Fish Creek Provincial Park Visitor Monitoring Program

March 2008

Prepared by Danah Duke, Tracy Lee and Ken Sanderson

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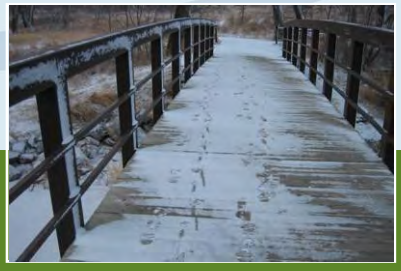

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INTRODUCTION

Fish Creek Provincial Park (FCPP) is one of North America's largest urban parks situated within Calgary, a city of over 1 million people. The park is challenged with a high visitor volume throughout the year, multiple user types and a high number of official and unofficial access points. Alberta Recreation Tourism and Parks, Parks Division recognizes the importance of acquiring visitor statistics to enhance park management. The following report provides recommendations for a Fish Creek Provincial Park (FCPP) visitor monitoring program. The primary objective of the program is to enable an estimation of total visitor use to the park but other secondary metrics are also addressed. In order to acquire an understanding of visitor use to Fish Creek Provincial Park an updated methodology visitor monitoring methodology is required, one that addresses recent changes to the Park, integrates new technology and integrates the number of visitor accessing the park via vehicles and pathways. This report provides a recommended methodology as well as initial steps for implementing a visitor monitoring program in FCPP.

BACKGROUND

Fish Creek Provincial Park (FCPP) is located within Calgary's southern city limits, in the Province of Alberta. FCPP is comprised of approximately 1,200 hectares making it the largest urban park in Canada and North America. Fish Creek is unique in the provincial park system due to it's location within a major urban area. The Park offers a natural environment surrounded by urban residential development and includes two riverine valleys: Fish Creek and the Bow River.

In the west end of the Park, the Fish Creek valley is characterized by steep valley walls that are heavily forested with white spruce and balsam poplar. The east end of the Fish Creek valley opens and widens into the broad valley of the Bow River. The Fish Creek valley floor is primarily open grasslands with stands of balsam poplar along Fish Creek and the Bow River. The Park is not entirely a pristine landscape as it has been manipulated throughout the years by native settlements, ranching, farming and industry. Although some of the Park has been changed by past and present use, much of the natural landscape (escarpment, floodplain, vegetation, stream channels) remain.

Several major roads access facility areas and trails within the Park. For example:

- Canyon Meadows Drive accesses Mallard Point,
- Bow Bottom Trail accesses Burnsmead/Bankside, Bow Valley Ranch site and Hullswood/Sikome Lake,
- Macleod Trail accesses the Shaw's Meadow/Glennfield facility
- Elbow Drive provides access to Voitier's Flats.
- In the west end of the Park, 24th street provides access to Bebo Grove
- 37th Street provides access to Shannon Terrace facilities

Many visitors also access the Park on pathways from the City of Calgary regional trail system or small community connector trails.

Major recreation facilities include the Bow Valley Ranch Visitor Centre, the Fish Creek environmental Learning Centre, Sikome Lake and several day use sites. A complete network of

walking and cycling trails are located in the Park. The Park provides recreation opportunities for the surrounding neighborhoods, other sections of Calgary, several nearby towns, as well as visitors to the region and province.

Fish Creek is classified as a day-use park. In general, most visitors come from within the City of Calgary, many from adjacent residential communities. The Park is used throughout the year with the summer season attracting the most visitors. Primary recreational activities include walking (which includes dog walking), cycling, picnicking, fishing, wildlife viewing, in-line skating, jogging, cross-country skiing, skating and swimming.

The most recent statistics available place visitation at approximately 1,800,000 users for the 2003/2004 season. This number should be considered very conservative given that the ratio of walk-in users vs. vehicle users has changed dramatically since they were created in the 1986 Day Use Calibration Program. Calgary has experienced a dramatic increase in population resulting in new residential communities surrounding the park and an increase in public transportation to the area. This has resulted in a significant increase in park walk-in usage which is not currently accounted for.

Current Monitoring Approaches

In 1986 a Day Use Statistics Collection program was completed for FCPP to determine total visitation, average size of party, accuracy of traffic counters and the origin of visitors. Fifty eight entrances to the park were identified including roads, official pathways and unofficial pathways. The number of visitors entering the park from roads and the number of walk-in visitors were both identified as important counts to ensure a successful program.

Nine vehicle counter locations were identified and used as the focal point for the program. Each of the nine locations were assigned 20 survey dates broken down roughly by 10 weekdays, 4 Fridays and 6 weekend days. Each day was approximately 8 hours long, often split to cover key activity points in the day.

At each location three types of surveys were completed: Traffic Survey Interviews, Walk-in Survey Interviews and Automatic Traffic Counter observations (referred to as field observations in literature review)

Automatic Traffic Counter (ATC) Surveys

ATC Observations were used to calibrate the traffic counter and develop a coefficient to account for any mechanical error with the counter. To complete this survey an observer recorded the counter location and date, as well as a start and end time of the observation period. Between the start and end times all vehicles were counted and direction was noted, depending on the counter. This information was recorded and the difference between observer vehicle traffic was compared the data from the traffic counter.

Walk-in Survey Interviews

The walk-in survey were conducted at the same time as the traffic counter calibration surveys to provide a ratio of walk-in visitors to drive-in visitors and enable the development of a co-efficient (ratio of walk in vs. vehicles) to estimate the number of walk-ins from traffic counter data.

Walk-in Survey Interviews were conducted while roaming a set area and route. Visitors were interviewed as completely as possible, or systematically if usage was too high to interview everyone. The following information was recorded for each interview:

- Method of locomotion (walking, running, jogging, biking, etc)
- Ask how they came to the park (walk-in, drive-in, jog-in, bike-in)
- Party size – how many people in their group
- Origin – where did they come from that day
- Residence – where their permanent residence is
- Date, time and location.

Traffic Survey Interviews

Vehicles were stopped and interviewed in a manner that was safe for the given site. The following information was recorded for each interview:

- Party size – how many people in their group.
- Have they entered the park previously that day
- Origin – what town/city did they come from that day
- Residence – what town/city is their permanent residence
- Date, time and location.

The 1986 day use statistics program completed 6786 Traffic Survey Interviews, 1273 Walk-in Survey Interviews, and 283 Automatic Traffic Counter Surveys (field observations) over the nine counter locations.

The field observations and interview information were used to develop coefficients as correction factors for the nine traffic counters to more accurately estimate total visitation to the park. The coefficients are still in used today, park staff record traffic counter numbers and provide to head office in Edmonton where total visitation is calculated.

In order to assess an accurate estimation of visitor use to Fish Creek Provincial Park an updated methodology is required, one that address the recent changes to the Park, integrates updated technology and accurately integrates the number of visitor accessing the park via vehicles and trails.

Objectives of the FCPP Visitor Monitoring Program

The primary objective of the Fish Creek Provincial Park (FCPP) visitor monitoring program is to accurately measure the **total number of visits to Fish Creek Provincial Park per year.** A visit is currently defined as an individual daily visit; therefore repeat visits within one day are counted as one FCPP visit. Total number of visits is a provincial metric calculated for all Alberta provincial parks, it is used in the development of economic impact models, park planning and management and as baseline data for many other park initiatives.

There are many park management objectives that would benefit from visitation monitoring. The FCPP staff identified setting management direction as a high priority for the proposed visitation monitoring program. The following management activities would benefit from accurate visitor statistics:

- Scheduling- where resources are allocated or programs are implemented within the park
- Enforcement
- Visitor services
- Maintenance
- Public safety- understanding where conflicts between user types is common

Furthermore, the management activities would further benefit from an understanding of the following secondary statistics:

- User types: percentage of park users that are recreational (joggers, walkers, skateboarding, in-line skating), commuters, dog walkers and cyclists.
- Temporal use of the park: total number of visits per time and season (also per user group)
- Spatial distribution of visitors through the park (also per user group)
- Diffusion rates from parking lots and access points to other areas of the park

LITERATURE REVIEW

Visitor monitoring is a relatively new and advancing field. The following literature review provides background information on the development of a visitor monitoring program. Sections include:

- the importance of visitor monitoring,
- defining visitor monitoring objectives,
- characterizing what, who and where,
- exploring monitoring techniques,
- developing a calibration program,
- selecting monitoring techniques, and
- data management protocols.

In addition, case studies of visitor monitoring programs, with a focus on urban forests or parks are reviewed and lessons learned are highlighted. The literature review provides important background information and context to the development of the Fish Creek Provincial Park Visitor Monitoring Programs.

THE IMPORTANCE OF VISITOR MONITORING

Parks are typically mandated for protecting ecological, historic and cultural values while also allowing recreation. Park managers therefore need to balance priority conservation objectives with often competing objectives for recreation and education. Achieving a management balance between these three objectives requires the appropriate monitoring of ecological, historical and cultural features as well as monitoring of visitors including use of patterns and characteristics. In addition, park managers would benefit from understanding visitor impacts on park features and processes as well as visitor conflicts and their satisfaction in regard to the recreational experience (Cessford and Muhar 2003).

Most parks have established long term ecological monitoring programs to assist in monitoring the health of ecological features and processes (Cessford and Muhar 2003). Visitor monitoring however has a much less established tradition. Visitor use estimates are often based on best guess by parks managers (Watson et al. 2000). A 1993 survey of over 400 wilderness managers in the United States reported 63% relied on best guess, 21% used field observations with only 16% used a systematic monitoring program to derive metrics on use (McClaran and Cole 1993). Similarly, a survey of land management agencies in the UK reported the use of some questionnaires and vehicle counts, but not in a systematic manner and with very little consistency between parks or across the region (Cope et al. 2000). Research has shown there is a statistical variation of visitor count data through-out the year, highlighting the need for the development of long term approaches to monitoring (Arnberger 2006).

Many park managers are faced with inadequate visitor use data, decreasing their ability to address critical park management issues. More recently researchers have begun to address the lack of visitor use information by assessing a variety of different visitor monitoring techniques (Watson et al. 2000, Arnberger et al. 2003, 2005). New technology and research advancement in the field of visitor monitoring has resulted in a variety of visitor monitoring options for parks. Selecting the appropriate sampling method/s depends on the identified objectives of the visitor monitoring program.

Defining Visitor Monitoring Objectives

As with any monitoring program, visitor monitoring needs to be tied to goals and objectives set by park management (Muhar et al. 2002).

There are a plethora of strategic and operational planning activities that would benefit from reliable and accurate visitor numbers. For example, visitor data may help to schedule maintenance tasks, staff allocation and resource provisioning or for the justification for visitor facilities, services and staff provisions. The data may assist park managers in reducing conflicts between user groups or to monitor visitor compliance with regulations (i.e. dog walking off-leash). This is by no means a comprehensive list, there are numerous other management objectives supported by visitor count data (Cessford et al. 2002, Cessford and Muhar 2003, Watson et al. 2000). The important point is that different management activities require different visitor count information. For example, justification for visitor facilities, services and staff provision may require knowledge on the total use of the park, while reducing potential conflicts between users requires knowledge on numbers, pattern and behaviors of different user types recreating within the park. Therefore it is important to define the monitoring objectives prior to developing a monitoring program as the monitoring techniques selected will depend on these objectives (Rupf-Haller et al. 2006). Each monitoring objective may require a different combination of data monitoring techniques. Once the objective(s) have been identified an assessment of what, who and where monitoring should take place is important (Muhar et al. 2002).

CHARACTERIZING WHAT, WHO AND WHERE.

When designing a monitoring program it is important to consider what, who and where to monitor. Understanding these questions will enable the appropriate selection of monitoring techniques to collect visitor count data (Cessford and Muhar 2003).

There are a variety of measurement units that can be obtained from visitor monitoring, such as number of visits, visitor load (visitors per hour), visitor flows (persons/hour/direction), visitor density, visitor activities (user types) and visitor dispersion rates from trail head to name a few. It is easy to lose track of the essential focus of the visitor monitoring program with the variety of metrics presented. What to measure should be linked to the defined objectives of the monitoring program?

Who to measure is also derived from the objective of the monitoring program. For example, if the park manager is interested in compliance of dogs on leash, then the focus is on sampling dog walkers. In addition, in some cases not everyone in the park is considered a traditional visitor, such as park staff or individuals commuting through the park. The Park may not want to include these individuals in a report on total visitor numbers and therefore their number must be accounted for and removed from total visitor counts. However, if the objective is to quantify the interaction between humans and the ecosystem then a total number of people are important and the reason for their presence is not as important (Muhar et al. 2002)

Where to measure is another essential component to assess before developing a visitor monitoring program. Most monitoring programs tend to focus on key park access points (park gates, parking lots), resulting in a bias toward short-time users or users with a minimal use radius (i.e. picnickers). If the purpose of the monitoring is to understand total number of visits to the park, this may be appropriate. However if the purpose is to understand the impact of visitors on ecosystem components of the park then monitoring at access points may not be appropriate (Muhar et al. 2002).

Characterizing who, what and where based on the management objectives will assist in the selection of appropriate monitoring techniques for acquiring visitor count data.

EXPLORING MONITORING TECHNIQUES

A wide variety of monitoring techniques are available for the collection of visitor count data. The techniques have been summarized in numerous papers (Muhar et al. 2002, Cessford et al. 2002, Cessford and Muhar 2003, Watson et al. 2000, Hornback and Eagles 1999). A description of each monitoring technique and a review of the advantages and disadvantages tables have been extracted from Cessford and Muhar (2002) are presented below. Cessford and Muhar (2002) categorize monitoring techniques into four broad categories:

1. Direct observations- include the use of cameras or human observers on site to record visitor numbers.
2. On-site counters – automatic devices record and store count data.
3. Visitor Registrations – using registration records or permits to estimate visitor numbers.
4. Inferred Counts – other means used to extrapolate on-site estimates.

Monitoring techniques can also be categorized into long and short term monitoring depending on the duration of the sampling period. Short term includes field observations and interviews while long term monitoring includes techniques with a longer sampling period such as counters, camera/videos. This distinction is important because short term monitoring has been shown to be heavily affected by statistical variations. Long term monitoring is an important complement to short term approaches to increase the accuracy of visitor monitoring data (Arneberger and Hinterberger 2003).

In addition to the monitoring techniques (counting based) described below, there are other means for acquiring visitor data that may be useful to park managers. For example interviews and GPS route tracking. These techniques although not direct counting, complement our understanding of visitor use when integrated with other counting methods.

Direct Observations

Direct observations occur using two techniques, field observations by human observers and camera/video recording. Each technique is described and the advantages and disadvantages are outlined in Table 1.

Field Observations

Human observers record visitor numbers at fixed sites or are roaming using recoding forms or hand counters. Tend to be for short observation periods, but could incorporated into a long-term technique though engagement of people working at a gift shop or information booth (Muhar et al. 2002).

Camera/Video Recording

Camera or time lapse video recording includes the installation of camera or video equipment to record and store data on site. The information is downloaded and reviewed by a human observer for data analysis (extracting count data). Camera or video technique is an alternative method for calibrating other data collection techniques such as counters or field counts. Research by Arnberger et al. (2005) compared data collected from field observers and time lapse video recording. The study concluded that there is little difference between human observers and video counts in regard to total numbers of visitors. However, in relation to heavily used intersections with multiple user types, video obtained more reliable data on group size and visitor numbers. Human observer data collection quality decreased during peak loads when visit rates where greater than 120 people per hour. Additionally, Brandenburg (2001) found that in high use recreational parks, recording 15 minutes of every hour allowed for accurate extrapolation of visitor data, effectively reducing the amount of interpretation required for long term monitoring.

Riding Mounting National Park used digital cameras to monitor the impact of visitors on the backcountry use of trails, although digital cameras proved to be an effect monitoring methods, the researchers stressed the importance of camera setup and placement in relation to the trail (Campbell 2006).

The disadvantage of camera/video use is the time required for visual analysis, a study by Janowsky and Becker in an urban forest reported a range between 18-210 minutes per recording day (2002).

Table 1. Direct observations – a summary of methods.

Field observers	Onsite recording of visit numbers by roaming or fixed-location staff using hand counters or recording forms.	
	Advantages	Accurate, flexible and mobile, can include descriptive data (e.g. visitor characteristics, behaviour, equipment), can be permanent in some staffed sites, preferred means for calibration of other counts.
	Disadvantages	Costly in staff time, competing staff tasks and priorities, often used in unsystematic and opportunistic ways, subjective, less feasible away from permanent sites or key access points and routes.
Camera recordings	Film/video onsite and visitor-count carried out when returned or transmitted to base.	
	Advantages	Accurate, flexible and mobile, can allow visual interpretation of visitor characteristics, provides the main alternative to direct observations for calibration of other counts, commercial units available from security/surveillance market. Motion-triggered recording or time-lapse video with adjustable recording intervals allow for longer observation periods without tape change. In the future, use of digital cameras with image transmission via high speed mobile phones will allow real time monitoring.
	Disadvantages	Costly and vulnerable equipment to use and maintain, staff time needed to interpret films, automatic image analysis still costly, needs long calibration phase, power requirements mean not a long-term option at unattended sites, less feasible away from permanent sites or key access ways, can raise ethical privacy issues.

Table reference Cessford and Muhar (2002).

On-site Counters

Gathering of long term count data through field observation and camera can be staff intensive. Automatic counting devices are an alternative for counting visitors numbers over a long period of time. There are many different types of counters on the market including mechanical, pressure, Seismic, infrared (passive and active), magnetic and microwave sensing. Each counter type is described and advantages and disadvantages are described in Table 2.

There are many different brands of counters available on the market. In this report TRAFX counters are specifically reviewed, as Alberta Parks has already purchased a number of these counters for use in visitor monitoring surveys.

Table 2. On-site counters – a summary of methods.

Mechanical	Physical displacement/movement triggering an attached mechanical count device (e.g. hinged boardwalks, turnstiles, gates, doors, stiles). In some cases, the displacement of paired magnets has been used to generate counts.	
	Advantages	Simple to build and maintain, low cost, built in to existing structures, long history of staff use and experience, can be linked to electronic loggers.
	Disadvantages	Moving parts susceptible to wear, water, deformation and/or blockage, associated high maintenance, often detectable and subject to vandalism or false counts, no date/time references, specific on-site structures required. Wildlife may trigger counts.
Pressure	Direct pressure triggering a sensor, transmitting a count to a data recording device (e.g. pneumatic tubes, sensor cables, pressure pads, strain gauges).	
	Advantages	Wide variety of technology for people and vehicles, can connect to variety of devices (electronic loggers, camera, video), easy to conceal, small size and weight, easier to protect from weathering, low power use, adjustable sensitivity and interval to exclude some false counts, can get time and date data.
	Disadvantages	Needs careful sensitivity calibration when constructed, maybe temperature variable, limited battery life, subject to integrity of electronics, usually requires being built in to a structure. Wildlife may trigger counts.
Seismic and vibration	Vibrations from direct pressure triggering a buried sensor, transmitting a count to a data recording devices (e.g. buried mats or tubes linked to sensor, geophones). Sonic vibrations have been investigated.	
	Advantages	Easy to conceal, small size and weight, easier to protect from weathering, low power use, can get time and date data. No structures are needed, can be buried in paths, may identify bicycles.
	Disadvantages	Soil type, compaction, moisture content, freezing and bury-depth can all affect sensitivity, as can footfall weight. Needs very careful sensitivity calibration at each site used. May undercount groups. Wildlife may trigger counts.
Active optical	Light beams interrupted by visitor passing, transmitting a count to a data recording device (e.g. active infra-red, visible light beam).	
	Advantages	Small size and weight, inexpensive, accurate, not temperature sensitive, long range, adjustable sensitivity and interval to exclude some false counts, can get time and date data.
	Disadvantages	Needs careful alignment of transmitter and receiver (or reflector if not a through-beam system), alignment sensitive to disturbance, hard to conceal so susceptible to vandalism, lenses/reflectors may be obscured or soiled, higher power consumption, light-beam counters maybe highly visible, wildlife or swaying branches may trigger counts.
Passive optical	Change in infra-red signature triggering a count, transmitted to a sensor (e.g. passive infra-red).	
	Advantages	Small size and weight, inexpensive, accurate, adjustable sensitivity and interval to exclude some false counts, can get time and date data, low power consumption.
	Disadvantages	Variable detection range depending on an object's infra-red characteristics relative to the background, may undercount groups if distance large, large sudden lighting changes may trigger false counts, lenses may be obscured or soiled.
Magnetic sensing	Changes in magnetic fields from passing metallic objects (vehicles, sports and camping gear etc.), trigger a count to data recording devices (e.g. induction loops, magnetic pads, count cards).	
	Advantages	Small size and weight, inexpensive, loop/pad sensors buried so not easily detected by visitors, other sensor boxes/cards sometimes buried (or on surface), can get time and date data, can indicate vehicle type, adjustable sensitivity and interval to exclude some false counts.
	Disadvantages	Primarily for vehicle detection (including bicycles), need sensitivity adjustment and calibration for different vehicle types and loadings, possibly needs specialised interpretative software, relatively expensive for sensor and download interface units.
Microwave sensing	Detects changes in reflected radio waves from moving objects.	
	Advantages	Small, can be set to detect vehicles or people, can be set to detect direction, can get time and date data, adjustable sensitivity and interval to exclude some false counts.
	Disadvantages	Usually for vehicles, needs clear line of sight, set high making it hard to conceal, will undercount groups, cannot distinguish vehicle type, high power consumption, relatively expensive, not much park application to date.

Table reference Cessford and Muhar (2002).

TRAFX REVIEW

TRAFx Research Ltd. manufactures a variety of traffic counters designed for counting hikers, bicycles, on-road vehicles and off-road vehicles. All the counters run on the same electronic hardware, but employ different means of collecting the data, such as infrared scope, magnetic sensors and pressure pads. The advantages and disadvantages between types of counters are provided in Table 3.

All TRAFx counters run off batteries that can last from four months to a year depending on the counter configuration and surrounding temperature. All TRAFx counters record data as timestamps, hourly or daily periods. Data is reported in the same format for each counter type, therefore making working with the data simpler. A pocket, laptop or desktop PC can be used to setup, launch and download data from the counters. The TRAFx User Manual is very user friendly and gives systematic instructions on proper installation of all types of counters and how to use the software. In order to minimize the loss of data due to human error or technical malfunction, all counters must be checked and downloaded regularly. Depending on the counter's configuration, it can hold between 14,000 (using timestamps) and 448,000,000 (using hourly or daily periods) records.

Table 3: Summary of TRAFX counters

Type	Uses	Setup Implications
Infrared Trail Counter	general traffic, such as hikers, runners, joggers, horses, snowmobiles or bicycles	1) range of 10 m, however functions most accurately when installed only 1-3 meters away from the centre of the trail; 2) most accurate if users are single file and separated by a meter or more; 3) higher error rates for cyclists at 15 mph or faster; 4) can use two infrared beams for example on a centre post, one pointing in each direction.
Pressure Pad Counter	best used for hikers, runners, or joggers	1) requires pads to be buried under trail; 2) works best with narrow well maintained trails, but may employ multiple pads or a combination of pad and infrared beam.
Magnetic Counter – Bike Mode	mountain bikes	1) requires counter to be buried under trail if trail wider then 1m; 2) detects the passage of a bike within 1m of the counter; 3) need to set delay of counter based on approximate speed of bike traffic.
Magnetic Counter – Vehicle Mode	highway vehicles	1) requires counter to be buried under wide roadways;

		2) variable detection radius ranging from 1 to 5 meters.

A report prepared for the WALKSAFE program by Southwest Region University Transportation Center, Texas Transportation Institute evaluated TRAFX infrared technology to determine accuracy levels by comparing with field observations from the same points. They concluded TRAFX trail counters were able to accurately detect a single pedestrian at typical walking speed or a bicyclist at slow speed (5 to 10 mph). In addition, the counter performed well in group situations but had difficulty detecting bicyclists traveling faster than 15 mph. The accuracy decreased in relation to field observations, the counter tended to under-represent counts on trails where groups were common. The use of these counters where groups are common may require the use of a group coefficient to increase the accuracy of count data (Shawn et al. 2007).

As the trails in Fish Creek Provincial park are multi-use trails, often 3 or more meters wide and with periods of dense use it is recommended that tests be conducted on the reliability of the counters within this setting before a wide scale deployment be completed. It may be necessary to narrow trails at counter locations or place a post in the center of the trail and count both sides. More detailed information on setup can be found in the TRAFx User Manual.

This summary was extracted from a more complete overview of the different types of TRAFx Counters in appendix A.

VISITOR REGISTRATIONS

Many Parks have a voluntary or compulsory registration system in place, where individuals can register before entering the park. Additionally there may be a permitting system or fee components (campgrounds) that can be used to estimate visitor numbers for certain types of user groups (Hornback and Eagles 1999). Some parks also have self registration options such as at trailheads or through summit books. To use self registration sites as visitor count data, the ratio of individuals that register to those that don't must be known (Muhar et al. 2002). A summary of the advantages and disadvantages of visit registers and permits booking techniques is presented in Table 4.

Table 4 Visit registrations – a summary of methods.

Visit registers	Voluntary or compulsory self-registration of visits (e.g. track registers, hut books, other site visitor books).	
	Advantages	Flexible and low cost, simple, can gather basic extra data, can link with safety check in/out processes, good indicator if well calibrated, long history in some regions, therefore useful to document long-term changes.
	Disadvantages	Limited if on voluntary basis, requires ongoing calibration, sites vulnerable to vandalism, response rates vary with site location, presentation, maintenance, advocacy and cultural tradition, regular maintenance and checking also required.
Permits Bookings Fees/charges	Records from site or trip permits, facility or trip bookings, fee payments to the park, and client data from private providers of facilities or trips.	
	Advantages	Flexible and low cost, simple, accurate, can gather considerable extra data, can link with safety management processes, can cover clients of related enterprises (e.g. cable cars, buses, shops etc.).
	Disadvantages	applicable only for situations and activities where bookings, permits, or fees are required, subject to visitor compliance (booking and paying), subject to cooperation of private enterprises.

Table reference Cessford and Muhar (2002).

Inferred Counts

An opportunistic method of linking counts of elements (garbage, trail deterioration, vegetation damage, footprints, car park counts) to visitor use, sometimes referred to as mapping of traces of use (Muhar et al. 2002). The premise of this approach is that recreational impact is correlated to the intensity of recreational use however it is very difficult to link actual visitor numbers to these elements. Elemental information might play a role in identifying hotspots and placement of monitoring options.

Interviews

Interviewing visitors is an integral component of visitor monitoring programs, providing qualitative information such as visitor needs, routes and behaviors. Information from interviews may enhance visitor count data by providing information needed in the development of correction coefficients (Muhar et al. 2002). For example, if it is desirable to understand the difference between recreational visitors and commuters, interviews are likely the only way to extract a ratio between these user types.

GPS Stick

New technological development, such as a GPS stick, a small device that can be attached to visitors enables tracking of routes within the park. These relatively low cost units ($178.00 each) could be used to assess route selection for different user types within the park. Understanding route selection will greatly enhance park manager's ability to understand potential areas of high impact and conflicts between users.

Community Surveys

With an expected large amount of use of the park being associated with nearby residential communities a targeted mail-out survey may prove beneficial. Similar questions asked in a personal interview could be provided or the focus could be on information needed during the pilot phase such as which access point to you use and how often.

Developing a Calibration Program

The description of the monitoring methods in the previous section highlighted the disadvantages of each technique. It is important to consider these limitations and develop plans to mitigate error associated with the selected counting technique. For example, the use of automatic counters is a widespread practice in many park systems for estimating visitor use. However, counters tend to systematically over count (i.e. when larger group sizes are common) or undercount (i.e. wildlife present in the area) visits. Calibration is the process for correcting the error associated with a monitoring technique (Ross 2005). Calibration occurs by comparing (correcting) one method to another of known accuracy. For example, counters may be corrected through comparisons to field observations at the same location. The error rate is identified and a correction coefficient is developed that can be applied to the counter at same location (Ross 2005).

Calibration is a very important component of a visitor monitoring program and requires careful consideration during the design phase. Calibration requires the implementation of secondary monitoring techniques which also have the potential to add valuable information to visitor count data (Cessford and Muhar 2003, Muhar et al. 2002). For example, if the primary data collection method is the use of counters, calibration options include field observations or camera/video. Both these options have the potential to provide a corrective factor so an assessment of these two options in relation to other information needs would be beneficial. Arnberger (2002) indicated that time lapse video monitoring was more accurate then field observations when the number of visitors exceeded 120 people per hour. Although camera/video require more intensive maintenance and time to interpret the images, it enables observation work to be conducted over longer periods of time than if usually possible with field observations (Ross 2005).

Other considerations for calibration include the sampling effort and frequency of calibration exercises. Sampling effort and frequency are largely related to the need for accuracy versus resource availability. Ross (2005) suggests calibration should occur on at least 2 days, one weekend and weekday per time period of interest. Although greater accuracy is achieved if sampling effort occurs over several weeks. Statistical models can be developed to calculate the accuracy provided by different sample sizes (number of days) (Ross 2005). If results vary between sampling sessions then more frequent sampling needs to occur.

The recommended frequency of fieldwork exercises varies from every six months to five year periods. Again the higher the accuracy level required the more often calibration exercises need to occur. Sites with a stable pattern of visitation do not need to be calibrated as often (Ross 2005).

Selecting Monitoring Techniques

The monitoring techniques presented all have advantages and disadvantages. Selecting the appropriate monitoring techniques will depend on the following factors:

- Objective of the monitoring program
- Availability of resource (equipment and staff time)
- Accuracy level required

Before monitoring techniques are selected it is important to access each factor to ensure the appropriate techniques are selected. The objective of the monitoring program is one of the most important considerations for monitoring technique selection. Different monitoring techniques provide different visitor count metrics as well as having their own set of advantages and disadvantages (Muhar et al. 2002, Cessford et al. 2002, Hornback and Eagles 1999). Monitoring will involve a combination of methods to compensate the disadvantage of a single technique as well as provide additional count data for calibration purposes. Additionally, a combination of methods has the potential to provide new insights through comparisons or correlations of the datasets (Muhar et al. 2002). Understanding the objectives of the visitor monitoring program and desired metrics will narrow the field of options available for monitoring.

To finalize monitoring technique selection it is important to have an idea of the budget committed to visitor monitoring (Muhar et al, 2002). For example, as the area or number of access points in a park increases so do the desired number of counters. As the number of counters increase, so do the costs associated with equipment purchase and staff time to maintain and download data. More counters also increases the chances of equipment failure and vandalism (Hornback and

Eagles 1999). To reduce the dependency of a high number of counters many sites have used an integration of permanent counters in combination with a rotating counter system (Cessford et al 2002, Watson et al. 2000, Janowsky and Becker 2002).

Accuracy level is another important factor in the design of a visitor monitoring program. Hendee et al. (1990) define reasonable accuracy as a level which is required to detect changes to the system that instigate management action. As the level of accuracy required increases so does the level of complexity in monitoring design (i.e. the number of coefficients required to correct the dataset) (Hornback and Eagles 1999). Increasing accuracy usually requires more monitoring techniques and more monitoring sites again increasing costs of the program.

The design of a visitor monitoring program has a number of compromises that need to be considered in the development phase to ensure objectives are met and the program is sustainable over the long term. To assist in evaluating these compromises, numerous studies have stressed the need for experimentation in the design phase of a visitor monitoring program (Hornback and Eagles 1999, Watson et al. 2000, Campbell 2006). Experimentation or a pilot project will assist in identification of where accurate counts are required versus approximations or estimates. Additionally, it may provide park managers with a better understanding of the extent of seasonal changes or shifts in visitor types. Understanding these factors will enable park managers to design a more efficient long term monitoring program. For example, if use is consistent in some of the seasons, then calibration does not have to occur in each season resulting in a reduction of sampling effort.

DATA MANAGEMENT PROTOCOLS

A systematic long term visitor monitoring program requires the use of multiple monitoring techniques resulting in the collection of numerous datasets. Data management processing and storage requires the development of a database to manage visitor data (Hornback and Eagles 1999). Ideally a centralized system would be developed where correction coefficients are incorporated into the structure (Ross 2005). An effective storage and retrieval system serves as an important link between the raw data and its use by park managers.

A paper by Henning (2006) suggests the development of a recreational information system that integrates four information components, park visitor numbers, conservation and landscape activities, infrastructure and stakeholders. Through databases and accompanying GIS layers, park managers should be able to access management issues through the development of a more comprehensive information system.

CASE STUDIES

Visitor monitoring in urban parks is often more complicated than remote parks, due to the variety of user types and the year round intensity of use on park facilities and ecosystem. Urban parks often need to address unique management challenges because of their close proximity to residential complexes and a large human population (Arnberger 2006). Fish Creek Provincial Park is a true urban park, surrounded on all sides by densely populated residential communicates.

There are very few published studies on the establishment of long term visitor monitoring programs for urban parks; the Danube Floodplains National Park in Lower Austria is an exception.

The Danube Floodplains National Park is located to the east of Vienna, a city with a population of 1.6 million. The visitor structure of this park is characterized by a high percentage of local recreationlists who come from adjacent residences for everyday spare time activities (i.e. jogging, dog walking). The temporal stress on urban parks is not limited to weekends or specific seasons, but is continual daily stress through-out the year (Arnberger and Brandenburg 2002). Another challenge for this park, was the change from a local public recreational area to national park status, resulting in traditional behavior patterns such as walking dog's off-leash being more difficult to manage. The Danube Floodplains National Park therefore needs to address two interests, conservation of the protected area and the recreational needs of near by residence. In order for park management to access the impacts of visitors on conservation objectives the types and amount of visitor use needs to be quantified. The visitor monitoring objective was to understand visitor structure to address temporal stress issues for different user types. The National Park administration therefore commenced a long term monitoring study to produce reliable and accurate visitor count data on specific user types by monitoring major access points into the park (Arnberger and Brandenburg 2002, Arnberger and Hinterberger 2003).

Three monitoring techniques, long term video monitoring, short term field observations and interviews were used in Danube Floodplains National Park to determine the extent of visitor use on the park and to understand impacts of different user types. Long term video monitoring was used as the primary methodology, enabling researchers to estimate visitor numbers, group size, and direction of travel, seasonal variations and an analysis of user types. Video monitoring was calibrated using field observations. Video monitoring occurred at five access points while short term field observations occurred at these five access points and seven other access points. Interviews were used to identify preferred routes- visitors were asked to draw on a park map how they had moved through the park (Arnberger 2006).

The degree of urbanity results in different recreational use levels, patterns and user composition when compared to more remote parks. Urban parks tend to play an important role for nearby residence in everyday recreation and commuting. Periods of high use have less fluctuation than remote parks, but there was a peak on weekends and workday late afternoons and evenings. Temperature had an impact on pedestrians and cyclists but had little impact on joggers and dog walkers. The study highlighted park management issues of concern with regard to crowding and users conflicts (Arnberger et al. 2001).

The following lessons are highlighted from the extensive visitor monitoring at Danube Floodplains National Park:

- The systemic visitor monitoring program implemented in Danube Floodplains National Park has resulted in numerous analyses that have contributed to improved sustainable management of the park.
- The quality of short term data (field observations and interviews) is affected by statistical variations, highlighting the importance of implementing long term monitoring methods.
- "The results show only a combination of long term monitoring and survey data obtained by various methods allows for a thorough analysis of visitor activities as a basis for the

> ecologically and economically sustainable management of recreation and conservation areas" (Arnberger et al. 2005).

The US Forest Service developed the National Visitor Use Monitoring (NVUM) program to standardize efforts across the United States in response to a survey that highlighted the number of managers making decisions on best guesses. The US Forest Service is mandated by legislation to monitor trends in visitor use and impacts on wilderness (Watson et al. 2000). In response to the knowledge gap a handbook was designed to standardize approaches across the Forest Service. "The handbook provides, in a single source, all relevant information on setting objectives, making decisions about what to monitor, developing a sampling plan, collecting the needed information, and computing basic statistics to provide input into management decisions (Watson et al. 2000)". The NVUM completed a full multiyear cycle of sampling in all National Forests in the US (Zarnoch et al. 2005). All National forests are sampled once every five years. Methods described in the handbook include, short term monitoring (field observations, interviews) and long term monitoring (registration and counters).

A paper by English et al. (2004) used the NVUM collected data to access visitor numbers in 18 urban forests in the Forest Service. The Forest Service recognizes there are a number of management issues associated with the volume and timing of visitation and visitor behavior associated with urban forests. Addressing these issues requires an examination of users and use patterns of visitors to disperse areas of these urban forests. In this study, field observations and interviews were used to assess users and use patterns.

Results indicted urban forests are receiving a larger volume of visitors than regular national forests. Visitation from local communities was high and frequent visitors accounted for 22% of the people visiting the park. Visits made by frequent visitors are short in duration and activities tend to focus on biking, hiking, walking and viewing wildlife. The management of urban forests may require special attention due to the high volume of visitors and the intensity of use. The NVUM program enhances the forest managers ability to sustainably manage the forest for recreational and forestry values.

The case studies both highlighted the need for systematic monitoring of visitor numbers to enhance urban park and forest management. Both used a combination of long and short term monitoring techniques to provide estimates on a number of metrics. They both concluded urban parks and forests management is complicated by unique issues associated with a high volume of multi-use visits occurring year round.

FCPP VISITOR MONITORING METHODOLOGY

The monitoring approach developed is an integrative concept of short term and long term monitoring techniques. Short term monitoring techniques include personal counts and interviews. Long term monitoring techniques include traffic counters, trail counters with an option of using cameras/video monitoring. As outlined in the literature review, each technique has strengths and limitations depending on the management objective or metric of concern. A combination of short and long term methods will enable managers to better understand visitor activities, forming the basis for conservation and recreational management for FCPP.

The field of visitor monitoring has immense potential due to new technological advancements of monitoring techniques, however these must be weighted with the reality of monitoring costs, including equipment and staff time as well as challenges of the physical settings (i.e., high traffic volume on three meter wide trails, concerns of vandalism). The visitor monitoring methodology proposed is flexible, to enable scaling of monitoring efforts depending on resources and staffing availability. Additionally, steps forward are identified including recommendations for pilot studies to test the proposed methodology in an effort to minimize sampling effort while retaining accuracy. Although delaying the full implementation of a visitor monitoring program may not be desirable, short term assessment of the sampling process could greatly reduce the number of counters, sampling effort and cost.

The methodology developed is based on an exit survey approach; both short-term and long-term monitoring techniques are focused on individuals exiting the park. Exiting was chosen to accommodate secondary metrics; it is easier for interviewees to accurately identify individual routes, distances traveled and behaviors when exiting the park.

The following section highlights the methods for estimating total visitor use to FCPP, the primary objective of the FCPP visitor monitoring program. As highlighted in the literature review there will be opportunities to collect data to address secondary objectives and metrics of benefit to park management. These opportunities are referred to in the methodology but are highlighted in more detail in the secondary metrics section.

TOTAL VISITS TO FISH CREEK PROVINCIAL PARK

The methodology designed to identify total visitor use includes mechanical counters on road and pathways with field observer calibration and sample interviews. A secondary option includes the use of camera/videos in place of field observations for long term calibration of counters. The advantages and disadvantages of the calibration options are highlighted in the literature review. Providing alternative monitoring technique increases the flexibility of the FCPP monitoring program.

Figure 1 and 2 provide a summary of the methodology, sampling methods and process for measuring total visits to FCPP. Figure 1 highlights the integration of short and long term approaches and the metrics obtained from each sampling method. Each monitoring technique is briefly described along with the equipment/resource needs, calibration requirements, frequency of monitoring and identification of the metrics associated with the monitoring technique.

Camera/video monitoring is represented in grey because this option is an alternative and is not necessary for the calculation of total visitor use. Figure 2 highlights the sampling methods (in lower rectangles) and the associated correction coefficients (represented in circles) required to calculate the total number of yearly visits to the Park. This figure highlights the process of calculating the total visitor use as well as the integration of the different techniques in providing the appropriate data to calculate correction coefficients.

As indicated in Figure 1 and 2, many additional metrics including user types, routes used, number of daily repeat visits etc. could be measured with the proposed techniques required to estimate total visitor use. However, depending on park monitoring priorities and resources available these additional metrics may or may not be integrated in the monitoring program.

	Short Term Monitoring		Long Term Monitoring		
Methods	**Field Observations**	**Interviews**	**Traffic Counters**	**Trail Counters**	**Camera/video**
Description	Field observations at 27 locations (9 vehicle access + 12 permanent trail counters and 6 rotating trail counters)	Personal interviews at 21 locations (9 vehicle access + 12 permanent trail counters)	Located at all 9 road access points	Located at key pathway access points	One camera located on pathways at key locations within each management zone
Calibration			Calibrated with interviews and field observations	Calibrated with interviews and field observations	Calibrated with trail counters and manual counts
Frequency	Minimum 8 days for each location	Minimum 8 days for each location	Year round	Year round	All year round - 15 minutes each hour
Resources/Equipment	Park staff/volunteers (216 people days total)	Park staff/volunteers (168 people days total)	9 traffic counters Personnel to maintain counters Personnel to process data (downloaded once/2 weeks)	12 permanent trail counters, 6 roaming trail counters Personnel to maintain counters Personnel to process data (downloaded once/2 weeks)	6 cameras Personnel to maintain counters and process data
Metrics	**Total visitor use per year** Frequency per season Frequency per week, day and time Direction of travel Group size User types				Direction of travel Group size User types

Figure 1: Components of the visitor monitoring methodology for FCPP

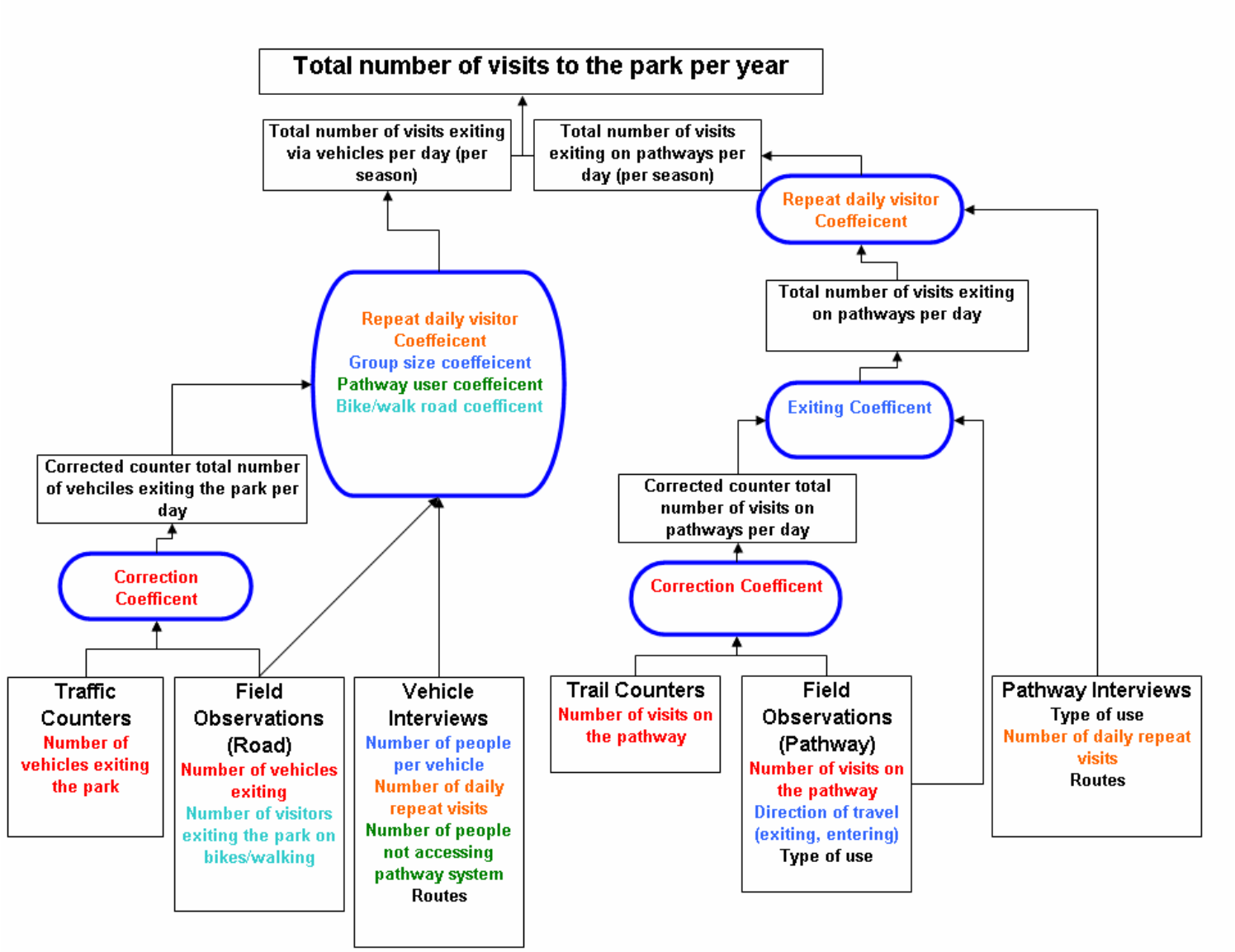

Figure 2: identifies the process for calculating total number of park visits

MONITORING TECHNIQUES

The primary long term monitoring techniques recommended are automatic counters, for both pathways and roads the frequency of sampling, location/placement of counters, sampling effort and staff requirements are identified. Data collected from counters must be calibrated using other monitoring techniques, field observations and interviews, these techniques are described in the calibration section.

COUNTERS

The primary method of data collection includes the installation of counters on pathway and road access points within FCPP. Pathways and roads are presented separately, although the data from each will be integrated to establish total visitor use.

PATHWAYS

FCPP has 53 official pathway access points into the park. To accurately monitor total visitor use on the pathways each access point is monitored using trail counters. Given the expense of purchasing, maintaining and calibrating this number of counters a second option is also presented.

PATHWAY MONITORING OPTION 1

In this option, all pathway access points are monitored. Maps 1 and 2 highlight the possible placement of 41 counters. Counter locations were selected using the following criteria:

- capture total number of exits from the park on a pathway
- doubling up access points on one pathway counter where possible
- counters not located directly on the access point (park boundary) to capture movement occurring in the park and not on the boundary trails.

Field staff tasks for this sampling approach include:

- Assessment of counter placement
- Installing permanent counters including security boxes to house the counter to prevent vandalism
- Downloading data every two weeks from counters and ensure they continue to function effectively.

PATHWAY MONITORING OPTION 2

To reduce the number of counters required, a second option was developed , including a system of permanent and short term rotational counters. A key assumption is that access points from specific residential communities will have similar rates of use. Therefore we propose dividing FCPP into six zones based on the FCPP management plan with the exception of Macleod which was added into their respective neighboring zones on either side of Macleod Trail (see map 1 and 2). In each zone, 2 permanent counters are placed on representative access pathways. The location of the permanent counters would include access points identified by field staff as representative of the zone (ideally one permanent counter is located on opposite faces of the zone to accommodate different residential communities). To test the assumption that access points from specific

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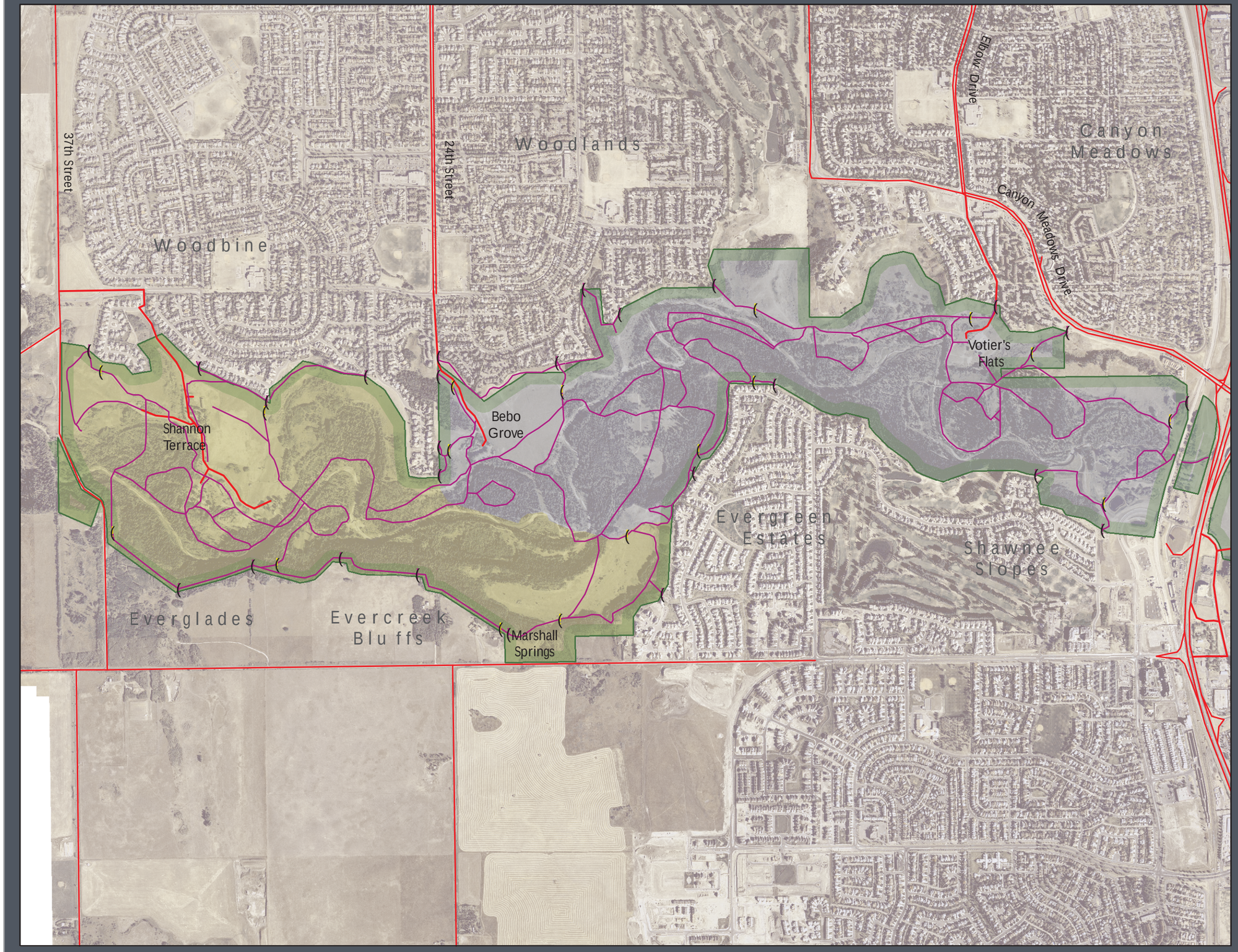
MAP1: FISH CREEK PROVINCIAL PARK - WEST



- Official Pathway Access
- Counter Location
- Pathway
- Road

FCPP Management Zones

- Woodbine Management Area
- Evergreen Woodland Management Area

0 250 500 1,000

Metres

MAP2: FISH CREEK PROVINCIAL PARK - EAST

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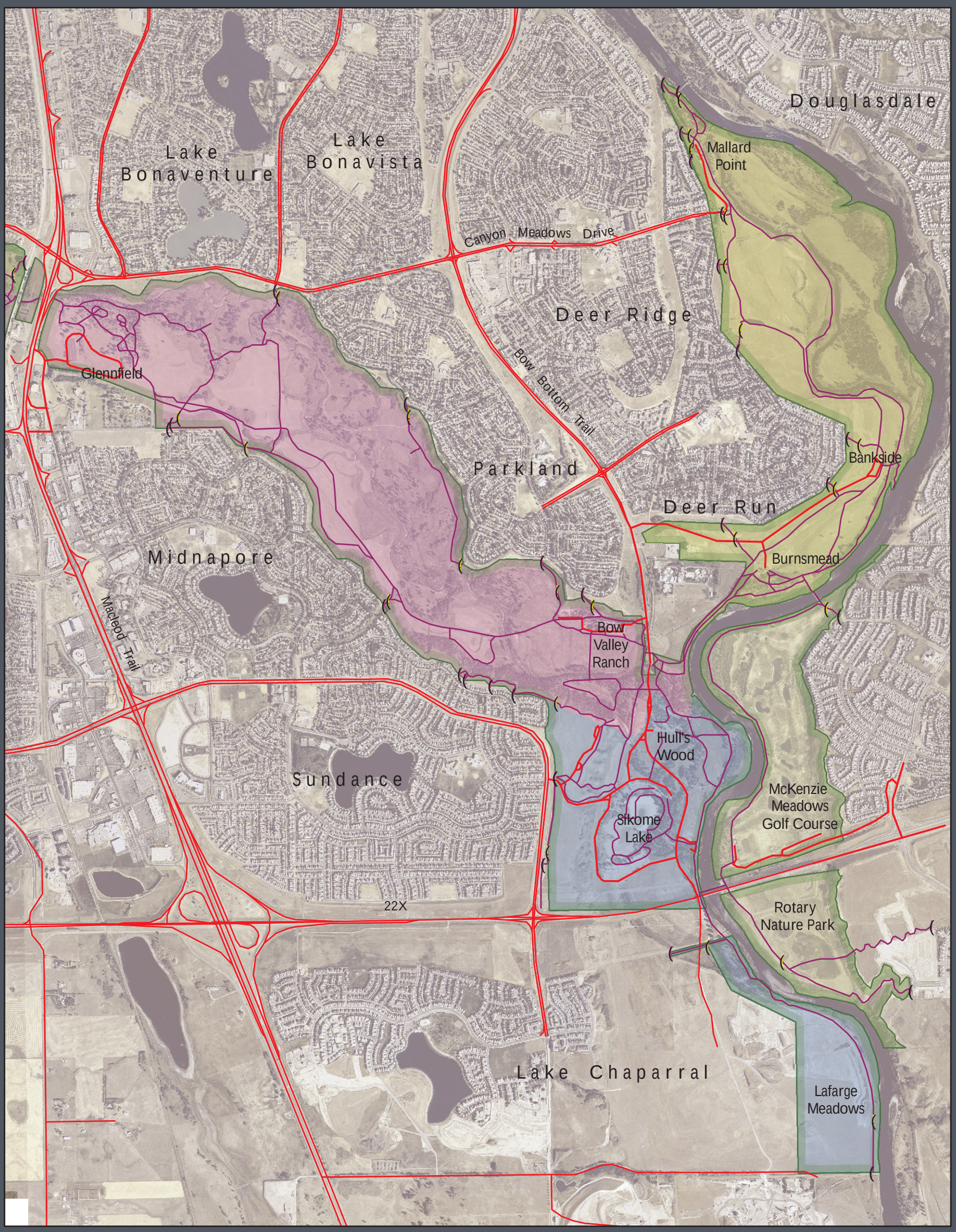

FCPP Management Zones

- Official Pathway Access
- Counter Location
- Pathway
- Road
- Deer Run Management Area
- East Bow River Management Area
- Parkland Management Area
- Sundance Management Area

0 365 730 1,460

Meters

communities represent similar level of use and to develop a correction factors based on actual use for each access point, one rotating counter for each zone is required. The rotating counters are used for short term monitoring to develop correction coefficients for each access point based on comparisons to the permanent counter.

Option two requires eighteen counters, twelve permanent for long-term monitoring and six used for short-term rotational monitoring. The six short-term counters would be available for other park management needs, such as the development of other visitor monitoring metrics when time and resources permit.

This approach requires the development of a sampling plan to identify systematic rotation of the counters within each zone. Additionally, the development of coefficients is created by comparing the permanent trail counters with the rotating counters.

Field staff tasks for this sampling approach include:

- Assessment of counter placement
- Installing permanent counters including security boxes to house the counter to prevent vandalism
- Downloading data monthly from counters
- Randomly moving the counters as per specified sampling design.

Counter placement points on maps 1 and 2 are an approximation only and depending on which pathway monitoring option is selected counter placement needs to be reviewed and ground-truthed by field staff to ensure ideal placement both for physical landscape considerations and to ensure location captures use effectively.

ROADS

FCPP has nine road access points that are currently monitored as part of an Alberta provincial park monitoring program. This system developed in 1986 needs to be updated with new counters and coefficients. The current system includes a walk-in coefficient that requires updating and integration with the new pathway monitoring protocols. The walk in coefficient was originally developed through a roaming interview process. The number of visitors entering the parks on pathways would be assessed through the new visitor monitoring methodology presented in this report.

Field staff tasks include:

- Assessment of counter placement
- Installing permanent counters including security boxes to house the counter to prevent vandalism
- Downloading data every two weeks from counters and ensure they continue to function effectively.

EQUIPMENT REVIEW

Automatic counters are required to count total visitor use on the pathway system and on roads in FCPP. The count accuracy is obtained through a calibration process from data obtained by human

observers and or camera/video options. If the later option is selected then camera/videos would also need to be purchased.

There are a number of counter options available for monitoring visitor numbers, the selection of a counter depends on installment site characteristics, environmental factors influencing counter accuracy, vandalism concerns and maintenance requirements. Some of the key concerns to consider with counters in FCPP include the width of the pathways (3 meters), potential for vandalism and the open nature of many pathway sections.

At the request of Alberta Parks, TRAFX trail counters were reviewed as a potential option for use in FCPP. See Appendix 1 for the full review.

Given the unknown nature of the accuracy associated with counters in FCPP, a pilot project is recommend to test different types of counters prior to a visitor monitoring program being implemented. Ross (2005) reports on a test protocol developed by the Scottish Natural Heritage, where a counter is deliberately passed 50 times at a normal walking pace. If the counter is accurate within + - 10% the counter in question is considered acceptable for use.

CALIBRATION

Calibration is a necessary and important component of visitation monitoring programs because visitor counting instruments may over or under count for a variety of reasons (Ross, 2005). In the case of this monitoring program calibration involves adjusting counters to a known accurate dataset to reflect true estimates of the number of visits. Calibration is therefore required for both the trail and vehicle counters in FCPP. In the case of vehicles two calibrations are required; the number of vehicles observed compared with the number recorded with the counter and a correction factor for the average number of people in each vehicle. Additionally, evidence indicates a high level of variation of vehicle occupancy rates between sites, making it necessary to calibrate counters at each site independently.

The counters can be calibrated using two possible methods, camera/video monitoring or through the use of field observations/counts. For this monitoring protocol, observation data and interview data are described as the key method for calibration and can be collected simultaneously. Observation data is usually very accurate but expensive therefore large sample sizes are often difficult to obtain. Calibration scheduling is a trade-off between the level of accuracy required and the staff time available for field work. To effectively correct data, every counter needs to be calibrated (Cope et al. 1999, Wardell and Moore 2004). The length of observation necessary is unknown, but research indicates visitor behavior and vehicle occupancy vary throughout the week (Ross 2005). Ross reports that in each calibration period, one weekday and one weekend day per season is included.

Recommendations in the literature on the frequency of calibration range from 2-3 years to every 6 -12 months (Ross 2005). For FCPP the frequency will depend on the rate of change occurring around and within the park.

FIELD OBSERVATIONS

All counters require a manual count calibration where human observer's record data in a standardized format at each trail and vehicle counter location in conjunction with recording the actual number of counts recorded by the counter. Each observer records at minimum:

- sampling location
- date
- start time
- initial counter reading
- each time visitor passes counter
- end time
- final counter reading

PATHWAYS

During the observation period a pathway observer records the number of individuals that pass in front of the counter, the time visitors passed, the direction of travel (entering/exiting and direction), and the user activity (Walking, Dog walking, Cycling, Running, Inline Skating, Skateboarding, Wheelchair, Other). Additional information, including user age and gender and the number of dogs, would facilitate data sharing and collaboration with the City of Calgary.

Ideally all counters are calibrated through observations on one weekday and weekend in each season. If option two were implemented, 18 pathway counters would need to be observed for 2 days in each season, with the temporary counters being observed at the same time as its permanent counterpart.

Field staff tasks for this sampling approach include 144 days of field sampling on pathways (equally represented in each season).

VEHICLES

For each vehicle counter location, a manual count records the number of vehicles exiting the park and the type of vehicle. Vehicle size is important characteristic, because different size vehicles will have a different number of average passengers. Other studies have classified vehicles into four categories:

- motorbike, cars, SUV, light van, utility vehicle
- Towing trailer
- Two-axle buses and trucks
- Three axle buses and trucks.

The average number of people per vehicles would be calculated for each classification. Classifying vehicles into size classification will increase the accuracy of estimating the number of visits. Also recorded is the number of non-vehicle users (bicycle, runners, etc.) using the roadway to enter or exit the park.

Vehicle calibration periods should be the same as pathways which would equate to nine counters to calibrate for 2 days within each season equaling 72 days of field sampling. To reduce the number of staff days required FCPP may lump seasons that have similar use rates.

INTERVIEWS

Personal interview are an important component of visitor monitoring, providing characteristic data that can not be obtained using counting methods. For calculating total visitor use, interviews enable the identification of the number of daily repeat visits, number of people using pathways from vehicles, number of people in vehicles and number of park staff encountered.

Developing sampling protocols for the number of interviews required is challenging. To extrapolate the results to total park use, 1% of the total visitors to the park should be interviewed. The total number of visitors to the park is not currently known. Therefore we suggest interviews take place in conjunction with the observational monitoring, sites and therefore require the same sampling effort. Based on a calculation of 12 permanent pathway counters and nine road counters, for two days in each season 168 field days are required.

PATHWAYS

Pathway interviews would record at minimum the following:

- Party size – how many people in their group.
- Activity type – walking, biking, jogging, etc.
- Entering or Exiting the Park
- Have they entered the park previously that day
- Origin – what town/city did they come from
- Residence – what town/city is their permanent residence
- Did their visit have them pass any of the other trail counters, if so how many?
- Date, time and location.

The inclusion of age (adult, child), gender, and number of dogs would align with the data the City of Calgary is recording on their trails.

VEHICLES

Vehicle interviews would record at minimum the following:

- Party size – how many people in their group.
- Have they entered the park previously that day
- Origin – what town/city did they come from that day
- Residence – what town/city is their permanent residence
- Did their visit have them pass any of the trail counters
- Date, time and location.

Additional questions could be included for both types of interviews to expand the metrics examined. For example, asking how far users traveled from their parked vehicles or the community would allow the calculation of a diffusion distance.

SECONDARY METRICS

FCPP staff identified a series of management activities that would further benefit from an understanding of the following secondary statistics:

- User types: percentage of park users that are recreational (joggers, walkers, s skateboarding, in-line skating), commuters, dog walkers and cyclists.
- Temporal use of the park: total number of visits per time and season (also per user group)
- Spatial distribution of visitors through the park (also per user group)
- Diffusion rates from parking lots and access points to other areas of the park

As noted in the literature review, opportunities to obtain visitor data to address these metrics may be a simple extension of the metrics already being employed to estimate total visitor use. For example, user types can be identified in both the field observations and interview component of the monitoring program. In addition, temporal use of the park per user group could be estimated for each user group from the field data collection and interviews. If a high level of accuracy is required for these secondary metrics the use of long term camera/video monitoring is desirable. One permanent camera/video set up per zone (six) would be a complementary monitoring method and could also allow for long- term calibration of counter data (error rate and exiting rate). Spatial distribution of visitors through the park could be assessed by adding a route description to the interview process. Alternatively, during the interviews visitors could be asked to draw their route on a palm pilot loaded with ArcPAD displaying a map of the FCPP with trails. Each route would be entered digitally allowing full scale analysis of route selection. For example some of the metrics that might be of interest to Park managers include key access and exit points, hotspots in the park , preferred trails per user group. Because interviews are a component of the proposed visitor monitoring program, the cost of purchasing palm pilots with ArcPAD would be a small expense in the overall budget .

Gaining an understanding of visitor diffusion rates from parking lots or key trail access points may be more complicated. It would require the placement of addition counters at key distances from parking lots and access point with in the park. The proposed method in this park focuses on visitors exiting from the park so counters are located near pathway access points, resulting in a bias toward short term users as opposed to movement through-out the park.

OPPORTUNITIES

The urban nature of FCPP opens the door to a number of opportunities that have the potential to enhance the visitor monitoring program;

- The volunteer capacity at FCPP is well established and supported as exemplified by the successful programs implemented by the Friends of Fish Creek Provincial Park. The Friends are involved in numerous volunteer based monitoring, maintenance and stewardship efforts to preserve the parks conservation integrity. The Friends of FCPP are currently monitoring water quality, beavers, amphibians and snakes within the park. In addition they are building single tracks for biker's through-out the park while reducing the impact on fragile environment with a program called Trail Care. They hold regular invasive species removal days and have established Park Watch a volunteer stewards program. The effective implementation of a visitor monitoring program in FCPP would greatly benefit from a volunteer component. Consultation with Friends of Fish Creek Provincial

Park prior to the implementation of a visitor monitoring program may greatly enhance the visitor monitoring program by building awareness of the importance of understanding visitor uses and patterns in the community as well as increasing the number of people available to implement the program.

- FCPP is situated within the City of Calgary which has an extensive city pathway system. The parks pathway system connects to city pathways on many of the parks borders, resulting in commuter flow through the park. The City of Calgary undertakes period monitoring of city pathways. A more detailed description of the city's current methodology is presented in Appendix 2. Both the City of Calgary and FCPP would benefit from some coordination of monitoring use on pathways. A formal data sharing agreement would benefit both agencies in their management efforts. The best starting point for this discussion would likely be the Pathways Division of the City Parks Department.

- FCPP is located in a city with a number of educational institutions, including the University of Calgary, Mount Royal College and the Southern Alberta Institute of Technology. The location of the park provides an ideal research site for students. The field of visitor monitoring is relatively new and there is immense potential for the development of student lead research projects that could greatly enhance the visitor monitoring program. For example;

    - Counter Evaluation: One of the recommendations from this report is an evaluation of infrared counters on pathways to determine the accuracy level. Concerns included the width of trails, difficulty in hiding the counters and the ability of counters to address large groups.
    - Assessing the commonalities in visitor numbers for access points related to specific residential communities within a zone. As previously noted, the large number of access points proposes a problem for monitoring, in the methods we recommend two permanent counter and one rotating counter within each management zone. In this approach we are assuming similar visitor numbers accessing the parks pathways from near by local communities. A pilot project to access if there are access hotspots is desirable.
    - Other student projects that focus on some of the secondary metrics identified by FCPP management, such as an analysis of route selection, understanding visitor behavior.

These three potential opportunities have the ability to greatly enhance FCPP ability to implement a sustainable visitor monitoring survey.

STEPS FORWARD

The following recommendations provide direction for moving forward with the implementation of a visitor monitoring program in FCPP.

- It is advisable that FCPP GPS the current trail system (including single track trails) and official access points. Additionally, GPS un-official trails and access points to enhance the parks ability to address or access these issues through the monitoring program.

- Consultation with the Friends of Fish Creek Provincial Park on opportunities to engage volunteers in the visitor monitoring program.
- Test different types of counters for reliability prior to a visitor monitoring program being implemented.
- Experimentation is an important component of the FCPP visitor monitoring program. The number of pathway access points complicates sampling protocols; a pilot project to test the visitor numbers from different access points from a community within a zone at FCPP is advisable. The pilot project should be implemented on one of the zone borders (representing access to one or two communities) to test the assumption that one permanent counter is representative of pathway access points from nearby communities. This pilot project could incorporate the testing of counters.
- Define what is meant by a visit to Fish Creek Provincial Park. Historically, the definition has used one 'visit' per person/group a day, only counting repeat visits by a user once per day. The definition of a visit tailors the nature of your repeat visit question used in the interviews and may eliminate the need for a repeat visitor coefficient.
- It might be beneficial to monitor visitor numbers in locations where future development may impact the visitation rate to the park. Additionally, as new developments are proposed (i.e. western corner of the park) and future access points are identified they should be incorporated into the visitor monitoring program.

REFERENCES

Arnberger, A. 2006. Recreation use of urban forests: An inter-area comparison. Urban Forestry & Urban Greening 4:135.

Arnberger, A., and C. Brandenburg. 2002. Visitor Structure of a Heavily Used Conservation Area: The Danube Floodplains National Park, Lower Austria. Pages 7-13 *in* Proceedings of Monitoring and Management of Visitor Flows in Recreational and Protected Areas.7-13.

Arnberger, A., Brandenburg, C. and A. Muhar 2001. An Integrative Concept for Visitor Monitoring in a Heavily Used Conservation Area in the Vicinity of a Large City: The Daunbe Floodplains National Park, Vienna. Pages 195-201 *in* Proceedings of Northeastern Recreation Research Symposium.195-201.

Arnberger, A., Haider, W. and C. Brandenburg. 2005. Evaluating Visitor-Monitoring Techniques: A Comparison of Counting and Video Observation Data. Environmental Management 36:317.

Arnberger, A., Haider, W. and A. Muhar 2004. Social Carrying Capacity of an urban park. *in* Proceedings of Policies, methods and tools for visitor management – proceedings of the second International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.

Arnberger, A. and B. Hinterberger. 2003. Visitor monitoring methods for managing public use pressures in the Danube Floodplains National Park, Austria. Journal for Nature Conservation 11:260.

Campbell, M. J. 2006. Monitoring Trail Use with Digital Still Cameras: Strengths, Limitations and Proposed Resolutions. Pages 317-321 *in* Proceedings of Exploring the Nature of Management. Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.:317-321.

Cessford, G. and A. Muhar. 2003. Monitoring options for visitor numbers in national parks and natural areas. Journal for Nature Conservation 11:240.

Cessford, G., Cockburn, S. and M. Douglas. 2002. Developing New Visitor Counters and their Applications for Management. Pages 14-20 *in* Proceedings of Monitoring and Management of Visitor Flows in Recreational and Protected Areas.14-20.

Cope, A., Doxford, D. and P. Probert. 2000. Monitoring Visitors to the UK Countryside Resources: the Approaches of land and Recreation Management Organizations to Visitor Monitoring. Land Use Policy 17(1) 59-66.

English, D. B. K., Kocis, S.K. and S.J. Zarnoch. 2004. Characteristics and Use Patterns of Visitors to Dispersed Areas of Urban National Forests. Pages 179-185 *in* Proceedings of Policies,

methods and tools for visitor management – proceedings of the second International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.179-185.

Hendee, J.C., Stankey, G. H. and R.C. Lucas. 1990. Wilderness Management. North American Press. Golden, Colorado.

Hennig, S. 2006. Going Ahead: From Visitor Monitoring to Recreation Use Monitoring - The Example of the EU Regional Recreation Area Berchtesgaden National Park/Salzburger Kalkhochalpen. Pages 322-327 *in* Proceedings of Exploring the Nature of Management. Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.:322-327.

Hornback, K. and P. Eagles 1999. Guidelines for Public Use Measurement and Reporting at parks and Protected Areas. IUCN, Gland Switzerland and Cambridge, UK 90pp.

Janowsky, D. G. B. 2002. Recreation in Urban Forests: Monitoring Specific User Groups and Identifying their needs with Video and GIS Support. Pages 296-301 *in* Proceedings of Monitoring and Management of Visitor Flows in Recreational and Protected Areas.296-301.

McClaran, M. and N. Cole. 1993. Packstock in Wilderness: Use, Impacts, Monitoring and Management. USDA Forests Service, General Technical Report INT-301. Intermountain Research Station, Ogden, Utah.

Peters, N. E. D. and Chad P. 2005. Estimating Visitor Use and Distribution in Two Adirondack Wilderness Areas. Pages 164-171 *in* Proceedings of Proceedings of the 2004 Northeastern Recreation Research Symposium. Gen. Tech. Rep. NE-326:164-171.

Ross, J. 2005. Visitor counters in parks: management practice for counter calibration. Pages 34 p. *in* W. Department of Conservation, editor. New Zealand Department of Conservation.

Rupf-Haller, R., Wernli, W. and F. Filli. 2006. Visitor Counting with Acoustic Slab Sensors in the Swiss National Park. Pages 72-77 *in* Proceedings of Exploring the Nature of Management. Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.:72-77.

Schneider, R. P., Toole, R. and C. Raborn. January 2005. Pedestrian and Bicycle Data Collection in United States Communities: Quantifying Use, Surveying Users, and Documenting Facility Extent. Pages 205p *in* O. o. N. a. H. E. United States Department of Transportation, editor. Federal Highway Administration and the Pedestrian and Bicycle Information Center University of North Carolina at Chapel Hill Highway Safety Research Center, Chapel Hill, NC 27599-3430.

S.Turner, D. Middleton, R. Longmire, M. Brewer, and R. Eurek. 2007. Testing and Evaluation of Pedestrian Sensors.. Texas Transportation Institute, Texas A&M University System College Station, TX 77843-3135. Report SWUTC/07/167762-1.

Watson, A. E. C., Turner, N., Reynolds, N. and Penny S. 2000. Wilderness Recreation Use Estimation: A Handbook of Methods and Systems. Pages 198 p. *in* U. S. D. o. Agriculture, editor. General Technical Report RMRS-GTR-56. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station., Ogden, UT.

Zarnoch, S. J. E., Donald B.K; and S. M. Kocis. 2005. An Outdoor recreation use model with applications to evaluating survey estimators. Pages 15p *in* F. S. U.S Department of Agriculture, Southern Research Station, editor. Southern Research Station, P.O.Box 2680, Asheville, NC 28802.

APPENDIX 1: AN OVERVIEW OF DIFFERENT TYPES OF TRAFX COUNTERS

Prepared by Elaine Lajeunesse

TRAFx Research Ltd. manufactures a variety of traffic counters designed for counting hikers, bicycles, on-road vehicles and off-road vehicles. All the counters run on the same electronic hardware, but employ different means of collecting the data, such as infrared scope, magnetic sensors and pressure pads.

All TRAFx counters run off batteries that can last from four months to a year depending on the counter configuration and surrounding temperature. All TRAFx counters can also record data as timestamps, hourly periods or daily periods. Data is reported in the same format for each counter type, therefore making working with the data simpler. A pocket, laptop or desktop PC can be used to setup, launch and download data from the counters. The TRAFx User Manual is very user friendly and gives systematic instructions on proper installation of all types of counters and how to use the software. In order to minimize the loss of data due to human error or technical malfunction, all counters must be checked and downloaded regularly. How often depends on the experience level of the person installing the counters as well as how busy the trail is. Depending on the counter's configuration, it can hold between 14,000 (using timestamps) and 448,000,000 (using hourly or daily periods) records. Most importantly, a researcher's first step in using TRAFx counters is to decide what is being counted, what type of counters are needed and where the best installation locations are for that particular purpose.

Counter data is imported into TRAFx Reporter software and can be reported and analyzed on an hourly, daily, weekly or monthly scale. The data can then be brought into other stats software such as EXCEL. The TRAFx Reporter software comes with the purchase of TRAFx counters and is very simple to use along with the TRAFx Reporter Manual. Along with other functions, this software allows data manipulation by adding an adjustment factor to minimize the amount of error (see the TRAFx User Manual and TRAFx Reporter Manual for further details on how to use this function properly).

INFRARED TRAIL COUNTER

The purpose of infrared trail counters is to count general traffic, such as hikers, runners, joggers, horses, snowmobiles or bicycles along trails. The counter has its electronics contained within a small waterproof box and an infrared scope that connects to the box. The scope and box can be attached to a tree or other structure. When necessary, two infrared scopes can run off one box.

www.trafx.ca

The infrared scope senses warm moving objects. It is always monitoring the amount of infrared energy within its field of view and when there is a significant change in this amount of infrared energy, then a count is recorded.

Proper function of the infrared counter requires careful instillation in the field. The infrared scope should be setup pointing towards the trail at the height of an adult's torso. Adjust accordingly depending on what type of user is being counted (e.g. point higher for horses). The scope has a range of 10 m, however functions most accurately when installed only 1-3 meters away from the centre of the trail. The accuracy rate can be as high as 95%-100% (Herrero J. Personal communication, Feb.2008) if the trail is narrow and hikers are in single file and spaced out (1-1.5m) when passing through the counter's detection zone. Conversely, if the trail is wide and users are traveling side-by-side or in tight groups, then the accuracy decreases to 75%-90% (Herrero J. Personal communication, Feb.2008). There are many factors that must be considered when installing and configuring the infrared trail counter such as trail width, surrounding vegetation, user flow, etc. A full range of these factors is discussed in the TRAFx User Manual.

The best use for the infrared trail counter is to count hikers, joggers, horses or slow cyclists along a trail. Turner et al (2007) found that the TRAFx infrared counter had no error in counting cyclists moving less than 10 mph, but had higher error rates for cyclists at 15 mph or faster. This is one place where the TRAFx bicycle counter would be more appropriate. The infrared counter is also not designed to count vehicles.

Advantages	Disadvantages
Can be virtually undetectable – if installed properly	Lens can become obscured by insects, moss, etc.
Can be set at different heights to count different kinds of users	Best accuracy is only on narrow paths where users are passing by in single file
Will count horses	Infrared scopes may be affected by extreme temperatures
The sensor is tiny and can be hidden on trees, walls or posts	Various environmental factors affect the sensor, finding the right location takes practice

* extracted from the article by The Access Company (2006)

TRAFx Pressure Pad Counter

The pressure pad is designed to be buried beneath a trail to detect traffic that steps directly on the pad. This type of counter needs to be on a narrow trail where people are in single file and have no choice but to walk or jog over top the buried pressure pad. It could also be used indoors by placing it under a doormat.

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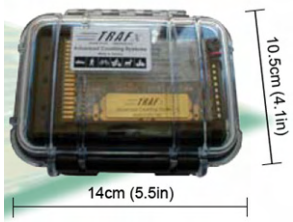
The Pressure Pad Counter is somewhat versatile. Multiple pressure pads, or one pressure pad and one infrared scope can be run by one field case. This allows the researcher to monitor, for example, two trails near a trail junction or in other complex situations (see the TRAFx User Manual for more information). These combinations can allow for a wide array of options in terms of study design.

Advantages	Disadvantages
Most accurate type of hiker counter	Must be used on narrow well-maintain trail
Can be used indoors to count the number of	Take longer to install and more difficult to

people walking through a doorway	maintain than the infrared counter
Affected by fewer environmental factors than the infrared counter	Are not suitable where the ground is very wet or muddy, or where the ground may freeze.

TRAFx Magnetic Counters



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The magnetic counter is designed to count mountain bikes, off-highway and on-highway vehicles. The same counter can do all of the above tasks by simply configuring the counter settings appropriately for each type of use. However, it cannot differentiate between each of these user types at the same time.

This type of counter detects when a metal object within the detection zone distorts the earth's magnetic field. The detection zone is approximately round with a maximum diameter of 10m. Metal objects that could set it off include vehicles, bicycles, ATVs, or other ferrous metal objects (with iron in them) including a shovel, hammer, etc.

This design can either be buried in the ground or snow, or placed in a roadside or trailside box. The electronics are protected in a waterproof Pelican case, but should be wrapped in a plastic bag or put into another waterproof container when buried to reduce the chance of breaking the seal with dirt and grit. It is important to install magnetic counters in a place where the traffic is not stopping or slowing down and not near an electrical transformer box or magnet. Likewise, temperatures around and below -20C are hard on the electronics and batteries. If installing a counter in this situation, bury the counter under about 20cm of snow to act as an insulator.

Mountain Bike Mode

When the magnetic counter is set in Mountain Bike mode (*MB*) it is capable of detecting bikes within a 1m radius in any direction of the counter. Therefore, if the trail is 1m wide or less, then the counter can be buried or otherwise hidden at the side of the trail. However, if the trail is 2m wide, then the counter must be buried in the middle of the trail. Bury the counter about 10cm deep.

When setting up a bike counter it is important to know the approximate speed of the bicycles traveling at that section of the trail. This will allow you to set the *delay* appropriately allowing for proper function.

Advantages	Disadvantages
Can hold over 400,000,000 records when set on hourly or daily periods, and batteries can last up to 7 or 8 months	Can be triggered by other ferrous metal objects other than bicycles
Resilient to most environmental factors	Trail must be relatively narrow so that bikes pass within 1m of the counter
Small and easy to hide	
Settings can be changed to convert counter to count other vehicle types	Two or more bikes in the detection zone at one time may be counted as one

Off-Highway Vehicle Mode

Off-highway vehicles include ATVs, dirt bikes, quads, etc. While in Off-Highway Vehicle mode (*OHV*) the magnetic counter has a detection radius of 1m in all directions. The OHV will be counted if any part of it enters into the detection radius. The *OHV* mode is very similar to the mountain bike mode in that it functions on single lane trails or backroads. The software differs slightly for example to allow for higher speeds. Advantages and disadvantages are the same as with those from the mountain bike mode above.

Vehicle Mode

The Vehicle mode (*VEH*) allows the researcher to collect data about a single lane of traffic, double lanes of traffic and/or an estimate of the percentage of smaller vehicles (e.g. passenger vehicles) to large vehicles (e.g. logging trucks, busses, etc.) using a road. There are five different modes within the *VEH* mode that allows for each of the above specifications. The single lane counting modes have detection radiuses of 3m, 2.4m or 1m. The double lane settings have detection radiuses of 2.4m or 5m. Each of these is used for different road circumstances and must be installed in different proximities to the road (See TRAFx User Manual for more details).

Advantages	Disadvantages
Can hold over 400,000,000 records when set on hourly or daily periods, and batteries can last up to 7 or 8 months	Can be triggered by other ferrous metal objects other than bicycles
Resilient to most environmental factors	Some single lane settings may detect some large vehicles in the opposite lane
Settings can be changed to convert counter to count other vehicle types	Requires practice and testing to ensure proper settings and location
Many adjustable settings allow researcher to specialize the counter for each particular location	If buried, can be dug up or disturbed by ploughs or graters working on the road
Small and easy to hide	
Can count one or two lanes of traffic	

References

The Access Company. 2006. *Extracts from The Access Company's report to the Countryside Agency on Evaluation of People Counters for National Trails*. Accessed Feb.25, 2008. http://www.nationaltrail.co.uk/uploads/people%20counter%20info%20summary.pdf

Kiser B.C. 2007. Assessing the Reliability of Computer Simulation Modeling for Monitoring and Managing Indicators of Wilderness Solitude in Great Smoky Mountains National Park. Thesis for a Master of Science in Forestry. Virginia Polytechnic Institute and State University. Blacksburg, VA.

Lawson, S. R., Hockett, K., Moldovanyi, A., Kiser, B.C., and Bullock, S. (2006). *Monitoring Visitor Use on the Gateway Trail, Blacksburg, Virginia using TRAFx Trail Traffic Counters*. Final Report. Department of Forestry. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Lawson, S. R., Hockett, K., Moldovanyi, A., Kiser, B.C., and Bullock, S. (2006). *Monitoring Visitor Use on the Poverty Creek Trail, Jefferson National Forest, Virginia using TRAFx Trail Traffic Counters*. Final Report. Department of Forestry. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Manley P.N., Stumpf J.P., Davis W.B., Craig D. and Mick K. 2004. Pilot Test of Programmatic Approach to Monitoring Winter Conditions and Trends of Wildlife Populations and Habitats in Off-Highway Vehicle Use Areas: First Winter Pilot Test Winter 2002-2003. Final Report. Pacific Southwest Research Station, USDA Forest Service. Davis, CA.

Ross J. 2005. *Visitor counters in parks: management practice for counter calibration*. Department of Conservation Technical Series 33. Department of Conservation. Wellington, New Zealand.
Schneider R., Patton R., Toole J. and Raborn C. 2005. Pedestrian and Bicycle Data Collection in United States Communities: Quantifying Use, Surveying Users, and Documenting Facility Extent. Federal Highway Administration Office of Natural and Human Environment. Chapel Hill, NC.

Turner S., Middleton D., Longmire R., Brewer M. and Eurek R. 2007. *Testing and Evaluation of Pedestrian Sensors*. Texas Transportation Institute. Texas, USA.

APPENDIX 2: CITY OF CALGARY PATHWAY MONITORING PROTOCOLS

A large part of trail use within Fish Creek Provincial Park will originate on the City of Calgary's pathway network. Any monitoring programs conducted on the City's pathways are of interest and adversely any information collected within the park will also be of interest to the City.

In conversation with Kevin Cross, of the city's Business & Market Research department, it was indicated that to date trail surveys have been completed in the form of a field observation study at over twelve selected sites on the more heavily used pathways within the city and generally ones that are cleared of snow and ice within 24 hours of a snowfall.

At each of the selected sites a reference point was established and city field staff recorded observations of users as they passed through this point of reference and did not engage users in any form. Observation periods were conducted on two weekend days and two week days per month from November 2006 to February 2007. The daily observation period was from 7:00 am to 6:00 pm.

The following information was recorded for each observation:

- User's activity - Walking, Cycling, Running, Inline Skating, Skateboarding, Wheelchair, Other
- User's Direction - North, South, East, West
- User's Age (estimated)- Child, Adult, Unknown
- User's Gender (estimated) - Male, Female, Unknown
- Presence of a Dog - Simply a tick box if a dog was present
- Number of dogs - An open-ended box if there was more than 1 dog present

It is important to note that the survey makes a distinction between users and uses. For the purposes of the city's survey they record uses, not individual users, which provide a figure that indicates total usage and may count a single individual multiple times if they were to pass through the observation point more then once in the eleven hour observation period.

Of these studies only one, the Parkland Pathway Study, is in the direct vicinity of the park. However, data collected on all city pathways could be used to study trends in trail use. While each agency has their own purpose and data requirements from their studies any opportunity to overlap methodologies is recommended along with some form of data sharing agreement be entered into with the City so that both agencies can benefit from the efforts of the other. The best starting point for this discussion would likely be the Pathways Division of the City Parks Department.