

City of Surrey

Parks, Recreation and Culture Department

Natural Areas: Fauna Management Strategy

Greg Ward

Manager, Park Urban Forestry and Environmental Services

Robertson Environmental Services Ltd.

Langley

Edited by: Diana Wegner

Professional Writer

Table of Contents

<i>Introduction</i>	3
A Mandate to Protect Wildlife.....	3
Ecological and Social Benefits.....	3
Purpose and Scope.....	4
History.....	4
Current Conditions and Initiatives	5
Policies and Procedures.....	7
<i>Fauna Management Strategy</i>	8
Principles.....	8
Goals and Objectives.....	8
General Planning and Development Guidelines	9
Parks Operations and Maintenance	11
Pest Management.....	17
Riparian Area Management.....	19
<i>Implementation Recommendations</i>	29
Appendix A: Fauna Resources and Habitats of Surrey	31
Appendix B: Terrestrial Fauna.....	33
Appendix C: Rare and Endangered Animal Species.....	35
Appendix D: Review of Plans, By-laws and Policies Affecting Fauna	37
Appendix E: Other Standards, Reports and Statutes.....	41
<i>References</i>	43

Introduction

A Mandate to Protect Wildlife

A tremendous variety of wildlife depend, in whole and in part, on Surrey's park natural areas for their existence. Wildlife habitat within the region, however, has been altered by human centered development and the precious interconnectivity of natural ecosystems fragmented to the point where many species are threatened, endangered and even eliminated. Wildlife habitat restoration and ecosystem sensitive natural area management is necessary in order to protect and rebuild the populations of wildlife that depend on the integrity of park natural areas for their survival and health.

The City has an important role to play in the protection and conservation of fauna resources and their habitats, primarily through its control over land use development, management practices in its parklands and this role and responsibility has not been explicitly articulated in other City documents. From large mammals to the wide range of insect species that populate park natural areas, the *Fauna Management Strategy* aims to address wildlife management practices in Surrey's parkland. Species diversity and viability are directly dependent on careful stewardship of these habitats and ecological functions as they exist in park natural areas. The City of Surrey Parks, Recreation and Culture Department should be a leader in this conservation process, however, with perhaps the exception of fish resources, relatively scant attention has been paid to the specific needs of wildlife.

Managing faunal resources is integrally tied to the management of the vegetation resource of natural areas. The Vegetation Management Strategy of the Natural Area Management Plan should be referred to in conjunction with this Strategy to fully appreciate their links and the interdependency of managing faunal resources along with the vegetation resource. There are a considerable number of co-dependent recommendations within each Strategy.

Ecological and Social Benefits

The wildlife that makes their home in, or visits park natural areas of the City is an integral part of the community. It is hard to imagine the City without eagles, hawks, deer, raccoons, opossums, trout, salmon and the innumerable insects that are necessary for ecological health.

The following are some of the benefits wildlife provide.

- Essential to ecosystem function
- Educational opportunities
- Important to agriculture and horticulture as pollinators and in pest control
- Essential to maintaining populations of other species- food source, predation
- Increased eco-tourism, economic prosperity and community value

-
- Increases aesthetics through their visual and aural presence

Purpose and Scope

Through its Parks, Recreation and Culture Department the City of Surrey has a key stewardship role to play in the conservation and management of local, regional and, in many cases, global faunal resources through sound management of its' natural area parklands. The purpose of this Strategic Plan is to provide overall direction to the Parks Division in the management of faunal resources that occur in Surrey parks. The Plan provides background and strategic direction as follows:

- A history and assessment of current conditions and initiatives
- Fauna management principles
- High level goals and objectives
- Specific recommendations concerning park planning, development, operations and maintenance and riparian, or streamside, area management.
- Implementation recommendations.

History

Prior to the arrival of humans, Surrey was dominated by temperate rainforests interspersed with areas of grasslands, wetlands and shorelines. Non-forested areas generally occurred in places that were too wet or too saline for trees to survive, or in areas where disturbances such as fire, wind or disease killed groups of trees, creating open meadows. Wildlife was relatively abundant.

Naturalists accompanying early explorers have provided a glimpse of the wildlife of the western Fraser Valley for the period before and during the early stages of the arrival of Europeans. For example, James Work, a member of the 1824 James McMillan expedition, recorded the occurrence of a herd of wapiti (elk) near the mouth of the Salmon River (Langley; cited by Leach, 1982). Settlers, who begin to arrive after the construction of Fort Langley, were attracted to the plentiful populations of fur-bearers. Barry Leach refers to the numerous beaver and mink which Sam Hall found after he built his cabin by the bank of the little Campbell River in 1845 (Leach, 1982). The literature tells us also that in the fall of 1858, John Lord and Charles Wilson explored up the Fraser River reporting California condor, turkey vulture, bear, deer, otter, mink, and the continuous cackling of geese and ducks.

As the area was settled and developed, most of these ecosystems were converted to other uses. Roads, railroads, utilities, subdivisions, industries, commercial areas and farms came to dominate the landscape. Over time, these changes have had a significant impact on wildlife in Surrey, both through the fragmentation of natural ecosystems and the introduction of invasive species. This fragmentation and subsequent loss of wildlife habitat have resulted in a serious, significant loss of biodiversity. Many species are now endangered or threatened and some

have already been eliminated (see Appendix C for a list of threatened and endangered species). To compound this degradation, new aggressive plant and animals species have been introduced into these areas, further displacing native animals and vegetation. Foreign animal species have had a significant impact on native animals, for they are often resilient and aggressive.

As the City has urbanized, the last vestiges of the wilderness that once were characteristic of Surrey's landscape are found primarily in the parkland that the City provides. Amongst the many residential subdivisions, commercial core areas and industrial parks, natural areas are sometimes being preserved as "nature preservation and linkage parks." Although approximately 60% of existing parkland is in a natural state, the native wildlife is still under considerable urban pressure.

Current Conditions and Initiatives

The City of Surrey has set aside considerable tracts of natural areas as parks. Parks such as Green Timbers, Sunnyside Acres, and Blackie Spit are testimony to the willingness of the City to participate in protecting the ecological health of the region. As well, the City is actively reserving riparian areas as parks through development processes with the overall goal of protecting fish habitat.

For many species, park natural areas provide a protected haven- a refuge for carrying out all or part of their life functions. Park natural areas provide wildlife, or wildlife populations, with the following

- Increased genetic diversity and species richness.
- Habitats for rare, endangered or uncommon species: for fish and wildlife species (both resident and migratory), and especially species which require larger areas for lifecycle functions.
- Travel corridors and resting places for migratory species.
- Breeding and nesting areas for colonial species such as Great Blue Herons and various fish species.
- Natural hydrological processes which provide the basis for groundwater recharge, constant stream flows which, in turn, then benefit wildlife.
- Benchmark natural areas for comparison with disturbed areas.
- Areas for research and study of wildlife resources
- Areas for education and enjoyment of wildlife

Despite a commendable effort in preserving natural areas as parkland, two general changes have occurred to Surrey's natural area land base that have had a significant impact on wildlife in Surrey.

Ecosystem Fragmentation

The landscape has been broken up into a series of isolated islands of habitat within developed areas. This fragmentation reduces the ability of species to move between habitat areas or colonize available habitat. Fragmentation also increases edge effects, impacts ecological functions and makes ecosystems more susceptible to the introduction of invasive species (both flora and fauna). Even benign facilities such as park trails can lead to fragmentation. Remnants of these previous ecosystems still exist in the City's parklands and other protected areas, reminding us of our wildlife heritage and the vast expanse of wild lands which occur not far from the City.

Without connections and corridors to other habitat areas, many species would not continue to survive. Surrey's network of streams and riparian forest (many of which are dedicated parkland) provide these critical wildlife pathways. Wildlife corridors allow dispersal of individuals or species between habitats and may provide an opportunity for recolonization of habitat patches following disturbance or loss of small local populations.

Introduction of Invasive Species

While not as dramatic as habitat fragmentation, invasive species can cause localized problems in natural areas. Invasive non-native plants can modify ecosystems through:

- Suppression or local eradication of native plant species and their associated organisms.
- Reduction in total native species diversity and numbers.
- Modification of soil nutrients and pH.
- Alteration of drainage patterns.
- Declines in survival rates of native animals.

Such species include non-native plants and animals as well as some native species that rapidly colonize ecosystems because of their competitive or adaptive characteristics. Other non-native species include domestic and feral pets, such as cats, are known to impact on birds, small mammals, insects, snakes and lizards. Pet owners have also introduced fish, rabbits and turtles into the City's natural areas.

The role of park natural areas to help maintain a diversity of ecosystem types and for conserving wildlife habitat is becoming increasingly important, particularly in the face of continuing urbanization and fragmentation. These park areas represent some of the last remaining and relatively undisturbed natural areas within an ever-growing urban environment. This situation presents formidable challenges for park managers as they strive to meet demands for both active and passive recreational activities while maintaining important habitat features. These challenges exist both at the planning and at the operations levels.

Although the Parks Division has conducted a forest management program in the past, few park maintenance and operation program activities have been developed for the direct

purpose of protecting and enhancing wildlife. Most park natural area management, to date, has been centered on the goal of ensuring safe human use with scant attention to the needs of wildlife. It is the intention of the Fauna Management Strategy to provide direction that will encourage a balanced approach to natural area management, ensuring human and wildlife needs are concurrently considered.

Policies and Procedures

The City's plans, policies, by-laws, and management approaches provide, indirectly, general goals for addressing wildlife resources and habitats. However, there does not appear to be one set of overall goals and objectives, or set of policies, for explicitly directing the management and protection of wildlife resources and habitats within parks.

What is needed is a common vision and Parks, Recreation and Culture Commission policy framework for protecting and managing park natural areas, including the wildlife resources, that is well understood by Council, all City commissions and advisory committees, the general public and park employees. The vision and policy framework should be integrated among the various park management service delivery teams, from planning to field operations.

The following sections propose a *Fauna Management Strategy* to guide the Parks, Recreation and Culture Department in protecting and managing wildlife. This strategy is consistent with the policies of the *Official Community Plan*, and the *Parks and Recreation and Culture Master Plan*. The *Fauna Management Strategy* will be an integral information resource for the development of a policy framework for managing park natural areas.

Fauna Management Strategy

The key to any fauna management, both short- and long-term, is habitat provision and protection. The concepts and recommendations found within this *Strategy* are generally directed at protecting wildlife populations in park natural areas through ecosystem based management activities, while also meeting the general need to provide Surrey residents the opportunity to enjoy park natural areas and all their wonders. Through creative planning, sensitive development, diligent and integrated natural area park operation and maintenance, Surrey's faunal resources will prosper.

Principles

The following principles provide direction and assistance for establishing fauna management goals and objectives, resolving management issues, developing a fauna management program, assisting with Parks Division resource allocation discussions, and developing Parks Division annual work plans for natural areas.

The informing principles of this Strategy are that:

- Park natural areas provide valuable and integral habitats for fauna
- Fragmentation of natural areas should be limited to encourage fauna populations
- Recreational activities must be compatible with the site and must not unduly impact significant habitats and vegetation
- Regulations designed to protect natural area parks should be developed and enforced
- Fauna in natural areas constitute a valuable community, regional and global resource and need to be protected, preserved and enhanced
- Fauna contribute significantly to biodiversity and environmental sustainability
- Fauna contribute significantly to park experiences, and to the cultural and heritage values of the City

Goals and Objectives

The overall goal in managing fauna is to protect, preserve and enhance the faunal resource through integrated resource planning and management.

The following general objectives assist in achieving the aforementioned goal:

- Acquire a wide range of faunal habitats that promote the principle of biodiversity and reduce habitat fragmentation

-
- Identify and designate sensitive wildlife species and habitats to be protected; restrict access and recreation to these habitats
 - Utilize management techniques, such as wildlife tree creation, to provide for wildlife
 - Implement the principle of no net loss of habitat when planning for park natural area uses that may negatively impact sensitive wildlife habitat
 - Protect threatened and endangered species habitat
 - Implement wildlife refuges that limit, restrict or prohibit human access or use
 - Re-introduce extirpated species to appropriate habitat
 - Monitor wildlife populations
 - Integrate vegetation resource management plans with fauna requirements; develop conservation plans
 - Ensure all major park planning processes adequately identify wildlife habitat and resources
 - Allocate resources to undertake habitat restoration, rehabilitation and enhancement initiatives that protect, preserve and prosper wildlife populations
 - Undertake public education initiatives to develop an understanding of wildlife requirements

The aforementioned objectives are described more fully in the following sections and are recommended for implementation through general planning and development guidelines, operation and maintenance initiatives, and riparian area management recommendations.

General Planning and Development Guidelines

Land Acquisition

The City should generally acquire natural areas to provide for a range of habitats that promote the principle of biodiversity, reduce habitat fragmentation, and acquire habitats for species of conservation concern.

Habitat acquisition includes:

- Upland coniferous and deciduous forested areas of at least 2 hectares (5 acres)
- Areas that promote connectivity between contiguous ecosystems or between protected habitats (e.g., wildlife corridors)
- Riparian areas adjacent to streams, lakes and wetlands
- Marine habitats and wetlands

-
- Old-field meadows
 - Seasonally flooded fields
 - Lands adjacent to existing parks that would increase the habitat size and protection for faunal resources

Park Planning

Planning initiatives and activities should include the following wildlife sensitive objectives:

- Consider the requirement to connect habitats and reduce habitat fragmentation
- Adopt and implement the concept of wildlife reserves where human access is restricted or prohibited.
- Ensure that all applicable park planning processes adequately identify and inventory faunal resources and habitat.
- Ensure that park plans identify and designate sensitive habitat areas and that any planning decisions fully consider these areas in a manner that protects faunal resources from undue human disturbance.
- Develop local wildlife habitat management plans for parks with a significant wildlife resource, based on biodiversity, the presence of species at risk, or species and/or species groups of conservation interest.
- Avoid sensitive wildlife habitat areas when planning park uses that would unduly impact the wildlife.
- Implement the principle of "no net loss" of habitat when planning for park uses that may negatively impact on sensitive wildlife habitat.
- Delineate buffers around core habitats. Vegetated buffers can help bear the brunt of edge effects such as windthrow, invasive species colonization, and increased access.

Park Development

Park development and construction activities can unnecessarily impact faunal resources if not carried according to reasonable standards and specifications. Often there is considerable opportunity for field staff to modify general park concept plans during park development to the benefit of wildlife.

- Develop a set of environmental design guidelines that would then be built into construction standards and specifications. The guidelines would have a net effect of protecting and enhancing wildlife.
- Consider the use of biofiltration swales and associated wetland development, rather than closed system drainage, to manage surface stormwater drainage.
- Structures that reduce ecosystem impact by vertically separating trail users from sensitive habitats may be used to permit access and views into locations that would

otherwise be closed to trail users. In addition, such structures provide well-defined trails and discourage trail wandering.

- Footbridges and boardwalks are useful in areas where pedestrians must cross streams, side channels, groundwater seepage areas, or soils that are vulnerable to erosion or compaction; they also allow users to skirt or cross wetlands and other sensitive aquatic features.
- Where off-trail wandering is likely to occur, or where even minimal off-trail wandering would be particularly harmful (such as near wetland areas), boardwalks should be designed with side railings to encourage users to stay on the defined trail.
- Viewing platforms, particularly those that are elevated, allow park patrons to see into sensitive areas, thereby providing educational opportunities while limiting disturbance to sensitive habitats. Near wetlands and rivers, viewing platforms can be used to give park users the feeling of being out over the water while minimizing shoreline impacts. Footbridges, boardwalks and viewing platforms can all be designed to permit wheelchair access.
- Boardwalks and viewing platforms located over sensitive habitats should be elevated a minimum of 1.0 metre to minimize shading of vegetation. Orienting these structures along north-south alignments also helps to reduce shading impacts by allowing different areas to be exposed to sunlight throughout the day.

Parks Operations and Maintenance

Recommended Park Operation and Maintenance Initiatives

The following are suggested as initiatives and activities that the Parks Division could undertake in the operation of its natural area parks to enhance wildlife populations.

1. Reduce ecological fragmentation

There are significant opportunities for the Parks Division to reduce ecological fragmentation in its existing parks where 'islands' of natural area habitats are separated from each other. The solutions can be as simple as eliminating regular lawn mowing to replanting of areas in between natural area islands with native plant material. Past planning and development processes intentionally created islands of natural areas within parks without a complete understanding of the consequences to natural systems.

2. Reintroduce extirpated species; enhance species at risk

Introduction of species to a natural area is often a controversial activity, however, Surrey's large natural area parks could serve as excellent habitat for species that have been extirpated from the area or are at risk. Since many park natural areas are separated from other natural areas where extirpated species currently live, it is likely some wildlife species would be

unable to repopulate some park natural areas. Reintroduction of extirpated species may be a solution.

3. Monitor presence of wildlife

In order to make informed and sensitive decisions on natural area development or management, it will be necessary for decision makers to fully understand the impact to wildlife. One facet on the decision making process is to understand the presence, or absence, of wildlife in natural areas. This can be accomplished, in part, through monitoring of wildlife populations through such means as naturalistic observations or even live trapping.

4. Inventory of natural areas

A key recommendation to successful fauna management is to understand the existing inventory of natural area lands and their potential in supporting fauna habitat. An inventory of natural area park land should be ecosystem based and detailed enough to promote the protection and conservation of faunal resources.

5. Educate park patrons on the value of wildlife

Parks are generally perceived to be for people and, although some parks should have 'wildlife reserves' that would restrict access by people in order to protect wildlife, there is a need to educate park patrons on the value of wildlife. Through signage, brochures, educational sessions the general public's awareness of, and sensitivity to, wildlife and their needs should be increased.

6. Introduce wildlife protection policies and by-laws

Currently the City relies primarily on senior government regulations and laws for wildlife protection within its City limits. Through by-laws and policies the City could take a more active regulatory role in wildlife management. With the exceptions of Urban Forest Park Policies, directed at the management of the City's three urban forest parks, the Parks, Recreation and Culture Commission Policy contains no reference to wildlife management at all. Commission wildlife management policy would do well to enshrine wildlife protection into the day-to-day operation of park natural areas and send a clear message that wildlife protection is an important direction for the Commission.

7. Manage natural areas to enhance wildlife

Past management activities for park natural areas has been directed almost entirely at meeting the needs of humans. Safety of park patrons has been in the forefront when managing vegetation, with the Parks Division implementing programs such as tree hazard mitigation and trail vegetation setback pruning. It is important to consider the needs of humans in the planning, development and operation of park natural areas, however, it is time for the City to also fully consider the needs of the faunal resources in conjunction with human interests. Programs that are directed at rehabilitating and enhancing natural areas through planting and caring for vegetation, for the sake of wildlife, is necessary for the City to live up to the responsibility of managing natural areas as local, regional, and global resources.

Recommended Modifications to Current Park Maintenance Practices

Park operation and maintenance practices have significant and direct impact on the health of fauna resources. Activities such as tree hazard abatement, vegetation mowing and pruning, trail maintenance and drainage management are some activities that can impact the wildlife of a natural area. Their implementation can be done sensitively to encourage wildlife populations.

8. Hazard Tree Abatement

The removal of hazard trees also has the unintended effect of removing wildlife habitat, since most hazard trees are potential wildlife trees. It is for this reason we have recommended that:

- Park facilities should be placed in locations away from potentially hazardous trees, so that their wildlife functions do not have to be eliminated in the name of public safety.
- Hazard trees provide habitat for a variety of cavity nesting wildlife and are a source of large woody debris, they should only be removed if they pose a safety risk.
- Removal of the stumps and roots of hazard trees in riparian areas should be avoided to prevent soil disturbance.
- Large woody debris resulting from hazard tree abatements should be left on site to enhance habitat for small mammals and other species.

For further information on wildlife and hazard trees refer to the Tree Hazard Management Strategy of the Natural Area Management Plan.

9. Vegetation Management

Vegetation management activities have a great potential to positively or negatively effect the health of the fauna resource. The recommendations found within the Vegetation Management Strategy of the Natural Area Management Plan, if implemented, sufficiently consider provisions for wildlife habitat creation and therefore do not bear mentioning here.

10. Refuse Management

- Yard and garden wastes should be disposed of outside of sensitive areas, particularly riparian areas as they may release toxic contaminants (fertilizers, herbicides and pesticides), shade riparian vegetation, and can cause nutrient loading if introduced to watercourses.
- If there is a concern that local residents are disposing of yard and garden waste in natural areas, possible solutions may include posting regulatory signage and erecting barriers that restrict access.

11. Trail Inspections and Maintenance

- Regular trail inspections and maintenance are necessary to ensure that trail use activities are not causing impacts to sensitive habitats or fauna. Trail closures may be necessary.
- Trail repairs should not result in additional vegetation removal or impacts to sensitive areas.
- Machine mowing of vegetation adjacent to trails zone should generally be avoided in place of selective pruning.
- Where trail erosion has occurred in riparian areas, installation of drainage ditches, small cross-culverts, or boardwalks may be required. Recurring trail erosion may warrant the relocation of the trail. In riparian areas, trailside drainage ditches that require the removal of additional vegetation should be avoided.
- Where trail width creep appears to be a problem, trail edges should be defined using wooden runners, logs, side railings, fences or other edging structures.
- Trails may be closed seasonally to protect aquatic or wildlife habitats during sensitive periods. Trail closures may be accomplished by erecting temporary barriers and posting informational signage.

12. General Maintenance

- Prevent power-washing runoff from entering directly into nearby natural areas, wash water should be directed to storm water management facilities that have sufficient capacity to handle the runoff.
- Oiling gravel roads and parking areas for dust control should be carried out in dry weather to prevent oil from entering watercourses in surface runoff.
- Dredging of wet ponds that provide habitat for waterfowl, frogs, salamanders and other aquatic fauna should take place during the in-stream fisheries work window, from August 1 to September 15. Approvals from the Ministry of Environment, Land and Parks and Fisheries and Oceans Canada may be required.
- Debris removal from wet ponds that provide habitat for aquatic fauna should be undertaken with minimal disturbance to aquatic habitats.

Recreational Activities

A number of recreational activities have the potential to impact wildlife, fish and other aquatic organisms—directly through disturbance to aquatic habitats or indirectly through impacts such as vegetation disturbance. While providing recreational access is an important function of many parks, some of the recreational activities normally associated with parks should be limited or restricted in sensitive areas. Many of the impacts related to these activities can be avoided through careful planning.

Impacts from Hiking and Walking

Soil Compaction and Erosion: Soil compaction on trails leads to a reduction in soil permeability, and thus greater runoff of unfiltered surface water into watercourses. Soil compaction also impacts nearby vegetation by compressing the root zone environment, which interferes primarily with the uptake of oxygen. The impacts of soil compaction along small trails located sufficiently far from the watercourse that allow surface runoff to be managed by riparian vegetation are generally not significant to aquatic habitats; however, increased runoff from larger trails, or from trails leading to watercourses, may have localized impacts.

Erosion of exposed soils on trail surfaces generates an increase in the amount of loose sediment available for transport to watercourses. Sediment reaching streams irritates the gills of fish, making it difficult for them to breathe, and it reduces their ability to forage for food items due to visibility impacts. As it settles, sediment can fill the spaces between gravels and cobbles in streambeds, impacting spawning habitat and the production of aquatic invertebrates on which fish and many other aquatic organisms prey.

Trail size and proximity to the watercourse will influence the level of impact.

Trail Creep: Trail creep is the process by which trails become wider through use. Trail creep can result in loss of wildlife habitat and riparian vegetation, which plays an essential role in protecting aquatic habitats. The removal of riparian vegetation can therefore have significant impacts.

Trail creep also exaggerates the problems of soil compaction and erosion. As a result, localized sedimentation of streams, ponds and wetlands may occur, as well as a reduction in the herb and shrub layer.

Garbage: Garbage brought into an area by hikers and walkers may affect water quality and/or stream flow; however, this is generally not a significant issue. To redress these impacts, the following activities are recommended:

- Inspect trails regularly for evidence of erosion, and take steps to correct erosion problems.
- Define trail edges using wooden runners or railings to discourage trail creep and thereby limit soil compaction adjacent to trails.
- Locate trash bins at strategic locations throughout the park (such as trailheads and viewpoints), and post occasional “no littering” signs along trails.
- Schedule regular trash pickup and periodically patrol trails for trash.

Impacts from Domestic Pets, Horses and Mountain Bikes

The recommendations in this section are general in nature, and do not reflect a thorough examination of these topics, such as the Greater Vancouver Regional District’s current study of the dog off leash issue.

The bottom line is that the unrestrained use of parks by cats, dogs, horses and mountain bikes has, and will continue to have, deleterious effects on certain park fauna. Impacts include bird mortality from domestic cats, wildlife disruption from free roaming dogs, and trail creation and habitat loss associated with biking. Increased levels of fecal coliform bacteria may also be expected to rise—this has a direct impact on aquatic fauna through water degradation. To redress these impacts, the following practices are recommended:

- Educate the public on the impacts to wildlife associated with domestic cat preying on wildlife.
- Require that dogs be leashed and that owners clean up after their animals. Designate less sensitive park areas for dog-off leash areas.
- Limit equestrian access to main trails, away from sensitive features.
- Provide a source of drinking water for dogs and horses to reduce their need to access aquatic habitats.
- Construct baffles or gated barriers to discourage mountain bikers from using trails in sensitive areas.
- Where it is likely that park users will travel to the park by mountain bike or by horse, provide bike racks and hitching posts at entrances to areas that do not permit these modes of transportation.
- Post trails regulations at strategic locations such as park entrances, trailheads and access barriers.

Development of Unsanctioned Trails by Park Users

Unsanctioned trail development is not associated with any particular recreational activity. Convenience trails may be developed as pedestrians and other trail users grow familiar with the trail system and create shortcuts to other known trails; mountain bikers may be keen to explore and to test their skills; sport fishers may create access routes to favoured fishing locations. While new trails may arise for a variety of reasons, most convenience trails develop as a result of either poor trail planning that does not account for patterns of use or preferred patterns of use that are incompatible with park management objectives, such as sensitive area protection.

The development of new trails is generally accomplished through trampling, pruning or clearing vegetation. The development of additional trails also magnifies the problems of soil compaction and erosion in parks; moreover, trails beside watercourses increase the risk of physical disturbance to sensitive habitats such as spawning and rearing areas, and nesting habitats.

To prevent the development of convenience trails, the following guidelines for trail locations are recommended.

- Where trails skirt sensitive areas, erect barriers to prevent off-trail wandering and the development of new trails into sensitive areas. Explanatory signs may be useful.

-
- Post signs at trail staging areas and along the trails to educate park users about the impacts of unsanctioned trail developments (such as stream bank erosion and disturbance to ground-nesting birds).
 - Assess unsanctioned for trails their impacts to sensitive aquatic habitats. If the impacts are low, the new trail may be adopted into the park's trail system if so desired; otherwise, portions of the new trail should be re-routed around sensitive features, or the trail should be decommissioned.
 - Decommission trails, through replanting, erecting barriers, posting informational signage, or ceasing maintenance activities.

Pest Management

Park departments are regularly contacted about animals considered dangerous, destructive or merely annoying to park users or neighbouring property owners.

Species Which Pose a Threat to People

Within City of Surrey's parks, black bear and cougar are the species that most logically fall into this category. The strategy practiced by most municipalities is to post the sighting at the park information kiosk, and contact the Conservation Officer from the Ministry of Environment, Lands, and Parks. The latter action frequently leads to the animal being shot or removed. This is not an ideal situation if a parks department wishes to conserve its wildlife legacy; however, park safety is an expectation of the general public whose support is key to the proper functioning of the parks department.

To ensure safety from such animals the following guidelines are recommended:

- Reports of dangerous wild animals (e.g. black bears, cougar) in the City's parks should be dealt with by posting the information at the park in question and by notifying the Conservation Officer, from the Ministry of Environment, Lands, and Parks.
- The City should inform MELP that while public safety is the highest priority, it is the City's preference to ascertain if the animal appears to be a possible threat, and if so to relocate the animal if that can be done humanely.
- The decision on how to deal with the animal will be based on determining if it is persisting in the park, or moving on. If it is the former, the animal should be removed, and an assessment made to determine if there are facilities in the park attractive to animals. If this is affirmative, these facilities should be removed or redesigned.

Species Which Pose a Nuisance

- Animals that present a nuisance to the public, and do not unduly interfere with the functioning of the park or adjacent private property, should be left to coexist within

the park. Ultimately, the determination of undue hardship may be determined through a claims process or even legal proceedings.

Alien Invasive Species Which Pose a Threat to Ecosystem Functioning

Jurisdictions and governments the world over are dealing with the invasion of alien animal species more and more. Gypsy moth control programs in the lower mainland have been undertaken on many occasions either through pheromone trapping or aerial spraying. The Canadian Food Inspection Agency of the Federal Government is the senior governmental agency responsible for regional invasive species control and will implement control programs in concert with local governments when it is determined the pest will have substantial impact to an area, either economic or environmental.

- The City of Surrey should undertake to eradicate alien invasive species in concert with senior government leads.
- The City of Surrey should undertake to eradicate alien invasive species, such as the American bullfrog, if it is determined the animal is interfering substantially with the ecological functioning of the natural area park
- The City of Surrey should develop a prioritized list of alien invasive species with the goal of undertaking control and eradication programs for those that pose the greatest threat to ecological functioning.

Beaver Damage

The American beaver is the primary species in this category. Its remarkable dam building efforts are accompanied by extensive tree cutting, and its impoundments can cause damage both within and outside of parks. While their populations in Surrey and Langley are believed to be close to saturation levels (Jack Evans, MELP, personal communication), there are actions that can be taken to avoid trapping beavers.

- If beaver activity is causing, or threatening to cause damage to park resources or damage to properties neighbouring the park, the first step should be to monitor the situation, by estimating the number of beavers involved, and gauging their potential to do further damage.
- Manual breaching of the dam is only recommended for the first visits. The speed of reconstruction will provide some indication of the seriousness of the problem.
- If the problem persists, a water leveling device should be installed, following a design employed by DFO (Matt Foy). This should stabilize water levels, allow the beaver population to persist, but it is not necessarily a permanent solution.
- Continued monitoring of beaver populations, particularly those whose activities may be damaging, is advisable.

Biting and Stinging Species

Wasps, hornets, yellow jackets, and various types of biting species range from being merely annoying, to being life threatening to a small proportion of people. Reports of wasp or hornet nests near trails and other public facilities represent a significant issue. At the same time, it should be recognized that these species are important insectivores and prey on certain smaller insects. Management strategies include the following:

- Reports of concentrations of stinging insects (wasps, hornets, yellow jackets, bees) should be dealt with by a qualified pest control officer.
- This officer should identify the source of the problem and based on its size, distance to public facilities, and thus public safety, make a decision whether the nest or other structure should be removed, and do so.
- Biting flies, such as mosquitoes, should not require any active control, except under unusual circumstances.
- To prepare for unusual conditions when biting fly concentrations become a public concern, a control program focused only on a specific problem, such as mosquito larvae, should be drawn up using biological control methods.

Riparian Area Management

Riparian areas play a vital role in maintaining the health of aquatic systems and as such bear special mention within this Strategy.

General recommendations to ensure protection and enhancement of wildlife within riparian areas include the following:

Development Within Riparian Areas

- Locate roads, parking areas and major structures outside of riparian zones and floodplains.
- Use semi-permeable driving surfaces to impermeable surfaces. Some semi-permeable options include hard-crushed gravel, open concrete blocks, and semi-permeable asphalt.
- Use best management practices for storm water management, such as oil/water separators, drainage swales, and permeable pavements, to prevent untreated surface water originating from roads and parking areas from draining directly to watercourses.
- Keep road widths and parking lot sizes to a minimum.

Trail Planning and Construction

For trail planning, construction, and maintenance, see the *Access and Recreation Management Strategy*.

-
- Locate trails, trailheads and trail staging areas outside of sensitive riparian habitats, or areas frequented by sensitive wildlife.
 - Trails greater than 1.0 metre in width should be restricted from riparian areas. The majority of trails located within the riparian zone should be designed as limited-access foot trails for pedestrian use only.
 - Limit trail networks to one side of small streams to discourage the development of unsanctioned stream crossings in sensitive areas.
 - Plan riparian access trails with a purpose in mind. Such trails can be planned to lead to viewpoints, other points of interest, or crossing structures that permit access to additional trails. Trails that meander through sensitive habitats, the riparian zone, or that run parallel to the watercourse, encourage the development of new trails that provide shortcuts to other trails or access to stream banks and other sensitive areas.
 - Locate riparian access trails away from particularly sensitive features such as seasonally wet sites and areas with highly erodable soils.
 - To limit the impacts of surface runoff associated with trails, avoid orienting trails down hillsides leading to watercourses. Trails should generally follow the natural contours of the land.
 - Post park regulations and general information at trail staging areas.
 - Post additional signs for specific regulations (such as “no littering” or “no dogs allowed”) at trail entrances.
 - Provide educational signage to explain regulations (such as “please keep dogs on leashes and stay on trails” along with information about ground-nesting birds that use the park.)
 - Bridges, boardwalks and viewing platforms should be constructed of materials that are not harmful to aquatic organisms.

Watercourse Crossings

Where a road or trail must cross a watercourse, impacts may include habitat fragmentation, loss of habitat for fish, invertebrates and other aquatic organisms through the placement of bridge footings or culverts in the watercourse, as well as disturbance to wildlife in adjacent areas. Culverts impact a larger area than bridges and are more likely to form debris barriers, impacting hydrology as well as fish access to seasonally important habitats such as feeding and spawning areas. In addition, closed-bottom culverts may prohibit fish access by increasing the speed of stream flows and eliminating the slow-water resting spots that are a feature of natural streambeds. Culverts that are perched above the watercourse at their downstream end are not accessible to fish. The length and grade of the culvert may also limit fish passage. Closed culverts properly fitted with baffles improve fish access; however, open-bottom culverts, which maintain the natural streambed, are preferred.

In addition to habitat impacts, watercourse crossings provide a location for surface runoff to reach the watercourse without the benefit of riparian filtering. High contaminant levels may be associated with surface runoff, particularly in the case of road crossings. Specific guidelines are as follows:

- Cross the watercourse and its floodplain at right angles to minimize the area of impact.
- Clear span bridges are the preferred crossing structure, as they prevent the habitat and hydraulic impacts associated with the placement of footings and culverts in watercourses. Footings should be located outside of the watercourse and its floodplain. Compensation may be required if footings are located within the wetted perimeter of the watercourse.
- Elevate bridges and excavate culverts sufficiently large enough to allow the passage of debris and high water. Seasonal fluctuations in water levels should be taken into consideration during planning.
- Where bridges are not feasible, choose open-bottom culverts vs. closed culverts fitted with baffles, to allow natural streambed to be maintained. Avoid closed culverts that are not fitted with structures to assist fish access. Refer to, *Juvenile and Resident Salmonid Movement and Passage Through Culverts*, Kahler & Quinn, 1998, and *Land Development Guidelines for the Protection of Aquatic Habitat*, Chilibeck, 1992, for further recommendations on culvert selection and installation.
- Where culverts are to be used rather than bridges, plan crossing locations to minimize culvert lengths and grades. Culvert grades of more than 3% and lengths more than 20 metres should be avoided as they may prohibit fish access.

Trail Crossings

- Where watercourse crossings cannot be avoided, provide formal crossing structures to prevent physical encroachment on the watercourse.
- Extend side railings beyond crossing structures to discourage trespass to stream banks.
- To limit the impacts of surface runoff, locate watercourse crossings in areas where bank slope on either side of the watercourse is minimal.
- Plan trail networks on either side of the watercourse carefully to prevent the development of shortcuts crossing the stream. Parallel trails visible to each other from across a small watercourse should be avoided.

Additional User Facilities

Additional user facilities at parks may include landscaped gardens, playing fields, picnic areas, wading and swimming pools, horseshoe pits, tennis courts, basketball courts, skateboard parks, bike racing courses, outdoor theatres, change rooms, and so on. Choices on location should follow these guidelines:

- Locate buildings, play areas and other user facilities outside of riparian areas to reduce impacts to sensitive habitats. This generally requires that facilities be located a minimum of 15 metres from the top of stream banks (Chilibeck, 1992). Avoid clearing riparian vegetation for the development of picnic areas and landscaped gardens.
- Use careful planning to locate access routes to user facilities outside of riparian areas.
- Use best management practices for storm water management, such as rooftop gardens, drainage swales and detention ponds to help detain and manage storm water around buildings and hard playing surfaces.

Clearing Riparian Vegetation

The development of most user facilities involves permanent vegetation removal. In riparian and other sensitive areas, native vegetation provides several aquatic and terrestrial habitat benefits, as described in Table 1; its loss can therefore have significant impacts. While areas subsequently planted with grass have some capacity to detain storm water and to absorb toxins and nutrients, they have limited ability to stabilize soils and do not provide important riparian functions such as water temperature regulation, protection from overhead predators, and contribution of large woody debris.

Impervious Surfaces

Many user facilities have relatively impervious surfaces in comparison with vegetated soils and thus contribute to surface runoff. Water draining from buildings, hard playing surfaces and areas cleared of natural vegetation may overwhelm the storm water management capacity of riparian areas, thereby increasing stream flows and resulting in an increase in the delivery of sediment and other contaminants to watercourses.

Contribution	Aquatic Habitat Benefits
Overhanging Vegetation	<ul style="list-style-type: none"> ▪ Regulates water temperature ▪ Provides cover from predators ▪ Contributes to aquatic food chains through the addition of terrestrial invertebrates
Large Woody Debris	<ul style="list-style-type: none"> ▪ Increases channel complexity, thereby providing a variety of habitats that can be used by salmonids and other aquatic organisms over different life stages ▪ Contributes to food production by trapping nutrients and providing habitat for aquatic invertebrates ▪ Captures gravels and cobble important for salmonid spawning habitat ▪ Contributes to soil stability ▪ Provides cover from predators

Soil Stabilization	<ul style="list-style-type: none"> ▪ Reduces in-stream turbidity, with benefits to respiration and foraging efficiency in fish ▪ Reduces sedimentation of gravel and cobble streambeds, with benefits to salmon spawning habitat and aquatic invertebrate production
Storm Water Management	<ul style="list-style-type: none"> ▪ Regulates stream flows ▪ Improves water quality by filtering contaminants from surface water

Table 1. Summary of Riparian Zone Contributions to Aquatic Habitats.

Construction Guidelines

- Review authorization documents and adhere to all conditions of approval.
- Keep vegetation removal to an absolute minimum, particularly in riparian areas.
- Erect snow fencing to protect riparian vegetation during construction.
- Use plastic sheeting, silt fencing, sediment control ponds, and other sediment control measures to minimize soil disturbance and control sediment movement during construction.
- Keep construction debris and materials away from sensitive features and locate staging areas and access roads outside of riparian areas.
- Following construction, institute a post-construction cleanup plan to remove all construction debris and materials from the site.
- In or near aquatic habitats, avoid the use of harmful materials.. Use pre-fabricated materials where possible to prevent accidental contamination of the watercourse.

A number of commonly used construction materials and practices can be toxic to fish and other aquatic organisms and should not be used in or near aquatic habitats. Some examples of these commonly used materials are listed in the table below.

The Dangers of Common Construction Materials	
Wood chips and bark mulches,	These materials are sometimes used to surface trails and playgrounds, release a toxic leachate that can make its way to watercourses in groundwater or surface water runoff.
Pour-in-place concrete	Increases the alkalinity off watercourses and can seriously harm aquatic life. Many fish kills are caused by the

	inappropriate use of concrete near streams.
Some treated woods	Which are used for pilings, bridges, and boardwalk surfaces produce a toxic leachate that may impact aquatic habitats directly (in the case of footings and pilings) or indirectly (through surface or groundwater runoff).
Paint	Whether wet or dry, paint is toxic.
Oil, hydraulic fluid and other liquids	This may leak from heavy equipment near watercourses.

According to the *Best Management Practices for the Use of Treated Woods in Aquatic Environments* (1994), pre-cast concrete and steel, natural untreated cedar, and woods treated with metallic salts are appropriate construction materials for freshwater environments. For further information on appropriate construction materials consult the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck, 1992).

Constructing Barriers

Where aquatic habitats are particularly sensitive to disturbance and the potential for encroachment is high, barriers may be necessary to prevent trespass by park users. Gated barriers and baffles can also be used to discourage specific park users (such as mountain bikers) from using certain trails—barriers may also be used to decommission trails. As hikers and walkers sometimes use roads as trails, barriers may also be required along roadsides to prevent unsanctioned trails originating from roads.

- Live barriers such as planted hedgerows are not recommended in riparian areas because they require the removal of the areas vegetation; however, where existing natural vegetation (such as Nootka rose) acts as a barrier due to its density and the presence of its thorns, a man-made barrier is generally not required.
- Outside of riparian areas, live barriers may be suitable. Live barriers should consist of native plant species, preferably with thorns, densely planted.
- Within riparian areas, barriers such as fencings and railings may be used to keep users on designated trails, or to protect sensitive areas from off-trail wanderers.

Refer to “Access Near Aquatic Areas” (1996) for additional information about planning and constructing barriers.

Horticulture and Turf

The most common impact of horticulture and turf management on aquatic and wildlife fauna is the contamination of watercourses through introduction of herbicides, pesticides and fertilizers used to keep lawns and gardens healthy. Riparian vegetation removal can also occur if gardens and lawns are located in riparian areas.

-
- a) Locate lawns and gardens outside of riparian areas. This generally requires these facilities to be located a minimum of 15 metres from the top of stream bank. Refer to the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck, 1992) for further information.
 - b) Prohibit the application of herbicides, pesticides, fertilizers and other chemicals from riparian areas unless riparian vegetation is at risk for severe pest infestation that cannot be controlled using alternative pest control methods.

Limit the application of herbicides and pesticides, fertilizers and other chemicals in lawns and gardens outside of riparian areas. Where feasible, use alternative methods of pest and plant control.

Habitat Restoration and Enhancement

Several techniques, some of which are listed below, are available for the restoration and enhancement of sensitive habitats. Integrated rehabilitation projects that use a number of treatment methods are often more successful than single-treatment projects. General guidelines are as follows:

- All habitat rehabilitation features must be carefully designed to ensure that they are structurally sound and will benefit aquatic and terrestrial fauna. Consultation with biologists, engineers and geotechnical specialists should normally be undertaken during the planning and construction phases of rehabilitation projects.
- Authorization from the Ministry of Environment, Lands and Parks is required for most habitat restoration and enhancement projects.
- Projects should be followed up for several years to ensure that the habitat enhancement features installed are functioning properly. Adjustments to features may be required.

Stream Bank Rehabilitation

Stream bank rehabilitation commonly involves installing structures or planting vegetation to help prevent bank erosion and increase the habitat value of the channel margin. Bank armouring may be accomplished with riprap, which provides a barrier between moving water and erodable soils, or with groynes and turning rocks, which deflect stream flow to the middle of the channel. There are also a number of soil stabilization techniques available that use either rooted plants or live cuttings. In addition to promoting soil stability by virtue of their root systems, streamside plantings ultimately enhance aquatic habitats by contributing to the riparian functions of storm water management, food production, shading, cover, and large woody debris production. Live cuttings are particularly versatile in bank protection projects, as they can be installed as a brush mat or tied in bundles and staked to the bank provide bank armouring before they are rooted. Plants can be used in conjunction with riprap, logs, timber, geotextile fabric or large woody debris to protect steeper slopes and improve in-stream habitat.

Off-Channel Habitat Rehabilitation

Off-channel habitats such as overflow channels, side channels, back-channels, groundwater channels and ponds provide over wintering and rearing habitat for coho, cutthroat trout, and to some extent chinook. Other salmonid and non-salmonid species also make use of off-channel habitats.

Where off-channel habitat already exists, enhancement may involve improving access for fish, stabilizing banks, providing new bed material, placing in-stream habitat complexing structures (such as large woody debris and boulder clusters), deepening pools, and so on. In some cases, new off-channel habitat can be created by excavating ponds or channels adjacent to an existing watercourse. Off-channel habitat should be 1 to 2.5 metres in depth, have groundwater flow to prevent stagnation, and have large amounts of wood debris for cover.

Main Channel Rehabilitation

Restoring Fish Access: Restoring fish access to upstream or downstream habitats may require the removal of log and debris jams, culverts, beaver dams or rockslides. Often fish access can be improved by replacing impassable culverts with bridges or with new culverts that are designed and installed to permit fish access.

Large woody debris (LWD) and boulders may be used on their own or in combination to create weirs, deflectors, boulder clusters, log jams, and other in-stream complexing structures that contribute to gravel collection and stabilization, pool creation, and debris capture. Properly installed, LWD and boulder features may help to prevent bank erosion, dissipate stream energy, provide salmonids with habitat for spawning, rearing and over wintering as well as cover and high-water refuge.

Spawning Habitat Rehabilitation: The enhancement of spawning habitat, particularly for salmonids, may involve gravel cleaning, gravel placement, the installation of gravel catchment structures that promote the development of pools and riffles (such as rock weirs, wing deflectors, and groynes), and the creation of off-channel habitat. Most small streams in the City of Surrey have adequate spawning habitat for salmonids.

Rearing Habitat Rehabilitation: Features such as pools and runs that hold sufficient water during low-flow periods provide holding and rearing habitat for salmonids. Such habitat can be established by using boulders and LWD to create low profile weirs and paired deflectors, which contribute to the development of pools. Excavation may be used to speed the natural process.

Restoring Channelized Streams

Channelized streams are generally characterized by a lack of large woody debris, spawning gravels, pools, off-channel habitats and other features that provide salmon and other aquatic organisms with habitats that they require. In addition, channelization often results in riparian vegetation removal, stream length reduction and increased gradient and velocity.

To increase habitat complexity in channelized reaches, boulders and cobbles can be used to construct riffles and contribute to the development of pools. Following this initial treatment, large woody debris and additional boulders can be installed, off-channel

habitats can be created, spawning gravels can be added, and so on. In some cases, it is more effective to reconstruct meanders, floodplain benches, and other channel features than to install small scale habitat components such as boulders and logs.

Authorization Requirements

Approvals from the Ministry of Environment, Lands and Parks (MELP) and from Fisheries and Oceans Canada (DFO) must be received prior to the commencement of any work in watercourses containing fish or fish habitat, or in the floodplains, wetlands, side channels or riparian zones of those watercourses. This generally applies to vegetation within 15 metres of seasonally or permanently wetted areas. Guidelines for applications are as follows:

- Normally applications must be submitted before May 1 to receive approval in time for summer work. Submit applications early to ensure that authorization documents will be received in time for work to proceed as planned. The City of Surrey's Watercourse Classification Map should be followed.
- Adhere to all requirements specified in the authorization documents. Failure to comply may result in an order to cease work, a fine, and/or criminal charges under the federal Fisheries Act or the provincial Fish Protection Act. While there are exceptions, authorizations for work in and around a watercourse normally include the following requirements, and often include additional requirements specific to the project.
- In-stream work is generally limited to the period between August 1 and September 15 of each year in Surrey streams. Plan work which could impact fish or fish habitat so that the goal is to avoid impact during sensitive activities such as spawning.
- Complete work within the watercourse free of flow and in dry weather conditions. Stream flow may be temporarily diverted during construction.
- Fish salvage permits from MELP and DFO are required before the salvage can be undertaken. Salvage fish and other aquatic fauna from the work site prior to the commencement of work and prevent entry into the site until construction activities are completed.
- Acquire prior approval from MELP for a sediment and erosion control plan, this is generally included with the application package. The plan, which may include such features as silt fencing, road sweeping, sediment control ponds, and construction platforms, must be adhered to throughout the course of the project.
- All machinery must be clean, free of leaks, and in good working order. Complete all work within the watercourse from the top of the bank, without machinery entering the watercourse.
- Complete work within watercourses as quickly as possible.
- Ensure a qualified environmental professional monitors work within a watercourse.

-
- Following construction, stabilize banks of streams and other water bodies where needed.

Removal of riparian vegetation or loss of fish habitat (through placement of structures within the wetted perimeter of the watercourse, among other activities) may require habitat compensation. Where indicated, provide a habitat compensation plan with the MELP application.

Implementation Recommendations

The implementation of the *Fauna Management Strategy* requires a number of key actions over the next five years. It is important to recognize that full implementation of the strategy will require intra- and interdepartmental cooperation and coordination, staff and other resources. The Parks, Recreation and Culture Department, Parks Division, should undertake the following recommendations.

- Circulate the *Fauna Management Strategy* to other sections within the Parks, Recreation and Culture Department and to other City departments for review and input and incorporate the goals and guiding principles into department policy and into the next update of the *Parks, Recreation and Culture Master Plan*.
- Establish a wildlife conservation working group within the Parks, Recreation and Culture Department (chaired by the Parks Division), drawing upon staff from other departments as required. The wildlife conservation working group would:
 - a) Develop a plan for implementing the recommendations found within this Strategy.
 - b) Work as a conduit to Department staff in ensuring the intent of this Strategy is undertaken by the various Departmental divisions, sections and teams.
 - c) Identify at a watershed scale, sensitive wildlife habitats (and corridors) within the City, with priority given to City parks and other City owned properties and other protected areas (e.g., GVRD Parks).
 - d) Identify key species of concern and their habitats (i.e., red and blue listed species).
 - e) Rate and rank wildlife habitats based on sensitivity. This rating should be done by the wildlife conservation working group, who would consult the 1997 ESA study, other recent documentation, and receive input from local naturalists in this process. The 1997 ESA study identified some site-specific wildlife sites (bald eagle nests, great blue heron rookeries) including sites used by species at risk. Wildlife corridors could be determined by the collective accounts of the current and recent conservation officers, police, SPCA and other agency personnel likely to be familiar with occurrence patterns of black-tailed deer, black bear, coyote, cougar, and other large wildlife.
 - f) Develop and recommend a priority wildlife habitat acquisition list based on the ratings and rankings, working with other wildlife conservation agencies/organizations as required identifying priorities and joint funding opportunities.
 - g) Prepare wildlife conservation plans for the most sensitive areas, including wildlife inventories, wildlife habitat protection measures, and details in terms of human activities and park management/operations.
 - h) Review existing and proposed park management plans to ensure they meet the goals, principles and guidelines of the *Fauna Management Strategy*. Where they do not, plans should be updated.

-
- i) Establish monitoring programs for determining wildlife habitat conditions and wildlife presence over time.
 - j) Identify and implement habitat enhancement and restoration activities for improving wildlife habitat within City parks and other City owned lands.
 - Review Parks planning, development, operations and maintenance activities to ensure they meet the principles, goals, objectives and guidelines outlined in the *Fauna Management Strategy*.
 - Prepare operating procedures based on the guidelines contained in the *Fauna Management Strategy* and ensure that all employees are fully aware of the procedures, including but not limited to employee training seminars, field demonstrations, etc.
 - Invite the participation of park volunteers, park associations, natural history societies and other community organizations in activities such as wildlife inventories, wildlife conservation plans and monitoring activities.
 - Continue to offer public awareness and education programs regarding the importance of wildlife in Surrey, especially the importance of protecting critical wildlife habitat in Surrey parks.

Appendix A: Fauna Resources and Habitats of Surrey

The following account provides a list of riparian area attributes and a general inventory of fauna resources and habitats within the City.

Riparian Areas

Riparian area attributes include the following:

- Food. Vegetated areas surrounding the watercourse contribute to the food chain within the watercourse by providing food for fish and other aquatic fauna, and for their prey.
- Shading and overhead cover. Overhanging vegetation shades watercourses and is important in regulating water temperature and protecting aquatic fauna from overhead predators such as birds.
- Large woody debris (LWD). Large trees in the riparian zone are the primary source of large woody debris in streams. LWD increases channel complexity, promotes pool creation, and provides cover from predators.
- In addition, LWD creates habitat for aquatic invertebrates, which are an important food source for many fish and other aquatic fauna.
- Soil stability. Riparian vegetation prevents bank and surface erosion, thereby contributing to channel stability and reducing sediment transport. Sediment in streams irritates the gills of fish and increases turbidity, making it difficult for many fish to forage. As it settles, it fills the spaces in gravel and cobble streambeds, negatively impacting fish spawning areas and aquatic invertebrate production.
- Storm water management. Throughout the width of the riparian zone, soils and vegetation absorb and detain storm water. This not only regulates stream flow but also is also important in filtering surface runoff, thereby removing many of the contaminants that would otherwise reach the watercourse.
- Fragmentation. While facilitating public access, roads within parks bisect a portion of the park landscape and thus further contribute to the habitat fragmentation process. Therefore, it is important for park planners and administrators to know the park environment well enough to choose corridors for roads that have the least impact on those faunal resources the park is attempting to conserve.
- Integrity of wildlife corridors. Within an urban setting wildlife corridors frequently parallel watercourses, reflecting that approved human settlement patterns protects watercourses and their surrounding riparian habitats.

Aquatic Fauna

Fish, amphibians and aquatic invertebrates live in numerous streams, rivers, lakes, ponds and wetlands in Surrey's natural areas.

A. Fish Occurrence and Distribution in Surrey Parks

Fish are the primary aquatic fauna found in aquatic ecosystems in the City of Surrey and are often the dominant vertebrate predator, both in terms of number of individuals and biomass. Fish also occur in roadside ditches, drainage channels, shallow ponds, habitat with seasonally high water temperatures and areas with poor habitat conditions.

For a number of reasons, fish and fish habitat are a critical component of fauna management:

- They are protected under the Federal Fisheries Act and the Fish Protection Act: several species are a conservation concern because of rarity or low numbers.
- They are of recreational importance in the City's natural areas;
- They are an indicator of aquatic ecosystem health.

The sections below divide aquatic ecosystems into five habitat types and describe the characteristic fish fauna in the City of Surrey.

Small Streams

Small streams are the most common aquatic feature found in Surrey's natural areas (e.g. Bon Accord Creek in Invergarry Park, Bear Creek in Bear Creek Park, and Latimer Creek in Port Kells Park). Streams range from intermittently flowing channels less than 1 metre wide, to 5 metre wide second-order streams with defined banks and gravel bars. Annual flow patterns in small Surrey streams typically follow seasonal precipitation with low flows in August and September, and peak flood flows in November and December. Species found in small streams include cutthroat trout, juvenile coho salmon, threespine stickleback, western brook lamprey and prickly sculpin.

Large Rivers

Dozens of parks border parts of Surrey's four large rivers—Fraser, Serpentine, Nicomekel and Campbell. Large rivers are typically 5 to 20 metres across, have well-developed floodplains and terminate in an estuary where salt and freshwater mix. Their flow patterns are similar to small streams but their hydrology is typically moderated by large watershed size. Large rivers usually support a very diverse fish community including species of salmonid not found in small streams—chinook salmon, pink salmon and steelhead, and non-salmonids such as starry flounder and staghorn sculpin associated with estuary areas.

Marine Waters

Several kilometres of Surrey's south shore are marine. Starting in the northwest just east of the Highway 99 and Highway 91 interchange Surrey's marine shoreline extends around Mud Bay, past Blackie Spit Park and Kwomais Point, as far as the international border at the edge of Semiahmoo Bay. The Serpentine, Nicomekl, and (little) Campbell rivers enter the ocean here, with the near shore habitats representing rearing areas for juvenile fish. Marine and estuarial fish of ecological importance, such as staghorn sculpin and starry flounder, ascend the lower reaches of these rivers.

Drainage Channels

Drainage channels are constructed of uniform depth and width to convey floodwaters or allow for drainage or irrigation of agricultural land. Riparian vegetation is often minimal and maintenance is required to remove accumulated sediment. Overall, fish habitat is poor because of the combination of poor water quality (e.g., high temperature, nutrient enrichment) and low habitat complexity. Characteristic fish species include threespine stickleback (commonly dominant), carp, brown bullhead and redbreast shiner.

Ponds, Lakes and Wetlands

Ponds and lakes are uncommon in Surrey's parks, although some have been developed for aesthetic purposes or to increase wildlife habitat. Pond fish community is determined by their degree of isolation from streams and rivers: some wetlands are seasonally inundated during winter floods and provide critical habitat for juvenile coho and other salmon species; others are constructed ponds that remain isolated from the natural stream system and are dependent on stocking. Threespine stickleback, carp, goldfish and introduced trout are common in artificial ponds.

Aquatic Invertebrates

Aquatic invertebrates encompass a diverse group of organisms including mollusks (e.g., clams and snails), crustaceans (e.g., crayfish), worms, and insects living within the water column, or more commonly, within the stream bed, or estuarial foreshore. Many insects including mayflies, caddis flies and dragonflies use aquatic habitat for portions of their life cycle before entering into the terrestrial environment as adults. Streams with year round flow, good water quality and undisturbed riparian forests support a higher abundance and a greater diversity of invertebrates than urbanized streams or watercourses degraded by development. In general, the populations of aquatic invertebrates are unknown because of the lack of comprehensive sampling, identification and data recording.

Appendix B: Terrestrial Fauna

Amphibians and Reptiles

Eleven amphibian species have been recorded in natural areas of Surrey. The presence of five salamander/newt species is significant, since these "delicate" animals are often the first to suffer from habitat disturbances such as pollution.

The list includes the Oregon spotted frog which is considered critically imperiled (red-listed). Three snake species and two lizards have been recorded in Surrey, and there is an expectation that a sixth, the blue listed (vulnerable) rubber boa, might occur. One native turtle, the blue listed western painted turtle, has also been recorded.

Birds

The bird species described here are of special concern to City management:

-
1. Bald eagles have historically maintained two active nests in Surrey (Booth and Farr, 1993). On the coast, the preferred nest trees are tall coniferous trees adjacent to the coast or along nearby riparian corridors.
 2. Northern harriers frequent the agricultural fields and beach areas of Surrey. Nest sites have been recorded in a number of fallow fields in Surrey (Tom Plath, MELP, pers. comm.).
 3. The Cooper's hawk, a forest hawk, is losing its local habitat (Conservation Data Centre). It nests in woodlands within the City of Surrey (Tom Plath, MELP, pers. comm.).
 4. Red-tailed hawks are often seen soaring high overhead, or hunting along power line right-of-ways and forest edges. This species nests in the City of Surrey.
 5. The *anatum* subspecies of the peregrine falcon has been placed on the provincial red list. A pair of peregrine falcons regularly nest on the Port Mann Bridge.
 6. Twelve species of owls have been recorded nesting or over-wintering in Surrey. The barn owl and short-eared owl are blue-listed. The barn owl is known to nest in a number of barns and buildings near agricultural areas of Surrey. Short-eared owl nests situated in hay fields have high mortality due to destruction by farm machinery (Campbell et al. 1990a).
 7. Approximately 100 species of waterfowl have been recorded within the City of Surrey. These include, ducks, geese, herons, egrets, cranes, shorebirds, terns and gulls. One species is red listed and six are blue listed.
 8. The western grebe is on the provincial red list. Non-breeding western grebes are regularly observed off Surrey's foreshore (Mud Bay, Crescent Beach, Ocean Park) particularly during the winter.
 9. Doubled-crested cormorants, blue listed, are relatively common off of Surrey's southern foreshore, and less common along the Fraser River. They do not nest within the City. The American bittern, also blue-listed, is found in marsh habitats within the City. Blue herons are blue listed. One great blue heron colony (35 ± nests) is found in South Surrey near the Nicomekl River, just east of the King George Highway. A second colony, just south of 88th Avenue near 200th Street, was active in 1994 (Gebauer, 1995a). Green herons, also blue listed, nest in trees and prefer fresh water, brackish sloughs, slow-moving rivers, and lakes whose shorelines are made up of thickets or woodlands of willows and alders along the shore.

Over 100 species of forest birds are known to nest or live in the City of Surrey. These include swallows, flycatchers, thrushes, chickadees and their allies, vireos, warblers, sparrow and finches. Species from this group of birds nest throughout the City in a variety of habitats.

Mammals

Fifty-five mammal species have been recorded or are suspected to live within the City of Surrey's natural areas. Those of current significance are noted here.

1. The Pacific water shrew, red listed, has been captured near Fergus Creek in South Surrey (Zuleta and Galindo-Leal, 1994).

2. Ten species of bats have been recorded in the City of Surrey. Both the red-listed Keen's long-eared and the blue-listed Townsend's big-eared bat may occur in Surrey. The City's knowledge of bats is limited, and the need for inventory information on these species has only recently been identified by regulatory agencies. In general, bat roosts and hibernacula are vulnerable to human activity.
3. The red listed southern red-backed vole (*occidentalis* subspecies) has recently been discovered in the northwest corner of Burns Bog (Fraker et al. 1999). It is likely this species may still occur in Surrey. Voles are the main food source for hawks, owls, herons and coyotes.
4. Coyotes occur throughout Surrey and it appears that their populations are on the rise throughout the Lower Mainland.
5. The coastal black-tailed deer is the only ungulate remaining in Surrey. It occurs in most parts of Surrey though documentation is limited.

Appendix C: Rare and Endangered Animal Species

The following tracking list of rare and endangered animals was provided by the British Columbia Conservation Data Centre (CDC) and represents their most up to date information (April 2001) for the Chilliwack Forest District. Surrey constitutes a small fraction of the Chilliwack Forest District, so it is possible that some of the species listed here have never occurred in Surrey. Only species that breed in the area are included on the list, species that occur here only as migrants are not included. Invertebrate species are not listed here since minimal work has been done for these animals and the information that does exist is province-wide. Species with provincial 'Red' list status are either extirpated, endangered or threatened. Species with provincial 'Blue' listed status are considered to be vulnerable or at risk. Species with provincial 'Yellow' listed status are not considered at risk in B.C., but are vulnerable at times of seasonal concentration.

This list could be utilized as a management tool to identify candidate species for specific habitat enhancement projects. In addition, when assessing land for its natural area values the presence of species from this list would allow staff to identify high value wildlife habitat.

Scientific Name	English Name	Prov. List
Freshwater fish		
<i>Cottus species 2</i>	Cultus Lake Sculpin	Red
<i>Acipenser medirostris</i>	Green Sturgeon	Red
<i>Acipenser transmontanus</i> population 4	White Sturgeon (Fraser River Population)	Red
<i>Oncorhynchus clarki clarki</i>	Cutthroat Trout, <i>Clarki</i> subspecies	Blue
<i>Salvelinus confluentus</i>	Bull Trout	Blue
<i>Salvelinus malma</i>	Dolly Varden	Blue

<i>Spirinchus</i> species 1	Pygmy Longfin Smelt	Red
<i>Thaleichthys pacificus</i>	Eulachon	Blue
<i>Hybognathus hankinsoni</i>	Brassy Minnow	Blue
<i>Rhinichthys</i> species 4	Nooksack River Dace	Red
<i>Catostomus platyrhynchus</i>	Mountain Sucker	Blue
<i>Catostomus</i> species 4	Salish Sucker	Red
Amphibians		
<i>Dicamptodon tenebrosus</i>	Pacific Giant Salamander	Red
<i>Ascaphus truei</i> population 2	Tailed Frog, Coastal population	Blue
<i>Rana aurora</i>	Red-legged Frog	Blue
<i>Rana pretiosa</i>	Oregon Spotted Frog	Red
Reptiles		
<i>Chrysemys picta</i>	Painted Turtle	Blue
<i>Clemmys marmorata</i>	Western Pond Turtle	Red
<i>Pituophis catenifer catenifer</i>	Gopher Snake, <i>catenifer</i> subspecies	Red
Birds		
<i>Aechmophorus occidentalis</i>	Western Grebe	Red
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Red
<i>Phalacrocorax pelagicus resplendens</i>	<i>Pelagic Cormorant, Resplendens</i> subspecies	Yellow
<i>Botaurus lentiginosus</i>	American Bittern	Blue
<i>Ardea herodias fannini</i>	Great Blue Heron, <i>fannini</i> subspecies	Blue
<i>Butorides virescens</i>	Green Heron	Blue
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Yellow
<i>Cygnus columbianus</i>	Tundra Swan	Yellow
<i>Chen caerulescens</i>	Snow Goose	Yellow
<i>Branta bernicla</i>	Brant	Yellow
<i>Histrionicus histrionicus</i>	Harlequin Duck	Yellow
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Yellow
<i>Buteo lagopus</i>	Rough-legged Hawk	Yellow
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	Red
<i>Grus canadensis</i>	Sandhill Crane	Blue
<i>Grus canadensis</i> population 1	Sandhill Crane, Georgia Depression population	Red
<i>Recurvirostra americana</i>	American Avocet	Red
<i>Sterna caspia</i>	Caspian Tern	Blue
<i>Brachyramphus marmoratus</i>	Marbled Murrelet	Red
<i>Columba fasciata</i>	Band-tailed Pigeon	Blue
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Red
<i>Tyto alba</i>	Barn Owl	Blue
<i>Strix occidentalis</i>	Spotted Owl	Red
<i>Asio flammeus</i>	Short-eared Owl	Blue
<i>Melanerpes lewis</i> population 1	Lewis's Woodpecker, Georgia Depression population	Red
<i>Sphyrapicus thyroideus thyroideus</i>	Williamson's Sapsucker, <i>thyroideus</i> subspecies	Blue
<i>Eremophila alpestris strigata</i>	Horned Lark, <i>strigata</i> subspecies	Red
<i>Progne subis</i>	Purple Martin	Red
<i>Sialia mexicana</i> population 1	Western Bluebird, Georgia Depression population	Red
<i>Sturnella neglecta</i> population 1	Western Meadowlark, Georgia Depression population	Red

Mammals		
<i>Sorex bendirii</i>	Pacific Water Shrew	Red
<i>Sorex trowbridgii</i>	Trowbridge's Shrew	Blue
<i>Scapanus townsendii</i>	Townsend's Mole	Red
<i>Myotis keenii</i>	Keen's Long-eared Myotis	Red
<i>Lasiurus blossevillii</i>	Western Red Bat	Red
<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Blue
<i>Lepus americanus washingtonii</i>	Snowshoe Hare, <i>washingtonii</i> subspecies	Red
<i>Aplodontia rufa rainieri</i>	Mountain Beaver, <i>rainieri</i> subspecies	Blue
<i>Aplodontia rufa rufa</i>	Mountain Beaver, <i>rufa</i> subspecies	Red
<i>Spermophilus saturatus</i>	Cascade Mantled Ground Squirrel	Blue
<i>Clethrionomys gapperi occidentalis</i>	Southern Red-backed Vole, <i>Occidentalis</i> subspecies	Red
<i>Orcinus orca</i> population 1	Killer Whale (Northeast Pacific Resident population)	Blue
<i>Orcinus orca</i> population 2	Killer Whale (Northeast Pacific Offshore population)	Blue
<i>Orcinus orca</i> population 3	Killer Whale (West Coast Transient population)	Blue
<i>Ursus arctos</i>	Grizzly Bear	Blue
<i>Mustela frenata altifrontalis</i>	Long-tailed Weasel, <i>altifrontalis</i> subspecies	Red
<i>Gulo gulo luscus</i>	Wolverine, <i>luscus</i> subspecies	Blue

Appendix D: Review of Plans, By-laws and Policies Affecting Fauna

The City of Surrey has several formal policies and standards that may directly or indirectly affect the management of faunal resources within its natural areas. At the highest level, the City is subject to federal and provincial statutes that protect faunal resources.

The Parks, Recreation and Culture Commission provides the overall policy direction and trusteeship for the delivery of local parks, recreation and culture services and functions as a board of appeal for decisions of the administration. Surrey City Council has the ultimate authority in determining the final budget and funding of park projects.

The Parks, Recreation and Culture Department is also subject to defined municipal policies that set out standards for park facilities and operations and must meet City by-laws. The Department has developed several plans that provide guidance for the development of park and recreation facilities within the City (e.g., draft *Urban Forestry Management Plan*, draft *Greenways Plan*). The City is subject to federal and provincial statutes that protect faunal resources.

A number of high-level plans, by-laws, policies and mandates guide the management of Surrey's natural areas.

Plans

Official Community Plan (1996)

The Official Community Plan (OCP) sets the overall direction for land use within Surrey. It contains policies for preserving watercourses and wetlands (OCP Policy E.1.1), environmentally sustainable practices in development (OCP Policy E.1.2), and protecting fish and wildlife habitats (OCP Policy E.1.3) (City of Surrey, 1996, 2-63 to 2-65). For example, under the protection of fish and wildlife habitats, the following goals are stipulated.

- Identify and endeavour to protect Fisheries Sensitive Zones
- Identify significant habitats for protection
- Recognize the intrinsic value of wildlife, bird and fish habitat to the quality of life
- Balance habitat losses with habitat replacement and/or compensation (no net loss)
- Conserve, enhance and promote wildlife corridors connecting parks, open spaces and habitat areas
- Acquire parks in or near environmentally sensitive areas.

The OCP contains a policy to secure linear open space, ravines, trails, walkways, and bicycle paths to connect parks and other open spaces, green belts and conservation areas. Access through agricultural lands is excluded (OCP Policy F.1.5).

A land use designation for conservation (CNS) is intended for major parks, open spaces, and environmentally sensitive areas in their natural state, including appropriate indoor and outdoor recreation activities and facilities (City of Surrey 1996, 3-3).

The Parks and Recreation Master Plan (1996-2006)

The Master Plan sets out future directions for the provision of recreation, heritage and cultural facilities and services for the City to 2006 (City of Surrey, 1995). Section 7.1.7 discusses the protection of the natural environment and recommends that the department review its environmental policies and procedures, and supports the City's Environmental Advisory Committee. Although the Master Plan does mention that parks and open space reservation and dedication are only one tool for protecting environmentally sensitive features, there is no direct mention of fauna management.

The Parks, Recreation and Culture Department Strategic Plan

Strategic result area #1, "Healthy Environment," outlines key action steps and measures for greenways initiatives, land acquisition, and new parks. There are no specific policies or regulations pertaining to park planning.

By-Laws

The Surrey Parks, Recreation and Cultural Facilities Regulation By-Law

This by-law regulates activities within the City's natural areas. It prohibits damage to vegetation (Section 15) and the fouling or polluting of any fountain, lake, stream, pond, well or spring within a park (Section 28). The by-law states that no person shall fish or angle in

any lake or stream without the prior written permission of the Parks, Recreation and Culture Commission or molest, disturb, frighten, injure, trap or snare any bird or animal (Section 34).

Dogs in parks are to be on leashes (Section 54), except in areas that are designated for dog off-leash areas (Section 55). The by-law also prohibits dog access to water bodies (Section 57) and requires immediate removal of excrement (Sections 58/60).

The Tree Preservation By-Law

This by-law applies to protected and significant trees. Protected trees include trees in high sensitivity areas on the City's ESA map, and trees planted to replace trees that have been removed or damaged. Most of these significant trees are defined in a schedule to the by-law as heritage trees.

The Soil Removal and Depositing Regulation By-Law

This by-law regulates the terms and conditions for soil removal and deposit and requires a permit for such activities. The by-law states that no permit shall be issued if the soil removal or deposit would "foul, obstruct, impede or otherwise adversely affect any stream, creek, waterway, watercourse, groundwater aquifer, waterworks, ditch, drain, sewer or other established drainage facility". It specifies requirements for soil movement for construction projects, and provides for inspection of soil movement to monitor compliance with permits.

The Waterways Protection By-Law

This by-law stipulates that "no person shall foul, obstruct or impede the flow of any stream, creek, waterway, watercourse, waterworks, ditch, drain or sewer, whether or not the same are situated on private property".

Policies

Stormwater Management Policies

1. Surreys Natural Drainage Policy promotes the maintenance of existing natural capacity to absorb and help control runoff that might exceed the capacity of the City's drainage system. The policy has twin goals of an efficient urban drainage system and the retention of the environmental and aesthetic benefits of natural drainage.
2. Master Drainage Plans (MDP) are intended to provide holistic watershed-based strategies for stormwater management. The protection of the environmental quality in watercourses, including wildlife and aquatic life, has become a major component of MDPs. During the preparation of MDPs, existing habitats and biota of stream systems are assessed, and alternative strategies are evaluated for preserving and enhancing habitat values. Several drainage facilities have been placed in parks that can either impact or enhance wildlife values.

The Ravine and Open Watercourse Preservation Policy (1976)

This policy is intended to establish a linear natural park system, protect the aquatic environment, maintain urban green space, protect fisheries streams, maintain natural

vegetation and features, provide natural drainage without erosion, protect children, eliminate flood damage, and protect maintenance access to stream corridors. To accomplish these purposes the Policy establishes “Preservation Limits” along ravines and watercourses as areas to be preserved in a natural condition.

The Parks Standards Policy

This policy (Municipal Policy L-2) sets the park standard (surface area) per population, for different park categories. Of special interest to fauna management would be the Special Areas category, which is designed to accommodate drainage courses or the retention of an existing natural feature.

Policy on Parkland Dedication

This policy (Municipal Policy O-12) allows the approving officer to make decisions regarding the requirement of 5% parkland dedication or cash in lieu from subdivision proposals. The officer shall have regard for relevant OCP provisions, future park needs, watercourse preservation, and linear open space linkages. Urban forest policy exists to promote tree preservation and planting in residential developments and parking lots (Municipal Policy U-2).

Hydrology Policy

According to policy P-4, hydrological assessments must be undertaken for each Urban Forest. Proposed developments in areas of hydrological influence around Urban Forests should conduct hydrological impact assessments to be reviewed by local management authorities. Mitigation measures must be undertaken where adverse impacts are anticipated (Policy Manual 4).

Parks Maintenance Policy

Municipal Policy L-1 specifies the functions of the Parks, Recreation and Culture Department: to develop and maintain park areas, and to preserve and care for greenbelts and urban forests. Park maintenance occurs according to service level standards for different park categories. A range of activities is covered, including tree removal, planting, cemetery maintenance and grass mowing.

Pesticide Policy

This Policy addresses pests, disease, and weed control. It recommends seeking viable alternative control methods before proceeding with toxic chemical control.

Urban Forest Parks

Urban Forest Parks are set aside for perpetuity for their intrinsic and heritage values, to provide long-term non-consumptive enjoyment and benefits for the general public (Policy Manual P-4 (1)). Local Urban Forest Advisory Committees oversee activities and operations in Urban Forests to ensure the ecological integrity of Urban Forests (Policy Manual P-5 (1)).

The management principles for Urban Forests (Policy Manual P-4 (1 to 4)) state that natural succession should be allowed to proceed with minimal intervention or disturbance. Fires are to be immediately suppressed with the least possible disruption to forests. Hunting, fishing, and the introduction of domestic or exotic species are not permitted. Local Urban Forest Advisory Committees may permit re-introduction of native species which have been extirpated, as well as enhancement of fish habitat, where such efforts do not compromise the forest ecosystem (Policy Manual P-4 (4)).

Recreation Management

The management principles for Urban Forests state that Urban Forests Advisory Committees may designate trails for specific uses and may prohibit certain uses, where those uses put at risk the enjoyment of others, public safety, or protection of the environment. As well, committees should set aside areas restricted to public access in order to protect forests from urban disturbance (Policy Manual P-4 (2)). Presumably, this policy could be used to protect fauna from incompatible recreation uses. There does not appear to be any other specific policies concerning fauna protection and recreation management in Surrey parks. Recommendations for managing recreational activities that could impact upon faunal resources are often included in park management plans.

Appendix E: Other Standards, Reports and Statutes

Watercourse Classification

This system, based on fish habitat values, was developed by the City in coordination with federal and provincial agencies. The system is administered through a memorandum of agreement with the Department of Fisheries and Oceans and Ministry of Environment, Lands and Parks. The classification system is used to plan capital and maintenance works and to address emergency in-stream work. The system includes measures for in stream work, and habitat mitigation and compensation.

The Fraser River Estuary Management Program (FREMP)

This program includes a review process for proposed development activities in natural areas that are within the foreshore of the Fraser River and Boundary Bay. FREMP has established habitat classifications for these foreshore areas and area designations.

Environmentally Sensitive Areas

The *Environmentally Sensitive Areas Report* and *North Slope Study* complement OCP policies (City of Surrey 1995, 69). *Finding the Balance: Environmentally Sensitive Areas in Surrey* (Abs et al., 1990) identifies environmentally sensitive areas (ESAs) and classifies them as either, high, medium, or low. This system is used extensively as a reference document in reviewing development applications (City of Surrey 1996, 2-62).

The Environmentally Sensitive Areas Update and Park Acquisition and Enhancement Study proposes principles and management guidelines for managing ESAs, dealing with aquatic resources, upland forests and vegetated areas, and wildlife resources (Coast River and

Quadra Planning, 1997, 26). Those that are particularly relevant to a faunal management strategy, include wildlife habitat, aquatic resources, wildlife corridors, and red- and blue-listed species (Coast River and Quadra Planning, 1997, 33-35).

The ESA Update report recommended implementing a system of park management concepts for ESAs that fall under the mandate of Surrey Parks, Recreation and Culture. These included:

Level 1: An area managed specifically for its ecological functions, with little, if any human intrusion, with the possible exception of habitat enhancement measures, scientific or research activities (i.e., analogous to an ecological reserve).

Level 2: An area managed primarily for its ecological functions, with some limited amount of human intrusion (e.g., walking trails around the perimeter of an area, depending upon size and sensitivity).

Level 3: An area managed for its ecological functions but which may have other compatible and managed activities that would not impair ecological functions (e.g., greenways/greenlinks, utility rights-of-way, old field habitat in active farming areas, wetlands, etc. (e.g., Serpentine Fen, Boundary Bay Wildlife Management Area).

Federal and Provincial Statutes and Regulation

Relevant statutes for faunal management include the federal Fisheries Act, federal Migratory Birds Convention Act, provincial Wildlife Act (which includes protection of habitat vegetation), and the provincial Fish Protection Act (which includes a draft Streamside Policy Directive for protection of riparian areas adjacent to streams).

References

- Banfield, A.W.F. *The Mammals of Canada*. National Museums of Canada, University of Toronto Press, 1974.
- Beebe, F.L., 1974. *Field Studies of the Falconiformes of British Columbia*. British Columbia Provincial Museum, Occ. Pap. No. 17.
- Catherine Berris Associates Inc., Dillon Consulting Ltd., and Ken Summers Biological Services. 1999. *Blackie Spit Park Draft Master Plan*.
- Booth, B. and A.C. M. Farr, 1993. *Bald Eagles in the Lower Mainland - Fraser Valley region of British Columbia: First steps towards a conservation strategy*. Habitat Conservation Fund.
- Campbell, R.W. 1998. *The Birder's Complete Lifest of British Columbia Birds*. Wild Bird Trust of British Columbia, Special publication Number 1. (new checklist order and bird names).
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall, 1990a. *The Birds of British Columbia. Volume II: Nonpasserines, diurnal birds of prey through woodpeckers*. Royal British Columbia Museum.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall, 1990b. *The Birds of British Columbia. Volume I: Nonpasserines, introduction and loons through waterfowl*. Royal British Columbia Museum.
- Child, M., N. Page, I. Robertson, G. Ryder, A. Grass, and J. Dunster, 1998. *Environmental Overview and Assessment of Proposed Road Improvements at Green Timbers Urban Forest, Surrey, B.C.* Coast River Environmental Services Ltd. report to the City of Surrey, Parks, Recreation and Culture Department.
- City of Surrey. 2000a. Key Goals for 2000. *Inter-office Memo from the Surrey City Manager to Mayor & Council*. January 18, 2000
- City of Surrey. 2000b. *Parks, Recreation and Culture Department Strategic Plan. 2000* Parks, Recreation and Culture Department.
- City of Surrey. 1998. Bylaw No. 13480: Surrey Parks, Recreation and Cultural Facilities Regulation.
- City of Surrey, 1996a. *Parks & Recreation Master Plan 1996-2000*. Parks and Recreation Department.
- City of Surrey. 1996b. *Official Community Plan*. Planning and Development Department.

City of Surrey. 1995. *Parks & Recreation Master Plan 1996-2000*. Parks and Recreation Department.

Coast River Environmental Services Ltd. and Quadra Planning Consultants Ltd. 1997. *Environmentally Sensitive Areas Update and Park Acquisition and Enhancement Strategy*. Prepared for City of Surrey, Parks and Recreation Department.

Coast River Environmental Services Ltd., 1996. *Tynehead Environmental Assessment Report* to the City of Surrey, Planning and Development Department.

Cowan, I. McT. and C.J. Guiguet, 1965. *The mammals of British Columbia*. British Columbia Provincial Museum Handbook 11.

Dunster and Associates Environmental Consultants Ltd.. *An Assessment of the Forest, Trees and Ecological Values: Mound Farm, Surrey B.C* 1999.

1999a. Panorama Ridge Park, Surrey, B.C. Biophysical Assessment.

Evans, Jack. Ministry of Environment, Lands, and Parks Personal Communication. 2000. Firman, M., M. Getty, and R.M.R. Barclay. *Status of Keen's Long-eared Myotis in British Columbia*. *Wildlife Working Report No. WR-59*. Wildlife Branch, Ministry of Environment, Lands and Parks.

Fraker, M.A., C. Bianchini, and I. Robertson, 1999. *Burns Bog Ecosystem Review: Small Mammals*. Robertson Environmental Services Ltd. report to Delta Fraser Properties Partnership and the Environmental Assessment Office.

Grass, A. Personal Observation. 1998.

Humeniuk, L. CN Rail. Personal Communication. 1999.

Kistritz, R.U., G.L. Porter, G. Radcliffe, and P.R.B. Ward, 1992. *An Ecological study of Surrey Bend*. Report to the Fraser River Estuary Management Program and the District of Surrey.

Leach, Barry. *Waterfowl on a Pacific Estuary*. British Columbia Provincial Museum, Special Publication No. 5. 1982.

McIntosh, A. and I. Robertson, 1999. *Burns Bog Ecosystem Review: Status of Black Bears*. Robertson Environmental Services Ltd. report to Delta Fraser Properties Partnership and the Environmental Assessment Office.

McIntosh, M. 2000. Vancouver Board of Parks and Recreation. Personal Communication.

McPhee, Michael et. al. (2000) *Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands* 1993-1997. Volume 2: Conservation Manual. Canadian Wildlife Service. Technical Report Series No. 345.

Municipal Policy L-1: Functions of Parks and Recreation Department

Municipal Policy L-2: Parks Standards

Municipal Policy O-12: Parkland Dedication

Municipal Policy U-1: Tree Preservation

Municipal Policy U-2: Urban Forest

Nagorsen, D.W., 1996. *Opossums, Shrews, and Moles of British Columbia. Volume 2, The Mammals of British Columbia.* UBC Press, Vancouver.

Nagorsen, D.W., and R.M. Brigham, 1993. *Bats of British Columbia. Volume 1, The Mammals of British Columbia.* UBC Press, Vancouver.

Page, N., K. Rood, T. Holz, P. Zandbergen, R. Horner, and M. McPhee, 1999. *Proposed Watershed Classification System for Stormwater Management in the GVS&DD Area.* Coast River Environmental Services Ltd. report to the Greater Vancouver Sewage and Drainage District, Burnaby, B.C.

Plath, Tom. 2000. Ministry of Environment, Lands, and Parks. Personal Communication.

Policy Manual. Parks, Recreation and Culture Commission (n.d.)

Ryder, Glenn. 1998. Field Observations

Sankey, Barbara. 1973. *Surrey's Green Timbers - A proposal to Preserve Lower Mainland wildlife* Association Publication. (The field notes of Glenn R. Ryder were used to prepare this document.)

Schaap, P. 2000. *Bell Park Wildlife Assessment.* Dillon Consulting's eight page letter to the City of Surrey.

Sharp and Diamond Planning/Landscape Architecture. 1996. *Elgin Heritage Park Master Plan.*

Sunnyside Acres Heritage Society. 1989. *A Management Plan for Sunnyside Acres.*

Toochin, Rick. 1999. Naturalist. Personal Communication.

Zuleta, G.A. and C. Galindo-Leal, 1994. *Distribution and Abundance of Four Species of Small Mammals at Risk in a Fragmented Landscape.* Wildlife Working Report No. WR-64. Wildlife Branch, Ministry of Environment, Lands and Parks.