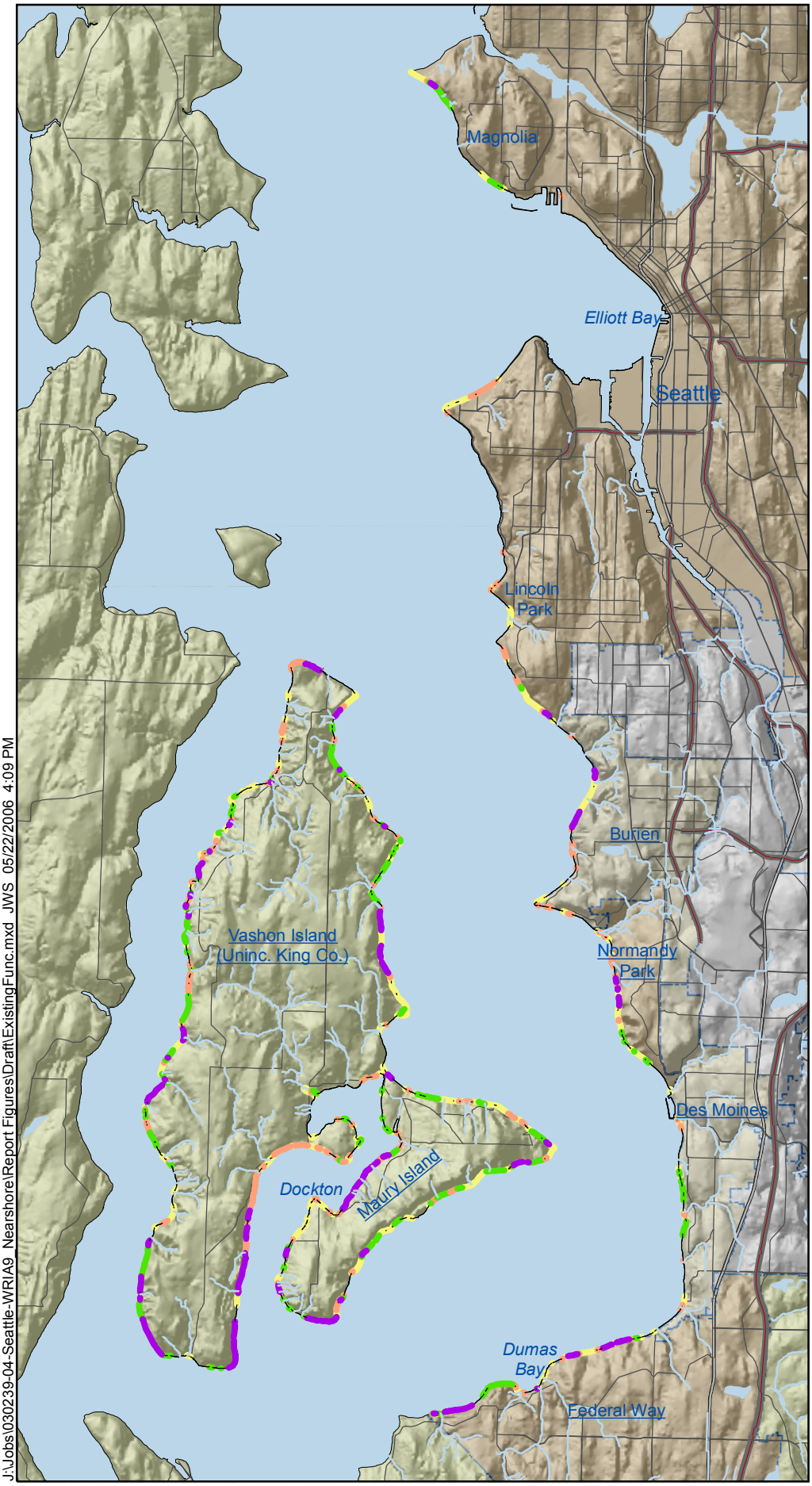
4 HABITAT FUNCTION MODEL RESULTS

The habitat function model was run using the methods described in Chapter 3, and model scores were produced that characterize current function, restoration potential, and rehabilitation potential. To evaluate these scores in the context of the project area, shoreline segments were assigned a percentile rank. A percentile rank is the proportion of scores in a distribution that a specific score is greater than or equal to. For instance, if a shoreline reach received a score of 95 out of a possible 100 and this score was greater than or equal to the scores of 88 percent of the reaches in the project area, then its percentile rank would be 88. Maps 3, 4, and 5 show miles of shoreline by percentile rank grouped in the following manner: 0 to 40 percent, 40 to 60 percent, 60 to 80 percent, 80 to 90 percent, and 90 to 100 percent.



LEGEND

Current Function

Percentile of Shoreline Length

- 90% - 100% High Function
- 80% - 90%
- 60% - 80%
- 40% - 60%
- 0% - 40% Low Function

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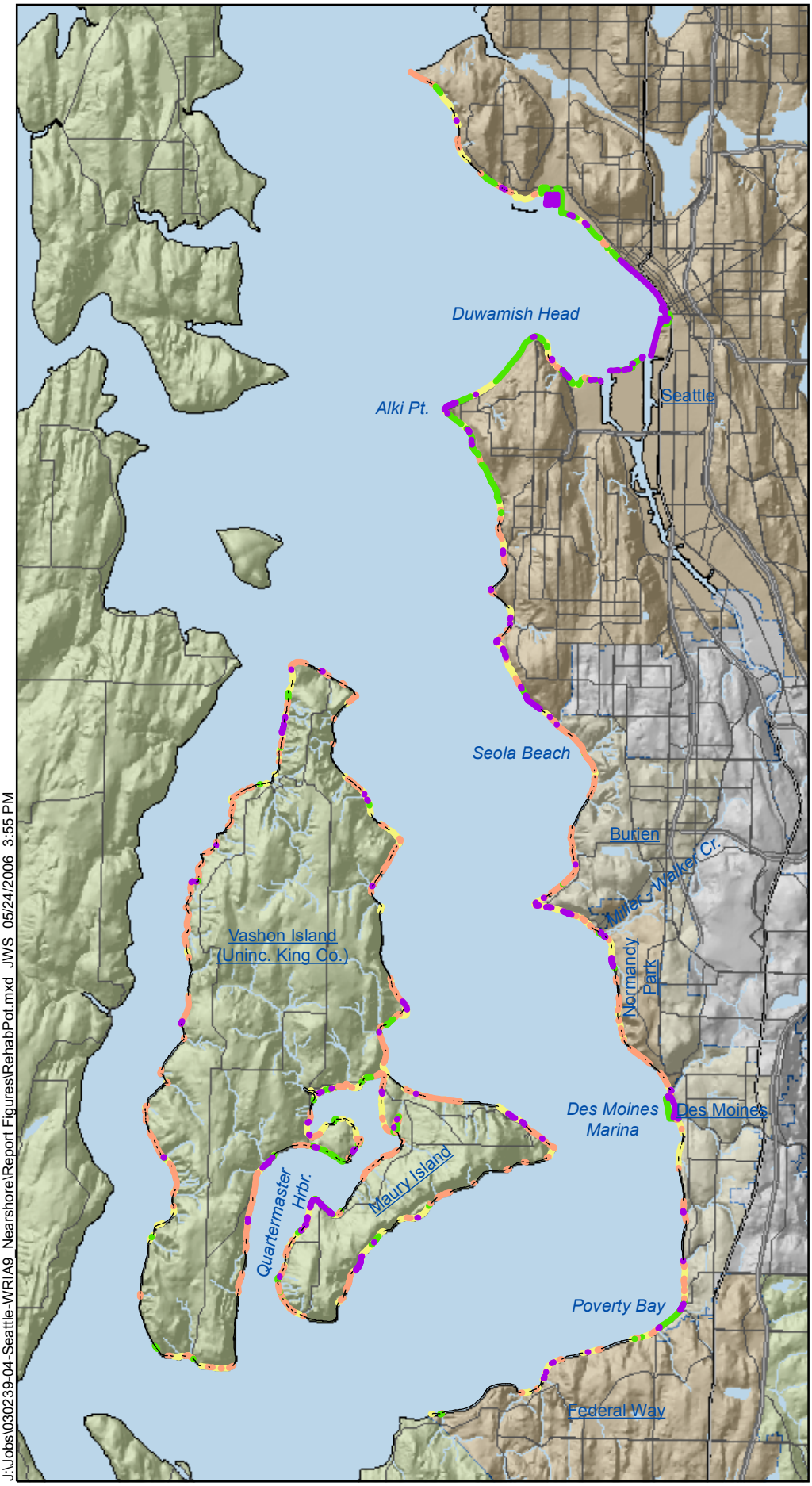
0 0.5 1 2
Scale in Miles

Map 3
Existing Habitat Function
Habitat Model Results
WRIA 9 Nearshore Habitat Assessment



LEGEND

Rehabilitation Potential

Percentile of Shoreline Length

- 90% - 100% High Potential
- 80% - 90%
- 60% - 80%
- 40% - 60%
- 0% - 40% Low Potential

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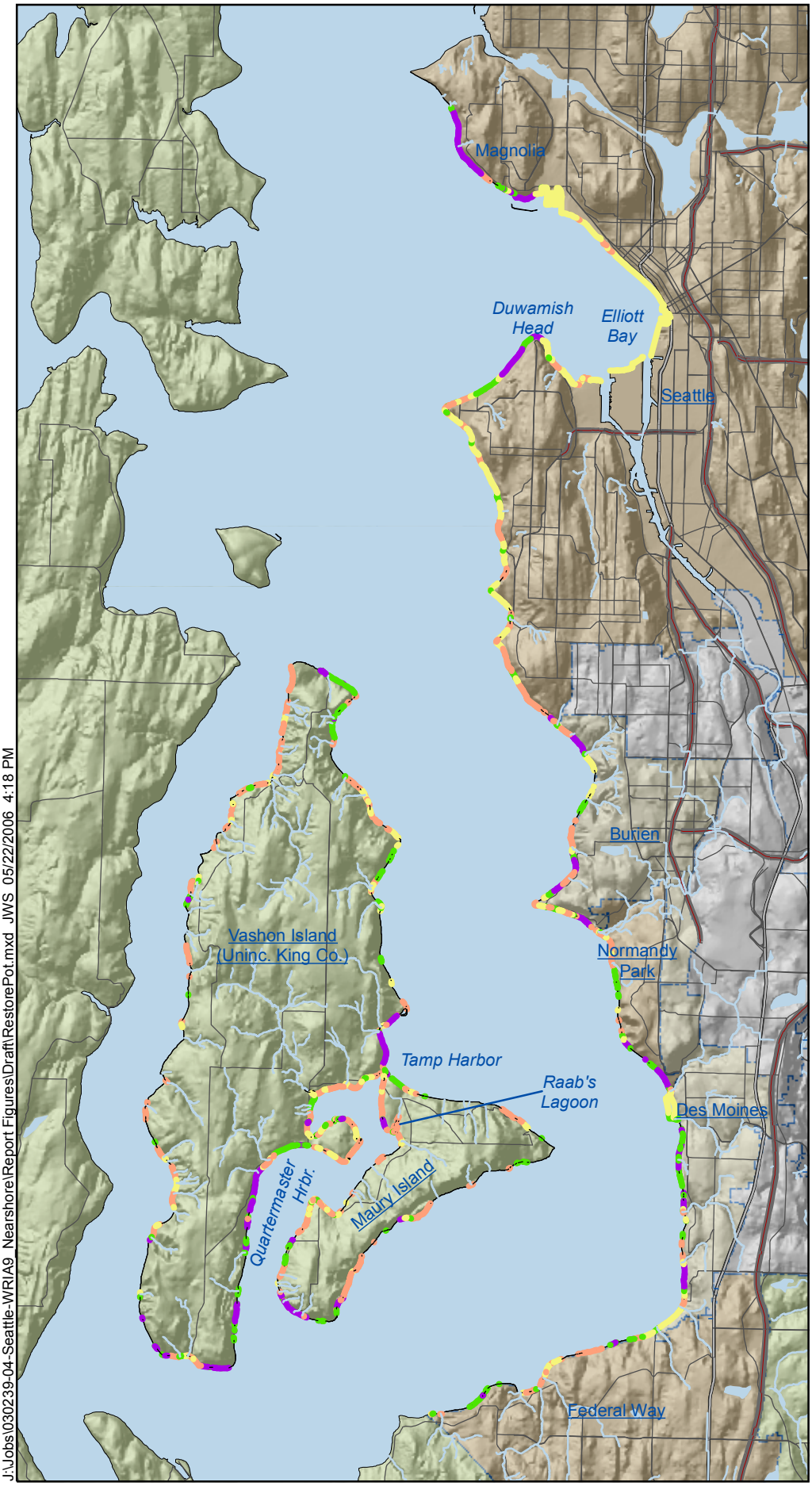
0 0.5 1 2
Scale in Miles

Map 4
Rehabilitation Potential
Identification of Priority Areas
WRIA 9 Nearshore Habitat Assessment



LEGEND

Restoration Potential

Percentile of Shoreline Length

- 90% - 100% High Potential
- 80% - 90%
- 60% - 80%
- 40% - 60%
- 0% - 40% Low Potential

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0 0.5 1 2
Scale in Miles

Map 5
Restoration Potential
Identification of Priority Areas
WRIA 9 Nearshore Habitat Assessment

4.1 Current Function

Model scores for current function mapped in this way indicated that the majority of highly functioning habitats and some of the longest continuous stretches of highly functioning habitat in the project area are on Vashon and Maury Islands (see Map 3). On Vashon Island, current function scored highest on the northeast shore, along the lower peninsula of the island, and along the north-central west shore of the island. On Maury Island, there was a concentration of high function reaches north of the point at Dockton.

Along the mainland shoreline, the highest functioning reaches were concentrated in the south, near Burien, Normandy Park, and surrounding Dumas Bay. The longest stretch of shoreline with low function was from just north of Lincoln Park to Magnolia, including Elliott Bay.

4.2 Rehabilitation Potential

Model scores for rehabilitation potential on the mainland were highest in the following areas: northeast Elliott Bay area, around Duwamish Head and Alki Point, near Seola Beach, near Miller/Walker Creeks in Normandy Park, at the Des Moines Marina, and at Poverty Bay (see Map 4). On Vashon and Maury Islands, the highest rehabilitation scores were on smaller sections interspersed throughout Quartermaster Harbor and along the southeast shore of Maury Island.

4.3 Restoration Potential

Scores for restoration potential on the mainland were highest near Magnolia, Duwamish Head, and scattered along the general stretch of shoreline between Burien and Des Moines (see Map 5). On Vashon Island, restoration potential scored highest near Tramp Harbor and from the southeast point north into Quartermaster Harbor. On Maury Island, high scores were located west of the south point and north of Raab's Lagoon. Restoration scores were moderate in Elliott Bay, although this was due largely to the fact that the scoring system did not include restoration of sediment delivery and transport because of the magnitude of alterations that have occurred in the bay. Elliott Bay offers high potential for substitution activities.

5 PRIORITY AREAS AND SUBAREA RECOMMENDATIONS

This section summarizes habitat conditions in the project area and discusses priority areas identified. Habitat descriptions are relatively brief because although the project collated habitat information within the entire project area, the primary purpose of collecting and refining this data was to support the effort to run the model. Also, an earlier report (Anchor 2004) summarized habitat conditions from photo interpretation and data compilation efforts. Thus, an exhaustive listing of project area conditions will not be included here; however, these data are available electronically in Appendix B in GIS format. Following the description of habitat needs in this chapter are the priority recommendations for habitat actions for the overall project area and within each of the subareas.

Note that some priority areas include entire drift cells or even multiple drift cells. Therefore, within an area identified as a priority for one habitat action there may be several additional opportunities for other habitat actions that are not identified at that scale. For example, a stretch of shoreline identified for conservation may contain sections where rehabilitation may be appropriate. Reflecting this, several of the priority areas contain a mix of prescriptions with the goal to provide an area of continuous, highly functioning habitat.

5.1 General Project Area Habitat Needs

5.1.1 Conservation

The WRIA 9 marine nearshore is heavily altered; however, there are areas that remain entirely or relatively intact. Conservation of these areas is of highest importance to prevent further degradation of nearshore habitat. Relatively intact stream mouths are often situated among more modified areas (e.g., Judd Creek on Vashon Island) and are the type of small-scale conservation opportunities that provide important functions and that can be greatly enhanced by also conducting restoration in adjacent shoreline areas. Stretches of largely unarmored shorelines with feeder bluffs in long drift cells are examples of larger conservation opportunities, particularly those contributing to an intact accretion shoreform, such as the lagoon at Point Heyer. In many of these extended areas that are priorities for conservation, a variety of restoration and rehabilitation opportunities may further improve habitat function.

5.1.2 Restoration

The majority of the project area shoreline lacks high quality feeding and refuge opportunities for juvenile salmon; therefore, one of the overall habitat needs and goals for the project area is to restore the processes and habitat features that provide these opportunities. In particular, restoring sediment delivery to the intertidal zone by removing armor that disconnects feeder bluffs (sediment sources) from the intertidal zone is important. Feeder bluff contribution of sediment is a natural process that benefits habitat quality in extended reaches of drift cells. This extended effect of feeder bluffs on entire drift cells makes their connectivity to the intertidal zone a critical component of a sustainable, high functioning beach to support juvenile salmonids.

Restoration of habitats that provide shallow, low energy conditions would offer much needed favorable feeding and refuge opportunities for juvenile salmonids. In the project area, numerous stream mouths are armored or piped; therefore, they do not form typical deltas or pocket estuaries that provide productive feeding and rearing habitat for juvenile salmonids. It is important to note that the priority restoration opportunities identified for the entire project area and subareas were identified based on their potential to improve conditions over a large area or provide an especially large functional benefit to habitat quality. However, opportunistic restoration actions that restore nearshore processes, yet were not identified as priorities in this report, should still be implemented because the general project area conditions indicate a great need for any and all restoration.

5.1.3 Rehabilitation

Given the broad extent of shoreline alterations in the project area, identifiable rehabilitation action opportunities occur throughout much of the project area. Rehabilitation actions could provide limited but meaningful improvements to habitat function along many of the residential and dense urban portions of the project area. In some of the most heavily urbanized areas, rehabilitation of riparian vegetation, stream mouths, and longshore sediment transport could provide particularly meaningful improvements to severely impaired areas.

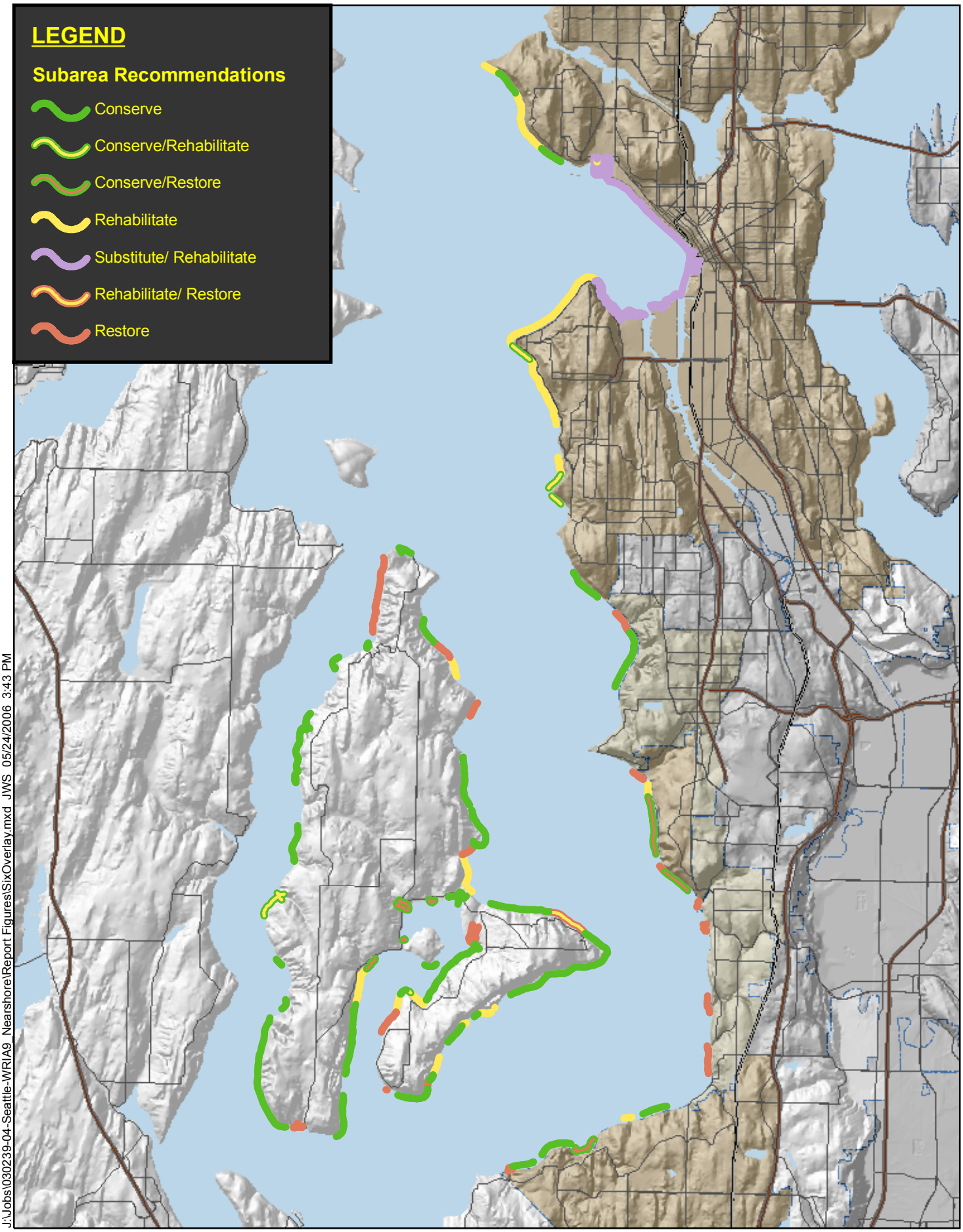
5.1.4 Substitution

Elliott Bay is highly modified through industrial and dense urban alterations that appear to make large-scale restoration infeasible. Given the bay's close proximity to the Green/Duwamish River and Cedar River/Lake Washington outlet, the bay is a key area to pursue implementation of habitat substitution actions in order to create shallow water and protected rearing opportunities for juvenile salmonids.

5.2 Study Area Priority Recommendations

With the above habitat needs in mind and using the processes described above, priority areas for the entire project area were identified (Map 6). These priority areas contain the most important potential actions to undertake in the entire project area. Given the shoreline conditions in the project area, the priority areas will provide the largest scale improvement or protection of habitat function, with particular attention to unique habitat types (e.g., pocket estuaries and lagoons).

Conservation of the relatively few intact reaches was a particular emphasis in the identification of priority areas, because preventing further degradation is of highest importance. Also, conservation of intact function is more certain than efforts to restore or rehabilitate nearshore function. As described by the Puget Sound TRT (2003), conservation provides the greatest certainty in achieving viable salmonid population parameters. The study area priority recommendations also emphasized conservation because these recommendations tend to be at a larger scale than restoration or rehabilitation opportunities. Given the condition of the project area, restoration, rehabilitation, and substitution actions are needed. Due to the size and certainty of restoration and rehabilitation actions, these types of projects were more often identified as priorities in the subarea recommendations rather than the study area recommendations. Map 6 includes an overlay of all subarea priority area recommendations. As described in the following subarea sections, these recommendations included more restoration and rehabilitation priorities than were identified as project area recommendations. The subarea recommendations also include small or site specific projects. Recommendations at smaller scales may differ from those at larger scales. This is due to the fact that different opportunities exist at different scales. Conservation of a large area may be complimented by rehabilitation of stream mouths or other site specific activities.



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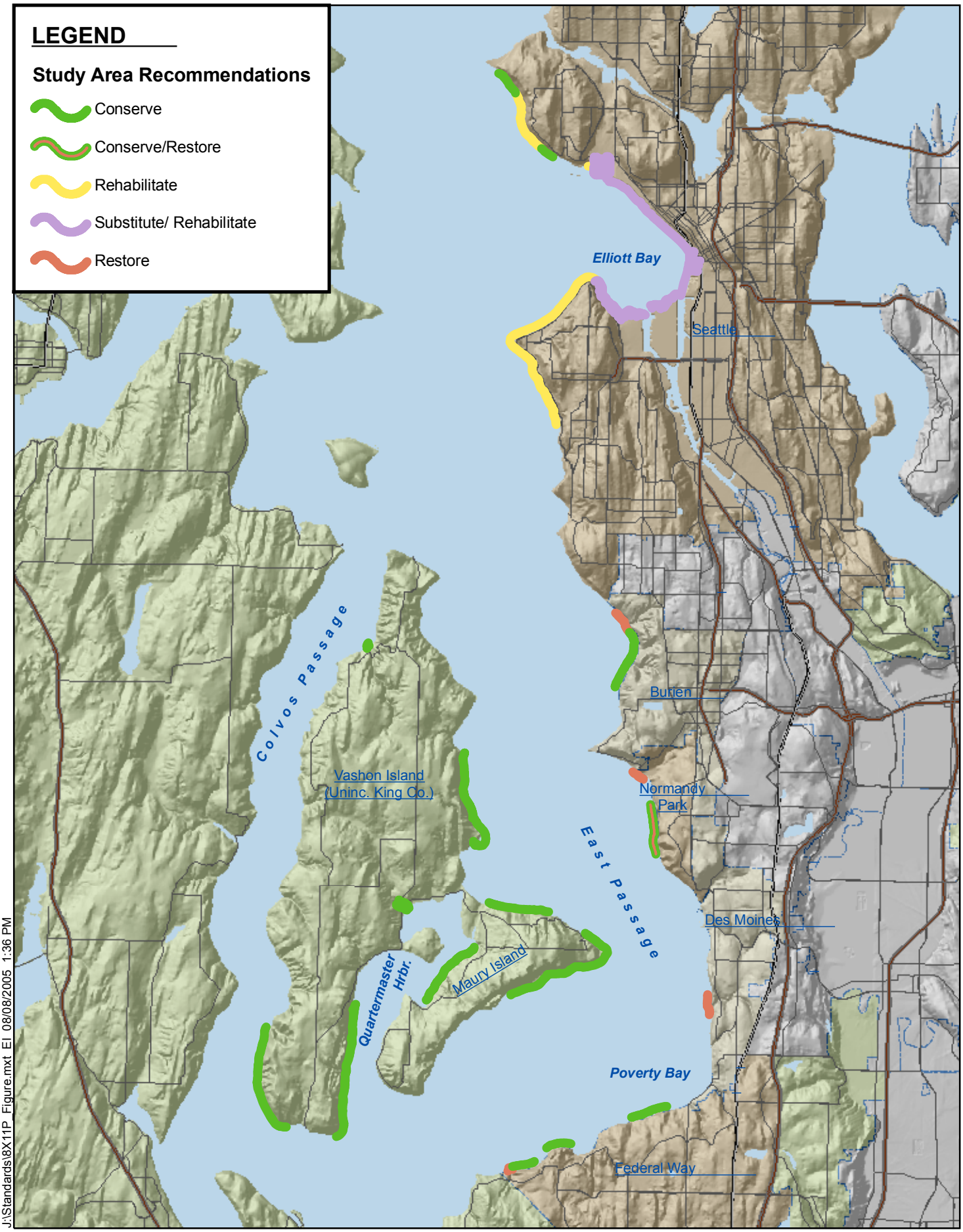
Map 6 Overlay
Subarea Recomendations
Identification of Priority Areas
WRIA 9 Nearshore Habitat Assessment



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Map 6
Study Area Recomendations
Identification of Priority Areas
WRIA 9 Nearshore Habitat Assessment

The priority study area recommendations are listed below moving from north to south on the mainland and counterclockwise around Vashon and Maury Islands (starting at the southern tip of Maury Island).

- **Magnolia Bluffs**
  - *Conserve* the unarmored bluffs and stands of trees in the riparian zones along the northern and southern Magnolia bluffs. This is a particularly important area because of its close proximity to the Green/Duwamish River and the Cedar River/Lake Washington outlet. These are two major salmon sources that produce outmigrating Chinook salmon. The continued long-term erosion of the bluffs along Magnolia Boulevard may be threatened by the very close proximity of the road to the top of the bluff. This is a key area that policymakers should be strongly encouraged to allow the natural erosion processes to continue, and therefore plan for the eventual removal of the road.
  - *Rehabilitate* areas between north and south Magnolia bluffs by removing groins and areas of protruding fill that impede longshore sediment transport.
- **Elliott Bay**
  - *Substitute* habitat throughout Elliott Bay from the Elliott Bay Marina in the north to the Duwamish Head in the west in order to create and improve habitat for juvenile salmonids. Opportunities for substitution (as well as rehabilitation) in this area should be explored and encouraged because the feasibility of potentially restoring processes in this area is very limited. There is great ecological value in providing improved feeding and rearing habitat for juvenile salmon through substitution and rehabilitation due to the area's proximity to two major salmon-producing river systems and the importance of early marine rearing in the overall marine survival of salmon. The eastern shoreline from Myrtle Edwards Park north to the Elliott Bay Marina provides substitution opportunities to pull the shoreline back to create embayments, and opportunities to add material to create shallow water habitat, and rehabilitation opportunities to plant riparian vegetation. Similar types of activities could be conducted along the western shoreline from West Waterway to the Duwamish Head in order to provide higher functioning habitat. Along the downtown Seattle Waterfront from Myrtle Edwards Park to the East Waterway, substitution activities to create

shallow water and protected habitat offshore from the seawall would provide improved rearing habitat for juvenile salmonids.

- **Duwamish Head**
  - *Rehabilitate* Schmitz Creek by daylighting the mouth of the creek to allow it to flow across the intertidal zone. This would provide some pocket estuary habitat in close proximity to Elliott Bay and along an extended reach with no other unpiped stream mouths.
  - *Rehabilitate* longshore sediment transport from Alki Point to the south end of Me Kwa Mooks Park by removing groins and areas of fill that protrude into the intertidal zone. This area is dense residential, which has disconnected available sediment sources from the nearshore. Rehabilitation of longshore sediment transport will improve habitat conditions in the drift cell.
  - *Rehabilitate* marine riparian vegetation from Duwamish Head to the Me Kwa Mooks Park seawall. Ideally, a continuous area of trees could be planted to provide increased shading and terrestrial inputs to the aquatic food web. If maintaining views is an insurmountable concern, then riparian vegetation species and locations can be selected that limit any potential effects on views, yet still provide some functional benefits.
- **Seahurst Park**
  - *Restore* the northern and central sections of Seahurst Park by removing armor and allowing landslide materials to feed the intertidal zone. This will extend a largely intact reach of feeder bluffs that are well connected to the intertidal zone. This reach includes the already restored southern section of the park, which successfully reconnects sediment sources and riparian vegetation, while also maintaining full function as a public park.
  - *Conserve* unarmored feeder bluff sections north and south of Seahurst Park that includes intact, mature riparian vegetation and large woody debris (LWD) across the intertidal zone. This reach and the southern portion of Seahurst Park are the primary remaining sediment sources for the longest drift cell in the project area.
- **Three Tree Point**
  - *Restore* the mouths of Miller/Walker Creeks and McSorley Creek at Saltwater State Park to create high functioning pocket estuaries. The lower portions of Miller and Walker Creeks could be reconfigured to provide more natural (less

channelized) rearing habitats and riparian tree/marsh vegetation. The mouth of McSorley Creek could be restored by removing armor and pulling back the shoreline to provide an open, more naturally meandering channel across the intertidal zone. Restoration of the park shoreline north of the creek to reconnect the sediment supply and riparian vegetation to the intertidal zone is also a priority.

- *Conserve/Restore* sediment supply along the extended reach south of Miller/Walker Creeks that currently has a mix of armored and unarmored feeder bluffs with mature riparian vegetation. Conserving and restoring sediment supply in this reach would benefit habitat conditions at all downdrift areas, including Three Tree Point. This restoration and conservation could also reduce the perceived "need" for groins by removing patchy armoring in a section of well-vegetated and lightly developed shoreline south of Three Tree Point.

- **Federal Way**
  - *Conserve* an extended reach east of Dumas Bay that has unarmored feeder bluffs that have mature vegetation. This reach is centrally located in its drift cell, but is the first extended reach of sediment source that is well connected with the intertidal zone. Therefore, it is a particularly important sediment supply area for the downdrift areas, including Dumas Bay.
  - *Conserve* two extended sections of unarmored feeder bluffs west of Dumas Bay that have mature riparian vegetation. These sections are separated by a reach with houses at the base of bluffs. The long-term existence of houses in this reach may be threatened through landslides or sea level rise. Nearshore habitat function would be enhanced by future activities that reconnect the sediment supplies to the intertidal zone.
  - *Restore* the tributary mouth at Dash Point State Park. The lower reaches of the creek (upstream and downstream of the road) could be restored by removing armor, adding sinuosity, and adding riparian vegetation.
- **Eastern and Northern Shoreline of Maury Island**
  - *Conserve* intact feeder bluffs and mature riparian vegetation in two reaches along the northern shoreline of Maury Island and the eastern shoreline of Maury Island. These areas are part of two drift cells that converge to form Point Robinson.

- **Point Heyer – Vashon Island**
  - *Conserve* the lagoon at Point Heyer (also known as KVI because of the radio tower on site) and the unarmored feeder bluffs providing sediment to the point. This drift cell is among the most intact drift cells in the project area. Conservation of unarmored shorelines with mature riparian vegetation would maintain high functioning habitat in the drift cell and maintain the sediment supply to the point. The marsh and lagoon at the point provide important habitat that is otherwise somewhat limited in the project area because of the extensive shoreline modification that has occurred.
- **Mouths of Shinglemill and Judd Creeks – Vashon Island**
  - *Conserve* unarmored mouths at Shinglemill Creek and Judd Creek, the two largest salmon producing tributaries on the islands. These creek mouths have extensive riparian vegetation and provide desirable pocket estuary habitat.
- **Southwestern Vashon Island**
  - *Conserve* unarmored feeder bluffs, intact riparian vegetation, and LWD across the intertidal zone. This is the longest almost continuously unarmored shoreline in the project area. This reach provides sediment to the updrift end (start) of an extended drift cell.
- **West Shoreline of Entrance to Quartermaster Harbor**
  - *Conserve* unarmored feeder bluffs, intact riparian vegetation, and LWD across the intertidal zone. This is an extended reach of good habitat that has added importance because herring are documented as spawning along the shoreline.
- **East Quartermaster Harbor**
  - *Conserve* unarmored feeder bluffs and wide corridors of intact riparian vegetation in the drift cell north of Dockton. This drift cell extends to Raab's Lagoon, provides an extended reach of high quality habitat, and has added importance because herring are documented as spawning along the shoreline.

5.3 Subareas

As discussed above, the project area was divided into 12 subareas that roughly correspond to drift cell units and major geographic regions within the project area (see Map 2). This section describes the habitat needs and goals of each subarea and lists priority recommendations for each (see Map 6 overlay of subarea recommendations).