

**A Preliminary Investigation of Wolves in the Long Beach Unit
of Pacific Rim National Park Reserve**

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INTRODUCTION

An important challenge for all national parks in Canada is to know what flora and fauna occur within their boundaries, know which ecosystems they use, and know how these species and habitats change with respect to time (Parks Canada 2003). As in other national parks in Canada, management efforts in Pacific Rim National Park Reserve (PRNPR) are focussed on maintaining intact ecosystems of native species (Parks Canada 2003). Pacific Rim National Park Reserve, created in 1970, is located on the west coast of Vancouver Island, BC. PRNPR is composed of three units: the West Coast Trail (WCT) that stretches from Port Renfrew to Bamfield, the Broken Group Islands (BGI) in Barkley Sound, and the Long Beach Unit (LBU) located between the villages of Ucluelet and Tofino. Some species of interest in PRNPR are the gray wolf (*Canis lupus nubilus*), the Columbian black-tailed deer (*Odocoileus hemionus columbianus*), the cougar (*Puma concolor vancouverensis*), and the Vancouver Island black bear (*Ursus amarus vancouveri* Hall). This preliminary investigation will deal primarily with the gray wolf. The other three species will be looked at secondarily in situations that involve the ecology of the gray wolf.

Wolves, like other large carnivores, are often viewed as the essence of unspoiled wild places in Canada. Many thousands of Canadians and visitors make pilgrimages to wild areas in an attempt to see wolves in their natural habitat (Hummel 1990). The Long Beach Unit of PRNPR is one example of a wild place that attracts visitors hoping to see or hear a natural population of wolves. Although numerous studies of wolf ecology and population dynamics have been conducted in North America (BC Resources Inventory Branch 1998), little information is known about the wolves in and around the LBU.

This preliminary investigation of wolves in the Long Beach Unit will consist of a sign-survey and a review of the PRNPR wildlife database. The sign-survey will focus on documenting presence of wolves, deer, cougar and bear throughout the LBU during November and December 2003. The wildlife database review will focus on estimating the number of wolves occupying the LBU and their diet. The findings of both investigations

will be combined in an attempt to guide future, most extensive studies on wolf ecology in PRNPR.

Sign-Survey

Preliminary surveys should be conducted prior to commencing large-scale inventory studies of wolves (BC Resources Inventory Branch 1998). One method of preliminary survey is conducting scat and track transects. Surveys of scat and tracks are simple, inexpensive, and relatively quick (BC Resources Inventory Branch 1998).

Scat and track surveys can have different levels of intensity. They can be used to determine a presence versus not detected (but possible), or they can be used to measure relative abundance in different areas (BC Resources Inventory Branch 1998). Since there is only believed to be a single pack of wolves in the LBU (B. Hansen, pers. comm. 2003), their relative abundance should be the same throughout the entire area. Therefore, this survey will be at the intensity of presence/not detected.

Presence/not detected surveys do not require a strict sampling design, however, survey effort should be distributed to maximise chances of encounter. Both temporal and spatial effort should be observed to allow presence surveys to be used as a precursor to future, more intensive surveys that assess wolf abundance (BC Resources Inventory Branch 1998).

This sign-survey investigation of the LBU will attempt to gather preliminary information that focuses on (1) the presence of wolves, and how it overlaps with the presence of deer, cougar, and black bear; and (2) the location of any potential den or rendezvous sites.

Presence of Wolves, Deer, Cougars, and Black Bears

Wolves, like other top carnivores, are not habitat specific to a vegetation or ecosystem type (Mladenoff et al. 1995). Therefore, detection of their presence in the sign-survey should be widely distributed with no preference for habitat type.

Ungulates are the primary prey species of wolves (Spaulding et al. 1998; BC Resources Inventory Branch 1998; Darimont et al. 2003), so a significant overlap in the presence of wolves and Columbian black-tailed deer can be expected in the sign-survey. A significant overlap in presence of wolves and cougars is also likely as cougars also prey primarily on ungulates (BC Resources Inventory Branch 1998). However, because cougars are highly secretive and sparsely distributed, detection of their presence may be difficult (BC Resources Inventory Branch 1998). Black bear presence should overlap with wolf presence somewhat because black bears are plentiful in PRNPR (B. Hansen pers. comm. 2003). Any overlap in presence of the two species is likely a result of them being sympatric, and not a result of major interactions between the two.

Potential den and rendezvous sights

Prediction of potential den and rendezvous sites is necessary to ensure protection of these areas during the breeding season (Theuerkauf et al. 2003). This can be difficult however, because den site habitat use is one of the least understood aspects of wolf ecology is (Norris et al. 2002).

Den sites are differentiated from rendezvous sites by their temporal pattern of use and the presence and size of pups (Ballard and Dau 1983). Wolves usually attend den and rendezvous sites during the day (Ballard et al. 1991; Mech and Merrill 1998), and are known to use the same den sites over several consecutive years, or intermittently over long periods of time (Mech and Packard 1990). A study of den and rendezvous site characteristics in southcentral Alaska found that wolves selected sites with south and/ or east aspects and sandy soil (Ballard and Dau 1983). Theuerkauf et al. (2003) found that den sites in the Bialowieza Forest (Poland) were located further from villages, forest edges, and heavily used roads than random points. Intolerance to human activity around den sites appears to be a common trend amongst wolves (Thiel et al. 1998). However, there have been some reports of higher levels of tolerance to human activity, especially when in protected areas such as parks (Thiel et al. 1998).

PRNPR Wildlife Database Information

A Microsoft Access database is used by PRNPR staff to store collected information on wildlife observations in the park. The database contains records of observations for all kinds of animals, both marine and terrestrial. For the purpose of this preliminary investigation, only those entries regarding wolves, deer, cougar, and black bear will be examined. Not all records are complete, but those that are contain information on time of day, date, location, habitat, and a description of the event. The database contains records from park staff, volunteers, visitors, and local residents.

All records are classified into one of six categories: observation of sign only, observation general, observation vessel or vehicle, encounter people, encounter place, or encounter vessel or vehicle. This investigation will focus on detection of animals' presence through observations. Encounters, which involve interaction between wolves and humans, are investigated further in the complimenting paper "A Case History of Wolf-Human Encounters in and Around Pacific Rim National Park Reserve".

This database investigation will attempt to gather preliminary information that focuses on (1) the number of wolves in the LBU, and (2) the diet of the wolves.

Number of wolves in the LBU

Gray wolves are considered to be highly territorial animals that maintain stable pack territories throughout the year (Cook et al. 1999). The Long Beach Unit of PRNPR, which has a terrestrial area of 70.33 km² (Parks Canada 2003) is smaller than even the lowest estimates of home range size for gray wolves. The Resource Inventory Branch of the BC Ministry of Environment, Lands and Parks (1998) found gray wolf home ranges in a variety of North American studies to range from 100 km² – 2541 km². Hummel (1990) reported average home range size for gray wolves in Canada to range from 146 km² – 1,390 km². This means the LBU is likely to small to comprise 100% of a pack's home range. Due to its' small size and the fact that it is mostly contained on a penninsula, the LBU most likely falls into a larger home range of a single wolf pack. If we assume this to be true, most signs of wolves in the LBU will be from this single pack. Hence,

reviewing the database for observations of multiple wolves or signs of multiple wolves over the past year will result in a strong estimate of the number of wolves in the LBU.

Diet of the wolves

Wolves are carnivores that predominately prey on adult ungulates (Spaulding et al. 1998; BC Resources Inventory Branch 1998; Darimont et al. 2003). The most abundant ungulate species in the LBU is the Colimbian black-tailed deer (*Odocoileus hemionus columbianus*). Signs of Roosevelt elk (*Cervus elaphus roosevelti*) have also been observed on rare occasions. However, if two or more large prey species coexist in the same area, wolves will concentrate their efforts on the smallest or easiest to catch (Mech 1970). Beavers, lagomorphs, and microtine rodents such as mice and voles comprise most of the remaining diet (Spaulding et al. 1998; BC Resources Inventory Branch 1998). Birds may also occupy a portion of a wolf's diet, particularly between periods of ungulate kills (Spaulding et al. 1998). Although wolves are primarily predators, they will also scavenge carrion (Darimont et al. 2003).

During September and October of 2001, Darimont et al. (2003) observed direct and indirect evidence of gray wolves preying on salmon. Previous studies had identified salmon remains in wolf scat, but could not differentiate between scavenging and predation. It is suggested that wolves commonly prey on salmon in areas where the two species are sympatric, and that salmon may be an important seasonal food resource (Darimont et al. 2003). Salmon are known to spawn in a number of streams in and adjacent to the LBU.

METHODS

Sign-Survey

Between November 10, and December 11, 2003, I surveyed a total of 13 transects throughout the Long Beach Unit (See Appendix 1 Predator-Prey Survey Airphotos). Most transects were examined once, with the exceptions of Florencia Bay, Wickaninnish Dunes, Schooner/Incinerator West, and the Goldmine Trail which were all examined twice. These areas have been identified by park staff to have frequent occurrences of wolf

observation and were therefore examined twice. Transects were conducted on old logging roads, trails, beaches at low tides, sand dunes, and airport runways and ranged in length from 1.156 km to 14.522 km. I divided transects into sections to identify changes in surrounding habitat and terrain type. I chose the locations of the transects so they would be distributed throughout the LBU in an attempt to maximise chances of encountering signs of wolf activity (BC Resources Inventory Branch 1998).

I walked each transect section slowly and recorded data of the habitat and tracking conditions for each section. I classified section types as old roads, trails, beach, sand dunes, or airport runways. I defined the surrounding habitat type as either closed logged forest, open logged forest, sitka spruce, second growth forest, bog forest (pine), cedar-hemlock closed, cedar-hemlock open, airport – disturbed lands, or sand dunes. I described tracking conditions as clear, covered with leaf litter, or flooded, and rated tracking conditions as poor, fair, good, or excellent. I recorded transects with frequent weigh points using a Garmin GPS 12XL. As I walked each transect slowly, I looked for signs of wolf, black-tailed deer, cougar, and bear.

For documenting presence of wolves I was primarily looking for scats and tracks, however, I also looked for scratching, and kill sites. For deer I looked only for scats and tracks. When I encountered any of these signs I recorded their locations (UTM's) with a weigh point, and photographed them with a digital camera if they were in good condition. When I encountered wolf tracks in good or excellent condition I measured them according to proper procedure (Cabrera 2004). This included the track length and width, and the heel pad length and width for all four paws. I also measured the stride length and width. I attempted to age tracks using knowledge of the last day of heavy rain as <1day, <3days, <7days, or >7days. I collected all observed wolf scats for future diet analysis and DNA testing. I considered scat to be <1day if it was very moist and gave off heat, <3days if it was still somewhat moist, <7days if it was beginning to dry, and >7days if it was dried, or leached. Later I calculated the number of wolf scats per kilometre for each transect.

I followed the same procedure as above for cougar scats and tracks, however, cougar scat can be very similar to that of wolves and may be difficult to tell apart (BC Resources Inventory Branch 1998). Therefore, positive identification of cougar scat, in the absence of tracks, may require DNA testing. For black bears I simply noted if signs of their presence (tracks and/or scats) were observed and recorded their locations with a weigh point.

While I walked each transect I also looked for holes that were large enough to be external openings of potential den or rendezvous sites. A study of den characteristics in southcentral Alaska found the mean height and width of large holes to be 42 ± 9 cm by 51 ± 13 cm, and small holes to be 23 ± 6 cm by 28 ± 7 cm (Ballard and Dau 1983). To indicate if any potential den or rendezvous sites were active I looked for bones, scat, trampled vegetation, and tracks in the immediate area (Norris et al. 2002).

PRNPR Wildlife Database Information

Number of wolves in the LBU

A total of 58 records involving wolves in the LBU of the PRNPR wildlife database for 2003 were examined. Records were divided into observations of single wolves and those of multiple wolves.

Diet Analysis

The PRNPR wildlife database was queried for all records concerning wolf diet. All three units of PRNPR were included in the query to increase the total number of observations. Records included observations of wolves chasing prey or feeding on a kill, remains of prey in scat, discovered kill sites, and observations of wolves scavenging on human food or garbage. Observations of wolves attacking dogs were also included because wolves are known to eat dogs (Fritts and Paul 1989).

RESULTS

Sign-Survey

Presence of Wolves, Deer, Cougars, and Black Bears

There was one direct observation of two adult sized wolves on the airport transect from about 130 m away. Both animals were fairly dark, although not black, with bright white muzzles. One animal, likely a female, was about the size of an average German shepherd. The other, likely a male, was 20-25 cm taller and much huskier. Both animals were lying down on the edge of the runway when first spotted. The observation lasted about 15-20 seconds and ended when the animals fled into the adjacent forest. The larger wolf fled first, with the smaller one following a few seconds later.

Presence of wolf tracks and/or scats were detected in 9 of the 13 transects (Table 1).

Presence of deer was detected in 6 of the 13 transects (Table 1). Presence of cougar was detected in 1 of the 13 transects (Table 1). Presence of black bear was detected in 8 of the 13 transects (Table 1). Of the 6 transects where presence of deer was detected, 4 (66.6%) also had positive detection for wolves (Table 1). The only transect that had cougar presence detected also had detection of wolves (Table 1). Of the 8 transects where presence of black bears was detected, 6 (75%) also had positive detection for presence of wolves (Table 1).

Table 1. Summary of presence detection for wolf, deer, cougar and bear in the LBU.

Transect	Wolf	Deer	Cougar	Bear
Airport	Detected	Not Detected	Not Detected	Detected
Combers/Greenpoint	Detected	Not Detected	Not Detected	Not Detected
Florenca Bay	Detected	Not Detected	Detected	Detected
Goldmine Trail	Detected	Not Detected	Not Detected	Detected
Wickaninnish Dunes	Detected	Not Detected	Not Detected	Detected
Old Army Road	Detected	Detected	Not Detected	Detected
Incinerator West/Schooner	Detected	Detected	Not Detected	Detected
KCR Road	Not Detected	Not Detected	Not Detected	Detected
Old Overflow CS	Not Detected	Detected	Not Detected	Not Detected
Information Trail	Not Detected	Not Detected	Not Detected	Detected
Willowbrae/Halfmoon Bay	Detected	Detected	Not Detected	Not Detected
Incinerator E./Long Beach	Not Detected	Detected	Not Detected	Not Detected
Radar Beaches	Detected	Detected	Not Detected	Not Detected

Track Measurements

Measurements were made on nine sets of wolf tracks and one set of cougar tracks (Table 2). Six of the nine sets of wolf tracks were considerably larger than the other three and were likely from an adult male (Table 2). The mean length and width of the larger six sets were 10.1 cm by 8.5 cm for track 1, 9.2 cm by 7.9 cm for track 2, 10.2 cm by 8.0 cm for track 3, and 9.2 cm by 7.4 cm for track 4 (Table 2). The three smaller sets of tracks may be from an adult female or juvenile. They had a mean length and width of 8.8 cm by 7.5 cm for track 1, 8.4 cm by 6.5 cm for track 2, 8.4 cm by 7.1 cm for track 3, and 8.6 cm by 6.6 cm for track 4 (Table 2). The cougar tracks had a length and width of 7.3 cm by 7.6 cm for track 1, 7.6 cm by 7.0 cm for track 2, 7.1 cm by 7.0 cm for track 3, and 7.4 cm by 7.6 cm for track 4 (Table 2).

Scat Transects

Wolf scats were found on 7 of the 13 transects with a total of 22 scats (Table 3). The Airport transect had 14 scats with mean of 0.96 scats/km (Table 3). The Incinerator West/Schooner transect had 3 scats with mean of 0.70 scats/km (Table 3). The Goldmine Trail transect had one scat with a mean of 0.61 scats/km (Table 3). The Combers/Greenpoint transect had one scat with mean of 0.52 scats/km (Table 3). The Willowbrae/Halfmoon Bay transect had one scat with mean of 0.49 scats/km (Table 3). Both the Florencia Bay and Old Army Road transects had one scat each with a mean of 0.24 scats/km (Table 3).

Table 3. Summary of wolf scat observations in the LBU.

Transect	Length (km)	# of Scats	Scats/km
Airport	14.522	14	0.96
Combers/Greenpoint	1.917	1	0.52
Florencia Bay	4.177	1	0.24
Goldmine Trail	1.647	1	0.61
Wickaninnish Dunes	2.370	0	0
Old Army Road	4.186	1	0.24
Incinerator West/Schooner	4.284	3	0.70
KCR Road	1.785	0	0
Old Overflow CS	1.156	0	0
Information Trail	1.74	0	0
Willowbrae/Halfmoon Bay	2.029	1	0.49
Incinerator Esat/Long Beach	3.942	0	0
Radar Beaches	2.556	0	0

Potential den and rendezvous sights

There were no potential den or rendezvous sites discovered on any of the 13 transects.

PRNPR Wildlife Database Information

Number of Wolves in the LBU

There were a total of 58 records of wolves in the LBU for 2003. Forty-two records (72.4%) were observations of individual wolves or observations of signs of individual wolves. Ten records (17.2%) were observations or observations of signs of two wolves. There were two records (3.4%) of observations of four wolves and one record (1.7%) of an observation of five wolves. There were three records (5.1%) where the number of wolves was unknown. These records were primarily from reports of wolves attacking dogs, where it was unclear of how many wolves were involved.

Diet Analysis

There were a total of 49 records in the PRNPR wildlife database from April 1978 to November 2003 regarding wolf diet. Records consisted of direct observation of wolves chasing prey or feeding on prey, remains of prey in scat, discovered kill sites, and observations of scavenging on human food or garbage. There were 20 records in the

database involving dogs, 18 records involving deer, 4 records involving black bears, and 2 records involving human food or garbage. There were also individual records involving mice, crab, raccoon, river otter, and whale.

DISCUSSION

The results of this preliminary investigation indicate that there is probably only one pack of wolves, consisting of an adult male and an adult female, in the LBU of PRNPR. The first indication of this is from the database review. Of the 58 records of wolves in the database for 2003, 52 (89.6%) were for one or two wolves. Only 3 of 58 (5.1%) records were for more than two wolves. Of these, two records were from park visitors who saw “several sets of eyes glowing in the dark”. Although these records cannot be dismissed completely, they cannot be confirmed either. The third record consisting of more than two wolves was an observation of tracks only. It is possible that this record may actually be from dogs, or from two wolves that were very active in the area.

The second indication that there are likely only two wolves in the LBU comes from direct observation of two wolves on the Airport transect while conducting the sign-survey. Both animals were adult sized, with one larger than the other. The size of the larger wolf indicates it is a male, with the smaller one likely a female. Although a single observation of these two wolves does not mean they are the only members in the pack, it does provide additional information to support this.

The third indication that there are likely only two wolves in the LBU comes from measurements of tracks taken while conducting the sign-survey. There were no observations of more than two sets of wolf tracks. Of the nine sets of wolf tracks measured, six were much larger and likely were those of the adult male observed on the Airport transect. The other three sets of tracks were smaller and were likely those of the adult female observed on the Airport transect. Because pack size and survival rate of pups in canids are generally considered to have a positive correlation, the low number of wolves in the LBU should be of concern (Pletscher et al. 1997).

If we accept the assumption that there are only two wolves in the LBU of PRNPR, we can also assume that all signs of wolf activity found in the sign-survey came from these two wolves. Therefore, the results of the sign-survey are an indication of this pack's presence throughout the LBU. Signs of recent wolf activity were found in 9 of 13 (69%) transects in the one month period from November 10 to December 11, 2003. Although presence of wolves was not detected on the KCR Road transect, Old Overflow transect, Information Trail transect, or the Incinerator East/Long Beach transect, this does not necessarily mean that these areas are not used. In fact, wolves have been observed before at the Old Overflow campsite and near Long Beach (B. Hansen pers. comm. 2003). Peters and Mech (1975) showed that free ranging wolves reach most parts of their territory at least once every three weeks and probably sooner. As previously stated, the LBU is likely too small to comprise 100% of a pack's home range. Therefore, we can reasonably predict the two wolves currently occupying the LBU traverse most of its' 70.33 km² in less than three weeks.

The results of the sign-survey for deer, cougar and black bear were in line with what might be expected. Presence of deer was found on 6 of 13 transects. Of these 6 transects, 4 (66.6%) also showed signs of wolves. This relationship is somewhat expected as ungulates are the primary prey species of gray wolves (Spaulding et al. 1998; BC Resources Inventory Branch 1998; Darimont et al. 2003). There was only one positive detection of cougar activity during the sign-survey. Because cougars are sparsely distributed and are highly secretive, the low detection of their presence in the LBU was also expected (BC Resources Inventory Branch 1998). Signs of black bears were detected on 8 of 13 transects, 6 (75%) of which overlapped with detection of wolf signs. The high overlap in black bear and wolf presence is probably a result of the high levels of black bear activity in the park. Sightings of black bears are a common occurrence in PRNPR (B. Hansen pers. Comm. 2003). Some of the overlap may also be attributed to wolf predation on black bears, as there were four records found of wolves preying on black bears in the wildlife database.

Of the 49 records reviewed in the wildlife database concerning wolf diet, nine different food sources were observed. Records involving dogs were the most common (20 of 49). Although wolves are known to prey on dogs (Fritts and Pual 1989), the high number of these records is probably due to the fact that attacks on dogs are more likely to be reported. The second most commonly reported food source was deer (18 of 49). The high number of records involving wolves preying on deer is consistent with previous studies on wolf diet (Spaulding et al. 1998; Darimont et al. 2003). The observations involving wolves preying on mice and scavenging on human food or garbage are also consistent with literature on wolf diet (Spaulding et al. 1998; Darimont et al. 2003). The records involving black bear, crab, raccoon, river otter, and scavenging on whale bones are of particular interest. There was no information found in the literature for wolf predation on these species. It is likely that these species only comprise a small portion of the wolves diet. There were no observations of wolves feeding on birds or salmon in PRNPR, but it is very likely that they occasionally do.

Although levels of use and selection cannot be determined from a survey of presence/not detected, inferences may be drawn from gathered information. One such inference would be a potentially higher level of use or importance of the area around the airport to the wolves. The first piece of information to support this is that the only direct observation of wolves during the sign-survey was at the airport. The second piece of supporting information is the high levels of wolf scat found on the Airport transect. Of the 22 scats found, 14 (63.6%) were on the airport transect (Table 3). The airport transect also had the highest density of scats at 0.96 scats/km (Table 3). It should be noted that the high density of scat on the airport runways may be partly due to an increase in detection caused by the absence of vegetative cover. The second highest density of scats, 0.70 scats/km, was found adjacent to the airport on the Incinerator West/Schooner transect where three scats were found (Table 3).

As mentioned above, prediction of potential den and rendezvous sites is necessary to ensure protection of these areas during the breeding season (Theuerkauf et al. 2003). Because pack size and survival rate of pups in canids are generally considered to have a

positive correlation, the low number of wolves in the LBU should be of concern (Pletscher et al. 1997). Identification of den and rendezvous sites is essential to ensure future success of the wolves in the LBU. Because wolves are usually intolerant to human disturbances around den sites (Thiel et al. 1998), the identified site(s) can be protected. Restriction of certain human activities within certain distances of den and rendezvous sites is a common management practice (Thiel et al. 1998). In Wisconsin, the Department of Natural Resources recommends closing areas within 100 metres of den sites and restricting use between 100 and 800 metres from March 1 to July 31 (Thiel et al. 1998).

In summary, there are likely two adult wolves currently in the LBU of PRNPR - one male and one female. They likely traverse the entire area of the LBU, and possibly more, in less than three weeks. They have a wide variety of prey species in their diet, but prey primarily on Columbian black-tailed deer. It is not known where these wolves den, or if their den site is within the park boundary. To better manage for these wolves, future studies should focus on aspects of den ecology and on their main food source – the Columbian black-tailed deer. If a more intensive sign-survey was conducted during the spring of 2004, the probability of detecting a den site may increase. Hopefully this report will provide park managers with some baseline information on wolves in the LBU and help to guide them in developing future studies.

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