevents erosion and helps to exclude noxious weeds. Federal agencies are the principal purchasers. At present, the seed is hand harvested from wild stands. With sufficient purchase commitments, this species could be profitable in many areas of the Columbia Basin.



Einkorn (*Triticum monococcum*)

Einkorn is an older wheat lower in quality than modern wheats. In harsh environments and poor soil, however, its protein content and yield can equal or exceed that of barley and durum wheat grown under similar conditions. If climate change should affect the Columbia Basin severely, einkorn might be an alternative crop.



Emmer (*Triticum diococcum*)

Emmer was grown throughout the U.S. in the early 1900s. It is another grain that can tolerate less-than-favorable growing conditions. It is used for cattle feed, replacing either oats or barley in feedlot rations. Some bread is made from emmer.



Fescue, Idaho (*Festuca idahoensis*)

Idaho fescue is a native bunchgrass that once covered thousands of acres on both sides of the Columbia river. Intense grazing by cattle and sheep in the early days of Euro-American settlement reduced its occurrence to a small fraction of the original acreage.



Idaho fescue is in great demand for restoration of land degraded by fire, overgrazing, or disturbance. The U.S. Forest Service and U.S. Bureau of Land Management are the principal market, but state and county parks and highway departments also purchase this species.

Most seed is hand harvested from native stands, but, with market commitments, commercial production could be feasible. In the Columbia Basin, Idaho fescue grows best on north-facing slopes. Where grazing does not occur, it can produce dense stands and profitable yields.

Hesperaloe (*Hesperaloe funifera*)

Hesperaloe is native to Mexico, where its fiber is used for cordage products. It also has potential for production of paper with exceptional tensile and tear strength. These qualities are important for specialty products such as currency paper, Bible pages, tea bags, and filters.

Blending with other fibers could increase the strength of products such as tissues and paper towels. Hesperaloe is not grown commercially in the United States, but test plots in southern Oregon have shown promise. Much of the Columbia Basin is similar in soil and moisture conditions to production areas in Mexico.



Junegrass (*Koeleria macrantha*)

Junegrass is a native bunchgrass that once was widespread throughout the west. It is considered an indicator of little-disturbed land. It is one of the most desirable native grasses for revegetating lands after fire, overgrazing, or other disturbance. It also is attractive in landscapes. Junegrass will grow almost anywhere in the Columbia Basin, but does better

where rainfall exceeds 20 inches. Harvesting of the seeds is somewhat challenging and generally is done by hand, so this species is a niche-market product.



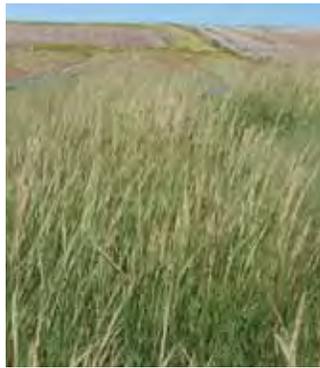
Kamut (*Triticum turgidum*)

Kamut is a specialty wheat that is marketed through health food outlets. Kamut products include whole-grain flour, breads, hot and cold cereals, pasta, and chips, in addition to dehydrated green plant product. Kamut products have a mild nutty flavor. Individuals who are allergic to common wheat can tolerate kamut.



Needlegrass (*Achnatherum sp.*)

Needlegrass is a genus of bunchgrasses that includes several species native to the intermountain west. It produces a gluten-free seed, which can be used to make gluten-free bread suitable for individuals who suffer from gluten intolerance. Needlegrass might be a good niche crop, along with Indian ricegrass, which has similar properties. It also is suitable for forage, although its sharp tips make it less desirable for this purpose. Needlegrasses grow well throughout the Columbia Basin.



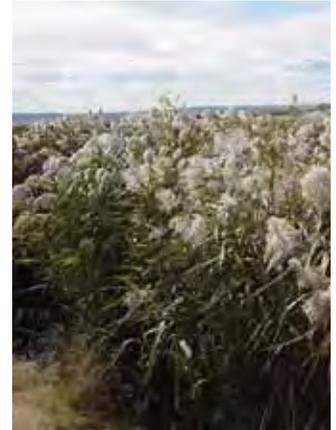
Oat (*Avena sativa*)

Oats are so common that they seldom are thought of as an alternative crop. Oats have been grown for a long time for livestock feed and for human consumption. The vegetative residue is used as bedding and other miscellaneous straw uses. Oats have been grown in the Columbia Basin since early days of Euro-American settlement. Oats were considered more important when draft animals were required for farm power. It is unlikely that significant additional acreage will be required in the foreseeable future.



Reed, Indian (*Phragmites communis*)

Indian reed is a very tall native grass that grows in riparian areas and, to a lesser degree, in swales and hollows. Historically, it was used for its strong, fibrous leaves and its long, straight, hollow stems. It is a noxious invader along the eastern seaboard, but in the Columbia Basin it simply fills its own niche. Much like Indian hemp, a small market for this historic fiber might be found.



Ricegrass, Indian (*Oryzopsis hymenoides*)

Indian ricegrass is a bunchgrass that is native from the Dakotas south to Texas and west to the Pacific Ocean. It is adapted to dry, sandy soils and is quite drought-resistant. It grows in clumps up to 2 feet tall. Livestock prefer this plant over other species, and it has been severely overgrazed throughout its range. This is an important species for reseeding rangelands, and a market for seed already exists. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>



In the past, Native Americans ground the seeds of ricegrass into meal and bread flour. The use of ricegrass flour in gluten-free bread is attracting an increasing market. Amazing Grains Grower Cooperative, in Montana, has been successful with this product. Gluten-free grains target millions of consumers who suffer from gluten intolerance and cannot eat wheat, barley, rye, and many other cereal grains.

Recent tests in Sherman and Umatilla counties indicate that local soils are suited to this native grass.

Rye (*Secale cereale*)

Rye was once used widely as a cover crop and for forage and hay. It is considered a contaminant in wheat, however, and reduces wheat value. It is important to prevent this aggressive species from invading where it is not wanted. It might have a place, however, in non-wheat-growing areas. Hybridization of wheat and rye (triticale) has produced vigorous yields. Further research is recommended.



Ryegrass (*Lolium perenne*)

Ryegrass is available as both an annual or a perennial. Both are used for forage and pasture. When mixed with legumes, perennial ryegrass can be grazed within 8 to 10 weeks of seeding. There also is some demand for perennial ryegrass for turf. Perennial ryegrass prefers higher annual rainfall than usually found in the Columbia Basin, but with supplemental irrigation, it can do well. Annual ryegrass has higher moisture requirements and is less adaptable to hot or cold periods.



Spelt wheat (*Triticum spelta*)

Spelt wheat is a winter wheat alternative to oats and barley in animal feeds. It can replace soft red winter wheat in flour production. Its characteristics make it desirable for pasta and high-fiber cereals. There is some cultivation of spelt wheat in the U.S., and it is suited to Columbia Basin conditions.



Squirreltail (*Elymus elymoides*)

Squirreltail is a native bunchgrass that is indicative of a relatively undisturbed habitat. Sometimes called bottlebrush, and formerly named *Sitanion hystrix*, this grass is unpopular with cattlemen because of its short grazing period; once the long awns begin to dry it becomes unpalatable. Nevertheless, it is well accepted as a revegetation species for disturbed lands. It is quite attractive in gardens when the grass begins to ripen. It is easy to grow almost anywhere in the Columbia Basin. Harvesting is done by hand, so it is a labor-intensive crop. Agencies such as state parks and highway departments provide a fairly steady market.



Sudangrass (*Sorghum sudanense*)

Sudangrass has been grown as a cover crop in parts of Oregon since the 1940s. It is a summer annual used as pasture, silage, or hay. In the Columbia Basin, it is planted as a cover crop in late summer following short-season potatoes. As a cover crop, it is allowed to grow 6 or 7 feet tall and then disked into the soil. It sometimes is grown in rotation with canola. It is very tolerant to herbicides and can be planted in fields with high herbicide residuals. Its ability to reduce wind erosion gives it additional value.



Timothy (*Phleum pratense*)

Timothy is an annual grass that works well as a companion crop with alfalfa. It generally requires two cuttings per season to be profitable. Timothy is grown alone or as part of a forage mix. It thrives where annual rainfall is 20 inches or more, or it can be grown with supplemental irrigation.



Triticale (*x Triticosecale Widdmark*)

Triticale is the stabilized hybrid of wheat (*Triticum*) and rye (*Secale*). It can be grown in areas where wheat performs poorly, including some parts of the Columbia Basin. Generally, triticale is considered of inferior quality to bread-making wheat and to durum wheat for pasta, but it is considered superior to rye. In Mexico, triticale is used for whole-grain breads and tortillas. In the U.S. there is a small market for pancake mixes and crackers, but the primary use is as livestock feed. Triticale also is used in ethanol production because it is processed more efficiently than barley and some other ethanol-producing species. Trials in the Columbia Basin have shown excellent yield results for both dry and irrigated triticale. This species also has produced excellent forage, particularly when grown with peas as a mixture. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>



Wheatgrass, bluebunch (*Pseudoroegneria spicata*)

Bluebunch wheatgrass is possibly the most significant native bunchgrass in the intermountain west. Vast areas, including much of the Palouse country, were covered with this bunchgrass prior to grazing and cultivation. As a soil stabilizer, especially in the loess, or windblown soils, that occur throughout the Columbia Basin, bluebunch wheatgrass is without equal. Cattle and sheep have overgrazed it until few high-quality stands remain. Once cheatgrass (*Bromus tectorum*) moves into the resulting vacuum, the chances of bluebunch wheatgrass naturally recurring are minimal. Bureau of Land Management attempts at salvaging denuded lands by introducing crested wheatgrass (*Agropyron cristatum*), an exotic, have been disappointing at best.



Recently, BLM has tried reintroducing bluebunch wheatgrass with encouraging results, but the number of acres presents a formidable challenge. Nevertheless, these efforts have created a market for bluebunch wheatgrass seed for revegetation after wildland fires and other land disturbances, and there could be a sustained market for this species.

Wildrye, Basin (*Leymus cinereus*)

Basin wildrye is the most remarkable native bunchgrass in eastern Oregon and Washington. Its sheer size is striking. In most years, it grows 5 or 6 feet high, and in good years it may reach 9 feet tall and 3 feet across. Many low-land meadows in the intermountain west had thick stands of this grass when Euro-Americans arrived. Its fibers were used by Paiutes and other tribes for many purposes. Because this species decreases under heavy grazing, the arrival of large numbers of domestic livestock in the 1860s began the decline of Basin wildrye communities. Now it is considered one of the rarest plant species in the intermountain west.

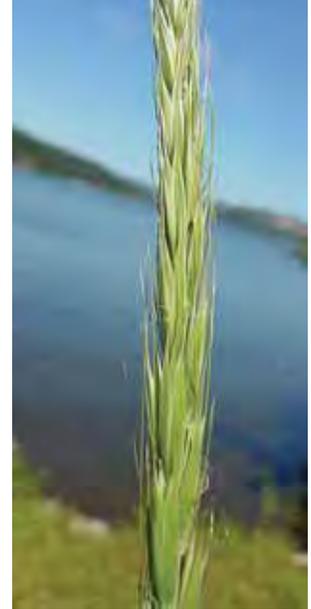


This species grows best in deep soils that are sub-irrigated or receive runoff from upslope. It continues to thrive in gullies, swales, and bottoms. It tolerates the saline to alkaline soil conditions that occur in the Columbia Basin.

Basin wildrye stands provide exceptional cover for wildlife. Deer, birds, and small mammals use the stands for nesting, hiding, and foraging. The U.S. Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service are beginning to pay more attention to this species. Some native seed companies harvest its seeds for revegetation purposes. Commercial production should be investigated further.

Wildrye, blue (*Elymus glaucus*)

Blue wildrye is a native bunchgrass that thrives in the Columbia Basin. It does especially well where annual rainfall is greater than 20 inches, but occurs on north slopes even in desert areas. It is another native perennial preferred by livestock. As with some other bunchgrasses, agencies are using this species to revegetate land degraded by fire or grazing. Presently, the market is small, but with commercial production it could expand.



Broad-leaved herbs and forbs

Asparagus.....7	Daikon 10	Herbs for cooking..... 13	Peppermint..... 16
Aster.....7	Desert-parsley..... 10	Horseradish 13	Pumpkin..... 16
Bean, common or field.....7	Dill 10	Jerusalem artichoke 13	Rapeseed (canola)..... 9
Bean, fava.....7	Evening-primrose..... 10	Lentil..... 13	Safflower 16
Bean, lima.....8	Fennel 11	Lupine..... 13	Salsify (oyster plant) 17
Bean, mung.....8	Flax 11	Meadowfoam..... 14	Soybean 17
Bladderpod.....8	Flowers (various) 11	Mustard..... 14	Spearmint..... 17
Buckwheat.....8	Garlic 11	Onions 14	Spurge 17
Buckwheat, native.....8	Ginseng..... 11	Pea, black-eyed..... 14	Sunflower..... 17
Cactus.....8	Gourd 12	Pea, chickpea..... 15	Sunn hemp..... 18
Canola (rapeseed).....9	Grape 12	Pea, field..... 15	Vernonia..... 18
Carrot.....9	Gumweed 12	Pea, grasspea..... 15	Watermelon..... 18
Crambe9	Hemp 12	Penstemon..... 16	Wormwood..... 18
Cuphea..... 10	Hemp, Indian..... 12	Pepper (chili) 16	Yarrow..... 18

Asparagus (*Asparagus officinalis*)

Asparagus is a perennial crop whose rhizomes produce edible stems each spring. With good care and suitable growing conditions, a plant will produce for up to 20 years. Asparagus is tended and harvested by hand, so production is labor intensive. It requires some irrigation, although it is harvested before the onset of hot weather.



Aster (*Machaeranthera canescens*)

Asters are good possibilities for sale to native plant gardeners. This species begins blooming in September and continues to December. It is native to the intermountain west and is very showy. It is easily grown from seed with minimal care. A small acreage in seed production could be profitable.



Bean, common or field (*Phaseolus vulgaris*)

White, pinto, pink, red, and kidney beans are typical examples. Green beans harvested early for canning, fresh use, or freezing are more commonly grown in the Willamette Valley, where rainfall is greater. Beans in the Columbia Basin are harvested later and are windrowed to dry the beans. While yields sometimes are good, harvesting is difficult, and some loss due to shattering is inevitable. Weeds are a problem too, and one should think carefully before putting in acreage of beans. Nonetheless, Washington produces about \$20 million in bean crops annually, so for some it is a good crop.



Bean, fava (*Vicia faba*)

Fava bean is a native of Europe. It can be used both for animal feed and for human consumption. Production is limited, due to inconsistent yields and poor market opportunities. A more humid climate than the Columbia Basin's is required for good production.



Bean, lima (*Phaseolus lunatus*)

Lima beans are bush beans that lend themselves to similar production methods as peas. Mechanical harvesting is difficult due to weed contamination, and irrigation is necessary. If these requirements are met, this species is a dependable cash crop.



Bean, mung (*Vigna radiata*)

Mung beans normally are grown for bean sprouts as a niche-market product. Other sprouting species are alfalfa, daikon, and clover. Producers might earn income from an otherwise idle corner of land with these seed crops.



Bladderpod (*Lesquerella fendleri* or *L. douglasii*)

Bladderpod is a perennial plant of the mustard family. It produces a seed oil high in hydroxy fatty acids. The oil is used for specialty lubricants, heavy-duty detergents, inks, and coatings. The plant is well adapted to semiarid locations, growing from Arizona to Washington in the intermountain west. It can be grown as an overwintering annual and harvested before irrigation is required in the spring. Although it is not grown commercially, small-plot studies conducted in southwestern Oregon have shown potential for this crop.



Buckwheat (*Fagopyron* sp.)

Buckwheat is a short-season crop that can be planted following wheat or potatoes. A 75-day growing season is typical. The market is limited in the United States, where some buckwheat is ground into flour and added to baking mixes. Some is exported to Japan, where it is made into soba noodles. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>



Buckwheat, native (*Eriogonum* sp.)

Native buckwheat includes several species that grow throughout the Columbia Basin. It is a very showy wildflower in April and May. It is popular with native plant gardeners, and there is some demand for seeds and starts for dryland or xeric gardens.



Cactus (*Opuntia fragilis*)

Also called prickly-pear, cactus is a native plant that grows from Arizona to Montana and west to the Cascade Mountains. With rising costs of water for irrigating lawns and gardens, homeowners are turning to low-maintenance species such as prickly-pear. A bunchgrass and cactus accent is attractive. This species is easy to grow from broken-off lobes, and there is a small, steady market.



Canola or rapeseed (*Brassica napus*)

Canola is a member of the mustard family. It has shown promise as a rotational crop in the Columbia Basin. Besides its value as an oilseed, it provides erosion control and reduces disease problems in cereals and legumes. Commercial cultivars with improved fatty acid composition produce edible oil. Aside from use in salad dressings, margarine, and cooking oil, some restaurants use large amounts for deep-frying chicken, French fries, and donuts.



In recent years, used canola oil has been recycled into biodiesel by pioneers in a cottage industry. This fuel burns well in unmodified diesel engines. Dedicated canola production for biodiesel is under consideration, and it could be cost competitive if produced in large quantities.

This species also can be used for industrial oil and for producing synthetic lubricants, varnishes, and plastics. After oil extraction, the mealy residue can be used as a high-protein (35–40 percent) feed supplement for livestock. Winter rapeseed can produce 5 to 9 tons of dry forage per acre, with 9 to 12 percent protein. Grain yields have averaged between 2,000 and 3,000 lb per acre on fallow ground in the Columbia Basin. When used as compost on fallow lands, it can suppress soil-borne pathogens of cereals, potatoes, and legumes.

Whole rapeseed is exported to some Asian markets, including Japan. Small domestic markets exist for industrial rapeseed.

Soils and rainfall conditions in the Columbia Basin allow cultivation of this species. In light of its many uses, canola/rapeseed could be one of the most significant non-cereal crops for the Basin. The best cultivars for this area are those that are fall sown and flower in springtime before irrigation is necessary.

Carrot (*Daucus carota*)

Carrots for fresh consumption, processing, and seed presently are an important crop in the Columbia Basin. Fresh-market carrots are popular, but processed carrots, found in many prepared foods, are the largest market. Carrot waste from processing is used in dog food. Half the carrot seed production in the U.S. occurs in the Columbia Basin.



Crambe (*Crambe abyssinica*)

Crambe is a native of Ethiopia. It produces an oil that is used in manufacturing synthetic oils and non-petroleum-based plastics. It has been grown in North Dakota, and it probably could do well in the Columbia Basin, although tests in Moscow, Idaho, revealed some problems with growth and harvest.



Perhaps the biggest problem is the lack of an oilseed crushing facility in this region. If a crushing facility were available, this and other oilseed crops would have significant potential.

Cuphea (*Cuphea* sp.)

With more than 260 species growing from South America to the United States, cuphea is being tested in Iowa and Minnesota. It might do as well, or better, in the Columbia Basin. This species produces an oily seed containing a high level of lauric acid, an ingredient used in detergents. It also could be used in products ranging from toothpaste to body lotion. Detergent maker Procter and Gamble has funded some of the research and is looking for a domestic source of this oil. The company estimates it could use at least a million acres of production. With potentially high demand for cuphea, research is proceeding rapidly, and this crop should be considered a promising one for the Columbia Basin.



Daikon (*Raphanus sativus*)

Also called Chinese radish, daikon typically is a late-summer or early-fall crop. It is planted in July and harvested several months later. Thus, some irrigation is necessary. It is used as a garden vegetable, but also can be grown for sprouts. Sprouts are grown year-round in greenhouses, so a steady demand for seed exists. Alfalfa, daikon, and clover sprouts make up the largest volume of the sprout market.



Desert-parsley (*Lomatium* sp.)

Desert-parsley occurs as a native, with as many as 25 species in the Columbia Basin. An early-spring wildflower, many species are used for gardening and land restoration projects. *Lomatium minus* and *L. cous* often bloom by the end of January in Wasco, Sherman, and Morrow counties. Other species bloom continuously until midsummer. In addition to their attractiveness, their history as food crops is significant. Many species have an enlarged root, which Native Americans dried and used as food. Fern-leaved desert-parsley has medicinal properties that are exploited by herbalists. Production of desert-parsley would be of two-fold value; it would prevent destruction of native populations and provide a profitable niche crop.



Dill (*Anethum graveolens*)

Dill is used as a fresh herb, dried herb, seed for oil, or seed for a condiment. Dill is an annual crop that is planted in the spring and matures in about 65 days. It can be produced for the fresh market or steam-distilled for oil using the same facilities as those used for mint.



Evening-primrose (*Oenothera caespitosa*)

Evening-primrose is grown for its oil, which is used in cosmetics and pharmaceuticals. It is not approved for use in the United States but has a ready market overseas. It is presently grown on a few hundred acres in east-central Washington. *Oenothera caespitosa* is a widespread native throughout the intermountain west. So far, great care has been made to assure planting of correct varieties for good oil production.



Fennel (*Foeniculum vulgare*)

Fennel is a tall, hardy, aromatic perennial of the parsley family that is native to the Mediterranean area. It looks much like dill, but has a very different flavor. It is grown for its seed and essential oils. The seed is used in cooking, and the oil is used in condiments, soaps, creams, perfumes, and liqueurs. Some fennel is grown in the Central Valley of California. With climate and soil requirements similar to dill, it could be grown in the Columbia Basin.



Flowers (various)

A market has developed for what are loosely called “wildflowers,” including *Coreopsis* sp., *Gaillardia* sp., *Centaurea cyanus*, and others. Seeds of these roadside plants are grown, packaged, and distributed as alternatives to horticultural varieties for gardens. While purists and conservationists spurn these species, preferring appropriate native plants, a significant market does exist. Responsible production requires that seeds be completely weed-free. This can be a labor-intensive process, but there is an established niche market for these crops.



Flax (*Linum usitatissimum*, *L. Perrine*, and *L. Lewisii*)

Flax has been grown in Oregon since pioneer times. This plant, which produces linseed oil and fiber for linen cloth, has long been popular as a multiuse crop. With the advent of petroleum-based fibers (rayon, nylon, etc.) and the use of cotton for fabrics, flax acreage has declined. Developing countries still use linen and linseed oil, but profitability for Columbia Basin farmers would be low. There might, however, be a niche market for Oregon-grown flax for use in clothing, draperies, furniture, and some canvases. The crop might have value in rotations, as it may reduce problems with weeds, diseases, and insect pests.



Linseed oil has a moderate but steady demand for use in paints, furniture polishes, wood finishes, etc. Continued studies of uses for this oil are warranted.

Linola is flax bred for its edible oil (low in linolenic acid, high in linoleic acid), similar in composition to the oils of sunflower, safflower, and corn. The meal remaining after oil extraction is used in animal feed to provide protein and energy. Linola seeds are golden yellow.

L. Lewisii is an Oregon native.

More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>

Garlic (*Allium sativum*)

Garlic is a high-value crop with a limited market. Usually, small acreages are planted because this crop is weeded and harvested by hand. Garlic is propagated by bulbils or cloves that are planted in the spring or in the fall for overwintering. Irrigation usually is required, but a properly managed acre of good soil can produce \$5,000 or more in gross income. Farming methods are similar to those for onions.



Ginseng (*Panax quinquefolius*)

Ginseng is a perennial herb of the aralia family. Its root is primarily used in Asia for medicinal purposes. Ginseng takes 4 years to mature. The Columbia Basin’s native wild ginseng is not harvestable because it is listed as a rare species. Availability of commercial cultivars is limited. Check with your state department of agriculture for more information.



Gourd (*Luffa acutangula* and *L. cylindrica*)

Gourds are fruit-producing vines and members of the cucumber family. Gourds are consumed as a vegetable when the fruit is young and the rind is soft. As the fruit ages, the rind becomes hard and the fruit inedible. Gourds also are produced for decorative purposes. Growing them is similar to growing melons and cucumbers; irrigation is required. At present, limited acreage is planted to gourds.



Grape (*Vitis vinifera* and other species)

Grapes have become a major Columbia Basin crop, and local wines have received worldwide approval. It takes 3 years for a vineyard to reach limited production, and the crop is labor-intensive. Irrigation is highly recommended.



Gumweed (*Grindelia* sp.)

Gumweed is a plant of the composite family that commonly grows on roadsides and dried beds of vernal pools east of The Dalles. It thrives in hot, dry, summer conditions. The Columbia Basin's native *G. squarrosa* and *G. columbiana* are widespread. *G. camporum*, which occurs in California's Central Valley, has been used for some commercial applications; resins have been patented for use in adhesives, rubber coatings, textiles, and polymers. *Grindelia* resins are a potential alternative source of fatty acids, rosins, and turpentine. Wood resin, formerly obtained from old-growth pine stumps, is no longer available, and gumweed resins could be a promising alternative.



Hemp (*Cannabis sativa*)

Hemp has been cultivated as a source of strong fiber, seed oil, and psychoactive drugs for many centuries. Historically, hemp was used mainly for cordage, but it has largely been replaced by relatively inexpensive cotton and synthetic fibers. As the U.S. supply of wood fiber diminishes, there is increased interest in hemp as a fiber for paper, textiles, and composite wood products.



Hemp has been classified as a controlled substance in the United States since 1937, as some cultivars are used to produce the drug marijuana. In other countries, cultivars low in psychoactive properties are grown for fiber and oil. Further development of this crop in the U.S. will not be possible until legislative restrictions are removed. The Columbia Basin is not a prime location for hemp production because it lacks adequate moisture. Some irrigated areas might do well, but dryland production is not promising.

Hemp, Indian (*Apocynum cannabinum*)

Indian hemp is a native plant of the dogbane family that grows at lower elevations in the Columbia Basin. While it tends to need more moisture than the related *Apocynum androsaemifolium*, it could be grown in niche areas throughout the Columbia Basin. Native American tribes used Indian hemp twine for nets, baskets, fishing line, and many other articles, and the best stands of plants were carefully guarded secrets. The fibers compare favorably to hemp or flax, and a niche market for this historic Great Basin fiber might be found.



Herbs for cooking

Anise, basil, burnet, caraway, catnip, chamomile, chervil, chicory, chives, coriander, cress, marjoram, oregano, parsley, rosemary, saffron, tarragon, and thyme are but a few of the many garden herbs. These are labor-intensive crops with a limited, but steady, market.



Horseradish (*Cochlearia armoracia*)

Horseradish is a garden vegetable used as a condiment. For 3,000 years, it has been used for medicinal and culinary purposes. More than 6 million gallons of prepared horseradish are produced in the U.S. each year. It has been cultivated in the United States for more than 150 years and is grown commercially in the Midwest and on the Oregon–California border.



Horseradish will grow in a wide range of habitats. It thrives in the Tulelake area, which is similar to the Columbia Basin in growing conditions. It is a short-lived perennial that matures in the autumn. Visit the Horseradish Council website (<http://www.horseradish.org>) to learn about marketing opportunities.

Jerusalem artichoke (*Helianthus tuberosus*)

Jerusalem artichoke is a sunflower that is grown for its root, which is eaten like a potato. There is a small market for human consumption, and this species also can be used for livestock feed. Because sunflowers are native in the Columbia Basin, this crop likely would perform well. Presently, a few acres are planted to this species.



Lentil (*Lens culinaris*)

Lentils are grown as a food crop throughout the Middle East, North Africa, and India. There has been some production in the Columbia Basin, and 90 percent of the annual crop is exported. Lentils lend themselves to the arid climate of much of the Columbia Basin. Mechanical harvest is difficult because plants are short, but research is underway to select for taller lentils. If the world market expands, this could be a promising crop. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>



Lupine (*Lupinus albus*, *L. angustifolius*, *L. luteus*, *L. mutabilis*, *L. cosentini*, and other species)

Lupine species are legumes cultivated worldwide as either grains or forage crops. They range from northern Europe and Russia to Australia and the Andes. They can be grown as overwintering or spring crops. In the Columbia Basin, they likely would be spring sown.



Lupine's seed protein content is high, making it potentially useful as an animal feed. It also can be used for human food. Many lupine species produce alkaloids that are poisonous, so it is important to choose alkaloid-free species.

Lupines were introduced as a cover crop in the southern cotton belt in the 1930s. By 1970, the cost of commercial nitrogen fertilizer was low enough that the more labor-intensive lupine green manure crop was out of fashion. Research has continued to produce improved cultivars, and trials in the Columbia Basin are promising. See OSU publication EM 8834-E, *Dryland Cropping Systems: Narrow-leaf Lupin*. Also see the section on native plants in this publication (page 25). This could be one of the more encouraging alternate crops for the Columbia Basin.

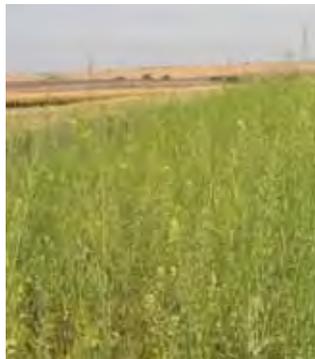
Meadowfoam (*Limnanthes* sp., *L. alba*, *L. floccose*, and other species)

Meadowfoam is native to southwest Oregon (the Medford area) and has been researched by OSU and USDA for its rare oil properties. Some commercial production exists, and meadowfoam has found uses in cosmetics, specialty lubricants, and polymers. The native species grows well in shallow soils with less than 20 inches of annual rainfall and temperatures comparable to those in many areas of the Columbia Basin. OSU has two publications on meadowfoam: *Growing Meadowfoam in the Willamette Valley* (EM 8567-E) and *Pollination and Seed Set in Meadowfoam* (EM 8666-E).



Mustard (*Brassica juncea*)

Mustard can be grown for leaves or seeds in a short growing season. Mustard greens are used in salads, cooked fresh, canned, and frozen. Mustard seeds are crushed to produce edible oil. The oil can be used for biodiesel production. The seed meal can be used as a soil fumigant. Livestock tend to reject this species because of its strong flavor. Mustard seed and ground mustard are used in meats, sausages, and relishes. Mustard can be used as a rotational crop with cereal grains to reduce diseases and to increase the following year's grain yield.



Onion (*Allium cepa*)

Onions can be planted either in the fall for overwintering and spring harvest, or in the spring for fall harvest. Well-known onions such as Walla Walla Sweets are harvested in the spring and have a storage life of about 2 months, while autumn-harvested yellow onions will keep for 6 to 8 months.



Onions are a valuable crop in the Columbia Basin, but most areas require irrigation. Onions are also grown as a seed crop on some acreage. The market and number of growers has stabilized, and little opportunity for expansion is foreseen.

Pea, black-eyed (*Vigna sinensis*)

Black-eyed peas are a warm-season crop that presently has some acreage in the Columbia Basin. Black-eyed peas that are harvested green and prepared fresh differ from those harvested later as dried beans (or peas). These peas commonly are sold at farmer's markets and used for southern-style cooking. There is room for market development. The crop grows well with minimal irrigation throughout the Columbia Basin.



Pea, chickpea (*Cicer arietinum*)

Chickpea is a cool-season annual. Chickpeas have been used for centuries, first in the Middle East and later throughout the world. India is the major producer and consumer of chickpeas. Indian consumers prefer the small-seeded chickpea called desi. Elsewhere in the world, the large-seeded variety, called either kabuli or garbanzo, is preferred.



Chickpeas are eaten fresh as green vegetables, parched, fried, roasted, or used as a condiment. They can be ground into flour that is used in soup or baked into bread. Garbanzos currently have a market in salad bars, etc., but there is an increasing domestic market for the desi varieties in ethnic communities.

Chickpeas also can be used as animal food. Glue can be made from the plant's vegetative parts, and its leaves yield a blue dye or can be used as sizing for silk, wool, and cotton cloth.

Chickpeas are in the legume family, and different varieties grow in the tropics, subtropics, and temperate regions. They are produced commercially in California, Washington, and Idaho. They likely would grow well in a number of Columbia Basin localities, and some test plots have shown promise. With the potential for export to large overseas markets, this crop could be profitable in the Columbia Basin. Additional information is available in *Chickpea Production Guide* (EM 8791-E) and on the CBARC website (<http://oregonstate.edu/%7Emachados/Agronomy/chickpea.htm>).

Pea, field (*Pisum sativum*)

Field peas are the most widely grown cool-season pulse. Peas are marketed fresh-shelled, as edible pods, dried, canned, or frozen. Grain yields range from 750 to 2,000 lb/acre in eastern Oregon. The plants themselves are used for silage and as green manure to restore depleted soils. Peas are also grown for dry forage. Forage yields range between 4,600 to 5,600 lb per acre at CBARC, Moro. The area between Pendleton and Milton-Freewater has produced large amounts of peas for more than 50 years. Improved cultivars and farming practices continue to ensure availability, and it is unlikely that additional acreage is needed at this time. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>



Pea, grasspea (*Lathyrus sativus*)

Grasspea is a creeping vine of the pea family. It was introduced to the U.S. from India, the Middle East, and southern Europe. Several native species of the genus *Lathyrus* occur in the Columbia Basin.



This plant is usually grown for grain, but can be used for fodder. It is high in protein, but a neurotoxic amino acid has prevented it from developing into an important food crop. New cultivars contain reduced toxin levels, giving it potential for semiarid areas in the Columbia Basin. It can serve as a green manure to improve soils and as a groundcover alternative to summer fallow.

Penstemon (*Penstemon* sp.)

Penstemon is a native flowering plant that is very popular in landscaping. Some species (*P. richardsonii*) bloom from May to November. Others (*P. deustus*) can handle the harshest of habitats and flourish. Some are so showy that viewers stand in awe (*P. barrettiae* and *P. speciosa*). These species are popular with public agencies for revegetation projects. A very small acreage can yield value in both seeds and starts. These crops are labor-intensive and take some commitment, but returns are good.



Pepper, chili (*Capsicum annuum*)

Chili pepper is a high-value, warm-season crop that needs a long frost-free period to mature. Production is very labor-intensive since the plants often are started in greenhouses, transplanted, and harvested by hand.

Tabasco peppers (*C. frutescens*) and habanero peppers (*C. chinense*) have similar production methods.



Peppermint (*Mentha piperita*)

Peppermint grows well in parts of the Columbia Basin. Oregon is the nation's leading mint producer. The area surrounding Madras, Oregon, produces some of the finest mint oil available, although plant diseases at times cause crop losses. OSU has a number of peppermint publications.



Mint oil is produced in tiny sacs on mint leaves. The entire plant is harvested in late summer, dried in the field, and then steam distilled to separate the oil.

Pumpkin (*Cucurbita pepo*, *C. moschata*, *C. mixta*, and *C. maxima*)

Pumpkin occurs as four species of squash-related plants. Pumpkins require a long, warm growing season and irrigation. There is some demand for processed pumpkin for pies and growing demand for pumpkin farms as a family Halloween destination. Although labor-intensive,



Rapeseed (*Brassica napus*)

See Canola.

Safflower (*Carthamus tinctorius*)

Safflower is a member of the aster (sunflower) family. It is native to Asia, Africa, and the Middle East. Historically, it was used for fiber, dyes, and food. In the United States, it is now grown principally for its oil. Safflower oil is commonly used as a cooking oil, salad oil, margarine, or shortening.



Access to a processing facility is necessary. The meal that remains after oil extraction has value as a high-protein supplement for livestock. Safflower oil, like canola, soybean, corn, and sunflower oil, can yield biodiesel for operation of motor vehicles. It also is used for producing synthetic lubricants, varnishes, and plastics.

This annual broad-leafed plant grows well in both dryland and irrigated areas. Commercial production is concentrated in California, North Dakota, and Montana, although Saskatchewan and Alberta also have significant production. Columbia Basin soils and climate are suited to safflower production. It is a spring-planted crop that is vulnerable to competition from weeds in its early stages, so good weed management practices are important. Some varieties of safflower are resistant to disease, although some are susceptible to bacterial blight. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.html>

Salsify or oyster plant (*Tragopogon porrifolius*, and *T. dubius*)

Salsify is a member of the sunflower family, a hardy biennial growing more than 4 feet tall. It has long, grasslike leaves, yellow or purple flower heads, and large, cylindrical roots.

This plant has naturalized as a weed throughout North America. Salsify is grown primarily for its edible root, which tastes like oysters. It is peeled and cooked like carrots or parsnips, added to soups or stews, parboiled and baked in casseroles with herbs and butter, pureed, battered and fried, or eaten cooked and cold in salads. It does not have a large market, but a small acreage could be profitable.



Soybean (*Glycine max*)

Soybean is a warm-season legume that is used in manufacturing edible oils, biodiesel, and industrial products such as paint, varnishes, resins, and plastics. Soybean meal is an important livestock feed. While soybeans are generally considered a southern crop, some tests in eastern Oregon and Washington have had limited success. Soybeans could be considered as a rotation crop where irrigation is available.



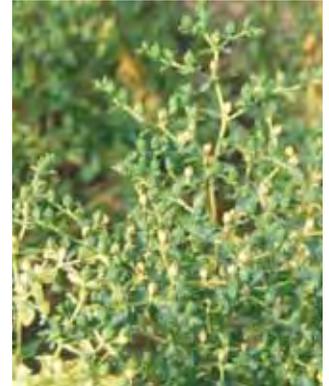
Spearmint (*Mentha spicata*)

Spearmint has similar harvesting methods and uses as peppermint. Mint flavorings are found widely in toothpaste and other products. It is unlikely that much additional acreage of mint will be required.



Spurge (*Euphorbia lagascae* and several other species)

Spurge is an herbaceous annual native to Spain, although several species are native to the Pacific Northwest. The seeds are a potential source of epoxy acid, which is used for adhesives, plasticizers, industrial coatings, varnishes, and paints. Tests have shown that *E. lagascae* can be grown successfully in the Columbia Basin. Further study should be done on other Euphorbia species.



Sunflower (*Helianthus annuus*)

Sunflower occurs in most of the temperate world and is an important source of edible oil. Uses include cooking oil, margarine, salad oil, lubrication, soap-making, and biodiesel production for motor vehicles. It also is used with linseed and other drying oils in paints and varnishes. Kernels are eaten raw or roasted.



Sunflower press-cake is used as a high-protein supplement for livestock. Sunflowers also are a source of silage and fodder, and hulls provide filler in livestock feeds and bedding. Sunflower also is used as a green manure crop and in seed mixes for both wild and caged birds.

The sunflower is the state flower of Kansas, and it grows as a native throughout the Great Plains and west to the Cascade Mountains. The native is less suited for seed production than are commercial cultivars.

Sunflower is drought tolerant if its extensively branched taproot can reach moisture approximately as deep as the plant is tall, a requirement for a good seed crop. Lack of suitable farming equipment and oilseed processing facilities have hampered the commercial potential of this plant in the Columbia Basin. Silage production has been more successful, and feeding trials have shown that sunflower is an acceptable forage crop for cattle. More information is available at <http://oregonstate.edu/%7Emachados/Agronomy/altcrop.htm>

Sunn hemp (*Crotalaria juncea*)

Sunn hemp produces a bast fiber that could be used in pulp and paper applications. The fiber presently is used in twine, rug yarn, cigarette and tissue papers, fishnets, sacking, canvas, and cordage. This species is widely grown in the tropics as green manure, and dried stalks are fed to livestock. The seeds are purported to be poisonous, but they are fed to horses in Russia and to pigs in Zimbabwe. Cultivation experience throughout the world seems to indicate that this crop could grow in the Columbia Basin.



Wormwood (*Artemisia dracunculus*)

Wormwood, or tarragon, is an aromatic perennial herb native to Russia that has become naturalized along the Columbia River. It is widely cultivated for its leaves, which are a source of aromatic oil used as flavoring in pickles and vinegar. The oil also is used in perfumes, soaps, and cosmetics. Cultivation should be successful in the Columbia Basin.



Yarrow (*Achillea millefolium*)

Yarrow is native to the temperate zone worldwide. It has a history of use as a scent for skin care products, nasal inhalers, etc. Yarrow grows abundantly throughout the Columbia Basin. It can thrive on shallow to deep soils with rainfall from 10 to 90 inches. Fall plantings overwinter as 6-inch basal leaves and can tolerate temperatures as low as 0°F. Yarrow revels in summer heat and can be harvested for oil extraction during the early bloom period. If left in the field, the seeds are ready for harvest by September or October.



Yarrow also has value as an herbal medicine, having astringent and antibiotic properties. It frequently is mixed with grasses for low-water landscaping and is an important ingredient in “ecolawn” mixes.

To date, the market for yarrow has been very limited and needs further development.

Vernonia (*Vernonia galamensis*)

Vernonia, or ironweed, is a native of eastern Africa. It is an annual composite family plant, somewhat like the native sunflower. It is grown for the oil in its seeds, which can be used for epoxies, adhesives, paints, and varnishes. It could be used in polyvinyl chloride (PVC plastic) production without the need for petroleum-based products. Its native habitat is similar in rainfall and temperature to the Columbia Basin, and this species warrants further research. As with other oilseed crops, processing facilities are lacking.



Watermelon (*Citrullus lanatus*)

Watermelon is a member of the cucumber family that thrives in warm weather and requires irrigation. Planting is timed so that fruits ripen from July through October. Watermelons are harvested carefully by hand. A dependable labor supply is important because fruits must be harvested daily throughout summer.



Shrubs and trees

Bitterbrush	19	Currant, golden	20	Horsebrush	20	Rabbitbrush.....	22
Cedar, incense-	19	Dogwood, creek or		Juniper	21	Sagebrush.....	22
Cherry, bitter	19	red-osier	20	Lavender	21	Sumac.....	22
Chokecherry.....	19	Elderberry, blue.....	20	Oak, Oregon white.....	21	Willow.....	22
Cottonwood.....	20	Hawthorn, Douglas.....	20	Olive.....	21		

Bitterbrush (*Purshia tridentata*)

Bitterbrush is a rose family shrub that is native to the intermountain west. It is important as forage for deer, antelope, and mountain sheep. Wildfire and overgrazing have reduced populations of this species, and active revegetation is an ongoing goal. Bitterbrush is propagated by seeds, and success rates are low, but additional research should improve results. Columbia Basin soils and climate are optimum for successful cultivation of this plant.



Cedar, incense- (*Calocedrus decurrens*)

Incense-cedar is a cypress family tree that grows in many canyons and flats throughout the Columbia Basin. It is a native that has been propagated for use around ranch houses for shade and greenery. It also grows west of the Cascades, but not as well as on the eastside. There is a small, steady market, and the price of a 6- to 12-inch start has ranged from \$1.50 to \$6.00. Even a small plot can yield revenue.



Cherry, bitter (*Prunus emarginata*)

Bitter cherry is a tree or shrub related to chokecherry, and it lends itself to the same uses. Neither bears fruit for human consumption, but wildlife like the fruit. As a native to the Columbia Basin, this crop can be grown without difficulty.



Chokecherry (*Prunus virginianus*)

Chokecherry is a native shrub or tree that grows in riparian areas and gullies throughout the Columbia Basin. It is useful for streamside shade to maintain cool water temperatures. As watershed councils become more active in the Basin, demand is increasing for trees and shrubs for streamside revegetation. Chokecherry starts are easily grown to a suitable size for replanting.



Cottonwood (*Populus* sp.)

Cottonwood, including aspen at higher elevations, are native trees indicative of the presence of water close to the soil surface. A spring that might not otherwise be noticed in the rolling hills of eastern Oregon usually is marked by at least one cottonwood tree.



Cottonwoods are used for riparian improvement. They shade and cool streams and retain organic matter in times of high runoff, making them a worthwhile addition to the mix of riparian vegetation.

Historically, cottonwoods (especially the introduced Lombardy poplar) have been used as windbreaks for farming. Traveling up the Columbia River, rows of Lombardy poplars serve as a buffer against gorge winds for crops such as grapes, peaches, apples, and pears. Other species from the cottonwood genus, many of which are native to the Columbia Basin, have been utilized. Some hybrid poplars are grown under irrigation as a source of pulp for paper. Others show promise as living filters for contaminated sites. Aspens grow at higher elevations and are under great stress due to land-use issues. Cottonwoods are easy to propagate, and there is a small, steady market.

Currant, golden (*Ribes aureum*)

Golden currant is a native member of the gooseberry family that grows throughout Oregon. It is valuable as a food source for wildlife and for streamside shade and cover. Its fruit was used by many Euro-American settlers and still has some use. It also produces beautiful yellow flowers each spring, and a market exists for golden currant as an ornamental shrub. The price for 18- to 36-inch starts has ranged from \$2.25 to \$11.25.



Dogwood, creek or red-osier (*Cornus sericea* or *C. stolonifera*)

Red-osier dogwood is a widespread native shrub of riparian areas. The Oregon Department of Transportation has planted millions of these shrubs at highway interchanges throughout the state. There also is a market for use as streamside revegetation.



Elderberry, blue (*Sambucus cerulea*)

Blue elderberry is a native shrub that provides wildlife food and streamside shade. It grows throughout the Columbia Basin and is commonly used for revegetation after land disturbance. A small, steady market exists.



Hawthorn, Douglas (*Crataegus douglasii*)

Douglas hawthorn is a native shrub or tree that is part of the mix of a healthy riparian system. Its berries serve wildlife needs, and its thorny tangles provide protective cover. Streamside restoration work includes this species, and a small, steady market exists.



Horsebrush (*Tetradymia canescens*)

Horsebrush is a native shrub that resembles rabbitbrush, although it blooms in spring instead of late summer. An area planted with both species is in bloom for months. This species has only recently been recognized for its value in landscaping.



Juniper (*Juniperus* sp.)

Juniper has been considered a weedy tree that encroaches on grasslands in the intermountain West. Aside from some use as firewood and fence posts, it has seldom been exploited. Woodworking (e.g., for furniture) provides a small market. Steam distillation of juniper's powerful oils is a possibility.



Lavender (*Lavandula angustifolia*)

Lavender is a bushy perennial shrub with purplish flowers. Its flowers often are dried, as they retain their aroma for a long time. Lavender has been used as a perfume in England for centuries. There is a small market for dried flowers. There is also a growing market for lavender oil for use in soap, hand cream, and other cosmetic products. Lavender is propagated by cuttings, and the plant likes dry soils and full sun. It grows wild in dry creek beds from Arizona north to the Columbia Basin.



Oak, Oregon white (*Quercus garryana*)

Oregon white oak is a recommended species for rehabilitation of disturbed areas on the east slopes of the Cascades. It is prime habitat for deer, elk, wild turkeys, and gray squirrels. Like other species, oak starts from the Willamette Valley do poorly east of the mountains, so nursery stock needs to come from a local source. State parks and highway departments are the primary markets, but private landowners are increasingly interested in oak for land restoration. The price for 18- to 24-inch oak has ranged from \$2.25 to \$11.95. Growing starts from acorns is labor-intensive but provides a good return.



Olive (*Olea europaea*)

Olive grows in Mediterranean-type climates similar to Oregon's. It is drought resistant and can tolerate temperatures to 15°F. Olives are long lived and are grown for pickles and high-priced oil. In the U.S., almost all olive production is in California's Central Valley.



Olives can be grown on land too poor to support other crops, but they require vernalization (chilling) to flower.

Rabbitbrush (*Ericameria* sp., formerly *Chrysothamnus*)

Rabbitbrush is considered a roadside weed in some places, but increasingly is being used as a landscape plant. The examples at the Columbia Gorge Discovery Center are striking. Note the comments under horsebrush for companion planting. Rabbitbrush is a native shrub occurring from the Dakotas to the Cascade Mountains. Recognition as an ornamental for xeric landscapes has created a market.



Sumac (*Rhus glabra*)

Sumac is a native shrub throughout the Columbia Basin. It is very showy in the fall, when its leaves are fiery red. It is used at highway interchanges and in landscaping. A small, steady market exists for starts ready for transplanting. Sumac may produce allelochemicals that can be used in the formulation of natural herbicides.



Sagebrush (*Artemisia tridentata* and other species)

Sagebrush is a synonym for the Old West, and the aroma of the prairies after a summer thunderstorm is etched into the memories of many people. This is a widespread native shrub that is seeing increasing acceptance as a landscape plant. There also is a small market for use as an air freshener, for which it is very effective. Although sagebrush sometimes has been considered a weedy species, it now is recognized as a valuable part of the plant communities that bear its name.



Willow (*Salix* sp.)

Willow is the primary streamside rehabilitation plant in Oregon. It provides quick growth, shade, cooling, and cover. A dozen native species occur in the Columbia Basin. As watershed councils become more active, the demand for starts should increase.



Opportunities for xeriscape plant nurseries in the Columbia Basin

As city water bills skyrocket and water shortages become more frequent, more attention is being paid to residential landscape alternatives.

Dry landscaping (xeriscapes) have become increasingly popular in cities such as Bend, Redmond, Sisters, Prineville, Madras, The Dalles, Arlington, and Pendleton.

The environmental price we pay to keep lawns, parks, and golf courses green is very high. Landscape water use draws down aquifers and reduces stream flows. Fertilizers and pesticides are expensive and can damage adjacent areas.

What can a Columbia Basin landowner do to further the use of xeriscapes as an alternative? He or she can offer appropriate seed and plants at a moderate cost. This involves some cost and risk, but at least a few native plant nurseries are thriving.

Some recommendations for xeriscape plant offerings include the following:

Shrubs

- Bitterbrush (*Purshia tridentate*), a shrub of the rose family that has clusters of small, yellow flowers in April and May. Some people confuse this species with sagebrush.
- Blue elderberry (*Sambucus cerulean*), a showy shrub that blooms in May and produces berries in September.
- Horsebrush (*Tetradymia canescens*), similar to rabbitbrush, including bright yellow flowers, but blooming in late May and June. These two species can be used together for continuous flowering from May to October.
- Rabbitbrush (*Chrysothamnus nauseosus*), a gray-leaved plant with bright yellow flowers from August through October, when little else is blooming.
- Sagebrush (*Artemisia tridentata*), the classic feature of the shrub-steppe zone. It blooms in October.
- Western sumac (*Rhus glabra*), blooming in July, with vivid red leaves in autumn.

Grasses

- Bluebunch wheatgrass and blue wildrye, good accents for partial shade.
- Bottlebrush squirreltail (*Sitanion hystrix*), a showy native bunchgrass suitable for accents.

- Great Basin giant wildrye (*Elymus cinereus*), a very tall bunchgrass that does well in gullies and low spots.
- Idaho fescue (*Festuca idahoensis*) occurs as a native bunchgrass on north slopes throughout the Columbia Basin where cattle have not grazed it to extinction. Attractive in a garden setting.

Forbs

- Asters, such as *Macheranthera canescens*, bloom for long periods, sometimes from September to December.
- Buckwheats, such as *Eriogonum strictum*, *E. compositum*, *E. elatum*, *E. douglasii*, and *E. thymoides*, thrive with little or no irrigation.
- Desert-parsleys, such as *Lomatium dissectum*, *L. cous*, *L. minus*, *L. grayi*, and *L. nudicaule*, are fine early-spring native ornamentals.
- Penstemons, such as *P. barrettiae*, *P. richardsonii*, *P. deustus*, and *P. speciosa* do well in xeriscapes. *P. richardsonii*, or cutleaf penstemon, blooms from May through November in favorable conditions.
- Prickly pear cactus makes a good accent.

Groundcovers

- Carpet bugleweed (*Ajuga reptans*)
- Creeping phlox (*Phlox subulata*)
- Creeping thyme (*Thymus praecox*)
- Hen and chicks (*Echeveria species*)
- Iceplant (*Delosperma cooperi*)
- Kinnikinnick (*Arctostaphylos uva-ursi*)
- Mock strawberry (*Duchesnea indica*)
- Periwinkle (*Vinca minor*)
- Snow-in-summer (*Cerastium tomentosum*)
- Squaw carpet (*Ceanothus prostratus*)
- Stonecrop (*Sedum species*)
- Wild strawberry (*Fragaria species*)

Perennials

- Basket-of-gold (*Aurinia saxatilis*)
- Blue flax (*Linum perenne*)
- Chives (*Allium schoenoprasum*)
- Coral bells (*Heuchera species*)
- Coreopsis (*Coreopsis species*)
- Cranesbill (*Geranium species*)
- Daylillies (*Hemerocallis hybrids*)
- Evening primrose (*Oenothera species*)

Fireweed (*Epilobium angustifolium*)
 Heartleaf bergenia (*Bergenia cordifolia*)
 Hosta lilies (*Hosta* species)
 Iris (*Iris* species)
 Lamb's ear (*Stachys byzantina*)
 Lupine (*Lupinus* species)
 Penstemon (*Penstemon* species)
 Red-hot poker (*Kniphofia uvaria*)
 Sea thrift (*Armeria maritime*)
 Sedges (*Carex* species)
 Sun rose (*Helianthemum nummularium*)
 Yarrow (*Achillea millefolium*)

Shrubs

Burning bush (*Euonymus alatus*)
 Cotoneaster (*Cotoneaster* species)
 Daphne (*Daphne* species)
 Lilac (*Syringa* species)
 Mock-orange (*Philadelphus lewisii*)
 Oceanspray (*Holodiscus discolor*)
 Oregon boxwood (*Paxistima myrsinites*)
 Oregon grape (*Berberis aquifolium*)
 Privet (*Ligustrum* species)
 Red-flowering or golden currant (*Ribes* species)
 Red-osier dogwood (*Cornus stolonifera*)
 Rhododendron (*Rhododendron macrophyllum*)
 Rocky Mountain maple (*Acer glabrum*)
 Rose (*Rosa* species)
 Salal (*Gaultheria shallon*)
 Serviceberry (*Amelanchier alnifolia*)
 Snowberry (*Symphoricarpos albus*)
 Spirea (*Spiraea douglasii*)
 Sumac (*Rhus glabra*)
 Vine maple (*Acer circinatum*)
 Yucca (*Yucca* species)

Trees

Ash (*Fraxinus* species)
 Bigleaf maple (*Acer macrophyllum*)
 Birch (*Betula* species)
 Chokecherry (*Prunus virginianus*)
 Cottonwoods (*Populus* species)
 Crabapple (*Malus* species)
 Dogwood (*Cornus nuttallii*)
 Flowering dogwood (*Cornus florida*)
 Honeylocust (*Gleditsia triacanthos*)
 Horsechestnut (*Aesculus hippocastanum*)
 Lodgepole pine (*Pinus contorta*)
 Mountain ash (*Sorbus* species)
 Norway maple (*Acer platanoides*)
 Oregon white oak (*Quercus garryana*)
 Ponderosa pine (*Pinus ponderosa*)
 Red alder (*Alnus rubra*)
 Redbud (*Cercis* species)
 Walnut (*Juglans* species)
 Western larch (*Larix occidentalis*)
 Willow (*Salix* species)

Suggested reading

Collecting, Processing, and Germinating Seeds of Wildland Plants, J. Young and C. Young (Timber Press).

Fire-resistant Plants for Home Landscapes: Selecting Plants that May Reduce Your Risk from Wildfire, PNW 590, A. Waldo and S. Fitzgerald (Oregon State University Extension Service).*

Gardening with Native Plants of the Pacific Northwest, A. Kruckeberg (University of Washington Press).

Water-efficient Landscape Plants, EC 1546, N. Bell (Oregon State University Extension Service).*

*Copies of OSU Extension publications are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog (extension.oregonstate.edu/catalog/) or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

Introduced species considered noxious weeds that may show possibilities for oilseed, adhesives, or other properties

Amaranth or pigweed (<i>Amaranthus</i> species)	Prickly lettuce (<i>Lactuca serriola</i>)
Babysbreath (<i>Gypsophila paniculatus</i>)	Queen Anne's lace (<i>Daucus carota</i>)
Buckwheat family (<i>Polygonum</i> , <i>Rumex</i> , <i>Eriogonum</i> and other species)	Rush skeletonweed (<i>Chondrilla juncea</i>)
Castorbean (<i>Ricinus communis</i>)	Sage (<i>Salvia</i> species)
Chicory (<i>Cichorium intybus</i>)	Salsify (<i>Tragopogon dubius</i>)
Common tansy (<i>Tanacetum vulgare</i>)	Soapwort (<i>Saponaria officinalis</i>)
Goldenrods (<i>Solidago</i> species)	Sowthistles (<i>Sonchus</i> species)
Groundsels (<i>Senecio</i> species)	Spurge family (<i>Euphorbia</i> species)
Gumweed (<i>Grindelia squarrosa</i>)	St. Johnswort (<i>Hypericum perforatum</i>)
Hemp dogbane (<i>Apocynum cannabinum</i>)	Sunflower (<i>Helianthus annuus</i>)
Kochia (<i>Kochia scoparia</i>)	Sweetclover (<i>Melilotus</i> species)
Lambsquarter (<i>Chenopodium berlandieri</i> , and other Goosefoot species)	Tarweeds (<i>Madia</i> species)
Lupines (<i>Lupinus</i> species)	Thistles including knapweeds (<i>Cirsium</i> , <i>Centaurea</i> , and other species)
Marijuana (<i>Cannabis sativa</i>)	Wild licorice (<i>Glycyrrhiza lepidota</i>)
Milkvetches (<i>Astragalus</i> species)	Wild mustards (<i>Brassica</i> , <i>Cardaria</i> , <i>Descurainia</i> , <i>Isatis</i> , <i>Lepidium</i> , <i>Raphanus</i> , <i>Sisymbrium</i> , and other species)
Milkweeds (<i>Asclepias</i> species)	Wormwoods and sages (<i>Artemisia</i> species)
Morning-glory and bindweed (<i>Convolvulus</i> species)	Yarrow (<i>Achillea millefolium</i>)
Peavines (<i>Lathyrus</i> species)	

Native grasses, herbs, and shrubs for land restoration after fire, erosion, or mechanical disturbance

In recent years, Oregon has experienced disastrous fire seasons. In a typical season, 200,000 acres burn in eastern Oregon, and many more in the Cascades, Siskiyou, and the Coast Range. In some cases, natural revegetation is allowed to occur. In other cases, state, federal, and private landowners choose to revegetate with native species to hasten recovery. Revegetation efforts could require up to several tons of native grass seed. Such quantities of seed do not presently exist, but they could be grown profitably on Columbia Basin farmland. To make such seed production feasible, there needs to be cooperation among involved agencies, funding, and farmers willing to explore production of these crops.

Native grasses for revegetation after fire

Basin wildrye (*Leymus cinereus*)
 Blue wildrye (*Elymus glaucus*)
 Bluebunch wheatgrass (*Pseudoroegneria spicata*)
 Columbia brome (*Bromus vulgaris*)
 Idaho fescue (*Festuca idahoensis*)
 Junegrass (*Koeleria macrantha*)
 Squirreltail (*Elymus elymoides*)

This list is not exhaustive; other species may also be suitable. In addition to these grass species, other plants, such as buckwheat, penstemon, desert-parsley, and aster, could be used to seed burned areas.

Shrubs as a seed source for revegetation

Bitterbrush (*Purshia tridentata*)
 Blue elderberry (*Sambucus cerulea*)
 Horsebrush (*Tetradymia canescens*)
 Rabbitbrush (*Ericameria nauseosa*)
 Sagebrush (*Artemisia tridentata* or *A. rigida*)
 Western sumac (*Rhus glabra*)

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<i>Achillea millefolium</i>	18	<i>Eriogonum</i> sp.	8	<i>Panax quinquefolius</i>	11
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<i>Brassica juncea</i>	14	<i>Helianthus tuberosus</i>	13	<i>Prunus virginianus</i>	19
<i>Brassica napus</i>	9	<i>Hesperaloe funifera</i>	2	<i>Pseudoroegneria spicata</i>	5
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