2.0 PROCESS AND METHODOLOGY

The process for establishing a Management Plan for Burnaby Mountain Conservation Area is presented in Figure 2-1. The following sections outline specific steps in the process and the techniques employed to collect, analyze and collate information to result in a preferred plan for the conservation area.

2.1 Public Consultation

Due to the complexity of some of the issues pertaining to Burnaby Mountain Conservation Area, the City of Burnaby encouraged public consultation at a number of stages during the planning process. At the earliest stages, the City of Burnaby sent out letters to all stakeholders and landowners presenting preliminary information on the process and requesting identification of issues. The following subsequent steps were then taken to involve the stakeholders in the planning process.

2.1.1 Informal Meetings

Soon after initiating the management planning process, letters were sent out to all stakeholders and landowners requesting identification of issues. Informal meeting with individual interest groups and members of the public were also held during the early stages of the process (i.e., throughout September 1997). The purposes of these meetings were to make initial contacts with stakeholders and to identify key planning issues. A series of meetings were held with the following groups:

- mountain bike clubs;
- environmental and stream stewardship groups;
- hiking and outdoor clubs;
- members of the former target ranges; and
- Simon Fraser University (SFU), Facility Services Department.

A meeting with representatives from the Burnaby Horseman's Association was also held at a later date (May 1998).

2.1.2 Public Open Houses

The first of three public Open Houses was held January 29, 1998 at Cameron Recreation Centre near the base of Burnaby Mountain. The purpose of the first Open House was to present results of the inventory phase as well as a preliminary list of issues that had been identified. A questionnaire was used to collect information on visitor activities and to gauge public opinion on resource management priorities as well as a proposed vision for the conservation area. Of the 200 members of the public who attended the Open Houses, 175 completed the questionnaire for a response rate of over 87 percent.

A second Open House was held September 30, 1998 at the Shadbolt Centre for the arts in Central Burnaby. This Open House provided an opportunity for participants to comment on options and management strategies for the mountain, including a draft Trail Concept Plan that incorporated ideas from previous public meetings and workshops.

A third and final Open House, hosted by the Burnaby Parks and Recreation Commission, was held October 28, 1998 at the Shadbolt Centre for the Arts. The meeting provided an amended Concept Plan and management recommendations for the conservation area. An open forum was used to solicit feedback and provide the public with a final opportunity to comment on the plan and recommendations. A summary of results from the three public Open Houses is presented in Appendix C.

2.1.3 Workshops

Representative members of the public were invited to attend two workshop sessions early in the design phase of the project (June 1998). Participants included local residents, members of environmental and stream stewardship groups, recreation club members, naturalists and academics.

Workshop 1 was used as an introduction and information session. Consultants reviewed the findings of previous research and then presented conceptual options for each of five sub-areas of the mountain. For each sub-area, two or three distinct design options were proposed based on the inventory information and considering the public input received to date.

Workshop 2 involved an interactive discussion of the pros and cons of each option. Participants were also given the opportunity to propose new options or combinations of options that they would like to see considered. While the discussion focused on potential options for allocating land uses (particularly with respect to trails), options for the management of natural and cultural resources were also considered.

2.2 Biophysical Inventory and Analysis

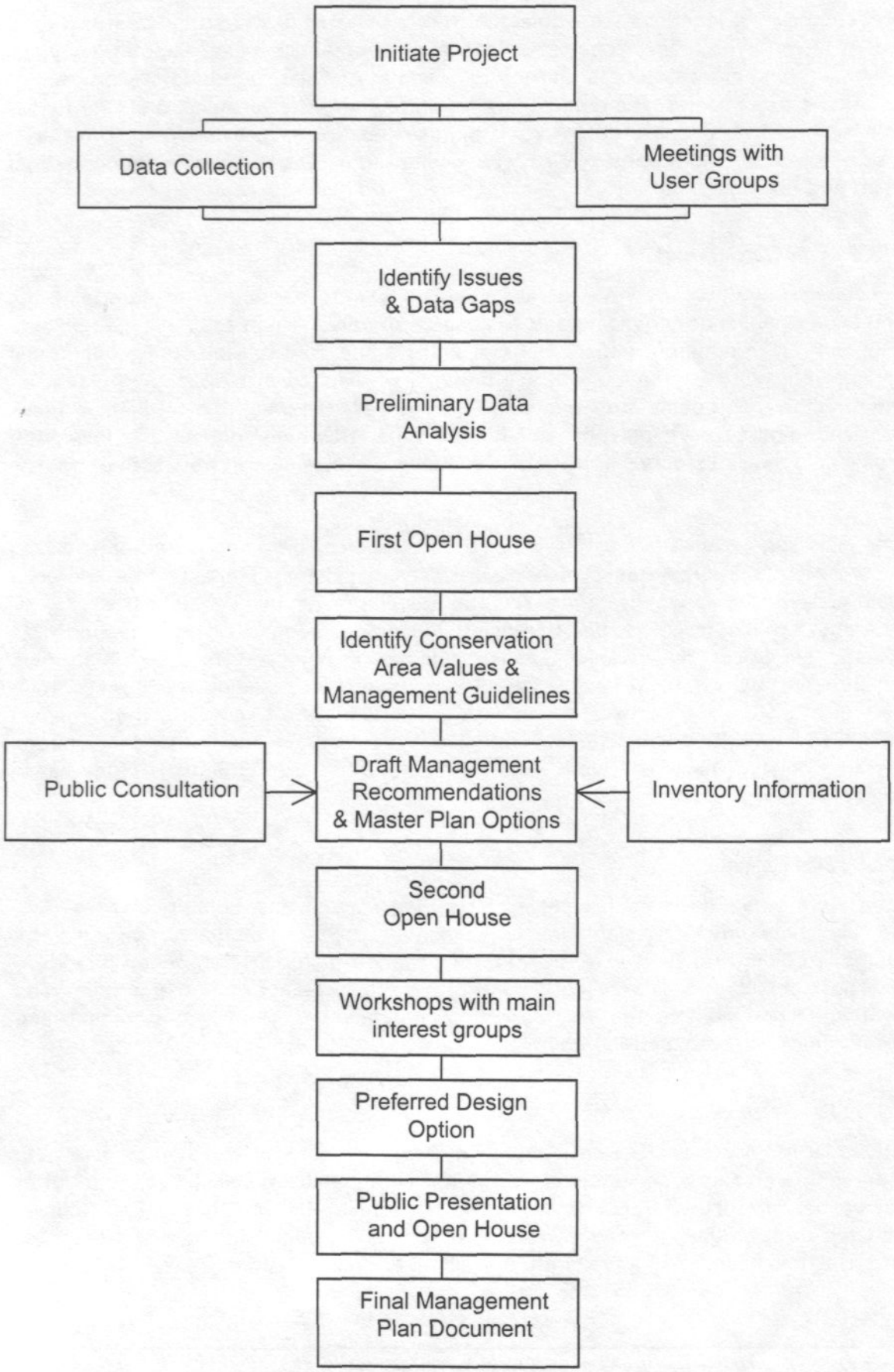
A biophysical field inventory was conducted during August, September and early October of 1997. The objective at this stage was not to perform a comprehensive resource inventory, but rather to establish a baseline understanding of the biological and physical features and habitats of the mountain in order to make recommendations for management.

The following methods were used to collect and analyze biophysical data on terrain, vegetation, and wildlife.

2.2.1 Plots for Vegetation and Soils

Forty plots on Burnaby Mountain were sampled using standard inventory

Figure 2-1. Burnaby Mountain Conservation Area Management Planning Process



procedures. Plot locations were selected from air photos of the study area (Figure 2-2). An effort was made to sample a range of geographic areas, vegetation types, elevations and slopes (access permitting). Field staff used round plots (10m radius) to sample tree species, 3m radius plots for shrubs and 0.5 m radius plots for herbs. The types of data collected for each sample location is presented in Table 2-1. Using this data, the mountain was later divided into 69 polygons denoting distinct plant and habitat types.

2.2.2 Wildlife Surveys

Reconnaissance level surveys of roads and trails were conducted to determine the presence or absence of wildlife and to observe the diversity of habitat types present (Figure 2-2). In addition, observations of wildlife and wildlife signs were conducted concurrently with vegetation and soil plots. This resulted in extensive coverage of the mountain with complete surveys of existing trails, as well as focal-point surveys corresponding to each polygon and habitat type. However, due to the fall/winter timing of the inventory work, many wildlife species were not active on the mountain.

Emphasis was placed on establishing which species are known and/or likely to occur on the mountain based on the suitability of existing habitats. This approach was believed to be appropriate for the development of a Management Plan, whereby more detailed studies or analyses may be recommended in response to specific issues or data gaps. Species lists were compiled by combining field observations with data from other studies and sources including the Conservation Data Centre (CDC), Ministry of Environment, Lands and Parks (MELP), the Canadian Wildlife Service (CWS) and local naturalist clubs such as the Vancouver Natural History Society. These lists were updated several times throughout the study based on subsequent site visits.

2.2.3 Bird Surveys

Birds were surveyed in each sample plot during August and September as part of the biophysical inventory component. In addition, early morning bird surveys were conducted along transects (i.e., trails) during the late fall migration period (Figure 2-2). These observations were combined with species lists from other studies and sightings from local naturalists to form a database of historic and recent bird observations for Burnaby Mountain.

2.2.4 Bat Surveys

Ultrasonic radio detectors were used to monitor bat activity and habitat use over one evening on Burnaby Mountain. Mist nets were set for at least two hours after sunset near Horizons Restaurant in the Centennial Pavilion area. Bat species detected through these methods were recorded on the species list along with other bat species expected to be present but which were not detected.

Table 2-1. Data Collected during Biophysical Inventory of Burnaby Mountain

Attribute	*Description*
Vegetation Attributes	
Cover Type	A classification based on the percent of tree cover occupied by coniferous trees, broadleaf trees, or a combination of coniferous and broad-leaved species (i.e. a mixed community).
Density	A measure of the density of tree cover, defined as sparse, open or dense.
Tree Species	Species found within the main and upper canopy tree strata (20m in height or above)
Understorey Tree Species	Species found within the understorey tree strata (10m to 20m in height)
Percent Cover	Tree crown closure that is the percentage of ground area covered by the vertically projected crowns of the tree cover within the polygon
Age	Estimated age of average individuals of each tree species within the polygon
DBH	Diameter at breast height of average individuals of each tree species within the polygon
Height	Estimated height of average individuals of each tree species within the polygon
Height Class	Classification of trees as dominant (highest), co-dominant (second tallest) or intermediate (third tallest)
Shrub Species B1	Tall shrub strata (2m – 10m in height)
Shrub Species B2	Low shrub strata (0m - 2m in height)
Percent Cover (shrubs)	The percentage of the polygon area being covered by each shrub species
Herbs	Main species found within the herbaceous layer
Percent Cover (herbs)	The percentage of the polygon area that is covered by each herbaceous plant species
Number of snags	The number of standing dead trees in the sampling area within each polygon
Witch's broom	The amount of witch's broom afflicting red alder trees within each polygon (classified as none to severe)
Disease / Damage	Other noticeable tree damage (e.g., Dwarf mistletoe, frost cracks, tree scars, broken tops, dead limbs, rotten core)
Wildlife Attributes	
Occurrence	Identification of wildlife and bird species either observed or heard
Sign	Identification of wildlife and bird species by sign (e.g., tracks, scat, middens, other)
Sex	Sex of species if identifiable by sight or sound
Behaviour	Behaviour of species observed, e.g., for birds – noted foraging, excavating, or flying
Woodpecker excavation	Evidence of woodpecker excavation and type of woodpecker if known
Nests	Locations of nests observed, e.g., in ground, shrub or tree layers
Wildlife trees	Locations and condition of wildlife trees
Wildlife trails	Locations of wildlife trails, e.g., for deer
Other Attributes	
Trails	Presence of hiking or biking trails within 5m of the sampling plot
Streams	Presence of streams or stream beds within 5m of the sampling plot
Other	Other notes and observations

2.2.5 Habitat Suitability Models

Habitat suitability models were developed for three species/species groups known to inhabit Burnaby Mountain: bats, black-tailed deer, and pileated woodpecker. All three species have been observed on Burnaby Mountain and are expected to reside there either seasonally or year-round. Due to the frequent and consistent human use of Burnaby Mountain, the consultants chose to develop habitat models for species that represent a range of tolerances to human disturbance. In this case, bats are the most tolerant of humans while pileated woodpeckers are the least tolerant. Deer residing in urban areas are moderately tolerant to human disturbances depending upon the season and frequency of encounters. While it is acknowledged that species-specific models do not provide an indication of habitat suitability for all species, for the purpose of this study these three species were selected to highlight potentially important habitat areas on Burnaby Mountain for small mammal, medium-sized mammals and birds.

Models were developed using inventory data for the study area, existing models for similar species, and knowledge of the ecology and habitat requirements of the selected species. For each species, rankings of high, moderate or low suitability were given to each of the 69 biophysical polygons. While using particular individual species will not provide an indication of habitat suitability for all species, for introductory purposes, these three species were selected to highlight potentially important habitat areas on Burnaby Mountain.

A more detailed description of the methodology for assigning habitat suitability rankings is presented in Appendix D.

2.2.6 Watercourses

Information on watercourses was first obtained from maps and literature describing Burnaby Mountain and the surrounding region. Once identified from these sources, watercourses were verified in the field to ensure that locations were accurately noted on the study maps. Detailed inventories on fish and aquatic habitat were not undertaken. However, the consultants received this information through studies conducted by local environmental groups, government, other consultants, and academic institutions (primarily BCIT student project reports).

2.2.7 Assessment of Critical Ecological Components

A more detailed analysis of ecological components was conducted for the conservation area as a means of displaying and summarizing data on vegetation, habitat, and watercourses (VHW). As part of the analysis, distinct polygons on the mountain (as defined through the biophysical inventory) were classified according to their relative ecological uniqueness or sensitivity. These rankings were later used to assist in selecting and rationalizing allocation of activities, proposed land uses, and necessary management actions.

Figure 2-2: Field Sampling Locations

VHW areas must be distinguished from Environmentally Sensitive Areas (ESA), a term which has been used throughout this plan to refer to Burnaby's city-wide classification of ecologically important lands. As part of a broader land assessment, the City of Burnaby has recognized Burnaby Mountain Conservation Area and the whole of Burnaby Mountain as an ESA of local and regional significance. At a more refined scale, VHW categories are used to classify the relative ecological significance of individual sites *within* the boundaries of the conservation area. VHW areas are also not readily comparable to Burnaby's ESAs since they do not include slope and geotechnical sensitivity, which is one of the criteria used to determine environmental sensitivity at the municipal level.

Regarding terrain sensitivity, it is recognized that terrain is an important component from an engineering and human use perspective. However, slope and terrain conditions were not directly factored into the overall VHW ranking for Burnaby Mountain Conservation Area for two reasons. First, it was felt that including terrain sensitivity in the overall ranking would skew the results of the analysis given the extreme topography in some sub-areas of the conservation area. For example, including terrain sensitivity in the analysis would make all areas on the steep north slope 'sensitive' even though this area has few permanent watercourses, limited vegetation diversity and is inaccessible for many species of wildlife. Second, available data allowed for only a rough assessment of potential erodability based on slope and soil characteristics. For planning and engineering purposes, a more thorough slope stability assessment should be done. Despite these assumptions however, a separate ranking was used to show relative terrain sensitivity for each polygon and this was later cross-referenced with the VHW map during the conceptual planning phase.

A more detailed description of the methods and results of the VHW analysis is presented in Appendix E.

2.3 Inventory of Historical, Cultural and Visual Resources

2.3.1 Historical and Cultural Inventory and Analysis

Historical and cultural features in the conservation area were identified from a review of existing documents, maps, aerial photography and site visits. Features of the inventory were mapped and reviewed with Burnaby staff and with the public through the Open House process.

2.3.2 Visual Inventory and Analysis

Long distance and panoramic view opportunities were noted in the field and mapped for use in the planning process. Views were assessed regarding their long-term stability; some views are stable while others are likely to disappear in the future unless steps are taken to manage the downhill forest cover.

2.4 Inventory of Facilities and Trails

Several detailed and up-to-date trail maps were available through mountain bike and hiking clubs as a starting point for trail inventory work. These maps were consolidated and field checked for accuracy and completeness. The major and well-established trails were mapped in the project map set. Numerous informal trails and paths also exist within the conservation area. A detailed survey of all informal trails was beyond the scope of this study although areas of significant off-trail use and braiding were noted.

Areas where recent trail activity has introduced new braided trails in wet and steep terrain were noted without mapping individual trail locations. A chart was produced which assessed each trail on the inventory with regard to dominant user groups, existing conditions, and preliminary assessment comments (see Appendix F). The inventory and preliminary assessment information was reviewed with City staff, displayed at the public meetings for comment, and revised to reflect new information over the course of the planning process.

2.5 Concept Design Plans

Using information collected from the inventory stages, and input from the public, several conceptual options were drawn up for review and discussion. These options illustrated the locations for key program elements including for the conservation area:

- existing, improved, or proposed new facilities;
- trails and trail uses;
- key views and viewpoints;
- areas of important habitat;
- access and links to other areas;
- interpretive displays and signage; and
- parking, traffic and pedestrian circulation.

Each option reflected a different approach to matching uses of the conservation area with the varying characters and environmental sensitivities of different sub-areas. Following discussions with Burnaby and public representatives (through the workshop approach described above), a matrix was developed to describe the relative advantages and disadvantages of each option or combination of options including the potential environmental implications of each.

A preferred option for the conservation area was then developed.