

5% cover by permanent open water. The AU has a highly disturbed buffer that includes roads, a horse pasture, mowed lawn, and houses.

#### Differences between 1998 and 2006 characterizations.

Generally, conditions in 2006 appear very similar to those observed in 1998 for AU 5. No substantial differences in wetland functions were noted between the 1998 and 2006 characterizations, although habitat suitability for anadromous fish would be qualitatively decreased in a practical sense due to the fish passage blockage beneath SR 20 (see below).

Willows within AU 5 are continuing to mature and are typically greater than 25 feet tall under current conditions. Much of the AU is covered with non-native plant species, consisting mostly of Himalayan blackberry and reed canary grass—particularly in the northwest corner of the AU and south near SR 20. The horse pasture, in use in 1998, appears not to be used for grazing under current conditions.

The culvert beneath SR 20, noted as a moderate constriction in 1998, may represent a significantly greater degree of constriction under current conditions due to sedimentation or other blockages. As noted below, only a small stream comes through the southern side of the culvert (AU 6), while the northern (AU 5) side shows substantial ponding of water. In essence, the southern portion of AU 5 acts as a large detention pond, and the presence of berms both to the east and west act to increase the storage capacity of the AU.

#### **Assessment Unit 6**

Assessment Unit 6 lies between SR 20 and Monroe Street.

AU 6 rated above average for removing sediment and potential for primary production/export. The wetland has a constricted outlet which results in slow flows and sediment deposition, a high percent cover of herbaceous species, and significant export of organic material. The AU rated below average for suitability for amphibians, aquatic mammals, and native plant communities. These low indexes are indicative of the poor buffer condition, intensity of land use in the vicinity, lack of large woody debris, lack of beaver browse, lack of connectivity with a forested or shrub corridor, small area of permanent open water, lack of permanent flowing water, moderate vegetative complexity, absence of mature trees, and high percent cover of non-native species. The AU rated average for the remaining functions. In general, AU 6 has a dense cover of vegetation, with moderate complexity reflected in the fact that it has forested, scrub-shrub, and emergent wetland classes. It has a high number of native plant species, but also a very high percent cover by non-native plants (primarily reed canarygrass). AU 6 is seasonally ponded over 90% of its area, but it has only 15% permanent open water. The AU has a moderately disturbed buffer that includes roads, mowed lawn, and some buffer area with native forest/shrub community.

#### Differences between 1998 and 2006 characterizations.

Generally, conditions in 2006 appear very similar to those observed in 1998 for AU 6. No substantial differences in wetland functions were noted between the 1998 and 2006 characterizations, although the amount of cover in the form of vegetation and undercut banks was reduced from moderate to low in 2006, and habitat function for anadromous fish would be reduced due to lack of cover and the downstream fish passage barrier (see below). Plant species not noted in 1998 but observed in 2006 include salmonberry, horsetails, and creeping buttercup, and the invasive Japanese knotweed (occurring in a large patch to the south of the railroad track).

AU 6 has significant constrictions at both its inflow and outflow. Flow into the AU via the inflow occurs at a low rate due to the culvert blockage under SR 20, and the outlet culvert beneath Monroe Street is similarly blocked or constricted, resulting in observable water level differences between AU 6 and downstream AU 7 and imposing a fish passage barrier at this point. Habitat suitability for anadromous fish scored moderate in 2006; however, this value would be qualitatively changed to "low" due to the partial barrier to fish passage at the outlet culvert, as well as complete barriers to fish passage occurring downstream (see AUs 9, 11, and 12). Due to the relatively flat nature of much of AU 6, and the constriction at the downstream end, potential for flooding during heavy precipitation events exists for this AU.

#### Assessment Unit 7

Assessment Unit 7 lies between Monroe Street and Hawthorne Street.

AU 7 rated above average for removing sediment, reducing peak flows, and potential for primary production/export. The wetland has a constricted outlet which results in slow flows and sediment deposition, a high percent cover of herbaceous and aquatic species which filter sediment and indicate high productivity, a high capacity for stormwater storage, and significant export of organic material. The AU rated below average for suitability for general habitat, amphibians, aquatic birds, aquatic mammals, and native plant communities. These low indexes are indicative of the poor buffer condition, intensity of land use in the vicinity, low canopy closure, lack of vegetative complexity, low interspersions of vegetation classes, lack of snags, lack of mature trees, low edge complexity, small area of permanent open water, lack of beaver browse, lack of connectivity with a forested or shrub corridor, lack of permanent flowing water, lack of denning banks, and high percent cover of non-native species. The AU rated average for the remaining functions. In general, AU 7 has a dense cover of emergent herbaceous vegetation. It has a moderate number of native plant species, but a high percent cover by non-native plants. AU 7 is seasonally ponded over 100% of its area, but it has only 5-10% permanent, unvegetated open water. The AU has a disturbed buffer that includes roads, mowed lawn, houses, and decrepit out-buildings.

**Differences between 1998 and 2006 characterizations.**

Emergent wetland habitat (PEM) in AU 7 increased from 55% in 1998 to 80 percent in 2006. Coupled with the increase in PEM habitat were decreases in aquatic bed wetland (from 30% in 1998 to 5-10% in 2006) and in open water wetland (from 15% in 1998 to 5-10% in 2006). A decrease in the amount of water charging AU 7 and the duration of inundation has likely occurred, resulting in a shift of habitat type within the AU away from permanently ponded water towards more seasonally flooded habitat. It is highly probable that this change in hydroperiod is due to the constriction of the inlet culvert beneath Monroe Street.

Additional changes include a reduction in cover or refuge in the form of vegetation and undercut banks from a moderate rating in 1998 to a low rating in 2006. This reduction, along with a potential fish passage barrier at the downstream end of AU 7, could qualitatively reduce the habitat suitability function of the wetland for resident fish from moderate to low. Additionally, habitat suitability for anadromous fish would be qualitatively changed to "low" due to complete barriers to fish passage occurring downstream (see AUs 9, 11, and 12). Debris, trash, and general human-induced disturbances were noted within the slough and its buffer. Other wetland functions for AU 7 appear unchanged from 1998 to 2006.

**Assessment Unit 8**

In 1998, Assessment Unit 8 was defined as lying between Hawthorne Street and East Rio Vista Road.

AU 8 rated above average for removing sediment, reducing peak flows, recharging groundwater, suitability for anadromous fish, and potential for primary production/export. The wetland has a constricted outlet which results in slow flows and sediment deposition, a very high percent cover of herbaceous species which filter sediment and indicate high productivity, a high capacity for stormwater storage, a long water retention time that potentially contributes to infiltration and groundwater recharge, significant export of organic material, and moderate amount of potential cover or refuge for fish. The AU rated below average for suitability for aquatic mammals. The low index is indicative of the poor buffer condition, intensity of land use in the vicinity, lack of beaver browse, small area of permanent open water, and lack of permanent flowing water. The AU rated average for the remaining functions. In general, AU 8 has a dense cover of primarily herbaceous species with a small area of deciduous forest. The AU has a high number of native plant species, and a high percent cover by non-native plants. AU 8 is seasonally ponded over 95% of its area, but it has only 10% permanent open water. It has a moderately disturbed buffer that includes roads, mowed lawn, and houses.

**Differences between 1998 and 2006 characterizations**

Few substantial differences in wetland functions were noted between the 1998 and 2006 characterizations of AU 8. Habitat suitability for anadromous fish scored moderate in 2006;

however, this value would be qualitatively changed to “low” due to complete barriers to fish passage occurring downstream (see AUs 9, 11, and 12). In addition, it was noted during the 2006 characterization that AU 8 can actually be subdivided into three smaller assessment units, based on changes in water regimes.

*AU 8a:*—The initial portion of AU 8 extends southwest from Hawthorne Street to just north of Fairhaven Avenue. This portion runs through a residential area of Burlington, and is characterized by a high cover (~75 percent) of reed canarygrass, some spirea, and Himalayan blackberry, as well as open lawns and mowed buffer reaching to the edge of the wetland. AU 8a continues into a forested area, dominated by cottonwood, alders, and willows in the tree canopy, with heavy blackberry cover along the east and south banks of the slough. Vegetative cover within the forested portion is approximately 80 percent. A flow constriction occurs somewhere in the forested wetland portion, resulting in ponding of water in the vicinity of apartments at 1237 Fairview, and constituting a water regime change that divides AU 8a from AU 8b.

*AU 8b:*—The AU continues as AU 8b south of the constriction in the forested portion of the wetland, and water flows freely beneath the Fairhaven Avenue bridge. South of the bridge, AU 8b is characterized by a relatively flat reed canarygrass meadow (PEM wetland) with a stream flowing through it. To the west, the topography slopes upward to houses and yards. To the east, an 80-90 foot buffer exists between the wetland and the fenced yards of nearby residents. AU 8b continues to the south, becoming a forested wetland intermixed with emergent and aquatic bed wetland habitat. Mature cottonwood is the dominant tree species in the forested wetland, co-occurring with willow, alder, hazelnut, salmonberry, and Himalayan blackberry. An old farm road crosses the slough via a wooden bridge, constituting a change in water regime that separates AU 8b from AU 8c.

*AU 8c:*—AU 8 continues to the south as AU 8c, widening as it passes underneath a second wooden bridge with no change in water regime. AU 8c widens to the west, resulting in seasonal flooding and containing a forested wetland habitat dominated by cottonwoods and hazelnuts. AU 8c continues to the south, terminating in open water wetland habitat at Rio Vista Avenue. At the time of the 2006 characterization, it was noted that numerous cottonwoods had been cut down within the buffer for AU 8c just north of Rio Vista Avenue, presumably for development purposes.

### **Assessment Unit 9**

In 1998, Assessment Unit 9 was defined as lying between East Rio Vista Road and Anacortes Street.

AU 9 rated above average for reducing downstream erosion, recharging groundwater, suitability for anadromous fish, and potential for primary production/export. The wetland has a constricted outlet which results in slow flows and sediment deposition, a moderate percent cover of herbaceous species which filter sediment and indicate high productivity, a long water retention time that potentially contributes to infiltration and groundwater recharge, significant export of organic

material, and a high amount of potential cover or refuge for fish. The AU rated below average for suitability for aquatic mammals. This low index is indicative of the poor buffer condition, intensity of land use in the vicinity, lack of beaver browse, lack of denning banks, small area of permanent open water, limited connection with a forested or shrub corridor, and lack of permanent flowing water. The AU rated average for the remaining functions. In general, AU 9 has a dense cover of vegetation, with high vegetative complexity reflected in the fact that it has forested, scrub-shrub, emergent, and aquatic wetland classes. It has a high number of native plant species and a low percent cover by non-native plants. AU 9 is seasonally ponded over 100% of its area, but it has only 10% permanent open water. The AU has a moderately disturbed buffer that includes active crop fields, roads, mowed lawn, houses, and a narrow forest fringe.

#### Differences between 1998 and 2006 characterizations.

Only one substantial difference in wetland functions was noted between the 1998 and 2006 characterizations of AU 9, due to the presence of a complete fish passage barrier within the AU (see below). Thus, although habitat suitability for anadromous fish scored high-moderate in 2006, this value would be qualitatively changed to “low” due to complete barriers to fish passage occurring in AU 9 and downstream (see AUs 11 and 12 also). During the 2006 characterization it was noted that AU 9 could actually be subdivided into three smaller assessment units, based on changes in water regimes.

*AU 9a*.—This portion of AU 9 continues to the south of Rio Vista Avenue and ends at a leaky gabion at South Skagit Street. Just south of Rio Vista Avenue, AU 9a is characterized by open water wetland fringed with reed canarygrass and yellow sword iris, and a forested buffer on the southeast and south banks. The banks climb relatively steeply to approximately 15 feet above the water. The dominant plant species in the forested buffer is red alder, which gives way to Himalayan blackberry as AU 9a turns and continues to the west. The north side of AU 9a is composed of residential lawns (mowed buffer) and open, disturbed sites. Debris, trash, and general human-induced disturbances were noted within this portion of the slough and its north buffer. As noted above, AU 9a terminates at a leaky gabion at South Skagit Street; there is no culvert or pipe beneath the road. The gabion presents a complete barrier to fish passage. For AU 9a, the habitat suitability function of the wetland for anadromous fish would be qualitatively reduced from the 1998 high-moderate rating to a low rating due to the complete blockage to fish passage.

*AU 9b*.—AU 9b runs from South Skagit Street to a culvert on East Sharon Avenue. As noted above, water passes under South Skagit Street via a leaky gabion structure into an open water and scrub/shrub wetland habitat. Water lily is the dominant open water plant species, and the scrub/shrub community consists of willow, dogwood, Himalayan blackberry, salmonberry, and spirea. AU 9b continues to the west past residential structures and yards in its north side buffer, and then veers southwest into a forested wetland habitat. The forested wetland habitat for AU 9b is dominated by relatively large willows in the overstory, and contains an invasive understory of reed

canary grass, Himalayan blackberry, bindweed, and bittersweet nightshade. Little or no emergent or aquatic bed wetland habitat occurs within this forested reach, and numerous large willow branches are growing horizontally across the water within the slough.

AU 9b terminates at the East Sharon Avenue culvert in a mix of forested and open water wetland, with water lilies dominating in the open water habitat and willow—some quite large—dominating within the forested portion of the wetland habitat. Spirea, salmonberry, and Himalayan blackberry comprise the shrub layer of vegetation in this reach. A number of new residential houses along the south side of the AU 9b reach of Gages Slough were noted, with fences well within the wetland buffer at distances of 3-10 feet from the water's edge.

Habitat suitability functions of the wetland for anadromous and resident fish would be rated, respectively, at the 1998 high-moderate and moderate levels within AU 9b.

*AU 9c.*—AU 9c runs from the southwest side of East Sharon Street to the east side of South Anacortes Street. This section of AU 9 generally consists of forested wetland habitat, dominated by willows rooted in the slough or along the northwest edge of the slough. The slough buffer to the southeast is mowed lawn to the wetland edge, the buffer to the northwest is composed of lawn and Himalayan blackberry, and the portion of AU 9c adjacent to the South Anacortes Street culvert is composed of bare mud, with a few reed canarygrass and yellow sword iris plants growing in that area.

## **Assessment Unit 10**

AU 10 is one of the largest assessment units in Burlington, running from South Anacortes Street to the bridge at South Burlington Boulevard.

AU 10 rated above average for removing sediment, reducing downstream erosion, general habitat suitability, suitability for invertebrates, resident and anadromous fish, aquatic birds, and native plant communities, and potential for primary production/export. The wetland has a constricted outlet which results in slow flows and sediment deposition, a moderate percent cover of herbaceous species which filter sediment and indicate high productivity, a moderate percent cover of woody vegetation which takes up water and helps retain storm flows to prevent downstream erosion, and significant export of organic material. With regard to habitat suitability, the AU scores high because it has moderate canopy closure, mature trees, moderate vegetative complexity, moderate number of snag and down woody debris types, high plant species richness, organic substrate, moderate interspersions of open water with vegetation, high interspersions among vegetation classes, and moderate amount of vegetative cover for fish. The AU rated average for the remaining habitat functions. In general, AU 10 has a dense cover of vegetation, with high complexity reflected in the fact that it has forested, scrub-shrub, emergent, and aquatic wetland classes. It has a high number of native plant species, and a moderate percent cover by non-native plants. AU 10 is seasonally ponded

over 95% of its area, and has approximately 5% of its area in permanent, unvegetated open water. The AU has a disturbed buffer that includes roads, mowed lawn, active agricultural fields, houses, and industrial lots.

**Differences between 1998 and 2006 characterizations.**

AU 10 has experienced development along a portion of its length since 1998, and the attendant loss of vegetation has decreased the overall vegetative cover from high in 1998 to a moderate rating in 2006. Large woody debris types within the AU have also decreased from a high number rating in 1998 to a moderate number rating in 2006. The combination of decreased vegetative cover and decreased large woody debris types may result in a qualitative decrease in general habitat suitability and habitat suitability for invertebrates, amphibians, and resident fish. Habitat suitability for anadromous fish scored high in 2006; however, this value would be qualitatively reduced to “low” due to complete barriers to fish passage occurring downstream (see AUs 11 and 12).

Permanent, unvegetated open water wetland habitat has decreased from 17% in 1998 to 5% in 2006, and an increase in development has occurred, particularly to the north and west of AU 10. Himalayan blackberry and Japanese knotweed have increased in cover percentages since 1998, and yard waste and application of herbicides were noted along stretches of AU 10. An increase in the number of storm drains discharging into AU 10 has occurred along with increased development in the vicinity. However, it is unclear how this has affected volumes of water discharged into AU 10.

During the 2006 characterization it was noted that AU 10 can actually be subdivided into two smaller assessment units, based on changes in water regimes. The remaining wetland functions for AU 10 are qualitatively similar to those from 1998.

*AU 10a.*—AU 10a extends from the west side of South Anacortes Street to the culvert at the west end of a pasture by the railroad bridge. This portion of the AU is lined with willows along the water to the east, and mowed yards to the west. Himalayan blackberry and Japanese knotweed occur along with the willows, and some larger cottonwoods and red elderberry also occur in this reach. The wetland primarily consists of forested and open water habitat. AU 10a passes through a pasture as open water wetland that is grazed to the edge of the water. This reach provides seasonal waterfowl habitat that dries up in the summertime.

*AU 10b.*—AU 10b extends from the railroad bridge to South Burlington Boulevard, and consists of willow-dominated scrub/shrub wetland with spirea and cattails. Relatively new residential units occur along the northwest side of AU 10b, and mowed yards run up to the edge of the slough in many places. The southeast side of the slough generally consists of fairly dense willow scrub/shrub wetland habitat. AU 10b runs to a culvert beneath South Burlington Boulevard, where it transitions to AU 11 by passing over an old beaver dam and into the culvert.

## Assessment Unit 11

AU 11 is also a large assessment unit, running from west of the bridge at South Burlington Boulevard to West McCorquedale Road.

To the east of the South Burlington Boulevard bridge, AU 11 consists of a large wet meadow of reed canary grass interspersed with some alder, willow, and spirea on the north bank, and larger willow and cottonwood on the south bank. Areas on the north side of AU 11 show dense Himalayan blackberry thickets where regular mowing does not occur, and two large stormwater detention ponds are just to the north of the slough. AU 11 continues beneath the I-5 bridge to the Goldenrod Bridge, where the slough becomes predominantly emergent wetland habitat with some aquatic bed wetland. Reed canary grass, water lily, cattails, and wooly sedge are the dominant plant species, interspersed with some smaller willows. West of the I-5 bridge, the north side of AU 11 is grazed pasture. Wetland mitigation plant installations occur in the vicinity of the Goldenrod bridge.

AU 11 has a juncture with Gages Lake to the west of the Goldenrod bridge, and then turns to the south around a plowed field and continues to a culvert at West McCorquedale Road. Open water wetland with some aquatic bed wetland occurs in the vicinity of Gages Lake; water star and water lily dominate these habitats. Nearby emergent wetland shows yellow sword iris and smartweed, with a fringe of willow shrubs and some taller cottonwood and alder. Once AU 11 has turned to the south, the slough is lined by residential lawns to the west and an agricultural field to the east.

AU 11 rated above average for removing sediment, suitability for invertebrates, anadromous fish, resident fish, aquatic birds, aquatic mammals, and native plant communities. The wetland has a constricted outlet which results in slow flows and sediment deposition and a high percent cover of herbaceous species which filter sediment. With regards to habitat suitability for the various groups listed above, the AU scores high because it has an organic surface substrate of leaf litter for invertebrates, moderate open water to vegetation interspersion, low number of large woody debris levels of decay, a high number of vegetative strata, moderate interspersion among vegetation classes, substantial area with prolonged inundation, moderate amount of cover types for fish, low number of snag and down woody debris types, large area of permanent open water, presence of beaver browse and denning banks, mature trees, and high plant species richness. AU 11 rated average for the remaining functions. In general, AU 11 has a dense cover of vegetation, with high complexity reflected in the fact that it has forested, scrub-shrub, emergent, and aquatic wetland classes. It has a high number of native plant species, and a moderate percent cover by non-native plants. AU 11 is seasonally ponded over 90-95% of its area, and has 20% permanent open water. The AU has a moderately disturbed buffer that includes active crop fields and pasture, roads, retention ponds, and parking lots.

### **Differences between 1998 and 2006 characterizations**

Generally, habitat function values in 2006 have remained similar to those calculated in 1998 for AU 11. However, the amount of cover in the form of vegetation and undercut banks was reduced from high to low-moderate in 2006, and downed woody debris and snags were reduced from moderate to low in 2006. General habitat functions declined slightly from moderate to low moderate, and habitat function for aquatic mammals declined slightly from high in 1998 to high-moderate in 2006.

Although calculated habitat values for resident and anadromous fish remain high in 2006, the opportunity for anadromous fish to use the slough habitat is low due to a downstream blockage in the form of a pump house and a culvert. Habitat value for anadromous fish in AU 11 would be qualitatively reduced to a “low” rating.

### **Assessment Unit 12**

AU 12 runs from West McCorquedale Road to the pumphouse at Pulver and West Whitmarsh Roads.

AU 12 rated above average for removing sediment. The wetland has a constricted outlet which results in slow flows and sediment deposition, and a high percent cover of herbaceous species which filter sediment. The AU rated below average for recharging groundwater, general habitat suitability, and suitability for invertebrates, anadromous fish, aquatic mammals, and native plant communities. These low indices are indicative of the poor buffer condition, lack of canopy closure, lack of vegetative complexity, lack of snags and down woody debris, low edge complexity, lack of aquatic vegetation structure, low amount of vegetative cover for fish, low rating of corridor connectivity, lack of beaver browse, lack of permanent flowing water, lack of native plant species, and high percent cover of non-native plants. The AU rated average for the remaining functions. In general, AU 12 has a somewhat sparse cover of non-native herbaceous species. It has low species richness. AU 12 is seasonally ponded over 100% of its area, and has about 60% of its area in permanent, unvegetated open water. The AU has a disturbed buffer that includes roads, mowed lawn, active crop fields, and houses.

### **Differences between 1998 and 2006 characterizations**

Generally, conditions in 2006 appear very similar to those observed in 1998 for AU 12. No substantial differences in wetland functions were noted between the 1998 and 2006 characterizations. Currently, the AU occurs as a channelized ditch between plowed agricultural fields. Steep banks are covered with reed canarygrass, horsetail, Japanese knotweed, fireweed, thistle, and occasional patches of common rush. AU 12 now ends in a relatively new pumphouse at Pulver Road, and would be considered highly disturbed along its entire length. Habitat value for anadromous fish was low in 1998, and is even lower in 2006, as the pumphouse and associated conveyance and discharge structures represent complete fish passage blockages.

## Conclusions

Gages Slough demonstrates ongoing trends and patterns, and this updated 2006 wetlands study technical report identifies some of those patterns. Additionally, water quality monitoring data have been collected over the past three years, and provide information on changing water quality conditions in the slough. Following are a list of conclusions concerning the Gages Slough wetland habitats:

- Hydroperiods of wetlands in Gages Slough may have been altered by gradual failures of the culverts linking adjacent AUs, due to sedimentation or physical buckling. This may be the case in AU 1 and AU 3, and is very likely the case with regard to AU 5 and AU 6. The pattern of a decrease in the amount of water charging AU 7 and the duration of inundation noted in 2006 may also be due to blockage of the culvert leading from AU 6 to AU 7.
- Hydroperiods of wetlands in Gages Slough have been altered by an increase in the impervious surface over the course of time. In 1993, approximately 26 percent of the City of Burlington consisted of impervious surface. In 2004, the percentage had increased to 36 percent. Almost all of the water from impervious surfaces in Burlington drains to Gages Slough. Thus, development and the attendant increase in impervious surface area have caused changes in the hydroperiod and wetland plant communities over time. This may be contributing to the change in hydroperiod and plant communities noted in AU 1 and AU 3, where the wetlands appear to be converting to more emergent wetland plants in AU 1 and more open water/unvegetated wetland in AU 3.
- Generally, wetland functions assessed in 2006 remained similar to functional values assessed in 1998. Exceptions included some declines in habitat function associated with general habitat, and declines in specific habitat features such as large woody debris, undercut banks, and vegetative cover, likely due to continued development adjacent to some of the AUs in Gages Slough.
- Habitat function for anadromous salmonids has declined to low levels throughout Gages Slough, due to installation of partial or complete fish passage barriers at various points along the Slough.
- Non-native invasive plant species appear more widely distributed and make up a larger proportion of the wetland plant communities in 2006 compared to 1998. This is likewise correlated with continued development and disturbance adjacent to the Slough.
- Water quality issues within the wetland continue to be an issue, based on data from ongoing monitoring in 2005 and 2006, and compared with data from 1998 (J. Scholz, pers. comm., 2007). Pesticide/herbicide runoff from nearby lawns, runoff containing fertilizer or animal waste, discharge of road runoff, etc. are still occurring within the Slough. Levels of dissolved oxygen, fecal coliform bacterial concentrations, and nitrate/nitrite levels continue to be problematic within Gages Slough. However, there appears to be some evidence of decreases in ammonia and phosphorous levels in 2005 and 2006 compared to 1998 levels.
- Development is continuing alongside Gages Slough, and disturbances and impacts to the Slough are associated with continued development in the area. However, opportunities exist to restore and improve degraded habitat within the Slough. Work is ongoing to identify habitat

enhancement and potential mitigation sites along Gages Slough, and to develop a mitigation site plan for the Gages Slough corridor as a whole. Criteria for site selection and mitigation approaches will consider wetland location, long-range City planning, proximity to existing mitigation sites, property ownership, potential linkage to City trail system, site restoration potential, and ecological conditions at each site. Table 2 displays 15 potential mitigation sites in the City of Burlington, and gives some information concerning each site. The accompanying map indicates the position of each mitigation site.

**City of Burlington Gages Slough Potential Mitigation Sites  
Draft Version**

Site #	City owned	Property #	Location	ecological benefit	wildlife benefit	provides habitat connectivity	potential trail site	flood relief potential	educational opportunity	comments
1	yes	P62349	north side of Gages Slough, south of the cemetery	buffer enhancement	yes	somewhat	possibly	unlikely	possibly	This buffer area along the Slough south of the cemetery could be enhanced by removing invasive weeds and planting native trees
2	no		south side of Gages Slough, between Peacock Lane and Gardner Road	wetland creation, buffer enhancement	yes	yes	yes	possibly	yes	Although privately owned and outside of the City limits, this pasture area offers a great potential for mitigation - both for wetland creation and buffer enhancement.
3	no		east side of Gages Slough, between Lei Garden Road and SR 20	buffer enhancement	yes	somewhat	possibly	unlikely	possibly	Although privately owned and outside of the City limits, this pasture area offers some potential for mitigation - primarily for buffer enhancement due to the relatively steep banks on the east side of the Slough.
4	no		east and west side of Gages Slough, south of Monroe St., west of Section St.	limited buffer enhancement limited wetland creation	yes	yes	unlikely	limited	possibly	This areas has limited mitigation potential due to the proximity of houses. However, the northern section primarily has a limited potential for buffer enhancement on both sides of the slough. The east side of the southern section has a potential for buffer enhancement as well as limited wetland creation.
5	no		north and south sides of Gages Slough, west of Hawthorne St, north of Fairhaven Ave.	buffer enhancement wetland creation	yes	yes	possibly	possibly	yes	Although the banks are somewhat steep in this area, the pastures on the north and south sides of the slough would provide space for some wetland creation and buffer enhancement.
6	yes	P72447	east side of Gages Slough, south of Fairhaven St - labeled as Ferry St. ROW	buffer enhancement limited wetland creation	yes	yes	yes	limited	yes	This is currently open space - an unused right-of-way. The upland meadow area offers a great potential for planting native trees and shrubs. Potential for wetland creation is limited by the relatively narrow width of the site.
7	yes	P72236 P72229	east and west side of Gages Slough, west of Section St., between Fairhaven Ave. and Rio Vista Ave. - Section Street Neighborhood Park	buffer enhancement limited wetland creation	yes	yes	limited	limited	yes	The parcels are currently open space that are proposed to become the Section Street Neighborhood Park. This section of Gages Slough is in fairly good condition - there are many trees and some understory. More native trees and shrubs could be planted, especially at on the east side of the slough, east of the existing tree line. Although there is a potential for some wetland creation, it is limited by the existing trees.
8	no		east and west side of Gages Slough, west of South Anacortes St., opposite the intersection with Gilkey Road	wetland creation, buffer enhancement	yes	yes	yes	yes	yes	Although privately owned, this large cow pasture offers a terrific potential for mitigation - both for wetland creation and buffer enhancement.
9	no		area between two lobes of Gages Slough, west of the RR tracks, east of South Spruce St. near its intersection with Walnut St.	either wetland creation or wetland enhancement, buffer enhancement	yes	yes	possibly	yes	yes	This area is currently open space within the Slough. We did not ground-truth this area, but depending on whether the area between the lobes is wetland or upland, it has a terrific potential for either wetland enhancement or creation. There is also a potential for buffer enhancement.
10	yes	P106699	south of the south lobe of Gages Slough, west of the RR tracks, north of the large commercial building at the end of Pacific Dr. (private)	limited wetland creation, buffer enhancement	yes	yes	possibly	limited	limited	This parcel is located at the SE corner of area 9, and it is currently open space. We did not ground-truth this area, but the contours indicate that it is relatively steep, so it is likely that the site has a better potential for buffer enhancement than for wetland creation.

**City of Burlington Gages Slough Potential Mitigation Sites  
Draft Version**

Site #	City owned	Property #	Location	ecological benefit	wildlife benefit	provides habitat connectivity	potential trail site	flood relief potential	educational opportunity	comments
11	no		south side of Gages Slough, north of Pease Rd., between the RR tracks and South Burlington Blvd.	limited wetland creation, buffer enhancement	yes	yes	limited	limited	yes	We only viewed this parcel from the north side of Gages Slough, but it appears to provide area for limited wetland creation and some buffer enhancement.
12	no		north side of Gages Slough, and wetland areas in the Slough, south of the big stormwater detention ponds south of Cascade Mall	wetland enhancement, buffer enhancement	yes	yes	yes	limited	yes	The upland south of the detention pond has great potential for enhancement. A significant portion of the emergent wetland between South Burlington Blvd. and I-5 could be enhanced by planting native shrubs and trees.
13	no		north side of Gages Slough, south of West Stevens Rd., west of I-5 to the City limits.	wetland enhancement limited wetland creation, buffer enhancement	yes	yes	yes	limited	yes	This area is north of the Goldenrod Bridge mitigation Site, and was considered as a possible Second Phase for that project. This area provides the potential for some enhancement of emergent wetland, and enhancement of upland buffer. Because of the proximity of West Stevens Road, only the western end of this site has the potential for wetland creation.
14	no		north and south sides of Gages Slough, south of West Stevens Rd., west of I-5, west of area 13, west of the City limits	wetland enhancement, wetland creation, buffer enhancement	yes	yes	yes	yes	yes	This area is located west of the Goldenrod Bridge Mitigation Site. The two sides of the Slough are either horse pasture or agricultural fields. Although it is outside of the City limits, this area provides a terrific potential for significant wetland creation and buffer enhancement, and some wetland enhancement. The fact that WSDOT is using the agricultural field adjacent to the west means that this mitigation site could become a significant wildlife habitat area.
15	no		east and west sides of Gages Slough, south of West McCorquodale Rd., from the culvert to just above the new pump station	wetland enhancement, wetland creation, buffer enhancement	yes	yes	yes	yes	yes	This site is located outside of the City limits, and both sides of the Slough are agricultural fields. Although the banks of the channel in this section are relatively narrow and steep, this area provides a terrific potential for significant wetland creation and buffer enhancement and limited wetland enhancement. Despite being separated by West McCorquodale Rd, the proposed WSDOT mitigation site in the parcel adjacent to the north means that this mitigation site could become a significant wildlife habitat area.

**City of Burlington Gages Slough Potential Mitigation Sites  
Draft Version**

Site #	City owned	Property #	Location	ecological benefit	wildlife benefit	provides habitat connectivity	potential trail site	flood relief potential	educational opportunity	comments
1	yes	P62349	north side of Gages Slough, south of the cemetery	buffer enhancement	yes	somewhat	possibly	unlikely	possibly	This buffer area along the Slough south of the cemetery could be enhanced by removing invasive weeds and planting native trees
2	no		south side of Gages Slough, between Peacock Lane and Gardner Road	wetland creation, buffer enhancement	yes	yes	yes	possibly	yes	Although privately owned and outside of the City limits, this pasture area offers a great potential for mitigation - both for wetland creation and buffer enhancement.
3	no		east side of Gages Slough, between Lei Garden Road and SR 20	buffer enhancement	yes	somewhat	possibly	unlikely	possibly	Although privately owned and outside of the City limits, this pasture area offers some potential for mitigation - primarily for buffer enhancement due to the relatively steep banks on the east side of the Slough.
4	no		east and west side of Gages Slough, south of Monroe St., west of Section St.	limited buffer enhancement limited wetland creation	yes	yes	unlikely	limited	possibly	This areas has limited mitigation potential due to the proximity of houses. However, the northern section primarily has a limited potential for buffer enhancement on both sides of the slough. The east side of the southern section has a potential for buffer enhancement as well as limited wetland creation.
5	no		north and south sides of Gages Slough, west of Hawthorne St, north of Fairhaven Ave.	buffer enhancement wetland creation	yes	yes	possibly	possibly	yes	Although the banks are somewhat steep in this area, the pastures on the north and south sides of the slough would provide space for some wetland creation and buffer enhancement.
6	yes	P72447	east side of Gages Slough, south of Fairhaven St. - labeled as Ferry St. ROW	buffer enhancement limited wetland creation	yes	yes	yes	limited	yes	This is currently open space - an unused right-of-way. The upland meadow area offers a great potential for planting native trees and shrubs. Potential for wetland creation is limited by the relatively narrow width of the site.
7	yes	P72236 P72229	east and west side of Gages Slough, west of Section St., between Fairhaven Ave. and Rio Vista Ave. - Section Street Neighborhood Park	buffer enhancement limited wetland creation	yes	yes	limited	limited	yes	The parcels are currently open space that are proposed to become the Section Street Neighborhood Park. This section of Gages Slough is in fairly good condition - there are many trees and some understory. More native trees and shrubs could be planted, especially at on the east side of the slough, east of the existing tree line. Although there is a potential for some wetland creation, it is limited by the existing trees.
8	no		east and west side of Gages Slough, west of South Anacortes St., opposite the intersection with Gilkey Road	wetland creation, buffer enhancement	yes	yes	yes	yes	yes	Although privately owned, this large cow pasture offers a terrific potential for mitigation - both for wetland creation and buffer enhancement.
9	no		area between two lobes of Gages Slough, west of the RR tracks, east of South Spruce St. near its intersection with Walnut St.	either wetland creation or wetland enhancement, buffer enhancement	yes	yes	possibly	yes	yes	This area is currently open space within the Slough. We did not ground-truth this area, but depending on whether the area between the lobes is wetland or upland, it has a terrific potential for either wetland enhancement or creation. There is also a potential for buffer enhancement.
10	yes	P106699	south of the south lobe of Gages Slough, west of the RR tracks, north of the large commercial building at the end of Pacific Dr. (private)	limited wetland creation, buffer enhancement	yes	yes	possibly	limited	limited	This parcel is located at the SE corner of area 9, and it is currently open space. We did not ground-truth this area, but the contours indicate that it is relatively steep, so it is likely that the site has a better potential for buffer enhancement than for wetland creation.

**City of Burlington Gages Slough Potential Mitigation Sites  
Draft Version**

Site #	City owned	Property #	Location	ecological benefit	wildlife benefit	provides habitat connectivity	potential trail site	flood relief potential	educational opportunity	comments
11	no		south side of Gages Slough, north of Pease Rd., between the RR tracks and South Burlington Blvd.	limited wetland creation, buffer enhancement	yes	yes	limited	limited	yes	We only viewed this parcel from the north side of Gages Slough, but it appears to provide area for limited wetland creation and some buffer enhancement.
12	no		north side of Gages Slough, and wetland areas in the Slough, south of the big stormwater detention ponds south of Cascade Mall	wetland enhancement, buffer enhancement	yes	yes	yes	limited	yes	The upland south of the detention pond has great potential for enhancement. A significant portion of the emergent wetland between South Burlington Blvd. and I-5 could be enhanced by planting native shrubs and trees.
13	no		north side of Gages Slough, south of West Stevens Rd., west of I-5 to the City limits.	wetland enhancement limited wetland creation, buffer enhancement	yes	yes	yes	limited	yes	This area is north of the Goldenrod Bridge mitigation Site, and was considered as a possible Second Phase for that project. This area provides the potential for some enhancement of emergent wetland, and enhancement of upland buffer. Because of the proximity of West Stevens Road, only the western end of this site has the potential for wetland creation.
14	no		north and south sides of Gages Slough, south of West Stevens Rd., west of I-5, west of area 13, west of the City limits	wetland enhancement, wetland creation, buffer enhancement	yes	yes	yes	yes	yes	This area is located west of the Goldenrod Bridge Mitigation Site. The two sides of the Slough are either horse pasture or agricultural fields. Although it is outside of the City limits, this area provides a terrific potential for significant wetland creation and buffer enhancement, and some wetland enhancement. The fact that WSDOT is using the agricultural field adjacent to the west means that this mitigation site could become a significant wildlife habitat area.
15	no		east and west sides of Gages Slough, south of West McCorquodale Rd., from the culvert to just above the new pump station	wetland enhancement, wetland creation, buffer enhancement	yes	yes	yes	yes	yes	This site is located outside of the City limits, and both sides of the Slough are agricultural fields. Although the banks of the channel in this section are relatively narrow and steep, this area provides a terrific potential for significant wetland creation and buffer enhancement and limited wetland enhancement. Despite being separated by West McCorquodale Rd, the proposed WSDOT mitigation site in the parcel adjacent to the north means that this mitigation site could become a significant wildlife habitat area.

# CITY OF BURLINGTON

## GAGES SLOUGH MANAGEMENT PLAN

*Spring 1999*

*(updated 9/1/99)*

Margaret Fleek, Planning Director  
Gages Slough Citizen Advisory Committee



# CITY OF BURLINGTON

## GAGES SLOUGH MANAGEMENT PLAN

*Spring 1999*



### SUMMARY OF RECOMMENDATIONS

The Citizen's Advisory Committee for Gages Slough, formed in 1996, has developed a proposal for action that is based on the scientific study that was done for the Slough in 1998 and the vision of the community for the future, recognizing that the plan for the Slough must take into account the adjoining land uses.

The Gages Slough Management Plan is a comprehensive program designed to gradually improve the deteriorated series of wetlands consistent with the long term goals of the community and the region for environmental quality, flood hazard mitigation and surface water management.

The step-by-step approach has eight major components including Community Involvement, Education, Best Management Practices, Regulations, Restoration Plan, Monitoring Plan, Capital Improvement Plan and Interlocal Agreements. These are outlined in this summary, followed by a more detailed description of each component.

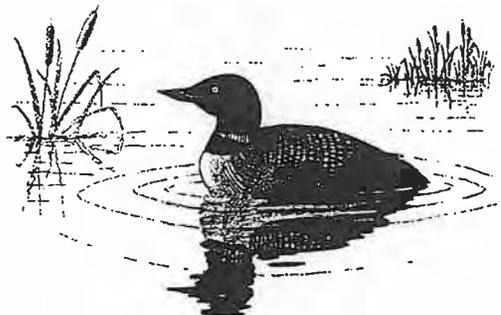
#### Community Involvement

- Abutting property owners are regularly notified of what's happening.
- Upland uses and properties are targeted for relevant issues.
- The Citizen's Advisory Committee is committed to seeing the process through and ensuring that key interests and issues are addressed.
- Monthly updates in the City Land Use Bulletin are a regular feature.
- Media coverage of events and activities is designed to bring broader interest and support.
- An annual clean-up event is scheduled during low water, until it is no longer needed.
- Gages Slough is a regular topic at the spring and fall Neighborhood Meetings and the management strategy is adapted as necessary to reflect neighborhood issues and concerns.
- The community process is used to design a clear plan of action that can be accomplished in a realistic and reasonable manner.

#### Education

*Short-term education of immediately affected parties:*

- Best management practices that provide the key to improving environmental quality are designed for the specific needs of each site or area.



## Education – Short-term (continued)

- A Backyard Wetland Restoration Demonstration planting project is funded at Section Street Neighborhood Park.
- Detailed information and suggestions designed for property owners planting projects will be prepared.
- A Wetland Restoration workshop is planned in concert with the Department of Ecology, which will likely need to be done at least annually to provide a training opportunity and information exchange.
- Work with local businesses to promote organic yard and garden techniques and products

### *Long-term education:*

- Classroom and field education programs for local schools to use
- Stewardship program for restoration projects including planting, maintenance and monitoring
- Develop interpretative areas with appropriate signage

## Best Management Practices

- Yards, Gardens - Using organic fertilizers and pest control where possible, managing the use of pesticides and herbicides, how to do your own backyard restoration plan
- Agriculture, Animal management - fencing out livestock; providing managed watering areas, pasture management, buffers.
- Septic systems - maintenance, failed systems, opportunities for connection to sanitary sewer, monitoring.
- Commercial/Industrial - tailored best management practices for sites pre-existing storm water regulations with piped runoff; industrial pre-treatment, waste disposal practices.
- Public Works projects and right-of-way management - managing the green spaces along the right-of-way, plantings in right-of-way abutting the Slough, use of pesticides and herbicides for right-of-way maintenance, retrofitting right-of-way to improve quality of existing storm water runoff, culvert cleaning and maintenance of sediment trapping areas upstream from culverts, culvert expansion and replacement for better flood water control while maintaining wetlands.

## Regulations

- Critical Areas Ordinance - Permanent buffer requirements; handling existing sites where no new development is proposed
- Shoreline Master Program for Gages Slough and the Skagit River Shorelines - awaits adoption of new state rules
- Nuisance Code- illegal dumping, littering, increase fines along Slough and post signs
- Street and Storm Sewer installations in the public right-of-way- add a maintenance component - new construction standards shall meet or exceed state law
- Surface Water Management Code - review and update to reflect state-of-the-art opportunities
- Habitat Conservation Plan - Getting OFF the 303(d) list of water quality violations, with "salmon-friendly" cool and clean water emptying into the river.

### Restoration Plan

- Develop design options and plant materials lists
- Design and construct Section Street Neighborhood Park Wetland Demonstration Planting Project; provide for maintenance and monitoring plan.
- Over time, restore existing public lands in the Gages Slough corridor, including right-of-way, and acquire land for restoration.
- Provide convenient and cost-effective access to materials
- Get businesses involved in action plan
- Work with Skagit Conservation Service to provide a cheap source of plant materials (wholesale nursery license)
- Each restoration plan, whether for one lot, or a city project, shall include a maintenance, monitoring and adaptive management component.

### Monitoring Plans and Adaptive Management

- Water quality sampling program - establish long range schedule
- Water level monitoring - Make and install additional floating cork or wood block style gages that will monitor peak flows between sampling; continue monitoring twice a month until trends show that less frequent monitoring is acceptable.
- Manage hydroperiod of Slough area that is influenced by the new Pump Station.
- Monitor restoration planting areas; keep detailed records of maintenance and management issues.
- Monitor wetland functional values relative to 1998 baseline data, including habitat values.
- Regular reports to Citizen's Advisory Committee and Public Works Department and adapt and adjust programs as necessary, including timing, tests, locations and other factors

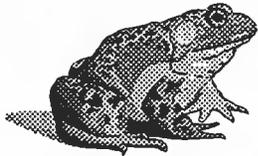
### Capital Improvement Plan

- Land acquisition and wetland restoration
- Culvert upgrades, balancing flooding and wetland elements
- Surface water management plan shall address state of the art standards
- Street Improvement plan shall address impacts on Gages Slough

### Interlocal Agreements

- Dike District #12 - pump station operation during flood season to manage hydroperiod of Slough
- Skagit County Public Works and Burlington Public Works - resolution of culvert maintenance and replacement issues; use of best management practices for maintenance program.
- City and County relative to application of Critical Areas Ordinance and developing a plan to get buffers and require their maintenance with or without development activity.

# INTRODUCTION TO THE GAGES SLOUGH MANAGEMENT PLAN



The Gages Slough Management Plan is not simple. There is nothing simple about restoring a deteriorated wetland that has over a 100-year history of flowing through an area that changed from forest to farmland and from low density residential to high density residential, commercial and industrial, over the course of time. The relationship of the Slough to the River also changed, as the Dike system became more effective. During the dry season, there is less fresh water entering the wetland system than at any time in the past.

The challenge today is to clean up the slough, improve its wetland functions and habitat diversity, monitor the project closely and utilize adaptive management techniques as necessary to ensure success. This requires the combined efforts of many people over a long period of time, ranging from business and industry representatives to homeowners, to farmers, and a big burden falls to government for the road runoff. The opportunity is presented to restore the wetlands to a level where they will be a key component of the quality of the environment in the area.

The Management Plan is divided into general, overall recommendations and recommendations specifically tailored to three major geographic areas, shown on Exhibit A:

**AREA 1. Habitat Corridor.** This area extends from the Pump Station (or River) to the northerly end of the Dynes Eggs pasture, just east of the Railroad tracks.

- *Target this area for public acquisition and restoration.* The City needs to control its major storm water conveyance and the City needs to play a major role in restoring the wetland, so that the outfall into the Skagit River is putting clean, cool water into the threatened salmon habitat, and Gages Slough comes into compliance with the Clean Water Act.

There is no high density residential use abutting the Slough in this area. There are a limited number of property owners, many of whom are already willing participants in this program and who are interested in public acquisition, whether through fee simple purchase, land donations with tax benefits, or conservation easements.

**AREA 2. Urban Residential Corridor.** This area includes all the remaining land in the City Limits and unincorporated Urban Growth Area lying North and East of the Dynes Eggs pasture, which is a series of single family neighborhoods intersected by streets and roads with some piped storm water outfall locations in the Slough.

- *This area is targeted for focused residential best management practices including an educational effort for yard, garden and lawn management.* A series of design options for different situations, such as high bank and sunny, low bank with trees, are being put together to assist homeowners. Issues such as getting blackberries and reed canary grass under control and how to maintain your backyard restoration planting area will be covered in a way that will help property owners figure out how best to manage their individual situation.



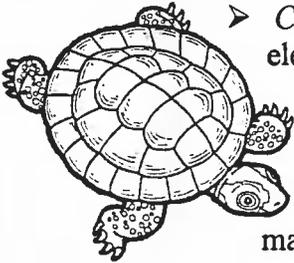
**AREA 3. Agriculture and Residential Corridor.** This area is the remainder of Gages Slough lying east of the Urban Growth Area, which is primarily Agriculture and Residential.

- *This area is planned to be the subject of an additional Interlocal Agreement with Skagit County.* The new Interlocal Agreement is intended to address all the Gages Slough Management Plan components that are located outside the City Limits, both east and west of town.

The intent is to promote best management practices in the mixed residential, commercial and agricultural area. A specific target will be means to fund fencing out livestock or limit access to watering locations, and septic system management, since there is no sanitary sewer service available in this area.

# GAGES SLOUGH MANAGEMENT PLAN ELEMENTS

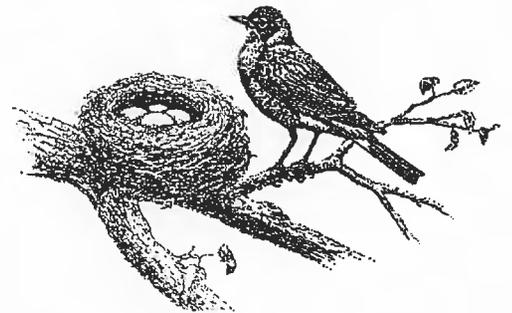
## Community Involvement



- *Continue community involvement program* - The Community Involvement program element started in late 1995, with a survey of all the property owners along Gages Slough. This was followed by four regular winter Neighborhood meetings (Burlington has on-going Neighborhood planning) at which the proposed Gages Slough program was discussed and options evaluated. Results of the Property Owners Survey were mailed to all the property owners, and included in that mailing was a request for interested citizens to help form an advisory committee.

**IMPLEMENTATION PLAN** - Because of the very long-term nature of this type of program, the community involvement element is planned to continue indefinitely. The committee has a regularly scheduled monthly meeting; if there is nothing to meet about, it is canceled to minimize use of citizen's time. Monthly updates in the City Land Use Bulletin are a regular feature. Media coverage of events and activities is designed to bring broader interest and support. An annual clean-up event is scheduled during low water, until it is no longer needed. Gages Slough is a regular topic at the spring and fall Neighborhood Meetings and the management strategy is adapted as necessary to reflect neighborhood issues and concerns. The community process is used to design a clear plan of action that can be accomplished in a realistic and reasonable manner.

- *Continue the slough clean-up campaign* - Schedule as-needed slough clean-up days, to be publicized and sponsored by the City. Brochures would invite the public to meet at a central gathering site. Team leaders would disperse groups to all the sites on the slough that are known garbage dumps from public road crossings. The brochures would also encourage private landowners to clean-up their own yard waste and garbage that they've dumped in the slough, and to properly dispose of it in the future. The City could schedule a special, curbside garbage pickup (free of charge) immediately following the clean-up days to dispose of the trash people collect out of the slough from their back yards. This would serve as an incentive to clean out the slough in a coordinated timely manner and to get rid of large items that would otherwise cost the landowner to dispose of. Educational information could be included in the notification brochure, addressing the functions of the slough and the potential impacts residents have by using lawn chemicals, clearing vegetation, allowing livestock to graze in the buffer, and illegally dumping refuse.



**IMPLEMENTATION PLAN** - In 1998, after several unsuccessful attempts to gain grant funding, the City was successful in getting a grant allocation through Skagit County Public Works, recipient of Department of Ecology Litter Pickup funds. The first ever Gages Slough Cleanup Day was held on September 19, 1998. The City has already applied for funding for 1999 under the same program, and excellent participation is expected again this year.

## Education

- *Post interpretive signs at road crossings of slough* - post signs that provide passersby with information on the ecology and functions of the slough, and on the importance of conserving wetlands. The signs should remind readers that this is a public resource in which everyone has an interest and a responsibility to protect.

**IMPLEMENTATION PLAN** - This will be a 1999-2000 project. This will be part of the focused public education process that will begin in earnest in early 1999.

- *Develop educational program on slough for use in schools* - Develop a program or brief curriculum that focuses on the ecology of the slough. This program could range from an hour-long presentation by City staff on the importance of the slough, to a notebook with information and exercises that could be used by teachers themselves. The program could be made available free or at minimal cost to local schools. The timing of this educational program could be designed to coincide with, or be integrated with the public clean-up campaign.

**IMPLEMENTATION PLAN** – The nature of the school system seems to dictate the development of a program without any assistance from them. It is hoped that some tools to facilitate this program may become more readily available from state, federal, or non-profit sources. Grant funding will be sought to develop such a program.

- *Manage public open space along slough to restore wetlands and educate public* - the City intends to manage the open space that it currently owns along the slough with the primary goals being to restore slough and buffer vegetation, allow public access and to provide education on the slough.

**IMPLEMENTATION PLAN** – This might include parking areas, walking trails, picnic tables, interpretive signs, educational pamphlets, planting of native species, clearing of invasive plant species, and other features. These sites could be integrated into the educational program for local schools by using them as fieldtrip destinations. They could also function as demonstration sites for the local landowners along the slough to show them how different landscaping and management techniques can be used to improve the habitat functions provided by the slough and its buffer, while being aesthetically attractive.

## Best Management Practices

- *The Water Quality study has identified several major water quality violators. Best Management Practices for septic system maintenance, and animal management are topics for these sites.*

**IMPLEMENTATION PLAN** – Property owners with significant water quality violations will be notified and required to design a compliance plan. Each site will be provided with educational materials and optional approaches that can be used to develop the compliance plan. This will be followed by enforcement action for significant water quality violations including animal waste and failed septic systems, if necessary.

## Best Management Practices - (continued)

Septic management plans will be offered, and the option of connecting to the public sanitary sewer when available.

Opportunities for grant funds or low interest loans to construct animal fencing and protect and restore the buffer area will be made available if possible for property owners.

- *The residential areas are targeted for focused residential best management practices including an educational effort for yard, garden and lawn management.*

**IMPLEMENTATION PLAN** - A Demonstration Wetland Restoration Planting Project is planned to be installed along Gages Slough in the Section Street Neighborhood Park. Grant funds were obtained from SeaFirst/Bank of America Northwest through the Burlington Parks Foundation for planting. The target is to plant in 1999. The goal of the demonstration planting area is to show property owners that a wetland area and buffer can be designed to suit the owner's preference in terms of appearance, while achieving goals of providing habitat and enhancing wetland functions. Detailed buffer design alternatives and planting standards, along with access to affordable and appropriate plant materials are just a few of the next steps to make this program element viable.

Best Management Practices brochures have been designed for each specific category where a need has been identified, using available literature. These include lawn and garden management, handling pasture and grazing animals including fencing and watering, planning for the optimal approach to fertilizing and using pesticides and herbicides, and failed septic systems along with septic system maintenance. The brochures will be accompanied by the development of individualized site planning questionnaires and there will be a major push for public education and action.

Viable options for homeowners, such as composting techniques, use of organic fertilizers, developing organic matter and soil fertility as the best means of weed and pest control will be emphasized. Local suppliers will be contacted and every effort made to get major outlets to promote organic gardening and lawn management.

A Wetland Restoration workshop is planned, targeted for Fall 1999, in concert with the Department of Ecology and other speakers and presentation. This is planned to be the first in an on-going series of workshop. A workshop tailored to each year's major focus or issues is expected to be needed to be done at least annually to provide a training opportunity and information exchange.

- *Work with Commercial and Industrial uses to better manage storm water. Areas #1 and #2 are the receiving areas for several large storm water outfalls, including Spruce Street that handles water from a substantial commercial and industrial area, some of which have complying storm water facilities and some of which predate the requirements. The outfall from Cascade Mall is also in Area #1.*

## Best Management Practices – (continued)

**IMPLEMENTATION PLAN** – The commercial and industrial contributors to the storm water system will be the focus of targeted best management practices to improve source control, along with an educational program to encourage pre-existing storm water facility owners to upgrade their facilities. Opportunities for funding assistance to implement this program will be sought. This recommendation will be followed for all commercial and industrial uses in Burlington, but starting with those whose storm water outfall is in Gages Slough.

There is current literature available and the plan for 1999 is to develop site planning questionnaires, brochures for on-site storm water system maintenance, retrofit information, and other techniques for source control of pollutants and storm water quantity. The Citizen's Advisory Committee will recommend a plan that may include forming a business assistance committee with representation from the types of businesses that need help in upgrading or changing practices.

- *Develop agricultural land use guidelines* - Develop and publicize guidelines for agricultural practices on lands within a certain distance of the slough. The guidelines would be voluntary but would argue a strong case for protecting the slough. Included would be provisions for:

- fencing livestock out of slough, and at least 25 feet back from the edge of wetlands,
- discouraging the practice of spraying liquid manure within 100 feet of the slough,
- discouraging the use of herbicides and pesticides within 100 feet of the slough,
- discouraging the use of inorganic fertilizers within 50 feet of the slough, and
- discouraging cultivation of land within 25 feet of the slough.

**IMPLEMENTATION PLAN**- Grant funding assistance for fencing will be sought. Property owners currently out of compliance with Zoning, Nuisance, or water quality standards would include these elements in their compliance plans.

## Regulations

- *The Critical Areas Ordinance relative to wetland buffers will be amended to clarify buffer standards.*

**IMPLEMENTATION PLAN** - Enforcement of the ordinance will be assigned to the Planning Director, and the Code Enforcement Officer. For the first year, property owners will be educated on best management practices, their role and responsibilities, and subsequently, a compliance program will be established to set up a schedule for each site as needed. Priorities will be carefully set and there will be on-going Neighborhood meetings, as well as meetings with the business community. If these measures are not adequate, enforcement action will be considered.

- *Take the next steps to complete the development and implementation of the Master Program for Gages Slough and the Skagit River Shoreline.*

## Regulations - (continued)

**IMPLEMENTATION PLAN** - The draft presented in December 1998 was developed using the latest available information from the Washington State Shoreline Commission and proposed Washington Administrative Code Rules and issue papers as of December 1998. Due to the lengthy processing time for Master Programs, final Washington Administrative Code Rules will be incorporated, as they become available in 1999 before public hearings are held to consider adoption of the Master Program.

- Integrate the elements of a proposed Habitat Conservation Plan into the Master Program and long range management plan for Burlington. Elements to be included are: The Gages Slough Management Plan and program to remove the Slough from the Department of Ecology's 303(d) list (areas in violation of the Clean Water Act).
  - Establish a monitoring program for the other two storm water outfall locations, one entering Joe Leary Slough north of Burlington Hill, and the other entering the Skagit River along Whitmarsh Road east of Burlington Boulevard.
  - The Wastewater Treatment Plant Total Maximum Daily Load (TMDL) program and long term monitoring of that program will be identified as components of the Shoreline Master Program.
  - The Dike District #12 shoreline program element which is primarily on-going maintenance and management, including Vegetation Standards adjacent to the Dike.
- *Post warning signs regarding littering fines* - post signs at public viewpoints along the slough reminding people that dumping refuse in the slough is illegal, and specifying a high fine for such dumping. This information could potentially be included on the interpretive signs. The City could also provide public trash receptacles at public road crossings.

**IMPLEMENTATION PLAN** – City Council action to promote this project element will be needed. Litter is already considered a violation of the Nuisance Code, but a separate fine could be instituted specifically addressing wetlands.

- *Enforce a 50 foot building setback along the slough in commercial and industrial areas and a 25 foot setback in existing developed residential areas* - Continue enforcement of what is currently an interim 50 foot building setback on the slough in commercial and industrial areas, from Dynes Eggs pasture just west of Anacortes Street, to the westerly City Limits. This buffer would mean that no new buildings would be permitted within 50 feet of the wetland edge. Buffer width averaging would be permitted if the applicant demonstrates that averaging is necessary to accomplish the purposes of the proposal and that no reasonable alternative is available; and averaging width will not adversely affect the wetland functions and values; and the total area contained within the wetland buffer after averaging is no less than that contained within the standard buffer prior to averaging. The buffer width shall not be reduced below 25 feet. Existing developed residential areas shall be permitted to use the 25 foot buffer and shall be encouraged to enhance the wetland buffer through best management practices.

**IMPLEMENTATION PLAN** – Amend the Critical Areas Ordinance to make this regulation permanent, and continue to work to improve the management practices of each property owner along the Slough.

## Regulations- (continued)

- *Enforce 25-foot buffer in which vegetation clearing is prohibited* - Enforce a 25-foot buffer on the slough in which no clearing of vegetation would be allowed. This provision would be enforced across the board for new construction unless the project included a detailed restoration planting and maintenance plan to improve the habitat quality and functions of the buffer area.

Fines for new clearing of vegetation in the buffer could be imposed. Existing residences would be grandfathered in, as long as mowing and ongoing clearing in the buffer area is discontinued, and the buffer replanted or allowed to naturally revegetate. Wetland buffers are often termed “native growth protection areas” and are typically not landscaped, but left natural.

Because of the existing problems with blackberries, reed canary grass, thistles and other invasive species, it is important to allow limited landscaping in this buffer area. The city will provide landowners with a list of appropriate native species to use in planting these areas, along with enough detailed information to help ensure the survival of the plants, and long term elimination of the problem species. Landowners will be encouraged to plant trees and shrubs densely and to consider plants that benefit wildlife. Landowners will be reminded that highly manicured landscaping, though traditionally considered more aesthetically pleasing, is much less conducive to attracting wildlife than is “the messy look”.

Exceptions for existing residences and businesses that are located less than 50 feet from the edge of the slough would be made on a case-by-case basis.

***IMPLEMENTATION PLAN*** – The City is committed to developing a demonstration wetland planting project to show property owners some viable alternatives. Enforcement of such a standard would be an entirely new program, and really a last resort failing all efforts in education, training in best management practices, working to make plants available at a low cost through the Skagit Conservation Service which has a wholesale nursery license, and working with retailers. However, the City is prepared to consider this step. With problem sites that are overgrown with vegetation that is not native, restoration is hoped to be primarily through a positive campaign to get the right vegetation in the right location.

## Restoration Plan

- *Target Area #1 for public acquisition, conservation, and restoration.* The City is developing a range of options to increase the ability to acquire the Gages Slough wetland corridor in Area #1 over the long term. These lands would be maintained as open space and managed as a long-range restoration project.

The City needs to control its major storm water conveyance and the City needs to play a major role in restoring the wetland, so that the outfall into the Skagit River is putting clean, cool water into the threatened salmon habitat, and Gages Slough comes into compliance with the Clean Water Act.

## Restoration Plan – (continued)

There is no high density residential use abutting the Slough in this area. There are a limited number of property owners, many of whom are already willing participants in this program and who are interested in public acquisition, whether through fee simple purchase, land donations with tax benefits, or conservation easements.

**IMPLEMENTATION PLAN** - An initial committee meeting to discuss hiring an appraiser to establish a "public value" for Gages Slough was held in early 1996. At that time, it was apparent that a scientific background study was critical to develop adequate information for use by an appraiser. With the completion of the Gages Slough study in 1998, an appraiser was retained by the City to develop a value pricing formula as a basic tool to determine land values for the purpose of conservation easements, land donations, seeking grants for land acquisition, and for establishing park impact fee credit for land donations.

The next phase of this program element is in process, utilizing the wetland delineation prepared by the project consultant as one critical element of the database. The City has contracted with an Appraiser with expertise in this area and an analysis of the value of the land in this area is in process, to develop a value pricing formula to estimate the appropriate market values of the acquired conservation easements and/or fee simple properties. With this tool in hand, we can work with individual property owners on the best options for their individual situation.

- *Develop subsidized planting program* - Develop a program that encourages landowners to plant native trees and shrubs along the buffer of the slough on their own lands. A list of recommended native plants for the slough and buffer is presented in Appendix C. Restoration of buffer areas along the slough is made difficult by the extent of private ownership and the potential costs of installing plants and providing long term care. Incentive would be provided by the City in the form of a partial or total subsidy for plant costs, free materials for staking trees, and free advice on planting methods. The City may be able to work out a deal with a local nursery in providing large volumes of plant materials at lowered costs. Also, the City could pursue salvaging plants from proposed development sites, plants to be used exclusively for this restoration program. Additionally, a plant propagation program could be initiated among local youth groups such as boy scouts/girl scouts, 4H groups, high school science clubs, etc. Source material for the program could be collected by cutting live stakes from local native trees and propagating them in pots. This involvement would increase the level of public participation in and, hopefully, a sense of responsibility for the care of the slough.

**IMPLEMENTATION PLAN** – Grant funding will be sought through a variety of public and private sources, since the City cannot pay for work on private land. The Burlington Parks Foundation will be working on private sources; the City will work on public sources and local service organizations.

## Restoration Plan – (continued)

- *Provide sanitary sewer service for all buildings within the Urban Growth Area (UGA)* - The City could continue to expand its sewer system to include all lots within the urban growth area that are currently on septic systems. The City might prioritize the areas that are nearest the slough to prevent further degradation of water quality. As an interim measure, the City could encourage residents to maintain all septic systems by pumping out the tanks on an annual or bi-annual basis by working with local Health Department staff to create a maintenance schedule review plan for properties. Best Management Practices for septic systems will be mailed to all identified septic system owners on Gages Slough.

**IMPLEMENTATION PLAN-** The entire Urban Growth Area is included in the Comprehensive Wastewater Treatment Plan; however, that is a twenty-year plan and the issue needs to be addressed today. The Skagit County Health Department is proposing legislation to require septage haulers to pay a fee that will contribute to a public education campaign. The city's effort is focused much more narrowly, but because of the limited geographic area, odds for success are much higher.

- *Develop a lawn care display for local hardware stores* - The City could develop a standing display to educate the public on low-impact lawn care practices, with an emphasis on protecting the water quality of the slough. The display would detail the benefits of using minimal amounts of organic fertilizers, leaving clippings on the lawn, allowing grass to grow longer, and so on. It could include advice on composting techniques and describe the consequences of high-impact lawn care practices.

**IMPLEMENTATION PLAN –** The Planning Department toured all local hardware and fertilizer outlets during the summer of 1998, to gather information about organic alternatives to fertilizing and herbicide/pesticide options. Only the local farmer's supply store even carries organic alternatives for lawns. This will be a major outreach effort to some of these big corporations. It is hoped that Cenex, the local farmer's supply outlets, will assist with this campaign, and that the city will be able to get cooperation from the corporations like Eagle Hardware and Fred Meyer. The coming focus on the Endangered Species Act may be the club needed to get the attention of all the players.

- *Make available inexpensive composting containers* - The City could subsidize the cost of efficient composting containers and make them available to residents at a low cost. The program could be publicized by inclusion of notice with residents' garbage bills. The notice could address the benefits of composting organic material and emphasize the importance of keeping yard waste out of the slough.

**IMPLEMENTATION PLAN -** Grant funding will be sought for this program; a similar program in 1998 sponsored by the Skagit Conservation Service was very successful.

## Restoration Plan – (continued)

- *Develop program for managing invasive plant species* - Restore certain portions of the slough that are dominated by the non-native reed canarygrass by temporarily flooding the plants and/or cutting and disposing of the existing sod, and then planting woody vegetation that would serve to shade out the invasive grass. The City could temporarily install standpipes on the outlet culverts of specified AUs that would maintain springtime water levels at elevations roughly 2-3 feet greater than the existing average levels. This would inundate the reed canarygrass to a greater depth and for longer periods than it could survive. However, the species could easily re-establish upon a return to normal water levels. For this reason, the sod should be cut out where possible and fast-growing woody species should be planted in the fall following the period of extended inundation. Appropriate species would include Sitka willow, Pacific willow, and red-osier dogwood. These could be installed most cost-effectively by cutting live stakes from existing plants in the area.

**IMPLEMENTATION PLAN** – The extent of this program will expand as properties are acquired by the City, as described in earlier recommendations.

- *Install snags and large woody debris in slough* - the City could seek out cooperation of private landowners, or use publicly-owned portions of the slough to enhance wildlife habitat by use of snags and downed logs. Snags could be created by girdling living trees currently in the slough, or by installing trees cut from other sites. The latter is done by burying the lower portion of the killed tree into the bank of the slough so the tree extends out over the water.
- Logs or root wads can also be placed within the slough or buffer of the wetland, and anchored as necessary.

**IMPLEMENTATION PLAN** - Public education and determinations about the appropriate locations for these installations are both necessary components of success for this recommendation. Land acquisition through donations, conservation easements, or fee simple acquisition is needed to obtain larger sites. The use of Gages Slough to remove flood waters means that these locations must be carefully chosen in buffer areas so that flood carrying capacity is not compromised.

- *Increase species diversity and structural complexity of the wetland and buffer* - the City could encourage the planting of various native conifers within the buffer of the wetland. A list of recommended species is available. Getting coniferous trees started will eventually help in increasing the habitat diversity, providing dense shade that may help reduce the dominance of the reed canary grass, and over time, provide a source of woody debris into the system. This effort can often be taken on successfully by a local citizens or student group who does the installation.

**IMPLEMENTATION PLAN** - Public education and determinations about the appropriate locations for these installations are both necessary components of success for this recommendation. Funding will be sought from a variety of public and private sources.

## Monitoring Plan

- *The new Gages Slough pump station shall be evaluated and regulated to establish an appropriate hydroperiod for the affected wetlands, which are primarily located west of Interstate 5. The area west of the City Limits, extending to the Skagit River is the subject of an Interlocal Agreement relative to the pump station and maintenance.*

**IMPLEMENTATION PLAN** - Monitor the existing Interlocal Agreement. Evaluate the best means and opportunity to amend and adapt the agreement so that the County will work hand in glove with the City relative to establishing and enforcing buffers along all of the Slough that is outside the City Limits. See Area #3 for the land east of Burlington.

Carefully monitor the influence of the pump station on the hydroperiod of the Slough and establish a water level management protocol that provides an agreed upon level under specified conditions, using data generated by the Technical Report prepared for this project.

While the Skagit County Critical Areas Ordinance requires buffers, there has been no enforcement of the wetland buffer quality requirements anywhere along Gages Slough to date, in either the City Limits or the County, other than to regulate the location of structures. Work to gain the support and assistance of Skagit County in public education and design of the best management practices approach needed for the mix of residential and agricultural uses located west of the City Limits.

- *Long term water level shall continue to be done on a regularly scheduled basis.*

**IMPLEMENTATION PLAN** - Additional water level gauges will be installed in addition to the staff gauges already in place to be able to take crest readings, using either the floating block model or the cork dust model. Monitoring will be done monthly.

- *Long term water quality monitoring shall continue to be done on a regularly scheduled basis.*

**IMPLEMENTATION PLAN** - Water quality monitoring will be done every three months and timed to catch the beginning and end of the rainy season. As specific problems are identified, additional sampling and testing will be done as necessary.

## Capital Improvement Plan

- *City stormwater system changes shall meet or exceed state minimum standards for both quantity and quality.*

**IMPLEMENTATION PLAN** - A long range program shall be designed and funded through the Capital Improvement Plan, to retrofit the city's existing storm water system including piped storm water from private property and surface runoff from streets, to provide quantity and quality improvements consistent with current standards.

- *Construct biofiltration swales or other water treatment features for storm drains where possible* - the City could install vegetated biofiltration swales where there is room and direct storm drain pipes into swales prior to draining to the slough. Grass-lined biofiltration swales could be installed in road rights-of-way in place of traditional roadside ditches, and storm pipes directed to the swales. Alternative filtering mechanisms such as oil/grease separators could be explored for sites with no room to install swales.

## Capital Improvement Plan – (continued)

**IMPLEMENTATION PLAN** - This will be included in the City's Capital Improvement Plan for new construction and retrofit of existing systems. New installations will be fully designed to meet or exceed state standards, and a plan to retrofit of existing pipe outfalls and road runoff will be established and funded over time.

- *Excavate sediment around upstream ends of culverts* - The City has implemented a regular maintenance program that prevents blockage of culverts along the slough. The areas immediately upstream of culverts accessible by machinery would be excavated to a level below the bottom of the culvert. When sediment deposits reached the bottom level of the culvert, the maintenance practice would be repeated. Maintenance would have to be scheduled in late summer to avoid/minimize adverse water quality impacts downstream.

**IMPLEMENTATION PLAN** – While regular maintenance is part of the city's program, it may need to be strengthened in terms of designing sedimentation areas behind culverts. The major problem is in the Urban Growth Area east of Burlington, and the need for an additional Interlocal Agreement is discussed in the Citizen's Advisory Committee recommendations above.

- *Replace specific undersized culverts* - The City plans to replace culverts that have been identified as particular problem areas with larger diameter culverts, half-rounds or box culverts, if deemed necessary. Criteria for replacement include localized flooding of road at culvert, localized flooding within Assessment units (AU) caused by severe water back-up, or a rate of sediment deposition that cannot be reasonably managed by a culvert maintenance program.

**IMPLEMENTATION PLAN** – The balancing act between flood control, wetland preservation and restoration, and storm water management will be able to be better managed because of the Technical Study performed for this project. Culvert work will be included in the Capital Improvement Plan and each installation will be designed to optimize the wetland functions while enhancing flood control and surface water management.

## Interlocal Agreements

- *Monitor the existing Interlocal Agreement with Skagit County for the pump station.* This agreement states that Skagit County will work with the City of Burlington and Dike District #12 to establish an appropriate procedure and accountability for the required maintenance and operation of the pump station and required upgrading and maintenance of the Slough and culvert system west of the City Limits.

**IMPLEMENTATION PLAN** - After one winter of experience, it appears that the design of the new pump station system is working very well. The pump station is bypassed except when the River elevation is high. Then, the pumps are very fast in lowering the water level. This should make it more feasible to work towards improving the wetland quality without compromising the conditions of abutting property owners.

## Interlocal Agreements - (continued)

- *Gages Slough wetlands located east of the City Limits as well as the land west of Interstate 5 that is now under an Interlocal Agreement are planned to be the subject of an additional Interlocal Agreement with Skagit County.*

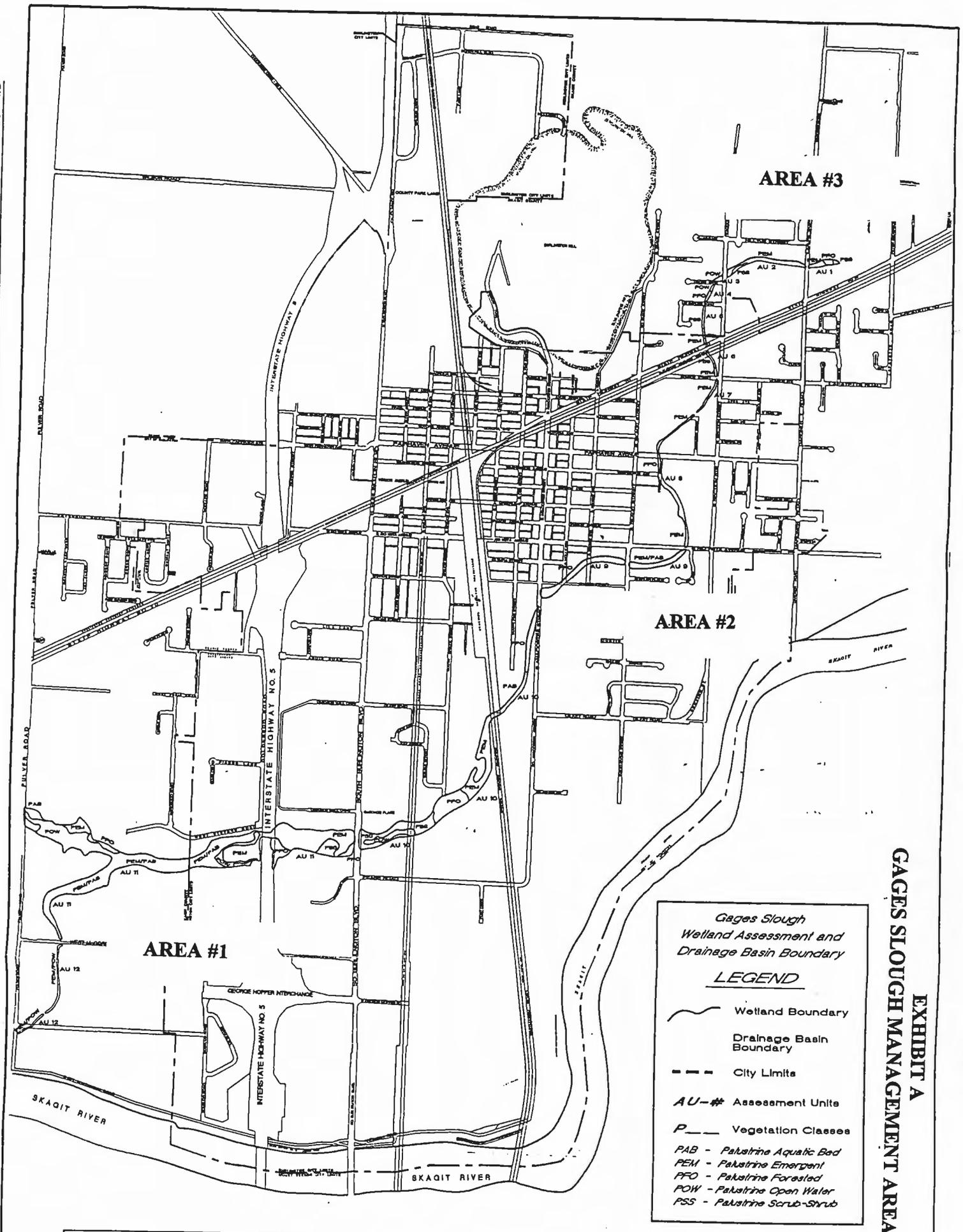
**IMPLEMENTATION PLAN** - The goal of a new Interlocal Agreement is to address all the Gages Slough Management Plan components that are located outside the City Limits, both east and west of town.

The intent is to promote best management practices in the mixed residential, commercial and agricultural area. A specific target will be means to fund fencing out livestock or limit access to watering locations, and septic system management, since there is no sanitary sewer service available in this area.

The consultant report found serious culvert maintenance problems in the Urban Growth Area east of Burlington, which need to be addressed in the Interlocal Agreement, whether the County does the work or contracts with the City for assistance. An additional issue is to work with the County to improve the quality of road runoff that enters the wetlands.

The City will work closely with Skagit County to encourage them to take a pro-active approach to improving the quality of the Gages Slough wetlands. If possible, the County's Critical Areas Ordinance will be used as a tool to encourage creating buffer areas and managing upland uses that drain into the wetlands.





*Gages Slough  
Wetland Assessment and  
Drainage Basin Boundary*

**LEGEND**

- Wetland Boundary
- Drainage Basin Boundary
- City Limits
- AU-#** Assessment Units
- P-#** Vegetation Classes
- PAB** - Palustrine Aquatic Bed
- PEM** - Palustrine Emergent
- PFO** - Palustrine Forested
- POW** - Palustrine Open Water
- PSS** - Palustrine Scrub-Shrub

**EXHIBIT A  
GAGES SLOUGH MANAGEMENT AREAS**

**CITY OF BURLINGTON  
WETLAND BOUNDARY MAP**

CITY OF BURLINGTON  
ENGINEERING DIVISION  
DATE: 11/18/98  
PROJECT: GAGES SLOUGH WETLANDS STUDY  
DRAWN BY: [Name]  
CHECKED BY: [Name]  
CITY OF BURLINGTON GIS MAPPING



## MEMORANDUM

**DATE:** 11 June 1999

**TO:** Margaret Fleek

**FROM:** Marcia Fischer

*MF*

**SUBJECT:** Gages Slough Planting Plans

Enclosed are the typical planting suggestions for the four "settings" we discussed, plant lists for each setting excerpted from the Technical Report we did for you last November, weed management information for the two most prevalent and problematic weed species in and around the slough, plant installation guidelines, and the planting plan for the Section Street Park demonstration wetland and buffer planting.

It sounds as though you are going great guns with implementation of the recommendations in the Technical Report. I hope these items help you towards that aim. As I mentioned to you over the phone, we should talk about how you can best use the Section Street Plan if you want to display it in some sort of sign format at the park. I want to give you a chance to look at it first, so that you can see whether or not it will fit the bill for that purpose. I can easily do a color version for you, or add anything else you think would be informative with regard to a sign. I'll give you a call Monday or Tuesday and we can talk about it.

Thank you for choosing to work with us, and thanks again for your patience; I've enjoyed working on this project.

enclosures

# PLANTING GUIDELINES

## GENERAL GUIDELINES

The Pacific Northwest has a mild maritime climate, with wet winters and relatively warm dry summers. Installing plants in your landscape is best done when the climate is least stressful for the plant, and when the plant is best able to cope with transplanting shock. In this locale, planting when plants are dormant (roughly October-March) is generally the most successful strategy for a number of reasons:

- ◆ cooler moister weather reduces drying out (desiccation) of plant and associated stress
- ◆ deciduous plants are leafless, which reduces desiccation and immediate moisture needs
- ◆ plants have the opportunity to develop root systems during dormancy and as they come out of dormancy that can supply them with the necessary moisture and soil nutrients before they come into leaf and flower
- ◆ the need for supplemental watering is reduced so plants are not as dependent on care from you to survive the first and most difficult year after planting
- ◆ other plants that might compete with the new plantings are also dormant which gives new plantings a chance to become adapted to the site before new growth occurs in surrounding plants

As you choose the species for your landscape, pay attention to the growing conditions on your site, and at different locations within the site. How much moisture does the soil have? How much sun does the site receive? Is it relatively cool morning sun, or hotter and more intense afternoon sun. Are there existing plants that create cool shade on your site that would be favorable for shade tolerant species? Consult the plant list information sheets for more information about the growing requirements of each species, as well as their wildlife features. Consider the ultimate size and shape of the plant, and make sure you are locating it in a place where it will have room to grow as tall and wide as it needs to. This will greatly reduce maintenance requirements such as on-going pruning, and will result in healthier, better looking plants too.

## TREE PLANTING

Trees should be planted as shown in the diagram below with the plant pit at least twice as deep and wide as the rootball of the plant. Topdressing with 3-4" of organic mulch helps keep in soil moisture, keeps the soil cooler, and reduces competition from weeds. If you are trying to achieve a naturalistic look, consider how the species grows in nature when you are determining the spacing and distribution of your trees. Alder and quaking aspen, for example, are usually in groves with individual trees close to each other (2-4' apart). Red cedars and hemlocks tend to have more distance between them (6-12' apart).

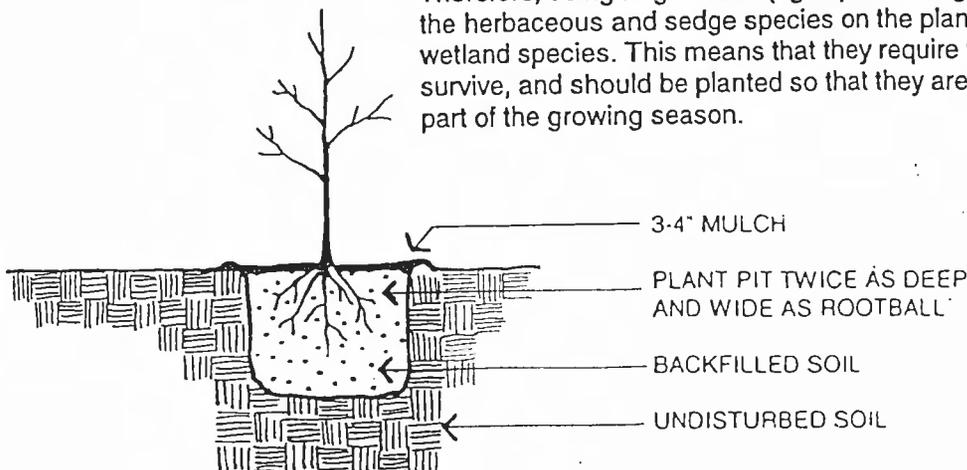
## SHRUB PLANTING

Shrubs should also be planted as shown in the diagram below with the plant pit at least twice as deep and wide as the rootball of the plant. Topdressing with 3-4" of organic mulch helps keep in soil moisture, keeps the soil cooler, and reduces competition from weeds. If you are trying to achieve a naturalistic look, consider how the species grows in nature when you are determining the spacing and distribution of the shrubs you choose. Wild rose and snowberry grow in dense mixed thickets, whereas species such as black twinberry and red elderberry are usually found as more isolated individuals in a landscape.

## HERBACEOUS AND SEDGE PLANTING

Wetland herbaceous and sedge species are often planted as "plugs", which are very small starts that are generally used when planting large areas. Waterfowl predation can be a big problem with these small seedlings. Therefore, using larger sizes (1 gal. pot and bigger) is recommended. All of the herbaceous and sedge species on the plant list are so-called "obligate" wetland species. This means that they require wet growing conditions to survive, and should be planted so that they are in saturated soils for a good part of the growing season.

## PLANTING DETAIL



# WEED MANAGEMENT INFORMATION SHEET

## **HIMALAYAN BLACKBERRY - *Rubus procerus***

Himalayan blackberry is an introduced species that has widely naturalized and is commonly found in disturbed areas and along streams and wetlands. This is a pioneering species, meaning it is one of the first to colonize and establish in a disturbed site. Himalayan blackberry is intolerant of deep shade. It forms thorny, tangled thickets which provide cover for wildlife, and bears fruits and flowers used by numerous wildlife species, birds, and insects. Despite these positive wildlife attributes, the aggressive nature of this plant and its tendency to form dense monocultures that eliminate other species make it an undesirable plant in a landscape context where plant communities made up of numerous species forming a more complex and diverse habitat are preferred.

Any proposed stream corridor restoration efforts along Gages Slough that contain Himalayan blackberry should include consideration of the weed management that will be necessary to make the project a success. Manual control of this plant usually takes the form of:

- 1) repeated cutting of stems at the ground to reduce plant vigor;
- and/or
- 2) removal of the entire plant including all of the roots (springtime is best).

Depending on the extent of coverage, either one of these methods may be more appropriate. If, for example, you are dealing with a dense thicket, repeated mowing may be a more feasible approach than handpulling or grubbing out the entire plant. Regardless of the approach, follow-up maintenance will be necessary – one eradication effort will not be enough. Foliar spraying of plants with herbicides is not very effective and is not recommended.

Areas that are to be planted with native species should be prepared by removing all invasive plants, including Himalayan blackberry prior to planting. Blackberry roots should be grubbed out and all plant parts should be disposed of off-site as resprouting from roots, shoots, and stems can occur. Management of new blackberry growth should continue for 1-5 years as needed so that plantings can become established. Plantings should be closely spaced to encourage accelerated formation of a canopy that can help control blackberry by casting shade.

# BLACKBERRIES

not so organic

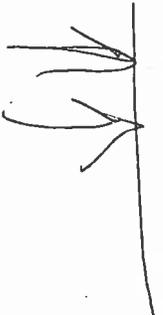
Bittersweet nightshade (*Solanum dulcamara*) and holly are also present in the northwestern section of the enhancement area, and should be removed.

The as-built site visit took place in the winter, and therefore we were unable to determine if the detention pond had been seeded at that time. It appears that if the detention pond was seeded, all plants have died. During the winter site visit, more water was observed in the pond than anticipated, and species to be installed in this area have been re-evaluated. The pond should be re-planted with species indicated in Table 1 below.

At the time of the site visit, the eastern half and the northwestern section of the enhancement areas were nearly weedy free, with exception of a few localized areas of weeds, and mulch was in good condition. However, the southwestern section of the enhancement area is overgrown with weeds and mulch appears thin in this area. Mulch is intended to help retain soil moisture, reduce fine sediment erosion, and discourage growth of weedy species, and should therefore be maintained at a depth of three to four inches throughout the enhancement areas.

In summary, the project appears well executed. In order to ensure project success the following maintenance practices are recommended on the site:

- Installation of plants as specified in Table 1 below, to ensure the project meets the performance standards as defined in the original mitigation plan of 100% survival of plant material during the first year. Trees and shrubs shall be planted in the fall/winter of 2005. Herbaceous material to be installed in the detention pond shall be installed in spring of 2006, and NES shall be contacted at that time to determine placement of herbaceous material;
- Continued removal of Himalayan blackberry, and removal of bittersweet nightshade and holly within the enhancement areas. Removal of blackberry will be aggressively managed by hand removal (pulling and cutting) and chemical treatment as necessary. Chemical treatment will be as follows: stems will be cut to within two inches of the ground late in the growing season (September to early October). Rodeo® shall be applied (25% solution with a sponge or similar applicator) manually to each stem immediately after the stem is cut. This treatment shall be applied in successive years to keep invasion of blackberry under control;
- Removal of weedy herbaceous material sprouting within a three foot radius of each installed plant, with particular attention to the southwest corner of the enhancement area. Weed removal shall be in the form of mechanical removal (hand pulling or cutting). Weeds should be cut to the ground 2 to 3 times during the growing season to ensure success of planted material;



# WEED MANAGEMENT INFORMATION SHEET

## **REED CANARYGRASS - *Phalaris arundinacea***

Reed canarygrass is a long-lived cool season perennial grass. It is an aggressive species, growing in dense stands along streams and wetlands or other moist, disturbed areas. It can grow up to 6' tall, and its roots form thick mats underground. Reed canarygrass is shade-intolerant, and also cannot typically withstand prolonged periods (e.g. an entire growing season) of inundation by water.

Ecologically speaking, reed canarygrass is not a particularly desirable species because it limits biological and habitat diversity by outcompeting native plant species and forming monocultures that spread underground from the rhizomes or underground stems. Besides its fast growth rate, growth habit and height, as well as effective means of spreading, reed canarygrass also has a competitive advantage over many other grasses because it starts its growth very early in the late winter/early spring. This early growth gives it a big head start, which results in stems that can be as tall as 2 ft. by the time other species are just emerging. It is the extensive root system that provides the nutrients for the impressive growth aboveground.

Almost any restoration or establishment of a woody riparian corridor along Gages Slough will require some management of reed canarygrass to allow maximum growth and survival of plantings. A common strategy usually involves a combination of:

- 1) reducing the vigor of existing plants so that new plantings can establish and successfully compete;
- and**
- 2) actually removing or killing reed canarygrass in particularly problematic areas.

Reducing the vigor of existing plants is done by depleting the nutrient reserves in the root mass by repeated cutting or suppression of the aboveground portions of the plant so that they cannot produce energy. Following is a protocol that should help your new plants become established:

1. Early in the growing season prior to fall planting, as soon as you notice new reed canarygrass growth in the spring, mow the grass short and try to keep it short (<6") throughout the spring and summer.
2. After planting trees and shrubs in the fall, cover the top of the plant pit with 2-4" of organic mulch or a sheet mulch to reduce regrowth of weeds. In some cases where grass is particularly dense, it is advisable to clear a 2-3' diameter circle immediately surrounding each new planting by removing the grass including the below-ground root mass prior to planting, and subsequently mulching with an organic material or synthetic sheet mulch after plant installation to eliminate light to the plant.
3. Keep grass low in a 2-3' diameter circle around each new planting throughout growing season in first and subsequent years as needed. Re-applying mulch may also be necessary. Mowing or use of weed whips should be avoided around new plants, as they are easily damaged. Use hand tools such as a hand scythe, hand shears or clippers rather than motorized mowers.

Once new plantings have become established and are creating some kind of a shade canopy over the ground, reed canarygrass usually becomes less problematic and aggressive. Keys to success are:

- 1) regular vigilance and management early on in the project (years 1-3);
- and**
- 2) installation of appropriate plants, including conifers, at fairly high densities so that they will thrive and rapidly form a canopy that will shade out the grass and provide long-term control.

## PLANT LIST FOR DRY SHADY WETLAND BUFFER AREAS

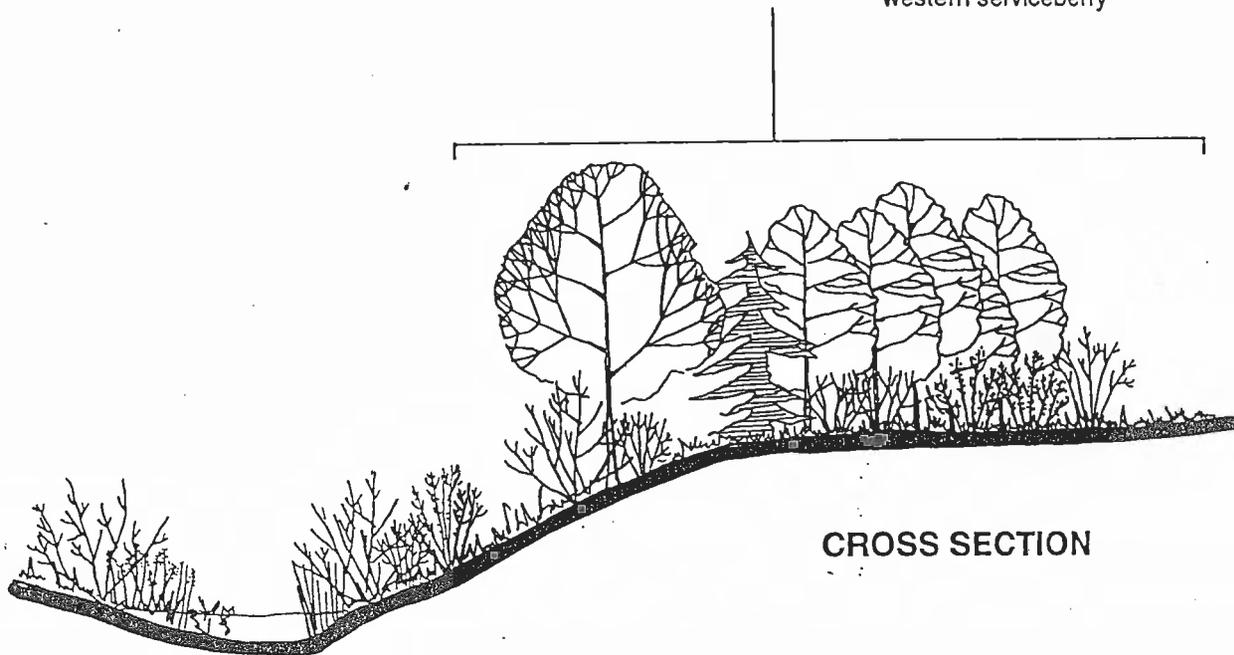
Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
<b>TREES</b>			
big-leaf maple	<i>Acer macrophyllum</i>	SPACING: 10-15'; very large, attractive tree; dry to moist sites, half to full sun	good for shade and nesting birds; fruits are food source for birds and small mammals
Douglas fir	<i>Pseudotsuga menziesii</i>	SPACING: 10-15'; OK in full sun; grows best in dry soils	predatory bird roosts; nesting bird habitat, good for cavity nesting birds and small mammals
grand fir	<i>Abies grandis</i>	SPACING: 10-15'; attractive, ordered appearance to branches; dry soils, OK in full sun	nesting birds and small mammals
red alder	<i>Alnus rubra</i>	SPACING: 4-6'; full sun, grows well in most soil conditions, esp. in moist soils, fast-growing, fixes nitrogen in soils; grows well in disturbed sites and wetland margins	good habitat for cavity-nesting birds and mammals
western hemlock	<i>Tsuga heterophylla</i>	SPACING: 10-15'; grows best in shade and moist to well-drained soils	winter forage for deer and small mammals
<b>SHRUBS</b>			
baldhip rose	<i>Rosa gymnocarpa</i>	SPACING: 2-4'; low to medium height, spindly growth, attractive flowers, dry to moist soils, tolerates sun or shade	hips eaten by birds
beaked hazelnut	<i>Corylus cornuta</i>	SPACING: 4-6'; tall, attractive open shrub; well-drained soils; attracts birds to area	nuts valuable for birds and small mammals; twigs and leaves browsed by deer; good nesting for perching birds
indian plum (osoberry)	<i>Oemleria cerasiformis</i>	SPACING: 3-5'; tall, open, attractive shrub; dry to moist soils; best in nutrient-rich soils; somewhat shade tolerant	fruits eaten by birds; nesting habitat for perching birds
Nootka rose	<i>Rosa nutkana</i>	SPACING: 2-4'; low to medium-height, dense shrub with attractive flowers; dry to moist soils; tolerates sun or shade	hips eaten by birds
red elderberry	<i>Sambucus racemosa</i>	SPACING: 4-6'; tall shrub with attractive racemes of small red berries; dry to moist soils; full sun to part shade	fruits important to many bird and mammal species; foliage and twigs eaten by deer
red flowering currant	<i>Ribes sanguineum</i>	SPACING: 3-5'; low to medium height, early blooming with handsome red-pink flowers; dry to moist soils in sun or part shade	flowers attract hummingbirds in spring
salal	<i>Gaultheria shallon</i>	SPACING: 2'; low-growing, attractive evergreen shrub; moist to dry soils; can form dense thickets	fruits important for some birds; leaves, buds, twigs browsed by deer
snowberry	<i>Symphoricarpos albus</i>	SPACING: 2-4'; low shrub with attractive white fruits that persist well into winter; best in well-drained soils in openings in forest canopy	fruits important food source for variety of birds, esp. in winter; twigs and foliage are good browse for deer
western serviceberry	<i>Amelanchier alnifolia</i>	SPACING: 4-6'; tall, open shrub; moist to well-drained soils; grows well in rocky soils and disturbed sites	fruits valuable food source for many bird species; twigs and leaves good browse

# PLANTS FOR DRY SHADY WETLAND BUFFER AREAS

Choose from the following species:

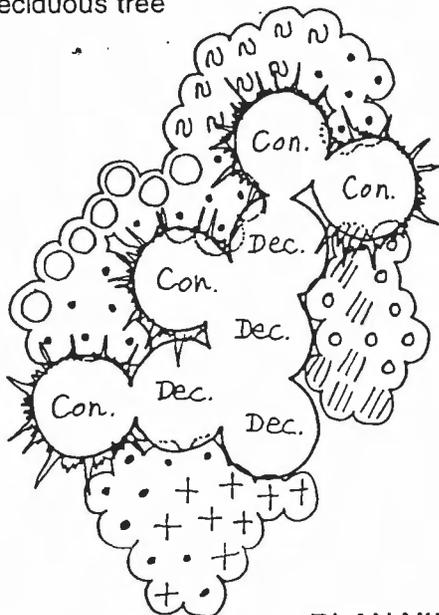
- TREES**
- bigleaf maple
  - Douglas fir
  - grand fir
  - red alder
  - western hemlock

- SHRUBS**
- baldhip rose
  - beaked hazelnut
  - indian plum (osoberry)
  - Nootka rose
  - red elderberry
  - red flowering currant
  - salal
  - snowberry
  - western serviceberry



**CROSS SECTION**

Con.= coniferous tree  
Dec.= deciduous tree



**PLAN VIEW (SCALE: 1"= 20')**

This plan view shows a typical assemblage of plants that you might install in your backyard adjacent to the slough. The most naturalistic planting scheme is one where plants of the same species are planted in clumps or groups with the plants in each group close together (2-4' apart for shrubs, 3-10' apart for trees depending on the species) and irregularly spaced. The symbols used do not represent any particular species, but intend to illustrate this clustering strategy, which mimics the drifts and groupings of plant species as they occur in nature. Consult the accompanying plant list and the cross section shown above to put plants in the right place with regard to soil moisture. Species that prefer moister soil regimes should be planted downslope towards the slough where moisture is greater. Likewise, plants that need drier growing conditions should be planted higher on the bank.

## PLANT LIST FOR DRY SUNNY WETLAND BUFFER AREAS

Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
<b>TREES</b>			
big-leaf maple	<i>Acer macrophyllum</i>	SPACING: 10-15'; very large, attractive tree; dry to moist sites, half to full sun	good for shade and nesting birds; fruits are food source for birds and small mammals
bitter cherry	<i>Prunus emarginata</i>	SPACING: 4-6'; medium-height tree with attractive flowers and fruits; moist soils, full sun (shade intolerant), shallow wetland margins	fruits good food source for birds; dead trunks decay resistant and good habitat for insects, amphibians and small mammals
Douglas fir	<i>Pseudotsuga menziesii</i>	SPACING: 10-15'; OK in full sun; grows best in dry soils	predatory bird roosts; nesting bird habitat, good for cavity nesting birds and small mammals
grand fir	<i>Abies grandis</i>	SPACING: 10-15'; attractive, ordered appearance to branches; dry soils, OK in full sun	nesting birds and small mammals
lodgepole pine (shore pine)	<i>Pinus contorta</i>	SPACING: 8-10'; tall, attractive pine; moist to well-drained soils, full sun	winter forage for small mammals
red alder	<i>Alnus rubra</i>	SPACING: 4-6'; full sun, grows well in most soil conditions, esp. in moist soils, fast-growing, fixes nitrogen in soils; grows well in disturbed sites and wetland margins	good habitat for cavity-nesting birds and mammals
western white pine	<i>Pinus monticola</i>	SPACING: 8-12'; familiar pine, commonly used in landscaping; dry, well-drained soils, does well in gravelly soils and full sun	seeds provide food source for small mammals
<b>SHRUBS</b>			
baldhip rose	<i>Rosa gymnocarpa</i>	SPACING: 2-4'; low to medium height, spindly growth, attractive flowers, dry to moist soils, tolerates sun or shade	hips eaten by birds
beaked hazelnut	<i>Corylus comuta</i>	SPACING: 4-6'; tall, attractive open shrub; well-drained soils; attracts birds to area	nuts valuable for birds and small mammals; twigs and leaves browsed by deer; good nesting for perching birds
Indian plum (osoberry)	<i>Oemleria cerasiformis</i>	SPACING: 3-5'; tall, open, attractive shrub; dry to moist soils; best in nutrient-rich soils; somewhat shade tolerant	fruits eaten by birds; nesting habitat for perching birds
red elderberry	<i>Sambucus racemosa</i>	SPACING: 4-6'; tall shrub with attractive racemes of small red berries; dry to moist soils; full sun to part shade	fruits important to many bird and mammal species; foliage and twigs eaten by deer
red flowering currant	<i>Ribes sanguineum</i>	SPACING: 3-5'; low to medium height, early blooming with handsome red-pink flowers; dry to moist soils in sun or part shade	flowers attract hummingbirds in spring
snowberry	<i>Symphoricarpos albus</i>	SPACING: 2-4'; low shrub with attractive white fruits that persist well into winter; best in well-drained soils in openings in forest canopy	fruits important food source for variety of birds, esp. in winter; twigs and foliage are good browse for deer
western serviceberry	<i>Amelanchier alnifolia</i>	SPACING: 4-6'; tall, open shrub; moist to well-drained soils; grows well in rocky soils and disturbed sites	fruits valuable food source for many bird species; twigs and leaves good browse

# PLANTS FOR DRY SUNNY WETLAND BUFFER AREAS

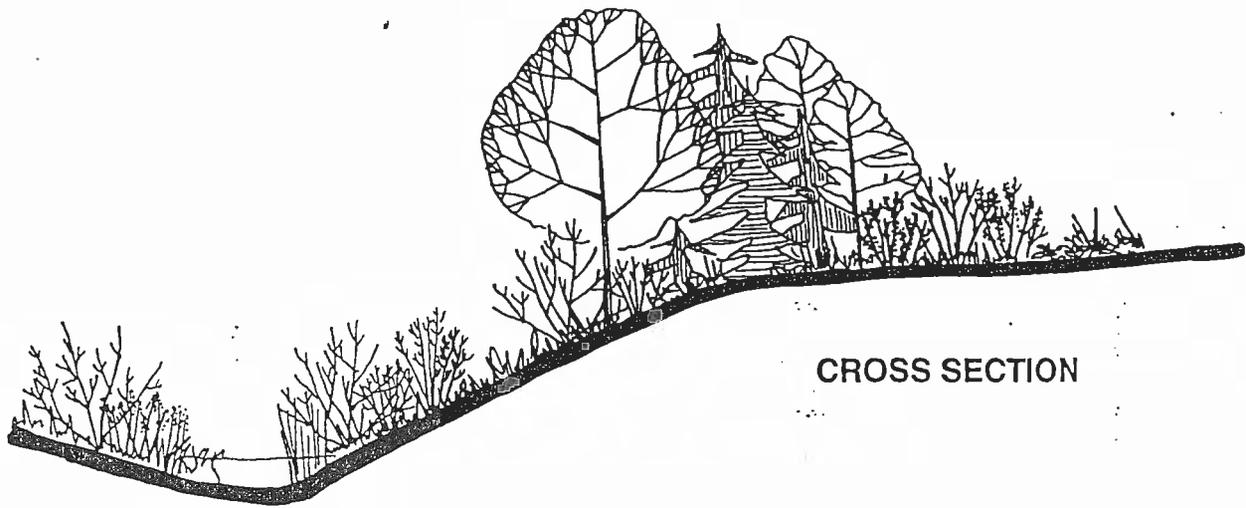
Choose from the following plants:

## TREES

bigleaf maple  
bitter cherry  
Douglas fir  
grand fir  
lodgepole pine (shore pine)  
red alder  
western white pine

## SHRUBS

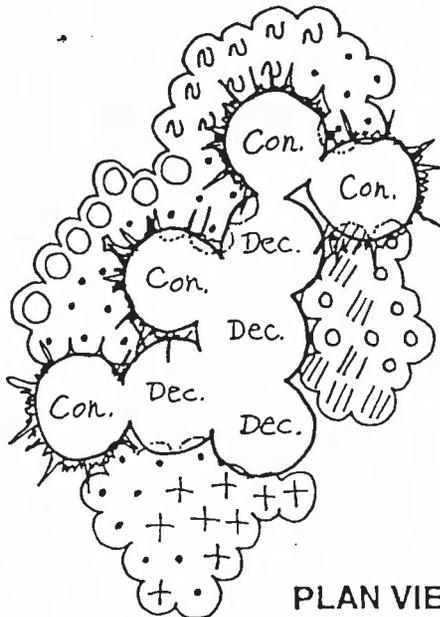
baldhip rose  
beaked hazelnut  
Indian plum (osoberry)  
red elderberry  
red flowering currant  
snowberry  
western serviceberry



**CROSS SECTION**

Con.= coniferous tree

Dec.= deciduous tree



**PLAN VIEW (SCALE: 1" = 20')**

This plan view shows a typical assemblage of plants that you might install in your backyard adjacent to the slough. The most naturalistic planting scheme is one where plants of the same species are planted in clumps or groups with the plants in each group close together (2-4' apart for shrubs, 3-10' apart for trees depending on the species) and irregularly spaced. The symbols used do not represent any particular species, but intend to illustrate this clustering strategy, which mimics the drifts and groupings of plant species as they occur in nature. Consult the accompanying plant list and the cross section shown above to put plants in the right place with regard to soil moisture. Species that prefer moister soil regimes should be planted downslope towards the slough where moisture is greater. Likewise, plants that need drier growing conditions should be planted higher on the bank.

## PLANT LIST FOR WET SHADY WETLAND MARGINS

Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
<b>TREES</b>			
black cottonwood	<i>Populus balsamifera</i>	SPACING: 5-10'; moist to well-drained soils, full sun, fast-growing, wetland margins	good for nesting birds
Pacific willow	<i>Salix lucida</i>	SPACING: 4-6'; moist to saturated soils; grows well from live stakes - commonly available already in Gages Slough	good shade tree
red alder	<i>Alnus rubra</i>	SPACING: 4-6'; full sun, grows well in most soil conditions, esp. in moist soils, fast-growing, fixes nitrogen in soils; grows well in disturbed sites and wetland margins	good habitat for cavity-nesting birds and mammals
Scouler willow	<i>Salix scouleriana</i>	SPACING: 4-6'; moist to saturated soils, intolerant of standing water; shade tolerant; fast-growing	good shade tree
Sitka spruce	<i>Picea sitchensis</i>	SPACING: 10-15'; appealing bluish color to branches; grows well in moist soils, wetland margins	predatory bird roosts; new shoots good forage for deer
western red cedar	<i>Thuja plicata</i>	SPACING: 10-15'; beautiful tree with graceful branches; plant only in full to half shade (sun intolerant); best in moist to saturated soils, wetland margins	snags important habitat for cavity nesting birds; stumps habitat for small mammals
<b>SHRUBS</b>			
baldhip rose	<i>Rosa gymnocarpa</i>	SPACING: 2-4'; low to medium height, spindly growth, attractive flowers, dry to moist soils, tolerates sun or shade	hips eaten by birds
black twinberry (twinberry honeysuckle)	<i>Lonicera involucrata</i>	SPACING: 3-5'; medium-height, graceful shrub; moist soils	deer browse twigs and leaves; berries eaten by birds; bark used as nesting material by birds and small mammals
black currant (stink currant)	<i>Ribes bracteosum</i>	SPACING: 2-4'; low to medium-height, straggly shrub; tolerates periodic saturation; best in partial shade	fruits and foliage eaten by birds and small mammals
Nootka rose	<i>Rosa nutkana</i>	SPACING: 2-4'; low to medium-height, dense shrub with attractive flowers; dry to moist soils; tolerates sun or shade	hips eaten by birds
Pacific ninebark	<i>Physocarpus capitatus</i>	SPACING: 3-5'; tall, attractive shrub; moist soils or short-term saturation; wetland margins; grows well in half-shade or sunny openings in canopy	twigs, buds, and foliage eaten by deer and small mammals
prickly currant (swamp gooseberry)	<i>Ribes lacustre</i>	SPACING: 2-4'; low to medium-height, straggly shrub; dry to moist soils; best in half-sun	fruits good forage for birds and small mammals
red elderberry	<i>Sambucus racemosa</i>	SPACING: 4-6'; tall shrub with attractive racemes of small red berries; dry to moist soils; full sun to part shade	fruits important to many bird and mammal species; foliage and twigs eaten by deer
red-osier dogwood	<i>Cornus sericea</i>	SPACING: 2-4'; medium-height; many thin stems; beautiful red bark persists through winter; moist to saturated soils	fruits, twigs and foliage valuable forage; good nesting habitat for perching birds

Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
salmonberry	<i>Rubus spectabilis</i>	SPACING: 2-4'; medium-height shrub with attractive berries; forms dense thickets; spreads easily by rhizome - somewhat invasive; moist to saturated soils; full sun to part shade	fruits important food source for birds and small mammals; early flowers good nectar source for insects and hummingbirds; leaves, twigs, and stems browsed by deer; thickets good nesting habitat for perching birds
Sitka willow	<i>Salix sitchensis</i>	SPACING: 3-6'; tall, multi-stemmed shrub; fast-growing; spreads easily by rhizome; moist to saturated soils; tolerant of periodic standing water and full sun; easy to establish by live stake, which are available from existing stands in Gages Slough	nesting habitat for perching birds
vine maple	<i>Acer circinatum</i>	SPACING: 3-6'; tall, open shrub; moist soils, no prolonged saturation; half to full sun; beautiful fall colors; commonly used in landscaping	nesting for small birds; twigs, buds, and seeds eaten by many birds and small mammals
western crabapple	<i>Malus fusca</i>	SPACING: 4-6'; shrub or small tree with many intertwined branches; moist to saturated soils; wetland margins	fruits good forage for birds; leaves, twigs, and buds browsed by deer; good dense habitat for nesting birds
<b>HERBACEOUS AND SEDGE SPECIES</b>			
beaked sedge	<i>Carex utriculata</i>	SPACING: 1-2'; emergent sedge; shallow standing water to 1 foot	
broadleaf arrowhead (wapato)	<i>Sagittaria latifolia</i>	SPACING: 1-2'; rooted aquatic with attractive white flowers; still or slow-moving water; reproduces by tubers and rhizomes	tubers eaten by waterfowl
hardstem bulrush	<i>Scirpus acutus</i>	SPACING: 1-2'; tall (to 8 feet) emergent sedge that forms dense stands; shallow standing water up to 3 feet deep	stems used by birds for nesting material and nesting habitat; seeds eaten by waterfowl
narrowleaf burreed	<i>Sparganium emersum</i>	SPACING: 1-2'; low-growing emergent with large, attractive fruits; shallow standing water to 3 feet deep	
slough sedge	<i>Carex obnupta</i>	SPACING: 1-2'; emergent sedge; spreads to forming extensive stands; saturated to shallow standing water to 1 foot	
water-parsley	<i>Oenanthe sarmentosa</i>	SPACING: 1-2'; low-growing, mat-forming rooted semi-aquatic; constant saturation or standing water; partial to full shade; replants easily, spreads well, useful in settling sediment	toxic to wildlife but not problematic
wooly sedge	<i>Scirpus atrocinctus</i>	SPACING: 1-2'; tall emergent in dense tufts; attractive flowering heads with wooly appearance; tolerates shallow inundation to 1 foot	good food source for waterfowl; leaves used by waterfowl for nesting material

# PLANTS FOR WET SHADY WETLAND MARGINS

Choose from the following species:

## TRANSITIONAL WET TO MOIST

Pacific ninebark  
Pacific willow  
Sitka willow  
western crabapple

## MOIST TO DRY

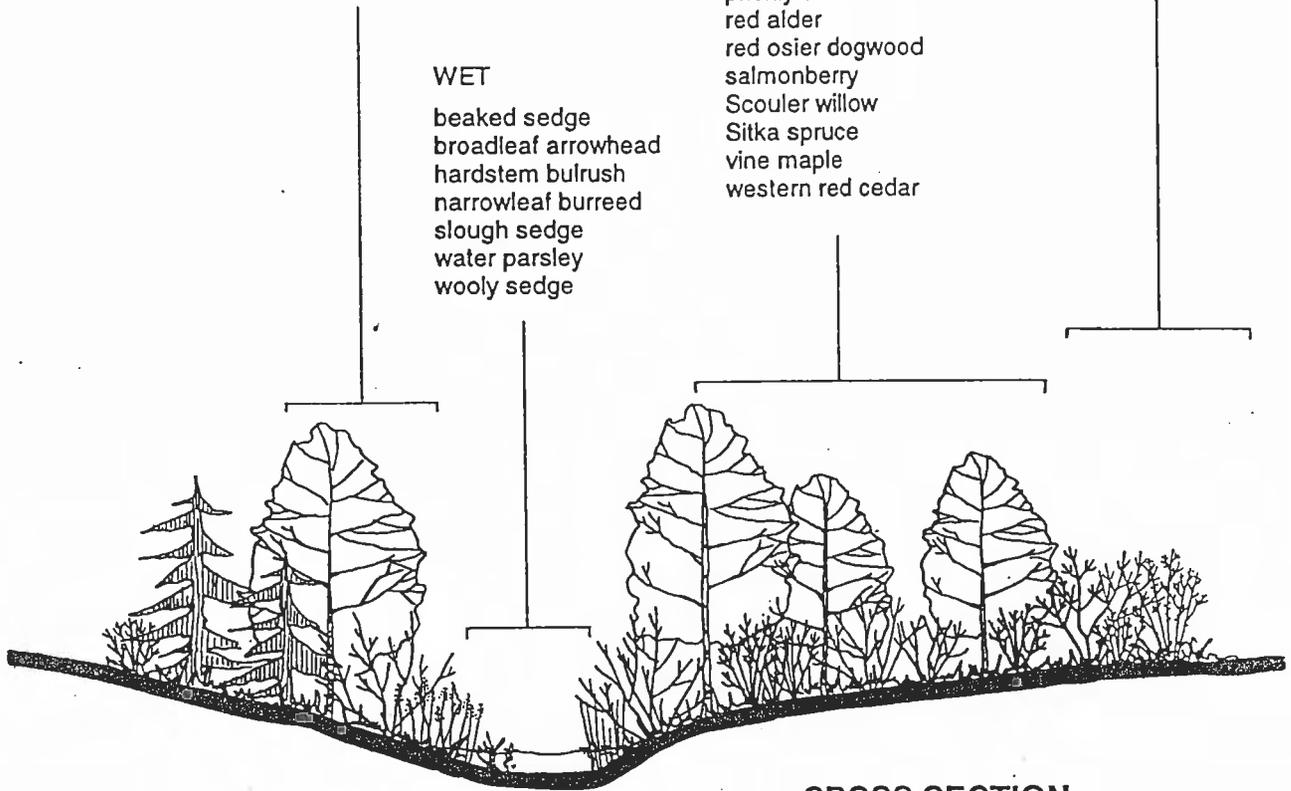
black cottonwood  
black currant  
black twinberry  
Pacific willow  
prickly currant  
red alder  
red osier dogwood  
salmonberry  
Scouler willow  
Sitka spruce  
vine maple  
western red cedar

## DRY

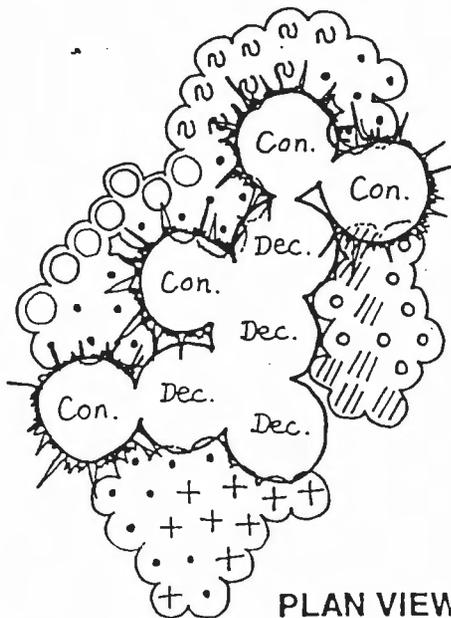
baldhip rose  
red elderberry

## WET

beaked sedge  
broadleaf arrowhead  
hardstem bulrush  
narrowleaf burreed  
slough sedge  
water parsley  
wooly sedge



Con.= coniferous tree  
Dec.= deciduous tree



This plan view shows a typical assemblage of plants that you might install in your backyard adjacent to the slough. The most naturalistic planting scheme is one where plants of the same species are planted in clumps or groups with the plants in each group close together (2-4' apart for shrubs, 3-10' apart for trees depending on the species) and irregularly spaced. The symbols used do not represent any particular species, but intend to illustrate this clustering strategy, which mimics the drifts and groupings of plant species as they occur in nature. Consult the accompanying plant list and the cross section shown above to put plants in the right place with regard to soil moisture. Species that prefer moister soil regimes should be planted downslope towards the slough where moisture is greater. Likewise, plants that need drier growing conditions should be planted higher on the bank.

## PLANT LIST FOR WET SUNNY WETLAND MARGINS

Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
<b>TREES</b>			
black cottonwood	<i>Populus balsamifera</i>	SPACING: 5-10'; moist to well-drained soils, full sun, fast-growing, wetland margins	good for nesting birds
lodgepole pine (shore pine)	<i>Pinus contorta</i>	SPACING: 8-12'; tall, attractive pine; moist to well-drained soils, full sun	winter forage for small mammals
Oregon ash	<i>Fraxinus latifolia</i>	SPACING: 6-10'; moist to saturated soils; wetland margins	good for nesting birds
Pacific willow	<i>Salix lucida</i>	SPACING: 4-6'; moist to saturated soils; grows well from live stakes - commonly available already in Gages Slough	good shade tree
quaking aspen	<i>Populus tremuloides</i>	SPACING: 3-6'; attractive tree with characteristic quaking of leaves in wind; saturated to dry soils, full sun, fast-growing, spreads easily by rhizome; wetland margins; don't plant near water lines	buds and bark good food source for large and small mammals, some birds
red alder	<i>Alnus rubra</i>	SPACING: 4-6'; full sun, grows well in most soil conditions, esp. in moist soils, fast-growing, fixes nitrogen in soils; grows well in disturbed sites and wetland margins	good habitat for cavity-nesting birds and mammals
Scouler willow	<i>Salix scouleriana</i>	SPACING: 4-6'; moist to saturated soils, intolerant of standing water; shade tolerant; fast-growing	good shade tree
<b>SHRUBS</b>			
baldhip rose	<i>Rosa gymnocarpa</i>	SPACING: 2-4'; low to medium height, spindly growth, attractive flowers, dry to moist soils, tolerates sun or shade	hips eaten by birds
black twinberry (twinberry honeysuckle)	<i>Lonicera involucrata</i>	SPACING: 3-5'; medium-height, graceful shrub; moist soils	deer browse twigs and leaves; berries eaten by birds; bark used as nesting material by birds and small mammals
Nootka rose	<i>Rosa nutkana</i>	SPACING: 2-4'; low to medium-height, dense shrub with attractive flowers; dry to moist soils; tolerates sun or shade	hips eaten by birds
red elderberry	<i>Sambucus racemosa</i>	SPACING: 4-6'; tall shrub with attractive racemes of small red berries; dry to moist soils; full sun to part shade	fruits important to many bird and mammal species; foliage and twigs eaten by deer
red-osier dogwood	<i>Cornus sericea</i>	SPACING: 2-4'; medium-height; many thin stems; beautiful red bark persists through winter; moist to saturated soils	fruits, twigs and foliage valuable forage; good nesting habitat for perching birds
salmonberry	<i>Rubus spectabilis</i>	SPACING: 2-4'; medium-height shrub with attractive berries; forms dense thickets; spreads easily by rhizome - somewhat invasive; moist to saturated soils; full sun to part shade	fruits important food source for birds and small mammals; early flowers good nectar source for insects and hummingbirds; leaves, twigs, and stems browsed by deer; thickets good nesting habitat for perching birds

Common Name	Scientific Name	Planting Notes	Noted Wildlife Features
Sitka willow	<i>Salix sitchensis</i>	SPACING: 3-8'; tall, multi-stemmed shrub; fast-growing; spreads easily by rhizome; moist to saturated soils; tolerant of periodic standing water and full sun; easy to establish by live stake, which are available from existing stands in Gages Slough	nesting habitat for perching birds
spirea (hardhack)	<i>Spirea douglasii</i>	SPACING: 2-4'; low to medium height, leggy shrub; thicket-forming; spikes of wooly pink flowers	thickets provide cover for perching birds
thimbleberry	<i>Rubus parviflorus</i>	SPACING: 2-4'; low to medium-height, dense shrub with bright red berries; moist to dry soils; full sun	fruits important food source for birds and mammals; deer eat leaves and twigs; dense thickets good for cover and nesting
vine maple	<i>Acer circinatum</i>	SPACING: 3-6'; tall, open shrub; moist soils, no prolonged saturation; half to full sun; beautiful fall colors; commonly used in landscaping	nesting for small birds; twigs, buds, and seeds eaten by many birds and small mammals
<b>HERBACEOUS AND SEDGE SPECIES</b>			
beaked sedge	<i>Carex utriculata</i>	SPACING: 1-2'; emergent sedge; shallow standing water to 1 foot	
broadleaf arrowhead (wapato)	<i>Sagittaria latifolia</i>	SPACING: 1-2'; rooted aquatic with attractive white flowers; still or slow-moving water; reproduces by tubers and rhizomes	tubers eaten by waterfowl
hardstem bulrush	<i>Scirpus acutus</i>	SPACING: 1-2'; tall (to 8 feet) emergent sedge that forms dense stands; shallow standing water up to 3 feet deep	stems used by birds for nesting material and nesting habitat; seeds eaten by waterfowl
narrowleaf burreed	<i>Sparganium emersum</i>	SPACING: 1-2'; low-growing emergent with large, attractive fruits; shallow standing water to 3 feet deep	
slough sedge	<i>Carex obnupta</i>	SPACING: 1-2'; emergent sedge; spreads to forming extensive stands; saturated to shallow standing water to 1 foot	
water-parsley	<i>Oenanthe sarmentosa</i>	SPACING: 1-2'; low-growing, mat-forming rooted semi-aquatic; constant saturation or standing water; partial to full shade; replants easily, spreads well, useful in settling sediment	toxic to wildlife but not problematic
wooly sedge	<i>Scirpus atrocinctus</i>	SPACING: 1-2'; tall emergent in dense tufts; attractive flowering heads with wooly appearance; tolerates shallow inundation to 1 foot	good food source for waterfowl; leaves used by waterfowl for nesting material

# PLANTS FOR WET SUNNY WETLAND MARGINS

Choose from the following species:

## TRANSITIONAL WET TO MOIST

Oregon ash  
Pacific willow  
Sitka willow  
spirea (hardhack)

## MOIST TO DRY

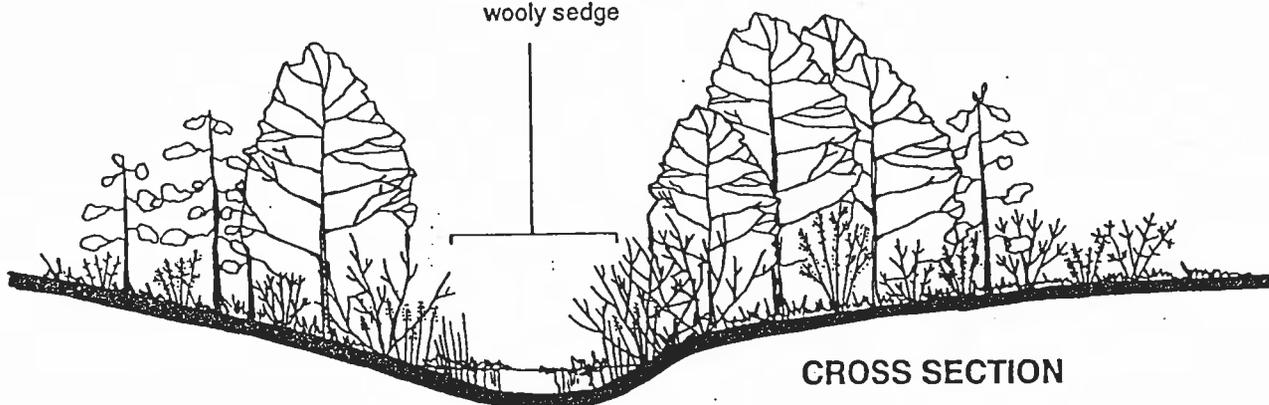
black twinberry  
black currant  
black cottonwood  
lodgepole pine  
Nootka rose  
quaking aspen  
red osier dogwood  
red alder  
salmonberry  
Scouler willow  
thimbleberry  
vine maple

## DRIER

baldhip rose  
red elderberry

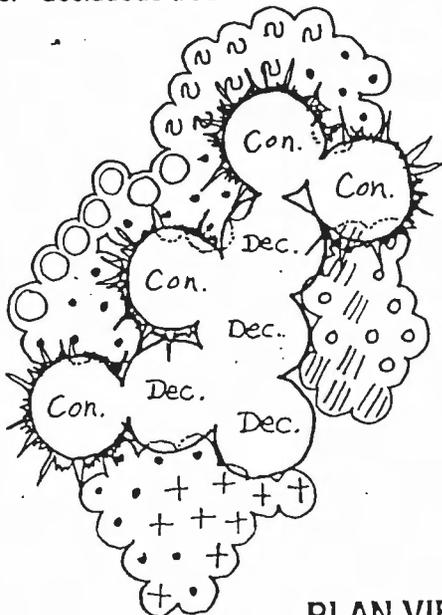
## WET

beaked sedge  
broadleaf arrowhead  
hardstem bulrush  
narrowleaf burreed  
slough sedge  
waterparsley  
wooly sedge



CROSS SECTION

Con.= coniferous tree  
Dec.= deciduous tree



PLAN VIEW (SCALE: 1"= 20')

This plan view shows a typical assemblage of plants that you might install in your backyard adjacent to the slough. The most naturalistic planting scheme is one where plants of the same species are planted in clumps or groups with the plants in each group close together (2-4' apart for shrubs, 3-10' apart for trees depending on the species) and irregularly spaced. The symbols used do not represent any particular species, but intend to illustrate this clustering strategy, which mimics the drifts and groupings of plant species as they occur in nature. Consult the accompanying plant list and the cross section shown above to put plants in the right place with regard to soil moisture. Species that prefer moister soil regimes should be planted downslope towards the slough where moisture is greater. Likewise, plants that need drier growing conditions should be planted higher on the bank.

# Technical Memorandum



10230 NE Points Drive  
Suite 400  
Kirkland, WA 98033  
Phone (425) 822-4446  
Fax (425) 827-9577

**To:** City of Burlington

**From:** Kevin O'Brien, Ph.D.  
Wildlife Biologist

**Copies:**

**Date:** August 31, 2006

**Subject:** Update for Gages Slough Wetlands Study Technical Report

**Project No.:** 30900

## Introduction

This memo is an update to a technical report, prepared by Sheldon & Associates, Inc. and dated November 18, 1998, characterizing wetlands associated with Gages Slough in the City of Burlington. The 1998 report was prepared under a Coastal Zone Management grant from the Washington State Department of Ecology, and provided an assessment of the wetland functions and water quality of Gages Slough. This memo updates the wetland characterizations and functional analyses provided in the 1998 report, based upon the original analyses conducted according to the Washington State Wetland Function Assessment Project, *Methods for Assessing Wetland Functions Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (Hruby et al. 1998).

## Slough Description

Gages Slough is located in the City of Burlington, in western Skagit County in Washington State. The slough originates east of the city limits, and is located in townships 34 and 35 north in ranges 3 and 4 east (Figure 1). The slough was originally an old meander channel or sub-channel of the Skagit River, and is currently isolated from the mainstem Skagit by a series of dikes. The slough originates at the north side of State Route 20 at a culvert leading from the north end of a forested wetland at Hart Island, and meanders through the City of Burlington, eventually discharging into the Skagit River approximately one mile west of Interstate 5, south of the intersection of Bennett and Pulver Roads. Gages Slough is considered a depressional flow-through wetland according to the hydrogeomorphic (HGM) classification system.

Gages Slough has a total length of approximately 7.3 miles, with 3.5 miles of that length occurring within the urban growth boundary for the City of Burlington. Water enters the slough from the Hart Island wetland during the rainy season, generally from November until May, and water also recharges the slough through a combination of hyporheic flow from the Skagit River, seeps and shallow groundwater, and as stormwater runoff from Burlington. Within the slough itself, water