

Chapter 11 – Agricultural Areas



The City of Bellevue Parks and Community Services Department manages the last remaining farm lands within the city. These lands comprise approximate 50 acres and are located in the rich peat soils of the Lake Hills Greenbelt and Mercer Slough Nature Park. These farmlands were established in the late 19th and early 20th centuries after clearing and draining opened the land for agriculture. Today these historic agricultural lands help preserve Bellevue’s agricultural past, provide community gathering spaces and increase wildlife habitat. The continued management of these agricultural lands is identified as a component of the master plans for each park. They are managed as farmed wetlands in an environmentally sensitive manner under the same set of multiple use goals consistent with other open spaces land to maximize public benefits.

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11.2 Definitions

Agricultural Area – An area set aside for the use of growing and producing a crop.

Harvester – Machine used for the mechanical harvest of crop, specifically blueberries.

Crop – A cultivated plant or agricultural good that produces a yield in a particular season.

Row – Straight line of crops placed next to each other possibly designated with a number for easy identification and placement.

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Block – A designated number of rows of typically similar crop cultivars.

Cultivar – A race or variety of a plant that has been created or selected intentionally, from a natural species, and maintained through cultivation. Varieties are created to enhance a specific characteristic, such as the fruit size, disease resistance, ability to withstand frost, color, etc.

U-pick – Refers to the act of letting the customers pick the amount or type of produce desired. This reduces farm labor costs, assists with bird control, allows for more even ripening and provides a recreational opportunity.

11.3 Background

All remaining agricultural lands within the City are located within the Lake Hills Greenbelt and Mercer Slough Nature Park. Agriculture in the Lake Hills Greenbelt was established in the late 19th century when early pioneers drained the land between Larsen and Phantom lakes by diverting natural flows into Lake Sammamish. Agriculture in the Mercer Slough Farm was established shortly after the creation of the Chittenden locks lowered the level of Lake Washington 9-12 feet in 1917. The blueberry farms were established in the 1940's. Current City managed farms includes the following:

1. 18 acre Mercer Slough Blueberry Farm
2. 4 acre Kinley Blueberry Farm
3. 3 acre Kinley agricultural land
4. 14 acre Larsen Lake Blueberry Farm
5. 10 acre Lake Hills Greenbelt truck farm

Existing Site/Environmental Conditions

- **Current Landscape and Field Condition:** All agricultural fields are located in wetlands associated with the Kelsey Creek drainage that have been converted to agriculture during the late 19th and early 20th century. The condition of current plant material may be a good indicator of existing cultural conditions. Master plans, soils types, moisture regimes, nutrient levels and types of pest populations determine farm renovation and plant selection options. Because of the wet soil condition and low air circulation associated with these sites, special attention must be given to cultural practices to help reduce root-rotting fungus

such as Phytophthora and berry-infecting fungus such as Monilina vaccinii-corymbosi (Mummy berry).

- **Soil Type and Condition:** Soil type can ultimately determine the longevity, mortality and health of the crop plants. The soils that make up both farms are predominately peats and/or mucks. Although blueberries like wet and acidic soil conditions, excessive water may cause root rot problems and must be carefully monitored and controlled through drainage.
- **Drainage:** Because of the subsurface irrigation that exists at both sites, irrigation is typically not necessary. Drainage, however, is essential in helping prevent disease and allowing access to the fields for maintenance activities. The maintenance of existing ditches and cross tiles is essential to help maximize yields and reduce disease.
- **Cultural Conditions:** Cultural conditions such as existing plant health, soil, moisture, sunlight, wind, rainfall, pests and disease all have an important role in plant health. Environmentally sensitive cultural practices such as mowing, weeding, pruning, mulching, pollination and drainage are used to increase plant vigor.
- **Safety:** Safety of citizens and farm workers is paramount in farm operations. Designation of U-pick areas, adequate signage, plantation design, plant maintenance, proper materials storage, harvesting coordination and elimination of undesirable pest populations all help to create a safe environment.
- **Cultivar Selection/Diversity:** Species diversity offers a longer harvesting season and cross-pollination. Monocultures can be more susceptible to total failure in case of insect or disease problems.

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11.4 Best Management Practices

The farms are components of Master Plans for both the Lake Hills Greenbelt and Mercer Slough Nature Park. BMP's for farm operations take into account the multiple use aspects of the parks and utilize environmentally sensitive cultural practices to help maximize public benefit and protect the environment. The uses of pesticides on the farms are extremely limited and, although not certified, the Mercer Slough farms are operated using organic farming techniques.

11 Agricultural Areas

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Major horticulture decisions regarding blueberry farms include nutrition, water management, pruning, pollination, harvesting and weed and pest management. Many cultural operations are timed to the annual growth cycle of the plants, which varies from year to year with climate and soil conditions. The table below shows a typical blueberry yearly calendar planning guide. It should be noted, however, the use of pesticides will be only considered as a last alternative.

Growth Period	Approximate Dates	Cultural Operations
Dormant	Nov.- mid March	Prune, apply dormant spray for scale growth if necessary, apply copper for bacteria canker if necessary, and remove diseased and winter-injured tissue.
Leaf and flower bud break	Late March – late April	Apply fungicide for primary mummy-berry if needed, control weeds, apply copper if needed.
Bloom Period	Late April- late May	Apply fungicides for mummy-berry if needed, apply insecticides to control aphids if needed, introduce bees for pollination.
Fruit Development	June and July	Cultivate or spray for weed control in row middles, install bird damage control devices.
Harvest	July – Sept.	Harvest and market fruit.
Post-harvest Growth	Sept. – mid October	Cultivate to control weeds, remove bird damage control devices.



Water Management

Blueberry plants have most of their effective root system in the upper 18 inches of soil. Normally, this would subject the plants to drought injury in the hot summer months when water availability decreases, however, the Lake Hills Greenbelt and Mercer Slough farms are located within wetlands comprised of hydric, peat soils which essentially eliminates the need for irrigation. The need for adequate drainage, however, becomes increasingly important for maintaining plant vigor.

Water management at the Mercer Slough farm faces additional drainage issues. Mercer Slough is an adjacent wetland to Lake Washington and the water level is artificially controlled by the Army Corps of Engineers through the operation of the Chittenden Locks in Seattle. The water level manipulation by the Corps creates a reverse hydrological effect in the wetland, keeping the level artificially higher in the summer months. This artificial hydrologic environment further exacerbates drainage issues that contribute to root rot and mummy-berry.

To assist with drainage, an earthen dike that was constructed when the slough channel was dredged in the early 20th runs parallel to the channel to help prevent field flooding. Individual blocks of berries are separated by dammed drainage ditches. Cross tiles running perpendicular to the drainage ditches pull ground water from the fields into the ditches. Water is pumped out of the ditches into the Mercer Slough channel via 2 Marlow (#MWS1512D4), 1 PH, 230 volt trash pumps. These pumps have a pumping capacity of approximately 360 gallons/min through 4" PVC pipes. These pumps utilize float valves triggered by rising water levels to control water levels. They also have the ability to grind up small woody debris to prevent clogging. Proper water management ensures present and future fruit production, good floral initiation for the next year's crop and that fruit skin moisture is maintained to prevent cracking or shriveling.

Pruning

Annual pruning is essential to maintain blueberry plant vigor, increase productivity, aid in pest management, maintain fruit quality and develop appropriate growth habits. Annual moderate pruning produces bushes with the fewest canes, but greatest yields. Proper

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pruning balances the production of new wood while maintaining fruit production. Although the best time to prune is during late winter dormancy as carbohydrates produced in late fall have had sufficient time to be stored and winter injured wood can be easily removed, blueberries can be pruned anytime between the end of fall harvest and spring bud break. Disinfect loppers and pruners between bushes to help prevent the spread of disease.

Technique:

Pruning with newly established plantings (1-2 years old) will primarily be directed at shaping the plant into an upright habit and encouraging new vegetative growth and vigor. Remove the older, twiggy growth from the base of the plants, strip blossoms off to accelerate plant and root growth.

In subsequent years (2-5), prune lightly to remove injured wood and twisted or low growing canes to promote new growth. Remove all but 2-3 newly produced canes at crown level. At 7 years old, plants should have 10 – 20 canes of different ages.

Pruning mature plants consists of cutting out old, larger, low producing canes and eliminating weak, twiggy growth in the top or outer areas of the bushes to facilitate aeration and encourage increased budding and large berries. In very mature neglected plantings, it may be beneficial to simply crown prune the entire plant at the base and start from scratch.

The following represents a systematic approach to pruning:

- In older plantings, remove 20% of older wood to stimulate new shoot growth.
- Remove low growth that would touch the ground when loaded with fruit.
- Cut off excess new growth that you don't want to develop.
- Remove any damaged canes and twigs.
- Cut out weak, twiggy growth from the top and outer parts of the plant to allow for light penetration and aeration through the plant.
- Prune to shape plant for appropriate harvest method (machine vs. hand picking).

Pollination

Although blueberry bushes are capable of setting fruit on 100% of

their flowers, 80% is considered a full crop. The conservation of wild bee habitat such as fallen logs, ditch banks and natural areas close to the field enhances wild bee populations. Honeybee pollination, however, is essential for sustainable yields. The following standards ensure a high probability that proper pollination will occur:

- Make sure the crop is an attractive crop. This entails making sure that pruning cultivates plants with high bud counts, and the chosen cultivar has desirable corollas (shorter corollas have proven to be more attractive to honeybees than longer corollas).
- Ensure that there are at least 4-8 bees/plant at any time during the warmest part of the day during bloom.
- Hives must be in place when a minimum of 5% and a maximum of 25% of the flowers have opened.
- Hives must be placed in a wind-sheltered sunny location and preferably facing East.
- Proper pollination requires a minimum 1-3 hives/2 acres, depending on cultivar.
- Hives should be distributed evenly throughout the field: 300ft. apart along every 10th row.
- Remove all competition from plant areas (e.g. dandelions, clover, etc.)

Additional efforts to encourage native mason bee population are also utilized.

Harvesting

U-pick and hand harvesting are done on all fields. Clearly designate blocks, varieties and U-pick areas for the public.

Diseases

- Disease problems shall be accurately identified and management strategies shall be tailored to actual diseases present in the field in current season.
- Disease resistant cultivars shall be used when planting new sites.
- Mummyberry incidence and severity shall be documented and mapped (noting varietal differences) by determining number of strikes/bush for primary infection and percent infected fruit for secondary infections.
- One or more of the following strategies shall be used to

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suppress primary infection of mummyberry (where needed):

1. Apply a thick layer (3-4") of organic mulch beneath bushes to cover fallen fruit in mid-spring.
 2. Rake, disk, or cultivate soil beneath bushes in spring prior to budbreak to disrupt mummyberry spores.
 3. Apply 200 lbs/Acre 50% urea pills beneath plants in spring prior to budbreak to 'burn' mummyberry spores. Despite a strong offensive, Lime sulphur may also be effective at burning spores.
- Diseased wood shall be pruned and destroyed. Pruning tools will be cleaned in a bleach solution between cuts.

Insects

- Insect problems shall be accurately identified and management strategies tailored to actual insect pests present in the field in current season.
- Insects that vector viral and MLO diseases (e.g. aphids and leafhoppers) shall be controlled, if necessary.
- Other insect pests (e.g. leaf rollers, gypsy moth, sawfly, Japanese beetle, spotted wing drosophila) will be monitored and controlled, if necessary.

Weeds

- Noxious weeds will not be tolerated and shall be removed from the sight wherever possible.
- Frequent mowing between rows shall be used to reduce weed competition.
- Invasive weeds may be somewhat tolerated, but shall be controlled through cultural and mechanical methods.

Vertebrates

- Bird depredation may be managed with the use of a scare device (usually audio).
- Bellevue Parks does not currently have depredation problems with deer or other large ungulates.
- Rodent depredation is generally tolerated on farm fields, but shall be monitored and controlled if necessary.

11.5 Integrated Pest Management

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Weed Control

- Noxious weeds will not be tolerated. Mechanical controls will be employed until a tolerable level is met.
- Invasive weed species will be removed through mechanical or cultural practices such as mowing or hand pulling.
- Some wetland approved herbicides may be employed if necessary and approved.

Insect Control

- Insecticides will be used only if found necessary and approved.
- Spot applications will control product drift. Broad applications will not be employed.
- Insecticides will not be used during bloom, when bees are active.

Disease Control

Mummy-berry is one of the more prevalent diseases to plague a blueberry field and thrives in wet environments with low air circulation. If mummy-berry is found on any Parks crops the following practices may be employed:

- Increase aeration through proper pruning of plants.
- Increase aeration through mowing. Drying out the site will decrease the possibility of spread of the disease.
- If cultural methods do not have the desired effect, the use of a fungicide may be employed if necessary. Organic fungicides will be given first consideration. Application may be to the individual plants to reduce product drift.

Vertebrate Control

- The use of audio bird chirpers will be utilized to help control birds. Starting in early June, 1-2 machines may be placed in the center of the field to maximize effect.
- If necessary, Parks may coordinate with WSDA and/or WSU Cooperative Extension on additional control methods.
- Chemicals shall not be used to control vertebrate pests.

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11.6 Training

- Full and part time crew personnel will be trained on all mowing and weed eating operations as well as correct pruning techniques.

