

**FREMP Habitat Inventory**  
**Groundtruthing Project -**  
**May-October 2006**

**Final Report**

Prepared for:  
The Fraser River Estuary Management Program (FREMP)  
Burnaby, BC

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## **I. Executive Summary**

In 2002, 1:20000 scale aerial photos were flown over the FREMP area. The aerial photos were interpreted and mapped from July 2002 to December 2003. First Order Habitat (intertidal or riparian) and Second Order Habitat (unvegetated, trees & shrubs, graminoids & forbs, mosses, lichen & algae), Community types (marsh, vascular meadow, deciduous tree woodland etc.) and dominant species were mapped. Few field surveys were completed of the inventory in 2003. In 2005 the FREMP Water and Land Use Committee indicated the need for further groundtruthing work to be completed. A grant from the BC Conservation Corps was secured for a two-person team to complete the field survey. In 2006 a refined habitat classification structure was developed in preparation for field work.

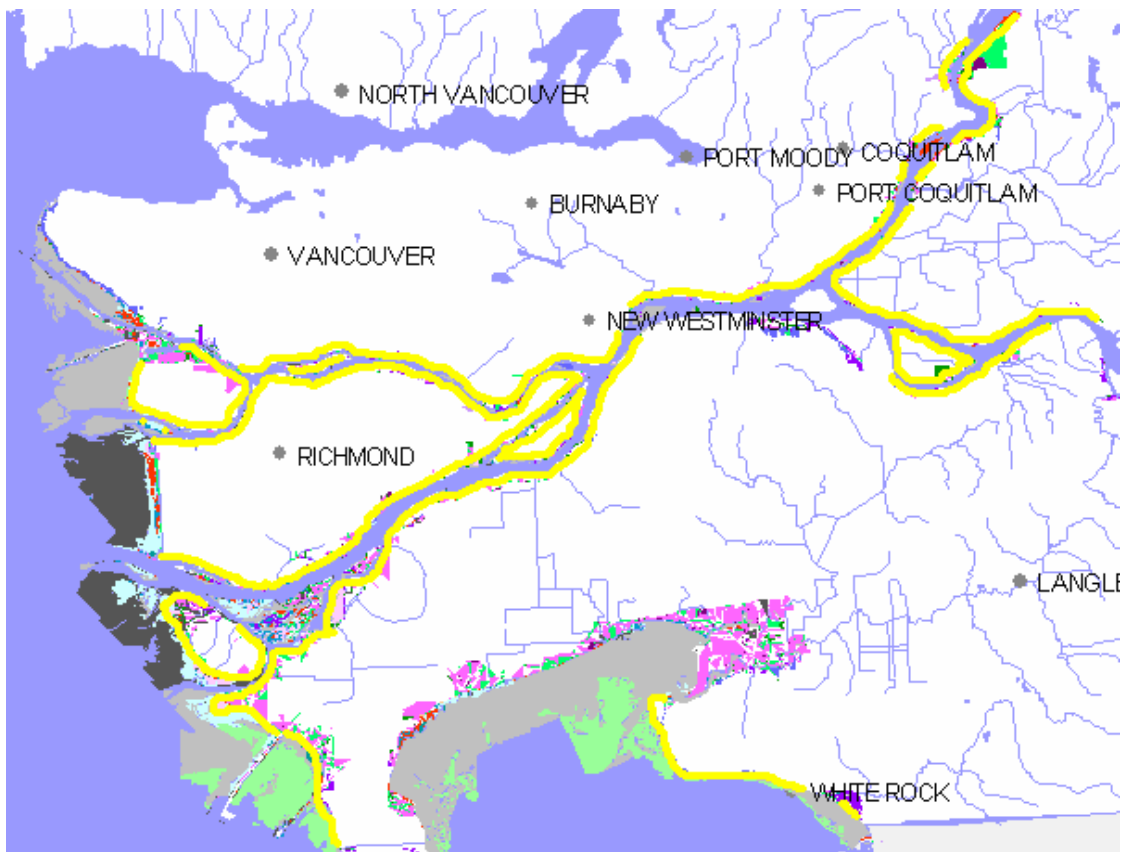
The habitat inventory groundtruthing was completed between June and October 2006. Polygons were accessed on foot, by vehicle or by boat. The field crew focused their study on the wetted side of the Fraser River dikes within the FREMP area and groundtruthed 26.2% (2776 polygons checked of a total of 10605 polygons) of the habitat inventory. Polygons that were classified as the same community that were adjacent to each other may not have all been groundtruthed. Only a small number of like classified polygons would have been checked if a survey of the general area found most of the polygons to be true. The entire FREMP area was groundtruthed except major parks and protected areas (Figure 1). See section IX, p.16-17 for a more detailed listing of the areas not groundtruthed during the project.

The accuracy of the 2003 habitat polygons were verified up to the Community level. Additional data were also collected for birds, wildlife, invasive species, modifications, discharge, and wildlife trees. The data collected on modifications and discharge were not used in the final data set because a more complete data set is available from the Great Vancouver Regional District. Of the total number of polygons groundtruthed (728 on the dry side of the dike and 2048 on the wetted side of the dike), 92.3% were found to have been correctly classified in 2003. This percentage is based on the combined percentage of 'True' and 'Change' polygons. Approximately 24.7% of all polygons checked experienced change. Of these polygons, 12.6% previously unvegetated areas supported vegetation, 79.6% experienced natural growth (e.g. tall shrubs to trees) and 7.7% were cleared, developed or under construction.

Of the 2048 polygons checked on the wetted side of the dike 74.5% were correctly classified, 17.0% experienced change and 8.4% were incorrectly classified. Some community information may have been added to correctly classified polygons to supplement existing community information. False polygons were updated and revised with new community information. Technical issues encountered between the Archer field PC and the Garmin 60cx GPS were resolved by changing the connection procedure between the two units.

In future projects, it is recommended that the Main, North, South and Middle Arm habitat polygons be groundtruted by boat and estuarine polygons be groundtruted on foot. Many polygons classified as unvegetated in 2003 supported vegetation in 2006, which may be due to natural vegetation growth. Polygons that were partially vegetated or unvegetated were classified as 'Change'. Observed community information and a percent vegetation cover was noted. In future projects timing of field work should be planned in conjunction with the tides in order to observe mudflats and sandflats. Numerous polygons were also classified as 'Change' if succession had occurred or if existing plant species had experienced natural growth, such as tall shrubs to trees.

The data set will be titled "2006 FREMP Habitat Inventory". It will contain 2003 data updated 2006 data collected during groundtruting and will be incorporated into the FREMP Geographic Information System. Three additional layers will be added to the dataset: Birds, Wildlife and Wildlife Tree. The dataset will also be made available on the Community Mapping Network (<http://www.shim.bc.ca/atlas/FREMP/main.cfm>), and will be available for viewing with the FREMP Atlas.



**Figure 1:** This map illustrates the FREMP area. The yellow highlighted were those covered during the FREMP groundtruting project. Major parks and protected areas were excluded from the study in order to maximize the amount of data collected in unprotected areas.

## **II. Introduction**

In 2003 the Fraser Estuary Management Program (FREMP) remapped intertidal and riparian habitat in the estuary, based on orthophotos flown in 2002. Coarse-level and detailed mapping provided full habitat inventory coverage of the FREMP area. At the time, lack of resources prevented substantial groundtruthing of the habitat polygons. In 2005, the FREMP Water and Land Use Committee (WLUC) identified the need to verify the habitat polygons. A two-person team, supported by a BC Conservation Corps (BCCC) grant, was retained to complete the work. The FREMP groundtruthing project began in May 2006 with the groundtruthing field work conducted from early June 2006 to October 2006.

The purpose of the project was to verify the accuracy of existing (2003) habitat inventory polygons on the wetted side of the Fraser River dikes within the FREMP area of interest. The sites were accessed on foot, by vehicle or by boat.

The first objective of the project was to update and revise habitat polygon data based on a refined habitat inventory framework developed in May 2006 by GL Williams & Associates Ltd. and ECL Envirowest Consultants Limited (See table 4). The second objective in the groundtruthing process was to gather other relevant field data to supplement the habitat inventory Access database. The additional information included observations of modifications, discharge, invasive species, wildlife, and birds. The data collected on modifications and discharge were not used in the final database as a more complete data set is available from the Greater Vancouver Regional District (GVRD). The data were incorporated into the FREMP Geographical Information System by independent GIS contractor Joy Appller and Sarah North of Northwest Hydraulic Consulting. The final data set will be titled "2006 FREMP Habitat Inventory" and will contain 2003 data updated by 2006 data. This version will be available for viewing with the FREMP Atlas.

The final report will provide a detailed summary of the results of the FREMP habitat inventory groundtruthing project.

### **III. Merging of the 2003 and 2006 Data Sets**

The 2006 field data will be combined with the accurate 2003 data in the FREMP Geographic Information System. The 2003 first order, second order and community categories will be revised based on the classification system developed in 2006. The changes to the classification system may be viewed in the Appendix (Tables 1-5). The 2003 data will be appended or overwritten with 2006 data depending on whether the polygon was True, False, or Change. The data set will be titled “2006 FREMP Habitat Inventory” and will contain the 2003 information updated by 2006 field data. It will be available for public use and will be incorporated into the FREMP Atlas located on the Community Mapping Network. A metadata document will also accompany the data set.

### **IV. Methods and Data Collection Procedures**

Polygonal habitat data was verified by observing an area from the dike or by walking through a polygon. A Garmin 60cx GPS was used to accurately determine the field worker’s position within a polygon. Shapefiles of the FREMP habitat area were loaded onto the Archer field PC and point data were added to individual polygons during field checking. Paper maps of aerial photos and habitat polygons were used for field note taking. Paper maps were also used for determining the field workers position when there was poor satellite reception. The data collected were subsequently entered into ArcPad 7.0. Collectively, the point data set were referred to as the “data dictionary”. The data dictionary structure will be available for viewing in the metadata for the FREMP groundtruthing project on the Community Mapping Network (<http://www.shim.bc.ca/atlasses/FREMP/main.cfm>). Additional layers were created for Wildlife, Birds, and Wildlife tree information collected in 2006. The decision making process that was used during data collection is outlined in Figure 2. The following data was collected during field checking:

#### **Polygon Check**

- This feature was used to indicate whether a polygon was checked and whether the information within the polygon was true, false or change. The observed plant community was noted in the comment field and further described using the Community point feature.
- Over the course of the project, changes were made to this point feature. In August 2006, three options were added to the Poly check field: partially vegetated, fully vegetated, or unvegetated. Partially and fully vegetated polygons were considered those classified as unvegetated in 2003 that supported vegetation in 2006. The percent of vegetation cover was also noted for these polygons. Unvegetated polygons were those classified as vegetated in 2003 that were unvegetated in 2006 due to development or habitat destruction. Threshold values for the percent vegetation cover of each of these options have been created: Unvegetated = 5-25% vegetation, Partially vegetated = 26-75% vegetation and Fully vegetated = 76-100% vegetation. Polygons noted as fully

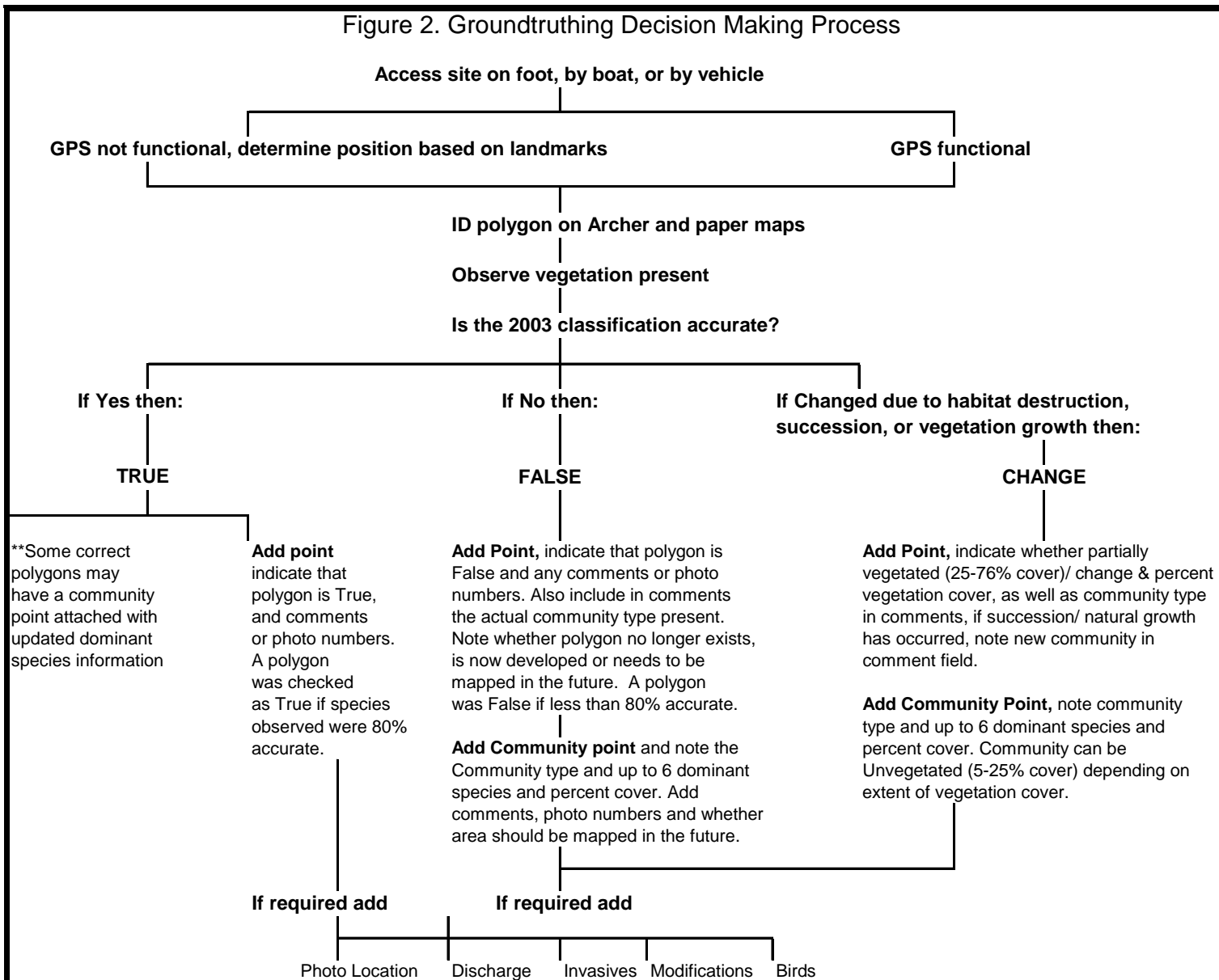
vegetated in 2006 were classified as “False” due to the significant change from the 2003 classification. Polygons noted as unvegetated, partially vegetated or those that experienced succession or natural growth in 2006 were classified as “Change”.

- The point feature was also used to delineate end points that were used as reference points when drawing a transect line. During the editing stage these points were used to draw new polygons and will be deleted from the final data set.

## Community

- Community points indicate the plant community type within a polygon observed in 2006. Up to six dominant species and their percent cover could be listed in a given point. Additional species were noted in the comment field if necessary. Photo numbers and other relevant information to a polygon were also recorded in the comment field.
- The following community classifications were used for data collection:
  - Coniferous tree woodland
  - Deciduous tree woodland
  - Mixed tree woodland
  - Tall shrub woodland
  - Low Shrubs
  - Vascular meadow (non-woody vascular plants)
  - Non-vascular meadow (non-vascular plants lacking vascular or transport tissue)
  - Marsh
  - Eelgrass
  - Macroalgae
  - Mud, sand and rock
  - Other
- Some information was gathered on substrate if necessary. If a vegetated polygon (2003) was found to be unvegetated (2006) the substrate (mudflat, sandflat or rock) was recorded. Community points were also used in some of these polygons to update the existing information if necessary.

Figure 2. Groundtruthing Decision Making Process



## **Transect Line**

- A transect line was used to delineate change within an original 2003 polygon based on community or species type. Transects were also drawn in polygons that were developed and unvegetated in 2006 that were vegetated in 2003. The transect line illustrated the new boundary of vegetation within a polygon. This information was used for redigitizing and remapping polygons in the editing stage. A point feature was placed on either side of the transect line to indicate which side was consistent with the existing information (true) and which was not (false). The transect line also contained community information, therefore the community data updated the side of the line that was false or change.
- The 2003 polygon boundaries were generally correct, therefore, transect lines were only required when updating community information or species change within a polygon.
- In total, 28 transect lines were drawn creating 34 new polygons.

## **Birds**

- Bird activity and sightings were recorded based on field observations. The following information was collected:
  - Evidence type (calls, nest, droppings, sighted, and other)
  - Species type and name
  - Activity (feeding, flying, nesting, perched, singing, and swimming)
  - Number
  - Additional comments and photo numbers
- Significant bird information was collected particularly in marshed areas and in Semiahmoo Bay. As the project progressed into the fall bird numbers increased, particularly in the outer banks of Semiahmoo Bay.
- In total 442 bird points were collected identifying numerous bird species and their activities. Approximately 5771 birds were observed during the project. Estimations were made for the total number of birds observed in flocks.

## **Wildlife**

- Wildlife activity or observed sightings during groundtruthing was recorded including:
  - Type of evidence - calls, egg masses, nests, sighted, scat/ droppings, tracks, and other.
  - Wildlife class – amphibian, large mammal, reptile, small mammal
  - Wildlife species
  - Additional comments and photo numbers were also logged. The wildlife point was not utilized as frequently as the bird point.
- Animal evidence (e.g. burrows and tracks) were not always recorded and observations tended to be more concentrated in the latter stages of the project.

## **Wildlife Trees**

- Wildlife tree location and descriptive information were recorded as wildlife tree points. The following information was collected:
  - Tree type – coniferous, deciduous, and unknown
  - Veteran tree – one option “yes”
  - Mast tree – one option “yes”
  - Nesting – potential, large, small
  - Tree state – living, dead, unknown
  - Woodpecker use – one option “yes”
  - Denning – one option “yes”
  - Perches – one option “yes”
  - Cavities – option of 1, 2, 3, or 4 or more
  - Additional comments or photo numbers were recorded.

## **Photo Locations**

- This point was utilized to identify a photo location. The location of the photo may not correspond precisely with the location of the point but will appear in the corresponding polygon. The precision of these points was determined by GPS reception, or by using landmarks to determine the location where a photo was taken. Photo numbers, were recorded in the comment field of the community and point features more easily.

## **Invasive Species**

- Up to six invasive plant species could be recorded in the database. Additional invasive species may also be noted in the comment field provided. A list of invasive species were collected using the Langley Environmental Partners Society and the British Columbia Ministry of Agriculture and Lands website resources.
- The most prevalent invasive species observed in the field were purple loosestrife, Himalayan blackberry and Japanese knotweed. Purple loosestrife was found in the intertidal areas while Himalayan blackberry and Japanese knotweed were restricted to disturbed riparian areas. In some locations Japanese knotweed appeared to be more aggressive than the Himalayan blackberry. The invasive plant data collected could be useful for local governments and other organizations such as River Works and the Invasive Plant Council of British Columbia, to utilize in creating invasive plant management strategies. Perhaps this data could be incorporated into the existing Invasive Species Atlas on the Community Mapping Network website in the future.

## **Modifications**

- Data relating to flood gates, garbage/ pollution and pump stations was collected with the modification point. The following data was gathered:
  - Modification type –dolphin, dredging, flood gate, garbage/ pollution pump station, and numerous others.
  - Material type - concrete, gabions, pilings, stonework, sandbags, wood, gravel, bark mulch, asphalt, dyke and other.
  - Bank type – stable, eroding, accreting.
  - Length, width and height information, photo numbers, and comments were collected as appropriate.
  - Any photos and comments were added in the relevant fields.
- Few modification points were collected during data collection as this information was not a project priority. The modification point was used for significant points of interest such as garbage and pollution.
- The modification data collected will not be incorporated into the final database as the shapefiles contain incomplete data and more detailed information is available from the GVRD.

## Discharges

- Discharge points, noting culverts, PVC pipes and storm drains, were recorded. Culverts were logged under “discharge type – other”, or “storm drain” and further described in the comment section. The following data were collected:
  - Discharge type – agricultural effluent, house effluent, landfill leachates, pollutant, pulp/ mill effluent, storm drain, septic effluent, tile drain, trench and other.
  - Bank – both, instream, left, and right.
  - Material – concrete, steel, wood, iron, PVC, asphalt coded, corrugated steel and other.
  - Headwall – concrete, concrete block, gabion, sand bag, and wood.
  - Occasionally data on the length, width and diameter was collected based on the accessibility of a culvert.
  - Photos or comments were included as appropriate.
- Few discharge points were collected during data collection as this information was not a project priority. The discharge point was mostly used for noting culverts and pump stations.
- The discharge data collected will not be incorporated into the final database as the shapefiles contain incomplete data, and more detailed information is available from the GVRD.

## **V. Groundtruthed Areas**

The field crew observed 26.2% of the FREMP habitat inventory and was successful in surveying 2776 polygons. Of the field checked polygons 92.3% of the habitat polygons were correctly interpreted up to the community level in 2003, and the remaining polygons were revised or supplemented with 2006 data. Many changes were made noting a natural growth in vegetation, such as tall shrubs (2003) that were trees in 2006. Additionally, 164 polygons were updated with more representative community information that were correctly classified in 2003. Of the updated polygons, 42 were detailed and 122 were coarse.

Areas that were groundtruthed during this project were from the coarse and detailed data sets. Prior to acquiring the detailed shapefile maps for the Archer field PC, the field crew began groundtruthing at Captain’s Cove Marina in Ladner and proceeded south to the Canada / USA border of Point Roberts. Next, the majority of Westham Island was completed as well as Garry Point Park, Richmond to the Massey Tunnel. Subsequently, the middle arm from Terra Nova Park, Richmond to the Richmond Market was completed followed by the north arm, Mitchell Island and Barnston Island.

The main arm of the Fraser River, the south east end of Annacis Island and the Pitt River were groundtruthed by boat. Sea Island was groundtruthed on foot. The Airport authority granted access to the marsh on the west side of the island, from Ferguson Road south to the Coast Guard Station.

The FREMP habitat inventory polygons were accessed mostly on foot or by vehicle and visually observed while standing within or adjacent to a polygon or by using binoculars. The majority of the polygons checked by boat were along the Fraser Main Arm and the Pitt River. The north side of Tree Island was also groundtruthed by boat.

## **VI. Data Dictionary**

As the project progressed, the data collection methods were adjusted and refined in an iterative process with FREMP partners and BCCC team members. Minor challenges required the attention of, and resolution by the working group advising on this project:

### **A. Technical Issues**

#### **Transect Line Feature**

- The Transect line feature was used to draw a line to split up a polygon. Ideally it should also be used in conjunction with a GPS track line. However, due to poor satellite reception and connection problems with the GPS unit and the Archer this was not possible. Fortunately, there was little need to groundtruth polygons using transect lines because shape of the polygons were generally correct.

#### **Photo Location Points**

- The photo location point feature was utilized when satellite reception was available. Photo location points were used for locations of significant importance. Photo numbers were recorded within the community or point feature comment fields.

#### **Polygon Check Points**

- Numerous updates were made to the poly check field to capture more detailed and representative data. The option of noting partially vegetated, fully vegetated and unvegetated polygons was added to the data dictionary in August. Tabulating representative statistics of the accuracy of the 2003 Habitat Inventory has been challenging. When the project began vegetation observed in an unvegetated polygon (2003) was noted in the comment section of the point feature and the relevant community information was noted. Editing data out of the comment fields has been challenging. During the editing stage, partially vegetated and unvegetated polygons were referred to as 'Change' and fully vegetated polygons were classified as 'False'.

## **B. Updates**

### **Community Points**

- One issue encountered in the field was the format of the community point. The species list was alphabetized based on species type and linear delineations were added between trees and plant types. This resulted in quicker identification of plant species.
- The initial classifications available for a marsh were Marsh Br (brackish marsh) and Marsh Bf (freshwater marsh). The field crew was not equipped to distinguish the differences between the two types of marsh in the field. This resulted in the combining of the two marsh classifications into one 'Marsh' community option.

### **Invasive Points**

- A point feature was created to note invasive species found within observed polygons. Up to six invasive species could be recorded with this point feature. This information will be useful to local municipalities in planning invasive species removal strategies. Throughout the project, species were added to the invasive point in order to create a more comprehensive list.

### **Bird Points**

- The bird point from the first version of the data dictionary was updated in order to incorporate more detailed information on bird observations. It was revised to include a list of bird species. An additional field was added to record bird activity (feeding, flying, nesting, perched, singing, and swimming).

## **VII. Technical Issue Encountered in the Field**

Technical issues were encountered in the field with the connection between the GPS unit and the Archer. The Archer would consistently freeze when connected to the GPS. Through trial and error this was found to be caused by poor satellite reception and the sequence of connecting the GPS to the Archer. Inadequate satellite reception caused a message reading "Error 55" to appear on the Archer. When this error message was received, the GPS unit was shut down, restarted and left to acquire satellites for several minutes. ArcPad was also shut down and restarted. The units were then reconnected by attaching all of the necessary cables to the GPS and then by connecting the Archer to the GPS. The GPS function was then turned on in ArcPad and if satellite reception was reinstated, the field workers' spatial location within a polygon would be shown. This issue impeded data collection because it prevented points from added to a polygon in a precise location. Powering down the Archer and rebooting was also a time-consuming process. In order to prevent the Archer from freezing, some data and shapefiles were moved on to the SD card and were only used when required.

Transect lines were drawn free hand when a GPS signal was not available, therefore the position of lines may not be completely accurate. Transect lines were used to illustrate a change in vegetation. Some of the new polygons that were created in the field could be groundtruthed during future studies and remapped if necessary. In addition to polygons created by transect lines, there will also be some polygons drawn in ArcGIS. These areas will be mapped using the 2004 aerial photos in ArcGIS. During groundtruthing, some areas were vegetated where there were no polygons digitized in 2003. Points were placed in these areas noting the communities present and a comment was added indicating that the area should be mapped in the future. Some of these areas were also redigitized in ArcGIS if they could be easily identified on orthophotos. These areas included:

- Riparian area in front of the CN Rail yard in Delta. (redigitized in Arc GIS using 2004 aerial photos)
- Large intertidal area just south of the Tsawwassen First Nations Reserve, approximately 200m from the Tsawwassen ferry terminal. (redigitized in ArcGIS using 2004 aerial photos).
- Several vegetated (2006) intertidal areas throughout the FREMP area classified as unvegetated in 2003. (To be mapped in the future)
- Riparian areas from Dinsmore Bridge to Moray Bridge on Sea Island. (To be mapped in the future)
- Intertidal area along rip rap at Sea Island from the Flying Beaver Pub heading east then north to the North Fraser Port Authority office. (To be mapped in the future)

## **VIII. Considerations for the Timing of Future Field Work**

### **A. Seasonal Variability**

Data collection during the spring/ summer months poses some dilemmas:

- Due to variations in blooming times the field team was not always able to observe flora in full bloom. This made some plants harder to identify in the field. More extensive planning could be done for observing a given area in conjunction with blooming times.
- Timing field studies to coincide with bird migrations would maximize the number of bird species observed.

### **B. Tidal observations**

Intertidal reconnaissance should be conducted at low tide to improve the quality of data collected. Many intertidal areas that were unvegetated in 2003 supported vegetation in 2006.

- The delineation of unvegetated sand/ mudflats cannot be seen at high tide. The difference between polygons containing these substrates is important when adding points and community information to ensure that the points are spatially accurate.

### **C. Accessibility of Polygons**

- Some polygons are located on private land, within sensitive habitats, or in industrialized areas that are difficult to access. Areas like these were checked by boat, using binoculars, or with the permission of the land or business owner. Most of the polygons located on private land could be observed with binoculars or by boat. Some polygons located on the north east side of Westham Island were not checked as there was no dike access in this area. Some polygons located in sensitive habitats (e.g. Ladner marsh) were viewed with binoculars to reduce impacts. Generally, polygons located on industrial sites were viewed by boat. The only industrial area that was not fully groundtruthed was the west point of Mitchell Island because Riparian Area Regulation (RAR) construction was underway. The west point of Mitchell Island should be groundtruthed again during future field work.
- Some polygons were only accessible by boat (e.g. Lion and Don Islands). The Main Arm had poor land access and most polygons were observed by boat.

## **D. Polygons Checked with Binoculars**

- Polygons checked with binoculars were initially recorded with the letter “B” in the comments field of the point or community point feature. This process was found to be a misrepresentation of how data was collected in the field, and was discontinued. Many of the polygons could be checked with binoculars while standing in an adjacent polygon or when a polygon was in plain view from a distance away.
- If an inaccessible polygon required updates or corrections, certain plants could have been missed by not walking through an area. Where possible the field crew utilized binoculars from adjacent viewpoints for observing inaccessible polygons.

## **IX. Areas that were not checked During Groundtruthing**

The majority of the areas not checked during the groundtruthing process were parks, green spaces or wildlife management areas (Figure 3). The following locations were not field checked:

### **South Arm**

- Woodward, Kirkland, Duck, Gun and Barber Islands.
- East side of Westham Island from southern boundary of George C. Reifel Migratory Bird Sanctuary southeast to the north side of Westham Island road at the bridge.
- The south sides of Steveston and Gilmore Islands.
- Deas Island.
- The marshed area on the west side of Richmond between Garry Point Park and Terra Nova Park.
- South facing sides of Lion Island and Don Island.

### **North Arm**

- Marine Drive Golf Club, Kerrisdale to UBC.
- Iona Island Park.
- Swishwash Island.

## Boundary Bay

- From the CN Rail bridge at Blackie Spit along the Boundary Bay shoreline to Beach Grove in Tsawwassen.

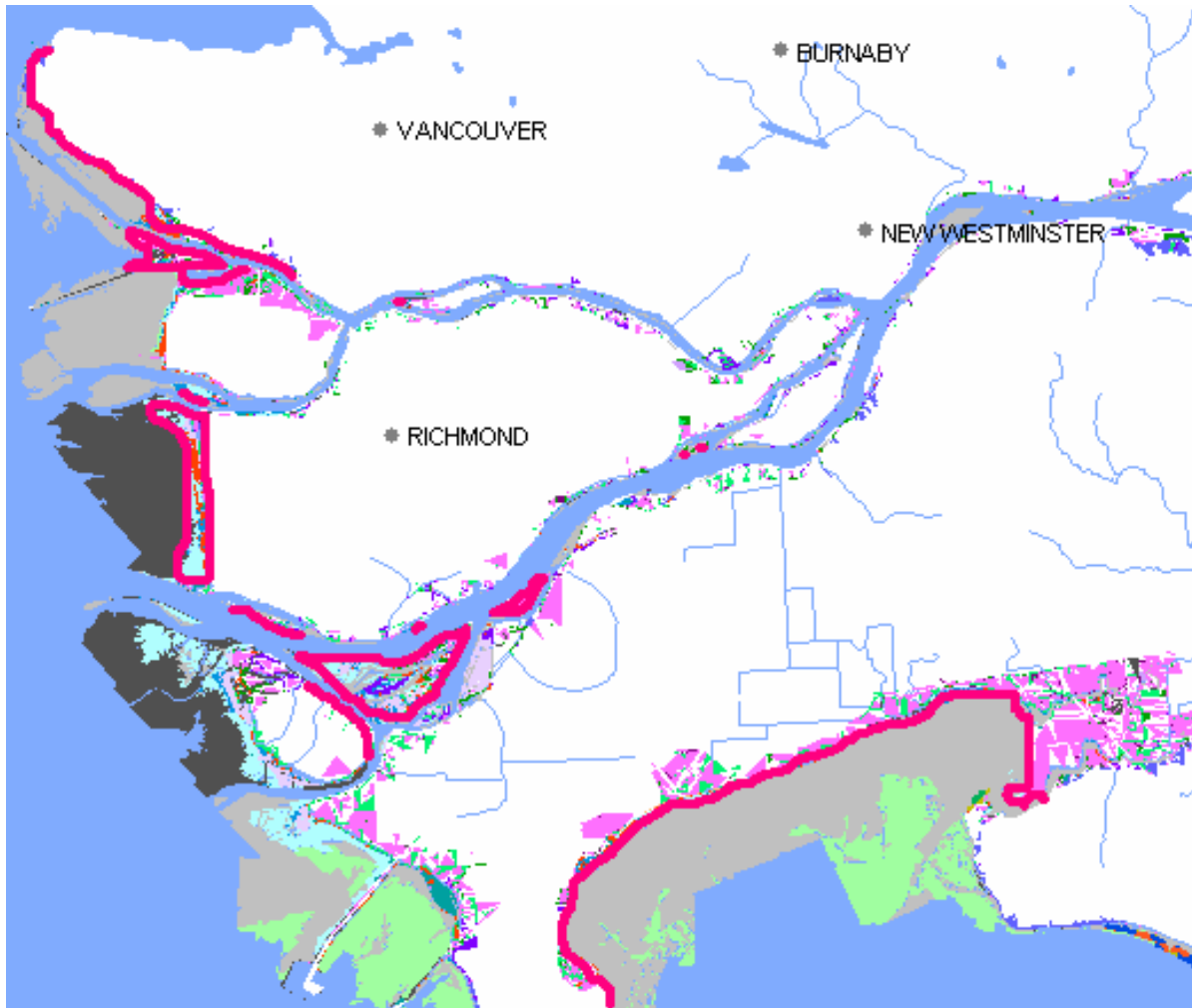


Figure 3: This map shows the majority of the FREMP area. The polygons highlighted in red indicate the areas that were not covered during the groundtruthing project.

## **X. Recommendations for Future Studies**

Suggestions to be considered for future studies:

- Shorelines along the Pitt River, the Fraser Main, South, North and Middle arms could be groundtruthed by boat. The estuary however should be groundtruthed on foot as more polygons are located in these areas and boat access would not be convenient.
- Future field crews should familiarize themselves with polygon locations in relation to land uses prior to commencing groundtruthing. This would allow the field crew to develop a landowner contact strategy to access polygons located on private property and would allow for the organization of boat access in certain areas.
- The field crew and project supervisors should also familiarize themselves with field equipment and software prior to commencing groundtruthing. All equipment should be ready and functional before the start of the project in order to begin groundtruthing as soon as possible.
- The point feature should include a field indicating that an area should be mapped in the future in order to aid future GIS technicians in their work.
- Only one version of the data dictionary should be used throughout field work in order to minimize problems with data editing and tabulating data statistics. Trial groundtruthing work could be completed by the field crew to determine the efficiency of the data dictionary and field equipment.
- Field crews should be skilled in flora and fauna identification. Before commencing field studies the field crew should familiarize themselves with plant, animal and bird species located in the area. The field crew should also be aware of endangered plant and animal species found in the study area.
- Acquiring a higher powered GPS, such as a Trimble, would allow points to be accurately placed within a polygon. A Trimble could also enable the field crew to map habitats that are not in the inventory.
- Additionally, a refined field classification system could be created for polygons that were mapped as unvegetated that have become partially or fully vegetated.
- Tall saplings or young trees should be added to the community list in the data dictionary to truly differentiate between young and mature trees.
- If possible a plant ID specialist / botanist should accompany the crew for 2 or 3 days to acquire better plant ID skills prior to commencing groundtruthing.

- Two computer work stations are needed at the FREMP office in order to accommodate two field crew members in completing administrative work.
- Groundtruthing should be completed before fall begins in order to ensure the identification of the most flora.
- The invasive plant data collected will be very useful for local governments and other organizations such as River Works and the Invasive Plant Council of British Columbia, to utilize in creating invasive plant management strategies. Perhaps this data could also be incorporated to the existing Invasive Species Atlas on the Community Mapping Network website in the future.

## **XI. Conclusions and Final Products**

The FREMP habitat inventory groundtruthing project was successful in accomplishing its objectives. The field crew surveyed 28.8% of the wetted side and 20.7% of the dry side of the Fraser River dikes. Supplemental information was collected to update or revise the existing inventory. Analysis of the 2003 habitat polygons groundtruthed on the wetted side of the dike in 2006 has found that 74.5% were correctly classified, 17% experienced change and 8.4% were falsely classified.

Approximately 24.7% of all polygons checked experienced change. Of these polygons, 12.6% previously unvegetated areas supported vegetation, 79.6% experienced natural growth (e.g. tall shrubs to trees) and 7.7% were cleared, developed or under construction.

At the completion of this project one updated habitat inventory layer and 3 additional layers (Wildlife trees, birds, and wildlife) will be added to the FREMP GIS and FREMP Atlas on the Community Mapping Network. The new layers will provide CMN users with updated information about the FREMP habitat inventory, building on the 2003 habitat inventory and including the more refined data collected as part of the 2006 groundtruthing project. A photo archive of plant species and other points of interest taken during field checking will be available for viewing at the FREMP office. Data on the observations of various invasive species is also available depending on resources and management needs of the FREMP partners.

The field crew surveyed 26.2% of the FREMP area of interest and collected new data on invasive species, birds, wildlife and wildlife trees. The field crew participated in providing input on the presentation of the data, how the data could be queried in the GIS format, data editing, data analysis and aided in the preparation of the metadata documents.

## XII. Appendix A – Data Dictionary

### FREMP July7, Dictionary

"**Start**", point, "", 1, seconds, Code  
 "Point\_id", numeric, 1, 0.0, 99999.0, 0.0, required, "unique point identification number", required, 1.0  
 "Date", date, auto, dmy, manual, required, required  
 "Time", time, auto, 24, manual, required, normal  
 "Weather", menu, normal, normal  
 "Light Rain",[L]  
 "Heavy Rain",[H]  
 "Snow/Sleet",[N]  
 "Over cast",[OV]  
 "Clear",[S]  
 "Partly Cloudy",[PC]  
 "Other",[O]  
 "GPS\_model", menu, normal, normal, Label2  
 "garmin"  
 "trimble xm"  
 "trimble xr"  
 "other"  
 "Crew", text, 50, required, required  
 "Comments", text, 100, normal, normal  
 "PhotoNum", text, 10, normal,  
 "Roll and print number of photograph", normal  
 "Location", text, 99, normal, normal, Label1  
  
 "**Point**", point, "", 5, seconds, 1, Code  
 "Point\_id", numeric, 1, 0.0, 99999.0, 0.0, required, "unique point identification number", required, 1.0  
 "Pnt\_Type", menu, normal,  
 "Point Type Code", required  
 "End\_pt",[E]  
 "Misc\_pt",[M]  
 "Poly\_check", menu, normal, normal, Label1  
 "True"  
 "False"  
 "Comments", text, 100, normal, normal

"**Community**", point, "", 5, seconds, 1, Code  
 "Point\_number", numeric, 1, 0.0, 99999.0, 0.0, required, "unique point identification number", required, 1.0  
 "Community", menu, required, normal, Label1  
 "Coniferous",[C]  
 "Deciduous",[D]  
 "Mixed",[M]  
 "Shrub\_tall",[ST]  
 "Shrub\_L",[SL]  
 "Meadow\_vascular",[MV]  
 "Meadow\_Non vascular",[MN]  
 "Marsh",[M]  
 "Eelgrass",[E]  
 "Macroalgae",[MA]  
 "Unvegetated",[UV]  
 "other",[O]  
 "SP1\_DOM", menu, required,  
 "Dominant species of community", normal, Label2  
 "Douglas fir"  
 "Grand Fir"  
 "Shore pine"  
 "Sitka Spruce"  
 "Western Hemlock"  
 "Western Red Cedar"  
  
 "=====  
 "big-leaf maple"  
 "black cottonwood"  
 "black hawthorn"  
 "cascara"  
 "domestic apple"  
 "domestic cherry"  
 "English hawthorn"  
 "paper birch"  
 "Pacific crabapple"  
 "Pacific willow"  
 "red alder"  
 "=====  
 "black twinberry"  
 "evergreen blackberry"  
 "Himilayan blackberry"  
 "Indian plum"  
 "ocean spray"  
 "Pacific Ninebark"

"red elderberry"  
 "red-osier dogwood"  
 "Saskatoon"  
 "Scotch broom "  
 "vine maple"  
 "willow"  
 "=====  
 "hardhack"  
 "Nootka rose"  
 "salmonberry"  
 "snowberry"  
 "sweet gale "  
 "thimbleberry"  
 "=====  
 "aster "  
 "beach pea"  
 "beaked sedge"  
 "big-headed sedge"  
 "bluegrass"  
 "bull thistle"  
 "buttercup"  
 "Canada thistle"  
 "common tansy"  
 "crabgrass"  
 "creeping bentgrass"  
 "dune grass"  
 "evening primrose"  
 "foxtail"  
 "foxtail barley"  
 "goldenrod"  
 "grey beach peavine"  
 "Japanese knotweed"  
 "lady fern"  
 "lawn grass"  
 "meadow fescue"  
 "orchard grass"  
 "pearly everlasting"  
 "purple loosestrife"  
 "quackgrass"  
 "red fescue"  
 "reed canary grass"  
 "reed mannagrass"  
 "ryegrass"  
 "seashore lupine"  
 "skunk cabbage"  
 "small-fruited bulrus"  
 "smartweed"  
 "soft rush"  
 "sow-thistle"  
 "tall fescue"  
 "timothy"

"vernal grass"  
 "woolly bulrush"  
 "yarrow"  
 "=====  
 "awned haircap moss"  
 "roadside rock moss"  
 "slender pixie cup "  
 "smooth pixie cup"  
 "=====  
 "American brooklime"  
 "American bugleweed"  
 "Arctic rush"  
 "arrowhead"  
 "bluejoint reedgrass"  
 "buckbean"  
 "common cattail"  
 "common vetch"  
 "dock"  
 "Douglas' aster"  
 "gumweed"  
 "hardstem bulrush"  
 "horsetail sedge"  
 "jointed rush"  
 "Lyngbye's sedge"  
 "pickleweed"  
 "Pacific silverweed"  
 "reed fescue"  
 "river scour rush"  
 "saltgrass"  
 "saltmarsh plantain"  
 "sandspurry"  
 "seacoast bulrush"  
 "seaside arrowgrass"  
 "shore sedge"  
 "slough sedge"  
 "smartweed"  
 "spear orache"  
 "spike-rush"  
 "sf forget me not"  
 "three-square bulrush"  
 "tufted hairgrass"  
 "water plantain"  
 "water sedge"  
 "water-starwort"  
 "yellow flag"  
 "=====  
 "Widgeon grass"  
 "Zostera japonica"  
 "Zostera marina"  
 "=====  
 "green algae"  
 "rockweed"  
 "sea lettuce"  
 "\_\_\_\_\_  
 "Other"

"SP1\_COV", menu, required,  
 "percent coverage of dominant  
 species", normal  
 "<5%",[T]  
 "5-25%",[L]  
 "26-50%",[M]  
 "51-75%",[MH]  
 ">75%",[H]  
 "SP2\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP2\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP3\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP3\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP4\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP4\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP5\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP5\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP6\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP6\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "Sand", numeric, 0, 0, 100, 0,  
 normal, normal

"Pebble", numeric, 0, 0, 100,  
 0, normal, normal  
 "Mud", numeric, 0, 0, 100, 0,  
 normal, normal  
 "Boulder", numeric, 0, 0, 100,  
 0, normal, normal  
 "BedRock", numeric, 0, 0,  
 100, 0, normal, normal  
 "Cobble", numeric, 0, 0, 100,  
 0, normal, normal  
 "Overhang", menu, normal,  
 "width of vegetation overhang",  
 normal  
 "none"  
 "<2m"  
 "2-5m"  
 ">5m"  
 "Distance", numeric, 1, 0.0,  
 0.0, 0.0, normal, "linear distance  
 to offset point", normal  
 "Bearing", numeric, 0, 0, 360,  
 0, normal, "compass bearing to  
 offset point", normal  
 "PhotoNum", text, 10, normal,  
 "Roll and print number of  
 photograph", normal  
 "Comment", text, 100, normal,  
 normal  
 "Tran\_line", line, "", 5,  
 seconds, 1, Code  
 "Line\_number", numeric, 1,  
 0.0, 99999.0, 0.0, required,  
 "unique point identification  
 number", required, 1.0  
 "Community ", menu,  
 required, normal, Label1  
 "Coniferous",[C]  
 "Deciduous",[D]  
 "Mixed",[M]  
 "Shrub\_tall",[ST]  
 "Shrub\_L",[SL]  
 "Meadow\_vascular",[MV]  
 "Meadow\_Non  
 vascular",[MN]  
 "Marsh",[M]  
 "Eelgrass",[E]  
 "Macroalgae",[MA]  
 "Unvegetated",[UV]  
 "other",[O]  
 "SP1\_DOM", menu, required,  
 "Dominant species of  
 community", normal, Label2  
 "Douglas fir"  
 "Grand Fir"  
 "Shore pine"

"Sitka Spruce"  
 "Western Hemlock"  
 "Western Red Cedar"  
 "=====  
 "big-leaf maple"  
 "black cottonwood"  
 "black hawthorn"  
 "cascara"  
 "domestic apple"  
 "domestic cherry"  
 "English hawthorn"  
 "paper birch"  
 "Pacific crabapple"  
 "Pacific willow"  
 "red alder"  
 "=====  
 "black twinberry"  
 "evergreen blackberry"  
 "Himalayan blackberry"  
 "Indian plum"  
 "ocean spray"  
 "Pacific Ninebark"  
 "red elderberry"  
 "red-osier dogwood"  
 "Saskatoon"  
 "Scotch broom "  
 "vine maple"  
 "willow"  
 "=====  
 "hardhack"  
 "Nootka rose"  
 "salmonberry"  
 "snowberry"  
 "sweet gale "  
 "thimbleberry"  
 "=====  
 "aster "  
 "beach pea"  
 "beaked sedge"  
 "big-headed sedge"  
 "bluegrass"  
 "bull thistle"  
 "buttercup"  
 "Canada thistle"  
 "common tansy"  
 "crabgrass"  
 "creeping bentgrass"  
 "dune grass"  
 "evening primrose"  
 "foxtail"  
 "foxtail barley"  
 "goldenrod"  
 "grey beach peavine"  
 "Japanese knotweed"  
 "lady fern"

"lawn grass"  
 "meadow fescue"  
 "orchard grass"  
 "pearly everlasting"  
 "purple loosestrife"  
 "quackgrass"  
 "red fescue"  
 "reed canary grass"  
 "reed mannagrass"  
 "ryegrass"  
 "seashore lupine"  
 "skunk cabbage"  
 "small-fruited bulrus"  
 "smartweed"  
 "soft rush"  
 "sow-thistle"  
 "tall fescue"  
 "timothy"  
 "vernal grass"  
 "woolly bulrush"  
 "yarrow"  
 "=====  
 "awned haircap moss"  
 "roadside rock moss"  
 "slender pixie cup "  
 "smooth pixie cup"  
 "=====  
 "American brooklime"  
 "American bugleweed"  
 "Arctic rush"  
 "arrowhead"  
 "bluejoint reedgrass"  
 "buckbean"  
 "common cattail"  
 "common vetch"  
 "dock"  
 "Douglas' aster"  
 "gumweed"  
 "hardstem bulrush"  
 "horsetail sedge"  
 "jointed rush"  
 "Lyngbye's sedge"  
 "pickleweed"  
 "Pacific silverweed"  
 "reed fescue"  
 "river scour rush"  
 "saltgrass"  
 "saltmarsh plantain"  
 "sandspurry"  
 "seacoast bulrush"  
 "seaside arrowgrass"  
 "shore sedge"  
 "slough sedge"  
 "smartweed"  
 "spear orache"  
 "spike-rush"

"sf forget me not"  
 "three-square bulrush"  
 "tufted hairgrass"  
 "water plantain"  
 "water sedge"  
 "water-starwort"  
 "yellow flag"  
 "=====  
 "Widgeon grass"  
 "Zostera japonica"  
 "Zostera marina"  
 "=====  
 "green algae"  
 "rockweed"  
 "sea lettuce"  
 "\_\_\_\_\_  
 "Other"  
 "SP1\_COV", menu, required,  
 "percent coverage of dominant  
 species", normal  
 "<5%",[T]  
 "5-25%",[L]  
 "26-50%",[M]  
 "51-75%",[MH]  
 ">75%",[H]  
 "SP2\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP2\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP3\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP3\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP4\_DOM", menu, normal,  
 "Dominant species of  
 community", normal  
 - same species list as in  
 'SP1'.  
 "SP4\_COV", menu, normal,  
 "percent coverage of dominant  
 species", normal  
 - same cover list as in 'SP1'.  
 "SP5\_DOM", menu, normal,  
 "Dominant species of  
 community", normal

- same species list as in 'SP1'.  
 "SP5\_COV", menu, normal, "percent coverage of dominant species", normal  
 - same cover list as in 'SP1'.  
 "SP6\_DOM", menu, normal, "Dominant species of community", normal  
 - same species list as in 'SP1'.  
 "SP6\_COV", menu, normal, "percent coverage of dominant species", normal  
 - same cover list as in 'SP1'.  
 "Sand", numeric, 0, 0, 100, 0, normal, normal  
 "Pebble", numeric, 0, 0, 100, 0, normal, normal  
 "Mud", numeric, 0, 0, 100, 0, normal, normal  
 "Boulder", numeric, 0, 0, 100, 0, normal, normal  
 "BedRock", numeric, 0, 0, 100, 0, normal, normal  
 "Cobble", numeric, 0, 0, 100, 0, normal, normal  
 "Overhang", menu, normal, "width of vegetation overhang", normal  
 "none"  
 "<2m"  
 "2-5m"  
 ">5m"  
 "PhotoNum", text, 10, normal, "Roll and print number of photograph", normal  
 "Comment", text, 100, normal, normal  
  
**"Birds\_Point"**, point, "", 1, seconds, 15, Code  
 "Point\_No", numeric, 1, 0.0, 99999.0, 1.0, required, "unique point identification number", normal, 1.0, Label1  
 "Type\_Evidence", menu, normal, normal, Label2  
 "Calls",[CI]  
 "Nest",[Nt]  
 "Sighted",[St]  
 "Droppings",[Sd]  
 "Other",[O]  
 "Conc\_type", menu, normal, "Type of bird concentration", normal

"Single nest",[S]  
 "Colony",[C]  
 "Overwintering Conc",[O]  
 "Migrating Flock",[M]  
 "Summer Moulting Conc",[SM]  
 "Summer feeding Conc",[SF]  
 "Comt\_Type", text, 100, normal, "Other Type Name", normal  
 "Species", menu, normal, normal  
 "Alcid",[ALCID]  
 "Bald Eagle",[BAEA]  
 "Black Oystercatcher",[BLOY]  
 "Brandt's Cormorant",[BRCO]  
 "Brant Geese",[BRAN]  
 "Cormorants",[CORM]  
 "Dabbling Ducks",[DADU]  
 "Diving Ducks",[DIDU]  
 "Double Crested Corm",[DCCO]  
 "Ducks",[DUCK]  
 "Geese",[GEES]  
 "Glaucous Winged Gull",[GWGU]  
 "Great Blue Heron",[GBHE]  
 "Gulls",[GULL]  
 "Loons",[LOON]  
 "Pelagic Cormorant",[PECO]  
 "Pigeon Guillemot",[PIGU]  
 "Raptor",[RAPT]  
 "Shorebirds",[SHOR]  
 "Songbird",[SONG]  
 "Swans",[SWAN]  
 "Terns",[TERN]  
 "Waterfowl",[WFOW]  
 "Other",[OTHR]  
 "Activity", menu, normal, "Bird Activities", normal  
 "feeding"  
 "flying"  
 "nesting"  
 "perched"  
 "singing"  
 "swimming"  
 "Comt\_Act", text, 50, normal, "Activity Comment", normal  
 "Species\_Name", text, 100, normal, "Species name", normal

"Bird\_Numbers", numeric, 0, 0, 99999, 1, normal, "number of birds", normal  
 "Comment", text, 100, normal, "General Comment", normal  
 "PhotoNum", text, 10, normal, "Roll and print number", normal  
  
**"Wildlife"**, point, "", 5, seconds, 1, Code  
 "Point\_number", numeric, 1, 0.0, 99999.0, 0.0, required, "unique point identification number", required, 1.0, Label1  
 "Type\_Evidence", menu, normal, normal, Label2  
 "Calls",[CI]  
 "Egg masses",[EM]  
 "Nest",[Nt]  
 "Sighted",[St]  
 "Scat/Droppings",[Sd]  
 "Tracks",[Tk]  
 "Other",[O]  
 "Class\_Wildlife", menu, normal, normal  
 "Amphibian"  
 "Large Mammal"  
 "Reptile"  
 "Small Mammal"  
 "Species\_Wildlife", text, 45, normal, normal  
 "CmmntFauna", text, 100, normal, "Fauna Comment", normal  
 "PhotoNum", text, 10, normal, "Roll and print number", normal  
  
**"Tree\_Wildlife"**, point, "", 5, seconds, 1, Code  
 "Point\_number", numeric, 1, 0.0, 99999.0, 0.0, required, "unique point identification number", required, 1.0, Label1  
 "Distance", numeric, 1, 0.0, 0.0, 0.0, normal, "linear distance to offset point", normal  
 "Bearing", numeric, 0, 0, 360, 0, normal, "compass bearing to offset point", normal  
 "Type\_Tree", menu, normal, normal, Label2  
 "Coniferous"  
 "Deciduous"  
 "Unknown"

"Veteran\_tree", menu, normal,  
 "Point location of a veteran  
 tree", normal  
 "Yes"  
 "DBH", numeric, 2, 0.00,  
 20.00, 0.00, normal, "Diameter  
 Breast Height", normal  
 "Mast\_tree", menu, normal,  
 normal  
 "Yes"  
 "Nesting", menu, normal,  
 normal  
 "Potential"  
 "Large"  
 "Small"  
 "State", menu, normal, "state  
 of wildlife tree", normal  
 "Living"  
 "Dead"  
 "unknown"  
 "Woodprk\_use", menu,  
 normal, normal  
 "Yes"  
 "Denning", menu, normal,  
 normal  
 "Yes"  
 "Perches", menu, normal,  
 normal  
 "Yes"  
 "Cavities", menu, normal,  
 normal  
 "1"  
 "2"  
 "3"  
 "4+"  
 "CmmntFlora", text, 100,  
 normal, "Flora Comment",  
 normal  
 "PhotoNum", text, 10, normal,  
 "Roll and print number", normal  
  
**"Invasive"**, point, "", 5,  
 seconds, 1, Code  
 "Point\_id", numeric, 1, 0.0,  
 99999.0, 0.0, required, "unique  
 point identification number",  
 required, 1.0  
 "Species\_1", menu, normal,  
 required  
 "baby's breath"  
 "burdock"  
 "cypress spurge"  
 "dalmatian toadflax"  
 "Daphne laureola"  
 "diffuse knapweed"  
 "english ivy"

"European Bittersweet"  
 "Evergreen blackberry"  
 "Field Bindweed"  
 "field scabious"  
 "Gaillardia aristata"  
 "giant hogweed"  
 "himalayan balsam"  
 "Himalayan blackberry"  
 "hogweed"  
 "holly"  
 "hound's tongue"  
 "Japanese knotweed"  
 "lamiastrum"  
 "morning glory"  
 "Mustard"  
 "musk thistle"  
 "orange hawkweed"  
 "oxeye daisy"  
 "periwinkle"  
 "poison hemlock"  
 "policeman's helmet"  
 "Purple loosestrife"  
 "Raphanus sativus"  
 "Reed canary grass"  
 "Scotch Broom"  
 "spotted knapweed"  
 "st. john's wort"  
 "tansy ragwort"  
 "Verbascum thapus"  
 "yellow toadflax"  
 "Zostera japonica"  
 "other"  
 "Species\_2", menu, normal,  
 required  
 - same species list as in '  
 Species\_1'  
 "Species\_3", menu, normal,  
 required  
 -same species list as in  
 'Species\_1'  
 "Com\_Inv", text, 100, normal,  
 normal  
  
**"Sp\_risk"**, point, "", 5, seconds,  
 1, Code  
 "Point\_id", numeric, 1, 0.0,  
 99999.0, 0.0, required, "unique  
 point identification number",  
 required, 1.0  
 "Species", menu, normal,  
 normal, Label1  
 "arctic daisy"  
 "awned cyperus"  
 "beach groundsel"  
 "beach sand-spurry"  
 "beaked spike-rush"

"bigleaf sedge"  
 "bog birds-foot "  
 "chaffweed"  
 "Chamisso's montia"  
 "common bluecup"  
 "cup clover"  
 "dwarf trillium"  
 "eminent bluegrass"  
 "false-pimpernel"  
 "field dodder"  
 "fleshy jaumea"  
 "flowering quillwort"  
 "four-leaved mare's"  
 "giant chain fern"  
 "Gmelin's sedge"  
 "graceful arrow-grass"  
 "green parrot's-feath"  
 "green\_sheathed sedge"  
 "hairy butterwort"  
 "Henderson's checker"  
 "heterocodon"  
 "Hornemann's willowhe"  
 "Howell's violet"  
 "hutchinsia"  
 "Kamchatka spike-rush"  
 "Large Canadian St. J"  
 "leafy mitrewort"  
 "least moonwort"  
 "lesser saltmarsh sed"  
 "long-leaved pondweed"  
 "Macoun's groundsel"  
 "Menzies' burnet"  
 "mountain sneezeweed"  
 "needle-leaved navarr"  
 "northern adder's ton"  
 "northern water-meal"  
 "Nuttall's quillwort"  
 "Nuttall's waterweed"  
 "Olney's bulrush"  
 "Oregon ash"  
 "paintbrush owl-clove"  
 "pigmyweed"  
 "pink water speedwell"  
 "pointed rush"  
 "poverty clover"  
 "purple-leaved willow"  
 "pygmy waterlily"  
 "QC avens"  
 "QC butterweed"  
 "QC twinflower vilole"  
 "rice cutgrass"  
 "scalepod"  
 "Scouler's corydalis"  
 "slender muhly"  
 "slender\_spiked manna"  
 "small-flowered louse"

"small-fruited willow"  
 "smooth willowherb"  
 "soft-leaved willow"  
 "Spanish-clover"  
 "three-flowered water"  
 "tooth-leaved monkey-"  
 "two-edged water-star"  
 "Ussurian water-milfo"  
 "Washington springbea"  
 "water bur-reed"  
 "waterwort water-milf"  
 "western mannagrass"  
 "western oxypolis"  
 "western pearlwort"  
 "western water-milfoi"  
 "white adder's-mouth "  
 "yellow marsh-marigol"  
 "Other"  
 "Comm\_sp", text, 100,  
 normal, normal  
**"Modification"**, point, "", 5,  
 seconds, 1, Code  
 "Point\_number", numeric, 1,  
 0.0, 99999.0, 0.0, required,  
 "unique point identification  
 number", required, 1.0, Label1  
 "Bearing", numeric, 0, 0, 360,  
 0, normal, "compass bearing to  
 offset point", normal  
 "Distance", numeric, 1, 0.0,  
 0.0, 0.0, normal, "linear distance  
 to offset point", normal  
 "Type\_Modification", menu,  
 normal, "Code for feature",  
 normal, Label2  
 "Bridge",[BR]  
 "Catchbasin",[CB]  
 "Channelization",[HOC]  
 "Dam",[HOD]  
 "Detention Pond",[DP]  
 "Dock",[DK]  
 "Dolphin",[DO]  
 "Dredging",[HBDD]  
 "Fences",[HOF]  
 "FloodGate",[FG]  
 "Garbage/Pollution",[WP]  
 "Gravel Pit",[GP]  
 "Livestock crossing",[LC]  
 "Logging",[LG]  
 "PipeCrossing",[PL]  
 "Pump Station",[PS]  
 "Retain Wall/Bank  
 Stb",[EHB]  
 "Rip\_Rap",[RR]  
 "Road",[R]

"Trail",[TR]  
 "Water Withdrawal",[FUP]  
 "Other",[O]  
 "Type\_Material", menu,  
 normal, normal  
 "Concrete",[C]  
 "Gabions",[GB]  
 "Pilings",[P]  
 "Stonework",[S]  
 "Sandbags",[SB]  
 "Wood",[W]  
 "Gravel",[G]  
 "Bark\_Mulch",[BM]  
 "Asphalt",[AS]  
 "Dyke",[DY]  
 "Other",[O]  
 "bank type", menu, normal,  
 normal  
 "stable"  
 "eroding"  
 "accreting"  
 "Length", numeric, 2, 0.00,  
 1000.00, 0.00, normal, "Feature  
 length", normal  
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 of Feature", normal  
 "Height", numeric, 2, 0.00,  
 1000.00, 0.00, normal, "Height  
 of feature", normal  
 "PhotoNum", text, 10, normal,  
 "Roll and print number of  
 photograph", normal  
 "Comments", text, 100,  
 normal, normal  
**"Discharge"**, point, "", 5,  
 seconds, 1, Code  
 "Point\_number", numeric, 1,  
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 "unique point identification  
 number", required, 1.0, Label1  
 "Bearing", numeric, 0, 0, 360,  
 0, normal, "compass bearing to  
 offset point", normal  
 "Distance", numeric, 1, 0.0,  
 0.0, 0.0, normal, "linear distance  
 to offset point", normal  
 "Type\_Discharge", menu,  
 normal, "Code for feature",  
 normal, Label2  
 "Agricultural  
 Runoff",[WPA]  
 "HouseEffluent",[WE]  
 "Landfill  
 Leachates",[WPML]

"Pollutant",[WP]  
 "Pulp Mill/Effluent",[WPP]  
 "Storm Drain",[WPD]  
 "Septic Effluent",[WPMP]  
 "Tile Drain",[WPI]  
 "Trench",[WPE]  
 "Other",[O]  
 "Bank", menu, normal, normal  
 "Both",[B]  
 "Instream",[I]  
 "Left",[L]  
 "Right",[R]  
 "Material", menu, required,  
 "Culvert material", required  
 "Concrete",[C]  
 "Steel",[S]  
 "Wood",[W]  
 "Iron",[I]  
 "PVC",[P]  
 "Asphalt coded",[AD]  
 "Corrugated Steel",[CS]  
 "Other",[O]  
 "Headwall", menu, normal,  
 "Does a headwall exist", normal  
 "Concrete",[C]  
 "Concrete Block",[CB]  
 "Gabion",[G]  
 "Sand bag",[SB]  
 "Wood",[W]  
 "Length", numeric, 2, 0.00,  
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 length", normal  
 "Width", numeric, 2, 0.00,  
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 of Feature", normal  
 "Diameter", numeric, 2, 0.00,  
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 "Diameter of feature", normal  
 "Height", numeric, 2, 0.00,  
 1000.00, 0.00, normal, "Height  
 of feature", normal  
 "PhotoNum", text, 10, normal,  
 "Roll and print number of  
 photograph", normal  
 "Comments", text, 100,  
 normal, normal  
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 seconds, 1, Code  
 "Point\_number", numeric, 1,  
 0.0, 99999.0, 0.0, required,  
 "unique point identification  
 number", required, 1.0, Label1  
 "PhotoNum", text, 30, normal,  
 normal, Label2

"Photo\_Direction", menu,  
normal, normal  
"Upstream",[U]  
"Downstream",[D]  
"Accross\_stream",[X]  
"Up",[UP]  
"Down",[BD]  
"Photo\_Bearing", numeric, 0,  
0, 360, 0, normal, normal  
"Photo\_Comments", text, 100,  
normal, normal

**"Photo\_Monitor"**, point, "", 5,  
seconds, 1, Code  
"Point\_number", numeric, 1,  
0.0, 99999.0, 0.0, required,  
"unique point identification  
number", required, 1.0, Label1  
"Photo\_Roll\_&\_Frame", text,  
30, normal, normal, Label2  
"Photo\_Direction", menu,  
normal, normal

"Upstream",[U]  
"Downstream",[D]  
"Accross\_stream",[X]  
"Up",[UP]  
"Down",[BD]  
"Photo\_Bearing", numeric, 0,  
0, 360, 0, normal, normal  
"Photo\_Comments", text, 100,  
normal, normal

### **XIII. Appendix B – Tables**

#### **Explanation of tables 1-3**

- The 2003 Habitat Inventory polygons were mapped according to a specific data structure. G.L. Williams and M. Adams prepared a revised data structure for use in 2006 updates to the Habitat Inventory. Field data recorded in 2006 used a modification of the 2006 revised data structure.
- The final 2006 Habitat Inventory will be presented according to the 2006 Revised Data Structure. In order to do this, two steps are required: (1) convert all polygon classifications from the 2003 Data Structure to their equivalent under the 2006 Revised Data Structure; and (2) convert all classifications from the 2006 field work to their equivalent under the 2006 Revised Data Structure.
- Every community value listed in Table 1 (2003 Data Structure) and in Table 3 (2006 Field Data Structure) must have exactly **one** equivalent value from Table 2 (2006 Revised Data Structure). See Link\_ID column. There is no need to relate the 2003 Data Structure directly to the 2006 Field Data Structure. Relationships between species lists under the 2003 and 2006 data structures are documented in other worksheets.

FirstOrder	SecondOrder	Community	Link_ID	Comment
riparian	grasses, shrubs & herbs	dry grass/herbs	6	
riparian	grasses, shrubs & herbs	wet grass/herbs	6	
riparian	grasses, shrubs & herbs	low shrubs (< 2 metres)	4	
riparian	grasses, shrubs & herbs	tall shrubs (2 - 6 metres)	5	
riparian	grasses, shrubs & herbs	cryptogam	7	
riparian	trees	coniferous trees	2	
riparian	trees	deciduous trees	1	
riparian	trees	mixed deciduous & coniferous trees	3	
riparian	marsh	reed canary grass	7	
riparian	marsh	mixed reed canary & other grasses	7	
riparian	marsh	other grasses	7	
riparian	marsh	sedges	7	
riparian	marsh	rushes	7	
riparian	marsh	other forbs	7	
riparian	marsh	cattails	7	
riparian	marsh	<i>field check required</i>	7	
riparian	swamp	coniferous trees	2	add "flooded" note to Notes
riparian	swamp	deciduous trees	1	
riparian	swamp	mixed deciduous & coniferous trees	3	
riparian	swamp	low shrubs (< 2 metres)	4	
riparian	swamp	tall shrubs (2 - 6 metres)	5	
riparian	swamp	<i>field check required</i>	n.a.	does not occur in 2003 data
tidal	marsh	reed canary grass	12	
tidal	marsh	mixed reed canary & other grasses	12	
tidal	marsh	other grasses	12	
tidal	marsh	sedges	12	
tidal	marsh	rushes	12	
tidal	marsh	other forbs	12	
tidal	marsh	cattails	12	
tidal	marsh	<i>field check required</i>	12	
tidal	mudflat	unvegetated	16	
tidal	mudflat	eel-grass	13	
tidal	sandflat	unvegetated	17	
tidal	sandflat	eel-grass	13	

Notes:

1. Based on 2003 FREMP Habitat Mapping Data Structure, version 7, 31-Oct-2003.

<b>Link_ID</b>	<b>FirstOrder</b>	<b>SecondOrder</b>	<b>Community</b>
1	riparian	trees & shrubs	deciduous tree woodland
2	riparian	trees & shrubs	coniferous tree woodland
3	riparian	trees & shrubs	mixed tree woodland
4	riparian	trees & shrubs	low shrub woodland
5	riparian	trees & shrubs	tall shrub woodland
6	riparian	graminoids & forbs	meadow, vascular
7	riparian	mosses, lichens & algae	meadow, non-vascular
8	intertidal	trees & shrubs	deciduous tree woodland
9	intertidal	trees & shrubs	mixed tree woodland
10	intertidal	trees & shrubs	tall shrub woodland
11	intertidal	trees & shrubs	low shrub woodland
12	intertidal	graminoids & forbs	marsh
13	intertidal	graminoids & forbs	eel-grass
14	intertidal	mosses, lichens & algae	macroalgae
15	intertidal	mosses, lichens & algae	meadow, non-vascular
16	intertidal	unvegetated	mud
17	intertidal	unvegetated	sand
18	intertidal	unvegetated	rock
19	other	other	other

Note: Category "19-other" indicates that the polygon classification needs to be reviewed.

2. Based on Williams, G.L., and M.A. Adams. 2006. "Fraser River estuary riparian and intertidal habitat classification." Report to Fraser River Estuary Management Program, Burnaby: 26 p.

<b>Community</b>	<b>Link_ID</b>	<b>Comment</b>
Coniferous	2	
Deciduous	1 or 8	check if in "riparian" or "intertidal"
Mixed	3 or 9	check if in "riparian" or "intertidal"
Shrub_tall	5 or 10	check if in "riparian" or "intertidal"
Shrub_L	4 or 11	check if in "riparian" or "intertidal"
Meadow_vascular	6	
Meadow_Non vasc	7 or 15	check if in "riparian" or "intertidal"
Marsh	12	
Marsh_BF	n.a.	change "Marsh_BF" to "Marsh"
Marsh_Br	n.a.	change "Marsh_Br" to "Marsh"
Eelgrass	13	
Macroalgae	14	
Unvegetated	16, 17, 18	probably 16-mud; see Comments, ask Michelle Scott
other	?	see Comments, ask Michelle Scott

Note: Can usually determine if "Unvegetated" is sand or mud based on 2003 data.

3. Based on "July 7 Data Dictionary" for "Community" data layer, output from 2006 field survey data logger and on field data received by 19-Oct-2006.

**Table 4:** This table illustrates the proposed FREMP inventory framework that was prepared by GL Williams & Associates Ltd. and ECL Envirowest Consultants Limited. This framework was used in the development of the data dictionary for the groundtruthing project. This framework was a modification of the system used for the ortho photo interpretation and mapping in 2003.

Notes:

<sup>1</sup> Riparian = above higher high water of maximum spring tide.

<sup>2</sup> Intertidal = between high and low water of maximum spring tide.

<sup>3</sup> Trees and shrubs = woody, vascular plants.

<sup>4</sup> Graminoids and Forbs = non-woody vascular plants: graminoids include plants with grass-like growth form including rushes (Juncaceae), grasses (Poaceae), and sedges (Cyperaceae); forbs include any non-graminoid herb species. Herbs are defined as any seed producing plant whose above-ground parts are composed of non-woody tissue and are not persistent; includes grasses and forbs.

<sup>5</sup> Moss, lichen and algae = non-vascular plants lacking vascular or transport tissue (i.e. xylem and phloem) and include algae, lichens, mosses, liverworts, as well as fungi. In the intertidal zone, marcoalgae are the usual non-vascular plant community encountered that would be mapped.

<sup>6</sup> Unvegetated = wetland type with vegetation cover that occupies less than 5% of the surface.

(Source: Williams, G.L. and Adams, M.A. 2006. Fraser River Estuary Riparian and Intertidal Habitat Classification. GL Williams & Associates Ltd. & ECL Envirowest Consultants Limited: 26p).

First Order (Tidal Position)	Second Order (Vegetation Type)	Community Type	Dominant Species
Riparian	Trees&Shrubs	Deciduous Tree Woodland	
		Coniferous Tree Woodland	
		Mixed Tree Woodland	
		Tall Shrub Woodland	
		Low Shrub Woodland	
	Graminoids & Forbs	Meadow Vascular	
	Mosses, Lichens & Algae	Meadow Non-vascular	
Intertidal	Trees&Shrubs	Deciduous Tree Woodland	
		Coniferous Tree Woodland	
		Mixed Tree Woodland	
		Tall Shrub Woodland	
		Low Shrub Woodland	
	Graminoids & Forbs	Marsh	
		Eelgrass	
	Mosses, Lichens & Algae	Macroalgae	
		Meadow	
	Unvegetated	Mud	
		Sand	
		Rock	

**Table 5:** Original FREMP first order, second order and community categories used in the orthophoto interpretation.

Notes:

<sup>1</sup> Swamp and Riparian marsh categories were added to account for wetted riparian habitats not directly connected to the Fraser River

<sup>2</sup> The cryptogam category was added under Grasses, Shrubs and Herbs to provide a special entry for non-vascular plants, e.g. mosses and lichen that were encountered on Iona Island near the airport growing on sand.

(Source: Williams, G.L. and Adams, M.A. 2006. Fraser River Estuary Riparian and Intertidal Habitat Classification. GL Williams & Associates Ltd. & ECL Envirowest Consultants Limited: 26p).

Order		Communities	Comments
First	Second		
Riparian	Tree (>6m height)	deciduous coniferous mixed	mosses and lichen by airport, Iona, over sand substrate
	Swamp <sup>1</sup>	deciduous coniferous mixed	
	Grasses shrubs & herbs	tall shrubs (2-6 m height) low shrubs (>2m height) dry grasses/ herbs wet grass herbs Cryptogam <sup>2</sup>  (ferns, mosses, algae & fungi)	
	Swamp <sup>1</sup>	tall shrubs (2-6m) low shrubs (<2m)	
	Riparian marsh <sup>1</sup>	mixed reed canary grass & other grasses other grasses sedges rushes other forbs cattails	
Tidal	Marsh	reed canary grass mixed reed canary grass & other grasses other grasses sedges rushes other forbs cattails	
	Mudflat	eelgrass unvegetated	
	Sandflat	eelgrass unvegetated	

