

9/25/2002

Preliminary Restoration Plan

Carpenter Creek Estuary, Kitsap County, WA
Section 206

1. Project Information

Name of Project: Carpenter Creek / Appletree Cove Estuary

Congressional District: WA-01

2. Project Location

The project area is located in Carpenter Creek / Appletree Cove estuary in unincorporated Kingston Washington, which is located in northern Kitsap County (**Figure 1** about 0.5 miles west of the Port of Kingston. Several small streams, including Carpenter Creek, drain into the estuary and then to the Puget Sound (**Figure 2**).

3. Project Description

Current Conditions

Several activities have lead to the degradation of the Carpenter Creek and Appletree Cove estuary. Generally, the lower estuary (Appletree Cove) maintains higher quality habitat, but is bisected north to south by S. Kingston Rd. The most obvious symptom of the environmental degradation in the lower estuary is the large scour holes at the entrance and exit of the box culvert under S. Kingston Rd (**Figure 3**). The constriction in tidal flows in and out of the estuary caused by an undersized culvert under the S. Kingston Rd. creates scour conditions on both sides of the culvert. Flows are constricted through the culvert opening and the increase in velocity causes contraction scour on the inflow side of the culvert. The large scour holes can strand fish after the tide recedes, and act as partial fish barriers (due to high velocities) (**Figure 4**). As flow exits the culvert, high velocities and secondary currents create general scour. Therefore, the scour effects are exacerbated by flows moving in both directions through the culvert. This flow pattern indicates that the tidal exchange is limited by the culvert and tidal exchange of water, sediment and decayed organic material (detritus) between the estuary and the Puget Sound have been reduced. The loss of historic intertidal habitat to the construction of the S. Kingston Rd. embankment, as well as some losses to shoreline development has caused additional degradation in the estuary.

Environmental degradation in the upper estuary has been compounded by a second undersized culvert beneath W. Kingston Rd (**Figure 5**). This culvert restricts tidal flows to the extent that the frequency, depth and duration of tidal inundation are insufficient to maintain salt marsh vegetation. Vegetation composition in the upper estuary is shifting from saltwater to freshwater emergent species (Stillwaters, 2001). In addition, the culvert under W. Kingston Rd is slightly perched at lower tidal inflows, has debris blockage and acts as a partial fish barrier. Constructions of the both W. Kingston Rd. and a second abandoned road embankment (**Figure 6**) to the west have also reduced the acreage of intertidal habitat in the upper Carpenter Creek estuary.

Historic Description

Historically, the Carpenter Creek / Appletree Cove estuary had more intertidal habitat, which has been reduced by road construction and the reduction of tidal flows to the system. The mouth of the estuary extended across the area between Arness Park, a historic sand spit and the north Appletree Cove shoreline. The estuary connected to the Sound through a primary drainage channel with eelgrass and other saltwater marsh vegetation near the edges of the mean high tide stage that provided fishery and macroinvertebrate habitats.

Historically there was a larger exchange of water, sediment and detritus between the estuary and the Sound. The mouth of the primary estuary was much wider, had a smoother transition into the estuary and allowed more flow (tidal prism) to pass in and out of the estuary. The upper Carpenter Creek estuary connected to the lower estuary through a tidal drainage channel that had a similar channel configuration to the channel on the south side of the main estuary. The southern tidal drainage channel morphology is wider and less sinuous than the Carpenter Creek drainage channels. This connection allowed for higher exchange rates of saltwater, sediment and detritus with the lower estuary. In turn, more areas were exposed to saltwater inundation that provided foraging and cover to migrating juvenile salmonids. The estuary hydrology functioned differently by flushing more organic materials into the lower estuary and nearshore areas of the Sound, which provided food for crustaceans that are preyed upon by migrating juvenile salmonids.

Project Objectives

The overall project objectives are to restore a more natural tidal hydrology, reclaim some of the historic intertidal habitat by removing fills, remove fish passage barriers (high-velocity culvert passages), and reduce sediment scour and deposition problems, as well as reduce the fragmentation of shoreline / upstream habitats and environments. The restoration activities will ultimately increase the estuary, shoreline, and habitat areas used by the Puget Sound chinook salmon, which are listed as threatened under the Endangered Species Act, a variety of other salmon species, as well as sea-run cutthroat and steelhead trout. Additionally, restoration activities will rejuvenate the natural processes of tidal, sediment and detritus exchange essential for maintaining quality estuarine habitats. Finally, restoration project goals align well with the regional restoration goals of reducing watershed/estuary/shoreline fragmentation, which has contributed to the decline of the Puget Sound chinook salmon population. The Carpenter Creek / Appletree Cove restoration project is a large estuary with quality habitat and is at a crucial location for migrating salmonids. The restoration project plays an important role in regional restoration efforts for salmon in the Puget Sound.

Preliminary Restoration Plan

The recommended preliminary restoration plan identifies several actions that are designed to satisfy the project objectives. The first proposed action is the S. Kingston Rd. culvert replacement with a 60-foot concrete span bridge. This will increase the tidal prism and exchange across the estuary inlet, eliminate salmonid stranding in the scour pools, restore natural sediment transport and improve localized degradation of hydrologic conditions.

The second proposed action is the W. Kingston Rd. culvert replacement, which is designed to improve several conditions including tidal inflows to the upper marsh, and sediment / detritus flushing from the upper estuary. This action proposes that the W. Kingston Rd. culvert be replaced with a 60-foot concrete span bridge that will open the upper estuary and promote more natural tidal hydrology and estuary habitat function.

Additional proposed components of the plan are to excavate the abandoned roadbed west of W. Kingston Rd. and dredge fine sediment deposits from the upper estuary. It is also proposed to excavate / regrade / dredge a network of tidal drainage channels and mud flats, and remove / replace invasive emergent freshwater vegetation with saltwater species.

Restoration Plan Alternatives

In addition to the preliminary restoration plan, several other restoration alternatives have been identified. Additional alternatives considered for the Carpenter Creek / Appletree Cove estuary restoration project include:

- A. Using different methods than those in the proposed plan such as using wide span-arch or box culverts instead of bridges,
- B. Developing educational and recreational facilities, and
- C. Incremental evaluation of replacing only one culvert instead of both, and with and without excavation and bridge.

An incremental analysis will be used to evaluate alternatives and optimize benefits from proposed restoration alternatives. For example, a hypothetical examination of different proposed alternatives could analyze the incremental effects of replacing either of the culverts with bridges at West and South Kingston Roads. Each of the individual restoration alternatives aims to increase tidal exchange and promote the natural processes of the estuary. The purpose of the incremental environmental analysis would be to identify the environmental outputs with respect to the individual restoration activity, and how much additional benefit is gained from implementation of both actions. A comparison of the effects on the tidal prism would evaluate each of the bridge / culvert alternatives individually and together using hydraulic and hydrologic modeling. Modeling will identify the potential beneficial and adverse effects of the alternatives and will help identify the preferred restoration alternative.

Without Project Conditions

Three to five acres of the Carpenter Creek / Appletree Cove estuary have been degraded due to road construction, shoreline development and altered tidal hydrology. The upper estuary is transforming from a predominately saltwater marsh into a combination of saltwater/freshwater emergent marsh, as a direct result of the reduction of tidal flows through both the South and West Kingston Roads. Habitat conditions will remain in a degraded state and may continue to shift further away from the saltwater environment to a freshwater emergent marsh system. Habitat function within the estuary including areas of cover, food sources and protection from predators for juvenile salmonids will remain in a degraded state compared to historic conditions without restoration. The road and culvert construction may also impair mammal travel route migration, which a bridge could potentially alleviate additional stress and mortality from road crossing.

The altered tidal hydrology within the estuary will continue to affect the productivity of adjacent marine waters, by impairing detritus export and sediment flux from the estuary. The reduction in detritus export affects secondary productivity, thereby affecting migrating juvenile salmonids by reducing the amount of food available. Natural processes including tidal, sediment and organic exchange will remain diminished due to the inadequate culvert sizing.

Another condition that will continue to remain in a degraded state are the scour holes that can strand fish in standing pools and limit passage at other flows. The scour holes will likely maintain their same configuration because the system has reached a localized equilibrium over time. However, the choking effect will continue to limit the amount of the tidal prism accessing the estuary and will further contribute to the transformation of the upper estuary into an emergent marsh.

Finally, the hydrologic and habitat continuum between the upper watershed streams, estuary, sound and ocean will remain fragmented. Fish passage is limited for low flow conditions and the overall export of detritus and sediment flushing from the upper estuary is also limited. These degraded conditions will continue to worsen without the restoration project. Currently planned restoration efforts in the upper watershed will be less effective because of watershed, hydrologic, and biologic fragmentation without the estuary restoration.

With Project Conditions

The proposed restoration activities include removing existing and historic roadbed, which will restore approximately 0.5 acres of historic estuary areas. Moreover, opening the culvert areas will increase the tidal exchange into the upper estuary and would restore the freshwater emergent vegetation to historic saltwater marsh vegetation composition. The proposed restoration goals are to restore a more natural tidal hydrology, thereby improving existing intertidal habitat, and contribute to reconnecting the fragmented habitats from the upper watershed areas to the adjacent nearshore marine waters. Restoring natural tidal hydrology will promote habitat functions that were negatively affected by anthropogenic influences that have caused shifts in natural processes. Restoration of ecological functions will promote habitat conditions for invertebrates (epibenthic crustaceans), fisheries (salmon and trout), birds (shore and migratory) and some mammals that are part of the estuary environment. Reestablishing a more natural exchange of tidal flow, sediment and detritus between the estuary and Sound will provide a variety of benefits. Increasing detritus export will improve secondary production, which will promote better foraging conditions for marine fishes in adjacent nearshore areas. By restoring tidal inundation depth, frequency and duration to the estuary, more natural mud flat and salt marsh communities are expected to develop. These areas will provide habitat for juvenile salmonids to forage and rest, as well as provide protective cover during their migration towards the Pacific Ocean. Ultimately these activities will improve estuary conditions for a variety of invertebrates, fish, birds and mammals that inhabit the estuary.

In addition, by installing properly designed span-arch culverts or pier span bridges, reductions in localized scouring and sediment deposition problems will be realized. This will reduce fish passage barriers and areas of potential stranding. Morphologically, the upper estuary has

experienced shifts in channel configuration due to the reduction of tidal and sediment exchange across the estuary mouth. Restoration activities will also promote the reestablishment of more natural dendritic drainage channels, which will ultimately increase habitat for invertebrate species and the salmonids that prey on them.

Project Importance

The Carpenter Creek / Appletree Cove estuary is a very large, high quality estuary that is located in a critical position for salmonids migrating from the Puget Sound to the Pacific Ocean. The project is near Admiralty Inlet, one of the major entrances to Puget Sound. Outmigrating juvenile salmon from river basins throughout southern Puget Sound pass through this area before becoming true ocean-going fishes. The project area provides some of the last significant rearing habitat before this critical transition is made. If the proposed project can increase secondary productivity in the project area, then the juvenile salmon could gain more weight, which may improve their chances for survival once at sea.

The proposed project is an important “piece” in the regional picture of Puget Sound environmental restoration goals. It is well aligned with the regional goals of salmon species protection and habitat restoration in the Puget Sound. Carpenter Creek / Appletree Cove Estuary is listed as a potential restoration site in the Washington State Conservation Commission, Salmonid Habitat Limiting Factors, WRIA 15, Final report and identified as the last significant functioning estuary before the northern tip of the Olympic Peninsula (Harring, 2000). Although the project footprint only involves areas in and around the estuary, it will contribute to the quilt work of restoration projects throughout the Sound. The area has been designated by the National Marine Fisheries Service as critical habitat for Puget Sound chinook salmon, which has been listed as a threatened species under the Endangered Species Act.

Environmental Outputs

The restoration project will promote a more natural tidal hydrology and help restore intertidal habitat, which has been filled by roadbeds, and promote natural habitat processes and functions. The primary result of these changes will be improved primary and secondary production at the site, which will create better foraging and refuge habitat for juvenile salmonids. Measurable outputs will therefore include both physical and biological parameters, such as area inundated, tidal prism, velocities at culvert openings as well as primary and secondary productivity.

The benefits of the restoration actions can be measured in a number of ways—everything from a simple calculation of acreage restored to a more complex model of the biomass of salmon prey produced per square meter of habitat restored (after Healey 1982). Evaluation of the environmental outputs will use an incremental analysis approach that will quantify the effectiveness an individual restoration alternative has with respect to other alternatives and contribution to overall restoration goals. Please see Table 1. for a conceptual evaluation framework and estimated outputs.

Table 1. Environmental Output Table for Incremental Analysis

| Output | <u>Alt. 1</u> No Action | <u>Alt. 2</u> Two 60-foot Bridge Spans | <u>Alt. 3</u> Two or more Box Culverts |
|--|--|---|---|
| Area inundated | 12-16 acres | 18-22 acres | 14-18 acres |
| Tidal prism | | increase above existing conditions | increase above existing conditions |
| Velocity at estuary mouth and culverts | does not meet state fish passage criteria | meets state fish passage criteria | meets state fish passage criteria |
| Salt marsh size | 4-8 acres | 10-14 acres | 8-12 acres |
| Freshwater wetland size | 6-8 acres | 0-2 acres | 2-4 acres |
| Net primary productivity | | increase above existing conditions | increase above existing conditions |
| Net secondary productivity | | increase above existing conditions | increase above existing conditions |
| Water quality (temperature/DO) | inadequate flushing-may not meet state standards | improved flushing-more likely to meet state standards | improved flushing-more likely to meet state standards |

Please note that these output estimates are preliminary, and will be refined during PDA. Those outputs measures qualitatively here will be expressed quantitatively after PED.

Planning, Design and Analysis (PDA) Study Methods

During PDA, hydrologic modeling could be used to identify bridge/culvert widths, which would maximize tidal inundation while minimizing costs. Important parameters such as velocities at the breach (a consideration for fish passage) and the frequency, depth, and duration of tidal inundation (a factor which will determine the success of salt marsh establishment) will drive the modeling effort.

During the next phase (PDA) studies will characterize baseline habitat / environmental conditions and identify the potential improvements to these conditions from the proposed restoration actions. Proposed restoration features will be analyzed using standard modeling techniques to determine if there are potential adverse effects (e.g., flooding of neighboring properties) from restoration activities. The index will also evaluate habitat benefits using an economic analysis of the proposed restoration alternatives. Preliminary costs and habitat outputs will be utilized to conduct a cost effectiveness and incremental cost analysis of the proposed project alternatives. The preferred restoration alternative will be chosen based upon the incremental analysis approach and evaluation of the Preliminary Restoration Plan and the restoration plan alternatives.

It is important to adequately assess both baseline conditions, which will provide information needed to estimate environmental outputs, and further develop restoration alternatives and designs. The PDA will identify and provide baseline information on several relevant parameters that will help quantify and characterize estuary conditions (see Table 1. above). A few of these parameters include water quantity (tidal exchange), estuary acreage, water quality, sedimentation and geomorphic characteristics, vegetative composition, degree of fish barriers, areas of aquatic and canopy cover and refuge, macroinvertebrate and fish population surveys.

LERRD

The Non-Federal Sponsor (NFS) for this project is Kitsap County, Washington. The project footprint is estimated to encompass 21.7 acres. The NFS owns about 4.3 acres of land within the proposed footprint. Additional lands within the proposed footprint include 13.2 acres owned by DNR, and 4.2 acres of privately owned land. The proposed project footprint affects 21 parcels with 14 owners.

All lands within the proposed project footprint have been identified by the NFS as wetlands or wetland buffer areas, which are regulated under the Kitsap County Critical Areas Ordinance. Without a variance to the restrictive ordinance, all development within the project area is prohibited by law. The preliminary estimate of land value is based on the assumption that development within the proposed project footprint is precluded by law, and that such land has no mitigation value tied to any future offsite development.

Lands in the proposed project area that are under DNR control are defined by Washington state law as *Second Class Tidelands and/or Second Class Shorelands* (RCW 79.90.050 and RCW 79.90.050, respectively). DNR may, with the advice and approval of the state board of natural resources, sell such lands at fair market value to any municipal corporation or agency of the state of Washington when said lands are to be used solely for municipal or state purposes (RCW 79.94.160). Preliminary land values have been estimated based on the assumption that conveyance of a fee estate is both legally permissible and generally required by the Corps for environmental restoration projects. The actual fair market value estimate of lands necessary for the project will be determined based on an appraisal of such lands performed by the NFS in a later project phase.

The need for an off-site disposal area is not anticipated at this time. Construction staging will occur within the project footprint, or within temporary work area easements that may be required for replacing culverts under W. Kingston Road, and S. Kingston Road. A reasonable detour route to allow access around the project area is not currently available; therefore, a temporary easement may be necessary to construct a reasonable detour route during periods of road closure. The preliminary LERRD value estimate below does not include values for such temporary easements.

A 25% contingency amount has been proposed to allow for the relative uncertainty of land values and the probability of protracted negotiations with DNR regarding acquisition of necessary real estate interests under their control within the project area.

NFS will need to acquire and certify all LER available before advertising for construction.

The estimated value for the LER is as follows:

| | |
|-------------------------------------|----------------------------|
| 21.7 acres fee | \$ 11,000 |
| NSF Acquisition & Cost Incidentals | + \$ 93,000 |
| | <u>\$104,000</u> |
| Contingency (25%) | + \$ 26,000 (rounded-up) |
| | <u>Sub-total \$130,000</u> |
| | |
| Federal Review and Assistance Costs | \$ 23,000 |
| Contingency (25%) | \$ 6,000 |
| | <u>Sub-total \$ 29,000</u> |
| | |
| Total | \$159,000 |

4. Consistency Statement (Section 206)

Not required for Section 206.

5. Views of the Sponsor

Kitsap County originally sought project assistance from the U.S. Army Corps of Engineers (Corps) under Section 1135 of the 1986 Water Resources Act. The Section 1135 program provides for structural modification or changes in operation of a Corps project to restore fish and wildlife habitat (USACE, 2000). The request was based upon the premise that the Port of Kingston breakwater influenced tidal inflows, sediment transport conditions and negatively affected the Appletree Cove / Carpenter Creek estuary. Due to the complex nature of tidal hydrodynamics and sediment transport regimes, it is difficult to extrapolate the effect the breakwater may have on the estuary. Observations, made during field reconnaissance, indicate that a more direct correlation exists for the changes in estuary condition from construction of road embankments and undersized culverts within the estuary proper. Therefore, Section 1135 authority is not applicable and further studies should continue under Section 206. Kitsap County is in agreement with this assessment (see Letter of Intent).

Coordination and cooperation with other local government landowners and private landowners are required for the successful completion of the project. Generally, the local community is in support of the Carpenter Creek / Appletree Cove estuary restoration project. Letters of support from the local community are also attached to this document. Kitsap County will continue to coordinate with the local community to address concerns regarding restoration actions.

6. Views of Federal, State and Regional Agencies

Local community groups are working to promote conservation and restore the upstream areas of Carpenter Creek and these supplemental restoration activities within the watershed promote the

holistic watershed and continuum restoration concepts. Understanding that the primary influence of degraded estuary conditions is a result of the development activities located directly in the estuary indicates that the Section 206 program is an appropriate vehicle for funding restoration activities. Restoration activities associated with the breakwater reconstruction have ecosystem restoration merit, but it is recommended that the project be pursued separately.

Other federal agencies with an interest in the project include the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, who will have consultation, permitting and scheduling requirements, but generally approve of estuary restoration activities. The proposed project is consistent with recovery goals for area salmonids protected under the Endangered Species Act. A state representative from the Washington Department of Fish and Wildlife (WDFW) was present during a group field visit and is supportive of the proposed project. The Suquamish Tribe also was represented and expressed support for the estuary restoration project and offered to coordinate and assist with fish monitoring services.

Letters of support for the project have been received from WDFW, the Suquamish Tribe, Kitsap Conservation District, local citizens and landowners located in the project footprint area.

7. Environmental Compliance Requirements

The project will be compliant with all applicable regulatory requirements. An Environmental Assessment, 404 (b) (1) analyses, water quality certification, Coastal Zone consistency determination, Cultural Resource Assessment, and Biological Assessment (BA) will be needed to complete the project. All environmental compliance will be completed prior to commitment of construction funds. The project sponsor is also expected to acquire the following environmental coordination: 1) Clear and Grade Permit (County); 2) Hydraulics Project Approval (WDFW); and 3) Shoreline Permit (County).

8. Costs and Benefits

The total estimated project cost is approximately \$1.48 million. Costs were roughly estimated for the construction of a 60-foot span bridge at South and West Kingston Roads, historic road embankment excavation, as well as dredging, excavation and other restoration activities in the estuary. Planning, design and analysis studies were estimated at 35% of the construction costs. The PDA study will refine project costs based upon the preferred restoration alternatives. Estimates of potential project costs have been developed and are included in Section 11.

The planning and design report will address monitoring, O&M requirements and associated costs. Operation and maintenance requirements after project construction are expected to be minimal. Debris removal is the most likely candidate for routine maintenance. However, it is anticipated that less debris will clog the larger span culverts and bridges. Monitoring costs are estimated to be less than 1% of the total project cost.

Benefits from the project are related to the recovery of endangered salmon species. The estuary restoration will provide additional areas of essential habitat to juvenile salmonid migrants and increase habitat function. Benefits are ultimately related to the area of recovery and future use of the restored environment.

9. Project Schedule

Depending upon agency and community coordination, and the ability to secure project funding, construction could begin during the summer of 2004. The schedule below was developed assuming that funding was not an issue and that the project proceeded to the PDA phase immediately.

Planning, Design and Analysis Phase April 2002 - June 2004
 Construction July 2004 - August 2004

10. Supplemental Information

The Carpenter Creek / Appletree Cove estuary site will have a monitoring plan as part of the project. Both baseline conditions and project effects will be monitored and evaluated for the restoration project. Monitoring will include items such as cross section surveys, vegetation and fishery surveys and general site characterization. In kind services will include post construction monitoring.

Site monitoring is one option of in-kind services Kitsap County, community groups, WDFW and the Suquamish Tribe could provide for the project.

11. Financial Data

Table 2. identifies the preliminary estimate of the cost burden and schedule for Kitsap County and the Corps.

Table 2. Preliminary Financial Requirements

| PHASE | TOTAL | FEDERAL | NON-FEDERAL | FY 02 | FY 02-03 | FY04 & Beyond |
|--------------|-------------|-----------|-------------|-----------|-----------|---------------|
| PDA | \$250,000 | \$250,000 | * | \$100,000 | \$120,000 | \$30,000 |
| Construction | \$1,230,000 | \$712,000 | \$518,000 | - | - | \$712,000 |
| TOTALS | \$1,480,000 | \$962,000 | \$518,000 | \$100,000 | \$120,000 | \$742,000 |

* Note: Planning, design and analysis study phase is initially Federally funded, and then at time of signing Project Cooperation Agreement (PCA), the costs are retroactively cost-shared by the sponsor.

b. Non-Federal Requirements

LERRD \$130,000
 Cash \$363,000
 In-Kind Services* \$25,000
 Annual OMRR&R \$20,000

*In-kind services performed after the PCA is signed are credited against the cash portion of the project. Examples of in-kind services include: revegetation, using Kitsap County trucks to haul excavated materials etc...

c. Fully Funded Cost Estimate

The fully funded cost as found in the PCA is estimated to be \$1,480,000.

12. Federal Allocations to Date: None to date.

References

Harring, D., 2000, Salmon and Steelhead Habitat Limiting Factors Water Resource Inventory, Area 15, Washington State Conservation Commission.

Healey, M.C. 1982. "Juvenile Pacific Salmon in Estuaries: The Life Support System." In *Estuarine Comparisons*, edited by V.S. Kennedy, Academic Press, 1982.

Stillwaters Environmental Education Center, 2001, Carpenter Creek Watershed Assessment (Pending).

USACE, 2000, ER-1105-2-100, Appendix F – Continuing Authorities

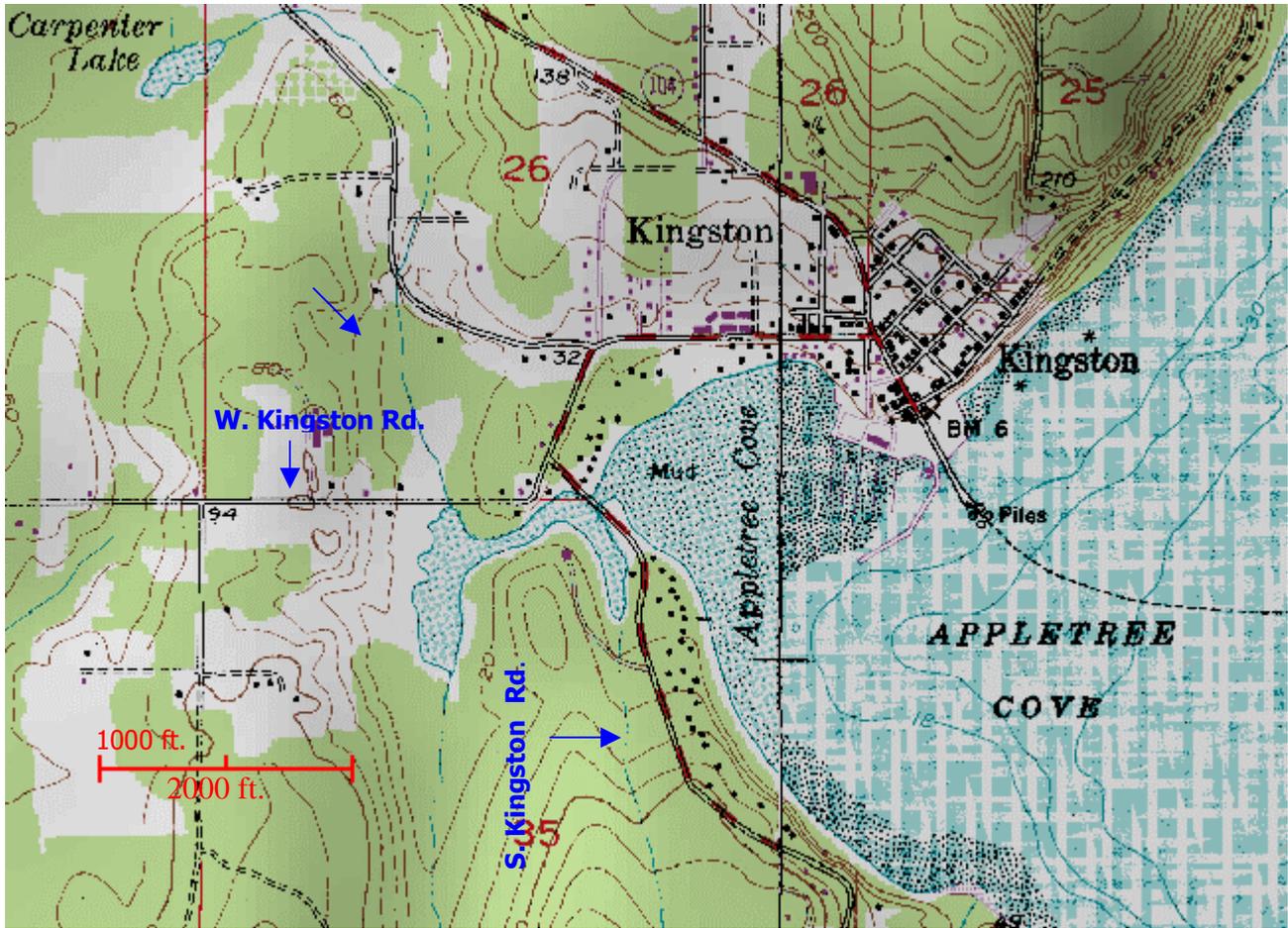


Figure 1. Carpenter Creek Estuary location map



Figure 2. Carpenter Creek Estuary Site



Figure 3. S. Kingston Rd. Tidal Inlet Box Culvert



Figure 4. S. Kingston Rd. culvert scour holes at low tide



Figure 5. W. Kingston Rd. culvert



Figure 6. Upper Carpenter Creek Estuary & Abandoned Roadbed