



12 Mile Coulee

NATURAL ENVIRONMENT PARK MANAGEMENT PLAN



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Alan Stephen
Linda Vaxvick

Overview

Part 1

Introduction

The following Management Plan outlines a framework intended to guide the long-term management of this Natural Environment Park. This plan will help establish sound management practices in order to achieve a gradual and lasting improvement in the health and condition of 12 Mile Coulee Natural Environment Park. The 12 Mile Coulee Management Plan recognizes 12 Mile Coulee as a Major Natural Environment Park and recommends compatible visitor uses with appropriate management strategies. Appropriate design and development planning will put into place the necessary infrastructure to realize and respect the vision and objectives of the park, ensuring its protection for the enjoyment of present and future generations.

Context

12 Mile Coulee is a Major Natural Environment Park located in northwest Calgary. Historically, 12 Mile Coulee formed a corridor that extended beyond the city's current boundary. Due to development within the city, the full extent of the coulee no longer exists. The largest contiguous portion that remains is included in the 12 Mile Coulee Management Plan. The existing park boundaries will help to protect and actively manage the largest remaining pieces of non-fragmented landscape. While several small pieces of fragmented

landscape remain west of the park along the historic alignment of 12 Mile Coulee, these parcels of land are still largely under developer control or have been modified for drainage and active recreation purposes. When development is complete, The City of Calgary will reassess their suitability. Due to the small fragmented nature of these parcels, they will likely be classified as supporting natural areas (see Map 1).

The 12 Mile Coulee study area is approximately 150 hectares and is bounded by Stoney Trail to the east, Nose Hill Drive to the south, the community of Tuscany to the west, and Crowchild Trail to the north. The study area contains prominent geographic features within the Bow River West segment of Calgary's Urban Parks system. A series of knoll formations and depressions characterize the topography of the benchlands near Stoney Trail. The coulee to the west is almost 290 meters wide and 50 meters deep at its southern end. An intermittent spring and stormwater fed creek meanders through the base of the coulee in a southerly direction. The creek enters the park along the northwest boundary along Tuscany Valley View (near the intersection with Tuscany Road). The creek exits the park through the wildlife underpass under Nose Hill Drive Extension, where its channel can be followed down to the Bow River. Although grasslands comprise a large portion of the park, a number of other vegetation communities exist including: low shrub, upland tall shrub, riverine tall shrub, white spruce, balsam poplar

and aspen. The value of the area in terms of its biophysical diversity, wildlife habitat suitability and recreational potential demonstrate the need for a comprehensive Management Plan.

Need for the Management Plan

As the communities that surround 12 Mile Coulee grow and expand, it is imperative that a management plan for 12 Mile Coulee is in place. Implementation of the Management Plan will help to protect and improve the sensitive landscape and habitats found throughout 12 Mile Coulee, now and into the future.

Pilot process

The Management Plan proposed here for 12 Mile Coulee Natural Environment Park will pilot a new process for Management Plans for The City of Calgary Natural Areas. This Management Plan pilot process reflects both the Natural Areas Management direction towards implementing an ‘Ecosystem-based Management’ approach, as well as highlighting the long-term fiscal requirements needed for the sustainability of the park. Fundamental to an ecosystem based approach is adaptive management¹ – which acknowledges that concepts put forth in the Management Plan need to be flexible and adaptive to the environment in which they are applied. This means that solutions put forward in the Management Plan will be evaluated over time to determine effectiveness. Approximately every five years, an internal project evaluation will be conducted. The intent of these evaluations is to provide Natural Areas management with an opportunity to review the operational requirements of the park. These reviews will help determine whether operational budgets are

¹ For the purposes of this Management Plan, adaptive management means that Natural Areas Management staff will conduct regular reviews and monitoring of the ecological success of plan implementation.

sufficient in order to maintain the ecological integrity of the park. An additional component of the pilot process is to include cost estimates for both one time capital and establishment requirements. Estimates of required funds are presented in Tables 1 & 2.

Overview of the Management Plan

The following Management Plan has been organized into three parts – **Part 1 Overview, Part 2 Management guidelines and recommendations, and Part 3 Technical background information.**

Part 1 – Overview provides a comprehensive overview of the process used to develop the Management Plan. Part 1 includes information on the Management Plan Development Process, review of the Guiding Documents, description of the Natural Environment Park Classification, description of the Decision-making Criteria and Park Ownership definition.

Part 2 – Management guidelines and recommendations provides detailed information on the management guidelines proposed throughout the plan. This section outlines how various components of the park (Designated Trails, Habitat, Interpretation, Education and Stewardship) will be managed. The Design Development Plan section of Part 2 outlines the proposed development phases and includes preliminary cost estimates for both capital and establishment requirements. **Part 3 – Technical background information** of the report presents the supporting technical background information.

Purpose

The purpose of this Management Plan is to guide future management decisions regarding resource and recreation management in 12 Mile Coulee. The Management Plan is designed to be consistent with the objectives and goals identified in the following City of Calgary documents: Calgary Open Space Plan (2003), Calgary Urban Parks

Master Plan (1994), Natural Area Management Plan (1994), Calgary Pathway and Bikeway Plan (2001) and The City of Calgary Cycling Policy on Undesignated Trails in Parkland (1998), all of which have been approved by City Council. The following goal and objectives highlight both the vision for the park, and the required actions needed to achieve the goal.

Goal

To provide overall direction for the protection, development and maintenance of 12 Mile Coulee in order to perpetuate the natural character and ecological function of the landscape while providing compatible, quality recreational opportunities.

Objectives

This Management Plan outlines how The City of Calgary will achieve the following objectives for 12 Mile Coulee Natural Area:

- Establish park boundary.
- Catalogue the habitats and landscape features within the study area and use this information to establish management zones as well as pathway and trail routes that are compatible with the natural environment.
- Determine the location of the Regional Pathway system.
- Determine the location of the designated trail network.



- Review and determine the types and locations of compatible recreational use.
- Establish the locations for general public access and parking.
- Identify user amenities and signage (and associated costs) that may be desirable (e.g. seating, garbage cans, pedestrian crossings, signage).
- Address potential points of conflict between various user groups.
- Develop recommendations for a public education program.
- Prescribe restoration strategies and prioritize restoration zones impacted by prior land use (i.e. grazing, powerline right-of-way).
- Maintain the natural environment in its native state with an emphasis on maintaining or enhancing the biological diversity of the area.
- Protect areas of high-quality environmental significance and to rehabilitate areas that have been previously disturbed and degraded.
- Ensure public access, safety and use at an appropriate environmentally sensitive level.
- Minimize the human footprint on the park, both through the reduction of negative environmental impacts and through the improved design and integration of site elements.
- Provide implementation phasing, timelines and construction costs.
- Identify establishment activities including budget and resource requirements for plan implementation in order to ensure long-term resource management for sustainability of the park.

Management Plan Development Process

Project team

The multidisciplinary team that worked together to develop the 12 Mile Coulee Natural Environment Park Management Plan included City of Calgary staff from Parks Resource Management (Natural Areas), Parks Public Education and Pathways, Engagement Resource Unit and Roads. Representatives from Alberta Infrastructure and Alberta Transportation, Archaeological Society of Alberta, Tsuu T'ina Nation and the University of Calgary also played key roles.

Citizen participation

The City of Calgary recognizes that decisions are improved by engaging citizens and other stakeholder groups where appropriate, and is committed to transparent and inclusive processes that are responsive and accountable (engage! Policy, 2003). The 12 Mile Coulee Stakeholder Input Group was established with representatives from local communities and interest groups to provide input during the plan development process. Thirteen meetings and three field trips were held through 2004 and 2008 to:

- (1) Develop a shared understanding of the vision and objectives of 12 Mile Coulee Natural Environment Park,
- (2) Obtain input into four key management issues (trail and pathway network, appropriate management zones, appropriate recreational uses, and educational resources), and
- (3) Provide direction to City Council to facilitate Management Plan approval.

The Engagement Resource Unit assisted Parks by facilitating discussions with the key stakeholders and using techniques outlined in the Council-approved engage! Policy. The information collected was integrated with existing City policy and site-specific technical reports to develop a draft of the 12 Mile Coulee Natural Environment Park Management Plan. Key stakeholders involved in the development of the Management Plan are as follows:

- Advisory Committee on Accessibility
- Archaeological Society of Alberta – Calgary Centre
- Calgary Aboriginal Affairs
- Calgary Field Naturalists’ Society
- Calgary Mountain Bike Alliance
- Calgary Pathway Advisory Council
- Calgary Road Runners Club
- River Valleys Committee
- Scenic Acres Community Association
- Seniors Outdoor Recreation Groups
- Tuscany Community Association
- Tuscany Community Representation
- Off Leash Calgary

The draft plan was subsequently presented to stakeholders and to the public at two open houses. Feedback and input received from the stakeholders and the public has been incorporated into the Management Plan.

Guiding Documents

The City of Calgary utilizes a number of documents that direct the management and development of Natural Environment parks. The Council-approved documents listed below provided information that guided the development of the 12 Mile Coulee Natural Environment Park Management Plan.

Plans

- Calgary Open Space Plan (2003)
- Bears paw East Area Structure Plan (2002)
- Calgary Pathway and Bikeway Plan (2001)
- Urban Parks Master Plan (1994)
- Natural Area Management Plan (1994)
- Revised West Scenic Acres Area Structure Plan (1993)
- East Scenic Acres Area Structure Plan (1990)

Policies

- City of Calgary Cycling Policy on Undesignated Trails in Parkland (1998)
- Transportation/Utility Corridor Program policy

Bylaws

- Parks and Pathway Bylaw 20M2003
- Animal Control Bylaw 23M89

City Council direction and Parks’ general vision regarding 12 Mile Coulee Natural Environment Park is provided in the Natural Area Management Plan and the Urban Parks Master Plan as identified below:

Natural Area Management Plan

The City of Calgary Parks recognizes the value of natural habitats relative to the healthy environmental and social functioning of the city of Calgary. We will maintain and protect the natural areas for public enjoyment, understanding and use.

Through appropriate resource management techniques, Parks will protect, maintain and/or reclaim significant natural habitat types and their relevant ecological associations and functions.

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1. Calgary Parks & Recreation will protect and maintain representative and viable natural habitat types as an integral component of the parks and open space system.
2. Calgary Parks & Recreation will manage designated natural parklands in a manner which will, by intent, maintain the natural character and integrity of these sites.
3. Calgary Parks & Recreation will encourage and welcome informed public, corporate and community participation, stewardship and partnerships in the acquisition, management, research and protection of appropriate natural environments.

4. Year-round enjoyment and use by all Calgarians will be encouraged with appropriate sensitivity to environmental impact and safety. Where recreational use and the long-term survival of significant habitats conflict, protection of the resource will take precedence. Recreational facilities will be designed and managed to minimize negative impact on natural areas.

Calgary Urban Park Master Plan

The Urban Park Master Plan is a policy document that guides the development of Calgary's river valley park system. The plan identifies a core vision and 18 principles (see Appendix 1). The management of 12 Mile Coulee Natural Environment Park will be guided by these principles.



12 Mile Coulee is identified as Planning Unit 3 in the Bow West River Segment. The direction provided in this document regarding The City's decisions for the use, management and maintenance of 12 Mile Coulee is as follows:

"The 12 Mile Coulee and the Scenic Acres escarpment are prominent geographic features with rich biophysical diversity which is further complemented by its association with Bowmont Park. The slopes of the escarpment and the coulee will be preserved in their native state. A regional pathway at the top of the escarpment will link a series of viewpoints overlooking the Bow River Valley.

Improvements are proposed as follows:

- Rehabilitation of disturbed areas.
- Regional pathway at top of slope.
- Viewpoints at the crest of prominent ridges.
- Unpaved secondary trails in 12 Mile Coulee designed for pedestrian use.
- Development setbacks for adjacent developments to allow for continuous public access at the top of the escarpment." (Urban Park Master Plan, 1994:36.)

Since the adoption of the Urban Park Master Plan (1994) the Cycling Policy on Undesignated Trails in Parkland (1998), which supersedes the Urban Park Master Plan, provides an overall direction to support multi-use. The trails in 12 Mile Coulee will initially be multi-use however trails will be monitored to determine long-term suitability. Active recreation in a Major Natural Area, as outlined in the Natural Area Management Plan, is to be restricted to designated trails, (as defined by the Urban Park and other Master plans) disturbed areas and recreation areas.

Natural Environment Park Classification

The Natural Area Management Plan (1994) divides The City's Natural Environment parks into four categories: Special Protection Natural Areas; Major Natural Areas; Supporting Natural Areas; and Other Parks with Natural Area zones.

A Natural Environment Park classification system is required to:

- Provide recognition of the variation, conditions and management requirements of the habitats within a natural area.
- Provide an objective method of assessing significance from a resource (ecological) perspective.
- Assign specific management or operational guidelines for different habitat types and conditions.

Based on the classification system, Twelve Mile Coulee was identified as a Major Natural Environment Park. Major Natural Environment parks have the following characteristics:

Overall Environmental Sensitivity: High to moderate
Resource Significance: city-wide
Wildlife habitat: Varying productivity
Primary zones: Natural Parkland
Percentage of natural environment: greater than 50 per cent
Natural condition of environmental area: Majority high

Other examples of Major Natural Environment parks include Nose Hill and Bowmont.

Decision-making Criteria

The decision-making criteria listed below are from Council-approved documents identified in the Guiding Documents section of this Plan. The criteria guided stakeholder and City decisions regarding protection, recreational use, management and maintenance of 12 Mile Coulee.

Use

Restricted to designated trails, disturbed areas and recreation areas (Natural Area Management Plan, 1994).

Where recreational use and long-term survival of significant habitats conflict, protection of the resource will take precedence (Calgary Open Space Plan; 2003; Natural Area Management Plan, 1994; Urban Parks Master Plan, 1994).

Off-trail and off-pathway use

Recommended on-trail and pathway use only except for disturbed and recreation zones (Natural Area Management Plan, 1994).

Trail use will be limited to designated routes in Special Protection Natural Areas and Major Natural Areas (Cycling Policy on Undesignated Trails in Parkland, 1998).



Dog use

- Dogs on leash, except in disturbed zones allocated for that use (Natural Area Management Plan, 1994).

Trails and pathways

- The principle of multi-use should be respected and encouraged wherever possible except for exceptional environmental and safety reasons (City of Calgary Cycling Policy on Undesignated Trails in Parkland, 1998).
- Locate pathway and trails, where possible, away from sensitive habitats and high wildlife use areas (Natural Area Management Plan, 1994).
- Mobility-impaired access where environmentally sound and physically realistic (and safe) (Natural Area Management Plan, 1994).

Park Ownership

The park is comprised of Transportation Utility Corridor (TUC) and Environmental Reserve (ER) (see Map 3). The Environmental Reserve is owned and managed by The City of Calgary. The TUC is owned by the Province of Alberta and managed by The City under a Recreational License Agreement that has specific conditions including the requirement to obtain written authorization prior to any surface disturbance. Because the 12 Mile Coulee Natural Environment Park Management Plan may make recommendations for improvements on TUC land, representatives from Alberta Infrastructure and Alberta Transportation have been working with The City during the plan development process to provide advice and guidance.

Management guidelines and recommendations

Part 2

The following section outlines the management guidelines and associated recommendations necessary to achieve the goal and objectives outlined for the 12 Mile Coulee Natural Environment Park Management Plan.

Capital and establishment responsibilities, and recommended monetary commitments are summarized in the tables in the Design Development Plan at the end of Part 2.

Management Zones

Resource zonation is a management tool used to define suitable dominant management strategies/goals in specific areas of a park. Resource zones are based on environmental sensitivity (to disturbance), resource significance (relative to city-wide and park-specific perspectives), appropriateness as wildlife habitat, and general habitat condition. Assessments are used to establish priorities for projects such as habitat restoration, and to determine the appropriateness of park amenities and facilities. These zones are not meant to be used as strict regulation but rather to provide guidance in decision-making.

The 12 Mile Coulee Natural Environment Park Management Plan has made use of resource zonation (red, yellow, green and purple) to allow for appropriate

emphasis on protection, restoration and public use. The zones are identified on Map 4 and are described below. Resource zones were determined through vegetation surveys (Jacques Whitford, 2003) and visual inspection of existing habitat types.

Red – Restoration zones

The restoration zones identify areas requiring immediate intervention and management. These areas are considered high quality and have high potential for rehabilitation into productive wildlife habitats. These areas are worthy of intensive management practices to help re-establish and maintain a natural state. These areas will require the highest funding and monitoring. Included in this zone are the creek crossing locations as well as the sandstone outcrops and surrounding areas that have been vandalized.

The key management objectives in these areas are to prevent further deterioration (invasive species, soil compaction, erosion, trail degradation, habitat fragmentation); begin to re-establish functional habitats that will be better utilized by wildlife; and create a safe designated trail system that includes creek crossings where necessary. Designated trails will be provided for public access. Informal trails will be closed and rehabilitated. The long-term restoration target for all the restoration zones will be to eventually eliminate all non-native species. Short-term operations targets will be to eliminate noxious and restricted species.

Yellow – Ecological Enhancement zones

These areas are highly significant and sensitive. The primary management objective for these areas is to improve habitat quality. The creek and adjacent riparian area are included in this zone. Designated trails will be provided for public access. Informal trails will be closed and rehabilitated.

The key management objectives are to control invasive, non-native plants; close informal trails, formalize the designated trail network; and re-establish native vegetation.

Green – Protection zones

Generally the habitat can be considered healthy. It contains a high diversity of native plants and forms a block of relatively unfragmented habitat. It functions as a food source, resting area, and a critical movement corridor for wildlife. It also contains the largest segments of native prairie within the park. The management priorities include implementing a designated trail network to provide public access as well as closing and rehabilitating informal trails. Long-term monitoring of the area will also be critical to identify and quickly address any changes in habitat health.

Purple – Multi-use zones

These fenced areas have been intentionally designed for active recreation, and facilities or amenities to support these pursuits will be provided. Permitted activities include off-designated trail access and dogs off-leash.

The management priorities required to ensure a positive recreational experience in these zones include fence construction, benches, and trail repairs when necessary.

Designated Multi-use Trail and Regional Pathway Network

A designated multi-use trail and Regional Pathway network has been developed for 12 Mile Coulee Natural Environment Park (see Map 5). The network will provide park users with an opportunity to experience the natural resource, while curtailing damage to surrounding vegetation caused by the proliferation of informal trails. The goal is to balance “use” and “protection,” while taking into account user preferences, environmental impact, and safety. This approach relies on appropriate user behaviour, and as such, monitoring, combined with an intensive public education program, will be required.

- *Regional Pathway* – Paved surface. Permitted uses include non-motorized activities for recreational and transportation purposes. All areas of Regional Pathway within the park are on-leash.
- *Designated Multi-use trails* – Formally recognised and maintained trails. The intent of creating a designated multi-use trail system is to help balance “use” and “protection” of the resource. Designated multi-use trails will be the official formalized trails. As per the Parks and Pathways Bylaw (20M2003), park users are required to use these specified designated trails only. All other informal trails will be closed and restored. Public awareness of the designated trails will be created through signage and public education campaigns. Non-compliance with designated trails will be monitored, and in circumstances where education is insufficient, enforcement may be required through the Parks and Pathways Bylaw. Permitted uses include slow-speed cycling (10km/hr maximum, for safety and environmental reasons), and pedestrian activities.

Regional Pathway

The routing pathway alignment takes advantage of existing desire lines, topography and special features within the park. The Regional Pathway planned for this park:

- Follows the top of the coulee and escarpment on the west and south sides of the park respectively.
- Connects the communities of Tuscany and Scenic Areas.
- Provides access to the Bow River.
- Forms an important Regional Pathway network link.
- Connects to the designated trail system within the park.
- Provides mobility-impaired access.

Designated Multi-use Trail

The trail network was determined by considering habitat, environmental sensitivity, park use patterns, topography and special features within the park. Existing undesignated (informal) trails that are not identified as part of the designated trail network will be rehabilitated over time as deemed appropriate under the restoration priorities for this Plan.

Principles and Recommendations

As part of the planning process, staff worked with the stakeholder input group to identify a conceptual routing system that would satisfy park access and park protection requirements. The following set of principles and recommendations was developed to aid in delineating the designated trail system. The general principles and recommendations were derived from informal discussions with the stakeholder input group members. These principles and recommendations will be integral in the management of 12 Mile Coulee's trail system.

Principles:

- To do nothing will result in increasing degradation of the park. If we do not provide adequate designated trail access to the park, people will continue to create their own trails.
- Designated trails will be used as a tool to protect natural environments, as well as provide necessary access (avoid sensitive and dangerous sites, or provide controlled access through areas of concern).
- It will be a fundamental message that trail sharing, trail-use education and appropriate behaviour be included in the operation of the trails within the park.

Recommendations:

- Trails will be multi-use where appropriate (in keeping with the Cycling Policy for Undesignated Trails). Trails will be monitored on a regular basis in order to assess long-term suitability of trail for multi-use. In the event that habitat damage or safety issues become a significant concern, multi-use suitability will be re-evaluated and restrictions to use may be applied.
- Connections will be required across the coulee.
- Where possible, accepted best practices such as City of Calgary standards will be used in trail design and maintenance.

- Designated trail surfacing will be varied, and will be intended primarily to ensure sustainability of each trail. Surfacing materials will not include pavement or asphalt but may include compacted gravel (Parks Trail Mix), or dirt, depending on localized conditions of slope, surface drainage, usage and context.
- Trails may be a variety of widths to suit safety and environmental objectives.
- Railings may be required where trails are adjacent to steep terrain.
- Creek crossings will connect trails where necessary. The proposed trail alignment crosses the creek where required.
- Final designated trail alignment will be located in the field to work with the existing conditions.
- Designated trails will follow natural contours where possible.
- Provide benched trails with positive drainage across the trail surface.
- Avoid using fill in trail subgrades; build the trail on existing compacted subgrades.
- Use switchbacks to ease trail gradients.
- A public education program is required to encourage appropriate trail usage.
- Mobility-impaired access will be provided where environmentally sound and physically realistic.
- Seasonal closures of trails may be considered for wildlife needs.
- Where disturbance due to trail construction occurs, the impacted areas will be rehabilitated.

Off-leash Areas

There is a high public expectation for dog use areas in this park. As a result, two off-leash zones have been planned (see Map 6). The zones have been designed to minimize the possibility of conflicts between users and to minimize negative impacts to wildlife.

Description

Off-leash zones will be fenced to clearly distinguish the area for park users and to reduce the potential for wildlife/off-leash dog interactions. The area will be managed to withstand heavy use. This may include the use of non-native plant material. The location of housing, Regional pathways and well established trails around the periphery of these zones significantly reduces the likelihood of non-native grasses from the off-leash zones encroaching into the natural habitats.

Principles and Recommendations

As part of the planning process, staff worked with stakeholders (input group members) to identify potential areas within the park that would be suitable as off-leash sites. Areas were selected based on the following general principles and recommendations, derived from informal discussions with the stakeholder input group members.

Principles:

- The most sensitive and environmentally significant areas of the park will remain as on-leash. The intent is to concentrate all users on designated trails to reduce impacts to the rest of the park.
- Off-leash zones will be determined by taking into account safety, environmental and access considerations.

Recommendations:

- Off-leash areas should have clearly identifiable boundaries.
- Selected areas should not be located in zones that are planned for immediate major restoration.
- Conflicts with the Regional Pathway or designated trails should be avoided wherever possible and warning signage should be used to reduce the potential for conflict.
- Off-leash areas should be located, when possible, to facilitate access from adjacent neighbourhoods and parking points.
- Consider creating long, circular walking routes within the off-leash area.
- An effective educational program will be required to promote understanding and encourage compliance with the off-leash areas, including information on key wildlife areas in the park.
- Where possible, minor restoration methods may be required to enhance the off-leash areas (i.e. tree and shrub planting to improve aesthetics).
- The need for and location of more refuse cans will be evaluated over time. Users will be encouraged to pick up after their dogs and take the waste home for disposal.



Parking

As stated in the Guiding Documents section, 12 Mile Coulee is a Major Natural Environment Park in Calgary. Year-round enjoyment and use by all Calgarians will be encouraged with appropriate sensitivity to environmental impact and safety. One parking area is proposed for the park, adjacent to the realigned Tuscany Boulevard (off of the condominium development access road off Stoney Trail) (see Map 4).

The proposed parking area will be gravel or dirt surfaced. Fencing or curb stops will serve to delineate the parking area for the park. The entries to the park from parking areas will be well defined with connecting trails, signage and entry features welcoming park users.

Tuscany Boulevard parking lot

Pending final approval from Alberta Transportation, the proposed parking lot will be constructed on the east side of 12 Mile Coulee southwest of Tuscany Boulevard. It will provide access for park users coming from other parts of the city. The parking lot will accommodate approximately 30 vehicles. Construction of the lot will be a high priority when the realignment of Tuscany Boulevard is completed. (Refer to the Park Ownership section for additional details.)

Additional parking options

The parking lot on Bears paw Dam Road adjacent to Baker Park will also be available for parking. The Regional Pathway system will provide a connection from the parking lot to 12 Mile Coulee.

Recommendations

As part of the planning process, staff worked with stakeholder input groups to identify suitable parking lot locations. Additional guidelines regarding parking lot development are provided below.

- All of the parking lots will be formalized with clearly defined parking spots.
- All of the parking lots will be surfaced with gravel.
- Curb stops and post and cable fencing will be used to delineate the parking areas and prevent spill-over into the park.
- Existing areas of on-street parking will be monitored to determine if additional off-street parking is required.

Amenities

Amenities will be kept to a minimum in 12 Mile Coulee Natural Environment Park. This is in keeping with Parks' intent to manage 12 Mile Coulee in a manner that will maintain the natural character and integrity of the park. Where needed, the following amenities will be incorporated into the park: benches, garbage cans, picnic tables and signage.

Benches

Specific considerations are required when placing benches in Natural Environment parks. Enough benches should be placed in a park to satisfy user needs without taking away from the natural character of the area. Appropriate bench styles and installation criteria are important considerations. For example, the use of hard surfaces like brick or concrete under benches should be discouraged in natural areas. The impact of increased traffic (potential for trail proliferation and ground disturbance), maintenance, vandalism and litter are also important considerations when identifying a suitable bench location.

Recommendations:

- The benches that currently exist in the park will remain.
- A small number of additional bench locations are recommended. They will be strategically located along designated trails, the Regional Pathway, or at entry nodes to provide rest areas that take advantage of views or unique park features.
- Memorial benches will be permitted in the park at the bench locations identified above. They must be the same style and placed in the same location as the pre-existing benches. No additional locations are recommended.
- Hard surfacing under the benches will not be permitted.
- The placement of additional benches within the park requires the written approval of the natural areas management co-ordinator.

Picnic tables

Recommendations:

The picnic area located at the base of 12 Mile Coulee will remain.

Garbage cans will not be provided. Users will be encouraged to remove all waste and take it home for disposal.

Garbage cans

Garbage cans should be located at major access points close to the Regional Pathway and designated trails. Operational realities (i.e. winter conditions, park topography) should be considered when placing garbage cans within the park.

Recommendations:

- Garbage cans will be located at major park entry points and at high-traffic areas along the Regional Pathway and designated trails that are easily accessible by Parks staff.
- The dog off-leash areas will be monitored to determine the need for additional waste receptacles, however, off-leash area users will be encouraged to pick up dog waste and dispose of it at home.

Washrooms

At this time washrooms are not planned for this park. Through continued dialogue with stakeholders, Parks will monitor if a washroom is a future requirement.

Memorial trees

Memorial trees place a large obligation on Parks. There is an expectation that the trees will be maintained for a long period of time. This requires a regular schedule of water, pruning, and usually the placement of a plaque.

Recommendation:

The planting of memorial trees will not be permitted in 12 Mile Coulee Natural Environment Park for the following reasons:

- Isolation – an isolated tree is more likely to be skipped in any routine maintenance or watering schedule.
- Access – the site will have to be easy to reach, limiting most sites to pathways and manicured areas nearby.
- Maintenance – this level of maintenance is not compatible with most management maintenance levels in natural areas.

Signage

The purpose of signage is to enhance users' experience without being visually intrusive. Signage will be strategically located to provide critical information while minimizing the number of signs required. The signage used will be designed in a manner that is in keeping with the beauty of the area.

Recommendation:

Four types of signage are required at 12 Mile Coulee Natural Environment Park: Entry feature signs, interpretive (educational) signs, trail markers and regulation signs.

Entry features

- Provide detailed routing map and orientation point identifying "You Are Here."
- Provide users with an overall understanding of the designated trail and Regional Pathway system.

Interpretive (educational) signage

- Provide interesting, relevant information on special interest areas.
- Inform users of the importance of respecting a particular area.
- Educate users of historic, culturally and environmentally significant areas.
- Help users gain an understanding of their natural environment.
- Create awareness and social responsibility toward the park.
- Focus on placing interpretive signs along the Regional Pathway for the education and enjoyment of all users.



Trail markers and regulation signs

Trail markers

- Distinguish designated trail route to reduce trail proliferation.
- Aid users in staying on the designated trail.

Regulation signs

- Speed limits.
- Trail closures.
- Restoration zones.
- Off-leash and on-leash area signs.

Resource Management

The following section outlines the necessary elements of the plan to ensure responsible resource management. One of the most difficult aspects of natural area management is the need to balance the public interest in “use” of parkland, with the public interest in its “protection.” Imposing restrictions creates limits to human use, while allowing overuse negatively affects the quality of the habitat and the interactions of wildlife, as well as public enjoyment. Not only is there a potential for conflict between park users and the environment, but also between users themselves. Potential impacts can be managed through the use of a designated trail system, public education, vegetative rehabilitation, management zoning and volunteer stewardship.

The overall goal of park management is to provide for and manage public use, without negatively affecting the environmental conditions of the site. Due to the special nature of the 12 Mile Coulee Natural Environment Park one should expect and encourage city-wide use. The proximity of the surrounding urban development and the strong desire of users to be close to the creek will add to the pressure of human activity on the site. Due to the sensitive nature of the site, extra emphasis

will be required to design facilities to aid in habitat protection (i.e. creek crossings) along with enhanced educational programs to encourage appropriate human behaviour. Activities such as bird watching, hiking, plant identification or simply sitting and watching the creek, will be promoted.

Trails

A significant problem in 12 Mile Coulee Natural Environment Park is the damage to vegetation and fragmentation of habitat caused by the proliferation of undesignated trails. Access to the park will be limited to the Regional Pathway and designated trails.

Informal undesignated trails will be closed and revegetated when they occur (see Map 7). It is important to identify priorities for vegetative rehabilitation of disturbed and impacted areas in the park, as park improvements will need to be staged over time.

Trail restoration priorities and recommendations

Priorities for restoration to be undertaken are as follows:

- Close and rehabilitate undesignated trails in spruce vegetation zone.
- Close and rehabilitate undesignated trails leading towards the wildlife underpass. Educational signage explaining the restricted use of the underpass for wildlife only will be included at the closure locations.
- Clear identification of the designated trail system.
- Construction of the creek crossings – the major missing link in the designated trail system.
- Monitor effectiveness of weed management and growth of new plantings on rehabilitated trails.

Designated trail alignment and creek crossings

The designated trail route primarily follows the creek alignment through the bottom of the coulee and crosses the creek where necessary (see Map 5). Selection of the designated trail route was based on topographical restrictions (steepness of side slopes), established use patterns, and sensitivity of surrounding habitats.

Recommendations:

- Creek crossing structures (wooden bridges) are a high priority for construction to complete the designated trail system and reduce impacts to the creek and surrounding vegetation.
- The areas surrounding the creek crossings require restoration.
- The design of the crossings will be in keeping with the character of the natural area.
- Railings may be required in some instances for safety reasons.

Wildlife underpass

The wildlife underpass is located at the southeast corner of the park below Nose Hill Drive. It was constructed in 2004 to facilitate the movement of wildlife from 12 Mile Coulee to the Bow River (see Map 8).

Recommendations:

- Educational signage is required to inform park users that the underpass is for wildlife only. Human activity in the underpass will significantly reduce the likelihood of wildlife use.
- Informal trails leading to the underpass are a high priority for closure and revegetation.

- Monitoring of wildlife use is required to determine the effectiveness of the underpass. Information gathered could be used to address wildlife movement issues in other areas throughout the city. Specific details that require additional research include the effective underpass dimensions (length, width and height), and the lighting requirements (artificial or natural). The City will investigate installation of wildlife cameras to facilitate the research.
- Habitat to the south of the underpass requires improvement.
- Signage at the intersection of the wildlife underpass and Bears paw Dam Road is required.
- Records of deer and vehicle conflicts on Bears paw Dam Road and the Nose Hill Drive extension would provide valuable information.

Escarpment

The escarpment to the south of the coulee contains the largest patch of contiguous native grassland in the park. It forms a critical wildlife corridor for animals travelling to other natural areas and towards the Bow River (see Map 8). Tuscany Hill Drive may impede wildlife movement if road traffic is not monitored and managed. Although a small box culvert (0.9 m high and 1.8 m wide) was constructed under the road to allow for the passage of small mammals and amphibians, it may be insufficient and does not address the movement of larger mammals like coyotes and deer. Development to the west of the escarpment may also negatively impact wildlife movement and survival if the wildlife corridor is not considered and integrated into future development plans.

Recommendations:

- The escarpment is narrow. Access will be limited to the Regional Pathway on the top, a local pathway adjacent to Nose Hill Drive west of Stoney Trail, and designated trails at key access locations.
- Wildlife crossing signage is required on Tuscany Hill Road.
- Speed limits must be enforced on Tuscany Hill Road to minimize the potential for collisions with deer.
- The use of the box culvert by wildlife should be monitored.
- Weed infestations adjacent to the Nose Hill Drive extension, Tuscany Hill Road and the periphery of the Tuscany development require management.
- Records of car collisions with wildlife should be kept.
- Wildlife fencing on the north and south sides of Nose Hill Drive extension is required.

Dog control

Dogs will be required to be on leash and under close control (Bylaw 23M89), except in designated off-leash zones. High traffic areas within the off-leash zones may require minor restoration methods such as temporary fencing and additional plantings to ensure the area is adequately vegetated to minimize erosion as well as to ensure the site conditions are pleasant for users.

Recommendations:

- Impacts and compliance rates will be monitored.
- Maintenance costs for off-leash areas will be monitored and reviewed to better determine the actual costs involved in maintaining an off-leash area. These costs include more frequent garbage pickups, sweeping and repair of turf damage.

Organized events

Organized events encourage people to participate in many healthy recreational/social activities and can have positive community-building effects. However, some organized events can create additional park demands. In some cases, use of the park (or certain facilities within the park) by a single group may conflict with casual park use, and in other instances, parking may be an issue. While the number of organized events is not overwhelming now, environmental impacts and potential increasing demands, particularly with respect to organized runs, walks, etc., are issues to be addressed.

Recommendations:

- Organized events will conform to the mandate of the park and the Natural Area Management Plan.
- Events will be subject to approval by the Natural Parkland Management Co-ordinator. Principles influencing approval will include environmental impacts, number of participants, safety, conflicts and timing.
- Participants will be expected to comply with policy and bylaw requirements pertaining to the use of facilities, designated trails and the Regional Pathway in the park.
- All permitted activities will have records kept and any relevant issues (i.e. complaints, etc.) will be recorded.

Vandalism

Vandalism is a major issue in the park. Incidents of vandalism include forts, bike jumps, broken glass, native plant removal, graffiti on the sandstone outcrops, graffiti on the pedestrian underpass, fire pits and trees cut down for firewood.

Recommendations:

- Parks staff will clean up vandalism as promptly as possible, in order to limit opportunities for further damage to the vandalized area.
- Volunteer involvement through the Natural Areas Adopt-A-Park program will be initiated.
- As part of the specialized maintenance procedures, regular assessments of frequently vandalized areas will be undertaken.
- Representatives from The City of Calgary Animal & Bylaw Services and the Calgary Police Service will be informed and updated.
- Partnerships with organizations like Block Watch will be formed in an attempt to reduce vandalism through community involvement and monitoring.
- Additional vandalism reduction methods (i.e. camera) will be considered for implementation at highly vandalized locations.
- Residents will be informed about the magnitude of the vandalism problem in 12 Mile Coulee through articles in community newsletters.

Encroachments

A number of Tuscan residents back on to 12 Mile Coulee Natural Environment Park. Encroachments occur when citizens extend their personal possessions or yard into the park space. Common encroachments include fire pits, mowed strips, unapproved plantings, yard waste dumping and compost bins. The planting of non-native plant material is of particular concern because many species are aggressive and will easily colonize within the park. Once established, they often out compete native vegetation. Species of concern that have been found in 12 Mile Coulee include cotoneaster and turf grass.

Recommendation:

- Educate residents that live adjacent to 12 Mile Coulee about the impacts of encroachments.

Hydrology and water quality

The developed neighbourhoods that surround 12 Mile Coulee affect the amount and type of water that enters the park and impacts the overall hydrologic system of the park. During storm events, an increased amount of water enters the park at numerous locations, and in some instances, has affected the severity of slope failures. The quality of water entering the park may also have negative impacts on the aquatic health of the park resulting in the overall deterioration of creek health.

Recommendations

- Educate park users and Tuscan residents about drainage-related issues which affect the hydrology and water quality of the park.
- Work with other City departments including Roads, Water Resources and Public Education and Pathways to address these drainage issues.

Habitat Management

Habitat quality in urban natural areas is constantly challenged by overuse, invasion by introduced plant species, and fragmentation. Parks' goal is to maximize the health or quality of these habitats, through a combination of preservation and rehabilitation.

Vegetation communities in more natural systems constantly change depending on the environmental conditions they face. Grazing, fire and flooding are all natural processes that are important to the maintenance and regeneration of our native plant communities. In an urban setting, these processes are usually controlled, providing less opportunity for natural vegetation communities to thrive and propagate. The resulting effects may be, for example, an increase of rose/cinquefoil/wolf willow invasion into grasslands, or a lack of new poplar growth in balsam poplar forests due to a lack of flooding.

Many people believe that natural habitats do not require maintenance. These areas should be left alone to survive and thrive. This would be true in a setting that is free from human interference. However, in an urban environment (an unnatural setting), habitats must be managed carefully with specific strategies designed for specific circumstances.

The following section outlines both overall and habitat-specific recommendations.

Overall recommendations:

- Natural vegetation communities will be managed at a variety of stages of maturity. In some cases, active control may be required (i.e. replanting, soil scarification). Protection of a variety of habitat types will be actively pursued during development of park restoration plans.
- Research regarding habitat management is essential and will be updated regularly as techniques are improved. Inventories will be established to determine ongoing conditions. These initial inventories will be used to create ecological classifications of the park and establish a baseline reading of the park against which future inventories can be compared in order to monitor the ecological conditions of the park.
- Wood and brush downfall and tree stumps will be maintained where safety is not a concern. These are important microhabitat sites for perching, nest and den sites for birds and mammals. They are also critical habitat for a wide variety of insects, fungi and nonvascular plants. They play a vital role in nutrient cycling and can serve as a nurse site for tree seedlings.
- Snags (standing dead or dying trees) are very important in all forested areas for providing nesting and perch sites for a variety of wildlife species including waterfowl, raptors and insect eating birds. Removal of significant snags can have a deleterious effect on the health of the woodland. Snags will be removed only after careful consideration of:
 - Safety issues will be addressed – especially near popular facilities such as the Regional Pathway (i.e. ensuring that the base of snags are firmly anchored).
 - Environmental value – snags most appropriate for nesting are generally over six years old, are more than 20 cm dbh (diameter at breast height), and have more than 40 per cent bark cover. A variety of snags attract wildlife, especially those greater than five metres in height.
 - A mixture of rotten and good quality snags will be maintained.
 - Trees with nest holes will be protected.

Habitat-specific recommendations:

Each habitat type requires specific management actions. The recommendations for each habitat type are presented here.

(Note: For more detailed description of the habitat types found at 12 Mile Coulee, please see Biophysical Inventory and Assessment in Part 3 of the Management Plan).

Balsam poplar

Regeneration campaigns will be undertaken for balsam poplar. A major concern in Calgary is that balsam poplar cannot propagate effectively and is gradually (almost imperceptibly on our time scale) being replaced

by other species such as manicured grassland, white spruce and river birch shrubs. Currently, the 12 Mile Coulee Natural Environment Park riverine woods area is in good condition, however, the number of young trees establishing within the area needs to be monitored and the following steps taken:

- Research into regeneration methods will continue.
- Areas suitable for balsam poplar regeneration will be identified and monitored. In some instances planting and root disturbance to promote suckering may be required.
- Conifer planting is not recommended.
- Recreational use will be limited to designated trails.



Aspen habitat

- Replanting will be undertaken where new suckers are absent (i.e. regeneration is not naturally taking place).
- Conifer planting is not recommended.

Native grassland habitat

- Invasive agronomic grasses, such as smooth brome, Timothy (*Phleum pratense*), foxtail barley (*Hordeum jubatum*), and crested wheatgrass (*Agropyron cristatum*) are “weed” grasses that tend to out compete other productive grasses and forbs. These species will be controlled where possible and attempts will be made to re-introduce native vegetation.
- Tree planting is not recommended in grassland areas.
- Grasslands are one of the most resilient habitats to a variety of impacts. However, if soil is exposed or on slopes, significant erosion is likely. On the escarpments, activities will be restricted to designated trails and the Regional Pathway.
- Closure and rehabilitation of informal trails.
- With the change in natural controls (suppression of burning and grazing), low shrub and wolf-willow have encroached into a variety of grassland habitat types. These encroachments will be monitored and controlled over time.

White spruce

Regeneration to be considered carefully due to the slow and difficult process of regrowth and the high chance of erosion in these areas. Major restoration efforts should be directed towards the closure of informal trails and the re-establishment of the understory. Expense of rehabilitation is high.

Disturbed areas

Disturbed areas are dominated by bare ground, introduced plant species and weeds. They are not productive areas for wildlife. Restoration is undertaken to increase bio-diversity and animal habitat suitability. Restoration projects are most successful when there is a specific objective identified, when natural vegetation (traditionally found on site) is used, and when the restored areas are consistently maintained over the long term. The more damaged an area is, the more costly and difficult it is to rehabilitate. We need to determine the most crucial restoration pieces and decide what level of repair is appropriate. Restoration work can be very invasive. It is very costly and it takes a long time to see the final product, but it is essential to improving the health and overall condition of the park for the long term.

General recommendations

- All planting in red, yellow and green zones will be strictly restorative or barrier in nature, with species used that represent the associated vegetation community.
- No introduced species will be used.
- A site-specific assessment and implementation plan will be required for all major restorative projects. Each project will be staff supervised.
- Long-term planning and maintenance will be taken into account.
- Monitoring and assessments of rehabilitated areas will be undertaken and kept on record.

- All restoration projects, with the exception of minor trail repair, will have detailed plans identifying objectives, specific restoration techniques, materials, timelines and plant lists. Monitoring of each restoration project will also be undertaken to evaluate effectiveness of the techniques and the progress towards the previously identified objectives.
- Signage will be used at restoration sites to inform and educate users.
- Bioengineering techniques such as erosion matting, landscape fabric, and specific planting techniques will be used where possible to control damage caused by erosion and other factors.
- Seed for revegetation will be identified and/or acquired by The City of Calgary Parks. Purchase by others except under the direction of Parks is not recommended.
- Seed collection by volunteers will be encouraged through the Natural Area Adopt-a-Park program.

Restoration priorities

All disturbed areas identified in red on Map 4 are high priorities for restoration. Specific locations that require immediate management include:

- Sandstone outcrops and surrounding area. The area is very sensitive, highly visible and has been vandalized.
- Riparian area at the base of the coulee by the tipi ring requires extensive restoration including weed management, replanting, designated trail delineation and trail closures.
- Spruce forest located on a steep west-facing escarpment that has been heavily impacted by informal trails.

Pests and Problem Wildlife

This section provides recommendations on the best methods of controlling pest species and problem wildlife specific to 12 Mile Coulee Natural Environment Park. Some existing species in the park that may be considered pests include Canada thistle and smooth brome grass, yellow and white clover, caragana and cotoneaster. Weed control involves active monitoring and the removal of those species that are potentially harmful to natural areas and to residential communities. Provincial guidelines also provide direction and specific controls for weed management.

Introduced animals and birds include grey squirrel, house sparrow and European starling. Indigenous wildlife may also become a problem when large populations or particular behaviours interfere with neighbours, or actually do long-term damage to the natural resource (e.g. beavers, coyotes, deer). In normal situations these species are considered important components of a natural environment. There are many incidents reported of conflicts between dogs and coyotes. Wildlife control is generally the responsibility of Provincial wildlife authorities.

Specific species recommendations:

Pest bird species: The primary control method suggested is to discourage the placement of birdhouses (erected by well-meaning public) in Natural Environment parks.

Richardson ground squirrel: Increase public understanding of the role of ground squirrels within the food chain.

Insect pests: Increase public understanding of the role of insects, and that most infestations (except introduced varieties) are a result of stresses such as water loss, small size and fragmentation.

Grey squirrel: Increase public understanding about the harmful impacts of this introduced animal.

Coyotes: They are commonly seen in and around Calgary. Coyotes are considered a valued wildlife species that have a natural diet of rabbits, small rodents, fruits and berries. They are not naturally aggressive to humans. Their population is increasing in urban centres because they are very adaptable. Areas most often inhabited are communities along our rivers and in large Natural Environment parks.

One of the primary roles of Natural Environment parks is to protect wildlife and wildlife habitat. Citizens strongly value these parks and feel fortunate to be able to share the areas with many species of wildlife, including coyotes. Park users recognize that they have a privilege and a responsibility in the park. They play a critical role in maintaining park health for the appreciation and enjoyment of others. While using off-leash areas, they are encouraged to closely supervise dogs, refrain from disturbing wildlife, and remove garbage. In instances when aggressive coyotes are identified, citizens are asked to contact the Alberta Environment Natural Resource Service Coyote Hotline at (403) 297-7789. They may also be directed to The City of Calgary Animal & Bylaw Services.

General recommendations:

Existing approved guidelines in the Natural Area Management Plan and Integrated Pest Management Policy will be applied to manage pest species in 12 Mile Coulee Natural Environment Park. Control will be at the discretion of the natural area management co-ordinator.

- If there is sufficient volunteer interest, a pilot project for manual weed control will be set up through the Natural Area Adopt-a-Park program. Parks will support the activity for an approved specified area with appropriate training for the volunteers.
- A variety of techniques will be used to decrease the risk of weed invasion in natural areas. Priorities for control will start with pests that threaten invasion into natural habitats and local residences, and will then include larger problem sites.
- The release of non-native wildlife within the park will not be permitted.
- Feeding of wildlife within the park will not be permitted.
- Monitoring of weed problem from April through October. Areas of concern will be inventoried and documented.
- Aggressive removal will be required to protect natural vegetation.
- Where possible, priority will be given to use less chemical options. Spot spraying is preferred in all natural areas. Integrated Pest Management (IPM) strategies will be followed.
- Priority will be given to closely monitor for noxious and restricted species such as nodding thistle.

Park Maintenance

Some aspects of maintenance in natural areas is similar to that of groomed parks. These activities include garbage pick-up and amenity repair. Both of these activities are undertaken by the North Area division of Parks. Specialized maintenance includes activities that are related to natural area restoration, or activities that may need specialized equipment or expertise, such as erosion control or wildlife habitat enhancement. These activities are usually non-repetitive and change from year to year. This work is undertaken by the Natural Areas Management section of Parks. These specialized maintenance activities are most costly in the initial establishment phases. These maintenance requirements and costs for each section have been identified under “Establishment” in the cost table at the end of the Design Development Plan. As these items are ongoing and essential to the successful implementation of the Management Plan, they have been included in an itemized way to ensure that the necessary establishment operations are accounted for. After the initial establishment period, these activities will be revisited to determine long-term requirements.

Regular maintenance recommendations:

- An annual assessment of specific maintenance requirements.
- Regular maintenance practices record keeping.
- The use of heavy machinery will be minimized on site except in disturbed sites (with specific sensitivity to wildlife seasonal use).
- A servicing schedule will be established for parking lots, garbage cans and fences.
- Enforcement and interpretive signage will be installed and maintained.
- Maintenance vehicle access to the park will be limited to the Regional Pathway.

Specialized maintenance recommendations:

- An annual litter clean-up will be conducted.
- The use of heavy machinery will be kept to a minimum, except in disturbed sites that are to be restored (with specific sensitivity to wildlife seasonal use).
- Designated trails will be maintained as required.
- Strategies will be developed for control of weeds and habitat improvement.

Transportation Utility Corridor (TUC)

The objective of the TUC is to facilitate development within Calgary by accommodating the provincial Ring Road system, major power lines, pipelines, regional water and sewer lines and telecommunication lines. The Ring Road system includes Highway 22X and Stoney Trail (Hwy 201).

The TUC was established on the principle that long-term planning for the accommodation of a number of transportation and utility facilities within a corridor can maximize the use of the corridor. The TUCs protect Ring Road and utility alignments from advancing urban development and offer a long-term solution to many of the land use problems associated with developing major linear facilities in the urban context.

The Minister of Alberta Infrastructure has administrative authority over all development within the Transportation / Utility Corridor, and that Ministerial Consent is required for any surface disturbance. Pathways and other amenities within the TUC portion of the park may experience temporary disruption during utility or road construction.

Although a large amount of the TUC will remain as part of the 12 Mile Coulee Natural Environment Park, Alberta Infrastructure and Alberta Transportation has planned road improvements. The road improvements include the realignment of Tuscany Boulevard and the Crowchild/Stoney Trail interchange. Estimated completion date for the work yet to be determined and the anticipated start date is 2009.

Recommendations:

- A number of utilities are situated in the park and there are, or will be requirements to maintain or upgrade them.
- For any utility upgrades or proposals for utilities in the park, The City of Calgary will request a Biophysical Impact Assessment² including public consultation.
- Access and rights will be maintained by existing utilities.

² A Biophysical Impact Assessment is an assessment that is undertaken to establish the issues and potential impacts of a specific project on the natural resource. It measures the scale and significance of the impacts and identifies any mitigation measures that could be used to minimize the anticipated negative impacts, or enhance a site/project. Specific details regarding Biophysical Impact Assessment requirements are provided in Appendix 3.

Cultural History

The interpretive potential of the known historic sites in the coulee is very high, as outlined in Lifeways' Historical Cultural Resources Overview of the 12 Mile Coulee Natural Environment Park (Vivian, 2006). The precontact native use of the area is marked by known archaeological sites which remain intact in the park. Twelve archaeological sites have been recorded within the park over the last 40 years. These sites range from stone tipi circle sites and small artifact scatters, to stone cairns along the coulee's edge. Archaeological research within the coulee and beyond indicates that the area was an important location in much earlier times, when native inhabitants in the region hunted buffalo, antelope and other animals here more than 7,000 years ago. Over the next millennia, as cultural adaptations to the local environment continued to change, the coulee and surrounding uplands became a focus for harvesting fresh foods in the early months of spring, as indicated by the many small short-term campsites found throughout this area.

While it is likely that all of the larger, more obvious sites have been recorded within the park, it is also likely that many smaller sites remain buried and undiscovered. In order to facilitate the ongoing construction of trails and other developments within the park, Lifeways developed a predictive site model based on the known site locations and on the archaeological potential of certain landforms. The predictive site model relies on data gathered from known sites and from Lifeways' understanding of Precontact land use patterns established through years of archaeological research in Calgary.

Recommendations:

- Information from the archaeological resources should be incorporated into the park's interpretation program.
- Twelve archaeological sites have been recorded within the 12 Mile Coulee Natural Environment Park boundaries. Some were ground-truthed as part of the overview. If any known site areas will be affected by new developments or trail redevelopments, a Historical Resources Impact Assessment (HRIA)³ should be carried out to reassess these and to insure that potential developments will not impact them.

³ Historical Resources Impact Assessments (HRIAs) entail a full survey of lands scheduled to be developed. An HRIA is conducted when previously recorded sites are known to exist on the lands or if the lands are in a location or have characteristics that indicate they have high potential to contain previously unrecorded sites.

- The greatest potential for as yet unknown and unrecorded archaeological sites is found on higher terraces associated with the first aggradational period. Any sites located here are not likely to be deeply buried. If any developments are planned along these higher terraces, an HRIA should be carried out prior to development to ascertain if any undisturbed archaeological sites remain here.
- While the sides of the coulee are generally too steep to be considered of much archaeological potential for Precontact camp or processing sites, a small bison killsite could be located on the heavily wooded north and east facing slopes towards the southern end of the coulee. An HRIA of these areas should be conducted in the event that developments are planned here.



- Outside of the bottom-lands, it is possible that cairn features may be found along the valley rim. It is unlikely that any undisturbed and unrecorded cairn sites remain here, as they would be highly visible were they present. Any developments in this area should be ground-truthed in the form of a Historical Resources Overview (HRO)⁴ with a field visit.
- Beyond the limits of the coulee, much of the uplands adjacent to Stoney Trail and south of Tuscany Boulevard have been ploughed and there is little or no chance that any undisturbed archaeological sites remain here. However, the northeastern portion of the park, which extends toward the Stoney Trail interchange, does hold some potential for intact archaeological sites. A couple of small ring sites were recorded here when the grass was grazed shorter, and it is possible that portions of these site still remain intact. Any developments in this area should be subjected to an HRIA.
- Finally, it is possible that other sites may remain buried in the swales and deeper sediment traps found in the hummocky terrain which typifies this portion of the park. Developments in areas containing such swales should be subjected to an HRIA with backhoe testing for deeply buried sites.

⁴ A Historical Resources Overview (HRO) consists of a review of Alberta Culture and Community Spirit's (ACCS) site files, and occasionally a site visit to assess the potential of the lands to hold unrecorded archaeological sites.

Interpretation, Education and Stewardship

Overview

Park interpretation, education and stewardship programs work together with Calgarians to create and sustain a vibrant, healthy, safe and caring community. The outcome of this collaboration is to gain the necessary skills to make informed decisions and to take responsible actions related to the city's natural environments and to become stewards of the local environment. Indicators of our success will include co-operative protection of City parks and green spaces, positive behaviours towards the local environment and enhanced experiences of 12 Mile Coulee Natural Environment Park.

Interpretive program

The intent of an interpretive program is to create community and city-wide awareness, appreciation, understanding and enjoyment of the importance of 12 Mile Coulee Natural Environment Park and its role in the overall system of Calgary's parks. Interpretive features will be strategically located throughout the park to provide users with information on specific historical, cultural and environmentally significant points of interest.

Education program

The intent of a comprehensive education program in the context of a park management plan for 12 Mile Coulee Natural Environment Park is to provide learning opportunities that develop public knowledge, attitudes, values and skills that contribute to the quality of the park. A program will be developed to provide memorable opportunities for students to experience the

12 Mile Coulee's unique features and explore, discover and learn about the natural world while engaging in health-promoting physical activity. Curriculum-link is essential for school group offerings to enhance academic achievement. The informal learning programs for adults and families could invite action towards community stewardship of the park. The education program will require an integrated process to take into account all user needs.

Stewardship

The Natural Areas Adopt-a-Park program gives interested individuals and groups opportunities to work collaboratively with The City of Calgary Parks to enhance Natural Environment parks. The program strives to educate volunteers about appropriate park use, create two-way communication between Parks and the public, as well as supply the resources needed by volunteers for various roles and responsibilities.

Parks recognizes that citizen involvement and stewardship through the Natural Areas Adopt-a-Park program will be a critical component of successful park management. Depending on their area of interest and level of expertise, volunteers will provide assistance maintaining and improving park health, informing users about its value and the importance of following rules, as well as monitoring for vandalism.

Recommendations:

- An interpretive program will be developed and phased-in over time.
- A Natural Areas Adopt-a-Park program will be implemented in 12 Mile Coulee Natural Environment Park as soon as feasible.
- Parks will work with interested organizations to develop and implement an integrated 12 Mile Coulee education program taking into account all user needs.

Design Development Plan

Constructed elements such as paved pathways, designated trails, parking areas, entry points and signage can be important tools in managing the impacts of heavy use on a site. The purpose of the 12 Mile Coulee Design Development Plan is to shape into hard design detail, the general recommendations for treatment of the park based on the Management Plan. Included in the Design Development Plan are phasing recommendations and cost estimates for implementation of the proposed work. Proposed work is broken out into capital (Table 1) and establishment (Table 2) budget requirements.

A large part of the establishment commitment at 12 Mile Coulee Natural Environment Park is for habitat restoration and associated monitoring. The monitoring outlined for 12 Mile Coulee Natural Environment Park will include habitat restoration monitoring as well as facility (e.g. designated trails, fences) monitoring. Monitoring data can then be used to help guide future management and develop operations budgets.

Establishment and monitoring requirements are outlined here for 12 Mile Coulee Natural Environment Park, but all of The City's Natural Area parks will benefit from identifying the proposed monitoring tasks. Monitoring of natural areas will begin with 12 Mile Coulee Natural Environment Park, but will likely need to be implemented in other natural areas as well.

Overview

In keeping with the 12 Mile Coulee Natural Environment Park Management Plan, there are a number of objectives which will directly shape and guide the proposed development of 12 Mile Coulee Natural Environment Park:

- Maintain the natural environment in its native state with an emphasis on maintaining or enhancing the biological diversity of the area.
- Protect areas of high-quality environmental significance and to rehabilitate areas that have been previously disturbed and degraded.
- Ensure public access, safety and use at an appropriate environmentally sensitive level.
- Minimize the human footprint on the park, both through the reduction of negative environmental impacts on the park and through the improved design and integration of site elements.

Any new developments proposed for the park will adhere to these objectives.

Plan implementation

For everyone involved in the management, protection and use of 12 Mile Coulee Natural Environment Park, a working and effective plan is required. In order to ensure that adequate funds are allocated for park management, a preliminary park-specific cost estimate (Tables 1 & 2) has been included as part of the Management Plan to outline anticipated management costs. Estimates have been prepared for both capital and establishment budget requirements. The Design

Development Plan presented here will identify the phasing, priorities and rough costs associated with the plan for the development of the park. The implementation of the plan needs to be monitored over time to ensure that management actions are effective and modifications are made where necessary.

Components

The following section identifies components for park implementation. User safety is identified as the paramount item. Subsequent phases are equally weighted. All the phases identified here are interconnected and interdependent on each other for success.

User safety

Safety risks – items that could potentially pose safety concerns, will be addressed. This includes, but is not limited to the removal of existing barbed wire fence; the installation of safety fence where necessary along the designated trail; and construction of the formalized creek crossings.

User information

Public information and interpretive educational signage including park identity signs and information signs at major and secondary nodes and community entries, directional signage along the trail and signage relating to off-leash usage of the park.

Park protection

- Designated trail development (long-term phasing for the establishment of the park-wide designated trail network).
- Rehabilitation of informal undesignated trails (occurring in tandem with designated trail development). Both the designated trail development and the rehabilitation of informal undesignated trails are long-term projects. Success of these items is directly linked to the successful implementation of a user information campaign.
- Enhancement of riparian area through native tree and shrub planting as well as weed control.

User access

- Parking lot construction.
- Off-leash area management.

Costing

Preliminary Design Development Plan cost estimate

The following tables outline the projected costs (both capital projects and establishment items) for the implementation of the Management Plan.

The time frame given for the tables is three years, in order to co-ordinate with the capital budget funding cycle. Including establishment budget requirements in the Management Plan is part of the pilot process being implemented at 12 Mile Coulee Natural Environment Park.



Table 1: Capital Projects Cost Estimate

CAPITAL PROJECTS (2009 – 2011)	Park development (one-time expenditure) total actual cost	Volunteer opportunities/ cost offsets	Total request
Habitat assessment and restoration zones Includes BIA and overall restoration plan, wildlife surveys, rare plant surveys, creek crossing rehabilitation, weed management and restoration plantings.	\$ 1,250,000	\$ 700,000	\$ 550,000
Infrastructure development Includes regional pathway, designated multi-use trails, off-leash zone fencing.	\$ 1,800,000		\$ 1,800,000
Creek crossing (part of Infrastructure Development) Estimate for 23 crossings at \$100,000 each.	\$ 2,300,000	\$ 460,000	\$ 1,840,000
Amenities Includes parking lot, interpretive signage, benches, garbage cans and entrance signs.	\$ 160,000		\$ 160,000
Public engagement outreach and education Includes cultural history management, interpretive education programming and public outreach.	\$ 90,000		\$ 90,000
TOTAL BUDGET REQUIRED:	\$ 5,600,000	\$ 1,160,000	\$ 4,440,000

Table 2: Establishment Cost Estimate

ESTABLISHMENT (2009 – 2011) (Continuation of large scale capital projects)	Establishment process (includes labour and material)	Volunteer opportunities/ cost offsets	Total request
Habitat assessment and restoration zones Includes implementation of restoration plan, wildlife surveys, rare plant surveys, creek crossing rehabilitation, weed management, monitoring and restoration plantings.	\$ 171,000	\$ 69,000	\$ 102,000
Infrastructure development Includes regional pathway, parking lot, designated multi-use trails, off-leash zone fencing.	\$ 80,000	\$ 4,500	\$ 75,500
Amenities Includes interpretive signage, benches, garbage cans and entrance signs.	\$ 4,500		\$ 4,500
Public engagement outreach and education Includes cultural history management, interpretive education programming and public outreach, park use studies.	\$ 48,000		\$ 48,000
TOTAL BUDGET REQUIRED:	\$ 303,500	\$ 73,500	\$ 230,000

Summary

The previous section, **Part 2 Management Guidelines and Recommendations**, presented both how the Management Plan will be implemented, and what the capital and operational requirements will be. Through the implementation of all of the recommendations outlined in Part 2, the Management Plan will be successful in achieving the Plan's outlined goal and objectives:

Goal

To provide overall direction for the protection, development and maintenance of 12 Mile Coulee Natural Environment Park in order to perpetuate the natural character and ecological function of the landscape while providing compatible, quality recreational opportunities.

Objectives

- Establish park boundary.
- Catalogue the habitats and landscape features within the study area and use this information to establish management zones as well as pathway and trail routes that are compatible with the natural environment.
- Determine the location of the Regional Pathway system.
- Determine the location of the designated trail network.
- Review and determine the types and locations of compatible recreational use.
- Establish the locations for general public access and parking.
- Identify user amenities and signage (and associated costs) that may be desirable (e.g. seating, garbage cans, pedestrian crossings, signage).

- Address potential points of conflict between various user groups.
- Develop recommendations for a public education program.
- Prescribe restoration strategies and prioritize restoration zones impacted by prior land use (i.e grazing, powerline right-of-way).
- Maintain the natural environment in its native state with an emphasis on maintaining or enhancing the biological diversity of the area.
- Protect areas of high-quality environmental significance and rehabilitate areas that have been previously disturbed and degraded.
- Ensure public access, safety and use at an appropriate environmentally sensitive level.
- Minimize the human footprint on the park, both through the reduction of negative environmental impacts on the park and through the improved design and integration of site elements.
- Provide implementation phasing, timelines and construction costs.
- Identify establishment activities and their associated required budgets and resource requirements for plan implementation to ensure long-term resource management for sustainability of the park.

This Management Plan will provide the necessary framework to ensure 12 Mile Coulee Natural Environment Park will be developed and operated in an ecologically responsible way. Implementing this Management Plan will enable this natural area to continue to provide ecosystem functions (and aim to enhance these functions where possible), offer habitat and refuge for a variety of wildlife, and provide recreation opportunities for Calgarians, now and into the future.

Technical Background Information

Part 3

The following section provides the technical background information that was utilized to formulate the previous sections of this Management Plan.

Park Use

The 12 Mile Coulee Telephone Survey (2002) and 12 Mile Coulee Use Study (2003) provided a foundation of knowledge to direct the development of the Management Plan based on the behaviours, opinions and attitudes of park users and existing conditions of the natural area.

12 Mile Coulee Use Study (2003)

In the summer of 2003, information was collected at 12 Mile Coulee to gain understanding of current human usage patterns within the park. The objective was to aid Parks in setting the overall direction for the protection, development and maintenance of 12 Mile Coulee by:

- Determining current types of use patterns.
- Studying trail usage.
- Determining if current dog use was in compliance with City bylaws.
- Determining where current users live.

The study sites were distributed throughout the coulee area and were chosen to represent different geographic areas. All of these sites were located at entry and exit points of the park (see Map 10).

Highlights of the findings

- Types of use observed included walking, running, cycling, and other.
- Walking was the most frequent activity (69.5 per cent), followed by cycling (15.9 per cent), then running (13.3 per cent) and other (.6 per cent).
- Other activities observed included inline skating, skateboarding and City trucks.
- 5.9 per cent of all people were using strollers or trailers.
- Overall, the paved pathways had a much higher percentage of users.
- Users were most likely to visit the park on a weekend (64 per cent of total visits).
- People with a dog or dogs comprised one third of total observations.
- Current dog use is not in compliance with bylaws (59 per cent of dogs were recorded off-leash).
- More than half of the users (55 per cent) were from the community of Tuscany.
- During inclement weather, fewer users were observed.

Southwest site

Second highest frequency of total users was observed at this site.

Northwest site

The highest frequency of total users was observed at this site, which was slightly shy of 50 per cent and therefore nearly as much as all other sites combined.

Sixty-two per cent of total weekday users were observed at the northwest site.

Northeast site

The northeast site has the highest proportion of people with dogs (62 per cent), but the site recorded only 13 per cent of all users.

Ninety-six per cent of observed dogs at the northeast site were off-leash, making this site the highest occurrence of non-compliance.

During the weekdays, only nine per cent of total users were observed at the northeast site.

Southeast site

The southeast site had the second highest percentage of dogs off-leash, at 88 per cent of all dogs observed at the site.

Weekday and weekend use at the southeast site remained at a steady 14 per cent of total users.



12 Mile Coulee Telephone Survey

A telephone survey was conducted with residents of Tuscany, Tanglewood and Scenic Acres between April 25 and May 7, 2002. In order for respondents to qualify for the survey, they had to be familiar with 12 Mile Coulee Natural Environment Park and have used the park at least once. Of the 1,099 individuals contacted, 400 individuals participated in the survey. A sample size of 400 for a population of 5,376 produces a margin of error of +/- 4.7 per cent within a 95 per cent confidence interval, or 19 times out of 20. A summary of the survey findings is presented below.

Types of use and locations

Nearly two-thirds (62.5 per cent) of survey respondents stated that they visit 12 Mile Coulee at least twice a month.

The top three activities respondents do when visiting 12 Mile Coulee are:

- Walking (80.0 per cent),
- Dog walking (28.3 per cent), and
- Cycling (22.3 per cent).

The main reasons people visit the park are:

- To enjoy nature (30.0 per cent),
- To exercise (28.3 per cent), and
- To walk their dog (24.0 per cent).



Dogs

42.5 per cent of respondents currently own one or more dogs.

Nearly all of these respondents (91.2 per cent) who own dogs, take their dog(s) for walks in 12 Mile Coulee.

When taking their dog for walks in the park:

- 32.3 per cent of respondents do not allow their dogs to go off-leash.
- 32.9 per cent of respondents allow their dogs to go off-leash everywhere.
- 27.7 per cent of respondents allow their dogs to go off-leash in the open fields along the top of the coulee.

While 28.0 per cent of survey respondents prefer to use the smaller, informal, non-paved trails, nearly half (48.5 per cent) prefer to use a combination of the paved pathway and smaller, informal, non-paved trails.

User interests

The most commonly cited park features or points of interest enjoyed by respondents are:

- Stream (19.8 per cent).
- Being in nature/undeveloped area (17.0 per cent).
- Flora and fauna (38.3 per cent).

User issues and needs

Common issues, needs or user conflicts reported by respondents are (unaided response):

- Ensuring people clean up after their dogs (41.7 per cent).
- Enforcing designated off-leash areas (32.2 per cent).
- Restricting development in/near the park (19.0 per cent).

The top three issues which respondents rated (aided responses) as high priorities for future planning/development of 12 Mile Coulee are:

- Preservation of natural areas (9.09 – mean score out of 10).
- Ensuring wildlife continues to use the park (9.00).
- Pathway and trail maintenance and management (7.01).

Interpretive or educational programming in the park

Most respondents indicated they would like to learn more about the history (39.9 per cent) and cultural history (35.5 per cent) of the park, and most would be interested in receiving educational information through interpretive signs.

Biophysical Inventory and Assessment

The assessment of the living and non-living environment is an essential step in determining the needs of any natural park space. It provides information on the existing conditions of the site and measures it against the expected characteristics of a relatively untouched area. The documents⁵ listed below provided the foundation of knowledge that directed the development of the Management Plan, based on the existing conditions of the natural area and the area's history. As part of the implementation of the Management Plan, The City of Calgary Parks Natural Areas will allocate funds to update the Biophysical Inventory and Assessment.

Landscape Evolution and Human Occupation during the Archaic Period on the Northern Plains (Oetelaar, 2004);
River of Change; A Model for the Development of Terraces Along the Bow River, Alberta (Oetelaar, 2004);
Checklist for Spring-Flowering Plants in Calgary – 2004 (CFNS, 2004);
12 Mile Coulee Vegetation Analysis (Jacques Whitford Environmental Ltd., 2003);
Biophysical Impact Assessment for the Proposed Extension of Nose Hill Drive N.W. (IEG, 2002);
Biophysical Inventory for Proposed Encroachments in Tuscany (IEG, 2002);
12 Mile Coulee Vegetation Communities Map (City of Calgary, 2001);
12 Mile Coulee Vegetation Assessment (City of Calgary, 2001); and
Beyond Activity Areas: Structure and Symbolism in the Organization and Use of Space Inside Tipis (Oetelaar, 2000).

⁵ Official document references are located under 'References' in the Plan.

The information is summarized in the Geomorphology and Geology, Vegetation, Wildlife, History and Naming of the Coulee sections of the plan.

Geomorphology and geology

The first page in 12 Mile Coulee's landscape story began over two billion years ago. Geologic processes took place that led to the formation of bedrock, the solid rock foundation that underlies the soil. At that time, igneous rock, formed by the slow cooling of molten rock several miles below the earth's surface, was pushed up over sections of the earth's surface including an area that is presently the interior of British Columbia. Particles from the igneous rock layers were stripped away and carried to Alberta by rivers originating from central British Columbia.

Over time, the particles accumulated on top of one another. The pressure created by the increased weight caused the layers to press and fuse together forming sedimentary rock. There are many types of sedimentary rock, depending on the size of particles that formed it. The sedimentary rock underlying the Calgary area, that can be seen in 12 Mile Coulee, is sandstone from the Porcupine Hills Formation. The Formation was laid down approximately 60 million years ago when the landscape was flat and the climate was tropical. Deciduous forest, swamps and broad slow rivers were the dominant features at that time.

During the following several million years, enormous upheavals in the earth's crust resulted in the formation of the Rocky Mountains. The great landscape alteration was accompanied by changes in elevation, drainage and climate. The new rivers flowing from the mountains to the west were fast and carried large amounts of sand and pebbles. In the early days of the landscape formation the rivers laid down beds of gravel over wide areas. Over time, they began to carve our well-defined waterways known as the Bow and Elbow river valleys.

About two million years ago, the climate started to get much colder. Glacial activity peaked during the Ice Age that began approximately one million years ago. During this time, the climate on the earth went through a series of cooling and warming cycles. Large sections of North America were repeatedly covered by ice and then exposed as the climate warmed and the ice retreated. Although many events during the Ice Age had an impact on the landscape now called 12 Mile Coulee, the last continental glaciation which took place 15,000 to 18,000 years ago was primarily responsible for the site's underlying character.

The southwestern extension of the Laurentide ice field (originating from Hudson's Bay area) contacted the Cordilleran icefields that were extending east and southward from the Rocky Mountains. Together the glaciers formed a large glacier that slowly flowed towards Montana. The moving ice stripped away preglacial soil and debris. Armoured with a load of fragmented debris, the glacier scraped off the underlying bedrock and left in its path unsorted materials of different sizes called till.

The Laurentide ice began to melt and retreat towards the northeast corner of Alberta approximately 14,000 years ago. Rock, rounded and sorted by glacial meltwater, was deposited from streams flowing from the melting ice. Approximately 10,000 years ago, the meltwater was dammed by the Laurentide ice. This caused the formation of Glacial Lake Calgary. The lake stretched from the base of Nose Hill beyond downtown to the south and towards Cochrane to the west. The meltwater deposited thick layers of fine sediment on top of the glacial till and glacio-fluvial material. Following an early episode of incision by glacial meltwater, gravel of the Bighill Creek Formation was deposited within the Bow River valley between 11,500 and 10,000 years ago.

Approximately 10,000 years ago, vegetation began to establish. Open forest was the predominant vegetation until grasslands began to replace the forested areas between 5,000 and 9,000 years ago due to drier conditions. What would become the Bow River was flowing at this time and it had cut a relatively deep channel, creating what is now called the 12 Mile Coulee escarpment. At that time the depressions of the 12 Mile Coulee uplands were deeper than they are today. The river then went through a period when new rock material was deposited in the Bow River valley from 9,000 to 5,000 years ago. During that time, approximately 6,730 years ago, Mount Mazama, also known as Crater Lake, Oregon, erupted and deposited thick layers of ash. Seventeen hundred years later the layer of ash that was left behind had formed surface soil. A grassland community successfully established on the new soil. The grassland community was very similar

to the one that currently exists. At this time, the river began its latest episode of downcutting in the river valley. That downcutting has continued to the present. Today, the Bow River has cut through the fine lake sediments and ash leaving the tall vertical cliffs on the north side of the Bow River in Bowmont Park.

The soil in 12 Mile Coulee formed from the gradual mixing of the original rock materials including the fine lake sediments deposited by Glacial Lake Calgary with organic materials. The rock particles combined with organic material to form a simple soil mixture. Over time the soil matured to form distinct layers commonly referred to as horizons. The horizons differ from one and other in properties such as color, structure texture, consistency and composition. Based on the soil properties, the 12 Mile Coulee soils have been classified as Black Chernozemic with Humic Gleysols in wet depressions based on the Canadian System of Soil Classification. Chernozemic soils have developed under grassland or grassland/forest plant communities. They are characterized by a dark-coloured surface horizon, at least 10 cm thick, that results from the accumulation of organic material from grasses and forbs. Gleysolic soils are poorly drained soils that often form in the presence of a high or fluctuating water table.

Vegetation

Calgary lies on the border of the Foothills Fescue Grassland and the Aspen Parkland Natural Ecoregions. An indistinct ecological break occurs between them somewhere west of Crowchild Trail. However, characteristics of each are found throughout Calgary including 12 Mile Coulee Natural Environment Park. The park is made up by a number of smaller units called “habitats” including native grassland, low shrub, upland tall shrub, riverine tall shrub, white spruce,

balsam poplar and aspen (see Map 11). The amount, quality, type and diversity of habitats are essential to the health of a park. Vegetation survey data and survey locations can be found in Appendix 2.

Native grasslands

Introduction

Native grasslands in the Calgary region have undergone many modifications over the years. Prior to the settlement of southern Alberta, wheat grass (*Agropyron sp.*) and needle grass (*Stipa sp.*) likely were the dominant grasses in this area. Originally, grasslands were influenced mainly by bison and wildfire. This ecosystem was in equilibrium until the bison succumbed to market hunting. Settlement of the prairies resulted in a decline in fire frequency as newly established communities sought to suppress this threat. Early settlers also brought livestock and agricultural technology that subsequently changed the face of the prairies. Vast, open grasslands became rangelands for cattle and horses, or were ploughed under to form cropland. The prairie has been transformed into a new mosaic of native grasslands, non-native grasslands, disturbed areas and fields of monoculture crops, evidence of significant human interference.

Ecological setting

Grasses typically grow in exposed areas where wind and sun prevail. Moisture tends to be limiting, especially on steeper hillsides. On the western edge of the city, where 12 Mile Coulee is located, grasslands are commonly found on south or south-west-facing slopes. To the east, grasses are the normal vegetation on flat lands as well.

12 Mile Coulee grasslands

Grassland communities are largely confined to the south-facing escarpment slopes and upper benches in 12 Mile Coulee. The existing grassland vegetation

communities are well-established in the park, with some of the best quality areas on the escarpment north of the Nose Hill Drive Extension. This area is particularly important to wildlife because it forms a long corridor that connects 12 Mile Coulee with other open spaces to the west.

Grasslands dominated by foothills rough fescue (*Festuca campestris*) are found on the upper, flat portions of the south and west facing slopes. The rarer Parry's oatgrass (*Danthonia parryi*) grows in association with the fescue in some areas. Slender wheat grass (*Agropyron trachycaulum*) is a common component of these grasslands. On steeper slopes needle grasses (*Stipa species*), wheat grasses (*Agropyron species*) and June grass (*Koeleria macrantha*) grow in mixed communities. Along some of the steep escarpments where sandstone outcrops are visible, grassland/juniper communities exist.

Native grasslands support a wide variety of forbs and herbs, including an abundance of wildflowers. Prairie crocus (*Anemone patens*), early cinquefoil (*Potentilla concinna*), early blue violet (*Viola adunca*) and moss phlox (*Phlox hoodii*) are common spring flowers, while golden bean (*Thermopsis rhombifolia*), hedysarum (*Hedysarum boreale*), sticky purple geranium (*Geranium viscosissimum*), fleabane (*Erigeron species*), northern bedstraw (*Galium boreale*), goldenrod (*Solidago species*), and aster (*Aster species*) are commonly seen in the summer.

Where the ground is disturbed, there has been an invasion of smooth brome (*Bromus inermis*), Canada thistle (*Cirsium arvense*), and gumweed (*Grindelia squarrosa*). This is particularly evident on the benchlands adjacent to Stoney Trail and across from Scenic Acres Link.



Balsam poplar woodlands

Introduction

Balsam poplar (*Populus balsamifera*) is the most abundant tree species in riparian ecosystems in Calgary. Riparian ecosystems are highly productive vegetation zones located along rivers, creeks or drainage courses between upland and aquatic ecosystems. They are among the most important habitats in North America for wildlife, especially for migratory and nesting bird usage.

Ecological setting

In Calgary, balsam poplar trees establish and grow to maturity in the span of 80 to 100 years. Historically, balsam poplar forests have established along the major rivers in Calgary in conjunction with natural flooding and drying processes or in areas with high water tables. They require moist ground with cycles of drying in order to survive, and may suffer accordingly if water table regimes are altered. A healthy balsam poplar forest is normally accompanied by an understory of red osier dogwood (*Cornus stolonifera*), willow (*Salix species*), water birch (*Betula occidentalis*), Saskatoon (*Amelanchier alnifolia*), and Canada buffaloberry (*Shepherdia canadensis*). Occasionally, white spruce (*Picea glauca*) may establish in shady, moist areas. A healthy forest understory can be directly correlated with increased wildlife use. A diversity of species and canopy structure allows for a variety of cover types for feeding, escape and nesting. Another significant factor in planning for healthy balsam poplar forests is the availability of other nearby vegetation communities, such as wetlands and grasslands. This juxtaposition of different habitat types adds to the habitat diversity. These edge sites, which exist mostly on the borders between forests and open areas, provide a higher food source. Many species such as flycatchers, prefer these locations.

12 Mile Coulee balsam woodland

In 12 Mile Coulee, a corridor of balsam poplar forest extends from the southern extent of 12 Mile Coulee north to Tuscany Boulevard. The balsam poplar forest corridor is adjacent to the creek located at the base of the coulee. A shrub understory of red osier dogwood (*Cornus stolonifera*), willows (*Salix species*), Saskatoon (*Amelanchier alnifolia*), wolf-willow (*Eleagnus commutata*), and bearberry (*Arctostaphylos uva-ursi*) accompany the balsam poplar. In some areas the forest has been disturbed through grazing and recreational use, resulting in a decrease in plant understory diversity as well as the introduction of a number of weeds and non-native grasses. Other areas adjacent to the creek where park users frequently cross, are becoming devoid of vegetation and are becoming severely eroded from trampling. Without proper management, the health of forests will continue to decline.



White spruce woodlands

Introduction

In Calgary, white spruce (*Picea glauca*) stands may be found along the moist, shady, north-facing slopes of the Bow, Elbow, and Fish Creek valleys as well as scattered stands in riparian environments of Fish Creek and the Weaselhead. They occupy relatively small localized areas within the city, in part, because they are not chinook wind-hardy, or flood tolerant.

Ecological setting

White spruce (*Picea glauca*) woods are not drought tolerant and therefore require shade and moisture for suitable growth. These conditions are provided by steep escarpment faces along the river valleys in the city, and at scattered locations within the floodplains of rivers. This kind of forest provides nesting and feeding sites as well as important cover and winter shelter for many species of birds and mammals.



Mature spruce woods can form very dense canopies that are characterized by little in the way of shrub understory. This is due, in part, to modifications imposed on the site by the trees themselves. Their long-term presence influences the soil regime, as the decomposed spruce needles create a highly acidic substrate. This, in combination with shade provided by the trees, results in limited establishment and propagation of a shrub understory. Often, spruce forests have a homogenous moss carpet at ground level, and have few other complementing species. Open spruce woods have a greater variety of plant species in the understory. Wind throw, natural mortality of trees, or other disturbances create gaps, allowing light-seeking plants to enter.

12 Mile Coulee mixed woodlands

Within 12 Mile Coulee, white spruce (*Picea glauca*) exist in mixed stands with balsam poplar and aspen along the steep north and north east-facing escarpments. Wild gooseberry (*Ribes oxycanthoides*) and Canada buffaloberry (*Shepherdia canadensis*) are commonly found in the understory. The white spruce (*Picea glauca*) woods in this park have been significantly impacted by recreational use. Trail proliferation is resulting in soil erosion and the drastic decline of understory vegetation. The areas are difficult to rehabilitate due to their steep grades. They are a high priority for immediate management.

Trembling aspen woodlands

Introduction

Trembling aspen (*Populus tremuloides*) is the most widely distributed tree in North America. Its success can be attributed to its ability to establish in a range of site conditions, and its prolific reproduction through suckering. While abundant, aspen have a relatively short lifespan. In Calgary, trees live approximately 65 to 80 years and individual trees are regularly regenerated. On poor quality sites, their lifespan may be reduced to 40 years or less.

Ecological setting

In the Calgary area, aspen can be found in both stands and as a component of mixed woods. Aspen stands tend to form in well-drained, moist areas on open plains, and on the moist northern exposures of small hills and ravines. In a grassland setting, aspen stands form small islands of woodland, providing additional diversity and “edge” in the prairies and foothills. Several species of birds and mammals feed in the open grassland, but require the nesting, hiding and thermal cover afforded by small tree stands.

Large continuous aspen forests are found in Calgary mainly along escarpments, in ravines, and in other areas which have had minimal urban development or disturbance. They give shelter to a wide variety of wildlife and wildflowers. Some of the birds and mammals that find shelter in the groves include Great Horned owls (*Bubo virginianus*), Black-billed magpies (*Pica hudsonia*), American robins (*Turdus migratorius*), Clay-colored sparrows, White-tailed and Mule deer (*Odocoileus species*), hares (*Lepus species*), as well as Meadow Voles (*Microtus pennsylvanicus*). These same areas often act as wildlife corridors through, and around, developed sites.

12 Mile Coulee trembling aspen woodlands

Aspen groves are one of the most characteristic features of 12 Mile Coulee. The stands are commonly found in depressions along the coulee slopes. A number of plant species are found underneath the aspen canopy including Saskatoon (*Amelanchier alnifolia*), prickly rose (*Rosa accicularis*), wild gooseberry (*Ribes oxycanthoides*), silverberry (*Eleagnus commutata*), buckbrush (*Symphoricarpos occidentalis*), and shrubby cinquefoil (*Potentilla fruticosa*).

The aspen are in generally good health although some are being damaged by the formation of informal trails in the groves. There is one exception – a large number of trees in the aspen groves adjacent to the sandstone outcrops at the base of the coulee are being damaged or destroyed as a result of vandalism. Trees are being cut down and burned at illegally placed fire pits located at the base of the sandstone outcrops.

Shrub communities

Introduction

Shrub habitats in Calgary's natural areas have been separated into riverine tall shrub, upland tall shrub, and low shrub. In 12 Mile Coulee, all three communities exist in the park and are described below. These habitat types occur as isolated stands, as transition zones between grassland and woodland communities, or as opening species/understory components in a woodland association.

Ecological setting

Shrub lands are a valuable habitat as they provide nesting, cover and feeding areas for a variety of birds and mammals. The density of vegetation, along with

the diversity of plant species usually found in these community types, makes shrub lands an active and highly productive wildlife area. Shrub lands are often a vegetation transition zone and represent valuable edge for grassland and woodland wildlife species. Birds and mammals alike seek the berries, leaves, twigs and bark of many shrub species in these communities. In addition to being a source of food and cover, shrubs are also attractive to some nesting birds and provide protection for birthing mammals. Where possible, trails and activity zones should avoid such areas.



The location of specific types of shrubs is regulated strongly by soil moisture, soil texture, shade and drainage. In open drier areas, taller shrubs will be confined generally to specific areas of higher moisture such as depressions, ravines, floodable areas on west, east, or north-facing slopes. South-facing slopes are usually too exposed and dry to support shrubs. In these areas, grasses have a competitive advantage. Places where moisture collects on south-facing slopes; however, may permit the development of low shrub stands composed of buckbrush (*Symphoricarpos occidentalis*), and rose (*Rosa species*).

Pure shrub communities commonly form dense thickets that present a formidable barrier to humans. Riverine red osier dogwood (*Cornus stolonifera*) and willow (*Salix*) communities are good examples of this growth habit. Low shrubs such as buckbrush (*Symphoricarpos occidentalis*), shrubby cinquefoil (*Potentilla fruticosa*), or rose (*Rosa species*) may form dense mats, effectively blocking out competing grasses and forbs. Other species such as wolf willow, may be opportunists, seeking and colonising disturbed and sandy areas.

Riverine tall shrub characteristics

Riverine shrubs are found along the floodway/ floodplain of major river valleys in Calgary. These shrubs, which commonly include red osier dogwood (*Cornus stolonifera*) and a variety of willows (*Salix species*), can withstand periodic flooding and are adapted to growth in coarse, unstable substrate. In general, riverine shrubs accompany balsam poplar woodland to form riparian areas along waterways. Riparian areas are often considered as highly productive, transition zones between wetland and the drier uplands. This area is particularly important to a variety of wildlife species. It has been estimated that 85 per cent of wildlife use it for all, or part, of their lifecycles.

Upland tall shrub characteristics

Saskatoon (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*) and wolf willow (*Elaeagnus commutata*) interact to form upland tall shrub communities. Typically these plants grow on the lower, more moist portions of a slope, or in protected ravines.

Low shrub characteristics

Low shrub communities may consist of buckbrush (*Symphoricarpos occidentalis*), shrubby cinquefoil (*Potentilla fruticosa*), or rose (*Rosa species*). In some cases. Canada buffaloberry (*Shepherdia canadensis*) and gooseberry (*Ribes oxycanthoides*) may be present, although they form a minor component of these shrub habitat types. Low shrub communities may be found along the dry, upper portions of the escarpment wherever pockets of moisture may be present or in shallow grassland depressions.

12 Mile Coulee shrub habitat

Riverine tall shrub

The riverine tall shrub understory is associated with balsam poplars (*Populus balsamifera*) along the creek. It is comprised of a willow-dominated shrub community (*Salix species*) that also includes red osier dogwood (*Cornus stolonifera*) and prickly rose (*Rosa acicularis*). False Solomon's seal (*Smilacina stellata*), harebells (*Campanula rotundifolia*) and veiny meadow rue (*Thalictrum venulosum*) contribute to the diversity of this habitat.

Upland tall shrub

The upland tall shrub vegetation communities that predominate in 12 Mile Coulee include wolf willow (*Elaeagnus commutata*) and Saskatoon/chokecherry (*Amelanchier alnifolia/Prunus virginiana*). These communities are found on the escarpments in shallow depressions. A number of shrubs, forbs and grasses are also commonly found within upland tall shrub communities of the park, including bearberry (*arctostaphylos uva-ursi*), wild strawberry (*Fragaria virginiana*), American vetch (*Vicia americana*), northern bedstraw (*Galium boreale*), and Canada buffaloberry (*Shepherdia canadensis*).

Low shrub

One of the most common types of low shrub land habitat found in 12 Mile Coulee is the buckbrush/rose (*Symphoricarpos occidentalis/ Rosa acicularis*) community. It is found on moderately steep south and west-facing slopes. It is often associated with a high diversity of forbs and dense grass understories. The grasses commonly found include rough rescue (*Festuca campestris*), slender wheat grass (*Agropyron trachycaulum*) and June grass (*Koeleria macrantha*). Three-flowered avens (*Geum triflorum*), early yellow locoweed (*Oxytropis sericea*), golden bean (*Thermopsis rhombifolia*), and sticky purple geranium (*Geranium viscosissimum*) create a colorful understory.

Wetlands

Introduction

The majority of wetlands in Calgary are found in the northeast and southeast quadrants of the city. Commonly, wetlands are situated in depressions along rolling or flat terrain, but they may also exist wherever the water table is in contact with the surface.

Ecological setting

Wetlands are characterized by saturated ground on a semi-permanent basis, and associated water-loving vegetation. Although a variety of trees, shrubs, forbs, and grasses may be found in wetlands of the Calgary region, cattails (*Typha latifolia*), sedges (*Carex spp.*), bulrushes (*Scirpus spp.*) and rushes (*Juncus spp.*) are generally identified as being the most dominant species.

Wetlands in 12 Mile Coulee

The wetlands in 12 Mile Coulee largely include the water edge along the intermittent creek. The emergent vegetation that can be found along the edges of the intermittent creek include sedges (*Carex spp.*), rushes (*Juncus spp.*) and reed canary grass (*Phalaris aruncinacea*). Water hemlock (*Cicuta maculata*) has also been found.

Disturbed/introduced

Introduction

Disturbance simply refers to areas where the majority of native species have been removed, leaving either bare ground or introduced plant species. There is little native growth. Non-native grassland refers to disturbed areas dominated by non-native grasses and weeds. These areas are often incorrectly assumed to be native grasslands.

Ecological setting

Disturbed areas are a significant problem, especially in urban natural environment parks. They occur for a number of reasons, including material dumping, utility construction, previous agricultural practices, encroachment and recreational uses. Disturbances can be found along the top of the escarpments, in some ravines as well as along the bottom of the escarpments. Non-native grassland species that are commonly found in Calgary include smooth brome (*Bromus inermis*), crested wheat grass (*Agropyron cristatum*), Kentucky blue grass (*Poa pratensis*) and timothy hay (*Phleum pratens*). Canada thistle (*Cirsium arvense*) and toad flax (*Linaria vulgaris*) are perennial weeds that are commonly present.

Disturbed areas in 12 Mile Coulee

12 Mile Coulee Natural Environment Park has been affected by a number of activities including previous agricultural practices (cattle and horses), current recreational uses, introduced species (smooth brome, Canada thistle), vehicles (off-road), utilities (power lines) surrounding land use (roads, housing) and road construction. Even with these disturbances, the park is generally in good condition.

The following disturbed communities exist in 12 Mile Coulee Natural Environment Park: unvegetated, smooth brome/Canada thistle, balsam poplar/manicured grass, and manicured grass/smooth brome. They are commonly seen adjacent to Stoney Trail, the Regional Pathway, and heavily used informal trails. Other species commonly associated with disturbed areas include yellow sweet clover (*Melilotus officinalis*), dandelion (*Taraxacum officinale*) and goat's beard (*Tragopogon dubius*).

Wildlife

Over 100 vertebrate species may potentially use habitats within 12 Mile Coulee Natural Environment Park and the surrounding areas including Bowmont Natural Environment Park to the east, Bow River Corridor to the south, and the Douglas Fir Preserve on the south side of the river.

A habitat assessment was conducted to identify key wildlife habitat within and surrounding 12 Mile Coulee. The approach involved the identification, description and mapping of habitat types, and the subsequent ranking of each habitat relative to its importance in sustaining wildlife groups represented by selected wildlife species. This process has been used by US Fish and Wildlife Services as well as being widely used throughout Alberta and other parts of Canada. Calgary Parks' perspective is that the type and quality of vegetation communities directly correlate to the potential for wildlife use. The diversity of vegetation communities and the size of the park enhance 12 Mile Coulee's quality. The assessment concluded that 12 Mile Coulee Natural Environment Park is a diverse natural area with high wildlife suitability. It is an important park within a network of natural areas in the city of Calgary. The following list identifies wildlife species that could potentially use the park. As part of the implementation of the Management Plan, the biophysical inventories will be updated to verify which wildlife species are using the park and how. The first of these updated biophysical inventories will act as a baseline study. As part of the ecosystem management approach implemented through this Management Plan, it is our intent to allocate operational dollars and collaborate with volunteer organizations to update the biophysical inventories through monitoring in order to determine the effectiveness of the Management Plan.

Mammals

masked shrew (<i>Sorex cinereus</i>)	raccoon (<i>Procyon lotor</i>)	Richardson's ground squirrel (<i>Spermophilus richardsonii</i>)	mule deer (<i>Odocoileus hemionus</i>)
pygmy shrew (<i>Sorex hoyi</i>)	short-tailed weasel (<i>Ermurtela erminea</i>)	northern pocket gopher (<i>Thomomys talpoides</i>)	snowshoe hare (<i>Lepus americanus</i>)
big brown bat (<i>Eptesicus fuscus</i>)	long-tailed weasel (<i>Mustela frenata</i>)	red-backed vole (<i>Clethrionomys gapperi</i>)	white-tailed prairie hare (<i>Lepus townsendii</i>)
silver-haired bat (<i>Lasionycteris noctivagans</i>)	least weasel (<i>Mustela nivalis</i>)	meadow vole (<i>Microtus pennsylvanicus</i>)	
hoary bat (<i>Lasiurus cinereus</i>)	American mink (<i>Mustela vison</i>)	deer mouse (<i>Peromyscus maniculatus</i>)	
little brown bat (<i>Myotis lucifugus</i>)	American badger (<i>Taxidea taxus taxus</i>) ^S	western jumping mouse (<i>Zapus princeps</i>)	
coyote (<i>Canis latrans</i>)	striped skunk (<i>Mephitis mephitis</i>)	porcupine (<i>Erethizon dorsatum</i>)	
red fox (<i>Vulpes vulpes</i>)	red squirrel (<i>Tamiasciurus hudsonicus</i>)	white-tailed deer (<i>Odocoileus virginianus</i>)	

Amphibians and Reptiles

tiger salamander (<i>Ambystoma tigrinum</i>)	boreal chorus frog (<i>Pseudacris maculata</i>)	plains garter snake (<i>Thamnophis radix</i>)	
northern leopard frog (prairie population) (<i>Rana pipiens</i>) ^{1,E}	common garter snake (<i>Thamnophis sirtalis</i>)	wandering garter snake (<i>Thamnophis elegans</i>)	

Birds (Non-passerine)

gray partridge (<i>Pedix perdix</i>)	Swainson's hawk (<i>Buteo Swainsonii</i>)	mourning dove (<i>Zenaida macroura</i>)	northern flicker (<i>Colaptes auratus</i>)
ring-necked pheasant (<i>Phasianus colchicus</i>)	red-tailed hawk (<i>Buteo jamaicensis</i>)	great horned owl (<i>Bubo virginianus</i>)	
Ruffed grouse (<i>Bonasa umbellus</i>)	American kestrel (<i>Falco sparverius</i>)	short-eared owl (<i>Asio flammeus</i>) ^B	
bald eagle (<i>Haliaeetus leucocephalus</i>)	merlin (<i>Falco columbarius</i>)	yellow-bellied sapsucker (<i>Sphyrapicus varius</i>)	
northern harrier (<i>Circus cyaneus</i>)	peregrine falcon (<i>Falco peregrinus</i>)	red-naped sapsucker (<i>Sphyrapicus nuchalis</i>)	
sharp-shinned hawk (<i>Accipiter striatus</i>)	killdeer (<i>Charadrius vociferous</i>)	downy woodpecker (<i>Picoides pubescens</i>)	
Cooper's hawk (<i>Accipiter cooperii</i>)	common snipe (<i>Gallinago gallinago</i>)	hairy woodpecker (<i>Picoides villosus</i>)	

Birds (Passerine)

olive-sided flycatcher (<i>Contopus cooperi</i>)	American crow (<i>Corvus brachyrhynchos</i>)	veery (<i>Catharus fuscescens</i>)	palm warbler (<i>Dendroica palmarum</i>)
western wood-pewee (<i>Contopus sordidulus</i>)	common raven (<i>Corvus corax</i>)	Swainson's Thrush (<i>Catharus ustulatus</i>)	Blackpoll warbler (<i>Dendroica striata</i>)
alder flycatcher (<i>Empidonax alnorum</i>)	tree swallow (<i>Tachycineta bicolor</i>)	American robin (<i>Turdus migratorius</i>)	black-and-white warbler (<i>Mniotilta varia</i>)
least flycatcher (<i>Empidonax minimus</i>)	northern rough-winged swallow (<i>Stelgidopteryx serripennis</i>)	gray catbird (<i>Dumetella carolinensis</i>)	American redstart (<i>Setophaga ruticilla</i>)
dusky flycatcher (<i>Empidonax oberholseri</i>)	black-capped chickadee (<i>Poecile atricapillus</i>)	brown thrasher (<i>Toxostoma rufum</i>)	ovenbird (<i>Seiurus aurocapilla</i>)
eastern phoebe (<i>Sayornis phoebe</i>)	red-breasted nuthatch (<i>Sitta canadensis</i>)	European starling (<i>Sturnus vulgaris</i>)	northern waterthrush (<i>Seiurus noveboracensis</i>)
eastern kingbird (<i>Tyrannus tyrannus</i>)	white-breasted nuthatch (<i>Sitta carolinensis</i>)	cedar waxwing (<i>Bombycilla cedrorum</i>)	MacGillivray's warbler (<i>Oporornis tolmiei</i>)
blue-headed vireo (<i>Vireo solitarius</i>)	brown creeper (<i>Certhia americana</i>)	bohemian waxwing (<i>Bombycilla garrulous</i>)	common yellowthroat (<i>Geothlypis trichas</i>)
warbling vireo (<i>Vireo gilvus</i>)	house wren (<i>Troglodytes aedon</i>)	orange-crowned warbler (<i>Vermivora celata</i>)	Wilson's warbler (<i>Wilsonia pusilla</i>)
red-eyed vireo (<i>Vireo olivaceus</i>)	golden-crowned kinglet (<i>Regulus satrapa</i>)	Tennessee warbler (<i>Vermivora pergrina</i>)	western tanager (<i>Piranga ludoviciana</i>)

Birds (Passerine)

blue jay (<i>Cyanocitta cristata</i>)	ruby-crowned kinglet (<i>Regulus calendula</i>)	yellow warbler (<i>Dendroica petechia</i>)	spotted towhee (<i>Pipilo maculatus</i>)
black-billed magpie (<i>Pica pica</i>)	mountain bluebird (<i>Sialia currucoides</i>)	yellow-rumped warbler (<i>Dendroica coronata</i>)	American tree sparrow (<i>Spizella arborea</i>)
chipping sparrow (<i>Spizella passerina</i>)	Brewer's blackbird (<i>Euphagus cyanocephalus</i>)		
clay-colored sparrow (<i>Spizella pallida</i>)	common grackle (<i>Quiscalus quiscalus</i>)		
vesper sparrow (<i>Pooecetes gramineus</i>)	brown-headed cowbird (<i>Molothrus ater</i>)		
Savannah sparrow (<i>Passerculus sandwichensis</i>)	Baltimore oriole (<i>Icterus galbula</i>)		
song sparrow (<i>Melospiza melodia</i>)	purple finch (<i>Carpodacus purpureus</i>)		
Lincoln's sparrow (<i>Melospiza lincolni</i>)	red crossbill (<i>Loxia curvirostra</i>)		
white-throated sparrow (<i>Zonotrichia albicollis</i>)	white-winged crossbill (<i>Loxia leucoptera</i>)		
white-crowned sparrow (<i>Zonotrichia leucophrys</i>)	common redpoll (<i>Carduelis flammea</i>)		
dark-eyed junco (<i>Junco hyemalis</i>)	pine grosbeak (<i>Pinicola enucleator</i>)		
rose-breasted grosbeak (<i>Pheucticus ludovicianus</i>)	pine siskin (<i>Carduelis pinus</i>)		
red-winged blackbird (<i>Agelaius phoeniceus</i>)	American goldfinch (<i>Carduelis tristis</i>)		
western meadowlark (<i>Sturnella neglecta</i>)	house sparrow (<i>Passer domesticus</i>)		

History

The following historical summary is based on the work completed by Dr. Gerald Oetelaar from the Department of Archaeology at the University of Calgary.

Under the terms of the *Alberta Heritage Act*, all developers must conduct mitigative work before initiating construction of new subdivisions. The Tuscany Archaeological project in 12 Mile Coulee began in 1995 when Carma Developers signed a two-year contract with the University of Calgary to fund a program of archaeological research and public education. The objectives of the project included:

- To meet permit obligations in order to proceed with the development.
- To conduct archaeological research.
- To provide hands-on educational opportunities for students.
- To increase the involvement of Alberta's Native community in archaeological research.

Before investigations began, members of the Tsuu T'ina Nation were contacted and invited to participate in the project. Elders in the community not only performed the appropriate ceremonies but also provided instructions on the proper treatment of the remains. Their active participation in the archaeological research makes this co-operative venture somewhat unique in the province.

One site of particular interest was a tipi ring found on an intermediate terrace on the eastern margin of Tuscany (see Map 9).

Two cultural deposits were found in the sediments which extended two metres below the surface. Artifacts recovered from the oldest cultural layer included stone tool remnants, fire broken rock and bone fragments. It is believed that the initial occupation occurred when

the upland location consisted of a moist linear depression supporting trees and shrubs. Human groups may have found this spot appealing as a campsite because the upland location offered expansive views of the nearby floodplain, as well as good access to the Bow River. About 7,000 years ago, or just before the eruption of Mount Mazama, this location was used by a second group of people who stayed at the site briefly to kill and butcher bison. During this occupation, the vegetation was predominantly grassland. Following the deposition of Mazama ash, human groups did not return to set up camp at this location until 5,000 years ago. Approximately 2,000 years ago, a stone circle thought to be used by Blackfoot Indians was located at this site. It is believed that the stone circle marks the location where a tipi once stood. The stone circle provides a framework for interpreting the organization of space within the tipi. A sleeping platform, storage space and work area were arranged in an orderly fashion relative to the entrance, the hearth and the family alter. Today, the stone circle remains as a reminder of the past inhabitants.

Naming of 12 Mile Coulee

In 1873, Methodist minister George McDougal built a mission church at Morleyville located close to the Stoney and Blackfoot reservations. The mission was located by the McDougal Church on the 1A Highway. In 1875, the North West Mounted Police built Fort Calgary at the confluence of the Bow and Elbow rivers. A trail was created between the two locations largely following existing native trails. 12 Mile Coulee is approximately 12 miles from Fort Calgary heading west towards Morleyville. As a result, it was used as a convenient mileage marker.

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Glossary of Terms

Abiotic – Not living.

Biophysical Impact Assessment – An assessment of the biotic and abiotic features in an area as well as the impacts a particular project has on those items. It should include any potential mitigation options.

Biophysical Inventory – An assessment of the biotic and abiotic features in an area.

Biotic – Living.

DBH – Diameter breast height measurement of a tree. 4.5 ft. above ground.

Design Development Plan – A plan that provides information on the phasing of park projects. It also includes the expected capital costs of a project and required operations commitments.

Diversity – The variety of species, vegetation communities, habitats or landforms in a given area.

Ecology – The study of relationships between living things, with each other and with their environments.

Ecoregion – An area characterized by a distinctive regional climate as expressed by vegetation.

Environmental Reserve – An open space area, established in accordance with the *Municipal Government Act*, which is usually not physically suitable for development. These areas are normally left in their natural state and include unstable slopes, swamps, ravines, floodway areas and shore setback.

Escarpment – A term used loosely to describe a steep slope formed by erosive action of water or wind and normally adjacent to a watercourse.

Exotic – A species which is not native and has been introduced to an area by people or their activities.

Forbs – Any herb other than grasses or grass-like plants.

Fragmentation – To separate or divide naturally occurring habitats or plant communities.

Habitat – A place where an organism lives.

Interpretation – Translation and communication of natural and historical information into meaningful and contemporary messages.

Introduced – Species or habitat created or transported by people or their activities.

Inventory – A survey of natural resources not necessarily including an assessment.

Maintenance – The keeping of parks, buildings, equipment and supplies in accordance with standards for effective operation.

Management – To direct to a degree, the outcome of a particular project or land area.

Native – Species that have not been introduced by people or their direct activities.

Natural – Ecological processes that are relatively unchanged by humans.

Naturalized – A previously disturbed site that is left to natural processes.

Natural Area – Any land and/or water area that has existing characteristics of a:

- Natural/native plant or animal community.
- Portions of a natural ecological and or geomorphic system.

Natural Environment Park – A park class included in the Open Space Classification.

Pathway – A multi-purpose thoroughfare controlled by The City and set aside for use by pedestrians, cyclists and persons using wheeled conveyances, which is improved by asphalt, concrete or brick, whether or not it is located in a park, and includes any bridge or structure with which it is contiguous (Parks and Pathway Bylaw 20M2003).

Pest – A species of animal that is undesirable. It may or may not be introduced.

Protection – A management technique used to keep an area from harm. It can include many methods.

Reclamation – The efforts to improve a disturbed site's condition.

Restoration – The efforts to restore a disturbed site to near its natural and native condition.

Riparian – The vegetation communities between the aquatic and upland ecosystem.

Trail – Established paths within parks used by pedestrians or cyclists, or both, which is not improved by concrete, asphalt or brick and includes any bridge or structure with which it is contiguous (Parks and Pathway Bylaw 20M2003).

Weed – A species of plant that is undesirable.

Wildlife – Native plants and animals living in natural conditions.

Appendices

Appendix 1 – Urban Park Master Plan Vision and Principles

Vision statement:

The people of Calgary envision a continuous integrated river valley park system that reflects the city's unique prairie and foothills setting. The river valley park system will express citizens' commitment to its preservation, use and historic heritage. We envision a river valley park system in which we will take pride and toward which every citizen will assume responsibility for its protection.

Vision statement principles

The 1984 Calgary River Valleys Plan and the following principles will guide the development of Calgary's river valley park system:

In principle:

1. The overall structure of the river valley park system will be based upon protection, rehabilitation and/or re-establishment of naturally sustainable landscapes, waterways and ecosystems.
2. All significant sources of contamination or degradation of river and related waters will be eliminated, recognizing that watershed management co-ordination with upstream and downstream municipalities and governing agencies will be essential.
3. The primary use of the river valley park system will be passive, low-intensity, informal, unstructured activities.

4. Intensively used facilities will be designated to appropriate sites that are not environmentally sensitive and that are carefully designed as special use areas.
5. The river valley park system will include a continuous river valley pathway, not always adjacent to the river's edge.
6. The river valley park system will be accessible, usable and safe for all persons where practical and environmentally appropriate, bearing in mind the needs of persons with disabilities.
7. Year-round enjoyment of the river valley park system will be encouraged but balanced with environmental impact considerations.
8. Appropriately designed park linkages will extend into adjacent communities connecting school sites, community centres, recreational facilities and urban open spaces.
9. Adjacent development will respect and reflect the character of the river valley park system and provide for reasonable public access.
10. The river valley park system will complement and reflect the unique character and the qualities of the individual park areas and adjacent communities.
11. The river valley park system will be designed to be accommodated by creative alternatives outside of the river valley.
12. Landscape features contributing to the visual continuity and aesthetic quality of the river valley park system will be protected, maintained and enhanced where appropriate.
13. Through protection, sensitive planning and design, education and interpretation, the river valley park system will promote a sense of stewardship in all Calgarians.
14. Calgarians will be urged to accept responsibility and liability for their use of the river valley park system.
15. To assure long-term benefits for all Calgarians, the success of the plan will depend on fiscal responsibility in planning, management and maintenance.
16. When human use versus wildlife use comes into serious conflict in those areas designated as major natural areas in the 1984 Calgary River Valleys Plan and the Urban Park Master Plan, wildlife and habitat will take priority.
17. The river valley park system will be a park resource for all Calgarians and will be in addition to the neighbourhood parkland entitlement within adjacent communities.
18. All bridges will accommodate pedestrian and bicycle use, and all new road and bridge construction required will comply with the vision statement.

Appendix 2 – Vegetation Assessment Data



ISO9001

Jacques Whitford
Environment Limited

Consulting Engineers
Environmental Scientists
Risk Consultants

708 – 11 Avenue SW, Suite 500, Calgary, Alberta, Canada, T2R 0E4
Tel: 403 263 7113 Fax: 403 263 7116

World Wide Web: www.jacqueswhitford.com
E-mail: info@jacqueswhitford.com

Alberta • British Columbia • Northwest Territories • Newfoundland & Labrador • Prince Edward Island • Nova Scotia • New Brunswick • Quebec • Ontario • Saskatchewan
Maine • New Hampshire • Massachusetts • Connecticut • Florida • Rhode Island • Pennsylvania • New York • Trinidad • Russia • Argentina • Brunei

Our File No.: ABC50472

October 27, 2003

Jennifer Symcox
Natural Areas Project Coordinator
The City of Calgary
111 - 17th Street SE
Calgary, Alberta T2E 6Z9

Dear Jenn:

Re: 12-Mile Coulee Road - Vegetation Plots

Jacques Whitford Environment Limited (Jacques Whitford) is pleased to provide you with the attached vegetation plots with your requested changes. We completed 11 plots in total. A digital version of the plot locations, vegetation tables and maps are included on the attached CD.

If you have any questions please give me call (781-4156).

Sincerely,

JACQUES WHITFORD ENVIRONMENT LIMITED

Craig Norris B.Sc. (EnSc.)
Environmental Scientist

CN/cn

Attachments:

- Vegetation plot sheets
- Figure 1.1 – Vegetation Plots on Aerial Photo
- Figure 1.2 – Vegetation Plots on Habitat map
- Photos of plots and special features

cc: Karen Oldershaw – Jacques Whitford

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Site and Vegetation Assessment Data

Date: September 2, 2003 **Plot No.:** 01
Land Use: Aspen Forest **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 10% **Aspect:** 16 degrees
(southwest)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	T	Aspen	<i>Populus tremuloides</i>	30	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	25	60
N	LS	Northern gooseberry	<i>Ribes oxycanthoides</i>	10	70
N	LS	Snowberry	<i>Symphoricarpus albus</i>	20	50
N	LS	Canada buffaloberry	<i>Shepardia canadensis</i>	1	70
N	HG	Meadow rue	<i>Thalictrum venulosum</i>	7	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	7	not measured
N	HG	Heart-leaved Alexanders	<i>Zizia aptera</i>	trace	not measured
N	HG	Aster	<i>Aster spp.</i>	1	not measured
N	HG	Canadian anemone	<i>Anemone canadensis</i>	trace	not measured
N	HG	American vetch	<i>Vicia americana</i>	1	not measured
N	HG	Yarrow	<i>Achillea millefolium</i>	5	not measured
N	HG	Star-flowered false Solomon's Seal	<i>Smilacina stellata</i>	1	not measured
E	HG	Kentucky blue grass	<i>Poa pratense</i>	40	not measured
n/a	G	Downed wood	n/a	10	not measured
n/a	G	Litter	n/a	90	not measured
NuW	HG	Dandelion	<i>Taraxacum officinale</i>	7	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 4, 2003 **Plot No.:** 02
Land Use: Balsam poplar forest **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 27% **Aspect:** 212 (southwest)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	T	Balsam poplar	<i>Populus balsamifera</i>	30	not measured
N	T	Aspen	<i>Populus tremuloides</i>	15	not measured
N	TS	Aspen	<i>Populus tremuloides</i>	2	120
N	TS	Balsam poplar	<i>Populus balsamifera</i>	2	110
N	LS	Red Osier Dogwood	<i>Cornus stolonifera</i>	10	90
N	TS	Silverberry	<i>Elaeagnus commutata</i>	3	130
N	LS	Snowberry	<i>Symphoricarpus albus</i>	5	50
N	LS	Bearberry	<i>Arcostaphylos uva ursi</i>	1	10
N	HG	Canadian anemone	<i>Anemone canadensis</i>	1	not measured
N	HG	Prairie sage	<i>Artemisia ludoviciana</i>	1	not measured
N	HG	Nodding onion	<i>Allium cernuum</i>	trace	not measured
N	HG	Harebell	<i>Campanula rotundifolia</i>	trace	not measured
N	HG	Aster	<i>Aster spp.</i>	1	not measured
N	HG	Buffalo bean	<i>Thermopsis rhombifolia</i>	trace	not measured
N	HG	Hedysarum	<i>Hedysarum spp.(boreale)</i>	trace	not measured
N	HG	Yarrow	<i>Achillea millefolium</i>	1	not measured
N	HG	American vetch	<i>Vicia americana</i>	1	not measured
N	HG	Western Canada violet	<i>Viola canadensis</i>	1	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	trace	not measured
N	LS	Northern Gooseberry	<i>Ribes oxycanthoides</i>	2	70
N	LS	Prickly Rose	<i>Rosa acicularis</i>	2	50
N	HG	Meadow rue	<i>Thalictrum venulosum</i>	trace	not measured
E	HG	Smooth brome	<i>Bromus inermis</i>	1	not measured
N	HG	Three-flowered avens	<i>Geum triflorum</i>	trace	not measured
N	G	Moss sp.	<i>n/a</i>	5	n/a
n/a	G	litter	<i>n/a</i>	85	n/a
n/a	G	Bare ground/rock	<i>n/a</i>	10	n/a
NuW	HG	Dandelion	<i>Taraxacum officinale</i>	1	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 4, 2003 **Plot No.:** 03
Land Use: Native Grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 34% **Aspect:** 240 degrees (southwest)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status **	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	LS	Saskatoon	<i>Amalanchier alnifolia</i>	7	50
N	LS	Silverberry	<i>Elaeagnus commutata</i>	2	60
N	LS	Snowberry	<i>Symphoricarpus albus</i>	7	40
N	HG	Blue flax	<i>Linum lewisii</i>	2	not measured
N	HG	Pasture sage	<i>Artemisia frigida</i>	2	not measured
N	HG	Prairie crocus	<i>Anemone patens</i>	3	not measured
N	HG	Lupine	<i>Lupinus sericeus</i>	trace	not measured
N	HG	Tufted white prairie aster	<i>Aster ericoides</i>	trace	not measured
W	HG	Goat's beard	<i>Tragopogon dubius</i>	trace	not measured
N	HG	Wind flower	<i>Anemone multifida</i>	trace	not measured
N	HG	June grass	<i>Koeleria macrantha</i>	5	not measured
N	HG	Green needle grass	<i>Stipa viridula</i>	15	not measured
N	HG	Common spear grass	<i>Stipa comata</i>	5	not measured
N	HG	Rough fescue	<i>Festuca campestris</i>	1	not measured
N	HG	Blue grama grass	<i>Bouteloua gracilis</i>	trace	not measured
n/a	G	Litter	n/a	100	not measured

*Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

**Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 4, 2003 **Plot No.:** 04
Land Use: Disturbed Grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: flat **Aspect:** n/a
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
E	HG	Timothy	<i>Phleum pratense</i>	10	not measured
E	HG	Smooth brome	<i>Bromus inermis</i>	30	not measured
N	HG	Yarrow	<i>Achillea millefolium</i>	2	not measured
N	HG	Pasture sage	<i>Artemisia frigida</i>	2	not measured
N	HG	Tufted white prairie aster	<i>Aster ericoides</i>	5	not measured
E	HG	Kentucky bluegrass	<i>Poa pratense</i>	20	not measured
N	HG	Wind flower	<i>Anemone multifida</i>	1	not measured
N	HG	Mountain goldenrod	<i>Solidago spp. (spatulata)</i>	trace	not measured
N	HG	Blue flax	<i>Linum lewisii</i>	2	not measured
W	HG	Yellow sweet clover	<i>Melilotus officinalis</i>	1	not measured
N	HG	Aster	<i>Aster spp.</i>	2	not measured
NW	HG	Smooth perennial sow thistle	<i>Sonchus uliginosus</i>	trace	not measured
N	HG	Prairie cinquefoil	<i>Potentilla pensylvanica</i>	trace	not measured
N	HG	Small-leaved pussy toes	<i>Antennaria microphylla</i>	1	not measured
n/a	G	Litter	n/a	85	n/a
n/a	G	Bare ground	n/a	15	n/a
NW	HG	Canada thistle	<i>Cirsium arvense</i>	5	not measured
NuW	HG	Dandelion	<i>Taraxacum officinale</i>	5	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G
** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 2, 2003 **Plot No.:** 05
Land Use: Shrubland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 43% **Aspect:** 120 degrees (southeast)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	LS	Silverberry	<i>Elaeagnus commutata</i>	15	60
N	LS	Saskatoon	<i>Amalanchier alnifolia</i>	15	40
N	LS	Snowberry	<i>Symphoricarpos albus</i>	15	30
N	HG	Pasture sage	<i>Artemisia frigida</i>	1	not measured
N	HG	Prairie sage	<i>Artemisia ludoviciana</i>	1	not measured
N	HG	Comandra	<i>Commandra spp. (pallida)</i>	2	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	1	30
N	HG	Tufted white prairie aster	<i>Aster ericoides</i>	2	not measured
N	HG	Lupine	<i>Lupinus sericeus</i>	1	not measured
N	HG	Aster	<i>Aster spp.</i>	1	not measured
N	HG	Green needle grass	<i>Stipa viridula</i>	10	not measured
N	HG	Blue flax	<i>Linum lewisii</i>	1	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	1	not measured
N	LS	Shrubby cinquefoil	<i>Potentilla fruticosa</i>	1	40
N	HG	Pulse milk-vetch	<i>Astragalus sp. (tenellus)</i>	1	not measured
N	HG	Wind flower	<i>Anemone multifida</i>	trace	not measured
N	HG	Slender wheatgrass	<i>Agropyron trachycaulum</i>	5	not measured
N	HG	Ricegrass	<i>Oryzopsis</i>	trace	not measured
N	HG	Wild bergamot	<i>Monarda fistulosa</i>	trace	not measured
n/a	G	Litter	n/a	95	not measured
n/a	G	Bare ground	n/a	5	not measured
NW	HG	Canada thistle	<i>Cirsium arvense</i>	trace	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 2, 2003 **Plot No.:** 06
Land Use: Native grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 20% **Aspect:** 230 degree (southwest)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	LS	Buffaloberry	<i>Shepardia canadensis</i>	trace	60
N	LS	Bearberry	<i>Arcostaphylos uva ursi</i>	20	10
N	LS	Snowberry	<i>Symphoricarpus albus</i>	5	40
N	HG	Rough fescue	<i>Festuca campestris</i>	10	not measured
N	HG	Star-flowered false Solomon's Seal	<i>Smilacina stellata</i>	1	not measured
N	HG	Aster	<i>Aster spp.</i>	1	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	10	not measured
N	HG	Wild bergamot	<i>Monarda fistulosa</i>	3	not measured
N	HG	Tufted white prairie aster	<i>Aster ericoides</i>	1	not measured
N	HG	Three-flowered avens	<i>Geum triflorum</i>	3	not measured
N	HG	Nodding onion	<i>Allium cernuum</i>	trace	not measured
N	HG	Strawberry	<i>Fragaria virginiana</i>	trace	not measured
N	HG	Puccoon	<i>Lithospermum ruderale</i>	trace	not measured
N	HG	Columbia needle grass	<i>Stipa columbia</i>	60	not measured
n/a	G	Litter	n/a	100	n/a

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 4, 2003 **Plot No.:** 07
Land Use: Native grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 5% **Aspect:** 110 degrees (southeast)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	HG	Rough fescue	<i>Festuca campestris</i>	10	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	10	not measured
N	LS	Creeping juniper	<i>Juniperus horizontalis</i>	2	10
N	HG	Blue flax	<i>Linum lewisii</i>	2	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	1	20
N	HG	June grass	<i>Koeleria macrantha</i>	15	not measured
N	HG	Broomweed	<i>Gutierrezia sarothrae</i>	1	not measured
N	HG	Green needle grass	<i>Stipa viridula</i>	5	not measured
N	HG	Three-flowered avens	<i>Geum triflorum</i>	trace	not measured
N	HG	Prairie crocus	<i>Anemone patens</i>	trace	not measured
N	HG	Pasture sage	<i>Artemisia frigida</i>	2	not measured
N	HG	Mountain goldenrod	<i>Solidago spp. (spathulata)</i>	1	not measured
N	HG	Western wheat grass	<i>Agropyron smithii</i>	1	not measured
N	HG	Wind flower	<i>Anemone multifida</i>	trace	not measured
N	HG	Aster	<i>Aster spp.</i>	trace	not measured
N	HG	Star-flowered false Solomon's Seal	<i>Smilacina stellata</i>	1	not measured
N	HG	Small-leaved pussy toes	<i>Antennaria microphylla</i>	trace	not measured
N	HG	Pulse milk-vetch	<i>Astragalus sp. (tenellus)</i>	trace	not measured
n/a	G	Litter	n/a	100	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 4, 2003 **Plot No.:** 08
Land Use: Native grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 20% **Aspect:** 214 degrees (southwest)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
N	HG	Purple prairie clover	<i>Petalostemon purpureum</i>	trace	not measured
N	HG	Wild bergamot	<i>Monarda fistulosa</i>	7	not measured
N	HG	Gallardia	<i>Gaillardia aristata</i>	10	not measured
NW	HG	Spreading dogbane	<i>Apocynum androsaemifolium</i>	5	not measured
N	HG	Blue flax	<i>Linum lewisii</i>	1	not measured
N	HG	Pasture sage	<i>Artemisia frigida</i>	2	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	1	30
N	HG	Common spear grass	<i>Stipa comata</i>	60	not measured
N	HG	Slender wheat grass	<i>Agropyron trachycaulon</i>	2	not measured
N	LS	Silverberry	<i>Elaeagnus commutata</i>	5	30
N	HG	Sandgrass	<i>Calamovilfa longifolia</i>	5	not measured
n/a	G	Litter	n/a	100	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments: Numerous pocket gopher holes



Site and Vegetation Assessment Data

Date: September 2, 2003 **Plot No.:** 09
Land Use: Disturbed grassland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: flat **Aspect:** n/a
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
W	HG	Goat's beard	<i>Tragopogon dubius</i>	trace	not measured
N	HG	Yarrow	<i>Achillea millefolium</i>	10	not measured
N	HG	Tufted white prairie aster	<i>Aster ericoides</i>	5	not measured
W	HG	Yellow sweet clover	<i>Melilotus officinalis</i>	15	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	10	not measured
E	HG	Smooth brome	<i>Bromus inermis</i>	20	not measured
N	HG	June grass	<i>Koeleria macrantha</i>	1	not measured
N	HG	Western wheat grass	<i>Agropyron smithii</i>	10	not measured
E	HG	Kentucky bluegrass	<i>Poa pratense</i>	10	not measured
N	HG	Prairie sage	<i>Artemisia ludoviciana</i>	1	not measured
n/a	G	Litter	n/a	80	not measured
n/a	G	Bare ground	n/a	20	not measured
NW	HG	Canada thistle	<i>Cirsium arvense</i>	trace	not measured
N	HG	Butter and eggs	<i>Linaria vulgaris</i>	trace	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments: Numerous pocket gopher mounds. Other small burrows, ground squirrel burrows. Good prey base for raptors



Site and Vegetation Assessment Data

Date: September 2, 2003 **Plot No.:** 10
Land Use: Grassland coulee (disturbed) **Investigator(s):** Karen Oldershaw, Brent Keeping
Slope: 5% **Aspect:** 180 degrees (south)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
E	HG	Smooth brome	<i>Bromus inermis</i>	60	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	1	40
N	LS	Snowberry	<i>Symphoricarpus albus</i>	20	40
N	HG	Prairie sage	<i>Artemisia ludoviciana</i>	10	not measured
N	HG	Sticky purple geranium	<i>Geranium viscosissimum</i>	1	not measured
N	HG	Northern bedstraw	<i>Galium boreale</i>	2	not measured
N	HG	Yarrow	<i>Achillea millefolium</i>	1	not measured
N	LS	Shrubby cinquefoil	<i>Potentilla fruticosa</i>	1	50
n/a	G	Litter	n/a	100	not measured
NW	HG	Canada thistle	<i>Cirsium arvense</i>	5	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G
** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



Site and Vegetation Assessment Data

Date: September 8, 2003 **Plot No.:** 11
Land Use: Aspen/shrubland **Investigator(s):** Karen Oldershaw,
Brent Keeping
Slope: 30% **Aspect:** 274 degrees (west)
Drainage: Not assessed **Moisture:** Not assessed

Vegetation Data

Status**	Layer*	Species		Abundance (% Cover) and height (cm)	
		Common Name	Scientific Name	Cover	Height
E	HG	Smooth brome	<i>Bromus inermis</i>	5	not measured
N	LS	Prickly rose	<i>Rosa acicularis</i>	5	30
N	LS	Snowberry	<i>Symphoricarpus albus</i>	20	40
N	LS	Silverberry	<i>Eleagnus commutata</i>	5	90
N	LS	Shrubby cinquefoil	<i>Potentilla fruticosa</i>	10	50
N	HG	Northern bedstraw	<i>Galium boreale</i>	20	not measured
N	HG	Canada Goldenrod	<i>Solidago canadensis</i>	2	not measured
N	HG	Spear grass	<i>Stipa spp.</i>	30	not measured
N	TS	Saskatoon	<i>Amelanchier alnifolia</i>	2	120
N	HG	Wild bergamot	<i>Monarda fistulosa</i>	1	not measured
E	HG	Kentucky bluegrass	<i>Poa pratense</i>	5	not measured
n/a	G	Litter	100		not measured
NW	HG	Canada thistle	<i>Cirsium arvense</i>	5	not measured

* Layers: Tree = T (>6-m), Tall Shrub = TS (>1-m), Low Shrub = LS (< 1-m), Herb/graminoid = HG, Ground = G

** Status: Native = N, Weed = W, Noxious Weed = NW, Nuisance Weeds = NuW

Comments:



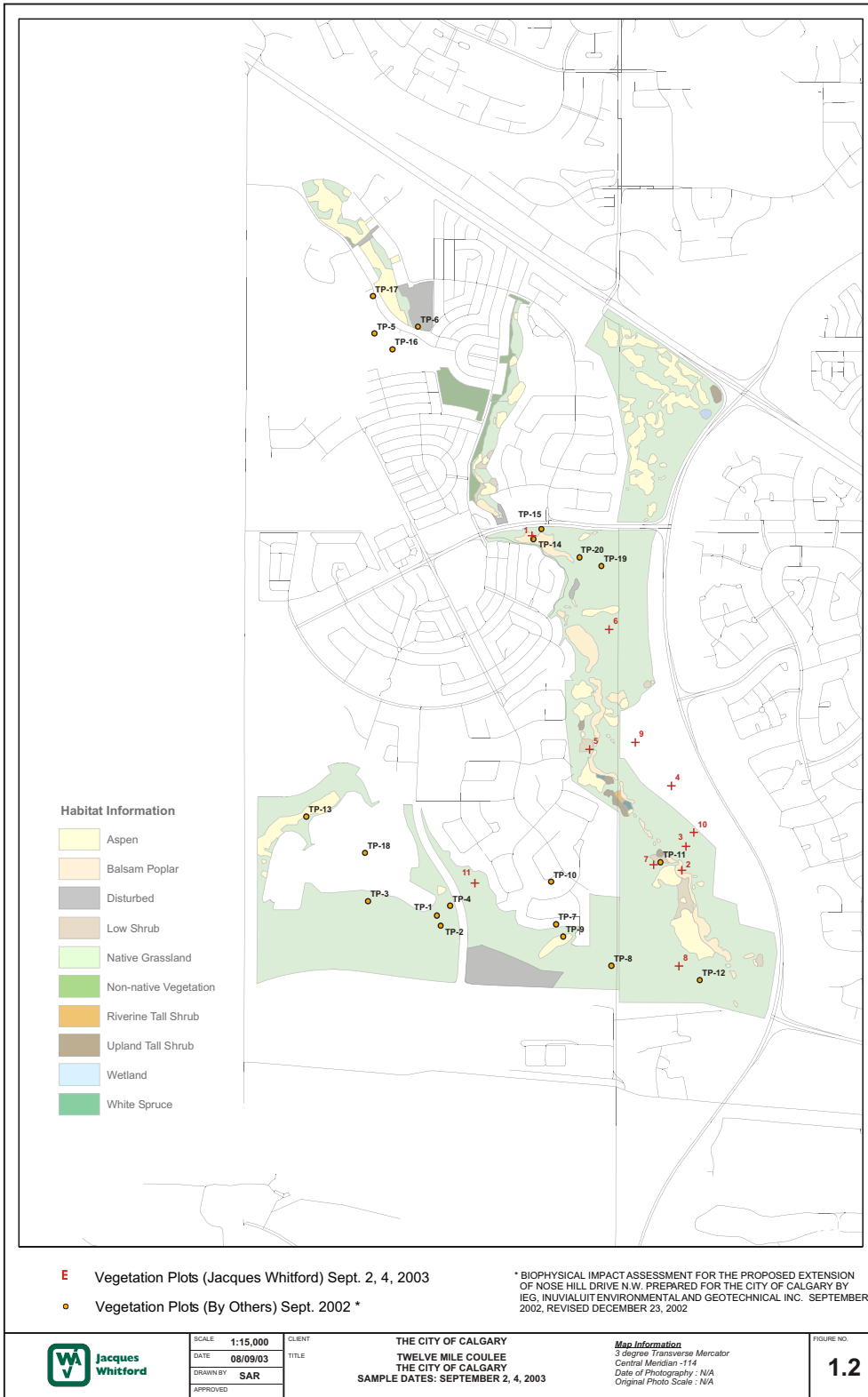




Photo 1: *Plot One - Aspen forest.*



Photo 2: *Plot Two – Balsam poplar along drainage.*

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Photo 3: *Plot Three – Native grassland.*



Photo 4: *Plot Four – Disturbed grassland.*

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Photo 5: *Plot Five– Shrubland.*



Photo 6: *Plot Six - Native grassland.*

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Photo 7: *Plot Seven – Native grassland.*



Photo 8: *Plot Eight – Native grassland.*

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Photo 9: *Plot Nine - Disturbed grassland.*

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Photo 10: *Plot Ten – Coulee with some smooth brome invasion.*

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Photo 11: *Road development across drainage.*



Photo 12: *Culvert system for maintaining creek flow during road construction.*

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Photo 13: *Structures located in aspen forest along western edge of study area.*



Photo 14: *Boundary between natural area and recent clearing for development west of the study area.*

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Photo 15: *Patch of smooth brome in native grassland along the eastern edge of the study area.*



Photo 16: *High percent cover of smooth brome in a ravine along the eastern edge of the study area.*

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Appendix 3 – Biophysical Impact Assessment Requirements

1. Description

Purpose, size and scope	<p>Detailed background reasons for the proposed impact activity (i.e. storm sewer outfall/upgrade; transportation/utility construction; etc.)</p> <ul style="list-style-type: none"> – Purpose cause or reason for disturbance. – Size is given in real measurements (m², acres, ha). – Scope indicates who is involved in the project (City and/or private contractors) and what level(s) of management and supervision are involved.
Capital cost and financing	<p>If applicable – indicates funding for the project and what real/proposed funds have been designated for long-term site recovery and maintenance.</p>
Proposed location	<p>Given as a map, address and legal description to identify exactly where the project is proposed (i.e. intersection of Country Hills Boulevard and Centre St. N. on the Northeast corner; NW1/4 Sec. 36 Twp. 25 R2 W5). The proximity to Natural Environment parks be indicated in detail.</p>
Consumptive use of natural resources during construction	<p>What on-site materials will be expected to be exploited/removed during the course of the project (e.g. gravel, sod, or soil, tree cutting, water drainage, etc.).</p>
Timing	<p>How long the project will take, including preliminary planning, on-site activity, and follow-up maintenance and reclamation. Time of season must be specified (e.g. early spring, late summer, winter, fall) so that appropriate evaluation of all natural impacts may be undertaken.</p>
Maintenance requirements	<p>Foreseen management requirements for short- and long-term site maintenance (e.g. include mowing, weed and pest management, irrigation, planting, etc.).</p>

2. Inventory

Topography	A physical description of existing land form, slope, aspect, and position within the landscape. In most cases this may require presentation of survey.
Geology, geomorphology	Description of surficial and sub-surficial geological (if possible) features at the affected site and immediate environment. Identified glacial landforms and stability issues should be included in the preliminary site report.
Pedology	Description of the physical properties of the soils (e.g. horizon depths, texture, drainage, salinity, sodicity) and classified to soil type according the <i>Canadian System of Soil Classification, Third edition</i> .
Biological resources	On-site flora and fauna with additional emphasis on habitat value, wildlife corridor importance, and role of resident vegetation within the localized system. May include rare species summary.
Cultural resources (prehistoric, historic and current)	Existing historical, interpretive, or recreational features. Includes the potential for developing recreational, interpretive or educational facilities at the site when completed.
Hydrology, water bodies	Listing of all standing water features, water courses, or other natural hydrological source, surficial drainage patterns, depth to water table, and other features.
Aesthetic	Subjective description of how this site fits into the landscape and/or cityscape, and other noted significant features such as planned vision from Council-approved policy and plans. Includes prominent views, human disturbance, aesthetic features, hydrologic/geological/biological resources, etc.
Other features	Descriptions or features which are of interest or importance to the site and are not included in the previous categories. May include man-made features at site (e.g. power lines, buildings, roads, etc.) or items of special concern.
Existing policy	Identify existing internal or external policy that may direct or influence proposal.

3. Impact

Biological resource impact	Comprehensive account of actual and potential risks/benefits from development activity to wildlife habitat, overall biodiversity, sensitive plant and animal populations, movement corridors, rare or threatened plants and animals and long-term flora and fauna community stability.
Geographical and geological impact	Physical impact of the development activity including, the elimination/alteration of unique landforms, alteration of drainage patterns, micro climatic effects, erosional processes, paleontological alterations surficial and sub-surficial; slope stability.
Pedological impact	Physical impact of the development activity to soils, including loss of intact/native soils, alteration or disturbance of soil profiles, salinity, erosion, compaction, wind-throw hazard, etc.
Visual impact	Actual and potential impacts of project from the perspective of the expert and the non-expert. Includes enhancement/reduction of aesthetic features, alteration/obstruction of view lines, introduction of weeds and/or pests, landscape alteration, etc.
Cultural impact	Actual and potential impacts of project from a heritage perspective. Loss/gain of interpretive resources; impact on historical or archaeological sites, etc.
Social/economic impacts	Actual and potential costs including the loss/gain of recreational resources. Localized community impacts. Long-term cost in dollars, capital, and manpower; problem created/solved from the perspective of the community.
Cumulative impact	Summary of combined (with other activities) actual and potential impacts, and how these will affect the rehabilitation, protection and operation of this site in the future.
Residual (unmitigable) impact	Summary of actual and potential impacts to the site which are inevitable, yet permanent. May include long-term species diversity, loss of habitat, loss of system connectivity, loss of public access, obstruction of wildlife movement, introduction of weeds or pests, long-term maintenance requirements, removal of natural features and aesthetic impacts.

4. Mitigation recommendations

Accepted methods	Methods of available damage mitigation or recovery using standardized industry techniques including signage and fencing, grading and loaming, sod stockpiling, seeding with native mixtures, native plantings, limited-impact construction, etc. Methods are well known to industry contractors who are involved in tender bidding for projects.
Experimental methods	Methods of available damage mitigation or recovery which are specialized, require outside expertise, or have site-specific value. May include sod transplants, loam shredding and re-application, specialized native seed harvesting and application, usage of organic fertilizer and erosion control devices as well as other unconventional methods.

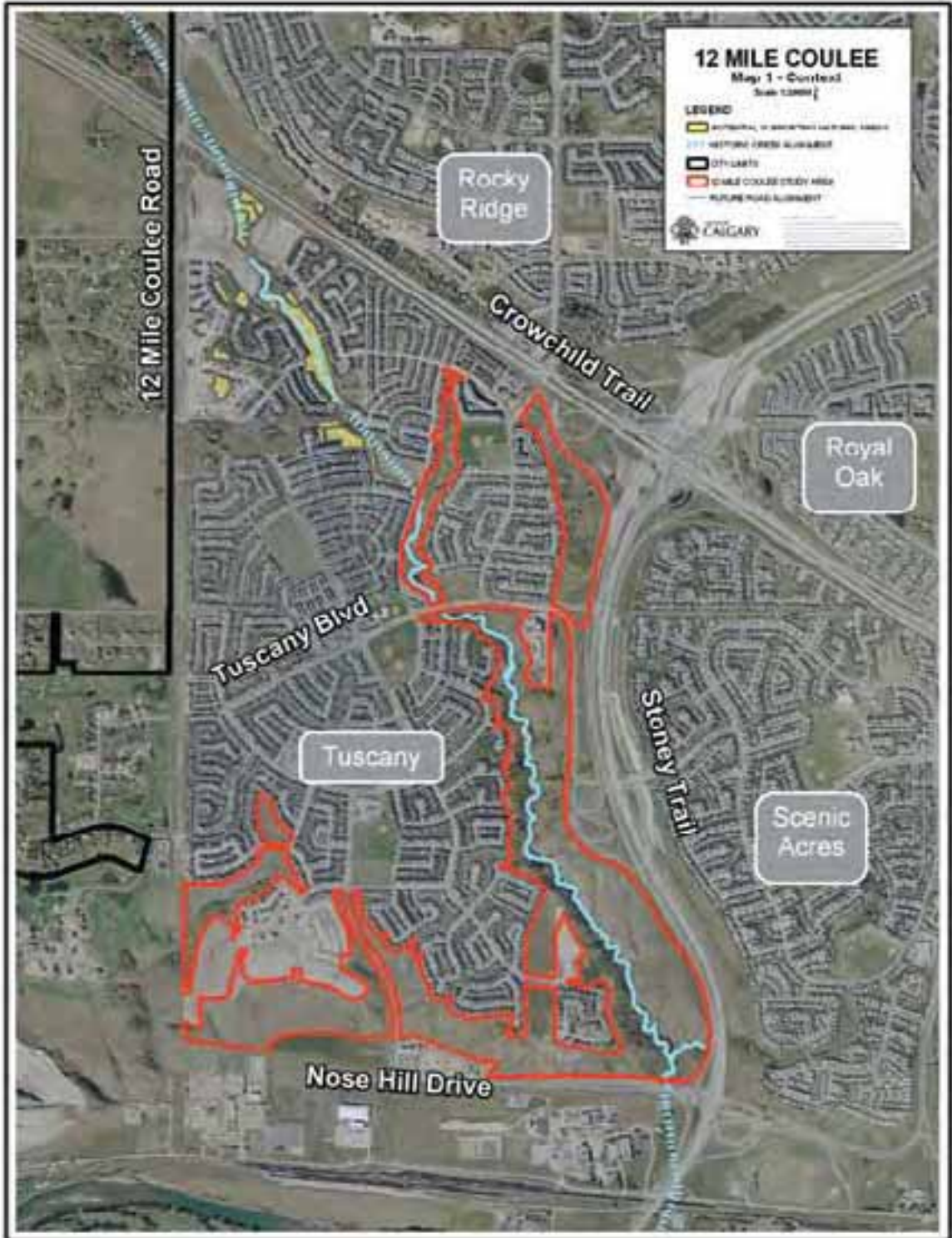
5. Significance of impacts

Regional	Cumulative assessment of impacts to the regional area, incorporating all above criteria. Includes biological, geological and hydrological impacts along with aesthetic, landscape, and social factors. Identifies loss/gain of regional resource and long-term effects on regional system. Attempts to extrapolate impacts to a south-central Alberta perspective (i.e. downstream effects, extra-municipal impacts, etc.).
City-wide	Cumulative assessment of impacts to Calgary's urban natural area system. Includes details of habitat loss/improvement, effects on system continuity and contiguous natural areas, effects on wildlife movement, large-scale aesthetic impact, social, cultural and economic impact on Calgarians, etc.
Park wide	Cumulative assessment of impacts to individual park. Similar to the above, but with a focus on identified environmentally significant areas, unique habitats, and representation within the park. How the impact adversely affects unique or under-represented habitats, system connectivity or system viability.
Local	Small-scale approach to impact assessment, including impacts to adjacent vegetation communities, loss/gain of community recreational or natural resources, community economic/social impacts, long-term site maintenance requirements, aesthetic impacts to site, introduction of weeds/pests to community, isolation/connection of site to city-wide system, etc.

Maps

1. Context
2. Study area
3. Park ownership
4. Management zones
5. Regional Pathway and designated trail network
6. Off-leash zones
7. Trail closures and creek crossing locations
8. Wildlife corridors
9. Cultural history
10. 2003 User Study locations
11. Habitat/vegetation communities

Map 1: Context



Map 2: Study area



Map 3: Park ownership



Map 4: Management zones



Map 5: Regional Pathway and designated trail network



Map 6: Off-leash zones



Map 7: Trail closures



Map 8: Wildlife corridors



Map 9: Cultural history



