Upcoming Workshops:

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Blueberries

Revised 2/21 (Gail Gibbard, Bob Taylor & Art Fuller)

Cowlitz County Master Gardener Program

Gary Fredricks: Extension Director/MG Coordinator
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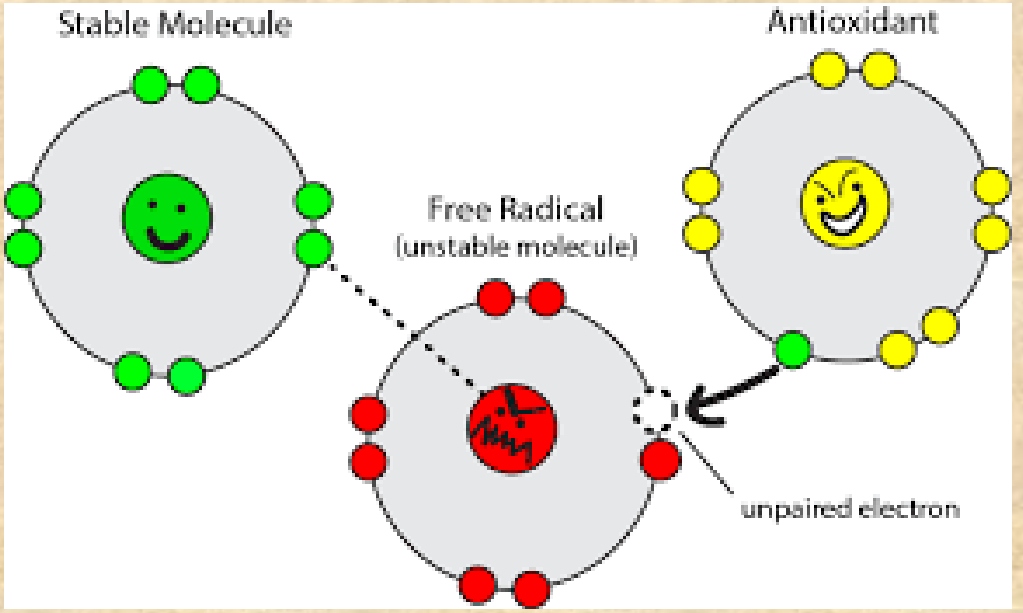
WASHINGTON STATE UNIVERSITY
COWLITZ COUNTY EXTENSION

Why Eat Blueberries?

- They are the KING of antioxidants.
- Antioxidants are substances that may protect your cells against free radicals, which may play a role in heart disease, cancer and other diseases.
- Free radicals are molecules produced when your body breaks down food or when you're exposed to tobacco smoke or radiation. (Mayo Clinic)

Other Bonuses from Blueberries!

- Anthocyanin.
- Vitamins A, B complex, C, and E.
- Copper (immune builder and anti-bacterial).
- Selenium.
- Zinc.
- Iron (promotes immunity by raising hemoglobin and oxygen concentration in blood.
- Boosts immune system to prevent infections.



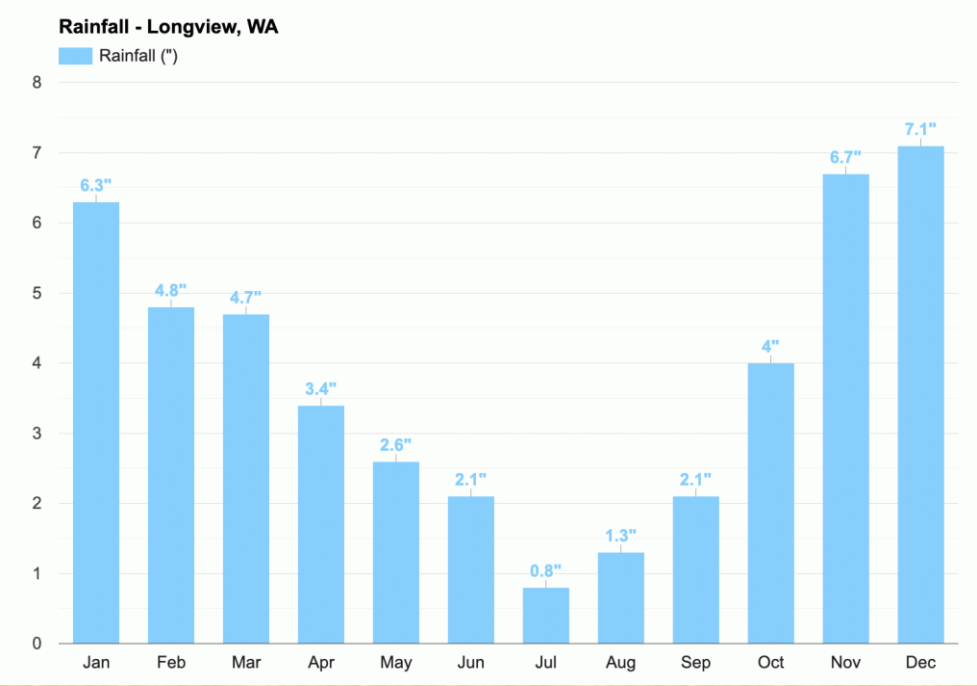
- Western Washington Climate.
- Site Selection.
- Soil Testing.
- Basics.
- Types.
- Cultivars.
- Planting.
- Mulching.
- Irrigation.
- Fertilizer.
- Pruning.
- Tools.
- Diseases.
- Insects.
- Vertebrate Pests.
- Harvesting and Storage.

Western Washington:

- Coastal maritime climate.
- Mild, wet winters.
- Wet springs.
- Micro-climates.

Site Selection:

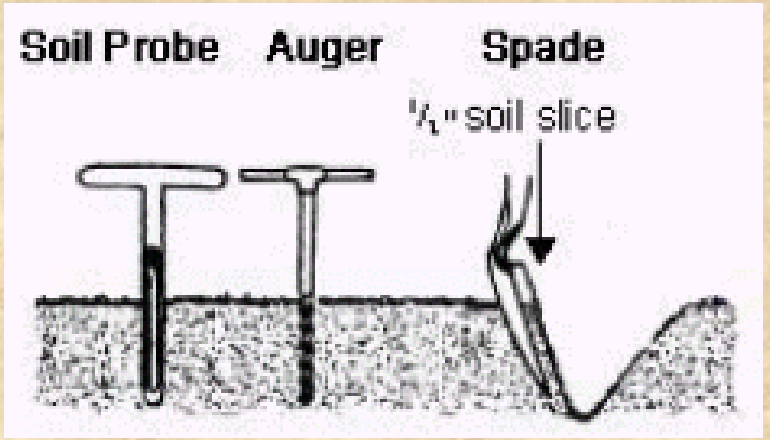
- Water availability (July - Sept).
- Remove competing vegetation.

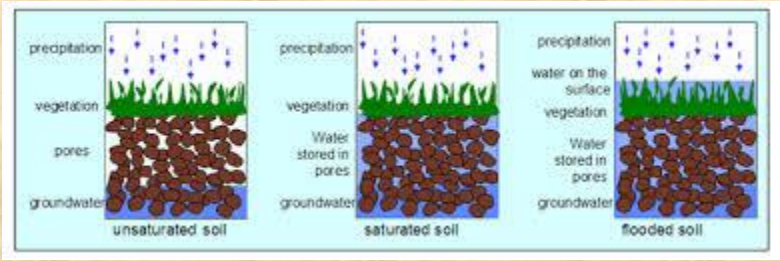


Site Selection/Preparation:

- Location.
  - Full Sun (Can handle late afternoon shade).
  - Good air circulation.

- Soil characteristics.
  - Soil testing.
  - pH 4.5 - 5.5.
  - Well drained soils.





Soil Testing:

- Soil testing should be done every 2 - 3 years.
- The best way to determine where your soil nutrient and pH levels are at is to obtain a soil sample prior to planting and send it to a laboratory for testing.

simplysoiltesting.com

- The important thing to remember is to be able to understand the results of the analysis.
- There are test kits that can be purchased such as Rapitest but, it will just give you an approximation where your soil primary nutrient and pH levels are at.

Soil Testing:

Soil Tests and Prices through Simply Soil Testing: Jan 2021

- Basic Soil Test - $16 per sample
  - Includes pH, lime requirement, potassium, phosphorus, calcium, magnesium, soluble salts and fertilizer recommendations.
- Basic Test + Organic Matter - $20.
- Basic Test + Fe, Mn, Zn & Cu - $20 (iron, manganese, zinc and copper).
- Basic Test + S and B - $24 (sulfur and boron).
- Complete Test - $32 All of the tests listed above.
- Soil Texture - $16 Percentage of clay, silt, sand and gravel in the soil, and classification of the soil type.
- Toxic Metal Testing - $24.
  - Levels of lead, cadmium and arsenic in the soil, and interpretation of the results.

Rapitest Soil Test Kit:

As for accuracy it does not give a precise reading.
It basically tells you if your primary nutrients and pH levels are high or low. $10 - $14 per kit (10 tests).

A lab test will give you precise pH, primary and secondary nutrient and micronutrient levels.

The best part of this test kit is the table provided for pH levels for over 450 plants.

Soil and Moisture:

Preferred Soil Type:

Acidic (4.5 - 5.5 pH level). Similar to azalea and rhododendron.

If pH is too high it can be gradually lowered using sulfur or ammonium sulfate (21-0-0) apply 5 lbs. per 100 square feet.

Moisture:

Well drained soil.

Very shallow fibrous roots - best to mulch.

Ensure ample water during dry times.

Some Basics about Blueberries:

- **Ripening Terminology:**
  - Early = Late June to Early July.
  - Mid-season = Mid July.
  - Late = Late July to Early August.
  - Growing season approximately 140 days.

Blueberry Types:

- Low bush: Requires mowing to the ground each year.
- Rabbit eye: Southeastern US. Turn pink then blue.
- Half high: Cross between a low bush and a high bush.
- **<u>High bush: Ideal for the PNW.</u>**

Blueberry - High Bush:

- Winter hardy.
- Not drought tolerant.
- Productive.
- Commercial & home gardens.

Table 1. Northern highbush and rabbiteye cultivars suitable for small farms and home gardens. * mummy berry resistant

Cultivars are northern highbush blueberries unless otherwise noted. Cultivars are listed in approximate order of ripening.

We do not recommend southern highbush cultivars (e.g., O'Neal, Star, Jewel, San Joaquin, Emerald, Santa Fe, Misty, Carteret, Pamlico) for commercial or home garden production in the Pacific Northwest.

Cultivar	Bush	Berry	Yield/Ripening
Duke	Erect, open, susceptible to root rot, self-pollinating.	Large, light blue, firm, excellent eating quality.	Medium to high Early
Earliblue	Vigorous, erect, self-pollinating.	Medium/large, light blue, firm, good sweet flavor.	Medium Early
Spartan *	Vigorous, erect, open does not do as well on heavy soil, self-pollinating.	Very large, light blue, Moderately firm, blooms late.	Medium to high Early
Reka	Very vigorous, upright, open, will over crop if not pruned well, semi self-fertile pollinate with other high bush.	Medium to large, dark blue good flavor.	Very high Early

Cultivar	Bush	Berry	Yield/Ripening
Toro	Stocky, spreading moderate vigor, longer to produce, very susceptible to root rot, self-pollinating.	Very large, light blue, firm excellent overall quality.	High to very high Mid
Olympia	Vigorous, spreading, semi self-fertile pollinate with another high bush.	Medium, dark blue, soft thin skin, excellent sweet flavor.	Medium Mid
Bluecrop *	Vigorous, upright, open, will overproduce if not pruned, self-pollinating.	Medium to large.	Medium to high Mid
Dixie	Medium height bush, self-pollinating.	Large - very large, firm, medium blue.	Mid - Late
Jersey *	Very vigorous, large upright, self-pollinating.	Small, medium blue, sweet, good flavor.	Medium Mid-Late
Blueray	Vigorous, upright, open, self-pollinating.	Large to very large, medium blue, excellent flavor.	Medium to high Mid

Cultivar	Bush	Berry	Yield/Ripening
Calypso	Vigorous, upright open, self-pollinating.	Large, light blue, firm, good flavor, concerns with texture.	Medium to high Mid - Late
Legacy	Very vigorous, requires a trellis, somewhat evergreen, self-pollinating	Medium to large, light to medium blue, firm, very good flavor, long fruiting season.	Very high Late
Liberty	Vigorous, upright requires trellis, susceptible to cane disease, semi self-fertile pollinate with another high bush.	Medium to large size, bright blue, slightly flat, firm, very good flavor.	High Late
Darrow	Vigorous, erect, sensitive to blight, semi self-fertile pollinate with another high bush.	Large to very large, light blue medium firm, excellent flavor, Resists cracking.	High Late
Chandler	Moderate vigor, slightly spreading sensitive to blight, semi self-fertile pollinate with another high bush.	Very large, medium to dark blue, firm, good flavor, long ripening season.	Medium to high Late

Cultivar	Bush	Berry	Yield/Ripening
1613-A Hardyblue	Vigorous, erect, open, adapted to wide range of soils, requires a pollinator.	Small size, dark blue, soft, excellent flavor.	Medium Late
Pink lemonade (Rabbiteye)	Moderate vigor erect, nice ornamental, self-pollinating.	Medium light to dark pink, good flavor.	Medium Late
Aurora	Moderate vigor, stocky, spreading growth habit, self-pollinating.	Medium to large dark blue, firm, mild flavor.	High Late
Ochlockonee (Rabbiteye)	Vigorous, upright, narrow crown, young plants sensitive to blight, requires a pollinator.	Medium to large, light blue, firm, good flavor, resistant to split.	Medium to high Late
Powderblue (Rabbiteye)	Vigorous erect, dense foliage, susceptible to blight and root rot, pollinate with Ochlockonee or Titan.	Small, very light blue, very firm good flavor, split resistant.	Medium to high Late

Table 2. Half-high and ornamental blueberry cultivars

Cultivars are listed in approximate order of ripening.

Cultivar	Bush	Berry	Yield/Ripening
Polaris	Compact, upright spreading to 4 ft. tall, requires a pollinator.	Small to medium, light blue, firm, good flavor.	Medium Early
Sunshine blue	Compact, to 3 ft., ornamental, self-pollinating	Medium, medium blue, sweet.	Medium Early
Northland	Vigorous, spreading, many shoots, to 4 ft. tall, self-pollinating.	Medium, dark blue, sweet.	Very High Early
Northcountry	Compact, to 3.5 feet tall and wide adapted to a range of soils, self-pollinating.	Medium sweet very good flavor.	Low to medium Early
Northsky	Compact, to 3 feet tall and wide, self-pollinating.	Small, very light blue, sweet, very good flavor.	Low Early - Mid
Chippewa	Compact, vigorous upright to 4 ft. tall, semi self-fertile pollinate with another half-high bush.	Medium, very light blue, medium firm very sweet.	Medium Late

Cultivar	Bush	Berry	Yield
Northblue	Upright, open to 3 feet tall, semi self-fertile pollinate with another half-high bush.	Medium to large, good flavor.	Medium Late
Brazelberries Peach Sorbet	Compact 1.5 ft tall 2 ft wide, ornamental foliage, potted, patented plant, self-pollinating.	Medium, fair to good flavor.	High Yield Late
Perpetua	Compact bush, upright canes, 3 to 4 ft., very dark green glossy leaves ornamental, self-pollinating.	Small, dark blue, mild flavor.	Medium Late

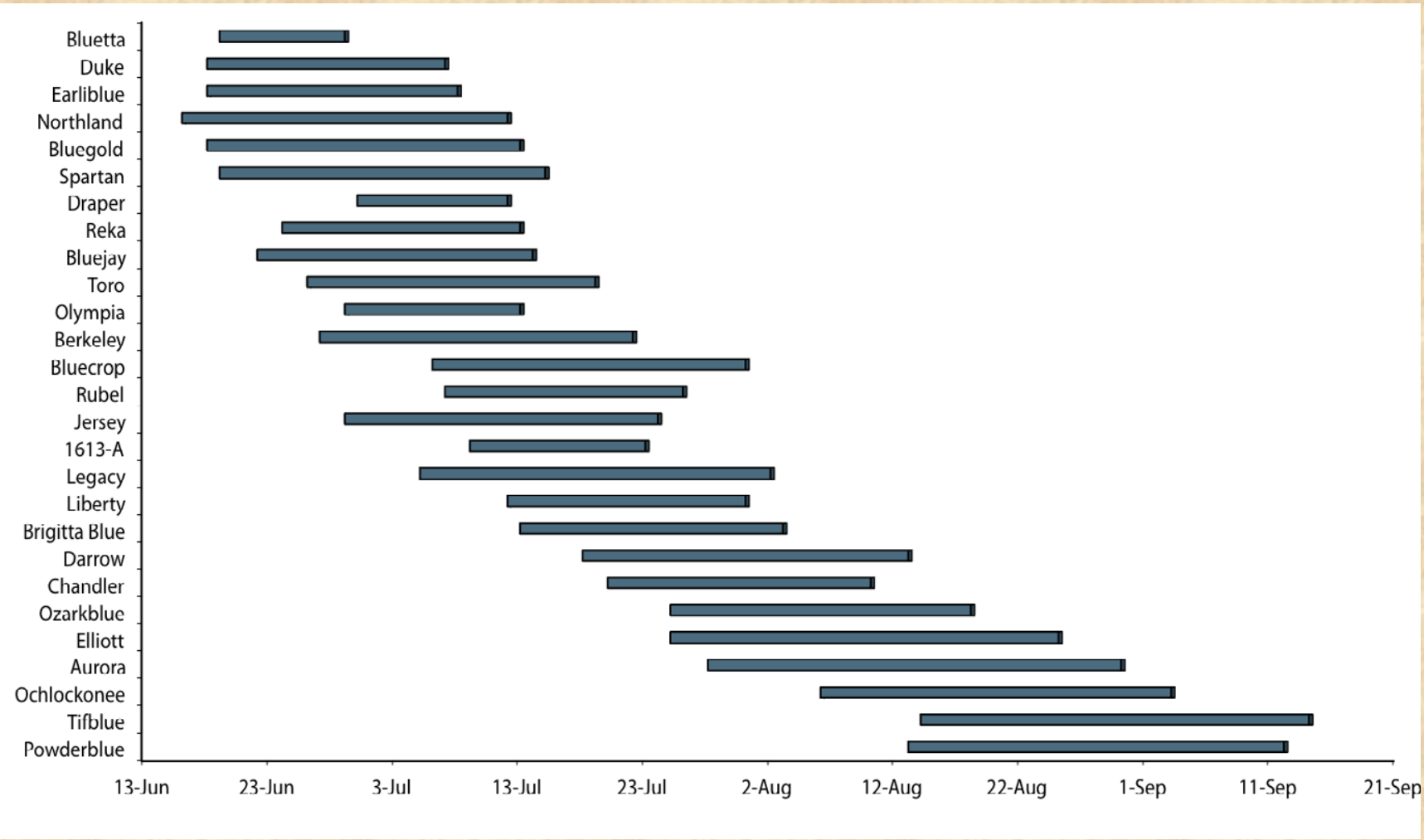


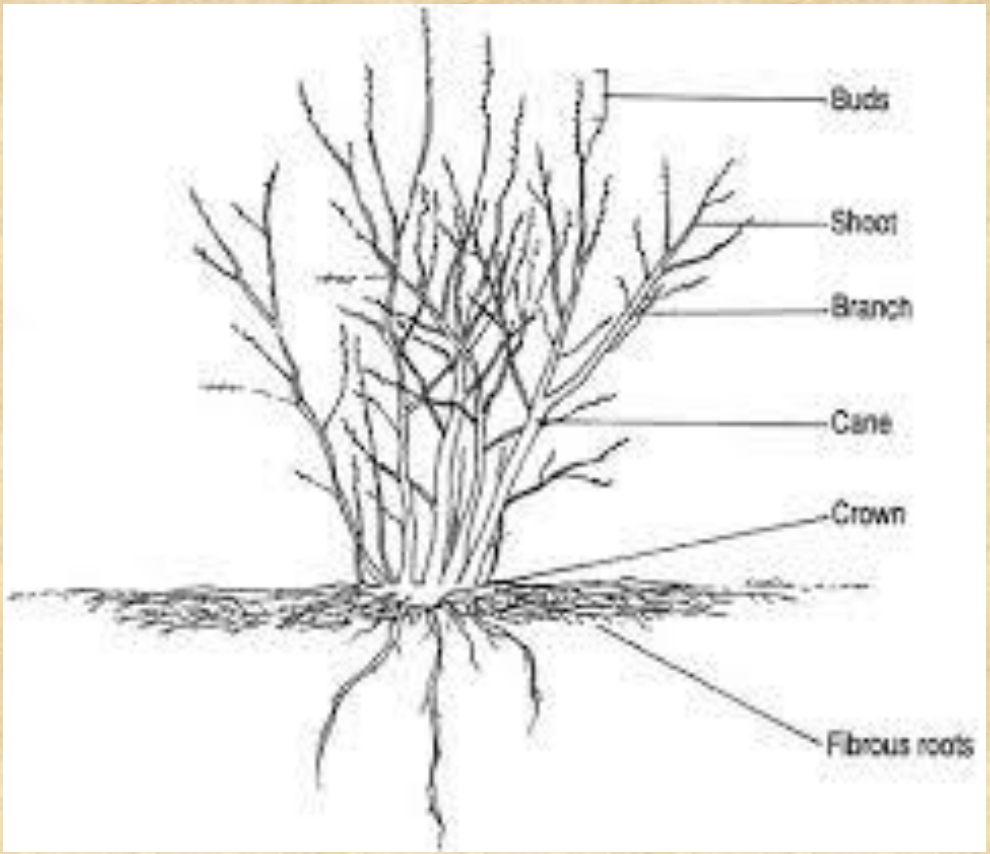
Figure 1. Approximate fruiting season of highbush and rabbiteye blueberry cultivars at the OSU North Willamette Research and Extension Center, Aurora, OR.

Bars represent harvest season for 5% to 95% of total yield. Cultivars are sorted by the date at which 50% percent of total yield has been harvested.

Ripening time can vary with year (weather) and cultural practices.

Planting:

- Full sun (can handle late afternoon shade).
- Spacing 4 - 5 feet apart and 8 feet between rows.
- Even though most are self pollinating it is best to have 2 different varieties (better berry size and yield).
- Number of plants - Rule of thumb 2 plants per household member.
- Plant in early spring - 3 years for good production.
- Rooting system (very shallow fibrous roots).

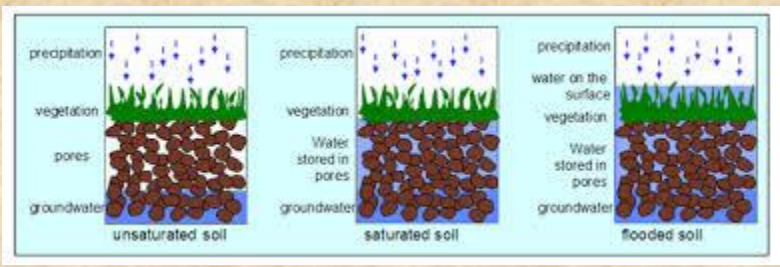


Planting:

- Old adage: $5 hole for a $1 plant.
- Plant high enough to allow for soil settling.
- If clay soil, break up sides of hole with garden fork to promote root growth and avoid root girdling.
- Well drained soils.

Shovel creates smooth edges creating a bowl effect and restricting root growth

Garden fork creates rough surface allowing roots to penetrate



Mulching:

- 2 to 3 inch deep mulch immediately after planting keeping the crown clear.
- Spread out past the dripline (Approximately a 4 foot circle).
- Sawdust (doug fir), fir needles, arborist chips. Preserves moisture and deters weeds.
- As plants mature over the next five to six years, increase the depth of the mulch to 4 to 6 inches.
- Mulch generally decomposes at a rate of about an inch per year.

Irrigation:

- After planting, water the plants to allow the soil to settle around the roots.
- Initially keep root zone and soil thoroughly wetted until roots are established with zero standing water.
- Established bushes need 1.5 - 3 inches of water per week. Especially during Jun - Aug during absence of rainfall.
- Avoid overhead watering.
- Drip irrigation is the best method.

Brown leaves indicate water stressed plant.

Drip Irrigation.

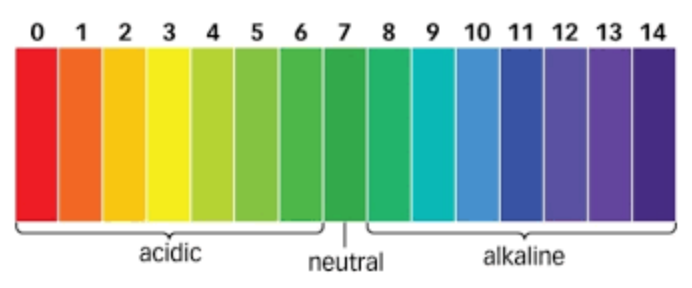
Fertilizing:

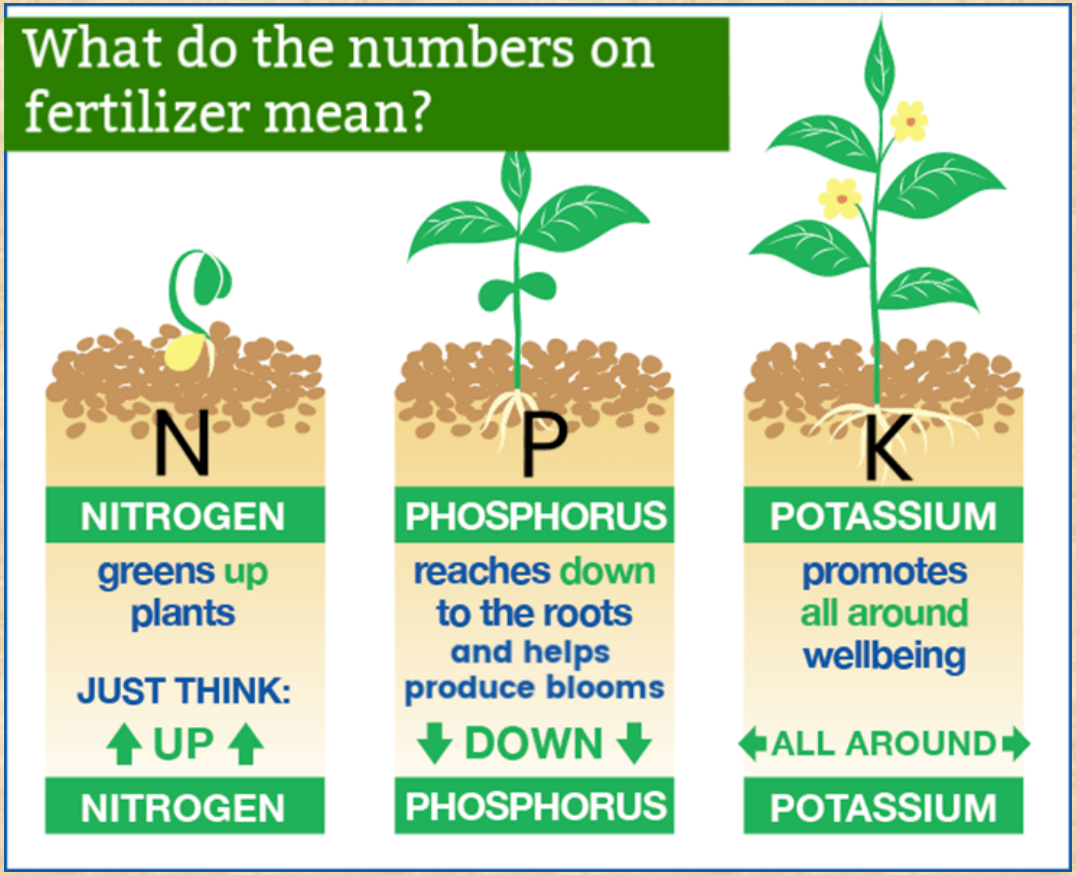
Primary Nutrients:

- Nitrogen
- Phosphorus
- Potassium

pH:

4.5 - 5.5





Fertilizer:

What do the numbers mean?

10 lbs. 5-10-10

Element	%		Weight		lbs.
N	5 = .05	x	10		0.5 lbs.
P	10 = .10	x	10		1.0 lbs.
K	10 = .10	x	10		1.0 lbs.
				Totals	2.5 lbs.

What are the remaining 7.5 lbs?

Inert ingredients such as sawdust, clean or sterile dirt, peat moss, sphagnum (moss), ground corn cobs and other products also serve as fillers.

Fertilizer:

Easiest way to explain the difference between organic and inorganic fertilizers are:

- Organic fertilizers are natural and breakdown to feed the micro-organisms in the soil and finally feed the plants.

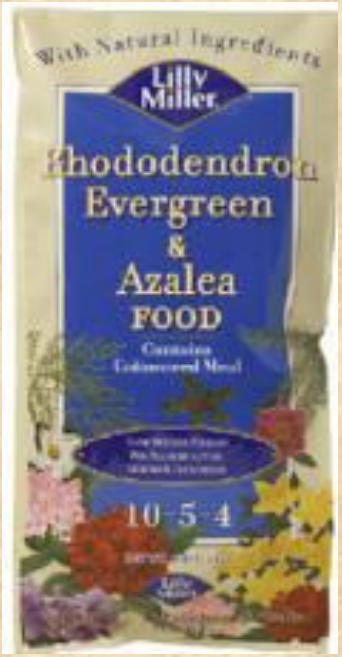
  Examples of organic fertilizers include manure (poultry, cow or horse), bone meal, cottonseed, or other naturally occurring materials.

- Inorganic fertilizers are man made products and feed the plant directly. They usually have a higher nutrient content.

Fertilizing:

- Avoid using fertilizer for 1 year on newly transplanted blueberries. This will avoid burning the developing root system and will allow the roots to expand and begin to explore soil.
- When fertilizing keep fertilizer approximately 2 inches away from the crown and spread around whole diameter of bush.
- If using sawdust use a higher Nitrogen to prevent leaf yellowing.
- If leaves start turning brown cut back on the amount of fertilizer.
- You can dissolve fertilizer such as ammonium sulfate into 1 gallon of water and apply or just apply granules and then water afterwards.

Fertilizer Examples:



Fertilizing:

Age of plants (from transplant)	5-10-10 ounce (cup) March 15 to April 15	Ammonium sulfate ounce (Tbsp) May 20	Ammonium sulfate ounce (Tbsp) June 15
Newly set	0	0	0
1 year	2 (1/4 cup)	1 (2 Tbsp)	1 (2 Tbsp)
2 years	4 (1/2 cup)	1 - 2 (2 - 4 Tbsp)	1 - 2 (2 - 4 Tbsp)
3 years	6 (3/4 cup)	1 - 2 (2 - 4 Tbsp)	1 - 2 (2 - 4 Tbsp)
4 years	8 (1 cup)	2 - 3 (1/4 cup + 1 Tbsp)	1 - 2 (2 - 4 Tbsp)
5 years	10 (1 1/4 cup)	2 - 3 (1/4 cup + 1 Tbsp)	1 - 2 (2 - 4 Tbsp)
6 years and older	12 (1 1/2 cup)	2 - 3 (1/4 cup + 1 Tbsp)	1 - 2 (2 - 4 Tbsp)

Table is from the WSU Master Gardener Training Manual and C008
https://s3.wp.wsu.edu/uploads/sites/2076/2017/06/C008-Blueberries-15.pdf

Fertilizing:

Age of plants from transplant	Ammonium sulfate in late April	Ammonium sulfate in late May	Ammonium sulfate in late June
Newly Set	1.0 ounce	1.0 ounce	1.0 ounce
Year 2	1.2 ounces	1.2 ounces	1.2 ounces
Year 3	1.2 ounces	1.2 ounces	1.2 ounces
Year 4	3.0 ounces	3.0 ounces	3.0 ounces
Year 5 and older	4.0 ounces	4.0 ounces	4.0 ounces

As plants age they should exhibit healthy green leaves, with 12" of new lateral growth per year. Plants yielding more than 15 lbs. of fruit/year require little supplemental fertilizer. If urea is used reduce the rates by one half.
http://pubs.cahnrs.wsu.edu/wp-content/uploads/sites/2/2016/04/em103e.pdf

- Dormant (Jan - Mar).
- Bloom (Apr - May).
- Crop (Jul - mid Sep) depending on cultivar.

Pruning:

- Young plants need little pruning during their 1st three years.
- Top buds are fruiting buds.
- Lower buds are vegetative.
- Promotes plant health (air circulation and light).
- Increases berry production, quality and size.
- Minimizes overgrowth.
- Remove damaged, dead, diseased and dysfunctional (crossing, interfering, old) branches.
- On mature plants prune out low spreading branches near the ground 1st.
- Then 2nd head back branches with little vigor. Thin twiggy branches out.
- Older plants remove 1” diameter branches at the ground line (ensures strong return bloom and larger fruit size). Leave 6 - 12 branches.

Pruning:

- Early spring.
- Remove old and dead branches (tan or black in color).
- Keep madrone (burnt orange/reddish) colored branches as they provide the most berries.
- Prune to get good air flow and prevent powdery mildew.
- Fruits on last years growth.

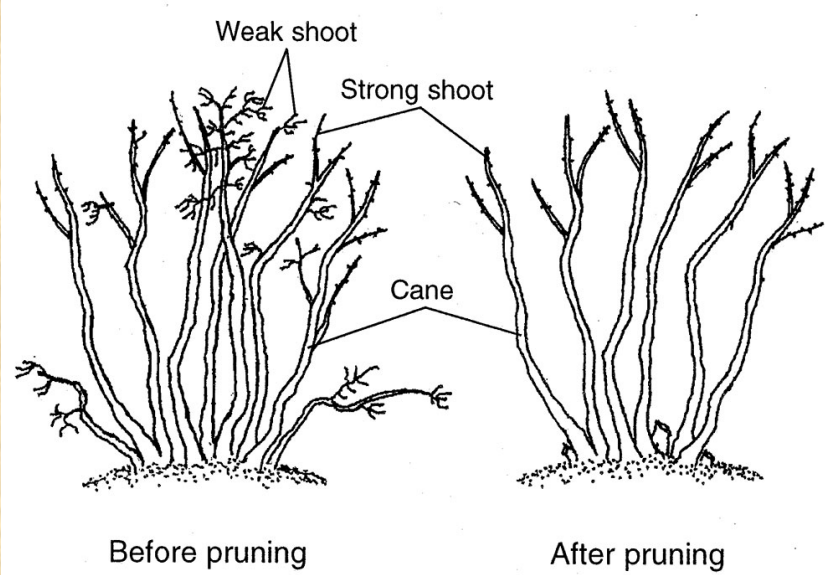
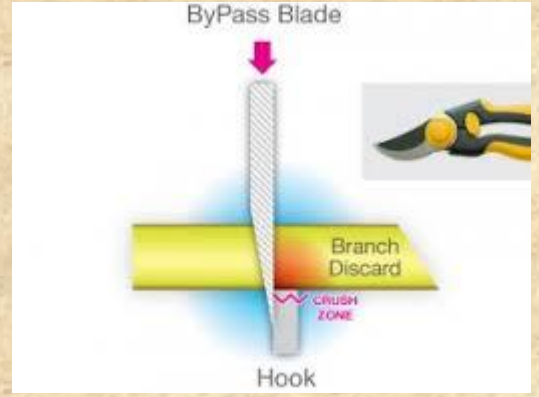
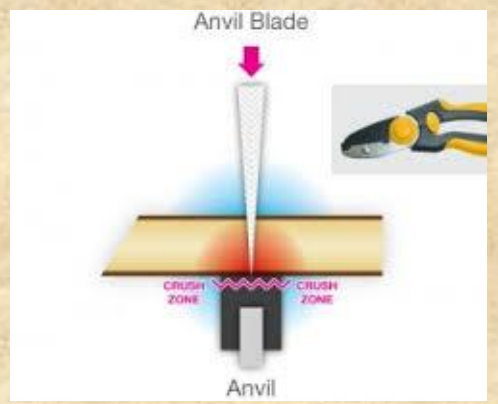


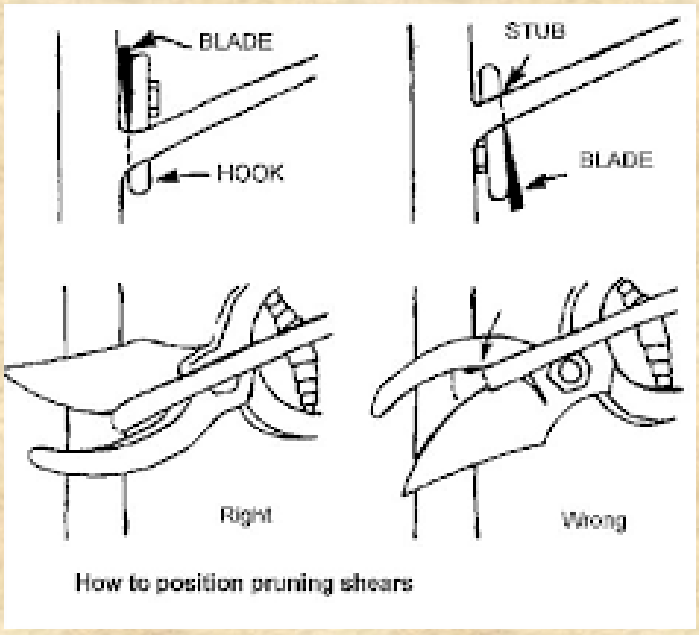
Figure 2. Dormant blueberry pruning

Tools:

- Pruners and Loppers:
  - Bypass.
  - Anvil.
- Cuts by each:
  - Bypass.
  - Anvil.

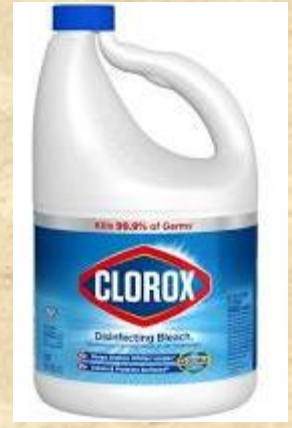


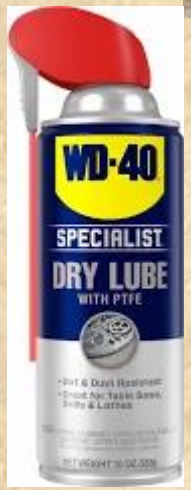




Tools:

- Sharpener.
- Files (Diamond files & follow blade angle).
  - Coarse.
  - Fine.
  - Extra fine.
- Disinfectant:
  - Alcohol.
  - 10% Clorox/Water solution (corrosive).
- Gloves.
- Lubrication:
  - Dry or silicone based lubricant to preserve.





Mummy Berry Disease:

Fungal Disease (it leaves fruit hard, white and inedible).

Prevention: Buy disease resistant plants, removal of mummy berry and blighted shoots and good spring raking.

Botrytis Blossom Blight:

Fungal Disease (gray mold on berries and happens during a prolonged wet spring).

Prevention: Keeping plants well pruned with good air circulation.

Insects: (Blueberries have few insect pests)

- Aphids (Prevention Lady Bugs).

- Cherry Fruitworm Larvae (feed on inside of fruit) (Prevention Insecticide).

- Root Weevil Larvae (larvae feed on root systems no pesticides available/adults feed on leaves at night. (adults are not harmful to plant).

Pests:

Biggest problems:

Birds (netting or cage).

Deer (fencing, netting or a cage works best).

Harvest and Storage:

- 4-5 years old before bearing well (life expectancy unlimited).
- Several signs of maturing:
  - Birds eating.
  - Color changing.
  - Taste.
  - Refractometer.
    - Brix scale read in degrees.
    - Increments mean 1 gram of sucrose per 100 grams solution.

- Harvest 4 - 5 days after 1st berries turn blue.
- Fresh berries have a 2 week shelf life when refrigerated.
- Can rinse freeze then transfer to a freezer container.

Brix	Poor	Average	Good	Excellent
Blueberry	7	9	12	15

Summary:

- Western Washington Climate.
- Site Selection.
- Soil Testing.
- Basics.
- Types.
- Cultivars.
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- Irrigation.
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- Tools.
- Diseases.
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- Vertebrate Pests.
- Harvesting and Storage

References:

Washington State University:

- WSU Master Gardener Training Manual.
- Hortsense.
- Pestsense.
- Growing Small Fruits in the Home Garden: http://pubs.cahnrs.wsu.edu/wp-content/uploads/sites/2/2016/04/em103e.pdf
- Berries for the Inland NW: https://pubs.extension.wsu.edu/berries-for-the-inland-northwest
- Blueberries: https://s3.wp.wsu.edu/uploads/sites/2076/2017/06/C008-Blueberries-15.pdf

Oregon State University:

- Growing Blueberries in your home Garden EC1304: https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec1304.pdf
- Blueberry Cultivars for the pacific Northwest. PNW 656: :https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw656.pdf

Miscellaneous:

- Sunset Western Garden Book: Pg. 226-227
- Washington Department of Fish and Wildlife (WDFW) website.

Videos:

- https://www.youtube.com/watch?v=fm6ZfpGy5oQ
- https://www.youtube.com/watch?v=r2oOBbLI0fg


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Presented by the

WSU Extension of Cowlitz County

Master Gardner Program.

304 Cowlitz Way

Kelso, WA 98626

Gary Fredricks

garyf@wsu.edu

(360) 577- 3014 ext 3

9 a.m. - 12:30 p.m.

https://www.cowlitzcomg.com/

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