BC Bear Viewing: An Analysis of Bear - Human Interactions, Economic and Social Dimensions With Recommendations for Best Practices

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Contents

1. Introduction

The Pacific mid-coast region of British Columbia has a mild, hypermaritime climate that places its biological productivity in the range of tropical rainforests. The low elevation river valleys are characterized by rich alluvial soils, further enriched annually by upstream nutrients flooding over the stream banks of the floodplains and distributing rich silt to the roots of giant Sitka spruce and Western hemlock forests.

Unique to Canada's rivers flowing into the Pacific (but not north into the Mackenzie River, for example) are the massive contributions of nutrients from the bodies of 5 species of anadromous salmonids. This flux of organic matter has long been recognized as essential to the production of young salmon but the additional fertility increment to riparian and upland forests is currently under intense investigation (Bilby *et al.* 1996, Cederholm *et al*. 1999, Willson *et al.* 1998). The crucial role of migratory salmon in supporting dense populations of grizzly bears has recently been demonstrated for a large sample of coastal bears in Alaska (Miller *et al.* 1997). A strong statistical correlation between the per cent of meat, mainly salmon, in the diet and bear density (Hilderbrand *et al*. 1999) confirmed earlier speculation by Miller *et al*. (1997) that Alaskan's most dense bear populations also had high salmon diets and were among the most dense on a world-wide basis.

Grizzly or brown bears on the coast of British Columbia and Alaska are the same species as the grizzly bears of the Rocky Mountains. However they are much bigger and have higher population densities because of abundant salmon (Hilderbrand *et al*. 1999). Alaskan population densities vary from a maximum of 550 bears /1000 km^2 in Katmai National Park where salmon are seasonally available to less than 5 bears /1000 km^2 for mountain bears of the eastern Brooks Range on a marginal food base (Miller *et al*. 1997).

Coastal Alaskan bears forage widely for fish. At Brooks River in Katmai National Park & Preserve bears feed on sockeye salmon starting in late June as soon as they enter rivers to spawn (Gilbert 1995). At this time, when the salmon are rich in fat, a fuel used to ascend rivers, build redds, mate and defend their nests against others, hundreds of bears have daily access to the fish. Bears feed on these salmon which have 50% of their caloric value in fat. From Katmai's Brooks falls bears migrate with the fish to their spawning beds and, later, back to the stream mouths where the dying fish are again consumed in prodigious numbers. The end result of this movement is a pattern of deposition of fish pieces and feces over the landscape. Studies of the fate of salmon carcasses in the state of Washington showed that 22 species of mammals and birds carried salmon pieces into the forest (Cederholm *et al*. 1989). The nitrogen in the fish parts and bear feces and urine is incorporated into plants and animals in the forest and in the streams thereby enriching the ecosystems there. Bears are one of the largest contributors because of the massive amount of material that they consume and the great distances that they move.

Many of the Alaskan sites with the highest bear densities have become popular, and profitable, tourist destinations. More recently a bear viewing/eco-tourist industry has begun to develop in British Columbia.

In March 1998 bear viewing policy and guidelines were presented in which the government expressed support for the use of bears for viewing. This study addresses the impacts of viewing on bears and presents recommendations for further research and the sustainable development of bear viewing in the province.

2. Methods

In this, the second year of study of the impacts of viewing on bear behavior in the Glendale Cove area of Knight Inlet, British Columbia, Canada (Figure 2.1), observations were structured to supplement 1999 observations and address issues which arose during that season (Nevin and Gilbert 2000).

The research design followed established field techniques (Nevin and Gilbert 2000, Chi 1999, Chi and Gilbert 1995, Olson *et al*. 1990). Data were collected at the Glendale spawning channel in a rigorous sampling design with the following measures:

MEASURE	METHOD
bear numbers	scan sampling
bear identification	photo-identification
age/sex class	photo-identification
time budgets	scan sampling
fish capture	continuous observation
social/aggressive interactions	scan sampling
human caused disturbance	continuous observation

As with Olson (1993), no significant difference was found between time budgets estimated by scan sampling and those recorded by continuous focal animal sampling during the 1999 field season. For this reason effort was concentrated solely on scan samples in 2000. However, focal animal sampling was performed simultaneously with scan samples when observers overlapped, and bears were present, to provide data for calibration of fish capture rates and to allow testing for observer bias.

With the exception of fish capture data, which had a normal distribution, all data were non-normally distributed (Zar 1996). Since extreme transformations to normality were inappropriate in this data set, non-parametric statistical tests were used. It should be noted that in preparation of this report much of the data presented by Nevin and Gilbert

(2000) has been reanalyzed. Changes in the data presented represent minor changes in the analysis performed, not substantive changes in our findings.

In order to address a lack of baseline data on the socioeconomics and preferences of ecotourists—specifically bear viewers—in British Columbia, the Knight Inlet Lodge guest survey was designed following Bailey (1987), Babbie (1990), and Henderson (1991). Since quality case studies are difficult to carry out, questions were carefully worded to minimize ambiguity, sensitivity, and leading respondents toward particular answers (Yin 1984, Bailey 1987). Closed-ended questions and Likert scales were used whenever possible for answer clarity and ease of analysis (Bailey 1987). The survey's 32 questions focused on three primary types of information:

- Guest demographics, including age, gender, country of origin, education, income, and travel costs.
- Guests' previous wildlife experience, including location and experience quality, wildlife viewing, and hunting.
- Guest satisfaction and preferences, including experience quality and value, desire to return, and the effect of hypothetical situations on the above.

The survey was distributed from August 26, 2001 to the end of the guest season on October 21, 2001.

When necessary, prices were converted to U.S. dollars at conversion rates as of Sept 1, 2000 using the OANDA online currency converter (www.oanda.com/converter/classic).

Of 146 surveys distributed, 136 surveys were filled out and returned, resulting in a response rate of 93.2%. This response rate provided a margin of error of plus or minus 4.2% at the 95% confidence interval (Sheskin 1985).

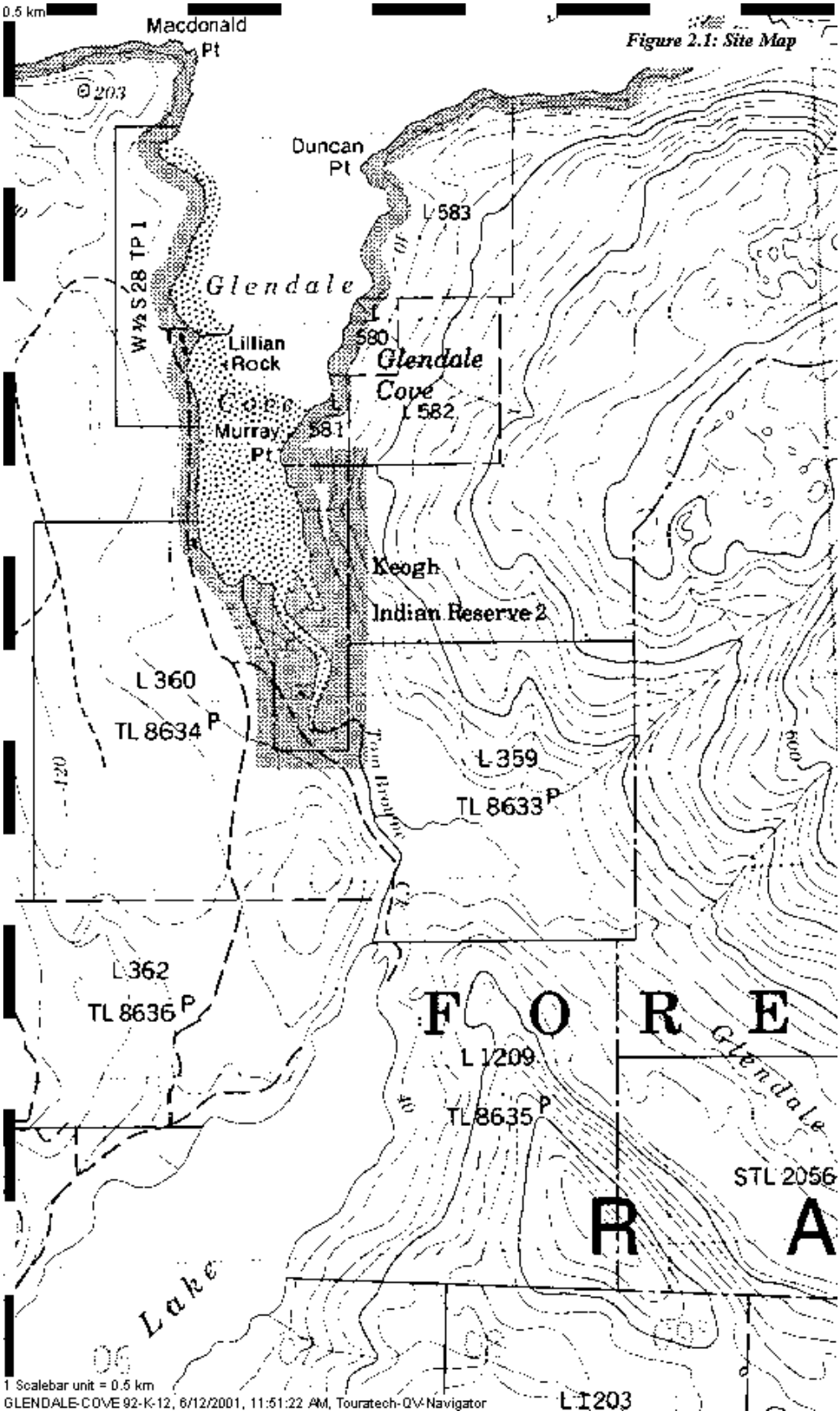


Figure 2.1: Site Map

3. Summary of Results

Through spring and summer the bears in Glendale Cove spend much time foraging on the estuary and in dense berry growth in the red alder stands in the Glendale Valley. Many bears also search for marine invertebrates (mollusks, isopods, crabs, etc.) in the inter-tidal zone. During this period in 2000 the population of identified adult bears was approximately equal to that observed in 1999 in size and age/sex structure.

Salmon were first seen in the Glendale River in late July (one month earlier than 1999). By late August the number of fish available had almost doubled their peak values for the 1999 season. Salmon numbers reached 750,000 in 2000 and 450,000 in 1999.

Bears were first observed searching for fish at the weir on August 7th (16 days earlier than 1999). Low numbers of bears were seen consistently at the weir from this date onwards. While systematic observations covered the entire 24-hour cycle, during the 2000 season bears were not observed fishing at night; this is in contrast to 1999, when bears were regularly observed fishing through the night. Fishing continued through November 8th, the end of the study period.

The following is a summary of observations; details are provided in section 5:

- There was a major bear "disappearance event" in early September.
- This disappearance immediately preceded the simultaneous injury of 3 bears from unknown causes.
- The population, before and particularly after disappearances, was highly skewed towards females with cubs.
- Under all viewing conditions representation of different age/sex classes differed significantly from their representation in the population (calculated either before or after disappearances).
- The proportion of time that bears spend fishing did not change when commercial bear tours were present.
- The proportion of time that bears spend fishing did not change between 1999 and 2000. (This did not effect all age sex classes equally. See Section 5.3.1.)
- Fish capture rates were not affected by the presence of bear viewing tours.
- Fish capture rates increased significantly in 2000.
- The proportion of days on which viewer density exceeded "threshold effect" levels (Nevin and Gilbert 2000) increased significantly in 2000.
- Observer effort increased 275% in 2000 (longer observation period, more observers) providing more than 30,000 minutes of observations for analysis.
- Visitation exceeded accepted limits on 45% of viewing days in 2000.

4. Human Activity Patterns

4.1. Daily and Seasonal Patterns

4.1.1. Bear Viewing

Bear viewing tours operate in Glendale Cove from early May through mid October. Early season tours mainly consist of boat based viewing from the cove. During the salmon run, bears are observed from 4 permanent viewing structures operated by Knight Inlet Lodge, vehicle based viewing operated by Tide Rip Tours and from walking tours operated by Discovery Tours as well as visits by unguided individuals.

During the 2000 season, viewing of bears at the weir began on August 19th, 13 days earlier than in 1999, and continued until October 21st.

Knight Inlet Lodge visitor numbers remained constant between the 1999 and 2000 season in accordance with their 1998 management plan. Knight Inlet Lodge continued to host professional photographers and film crews who, while guests of Knight Inlet Lodge, operate in small numbers (1-3 people) on a different schedule from other bear viewing. Use of the site by other commercial operators increased substantially during the 2000 season.

While the BCAL permitted 42 visitor-viewing periods per day between all operators, visitation rates as high as 75 visitor-viewing periods per day were observed during the 2000 season. Not only did the peak visitation rates increase but also the proportion of days on which the "threshold density" of 14 viewers (Nevin and Gilbert 2000) was exceeded rose to 45% of observed days.

It can be clearly seen that while individual operators may continue to strive to leave 40-50% of daylight hours free of visitation and to restrict viewing to the permitted number of visitor-viewing-periods per day, self regulation is routinely missing. It is difficult to see how multiple operators can function together without strict regulation of viewing periods and visitor numbers.

If the 75% decline in bear activity in the Glendale valley during the 2000 salmon season proves to be related to the disturbance caused by this seasons high viewing densities, the question of how much viewing can be allowed at this or other similar sites must be seriously addressed.

4.1.2. Hunting

There is currently a 17.5 km^2 (approximately 3.3km * 5.3km) hunting closure around the Glendale River spawning channel. This includes the valley bottom from the estuary upstream to the spawning channel and continues upstream towards Glendale Lake and has been in effect since 1995.

The fall brown bear hunting season in this part of British Columbia lasts from October 1 to November 15 and the spring season from April 1 to May 31. Both of these seasons overlap with the bear viewing period. By October, bears in the Glendale Valley have been encountering non-threatening humans regularly for 5 months and, if they have been fishing at the weir, they have been coming into very close daily contact with non-threatening humans for at least a month. This makes these habituated bears extremely vulnerable to hunters when they move outside the small closure around the spawning channel.

On February 8th 2000, a three-year moratorium on brown bear hunting in British Columbia was introduced. This suspension, if sustained, of hunting will allow further investigation of the appropriateness and effectiveness of the current closure. Limited telemetry studies proposed for the 2001 season will aid in this investigation.

4.1.3. Proximity of Viewers to Bears

Between the 1999 and 2000 seasons there was no change in the proximity of bears and viewers visiting the site with commercial tour operators. There was, however, an increase in the unregulated visitation of the site by unguided individuals. On occasions, these individuals have come dangerously close to bears and have shown a distinct lack of knowledge of appropriate behavior in such densely populated bear habitat.

The unregulated use of this site demands immediate attention because of the threats posed to human safety, bear safety and the future viability of commercial bear viewing at this site and perhaps others.

5. Bear Activity Patterns

Analysis of bear behavior and activity patterns is based on more than 500 hours of observations at the Glendale River artificial spawning channel during salmon season. All observations were made from the Knight Inlet Lodge viewing structure nearest to the weir. Cubs were excluded from this analysis since they replicate their mother's activity patterns. The age/sex class "Other Males" in Nevin and Gilbert (2000) has been more appropriately titled "Sub-adults" in this report. These age/sex classes are, however, comparable.

Behavioral observation and analysis is focused on the salmon feeding period and so largely represents "post-disappearance" bears.

Unless otherwise stated all results are statistically significant at $\alpha = 0.05$.

5.1. Population Decline

One of the most significant events of the 2000 field season was the disappearance of 50% of the adult bears in the population during 3 weeks in late August and early September. The timing of this disappearance makes investigating its causes somewhat problematic since many events are clustered around this time. These events include:

Arrival of the salmon
The start of viewing at the spawning channel
Injuries to the legs/feet of several bears

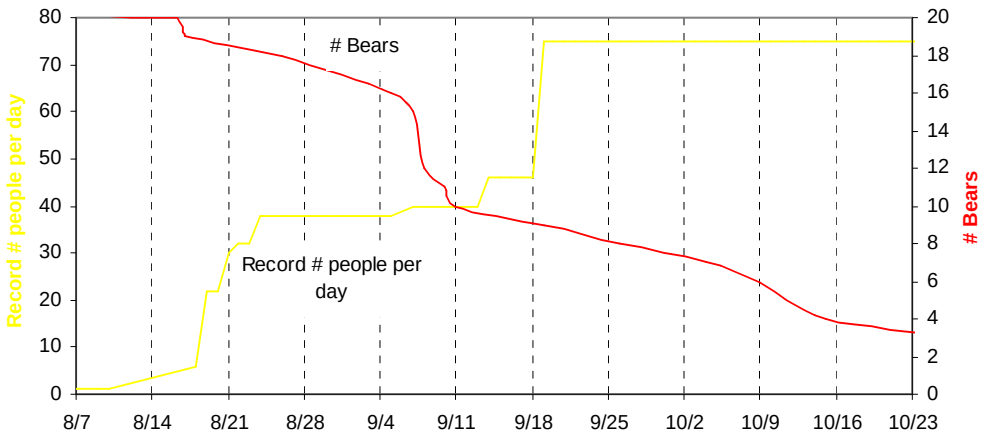
We have been unable to draw firm conclusions as to the cause of the decline that was observed during this period. We have, however, proposed the following competing hypotheses:

H1.Human activity at the site caused abandonment of the site
H2.Changes in salmon availability at the site caused the abandonment
H3.Missing bears were killed by poachers
H4.Combining H3 and H1 – Human impacts on sensitized bears

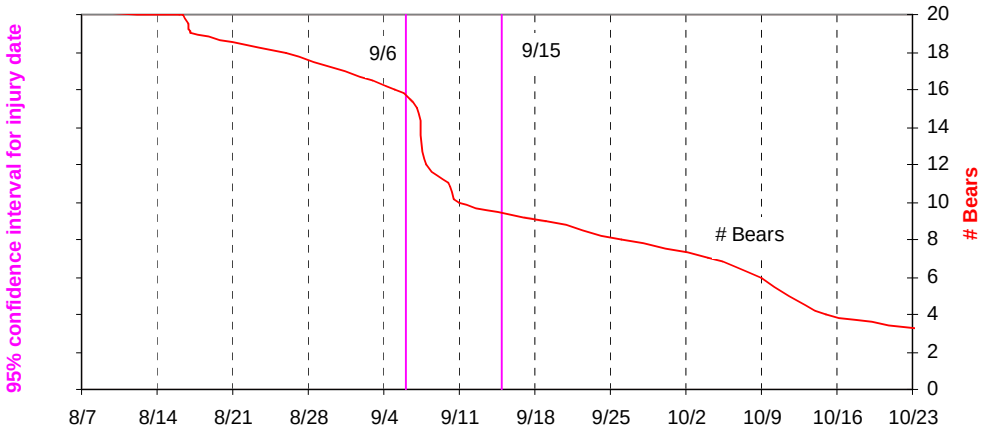
While no firm conclusion can be reached, evidence in support of each hypothesis is presented below. Figure 5.1 allows graphical comparison between the hypotheses.

Figure 5.1 – Hypothesized causes of population decline

a: Record number of people per day



b: 95% confidence interval for injury date



c: Cumulative number of people

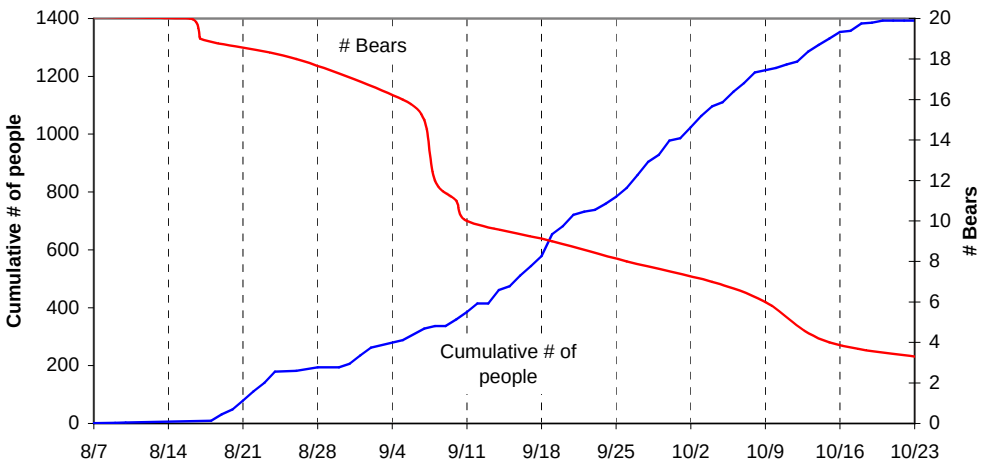
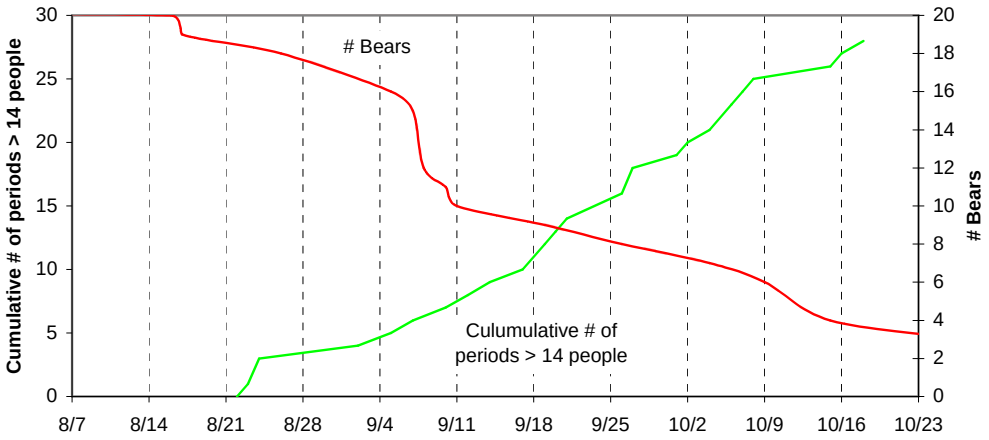
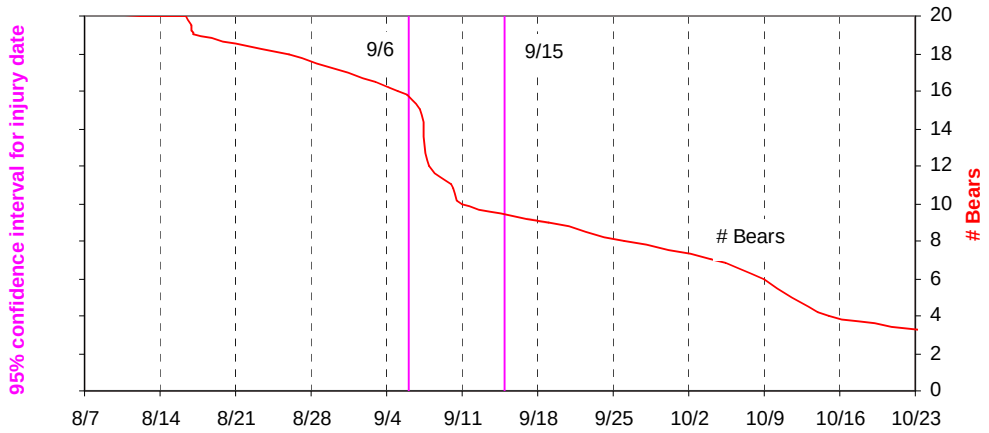


Figure 5.1 continued – Hypothesized causes of population decline

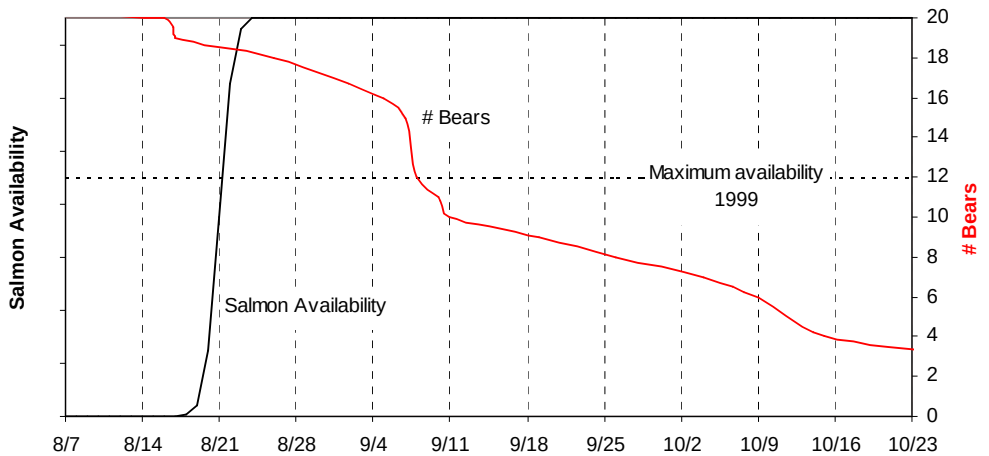
d: Cumulative number of viewing periods with more than 14 people present



e: 95% confidence interval for injury date



f: Salmon availability



5.1.1. H1. Human Activity at the Site Caused Abandonment of the Site

This hypothesis, that viewing impacts caused bear disappearances at the exact time of the appearance of abundant, easily caught salmon, flies in the face of an extensive series of coastal Alaska bear studies at Brooks River, McNeil Falls, Pack Creek and Anan Creek and our experience of bears at this site (Nevin and Gilbert 2000). These studies provide results from sites with long-term bear viewing, where visitor numbers are similar to Glendale. It can be seen (Figure 5.1a, c, d) that whichever measurement of human activity is used there fails to be any directly attributable "cause and effect" relationship.

When considering the cumulative number of people using the site it can be seen (Figure 5.1c) that, while the start of viewing and the start of the decline are coincident, there is no change in the rate of increase in the cumulative number of people having used the site between September 4th and 11th that would account for the rapid loss of bears during this period.

If, because of the increased impacts observed in 1999 (Nevin and Gilbert 2000), viewing periods with over 14 people present are considered to have an adverse affect on the bears, the cumulative number of periods during which this threshold was exceeded will give some measure of the impact of human activity at the site. It can be seen, however, (Figure 5.1d) that the decline in bear number began before this threshold had ever been exceeded. As with the cumulative number of visitors, there is no change in the rate of increase in the number of periods during which this threshold was exceeded between September 4th and 11th that could account for the increased loss of bears during this period.

A final measure of human impact would be the season record visitation events as illustrated in Figure 5.1a. This is a measure of human activity to which animals can be expected to respond, especially since, in this case, the response is the abandonment of the site. If a bear left the area because the human use had risen to a level that it was unwilling to tolerate, it had no information as to any change in human use patterns after its departure. The sudden changes in the record number of people using the site per day to some extent reflect the sudden changes in the number of bears using the site. However, the changes in human behavior occurred 7 – 10 days after the sudden decline in bear number. While bears may have been in the area for several days after they were last observed, it is unlikely that a bear could have used the site for 7 – 10 days without being observed since observations extended to a full 24 hour cycle during this period.

While the high levels of human activity at the site are a cause for concern, particularly in light of the findings of Nevin and Gilbert (2000), the loss of bears cannot be conclusively attributed to human impact alone. It is important to remember that human impacts are being considered here in isolation.

5.1.2. H2. Changes In Salmon Availability at the Site Caused the Abandonment

Late arrival and low numbers of salmon are two potential reasons for bears to abandon a site. However, in the 2000 season abundant salmon became available to bears 15 – 20 days earlier than they had in 1999. Furthermore, the arrival of the fish was much more rapid, and within days they had exceeded their 1999 densities in the river (Figure 5.1f). By August 25th there were 750,000 fish estimated to be in the Glendale drainage, almost double the number seen in 1999. A die off, related to insufficient oxygen in the water, lasting for several days from August 28th, made fish even more readily available to the bears.

Given these conditions it seems unreasonable to consider a change in salmon availability as being related to the decline in bear numbers. It is possible, however, that the high availability of salmon made the use of secondary feeding sites a profitable alternative to tolerating human disturbance at the spawning channel. While inconclusive, searches of the Glendale and neighboring drainages, on foot and by air, failed to provide evidence of bears feeding on salmon outside the immediate vicinity of the spawning channel.

5.1.3. H3. Missing Bears Were Killed by Poachers

An onsite investigation by MELP conservation officers failed to find substantive evidence of poaching. However speculation that poachers killed missing bears, although based entirely on circumstantial evidence, deserves careful consideration.

On September 16th and 17th, immediately following the disappearance of 5 bears in 5 days, 3 bears returned to the spawning channel with injuries to their legs or feet, including one bear that was missing an entire foot. Using the dates these injured bears were last seen uninjured and a normal probability distribution, we generated a 95% confidence interval within which we assume the injuries occurred. This interval (Figure 5.1b and e) includes the period from September 6th to the 15th and clearly coincides with the period of steepest decline in bear numbers.

While, once again, this is not conclusive proof of cause and effect, this may be the clearest relationship that was found when each hypothesis is considered in isolation.

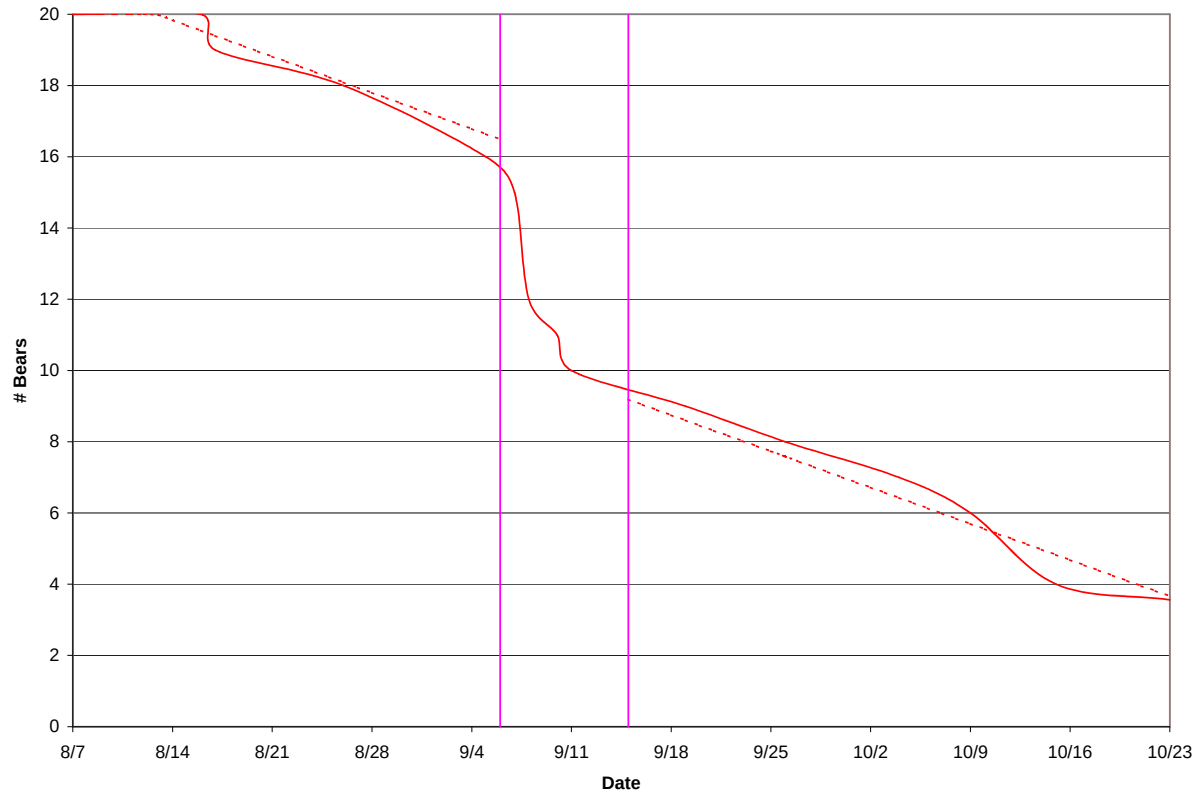
5.1.4. H4. Combining H3 and H1 – Human Impacts On Sensitized Bears

There is clear evidence (Chi 1999) that snaring can sensitize bears to human activity on a site. If we accept that there was some level of poaching in the Knight Inlet area during the summer and fall of 2000, declines in bear numbers could be attributed to both removal of individuals and hyper-sensitization of others to human disturbance. It can be seen (Figure 5.2) that, outside the period when injuries occurred, there is a constant linear

decline in the number of bears seen. This may reflect a response to the use of the site by viewing tours by bears that have been sensitized by some other form of disturbance. This could include viewing activities outside the normal viewing routine, for example the activities of a film crew at the site during the night or an unguided visitor who came into confrontation with several bears.

Once again the evidence is not conclusive. However it does make a compelling case for further investigation of the poaching hypothesis and a substantive reduction in the human use of the site during the 2001 season.

Figure 5.2 – Linear decline in bear population



5.2. Age/Sex Class Distribution of Population

5.2.1. Pre-Disappearance Composition of the Population

Between mid-June and mid-September 2000 31 bears were identified in the Glendale Cove area. This is comparable with the 38 bears identified in 1999 (Table 5.2.1).

Table 5.2.1: Identified Bears

	1999	2000
Large Males	4	4
Lone Females	4	2
Sub-adults	7	8
Females with Cubs	8	6
Cubs	15	11

30% of the adult bears identified in this year's study were females with cubs. While slightly lower than 1999, this still exceeds the proportion of the population made up of females with cubs exceeds at similar sites (Darling 1987, Dean 1976, Martinka 1974, Murie 1981, Olson *et al*. 1990, Olson and Squibb 1990).

5.2.2. Post-Disappearance Composition of the Population

The age/sex distribution of bears seen between September 15th and November 8th (2000b) is shown in Table 5.2.2. The number of bears seen before September 15th (2000a) is equal to the total number of bears identified for the 2000 season since no new bears were identified in the Glendale area after the major decline in early September.

Table 5.2.2: Identified Bears

	1999	2000a	2000b
Large Males	4	4	0
Lone Females	4	2	0
Sub-adults	7	8	5
Females with Cubs	8	6	5
Cubs	15	11	9

Following the disappearance 50% of the adult bears identified were females with cubs. However, more striking than this is the total absence of single adult bears. Whatever the cause this is extremely worrying. As outlined above (Section 5.1) there have been

several causes for the decline postulated and without further study of the Knight Inlet population it will not be possible to identify the cause.

Table 5.2.3: Age/Sex Class Distributions

	% of Population	Tours Absent			Tours Present		
		% of observed bear minutes	+/-		% of observed bear minutes	+/-	
			Expected	1999		Expected	1999
Large Males	0	*	*	*	*	*	*
Lone Females	0	*	*	*	*	*	*
Sub-adults	50	16	-	0	26	-	0
Females with Cubs	50	84	+	+	74	+	+

** No observations in 2000*

It can be seen (Table 5.2.3) that both during viewed and non-viewed periods each age/sex class was observed with a frequency which differed significantly from its representation in the population.

While the number of bears present is not significantly different between viewing and non-viewing periods there is a significant increase in sub-adult presence during viewing. This is consistent with the findings of Olson *et al*. (1997) at Katmai National Park, Alaska and with observations in the 1999 season.

5.3. Time Spent Fishing

5.3.1. Analysis by Age/Sex Class

Table 5.3.1: Time Spent Fishing

	Tours Absent	Tours Present	
	% of Observed Bear Minutes	% of Observed Bear Minutes	+/-
Large Males	0	0	0
Lone Females	0	0	0
Other Males	79	73	0
Females with Cubs	77	70	0

Table 5.3.2: Time Spent Fishing 1999 vs. 2000b

	Tours Absent	Tours Present
	+/-	+/-
Large Males	*	*
Lone Females	*	*
Sub-adults	0	+
Females with Cubs	+	0

** No observations in 2000*

5.3.2. Analysis For All Bears

Table 5.3.3: Time Spent Fishing

	Tours Absent	Tours Present	
	% of Observed Bear Minutes	% of Observed Bear Minutes	+/-
All Bears	77	71	0

Table 5.3.4: Time Spent Fishing 1999 vs. 2000b

	Tours Absent	Tours Present
	+/-	+/-
All Bears	0	0

Again in 2000, with multiple operators, tours were, at times, present for periods extending to almost 100% of daylight hours. However, for the bears that remained active at the site, there was no difference in the proportion of time spent fishing between viewed and non-viewed periods. In the absence of large male bears, females with cubs have increased their time spent feeding during non-viewed periods to the level observed during viewing in 1999 and 2000. Sub-adults have increased their time spent feeding during viewed periods to the level observed during non-viewed periods in 1999 and 2000. It is unclear whether this is due to increased sub-adult habituation or some cascading effect caused by changes in the behavior of more dominant age/sex classes.

As mentioned in Section 4.1.1, the viewing density at which the level of disturbance begins to increase rapidly was exceeded on 45% of days during the viewing season at the spawning channel. This is a significant increase from the 1999 season and may have impacted bears willingness to feed at the site.

5.4. Fish Capture Rates

Again in 2000 there was no significant difference in the number of fish caught per minute spent fishing (catch per unit effort) by bears between viewed and non-viewed periods. There was, however, a substantial increase in capture rate between 1999 and 2000. It must be noted, however, that while fishing success increased in 2000, the lower overall activity levels seen during salmon season counteracted this.

Table 5.3.1: Fish Capture Rates

	1999	2000	+/-
Fish caught per bear fishing minute	0.34	0.54	+

Given the increase in the number of salmon available in the river in 2000 this increase in catch rate is equal to that that would be predicted using a simple Catch Per Unit Effort fisheries model.

5.5. Bioenergetic Effects

Population density of brown bears is directly related to the level of meat consumption (Hilderbrand *et al*. 1999). The correlation that Hilderbrand described suggests a highly significant direct relationship between access to, and ingestion of, a high quality diet (in this case animal tissues) and population density. It is not only the availability of high quality food resources that effects population density but also the timing of its seasonal availability. The availability of highly digestible meat resources, such as spawning salmon, in late summer and fall improves population productivity by providing the resources required for reproduction (Gilbert and Lanner 1995). Strong positive relationships between dietary meat and mean litter size and mean female mass were also found by Hilderbrand *et al*. (1999).

While the precise demographic impacts of access to, and abundance of, salmon are not yet known, it is important to monitor how human-bear interactions, bear-bear interactions and inter-annual variations in salmon number affect access to salmon at viewing locations.

5.5.1. Activity Budgets and Fishing Success

There was a 75% decline in bear activity during salmon season in the Glendale Valley in the 2000 season. This decline reflects the 50% decrease in the number of bears in the system in early September, addressed in Section 5.1, as well as a 50% decline in the activity levels of the remaining bears. This suggests that, with the increased fishing success (Section 5.4) observed in 2000, the remaining bears encountered some physiological constraint to feeding, for example stomach capacity. Estimates of salmon consumption by females with cubs indicate that the quantity of fish consumed per individual increased over 60% while fish consumed by subadults fell by over 40%. This, however, requires further investigation and analysis.

5.5.2. Human Disturbance

For the small number of bears that continued to feed at the site during the fall of 2000, human disturbance had little or no bioenergetic impact. With population densities 50% lower than the previous season and the absence of large males, ample feeding opportunities were available for habituated females with cubs and sub-adult bears.

It is not known, however, what impact the increased human use of this feeding site had on the bears that disappeared in early September. If human activities forced these bears to abandon the spawning channel, what was the cost?

Due to the presence of the artificial spawning channel, the Glendale drainage has the most abundant and accessible salmon run in this area. Abandoning this site to feed elsewhere would therefore lead to lower net energy gain, either through lower salmon consumption, increased energy expenditure or both, at less productive sites. Further, movement of bears outside the immediate area of the spawning channel and the hunting closure exposes them to increases risk of mortality through poaching, if this is in fact taking place in the area, and through hunting when the current moratorium is lifted.

Additionally, in the context of a source-sink model of BC bear populations, where protected feeding sites act as source populations, human activity levels which force particular age/sex classes to abandon protected sites lead to increases exposure to risk for these age/sex classes outside the protected area.

6. Economic and Social Perspectives

6.1. Economic Considerations

6.1.1. Ecotourism Defined

The clearest definition of ecotourism comes from The Ecotourism Society (TES): "responsible travel to natural areas that conserves the environment and improves the well-being of local people" (Honey 1999).

Ecotourism is considered a subcategory of nature tourism, which has been defined as "domestic or foreign travel activities that are associated with viewing or enjoying natural ecosystems and wildlife for educational or recreational purposes" (HaySmith and Hunt 1995). Further subcategories occasionally distinguish the various activities possible within the definition of ecotourism, such as wildlife viewing and "adventure travel" activities or other forms of physical recreation. It is important to note that, as the economic value of ecotourism (and the term itself) has become clear to business owners and industry planners, not all activities referred to as "ecotourism" satisfy the TES definition. Many, in fact, fall far short. (Oram 1995)

6.1.2. Ecotourism Demand

6.1.2.1. Worldwide

The upward trend in ecotourism as a whole is substantial, as is the industry's earning potential, and wildlife viewing accounts for a significant percentage of this (Boo 1990, HaySmith and Hunt 1995, Honey 1999). Even though vague, often conflicting definitions of ecotourism can result in widely divergent statistics, the growing ranks of ecotourists are increasingly being targeted by the tourist industry as a promising market segment (Pearce and Wilson 1995). Since ecotourism occurs predominantly in rural areas, the economic impact of even small sums can be substantial (Payne 1991).

Ecotourism is central to many developing nations' conservation effort and economic development strategies (MacKay *et al*. 1996). Estimates for the industry's overall economic impact in developing countries reach up to $30 billion per year, and it is the largest foreign exchange earner in countries such as Costa Rica, India, Kenya, and Tanzania (Honey 1999). (All currencies in this report are in U.S. dollars unless noted otherwise.)

Costa Rica, one of the most popular ecotourism destinations in the world, received almost twice as many visitors in 1992 as it did three years earlier (HaySmith and Hunt 1995), and saw visitation at its Monteverde Cloud Forest Preserve rise from 450 in 1975 to over 50,000 in the late 1990s (Honey 1999). In Africa, wildlife tourism brings in nearly $350 million per year in tourist receipts (Whelan 1991).

6.1.2.2. North America

In more affluent countries the numbers are even greater. The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, performed every five years by the US Fish and Wildlife Service, showed that in 1991 almost 100 million Americans 16 years and older—about half of the country's adult population—participated in some form of recreation related to fish and wildlife and spent $59.5 billion in the process. Of these, some 76 million participated in non-consumptive wildlife recreation, including feeding, observing and photographing wildlife (USFWS 1992).

A 1992 survey by the US Travel Data Center showed that 7% of US travelers (eight million people) had taken at least one trip they considered "ecotourism," and that 30% (35 million) planned to in the next three years (Boo 1990). By the early 1990s, ecotourism in the U.S. was experiencing a 30% annual increase, compared to 4% in the travel industry as a whole (Honey 1999). Non-consumptive wildlife-related recreation on the Pacific coast of the U.S. (California, Oregon, Washington, and Alaska) shows a recent short-term decline in participation but is predicted to increase 77% by the year 2050 (Flather *et al*. 1999).

Even an activity as specific as bird watching can generate significant revenue. In 1991 bird watching's growing popularity injected over $100 million into the economies of sixteen U.S. states, including over $200 million into the economies of six of these and $622.6 million into the economy of California alone (Dickinson and Edmondson 1996).

In 1999, Canada received 662.9 million tourists, up from 327.1 million in 1985 and ranked seventh out of the world's top tourism destinations in terms of tourist arrivals (Canada Tourism 2000). In that same year, tourist industries, including transportation, accommodation, food services, recreation and entertainment, and travel agencies, brought in over $50 billion in revenue and employed 411,800 Canadians (Statistics Canada 2000). Nature tourism provided a large portion of this income. In 1996, Canadians alone spent a total of $11 billion in their own country on nature-related activities including fishing, hunting, camping, and donating to maintain or set aside lands for conservation. Wildlife viewing ranked fifth in the list of activities in the average amount spent per person annually ($297), adding $1.28 million to the country's GDP and sustaining 22,300 jobs (FPTTFINC 2000)

This demand is poised to clash—and in some cases already has—with a lack of supply. In their profile of North American wildlife agencies' viewing programs, Pierce and Manfredo (1997) found that, although such programs are in high public demand, approximately 97% of them are understaffed and under-funded, and 55% suffered from lack of agency support and credibility. Compared to funding for extractive uses on public land, funding for wildlife viewing opportunities is miniscule: the average budget per viewing program in 1994-5 ($346,000 in the U.S. and US$85,000 in Canada) was equivalent to 3% of the average annual budget for hunting ($11.7 million) and 4% of the average budget for fishing ($8.3 million).

6.1.2.3. British Columbia

In 1997 tourism was British Columbia's second-largest land-based industry behind forestry, bringing in $8.5 billion in revenue and employing over 235,000 provincial residents (Tourism BC 2000). The number of tourism-related businesses in the province grew from less than 10,000 in 1990 to over 15,700 in 1996 (BCSN 2001).

British Columbia's relative abundance of wilderness and opportunities for outdoor activities makes it a popular destination for visitors in search of experiences involving wildlife and wildlands. Ecotourism is the fastest growing segment of the BC tourism sector, and predicted opportunities for expansion are substantial (The Randolph Group 1997, BCSN 2001).

On a per-capita basis, BC is the number one bird and wildlife viewing destination in the country, since almost three-quarters of bird and mammal species known to breed in Canada can be found in the province, resulting in the most biologically diverse assemblage of such species in the country (Smith 2000). Over 2,300,000 British Columbians spent almost $2 billion on nature-related activities in 1996, ranking second only to the Yukon in average per capita expenditures on all outdoor pursuits ($902 and $1,298, respectively, versus a countrywide average of $704). Wildlife viewing in BC ranked third in average yearly expenditures by participants, behind the Yukon and Alberta (Reid 1998, FPTTFINC 2000).

Thanks to British Columbia's growing demand and large natural areas yet untapped for ecotourism, the opportunities to expand the province's ecotourism sector are considered "substantial" (BCSN, 2001).

6.1.3. Potential Economic Pitfalls of Ecotourism

By its nature as a luxury industry, tourism tends to experience unpredictable cycles of demand (Honey 1999). Local economies and small companies (as many ecotour businesses are) that depend on such a fluctuating external source of income may suffer during periods of low demand, when discriminating tourists travel to less expensive destinations or stay home altogether (Boo 1990, Honey 1999).

Not all income generated by ecotourism ends up in local pockets: local residents can end up in menial service jobs while more highly trained and educated workers from abroad are brought in and paid substantially more. Foreign-owned businesses can siphon funds abroad, sparking local resentment and undermining motivations to conserve the ecosystems in question (Matthieson & Wall 1982). In its trend toward increasing expense and exclusivity, ecotourism threatens to alienate local communities in favor of rich foreign visitors (Honey 1999).

Ecotourism opportunities are often undervalued, especially in developing countries, where entrance fees are often small. While small fees may encourage local usage of a resource, the money lost due to consumer surpluses—a situation in which visitors would have been willing to pay more than what they actually paid (discussed below)—is often a greater concern in terms of the economic viability of ecotourism operations. This is significant in light of the fact that non-resident visitors, especially those from other countries, typically spend more than resident visitors to visit ecotourism sites. This difference is often due to higher travel costs to arrive at the site, but can also result from higher prices paid for amenities while at the site, due to a desire for a higher level of comfort or simply higher prices charged to non-residents (Barnes *et al*. 1992, Eubanks *et al*. 1993). The higher the proportion of foreign visitors, therefore, the more income is possible for an ecotourism destination to draw and distribute into surrounding communities.

At High Island, a popular birding spot in Texas, a 1992 survey found that local visitors spend an average of $46 per person on travel and lodging per visit, compared to $693 per person for non-resident American visitors and $1,881 per person for foreign visitors. Of the $2.5 million total estimated economic impact of birding, local residents generated only $120,000 (Eubanks *et al*. 1993). Barnes *et al*. (1992) reported that foreign visitors to Thailand's Khao Yai National Park spent between 500-800 baht on average per day, compared to the 350-600 baht daily average spent by Thai visitors.

In developing countries and poor areas, therefore, a balance must be struck between the high fees that foreign travelers can and will pay and fees that are low enough for locals to afford—suggesting a direct relationship between fee levels and exclusivity. In some cases, such as Kenya's national parks, a two-tier system with lower fees for locals and higher fees for foreign visitors attempts to achieve this balance.

Wells (1993) found that, of the $27 million generated by tourism expenditures in Nepal's protected areas (some of the country's most popular tourism draws) in 1988, only $1 million came from direct fees charged to visit parks. Maille and Mendelsohn (1993) found an average consumer surplus of $276-360 per foreign visitor in visits to Madagascar's tropical biological reserves. They conclude that the entrance fee of $11 per person could be raised substantially, and that directing the increased income to local communities could raise local interest in conservation.

Barnes *et al*. (1999) described a similar situation in Namibia, where wildlife viewing contributed an estimated N$250.3 million to the national income in 1995, or N$907 per tourist. Domestic tourists were found to be willing to pay an average of N$362 per tourist more for wildlife viewing than was actually paid or N$30 million in aggregate. Foreign tourists experienced a consumer surplus of N$627 per tourist, or N$121 million in aggregate. The authors suggested that the introduction of higher park admission fees or the introduction of wildlife conservation and community trust funds could extract this foreign consumer surplus. The resulting capture—estimated at N$35.9 million per annum—could be invested in the wildlife sector and rural development.

Navrud & Mungatana (1994) use various economic models to estimate the recreational use value of wildlife viewing in Lake Nakuru National Park in Kenya populated by world-famous flocks of flamingos. A random sample of park visitors was surveyed during peak tourist season (1991) revealing an average recreational value of $1,672 per trip to Kenya. Since viewing is only part of the usual overall recreational experience, this was considered a very conservative estimate of the total economic value of the park's wildlife, and reflected an estimated recreational value 10-20 times greater than the total revenue fees collected at the time. A similar set of questions posed to visitors at the McNeil River State Game Sanctuary in Alaska, one of the world's foremost areas for viewing grizzly bears (*Ursus arctos*), revealed that visitors would be willing to pay at least $150 more than the current $50 permit fee to visit the area (Clayton & Mendelsohn 1993).

One of ecotourism's greatest challenges is when it comes into conflict with other resource uses, often traditional and/or extractive, such as timber harvest, agriculture, development, or hunting. Some resources cannot be used in multiple ways—for example, the same bear cannot be both hunted (successfully) and viewed. At its most extreme, the conflict can be seen as one of indulgence (the luxury pursuit of ecotourism) versus livelihood (resource uses that may help ensure survival, such as subsistence hunting and agriculture). Economic analyses, however, often find that the income potential from non-consumptive wildlife-oriented recreation is as great or greater than that from direct consumptive uses. Grossman and Koch (1995) reported that the estimated income from a ranch in Zimbabwe used as a base for wildlife tourism (including hunting) was three times greater than if the ranch were used only to raise cattle, and that wildlife tourism in South Africa generated ten times more net income than cattle ranching and fifteen times as many jobs.

An economic model developed for Kenya's Amboseli National Park estimated the net value for wildlife viewing to be $40 per hectare compared to $0.80 per hectare for potential agriculture, even using "the most optimistic results" (Western 1982). Another study in 1972 predicted that the park's wildlife could produce eighteen times as much annual income as the targets of wildlife viewing than if the park were used to raise beef cattle (Western and Henry 1979).

In British Columbia this conflict is particularly divisive. The traditionally resource-based BC economy, drawing on an abundance of timber, fish, and minerals, has found itself struggling in recent years due to rising costs, decreased access to resources, and competition from foreign producers (Hamilton 2000, Nutt 2000, BCSN 2001). Despite the instability of this situation, and the mounting evidence of nature tourism's income potential, this "resource commodity mentality" is proving difficult to uproot (BCSN 2001), even though studies find positive correlations between environmental regulation and economic development (Goodstein 1999, Hutton 1995).

6.1.4. Calculating the Value of Viewed Wildlife and Wildlands

To demonstrate the income potential of ecotourism and wildlife viewing in comparison to other resource uses, it is necessary to determine a value for wildlife, or at least the wildlife viewing experience. This type of economic valuation is a relatively recent phenomenon, due to both a lack of data—particularly in developing countries—and challenges inherent in calculating the value of non-market goods (Davis and Lim 1987, Barnes *et al*. 1992, Matz 2000).

In a typical market situation, supply and demand dictate a specific price based on private ownership. Wildlife, however, is often considered a public good, which means it is non-exclusive—it can not be exclusively "owned" in the traditional sense, since use by one individual does not interfere with simultaneous use by another (Aylward 1992). Still, it is possible to assign certain types of values to wildlife and wildlands. These values can be divided into two main classes. The first, use values, are incurred through direct interaction with the resource. These can include the consumptive values of one-time uses such as hunting or cutting trees, as well as non-consumptive values in which the target is not killed or removed, as in wildlife viewing. Also found under this heading (though occasionally categorized as non-use values) is option value - the price an individual or society would be willing to pay to ensure the resource exists for future generations (Randall 1992). Since payment is often involved in these uses, whether through travel, fees, or equipment, these kinds of values are often straightforward to measure, although they cannot always be consistently measured and are not always positive (Davis and Lim 1987).

Nonuse values do not involve direct interaction with the resource. Although they can be of a significant size when compared to use values (Aylward 1992), by their nature they can be difficult, if not impossible, to measure (Matz 2000). A resource's nonuse value may include: indirect use value, in which the resource is experienced vicariously through various forms of media; existence value, which measures the benefit received from knowing that a resource exists (often high in rare species such as bears); bequest value, the benefit derived from leaving a resource for future generations to enjoy; cultural value, in which a resource has a specific value in a cultural setting; ecosystem service value, such as living forest storing atmospheric carbon; and genetic resource value, exemplified by a plant species used to manufacture medicine (Swanson *et al*. 1992, Aylward 1992, Randall 1992).

While some nonuse values can be directly measured in economic terms—a food crop, for instance, or a wetlands filtering a water supply versus the cost of a water treatment plant—the subjectivity and hypothetical nature of others can cause problems to arise in calculating the net economic value of wildlife or wildlands. Non-market values may be ignored altogether, as they are in some environmental impact assessments or statements. In addition, in common cases in which negative monetary values (costs) of these public goods fall on private individuals (as in deer-automobile collisions), the result is an economic externality in which the marketplace cannot act efficiently to establish an

optimal price for the good. This in turn causes a market failure and a distorted price for the resource, if one is produced at all (Matz 2000).

One common outcome of this kind of market failure is a consumer surplus, in which consumers would be willing to pay more for the resource or experience than they actually have to (Conover 1997). The result is that much of the value of wildlife—particularly with rare species popular with the public such as bears—is not accurately reflected in value calculations (Matz 2000). The value of a viewed wildlife species may therefore be underestimated in using the price of a viewing or hunting trip as a measurement (Navrud and Mungatana 1994). Nonetheless, it is often easier to measure the value of an experience involving wildlife or wildlands than it is to attach a value to a species, population, individual or landscape.

6.1.5. Methods of Wildlife/Wildland Value Calculation

A straightforward way to estimate a resource's value is to measure how much individuals spend to acquire it or participate in an activity involving it (Conover 1997). The Travel Cost Method (TCM) takes travel costs, food, lodging, entrance fees, and the value of wages lost during travel into account (Navrud and Mungatana 1994). For reasons stated above, this method results in underestimation of value, since it does not factor in the possibly non-monetary value of the experience itself, just what it cost to get to the location.

Other, more subjective types of nonuse values such as bequest and existence values can be measured using the Contingent Valuation Method (CVM), which most often uses surveys to determine respondents' "Willingness-To-Pay" (WTP) for specific goods and services in hypothetical situations (Navrud and Mungatana 1994).

Methods such as the TCM and CVM are indirect by nature, since they are calculated outside of actual market systems. Economists and policy makers, therefore, have called the accuracy of their results as an approximation of the market, into question (Davis and Lim 1987). Although subject to biases due to the hypothetical nature of the questions, however, the CVM has been judged reliable enough to produce data useful in judicial or administrative decisions regarding natural resource damages (Navrud and Mungatana 1994). The TCM provides a reasonable approximation of the value of experiences themselves, even if the values of their individual components (such as the viewed wildlife itself) are indistinguishable (Loomis 1993).

6.1.6. Examples of Wildlife/Wildland Value Calculation

Conover (1997) provides a good example of the difficulty of attaching an accurate net value to a species. He estimated the net annual monetary value of deer (*Oedocolius* spp.) in the United States in 1991 at over $12 billion. While some components of this figure were accurate—for example, hunters' travel and equipment—others were crude estimates, such as the damage to agricultural productivity caused by deer, and what percentage of the $18 billion spent annually for non-consumptive wildlife-related activities were specific to deer. This calculation also does not attempt to estimate values for lives lost due to Lyme disease spread by deer or deer-vehicle collisions.

Tourism in Africa, with its wealth of large, charismatic mammal species, presents many opportunities to calculate recreational use values of wildlife viewing. Brown and Henry (1989) used TCM and CVM calculations to determine the value of viewing elephants (*Loxodonta africana*) in Kenya was US$25 million per year (1988 US$). Using an economic model developed for Kenya's Amboseli National Park, Western (1982) computed a gross annual value of $27,000 per lion (*Panthera leo*) and $610,000 per elephant herd due to non-consumptive viewing activities.

Navrud and Mungatana (1994) used both TCM and CVM calculations to estimate the recreational use value of wildlife viewing in Kenya's Lake Nakuru National Park, popular for its large flocks of flamingoes. A survey of a random sample of visitors during peak tourist season revealed a total value of $7.5-15 million, or an average recreational value of $1,672 (1991 US$) per person per visit to Kenya. (One-third of this value is estimated to result from the park's flamingoes.) Since the total revenue fees collected that same year were at least ten times less than this total value figure, these results suggest that the park has a largely unrecognized economic potential.

Numerous studies have attempted to calculate both consumptive and non-consumptive use values for bears (*Ursus* spp.). Figures are almost universally high compared to other species, due to bears' popularity as the target of viewing and hunting.

The final Environmental Impact Statement prepared for the grizzly bear recovery effort in Idaho's Bitterroot Ecosystem determined the overall existence value of grizzly bears in the area in question at $40.5-50.6 million per year. This figure was calculated by discounting the net economic existence value as determined by a phone survey by 70%, to reflect the difference between expressed desire and actual action, then annualizing over a perpetual time horizon at a 7% rate (USDOI and USFWS 2000).

Bear viewing values are among the highest of any species yet calculated, and often reveal not only high demand but also a consumer surplus. Neary (1995) reported that the estimate gross economic value (GEV) for bear viewing in North America was $485 million in the mid-1990s. A set of CVM questions posed to visitors to Alaska's McNeil River bear-watching sanctuary revealed that visitors would be willing to pay $217-248 per person to visit the area, which is significantly greater than the then-current fees of $50

per permit (Clayton and Mendelsohn 1993). In Churchill, Manitoba, the most popular polar bear viewing destination in North America, MacKay (1998) used exit surveys to determine that non-resident tourists paid $797, $803, and $2,103 per person to visit in spring, summer, and autumn, respectively.

The most comprehensive valuation survey on wildlife viewing of large mammals in North America comes from a mail survey of Alaskan resident voters, resident hunters, and non-resident hunters performed in 1992 by Miller *et al*. (1998). Both Alaskan residents and visitors were willing to pay more to view grizzly (brown) bears, in a hypothetical day-trip scenario, than any other type of animal, including wolves *(Canis lupus)*, moose *(Alces alces)*, caribou (*Rangifer* spp.), and bighorn sheep (*Ovis* spp.). The GEV of bear viewing trips ($485) was higher than for any other species, even when bear viewing was incidental to the trip. Trips on which viewing bears (both grizzly and black) was the primary successful objective had a higher Total Social Benefit (actual expenditures plus WTP) than for any other wildlife species.

Total expenditures on trips in which grizzly bears were seen were higher ($582) than for any other type of animal seen besides wolves ($611). When WTP figures were factored in, however, trips in which grizzlies were seen had the highest GEV of any type of target animal. In addition, trips in which grizzly bears were the specific viewing target had the highest GEV. Whale watching trips were second in value with survey respondents—an important consideration for coastal British Columbia, where killer whale (*Orcinus orca*) viewing is already an important tourist industry.

It is interesting to compare these figures from repeatable non-consumptive bear uses to those from bear hunting, a one-time consumptive use. A survey of businesses who advertise bear hunting trips on the Internet reveal prices ranging from $5,995 to $13,500 for 7- to 14-day grizzly hunting trips in Alaska and British Columbia, not including licenses, tag fees and trophy fees, which can add almost $4,000 more to the price. (Associated Hunting Consultants 2001, Bear Lake Guides and Outfitters 2001, Fox Lake Outfitters 2001, Kyllo Brothers 2001, Moose Outfitters 2001, Northern Woodsman Outfitting 2001). In all, the BC Environment Ministry reported that grizzly hunting generated $700,000 in revenue in 1998 (Brooke 1999).

6.1.7. Alaskan Bear Viewing Programs

Due to the similarities in wildlife and ecosystems between Alaska and British Columbia, an analysis of successful Alaskan bear viewing programs may provide insight into the possible future path of BC's bear viewing industry.

In their comprehensive analysis of Alaska's visitor industry, Miller and McCollum (1999) draw on the results of earlier surveys (Miller and McCollum 1994, Miller and McCollum 1997, Miller *et al*. 1998) to conclude that wildlife in the state is an "underutilized asset" and that the statewide demand for wildlife viewing is "significant"

and "expected to increase." Wildlife's income potential is also deemed to be high, since visitors and Alaskans alike expressed high WTP levels to view wildlife, and the average in-state economic impact of wildlife viewing trips in Alaska was greater than for other kinds of trips. Grizzly bears stood out significantly as having the highest WTP value of any species (Miller *et al*. 1998, Miller and McCollum 1999).

The McNeil River State Game Sanctuary, approximately 250 miles southwest of Anchorage on Kamishak Bay, is a well-known bear viewing location. Groups of 40 or more grizzlies are seen regularly from July to August feeding on abundant spawning salmon (*Oncorhynchus* spp.) that congregate near McNeil Falls. This remote location offers no visitor amenities and is only accessible by floatplane.

In 1973, the Alaska Department of Fish and Game instituted a permit system to regulate visitor numbers, making the sanctuary the first of its kind to establish a formal viewing program with limited visitor entry. Today, as then, the system permits a maximum of ten visitors per day at the viewing area between early June and late August. Applicants pay a non-refundable fee of $25 to enter a lottery system that distributes 185 regular permits. Lottery winners must pay $150 (Alaska resident) or $350 (non-resident) for each permit, which allows up to three people to stay for four days of viewing. Fifty-seven standby permits are offered to replace "no-shows," for a cost of $75 for residents and $175 for non-residents, and fifteen permits are reserved for scientific, educational, and administrative purposes.

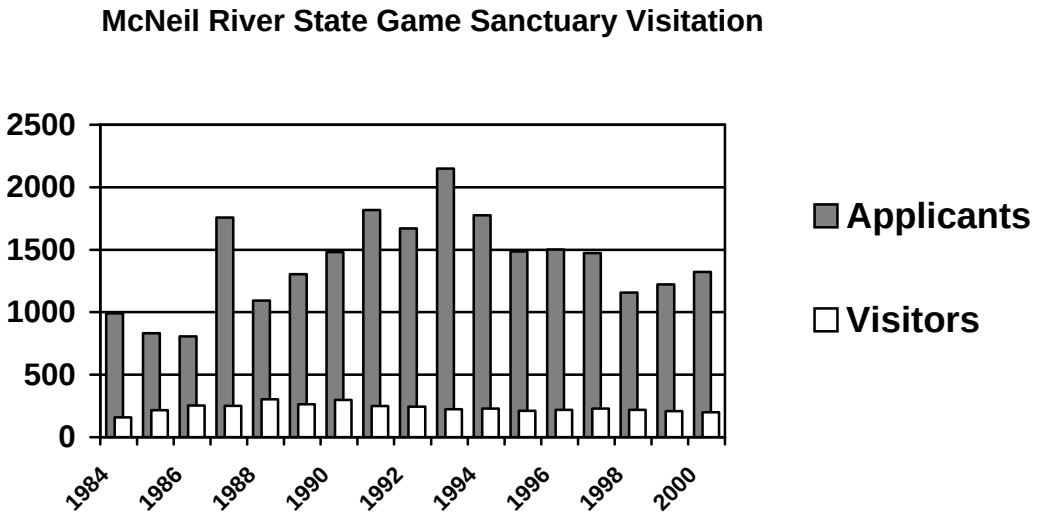
McNeil River visitation statistics (Figure 6.1) show that far more potential visitors have desired these permits than there were permits available since at least 1984. In economic terms, this means that the price for the limited number of permits is probably much lower than it could be. Demand has grown from the early 1980s to hover in the 1990s at around six times the number of allowed visitors, meaning that only 10-15% of applicants receive permits (Anonymous 2001).

Brooks River Falls in Katmai National Park and Preserve in southwestern Alaska is one of the most popular places to view grizzly bears in the state (NPS 2001). Dozens of the approximately 2,000 bears that live in the park congregate at the falls and adjoining river from late June to October to feed on migrating salmon.

A large percentage of the park's annual visitors go to Brooks Falls and stay at Brooks Camp, where they are informed of bear viewing etiquette before mounting viewing platforms near the falls. A $10 fee is charged per person per day for access to the Brooks Camp area (NPS 2001).

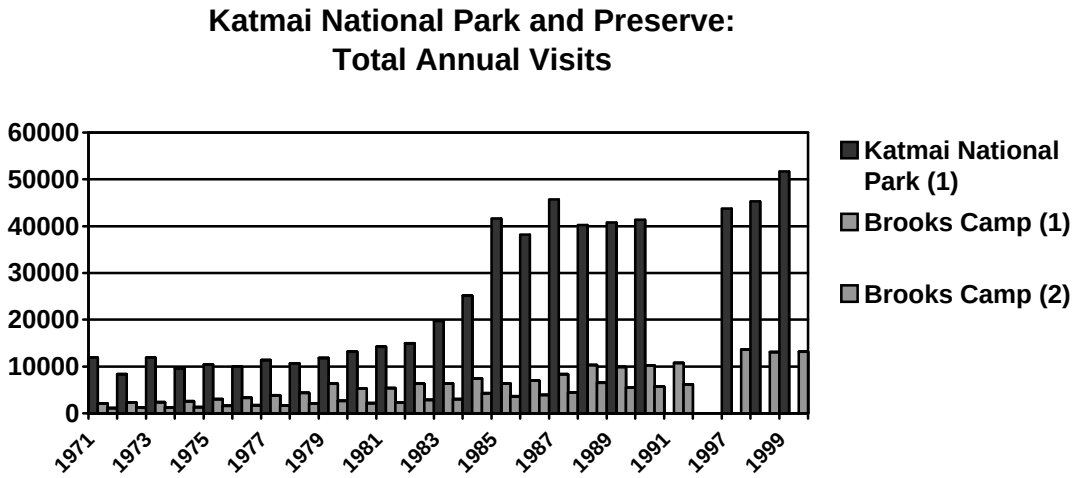
Katmai visitation statistics (Figure 6.2) show a trend of slowly but steadily rising demand. The fact that a one-hour viewing limit must be imposed during peak seasons in July and September, and that the 60-person campground regularly fills up in July, suggest that demand outstrips supply at least during these periods (K. Bergeron, pers. comm.).

Figure 6.1 – Annual demand and visitation, McNeil River



Source: McNeil River State Game Sanctuary Management Plan.

Figure 6.2 – Annual visitation, Katmai National Park



Sources: (1) Katmai National Park, Brooks Camp Arrival Logs, Activity Reports and Field Notes
(2) National Park Service, Monthly Public Use Reports and Field Logs

6.1.8. Knight Inlet Lodge: An Economic Case Analysis

An analysis of an established private bear viewing lodge in British Columbia may provide useful data to assess the current market and demand for wilderness bear viewing experiences in the province. Knight Inlet Lodge is the only business of its kind in British Columbia, and one of the few strictly bear viewing lodges in the world.

6.1.8.1. Lodge Rates

Knight Inlet average retail prices for 1999, 2000, and 2001 are shown in Table 6.1.8.1. Various visitation packages of 1-8 nights were offered during those three seasons. For ease of analysis rates were averaged to calculate one overall fee per double room night per season, and assumed an equal number of guests choosing each package length (the average stay as determined by the 2000 visitor survey was three nights).

Prices include transport to the lodge from Campbell River, Vancouver Island, and all meals, guide services, and excursions. (Those for 1999 and 2001 include one night in a hotel in Campbell River.) Prices were converted to US$ as of January 1 of each respective year, and do not include a 7% Canadian Goods and Services Tax (GST), which foreign visitors can have refunded for their accommodations expenses upon leaving the country.

Table 6.1.8.1: Knight Inlet Lodge Guest Rates

	1999	**2000**	**2001**
Low Season (late June-late Aug.)	$297.52	$408.79	$297.60
Shoulder Season (early May-late June)	$320.15	$455.10	$330.01
High Season (late Aug.-mid Oct.)	$349.46	$506.52	$363.97
Overall	$322.27	$458.22	$330.53

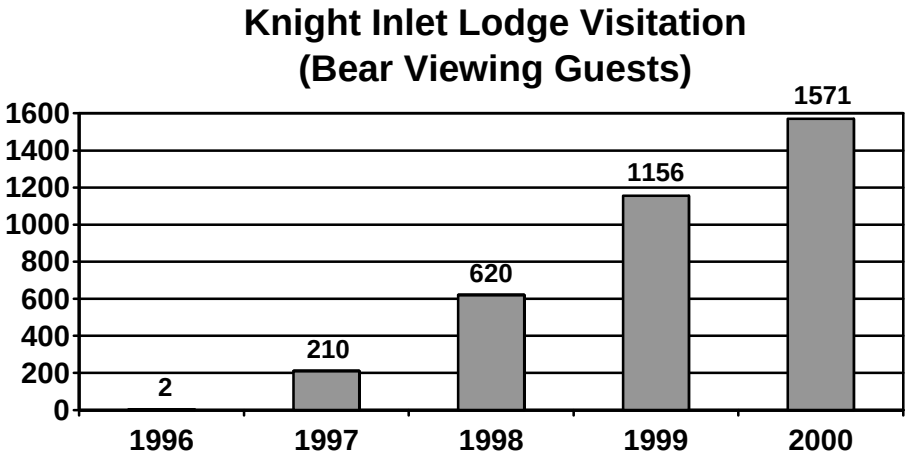
(Average per double room per night, US$)

Source: Knight Inlet Lodge

6.1.8.2. Visitation

Bear viewing guest visitation to Knight Inlet Lodge is shown in Figure 6.3. A steeply sloping curve, and the fact that the lodge's limited number of rooms have been reserved months in advance during peak seasons since 1999 (D. Wyatt, pers. comm.), indicate a high demand for the lodge's viewing programs.

Figure 6.3 – Annual visitation, Knight Inlet Lodge



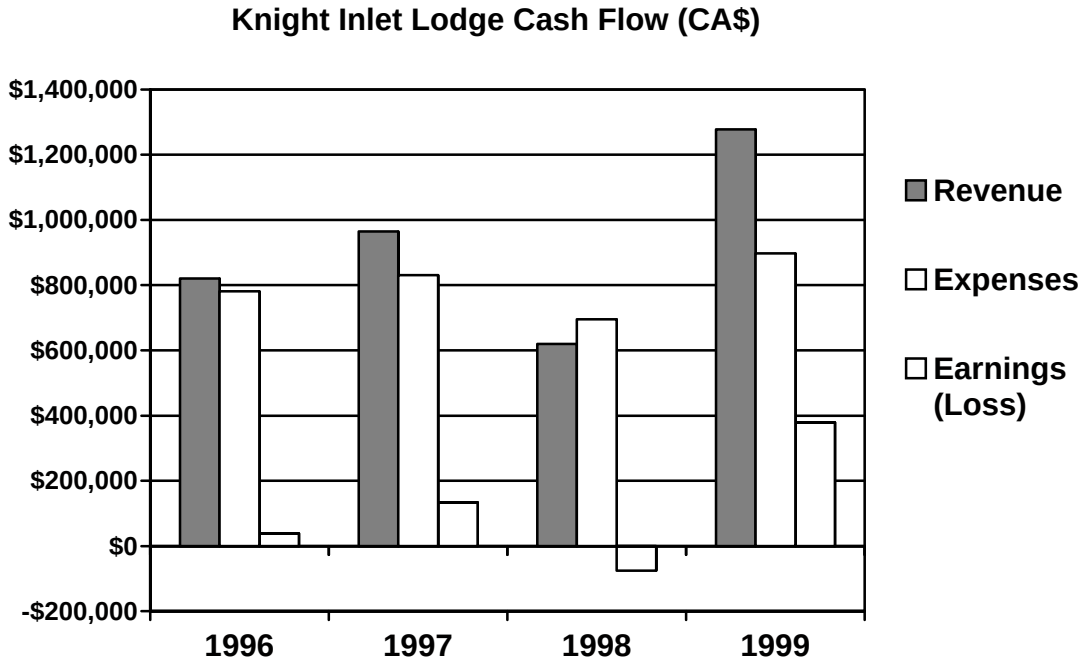
Source: Knight Inlet Lodge

6.1.8.3. Cash Flow

Revenue, expenses, and earnings (loss) before income tax (less amortization, loss on disposition of capital assets, and management fees), as shown in annual lodge financial statements, are shown in Figure 6.4. It should be noted that some revenue for 1996 includes income from guests booked previously by a former owner, and that a decrease in revenue in 1998 reflects the lodge's shifting in public perceptions from a fishing destination to one concentrating on bear viewing (D. Wyatt, pers. comm.).

Evident from these figures are steadily climbing revenue, visitation and earnings (despite a drop in 1998), costs that are high relative to income but remaining roughly the same year to year, and a profit first shown in 1999.

Figure 6.4 – Annual Cash Flow, Knight Inlet Lodge



6.1.8.4. Price Value

In answer the question "Looking back on your stay at Knight Inlet Lodge, do you think the price you paid was fair value for the experience, or was it too high or too low?" a majority of respondents (77.2%) considered the price they paid for their visit to Knight Inlet Lodge was "fair" ("the experience was worth exactly what I paid for it"). Only two respondents (1.5%) reported that the price they paid was "too low" ("the experience was worth *more* than I actually paid"), and of these only one indicated by how much ($380).

Fifteen respondents (11%) indicated that the price they paid to come to Knight Inlet Lodge was "too high" ("the experience was worth *less* than I actually paid"). Of these, twelve indicated how much less they would rather have paid for their visit, with an average amount of $565.75 (n = 12). This value should be used as only a rough approximation for dissatisfaction, however, since response range varied widely ($120-$1,216, SD = $379.80) and, illogically, some answers were as much or more than the respondents actually paid for their trip.

These results are subject to various interpretations; the respondent who gave the second-highest "price-too-high" amount ($1,000) also rated his or her overall experience as a 2 out of 10, which could indicate complete dissatisfaction with the experience and the desire for reimbursement. On the other hand, since the respondent who gave the highest

answer ($1,216) rated his or her overall experience quality as a 9 out of 10, these values could also indicate impulsive, unrealistic answers. Another possibility is that, since this was one of the most complicated questions on the survey, some respondents might have rated their experience price as "Fair" partly because that was the easiest answer to check off

6.1.8.5. Visitor Origin

Approximately 95% of survey respondents were from other countries besides Canada. This is of great economic significance since foreign visitors tend to spend more on ecotourism trips (see Section 6.1.3).

6.1.8.6. Travel Costs

The survey asked guests to give their travel costs to arrive at Knight Inlet Lodge. Respondents were also asked to indicate currency and whether the amount was for a one-way or round-trip fare. Values were converted into US$ and were doubled if "one-way" was indicated. The average travel cost was $1,949.36. A number of factors must be considered when interpreting this value. For example, many respondents indicated that, since they were visiting Knight Inlet as part of a larger package tour, they did not know how much they paid to get there per se. Some respondents may also have included the price for Knight Inlet itself in their figures.

These complexities are reflected in a low rate of response for this question (51%), and the wide range of values given ($180-18,012, SD = $2,687.79). Dropping the most likely erroneous $18,102 outlier gives an average of $1,713.15 and a standard deviation of $1,850.54.

6.1.9. Economic Conclusions

Demand for ecotourism is high, both worldwide and in Canada and British Columbia in particular. Despite the potential economic pitfalls of ecotourism and difficulties in calculating the value of viewing wildlife and wildlands, a high demonstrated-value attached to ecotourism experiences promises significant income potential. Examples of wildlife viewing programs in Alaska support these findings in the case of grizzly bears.

An analysis of the finances of Knight Inlet Lodge in the four years since its conversion to a bear-viewing destination indicates an increasing demand for its bear viewing opportunities. Guests, most of whom are foreign, are willing to pay large amounts to visit such a lodge, but, according to their responses to questions of satisfaction, the experience is considered to be, on the whole, well worth the price. A consumer surplus does not seem to exist, since most guests rated the price they paid as fair or too high. Generally rising revenue and earnings and stable expenses suggest a profitable future for the business.

6.2. Social Considerations

For a nature viewing business or industry to be socially sustainable, it must satisfy the needs and desires of both visitors and local residents. Information on typical guest characteristics and motivations, usually acquired through surveys, is useful in helping planners and business owners structure nature viewing programs and attendant marketing strategies to attract the most visitors and give them as enjoyable an experience as possible—and to find the conditions under which those two goals can be made compatible.

The support of local residents stems from the original definition of ecotourism from The Ecotourism Society: "responsible travel to natural areas that conserves the environment *and improves the well-being of local people*" (Honey 1999, emphasis added). Residents who receive monetary or cultural benefits from ecotourism ventures will tend to support them and uphold their conservationist goals, while businesses that are seen as taking more from local communities than they return are often the victims of legal opposition or outright sabotage, as has occurred with the Molokai Ranch on the Hawaiian island of the same name (Kane 2001).

Tourism is a double-edge sword: while it can be a means of sustaining the economies and cultural heritage of surrounding communities, both in developed and developing countries, when improperly structured it can also offer little or nothing in exchange for environmental and social degradation (Boo 1990, Barnes *et al*. 1992, Gertler 1993).

6.2.1. Nature Tourists: General Profiles

Although little empirical research has been conducted on the socioeconomic characteristics of ecotourists, they have been found to differ significantly from participants in "mass" tourism in a number of attributes, some of which are related to destination settings (Pearce and Wilson 1995, MacKay *et al*. 1996). Participation in ecotourism has been found related to income, gender, race, and environmental attitude (Luzar *et al*. 1995).

In a summary of ecotourism research, McKay *et al*. (1996) reported that experienced ecotourists tend to be older (between 45 and 65 years old), from the industrialized nations of the northern hemisphere (Europe, North America, and Japan), college educated, and possessing a high discretionary household income. Honey (1990) reported that most ecotourists are well educated, older, often physically active professionals or businesspeople with combined annual household incomes of $50,000 or more and a sincere interest in learning about nature. In general, Honey concluded they are typically "better informed, more experienced, and more adventuresome travelers than the conventional tourist" in keeping with the strenuous nature of many ecotourism activities. Both McKay and Honey reported that in most cases both genders tend to be equally represented among ecotourists.

Bird-watchers, the largest subclass of wildlife viewers, share many of these characteristics. At High Island, Texas, the "typical" avitourist was found to be a "middle-aged, well-educated, financially successful male" (Eubanks *et al*. 1993). Dickinson and Edmondson (1996) describe bird-watchers as typically older (over 45), well educated, suburban, and relatively affluent (in 1996, 58% of *Audubon* readers earned over $50,000 per year, as compared to 31% nationally). Their numbers are predicted to grow in the U.S. as "baby-boomers" age (Dickinson and Edmondson 1996).

Ecotourism trips tend to be longer than typical mass tourist trips, involve smaller groups, and have a significant percentage (one-third in one study) of repeat customers (Whelan 1991, Crossley and Lee 1994). Honey (1999) described a "bipolar vacation disorder" among ecotourists, who tend to prefer strenuous activities during the day and comfort at night.

Partridge and MacKay (1998) found the travel motivations of bird-watchers to closely parallel those of most ecotourists. Most important were wild and undisturbed settings and their ability to provide opportunities to increase knowledge. Local cultural and historic features, shopping, quality restaurants and hotels, and opportunities for fishing and hunting all rated low in importance, in accordance with previous nature-based tourist studies. Differences between bird-watchers and other nature-based tourists included the importance of guides and organized tours (birders tended to desire independence) and the availability of a range of other activities and experiences to incorporate into a total trip (birders tended to be more focused on birding alone).

In a series of surveys of Alaska residents and visitors, Miller and McCollum (1994, 1997) amassed an impressive body of data concerning respondents' socioeconomic profiles and their attitudes regarding wildlife and conservation. Alaska voters and resident and non-resident hunters all demonstrated a concern for wildlife and wildlife viewing opportunities. In response to the statement "wildlife adds a great deal to my enjoyment of living in Alaska," 80.8% of respondents "strongly agree[d]" and 15.3% "moderately agree[d]," for a total of 96% in agreement.

Statements concerning conservation and wildlife viewing, on the whole, received positive responses as well:

> "I think more concern should be given to protecting the land and water where wildlife live"
>
> 46.9% strongly agree, 29.2% moderately agree
>
> "I think more areas in the state should be managed and developed for wildlife viewing"
>
> 20.1% strongly agree, 36% moderately agree
>
> "I think more areas in the state should be managed and developed for wildlife viewing, even if that means closing some areas to hunting"
>
> 16.7% strongly agree, 23.3% moderately agree
>
> (Miller and McCollum 1994)

Visitors to Alaska tended to be moderately affluent and well educated. The largest category of pre-tax household income (20.9%) was $50-75,000 per year, followed by $35-50,000 (14.8%) and $75-100,000 (14.4%). Graduate school was the highest level of education completed for the largest segment of visitors (26.3%), followed by college graduates (24.3%) and people who had completed "some college" (20.1%) (Miller and McCollum 1997).

6.2.2. Nature Tourists in Canada

The 1998 Canadian Travel Survey by Statistics Canada found that Canadian wildlife viewers traveling in Canada tended to be well educated: 61% of respondents had university degrees or post-secondary certificates or diplomas. Canadian wildlife viewers were not necessarily wealthy, however, with household incomes distributed virtually evenly across all income ranges examined in the survey (under CA$20,000; $20-40,000, $40-60,000, $60-80,000, and over $80,000), with the exception that few earned less than CA$20,000 per year. This may reflect the fact that traveling in-country is less expensive for residents or that wildlife viewing often does not require participants to purchase expensive equipment or pay high fees for entrance or participation. Canadian wildlife viewers also participate in a range of outdoor activities, including swimming (64%), water sports such as kayaking, boating, and scuba diving (46%), fishing (40%), and bicycling (23%) (Smith 2000).

In surveys of visitors to Churchill, Manitoba—probably the most well-known location for viewing polar bears in North America—MacKay (1998; see also MacKay *et al*. 1996) found similar results. The largest segments of respondents earned over CA$80,000 per year (28.1%); possessed a university degree (57%); and were 55-64 years old (21.7%), with 62.8% between 45 and 74 years old. Most were also first-time visitors (86.4%), with an average travel party size of 1.9.

The survey also found a high value placed on scenery and environmental quality, education, personal interactions and safety, and a relatively low importance attached to typical tourist amenities such as hotels and restaurants. When asked to rate fourteen destination attributes on a scale from 1 ("not important") to 4 ("very important"), respondents reported "wilderness and undisturbed nature" as most important, with a mean rating of 3.57. This was followed by a tie for second between "interesting scenery" and "opportunities to increase knowledge " (mean = 3.40). "Interesting/friendly local people" ranked third (3.20), "environmental quality" ranked fourth (3.15), a "safe environment for locals/visitors" ranked fifth (3.06), and a "variety of short guided tours" ranked sixth (3.06). Quality hotels and restaurants ranked ninth and tenth, respectively.

An overwhelming majority of travelers in Canada are Canadian, while most foreign visitors to Canada come from the United States and the United Kingdom, which consistently rank first and second, respectively, in foreign visitor origins by country. From 1988-1999, U.S. visitation increased 19% from 12,763,000 to 15,180,000, and

visitation from the United Kingdom increased 48% from 527,000 to 780,000. Overseas visitation as a whole increased 54% during the same period. Foreign overnight person trips increased 21.5% during the same period, from 15,485,000 to 18,828,000, while domestic overnights fell 6.4%, from 79,460,00 to 74,409,000 (Statistics Canada 2001).

Using on-site interviews, intercept surveys and mail questionnaires, MacKay and McIlraith (1998) found that overseas visitors to Churchill were equally likely to visit in spring, summer, and fall. Americans were most likely to visit in the fall, when Canadians were least likely to visit.

Nature tourism in British Columbia is consistent with the province's wealth of sights and activities and an overall provincial attitude favoring conservation and participation in wildlife-related activities. In a 1991 survey on the importance of wildlife to Canadians, Environment Canada (2000) found that residents of British Columbia responded more positively than residents of almost all other Canadian provinces. British Columbians ranked first among provinces in positive response rates to questions assessing their opinions on the following statements:

"great or some interest in joining or contributing to a wildlife-related organization"
33.6%
"great or some interest in participating in direct non-consumptive wildlife-related activities"
80%
"maintaining abundant wildlife is very or fairly important"
90.9% in agreement
"preserving declining or endangered wildlife is very or fairly important"
88.6% in agreement

Residents of British Columbia ranked second in their responses to being "willing to help pay to protect habitat for abundant wildlife through increases of 1-5% in taxes or prices on four selected items" (69.2%) and "willing to help pay to protect declining or endangered wildlife from pollution through increases of 1-5% in taxes or prices on five selected items" (60.1%).

6.2.3. Knight Inlet Lodge: Guest Data and Attitudes

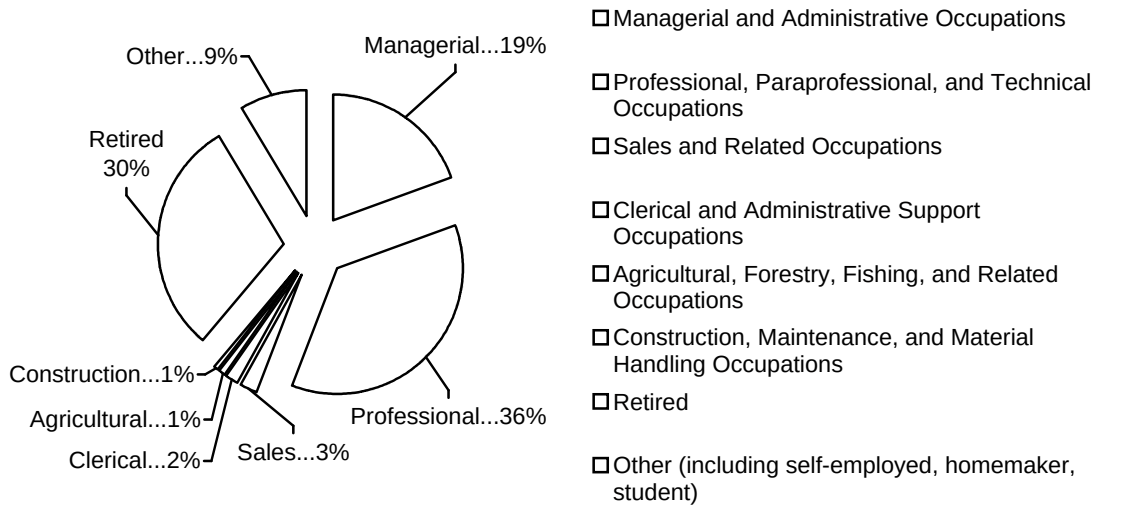
6.2.3.1. Demographics

The 2000 visitor survey requested respondents' ages, professions, education levels, countries and cities of origin, and incomes. Guest ages ranged from 27 to 81, with an average age of 53.8. This high average age is reflected in the fact that 30% of respondents were retired (see below). Approximately 21.1% of respondents were 65 years of age or older, compared to the U.S. national average in 1999 of 12.7% (USBC

2001). Slightly over half of respondents (59.2%) were male, and a majority of respondents (78.3%) indicated their marital status as "married/partner."

When guest professions were grouped according to categories obtained from the U.S. Bureau of Labor Statistics (USBLS 2000), professional and technical occupations were most common (36.2%) (Figure 6.5). The next highest percentage of respondents (30%) indicated that they were retired, followed by managerial and administrative occupations with 19.2% of responses. About 8.5% of respondents fell within an additional "Other" category added to include non-traditional occupations such as the self-employed, homemakers, and students not included on the original USBLS list.

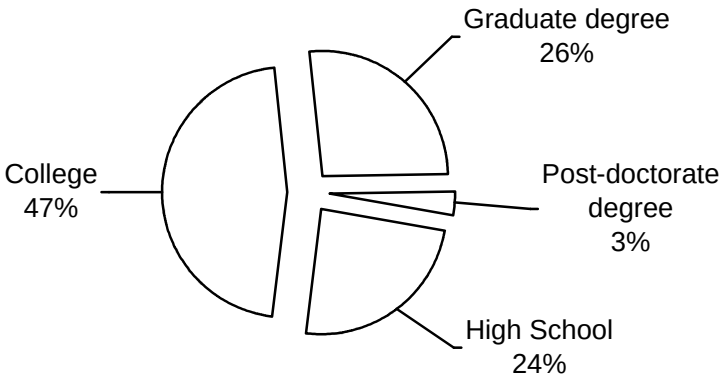
Figure 6.5 – Profession of visitors, Knight Inlet Lodge



The least common professional categories indicated by Knight Inlet guests—"Sales and Related Occupations," "Clerical and Administrative Support Occupations," "Agricultural, Forestry, Fishing, and Related Occupations," and "Production, Construction, Operating, Maintenance, and Material Handling Occupations", the "Service Occupations" category received no responses. For statistical purposes, these five categories were grouped under a new "Support/Agriculture" category that represented 6.2% of respondents.

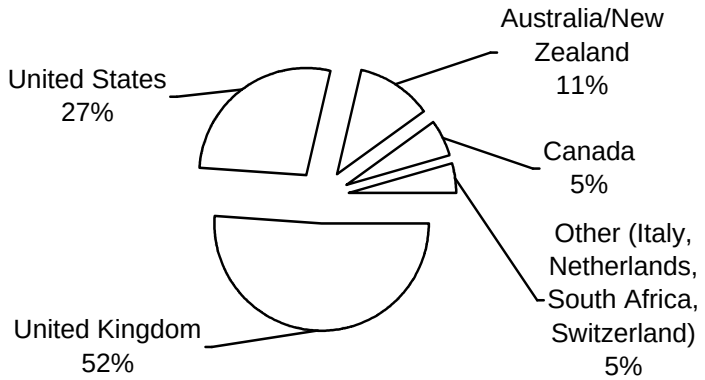
A majority of respondents (46.6%) indicated a college degree as their highest completed level of education (Figure 6.6), which is significantly higher than the 25.2% of the United States population that completed four of more years of college in 1999 (USBC 2001). High school and graduate degrees were approximately equally represented (24.1% and 26.3% of responses, respectively), while only a few post-doctorate degrees (3.0%) were indicated.

Figure 6.6 – Educational level of visitors, Knight Inlet Lodge



Slightly over half of respondents (50.8%) came from the United Kingdom (Figure 6.7). The United States was the next most common country of origin (27.3%), followed by Australia/New Zealand (11.4%), Canada (5.3%), and other countries (Italy, the Netherlands, South America, and Switzerland) (5.3%). For analytical purposes these countries of origin were combined into three categories: United Kingdom (still 50.8%), North America (32.6%), and "Other" (16.7%).

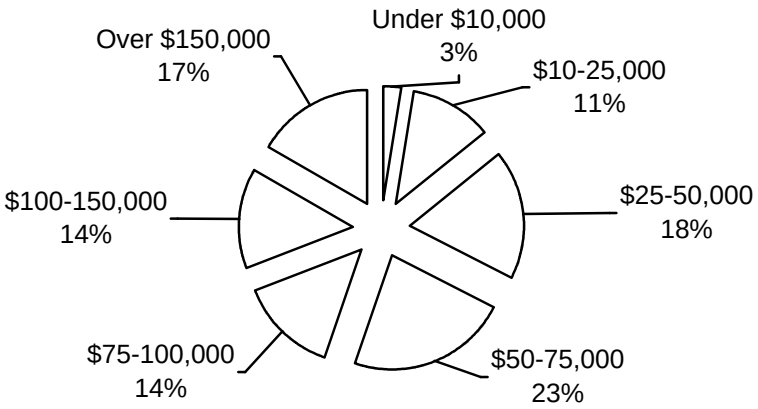
Figure 6.7 – Home country of visitors, Knight Inlet Lodge



The preponderance of visitors from the United Kingdom reflects the lodge's popularity among tour operators in that region who book visitors on package tours of Canada (D. Wyatt, pers. comm.). Statistical cross-tabulation showed that visitors from North America were more likely to have viewed bears before (17 vs. an expected 11.2) and visitors from the United Kingdom were less likely (12 vs. an expected 18.1) ($\chi^2 = 7.135$, df = 2, p = 0.028).

A majority of respondents (22.8%) indicated that they earned between $50,000 and $75,000 per year (Figure 6.8). In all, 78% respondents indicated they earned over $50,000 per year. Only 2.6% of respondents indicated they earned less than $10,000 per year. Two factors should be taken into account when interpreting this data: answers were assumed to be in U.S. dollars and to indicate respondent's income only, not total household income. It is worthy of note to compare these amounts and percentages to the median U.S. household income in 1999 of $40,816 (USBC 2001).

Figure 6.8 – Annual income of visitors, Knight Inlet Lodge



6.2.3.2. Previous Wildlife Viewing Experience

Most survey respondents had taken wildlife viewing trips before to a variety of locations, but few had traveled to see bears previously, and even fewer had ever been to Knight Inlet before. Knight Inlet compared favorably to guests' previous wildlife viewing experiences.

As expected, an overwhelming majority (93.4%) of respondents came to Knight Inlet to view grizzly bears. Approximately 14% came to "view other animals" such as bald eagles (*Haliaeetus leucocephalus*) and killer whales, 8.1% came for "other reasons" (a small number of examples such as photography were noted), and 2.9% came to "relax."

Nearly three-quarters (74.6%) of respondents indicated they had taken a wildlife viewing trip before. Of these, 41.3% took such trips, on average, about once per year; 24.5% took them less than once a year but more than once every five years; 20.6% took wildlife viewing trips more than once per year; and 11.8% took them less than once every five years.

Slightly over one quarter of respondents (27.9%) had taken a trip specifically to view bears before coming to Knight Inlet. Of those respondents who answered this question, 28.7% had been to at least one bear viewing location previous to Knight Inlet. About 7.8% of respondents had been to two other locations to view bears previously, and 3.1%

had been to three. Country of origin had no significant effect on whether respondents had viewed bears or any other wildlife before.

A total of twenty different bear viewing locations were listed. Of these, Churchill, Manitoba, a well-known destination for viewing polar bears, was the most popular, with 35.1% of responses. Jasper National Park received 10.8% of responses, and Banff and Katmai National Park in Canada and Alaska, respectively, each received 8.1%. Alaska as a whole received 35.1% of responses.

Only 9.6% of respondents had been to Knight Inlet before; 6.6% once before and 1.5% twice.

Knight Inlet compared well to other destinations where viewing wildlife (not just bears) was the main focus. Respondents listed seventy-five other wildlife-viewing locations. Kenya and South Africa were the most popular, each receiving 11% of responses. Churchill, Manitoba was next (9.8%), followed by Yellowstone National Park (7.3%) and Zimbabwe (6.1%).

Of the 36 different viewed animals listed by respondents, whales were the most popular (22%), flowed closely by birds (species unspecified) and elephants, each receiving 20.7% of responses. Bears (all species) came next with 19.5% of responses, followed by three of Africa's "Big Five" wildlife species: lions (*Panthera leo*) (18.3%), giraffes (*Giraffa* spp.) (17.1%), and rhinoceroses (*Rhinoceros* spp.) (15.9%).

In comparison to these other wildlife viewing locations, Knight Inlet Lodge received an average rating of 5.21 (n = 128, SD = 1.39) on a Likert scale ranging from 1 ("much worse") to 7 ("much better"). In other words, guest experience at Knight Inlet Lodge was, on average, somewhat better than guests' most recent wildlife viewing experiences. However, many respondents commented on the difficulty of comparing very different wildlife viewing experiences.

6.2.3.3. Hunting Experience and Attitudes

Few of the lodge's guests participated in or supported hunting, particularly of bears. Only 7.4% of respondents had ever sport or trophy hunted, and only 2.9% reported hunting more than once per year, on average. No respondent reported ever having hunted bears.

Concerning guests' overall feelings toward sport/trophy hunting of bears, the average response on a seven-point Likert scale ranging from 1 ("very negative") to 7 ("very positive") was 1.36 (n = 132, SD = 1.06). Only four "neutral" responses (4) and three "positive" responses (5, 6, or 7) were recorded.

6.2.3.4. Visit Statistics

The most common visit was two to three people staying for three nights as part of a larger trip. The number of nights guests spent at Knight Inlet Lodge ranged from one to ten, with an average stay of three nights/four days (n = 135, SD = 2.2). Length of stay had no significant effect on guest quality of experience or desire to return.

Since the number of other persons reported in the respondents' travel group ranged from one to eleven with an average of 1.82, group size ranged from two to twelve. A majority (69.7%) of respondents indicated one other travel companion.

Approximately 74.2% of respondents indicated their visit to Knight Inlet Lodge was part of a larger trip (i.e., that they visited other locations besides Knight Inlet Lodge on this particular vacation). Many guests, especially those from Europe, reported in person that they were visiting the lodge as part of a larger group package tour of Canada. Statistical cross-tabulation showed that visitors from the United Kingdom were more likely to be part of larger trip (61 vs. an expected 49.7) and that visitors from North America were less likely (13 vs. an expected 29.7) ($\chi^2 = 52.527$, df = 2, $p < 0.001$). Whether or not guests were part of a larger trip had no significant effect on their desire to return, but guests who were part of a larger trip had a lower average quality of experience (8.61) compared to those who came to Knight Inlet only (9.21) (T = -2.427, df = 75.389, p = 0.018).

6.2.3.5. Guest Satisfaction

Overall experience quality was high. On a ten-point Likert scale ranging from 1 ("terrible") to 10 ("outstanding"), the average response was 8.75 (n = 135, SD = 1.45). Responses were skewed strongly toward the positive end: no responses of 1 were reported, 97% of responses ranging from "positive" to "outstanding" (6 to 10), and 39.3% of respondents rated their experience at Knight Inlet Lodge as "outstanding" (10).

Not only were guests' experiences overwhelmingly positive, but on average they were better than expected. A seven-point Likert scale, ranging from 1 ("fell far short") to 7 ("far exceeded"), was used to determine how the respondent's actual visit, in hindsight, compared to his or her expectations. The average response was 5.52 (n = 125, SD = 1.25), with 76.8% of responses ranging from "exceeded" to "far exceeded" (5 to 7). Approximately 16.8% of respondents reported their actual experience "far exceeded" (7) their expectations for it.

6.2.3.6. Guest Preferences

The survey used hypothetical situations to determine the importance of the quality of surroundings, the numbers of viewed animals, and the effect of viewing on target animals to the guest experience. A seven-point Likert scale ranging from 1 ("no effect") to 7 ("great effect") was combined with two check boxes ("positive" and "negative") to

determine the degree and type of effect. Some respondents neglected to check the "positive" or "negative" box.

Seeing more bears during their visit would have improved guests' experience, but only somewhat. Average response to the hypothetical situation of seeing twice as many bears was 3.51 (n = 134, SD = 2.03), corresponding to "some effect," and 94.3% indicated that this effect would have been "positive".

Respondents indicated that significant visible clearcuts nearby ("Imagine…all the surrounding hillsides in Glendale Cove visible from the lodge had [had] all trees removed…for timber") would have had a significant negative effect on their experience. Answers averaged 6.27 (n = 135, SD = 1.06, range = 3-7), and 95.7% of respondents indicated that this effect would have been "negative". 57.8% of respondents chose 7 ("great effect") and 81.5% chose 6 or 7.

If they had known with certainty that their presence as viewers had an adverse effect on the bears they came to see, many guests would apparently have reconsidered their decision to come to Knight Inlet. Average response to this hypothetical situation was 5.48 (n = 134, SD = 146), between "some effect" and "great effect," and 98.4% of respondents indicated this effect would have been "negative (less inclined to come)".

An overwhelming majority of respondents (97.8%) indicated that they would like to come to Knight Inlet Lodge or a similar lodge again. The same three hypothetical questions (clearcuts, more bears, and negative observer effect) were then posed in regard to their effect on guests' desire to repeat their trip, using a seven-point Likert scale ranging from 1 ("less desire to go") through 4 ("no effect") to 7 ("more desire to go").

Responses were similar to those above. Seeing twice as many bears would have given respondents somewhat more desire to take a similar trip again, with an average response of 4.95 (n = 133, SD = 1.22). Visible clearcuts and a negative observer effect on the bears elicited more pronounced responses. Clearcuts would give guests significantly "less desire to go," with an average response of 1.81 (n = 134, SD = 0.80, range 1-4). Almost all respondents (97%) indicated an effect of "less desire to go" (1-3). Knowing their presence would have a negative effect on the bears would have a similar negative effect on guest desire to repeat their experience. Responses averaged 1.90 (n = 133, SD = 0.83, range 1-4). Again, almost all (97.7%) respondents indicated they would have "less desire to go" (1-3) and 37.6% answered 1 ("least" desire to go).

Income, education, occupation, and country or origin had no significant effect on respondents' desire to return.

6.2.4. Social Conclusions

Knight Inlet visitors fit the typical ecotourist profile in most criteria: they tend to be middle-aged, college-educated, moderately well off professionals (or retired) from the U.S. or Europe. The average stays was not particularly long (3 nights/4 days), but most visitors were traveling in small groups.

Most visitors had been wildlife viewing before, primarily whale-watching, bird watching, and African safaris. About a quarter of visitors had viewed bears before, mostly at Churchill, Manitoba and in national parks in Canada and Alaska, but almost all visitors indicated a high desire to return. This suggests that the relatively high prices and remoteness of bear viewing locations may discourage visitors who would otherwise repeat the experience.

Visitors from the U.S. were most likely to have viewed bears before (as would be expected among Canadians, if there had been more Canadian respondents), and visitors from the U.K. were less likely. This contrasts the fact that most respondents came from the U.K., suggesting that the relative lack of opportunities to view bears or other large mammals in that part of the world may provide an extra incentive to overcome the cost and inconvenience.

As a model bear viewing operation, Knight Inlet Lodge seems to be doing well. It compared favorably to guests' previous wildlife viewing experiences and in large part fulfilled their expectations, which can be assumed to have been high considering the expense and effort required to reach the lodge. Knight Inlet appealed to guests equally, regardless of income, education, and country of origin.

It is noteworthy that whale watching is so popular among Knight Inlet visitors, since it is already a significant source of tourist revenue for British Columbia. This, combined with the finding that most visitors came as part of a larger trip, suggests that package tours combining bear viewing and whale watching would be a successful approach.

The three hypothetical situations shed light on the importance of bear numbers, the surrounding viewscape, and the potential negative effects of viewing on guests' quality of experience and desire to return. Seeing more bears would improve the quality of experience, but only somewhat, suggesting that the relationship between bear numbers and experience quality is not directly correlated, but that there is instead an upper asymptote at which experience quality levels off—i.e., that beyond a certain amount more bears do not directly equal a better experience.

Viewscape, however, was very important to respondents, as evidenced by the fact that clearcuts would significantly detract from both experience quality and guests' desire to return. This point is therefore important to consider in the selection of viewing locations, as well as forest management practices on the landscape surrounding bear viewing operations.

Guests were somewhat concerned with the idea of their presence having a detrimental effect on the bear they were watching. This suggests that pre-viewing education and explanations of the importance of following established bear viewing guidelines (to avoid such negative effects) would alter viewer behavior, but only up to a certain point.

A detailed socioeconomic analysis of the effect of Knight Inlet Lodge on the surrounding local communities is beyond the scope of this report. It is important to note, however, that the owner of the lodge is Canadian and a resident of Black Creek, which, aside from Campbell River, is the closest community. Lodge employees are all Canadian, and most if not all of the money spent to run and maintain the lodge stays within British Columbia if not Vancouver Island itself, including food, float planes, gas, and other supplies.

7. Recommendations

7.1. Best Practices Based on BC and Alaska Bear Viewing Programs

Bear viewing programs have been in existence since 1935 when a trail and two observation platforms were constructed at Pack Creek on Admiralty Island, near Juneau, Alaska. Currently there are about 11 formal recognized bear viewing sites in Alaska, British Columbia, Yukon and Russia. A wealth of experience has been gained from managing these sites, which was shared at a workshop in 1995 for site managers. Highlights were summarized in informal notes (Neary 1995). The following list excerpts many of the elements that constitute a successful bear viewing program. These recommendations, and our research experience at Glendale Cove in Knight Inlet are the basis for these "best practices" recommendations.

In the 1995 bear viewing managers' workshop, the program at McNeil River State Wildlife Sanctuary was presented as a case study. Their program began because public use "was destroying it". Unrestricted use caused bears to abandon the falls. The whole program evolved from one objective: to protect the unique concentration of bears through unswerving adherence to management practices that put bears first. This involved limiting visitation to 10 people per day and conforming to that from 1973 to the present.

7.1.1. Best Practices for Management and Habituation

(Summary from the 1995 Alaskan bear viewing workshop)

7.1.1.1. Management

- decide if an area should have a formal bear viewing area
- have specific, clear, bear viewing objectives with measurable standards; if use of an area just evolves, confusion, controversy and power politics result
- put bears first; if not, other objectives become superficial
- clarify strengths and weaknesses of individual bear viewing sites and avoid copying one model
- avoid temptation to provide close views of many bears where densities are low

7.1.1.2. Bear Habituation: Desirable Levels for Bear Viewing

- be consistent and predictable; includes all staff and visitors
- use behavior that bears will recognize (no sneaky actions)
- habituated bears are safer where visitors are naive about bear behavior
- habituation levels will vary but strive for least effect on bears
- more visitors means more habituation and management control needed
- if bears very concentrated, more habituation is needed among the bears
- no fishing around bears: anglers may refuse to move; risks food-conditioning

7.1.2. A Role for Bear Viewing in British Columbia

In recent years, throughout Canada and the USA, a broad range of provincial and state programs for wildlife viewing have been designed. Agencies have provided a variety of interpretive materials including maps and guides to meet the public's exploding interest in locating places to observe and photograph wildlife. Since 1960 on Alaska's world-famous Brooks River in Katmai National Park, over 50 bears and thousands of visitors and anglers have co-existed peacefully on a 1.5km. river. At McNeil River State Wildlife Sanctuary a guided viewing program solely for observing bears fishing on salmon has been managed by the Department of Fish and Game. In BC demand for viewing bears has expressed itself in crowds of foreign and Canadian visitors to places like Adams River to see spawning sockeye and at Stewart BC where brown and black bears can be seen at Fish Creek near Hyder, Alaska. Here the U.S. Forest Service has constructed a platform overlooking the spawning habitat of a race of especially large Chum salmon (*Onchorynchus keta*).

In all bear-viewing programs managed by government agencies that we could find the habituation response of bears is viewed as very positive. It reduces stress and the defensiveness of wildlife, permits them to conserve their energy, and avoids displacement to other habitat patches, at least among those tolerant enough to adapt. However no studies have assessed the potential aversive effects of hunting and poaching (Gilbert

1989), especially when it is done along salmon spawning streams at the bears most important seasonal habitat. A special Act by the state of Alaska protected a zone around McNeil River State Game Sanctuary from hunting. Alaskan bear scientist Sterling Miller generalized that "in populations that are subject to hunting, bears tend to develop avoidance reactions to human presence" (Miller 1987). Consideration and balance in the treatment of these issues of how to integrate viewing and trophy hunting need further research and evaluation.

The assessment of bear viewing by the Canadian bear researcher, Dr. Stephen Herrero, may prove insightful. After his visit to a bear-viewing program just north of the BC border at Anan Creek in July 1994, he reported on the intrinsic value bear viewing in a succinct report to the Wrangell Ranger District, Tongass National Forest, Alaska:

> "Anan is a unique and extremely valuable natural resource. It is either the best, or close to the best, place in North America (hence the world) to observe black bears interacting with one another, and fishing for salmon. Because they also occasionally interact with brown bears and people can observe all the aforementioned interactions, we consider Anan to be a world class viewing site."

7.1.3. A Balanced Perspective About Bear Viewing

There is no question that bear viewing has the potential for negative impacts on bears. However careful planning needs to focus on realistic future scenarios and avoid debating a false dichotomy: either a future with bear viewing or the traditional use of trophy hunting.

Our choices are not between current uses and future uses but among a variety of future scenarios. We do not have the option of turning back the clock. Planning to accommodate the societal footprints of the past in the face of growing affluence, populations and motorized recreation may have limited utility. Are there alternative futures for bears other than land uses that have very negative habitat impacts on wildlife species, like logging, mining and associated roads (e.g. Taku River) and expanded helicopter-based recreation?

One way to provide more balance is to evaluate additional potential or theoretical benefits to bears from well-managed viewing, especially on the important reproductive segment of the population. There is growing empirical evidence from scientific publications of a correlation between increasing numbers of people at viewing areas and higher maximum numbers of bears tallied at salmon streams, up to a certain threshold. Brooks Falls in Katmai National Park, a site with burgeoning visitation, Anan Wildlife Observatory, and Glendale Cove all have documented increases in some categories of bears coinciding with increased visitation. McNeil Falls has had constant levels of visitation and also witnessed increasing numbers of bears. While it is difficult to tease out the effects of rehabilitated salmon runs (Glendale River), added security, or

increasing runs of salmon, it is evident that bear populations did not decline as visitation went up.

Consideration of bear productivity on the coast could benefit from a source-sink conceptual framework (Doak 1995). If the reproductive-age females of a bear population are given maximum protection, including full access to crucial foraging habitat (salmon spawning streams, and falls during the period of hyperphagia), then they will maximize recruitment of young into the population. Bears in excess of the local carrying capacity would then be available to disperse into hunted areas and mortality sinks (places where mortality exceeds local production of young). This management scenario has been demonstrated in forest black bears to secure populations from extinction in North Carolina where illegal kills are high (Powell 1987). In other areas such a refuge system can provide a cushion against over-hunting that requires much less intensive monitoring to detect over-harvest, as the system tends to be self-correcting. This would be a considerable economic advantage in remote areas of coastal BC

There are successful examples of win-win situations with trophy bear hunting and bear viewing. Recent discussions with managers in Alaska going through scoping for new management on Kodiak Island (telephone interview/Bill Pyle) reveal that bear viewing is considered by some guide-outfitters as an economic asset and new opportunity during their slow, summer season between spring bear hunts and fall deer and bear hunts. Interagency planning staff for Kodiak region inform us that the approximately 60 tour operators and guide outfitters, many of whom are wildlife viewing guides, see bear viewing in a positive light. However, only as long as the contacts between people and bears are kept at a sufficient distance so as not to predispose the bears to food-conditioning, damage to camps and raise a concern about the ethics of shooting “tamed” bears. In view of the intensity of bear and deer hunting on Kodiak Island the degree of risk from conditioned response of bears to rifle reports or “dinner-belling” has been a concern for some time. There has been a learning phenomena among bears that is difficult to manage and habituation is just another of these, not a new impact.

7.2. Knight Inlet

7.2.1. Viewing Infrastructure

It remains our recommendation that there be no further development of new viewing locations at bear feeding sites on the Glendale River until further study has been completed on the substitutability of other fishing sites.

Based on the results of our observations in 1999 and 2000, the location of current viewing structures, while having some measurable impact on bear fishing behavior, can be maintained with minimal bio-energetic impact on the KI bear population, if use levels are carefully controlled. Some modification of the current viewing regimen will further minimize these impacts.

Reduction of vehicular traffic close to the weir will be an important step in the process of reducing the impacts of viewing. The simplest reduction in vehicular impact can be achieved by stopping the use of the slope between the Knight Inlet Lodge stand and the weir for turning buses. If vehicles are to be removed entirely from the ground close to the weir alternative methods of accessing the current viewing structures should be considered. Given the fact that bears cross over and travel along the roadway regularly and the nature of the steep sided causeway upon which the road is situated, surprise encounters between bears and groups of visitors on foot are likely. At both Brooks and M^{c}Neil such encounters are a regular occurrence. However, unlike these sites where safe alternative routes are available for both parties, at the Glendale spawning channel no such alternative exists. Creation of a raised walkway for visitors on the slope of the causeway would circumvent this problem by creating an alternative route for human use only. Raising the walkway and placing it to the side of the roadway not only separates guests and bears but also allows bears to pass unobstructed beneath it and leaves the road available for maintenance and other DFO activities. Another alternative is to approach the viewing structures on a raised walkway from the other side of the Glendale River. While the expense associated with such a structure may be significant it has several advantages:

- Total removal of vehicular disturbance from the immediate vicinity of the bears' primary feeding site.
- With only one access route to the viewing platforms, visitor numbers can be more easily recorded/regulated.
- This is a more aesthetically pleasing arrival method for visitors to the site.

The removal of the earliest and/or latest daily viewing periods would provide significantly more undisturbed time for the bears with little impact on tour operators schedules.

7.2.2. Management of Viewing

7.2.2.1. Setting and Controlling Viewing Periods

If multiple tour operators are to be allowed to bring bear viewing tours to the Glendale area of KI, viewing periods need to be carefully regulated. It is not sufficient that each operator proposes a schedule that provides adequate undisturbed time for the bears: these schedules must be coordinated. In the 2000 season there was no enforcement of viewing guidelines and application was left to the discretion of individuals and tour operators using the site. It should be noted that operators, having traveled long distances with guests, would frequently overstay assigned viewing periods, especially when bears had been few or absent earlier in their viewing.

The frequently cited "tragedy of the commons" (Hardin 1968) is highly applicable to this situation. For each operator the benefits of over use are large, immediate and readily identifiable (satisfied customers, repeat business, tips etc.) yet the costs (increased disturbance, site abandonment, bioenergetic and demographic impacts on the bears) are spread among all operators or apply only to the "ownerless" bears.

The benefit/cost ratio of over use is different for each user group. Unguided individuals and infrequent visitors suffer no cost from their over use of, or inappropriate behavior on, the site. Given that they perceive some benefit from behaviors such as getting close to bears, visiting the stands at night, or staying for extended periods, they will be inclined to act in these ways. Tour operators who come to the site from another location as a day trip experience little cost for their overuse. Even if the Glendale River was to be totally abandoned by bears, they can easily take their guests to another location. Knight Inlet Lodge has invested in infrastructure at this site such as the lodge, the viewing structures and road maintenance. Whatever the cause of reduced numbers of bears at the site, Knight Inlet Lodge faces the greatest cost. Also, because of the nature of their operation, there is little benefit to be derived from overstaying an assigned viewing period.

Having a single operator using a viewing site, much as is the case for hunting with guide-outfitters, creates a sense of ownership. A single operator is less likely to behave in a manner which is unduly disturbing to the bears since they alone suffer the cost of any reduction in bear activity. There is therefore an immediate economic incentive to practice appropriate bear viewing and follow guidelines. If such an operator has invested heavily in the site, the incentive is even clearer.

7.2.2.2. Training of Guides

Staff guiding the visiting public should have a consistent basis in knowledge of bear behavior, ecology and human-bear interactions. Guests should expect not only to be safe but also to enjoy a superior wildlife experience without anxiety.

All staff who accompany guests should have attended a 3-4 hour training course and have a minimum of $^1/_2$ day of field training.

7.2.3. Hunting

By substantially extending the current hunting closure in the Glendale area of Knight Inlet this area can become a resource not only for the eco-tourism industry but also for the conservation, and even the strengthening, of brown bear populations on this area of the BC coast. By protecting an area of high productivity, such as this, we provide a source of dispersing bears, which serves to counterbalance losses in surrounding areas of low productivity and high mortality.

It is particularly appropriate to explore this option during the current moratorium on brown bear hunting in British Columbia in an attempt to establish a sustainable basis for any future return to hunting.

7.2.4. Research

7.2.4.1. Home Ranges of Bears Using this Area

In light of the disappearance of so many bears from the Glendale drainage this summer it is imperative that we immediately begin to identify the home ranges and access routes (mountain passes) used by resident bears. If missing males return to the estuary in breeding season, they can be targeted for satellite telemetry to establish home ranges, seasonal use patterns and travel routes. These bears should also be marked with subcutaneous microchips (PIT tags) and tetracycline to aid in identification and the anti-poaching effort. It is of the utmost importance to the conservation and management of this population that we have an understanding of the home ranges of its members.

7.2.4.2. Availability of Alternative Feeding Sites

To effectively manage bear viewing on this site we must not only have an understanding of the impacts at viewing sites, we must also have an awareness of the availability and substitutability of alternative feeding sites. To this end, a small sample of female and subadult bears should be collared for high-resolution telemetry. This will allow us to investigate their use of alternative feeding sites as well as their use of viewing sites in the absence of all observers.

7.2.4.3. Age/Sex Structure and Stability of the Population

As outlined in Section 5.2. the KI population does not seem to have a stable age/sex structure. It will take further study to determine the causes of the age/sex structure that has been observed. An understanding of these factors is essential to the management of this population.

7.2.4.4. Socioeconomic Factors

The research objectives of this report did not address the effects of Knight Inlet Lodge on local communities and the resulting attitudes toward such an operation. Surveys of residents could determine what such operations can do to fulfill ecotourism's goal of improving the well-bring of local people.

More detailed economic analysis of wildlife viewing operations—ideally over longer time periods—could provide more specific data on the long-term economic prospects for such businesses. Knight Inlet Lodge seems to be doing well so far, but more robust conclusions could be drawn after ten or fifteen years of operation.

7.3. British Columbia Coast

7.3.1. Policy Options for Bear Viewing

The demand, marketing and economics of bear viewing were not part of this study, but would be a legitimate and crucial next step by qualified resource economists. We offer the following suggestions based on bear behavior, a successful BC bear-viewing business and direct experience of Alaskan viewing programs managed by U.S. government agencies.

Option 1

Expand opportunities for bear viewing in BC on salmon streams and estuary concentration sites. These areas or ecocenters are already being targeted for greater protection (no-hunting zones, limited permitted viewing (e.g. Kutzemateen estuary)). It is becoming widely recognized that such protection from hunting is consistent with the principles of professional population management as well as ethical consideration of fair chase.

Coastal brown bears in BC, as elsewhere, have special requirements for safety and minimized disturbance. At present it is uncertain how those responsible will manage for these requirements. Wildlife managers could designate employees, seasonal guides or volunteers to live on site. Where an established business has the requisite experience and an accepted written plan, revocable permits seem appropriate. It seems quite clear that unlimited access by inexperienced private operators is inappropriate for ground observation of bears as it is proving to be for ocean observation of whales. While there are many considerate, ethical operators, others, it appears, are drawn by the lure of heightened business returns in exchange for the provision of up-close experiences. These have a high probability of unacceptable impacts on the animals.

Option 2

Bear viewing could continue to be subordinated to traditional trophy hunting interests in provincial management and policy. This is neither consistent with the public's attitudes in general, nor, necessarily, with that of other hunters. For example, even among resident hunters in Alaska, the majority of them are not in favor of trophy bear hunting (McCollum and Miller 1994). One might predict that this would be true in BC, especially of the highly mechanized, easy access type of coastal brown bear hunting recently witnessed and reported (Horesji *et al*. 1998, McAllister and McAllister 1997).

Space does not permit an evaluation of the compatibility of hunting and bear viewing. However, conflicts in values are clearly evident with suspicion among hunters in Kodiak National Wildlife Refuge that small, protected areas on streams will expand under pressure from bear viewing clientele and sympathetic environmental organizations. We suggest that research on the home range size of females congregating on spawning channels will help rationalize the extent of zone closures. Further, population modeling based on a population of individually recognizable bears (e.g. Glendale) could provide evidence of the benefits of increased recruitment to the population resulting from increased access to salmon and other concentrated foods as a consequence of protection (site specific habituation to people) vs. aversion from hunting. The most serious impacts to populations would occur where the hunting season overlaps the peak period of hyperphagic salmon eating.

If BC decides to better exploit the international markets for wildlife viewing (specifically coastal species, focusing on bears), the steps recommended in the following quote from Miller and McCollum (1999) are helpful:

- "The [province's] tourism policies and goals must be articulated. A marketing strategy to maximize instate spending will be very different from one designed to maximize the number of visitors."

- "A benefit segmentation study of [BC's] visitor market should be conducted to identify specific benefit seek. Our study revealed a significant benefit segment, that of wildlife viewing; it was not intended to analyze other aspects of the visitor industry."

- "A better segmentation of the specific wildlife viewing experience sought by both visitors and residents is needed. More wildlife viewing opportunities offering a variety of benefits and experiences, need to be developed and marketed."

- "Wildlife management policies for wildlife viewing need to be articulated. Creating wildlife viewing opportunities requires coordinated efforts among wildlife managers, land managers, and the visitor industry".

- Initiate coordinated efforts to create wildlife viewing opportunities among wildlife, land and tourism managers (Miller and McCollum 1999).

7.3.2. Management of Viewing Locations

It is recommended that the management of viewing at KI become the model for other similar sites on the BC coast. Access should be controlled by either permitting only one viewing operator or appointing an on-site observer.

If locations for viewing are carefully selected using population models based on the salmon density - bear density relationship, a network of reserves can be established along the coast. By closing these reserves to hunting and logging they will become source populations for bears and centers of bio-diversity preservation and restoration. Yet, unlike many proposed reserves, these areas will have great economic value because of their use in eco-tourism and sustainable harvest of marine resources.

Coordinated efforts to create wildlife viewing opportunities needs to be initiated among wildlife, land and tourism managers (Miller and McCollum 1999).

7.3.3. Management of Bear Attractants

7.3.3.1. Bear Biology and Behavior

Bears are long lived, large brained, intelligent mammals whose behavior is a complex product of learning. Their feeding behavior is largely determined by learned behavior during long association with and guided by their mother. Bears seem always to explore new foods since they can and will eat just about any kind of digestible substance. The mountain grizzly bear's diet is largely plant materials but when rodents and deer are available they are preferred. On the BC coast, as happens on the Glendale, Namu and Kutzmateen rivers, bears aggregate on salmon streams, attracted to the fat-rich fish.

Bears learn about new foods and develop strong traditions that guide them to return to these places to seek seasonal foods. Young bears observe and learn these locations from other bears, continuing the tradition. This leads to the food specialization that biologists have observed in individual bears.

In Alaska, population density of bears varies from place to place, depending on the quality and quantity of food. Where food is low on the Arctic coastal plain we find 3.8 bears/1000 km^2, while in the salmon rich drainages of the Alaskan peninsula, including Katmai NP, we find as many as 550 bears/1000 km^2. Similarly, artificial or supplemental food in the form of garbage can increase local densities of bears over time but the consequences of this are widely considered to be negative for people, property and bears.

When bears are redirected from natural food negative attitudes toward all bears may follow.

7.3.3.2. Problem Bear Conflicts: Their Development

The history of bear management (in BC, Jasper NP, Churchill, Manitoba, Yellowstone NP and Algonquin Park) shows clearly how small attractants for bears develop an association with people leading to eventual epidemics of damage. It is abundantly clear that the potential bear problem needs to be addressed promptly.

The crucial point for managers is to begin planning and action before any sign of a problem. Responsibility falls to the bear-viewing operators to have acceptable written plans and training of all staff.

Based on the situations at landfills in Churchill (polar bears), Yellowstone (grizzlies), and Minnesota (black bears), the process by which bears become problems is outlined below:

Stage 1. Ecological Priming Factors

North American species of bears commonly experience food shortages that cause them to roam and explore new food sources. As opportunistic feeders, bears are naturally attracted to food odors; including those that would not interest them if they were satiated on natural foods. Dozens of news articles in Canada and Alaska report widespread bear problems when the berry crop fails. Wildlife naturally seeks out other, richer food supplies including those we have grown or stored.

Stage 2. Biological Priming Factors

Bears are significantly different than other animals because, when preparing for hibernation, they need to accumulate a huge surplus of fat to survive up to 6 months in a winter den. Simultaneously they have an obsessive attraction for fats and oils. Bears eating fat-rich salmon gorge themselves, consuming over 15 salmon per hour and one hundred thousand calories per day.

If bears with huge appetites are faced with little natural forage then concentrations of garbage, pet food or agricultural crops attract them. It is imperative, then, to predict these occurrences and initiate preventive management.

Stage 3. Triggering Situations for Bear Problems

Not all bears develop into problem bears. A crucial experience, an opportunity to learn where to get rich food from people, starts the simple learning sequence. It is one-trial learning and the habit is imprinted.

Stage 4. Transmission of the Learned Trait

After a bear gets food from people they may be observed by their young or other bears and the learned behavior passes on to other bears. This becomes a behavioral epidemic because it spreads so rapidly through the bear population. Places like Yosemite National Park have gone through a number of these periods with their bears in campgrounds. The scenario is well-known but not well-managed or controlled.

Stage 5. Consequences of the New Trait (Population feedback)

As bears concentrate and specialize on the new, rich food source females produce more young, breed at an earlier age, have shorter intervals between births and produce larger litters from which more survive to adulthood. Males breed more females because they are more aggressive and dominant, thus passing on the genetic predisposition as well as the learned aspects of the feeding syndrome.

The combination of new behavioral traits, adapting to people and food-conditioning, opens up a new feeding niche in which the animal excels and so the trait spreads.

Stage 6. A Population of Problem Bears

What may begin as a seemingly minor, single bear conflict can, through learning and population change, becomes an expensive and potentially dangerous problem. Although problems develop slowly resolution may require destruction of bears when they become a threat. Through no fault of their own, bears around small communities or lodges can be "trained" by people's mismanagement of bear attractants. Their management can become a drain on budgets, diverting biologists from more productive work to address chronic animal damage situations and people's fears. Inevitably the responsible agency is asked to destroy these animals, engendering the slogan: "garbage kills bears".

7.3.3.3. Problem Bear Conflicts: Their Prevention

Careful planning and management is essential in the prevention of human-bear conflicts at viewing sites:

1. Accurate biology and behavioral science is fundamental.

2. Proactive planning, not reaction, is essential with learning phenomena. Behavior cannot be unlearned, only deterred and then perhaps only temporarily.

3. Build on the experience of others through consultation, e.g. provincial inter-agency committees (agriculture-wildlife), electric fencing of coastal lodges and storage sheds. There are no "cookbooks" but many helpful sources are available.

4. Involve and educate people at all levels. If only a single technical approach is tried then the problem may recycle and be costly.

5. Solutions should be integrated with overall planning.

6. What constitutes a "problem bear" (i.e. bear behavior warranting destruction of the bear) requires careful definition. If there have not been numbers of people at developments many bears may not be so habituated to people that they pose a significant risk of injury or damage to property. These bears can be expected to

disperse into the bush and not turn to cabins and other buildings if they avoid people or are conditioned by planned harassment or capture.

7.3.3.4. Solutions

- Recognize that bear problems are a fact of life in bear country: have preventive programs in preparation for inevitable problems. In view of the extensive bear habitat in British Columbia recommendations for better preventive bear management need to be incorporated in all sites of structures and food storage plans.
- Promote public understanding of the relationship between loss of wild foods and security to bears (the specific details of nutritional needs, "habitat") and triggering of bear problem irruption.
- Develop "bear awareness" programs that sensitize people to the relationship between availability of stored food, garbage etc. and consequent risks to humans and bears alike. Include technical development of garbage handling, transfer processes, containers, fencing and all types of mechanical protective techniques for food sources of all kinds.
- Create committees of wildlife, enforcement, police, public relations and other agencies prepared to deal quickly and professionally with individual problem wildlife that have been "trained" either by accident, bad luck or ignorance.
- Develop an information system and a written management plan. Outline preferred action to guide behavior but sufficient flexibility in decisions to avoid inappropriate legal action in cases where personnel could not have been reasonably been expected to foresee and prevent damage or injury.

7.3.4. Hunting

As stated in section 7.2.3. (see also Section 7.1.3) we recommend further investigation of the value of hunting closures around high productivity viewing sites as part of a source-sink model for sustainable hunting in British Columbia. This is especially important in light of the current short term hunting moratorium.

7.3.5. Research

Pursue research on modeling of the salmon density-bear density relationship. This is important for the province of BC so that rates of increase can be predicted, providing refined information for extrapolation coast-wide. Should salmon continue to decline precipitously such information would be crucial for precise harvest management. It should be done at Glendale to benefit from the known, individually recognizable bears at this site. Proposed limited telemetry studies at the site add a dimension to ongoing behavioral studies and will move us one step closer to this goal.

There is much opportunity to collect data on wildlife viewing ecotourists' attitudes and satisfaction. Surveys of current ecotourists could clarify which parts of their experiences they did or did not enjoy and why, assisting in future site selection and operation management. Surveys of potential future ecotourists would provide willingness-to-pay figures to create economic demand curves and valuation estimates for both the bear viewing experience (which would be easier with more detailed travel cost figures) but also, possibly, even the animals themselves.

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Appendix I: Ecotourism and the recreational use of bears - An annotated bibliography

A bird in the bush is worth big bucks. 1995/6 *National Wildlife*. 34:8+.

> Declining populations of nesting birds are threatening bird watching, a surprising popular pastime which, according to a USFWS report, earns $5.2-9 billion yearly from 65 million American adults. Bird-watching supports an estimated 200,000 jobs, and can inject million of dollars into local economies in bird-watching hotspots.

Barnes, J. and J. de Jager, 1996. Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. *S. Afr. J. Wildl. Res.* 26(2):37-46.

> The increasing shift from livestock to wildlife production (both pure wildlife operations and mixed cattle/game ranch systems) on private ranches in Namibia reflects the relatively large potential markets for wildlife uses, ranging from venison production to hunting and wildlife viewing tourism. This shift has resulted in dramatic increases in wildlife numbers (70%), biomass (84%), and species diversity (44%) from 1972 to 1992.
>
> Questionnaire surveys (in 1972 and 1992) and cost-benefit analysis models indicate that wildlife production for non-consumptive wildlife viewing, in the form of large scale land conservancies, offer greater economic benefit for private landholders in Namibia than smaller ranches producing either livestock, wildlife for consumptive use, or a combination of the two.
>
> Economic modeling indicates that, while all activities modeled are economically efficient, conservancy scale land use systems demonstrated both positive financial profitability (and thus incentive for investment), and positive economic value (i.e. contribution to the overall welfare of society and the nation) over a ten-year period, while pure game and mixed cattle/game ranching systems demonstrated negative financial profitability and relatively lower positive economic value. The current national policy of support for the use of wildlife and the development of wildlife conservancies on private commercial land therefore appears economically sound.

Bath, A. 1998. The role of human dimensions in wildlife resource research in wildlife management. *Ursus* 10:349-355.

> "Wildlife management decision-making has become as much a sociopolitical issue as a biological one...The question agencies face...is how to involve the

public without compromising the biological basis for implementing certain policies...The public should not dictate wildlife policy, and wildlife management should not be a popularity contest."

Bayless, D. S. and Bergstrom, Messonnier, Cordell, 1994. Assessing the demand for designated wildlife viewing sites. *Journal of Hospitality and Leisure Marketing.* 2(3):75-93.

Recreational wildlife viewing is on the rise in the U.S., and with it the demand for designated viewing sites. A USFWS survey found that 74 percent of American adults participated in some form of recreational wildlife viewing, feeding, or photography in 1985, up from 55 percent in 1980. In 1990, U.S. citizens spent over $18 billion on these activities while logging an estimated 21.5 million visits on the National Forest System alone. The trip response model (TRM), a variation of the standard travel cost method (TCM), was used in a mail survey to assess demand for potential wildlife viewing sites on National Forest land. Results suggest that the market area for wildlife viewing sites is relatively local (within roughly 100 miles of population centers), and that potential visitors would pay an average of up to $58 per round-trip visit. Respondents averaged 53.6 years old, and a significant percentage (40%) were retired.

Boo, E. 1990. *Ecotourism: The Potentials and Pitfalls.* Washington, D.C.: World Wildlife Fund.

Boyle, S. and F. Samson, 1985. Effects of non-consumptive recreation on wildlife: a review. *Wildl. Soc. Bull.* 13:110-116.

As of 1985, non-consumptive wildlife-oriented recreation had increased greatly in recent decades, and was projected to increase even more in decades to come, to the point where it might outweigh direct consumptive values. In 1980, 73% of the U.S. population (145 million people) participated in non-consumptive wildlife recreation. Of 536 references concerning the impacts of this type of recreation on wildlife, 31 were found to deal with wildlife observation and photography. Of these, 21 concerned birds: 19 found negative effects and two found no effects. Of the ten references concerning mammals, five indicated negative results, one indicated a positive result, and four found no effect. The authors propose that these negative impacts can be explained by tendency of wildlife viewers and photographers to seek and approach wildlife, especially rare and/or unusual species. Viewing/photography encounters tend to be more frequent and of longer duration. Birds seem to be more sensitive to disturbance than large mammals.

Brannon, R., R. Mace and A. Dood. 1988. Grizzly bear mortality in the Northern Continental Divide Ecosystem, Montana. *Wildl. Soc. Bull.* 16: 262-269.

Of six ecosystems identified for the management of grizzly bears in the lower 48 states by the U.S. Fish & Wildlife Service's Grizzly Bear Recovery Plan, the Northern Continental Divide Ecosystem (NCDE) contains the largest numbers of bears, and is the only one where hunting is allowed. Statistical analysis indicates that an annual quota of 25 grizzly bear mortalities from all human causes, including hunting, control kills, accidental deaths, and aboriginal kills, has been effective in limiting harvest, controlling mortality of female bears, and regulating overall bear mortality. While average annual human-caused mortality and hunter harvest declined, illegal kills increased, indicating that a quota system has advantages and disadvantages that wildlife managers would do well to consider before implementation.

Brooke, J. 1999. Furor rises in Canada over hunt for grizzly. *The New York Times* 11/14/99, Sec. 1:17+.

British Columbia is coming under fire for being the last Canadian province to allow a major grizzly bear hunt. Uncertainty over true population sizes (ranging from 6-12,000) is at the core of the debate. Recent restrictions have caused bear harvests to drop from an average of 350 in the early 1990s to 207 in 1998. According to the B.C. Environment Ministry, grizzly hunting generated $700,000 in revenue in 1998, compared to $2.5 billion from tourism as a whole, which is booming along the province's Pacific coast. The Guide Outfitters Association of British Columbia argues that hunting provides jobs to economically depressed rural communities, and claims that if a complete ban were instituted, wealthy hunters would simply fly to Alaska, where 1,200 bears are harvests every year.

Burger, J., M. Gochfeld and L.J Niles, 1995. Ecotourism and birds in coastal New Jersey: contrasting responses of birds, tourists, and managers. *Envi. Cons.* 22(1):56-65.

A number of ways in which ecotourists can adversely affect the behavior, reproductive success, and population levels of viewed animal populations—in this case, breeding and migratory birds in New Jersey. Different avian situations (breeding birds, migrants, solitary vs. colonial species) and different ecotourism types (solitary visitors, small groups, large groups) are presented as explanations of variations in the effect of visitors on the animals. The authors present as a crucial factor the maximum human use a sensitive avian resource can withstand before suffering population declines, and conclude that situations with controllable access are the most amenable to situations with a minimal negative impact on viewed species.

Burton, T., D. Koch, D. Updike, and A. Brody. 1994. Evaluation of the potential effects of sport hunting on California black bears. *Int. Conf. Bear Res. and Manage.* 9(1):231-235.

> Annual analysis of California bear-hunting statistics gathered since 1957 indicates that reported kills have increased significantly, illegal kill has declined (as a result of the banning of hunting using hounds), hunters numbers have declined, catch per unit effort has increased, and the percentage of females killed has declined significantly. Since 1982, median hunter age has increased and bear depredations have increased. This analysis, in accordance with the California Environmental Quality Act (CEQA), suggests that black bear populations in California may be increasing.

Carpenter, L. 1994. Politics, predators, and state wildlife agencies: A lethal mix? *Western Proceedings* 74:58-63.

> Recent experiences of the Colorado Division of Wildlife illustrate how the political pressures experienced by state wildlife agencies regarding predator management do not always coincide with what is best biologically for the species in question. Contrasting public values and management expectations, special-interest groups, and public emotional considerations can all significantly affect the final outcome of controversial management plans, demonstrated in 1992 when a public ballot initiative prohibited spring hunting of black bears as well as the use of bait and dogs. Reintroduction of the (arguably) extirpated grizzly bear to the San Juan Mountains is another ongoing predator management debate.

Clayton, C. and R. Mendelsohn, 1993. The value of watchable wildlife: a case study of McNeil River. *Journ. Env. Mgmt.* 39:101-106.

> A set of four contingent valuation questions posed to visitors to the McNeil River bear-watching game sanctuary revealed that visitors would pay between $214 and $424 per person to visit the area ($217-248 when outliers are truncated). This suggests that, since visitors would accept higher fees, significantly increasing revenues could be generated; current permit price is only $50 ($25 for a standby spot). In a greater sense, watchable wildlife has the potential to raise substantial revenue that could provide support for conservation efforts.

Corkeron, P. 1995. Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland: behavior and responses to whale-watching vessels. *Canadian Journal of Zoology* 73(7):1290-1299.

> Humpback whales in Hervey Bay, Queensland were found to dive (as opposed to slip under) more often when viewing vessels were with 300 m. Since Hervey Bay

is considered whale breeding grounds, pods with calves, even if only moving through the area, may be particularly susceptible to disturbance. Whether or not these short-term behavioral effects constitute a "sign of a whale becoming disturbed or alarmed," as described in the Hervey Bay whale-watching regulations, remains to be determined.

Dickinson, R. and B. Edmondson. 1996. Golden wings. *American Demographics* 18:47-9.

The growing popularity of bird-watching injected over $100 million into the economies of sixteen U.S. states in 1991, including over $200 million into the economies of six of these and $622.6 million into the economy of California. Bird-watchers tend to be older (over 45), well educated, suburban, and affluent (in 1996, 58% of National Audubon readers earn over $50,000 per year, as compared to 31% nationally), and their numbers are predicted to grow as baby-boomers age. In 1991, eight million Americans traveled between states in 1991 to watch birds, and non-consumptive wildlife recreation (including travel, equipment, magazines, dues, and contributions) injected $18.1 billion into the national economy. The ranks of birders, estimated at over 10 million, are considered a disorganized and relatively untapped market.

Dortch, S. 1997. Waning wildlife watchers. *American Demographics,* 19(9):36+.

According to the 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (conducted every five years by the U.S. Fish & Wildlife Service), 62.9 million people engaged in wildlife watching as the primary purpose of their outdoor experience in 1996, marking a 17 percent decline from 1991. Participant numbers are down for both residential and nonresidential participants. The numbers of people who spent money to observe, photograph, or feed wildlife declined 7 percent over the same period, to 54 million in 1996. On the other hand, average participant expenditures increased 57 percent from 1991, to $570 per participant. Trip-related spending was up 42 percent (in 1996 dollars) to $440 per capita.

Duffus, D. and K. Wipond, 1992. A review of the institutionalization of wildlife viewing in British Columbia, Canada. *Northwest Envirn. J.*; 8(2):325-345.

An analysis of British Columbia's Wildlife Viewing Program, established in 1989, suggests a focus on three evaluative criteria: ecological soundness (minimal intrusiveness); recreational and social benefits (sufficient to meet public demand and justify the program); and conservation ethic (instilled in the general public). The program is found lacking in the first two areas, showing a disconcerting emphasis on tourism and marketing as opposed to wildlife welfare and

sustainability. Out of 12 "goals," "guiding principles," and "strategic objectives," five emphasize economic aspects, four emphasize recreational aspects, and only one advances wildlife protection per se. This inadequacy is described as stemming from having to fit the program into an existing institutional and budget framework, resulting in dual objectives that are sometimes contradictory: the promotion of resource extraction and regional economic development through tourism on one hand, and sustainable, sound wildlife management on the other. To avoid this, wildlife programs must treat wildlife viewing as a primary issue, emphasizing education and broader ethical and moral issues.

Erickson, G. 1994. The politics of living with grizzlies. *Western Proceedings* 74:38-47.

The controversy over grizzly hunting in Montana serves as a good example of new concerns wildlife-management agencies have to take into account when formulating predator control policy. These can be summarized as the main political forces with which the agency must contend, how the agency views these forces, how the agency responds, and what works or doesn't in the process. In this case, the controversy focusing on the spring grizzly hunt led to the termination of grizzly hunting in the lower 48 states.

Farnham, A. 1992. A bang that's worth ten billion bucks. Fortune 125(5):80+.

17 million Americans participate in hunting, spending over $10 billion annually. Of this amount, 4% ($435 million) goes to permits, licenses, and other government fees, comprising almost the entire bill for state wildlife restoration programs. Big-game hunting accounts for 60% of total hunter expenditures. Hunter demographics are changing: hunters are better educated, more likely to be a manager or professional, more likely to be female (11%), and earned more (average income $43,120) than their counterparts of even five years before.

Harris, R. and L. Metzgar. 1986. Harvest age structures as indicators of decline in small populations of grizzly bears. *Proceed. 7th Intl. Conf. Bear Res. and Manage*. Pp 109-116.

Statistical analysis of simulated grizzly bear harvest data suggests that the chance of detecting grizzly bear population declines at their outset will be unreliable when based solely on harvest age structure data, since statistical power remained low on anything but severely over-harvested populations. These results are in general agreement with Gilbert et. al. (1978) in indicating that females and young males are increasingly favored in harvest age structures as hunting intensity increases, and that grizzly bears are limited in their ability to withstand harvest.

Holmes, S., 1995. Wyoming's animals, observed. *The New York Times (Late New York Edition)* 1/29/95 p. 12+, sec 5.

> The Wyoming-based Great Plains Wildlife Institute, run by a former Federal wildlife biologist, uses fees and amateur participation from wildlife-viewing trips to fund and gather data for journal papers and formal reports to Federal and state agencies. This self-titled "free-market environmentalism" approach entertains and educates participants as it provides low-cost research data (albeit of questionable quality).

Horejsi, B., B. Gilbert, and F. Craighead. 1998. "Hunting Management" (3.3) and "The Special Case of Coastal Bear Hunting" (3.4), in *British Columbia's grizzly bear conservation strategy: an independent review of science and policy.*

> The presence of hunters in grizzly territory in British Columbia has a significant negative impact on the animals, both directly (killing specific bears) and indirectly in the presence and actions of hunters. The expansion of road systems and the use of motorized means of access and pursuit cause habitat fragmentation, and the killing and general disturbance of bears can threaten population viability beyond the sustainable bounds of a "diminishing return—diminishing effort" hunting system. Hunting bans, both long- and short-term, and the creation of No-Hunting areas near salmon spawning sites (where bears are particularly vulnerable to hunters) are two management strategies that could mitigate these effects.

Kane, D. and J. Litvaitis. 1992. Age and sex composition of live-captured and hunter-killed samples of black bears. *Journ. Mamm.* 73(1):215-217.

> Age-class distributions and sex rations differed between captured and hunter-killed samples of black bears. Captured bear on average were older than hunter-killed bears, and included more females. Time of capture between the sample groups may explain age-class differences, while differing mobility may explain sex-ratio difference. Since it is not certain which sample best represents the true population parameters, wildlife managers should take both strategies into account when estimating bear populations.

Knick, S and W. Kasworm. 1989. Shooting mortality in small populations of grizzly bears. *Wild. Soc. Bull.* 17:11-15.

> Reproductive and survival rates and causes of mortality in two of the six ecosystems where grizzly bear populations are listed as threatened indicates that illegal shooting is a primary cause of mortality and that female animals are more likely to survive (annual survival rates of 0.89 and 1.00 vs. 0.53 and 0.86 for

males, respectively). This combination of high mortality and low reproductive rates may make recovery of small populations such as these difficult.

Kontio, B.D. and D.L. Garshelis, E.C. Birney, and D.E. Andersen, 1998. Resilience of a Minnesota black bear population to heavy hunting: self-sustaining population or population sink? *Ursus* 10:139-146.

A tag-and-release study of a heavily-hunted black bear population in east-central Minnesota contradicted the hypothesis that the area was a population sink supplied by seasonal young male immigrants. On the contrary, all captured bears appeared to be residents of the study area and not seasonal migrants. The captured population's sex-age structure did not indicate influx of dispersing-age males for a number of reasons: a similar fraction of males was recorded in the study area as statewide; there was no evidence of male-biased recruitment in the sex ratio of the captured bears; and yearling males composed a high proportion of harvest, indicating that an influx of males was not retarding the rate of decline of fraction of males in population due to high harvest mortality.

A population model suggested that bear numbers in the study area (one of few areas in Minnesota with no quota on hunting licenses) were stable or increasing under observed intense harvest levels due to reproduction and not immigration. The authors suggest that this could be explained by high habitat quality and good food supply (from crops) in the study area compared to the primary bear range over northern Minnesota. Lower harvest mortality was observed in the no-quota area relative to general population. Learned cryptic behaviors from increased contact with humans and hunter selectivity against subadult bears are both offered as explanations.

Litvaitis, J. and D. Kane. 1994. Relationship of hunting techniques and hunter selectivity to composition of black bear harvest. *Wild. Soc. Bull.* 22:604-606.

Hunter-kill data suggests that harvest technique and hunter selectivity affected the age and sex compositions of bears taken. Hunters who used hounds and bait tended to take male bears; the use of hounds corresponded to the taking of older bears, while stalking techniques without hounds resulted in an equal numbers of male and female bears. These trends could be used in management harvest calculations.

Mace, R. and J. Waller, 1998. Demography and population trend of grizzly bears in the Swan Mountains, Montana. *Cons. Biol.* 12(5):1005-1016.

Population studies of grizzly bears in wilderness and non-wilderness portions of the Swan Mountains of northern Montana indicates significantly (21 times) higher

mortality in wilderness and rural (non-wilderness) zones than in multiple-use (non-wilderness) areas. Annual density was five times higher in the multiple-use zone. The data suggest source-sink population dynamics, with the multiple-use zone, at near capacity for grizzly bears, acting as a population source, and the rural and wilderness zones acting as sinks. Management implications include the protection of high-security core habitat areas to minimize disturbance and illegal mortality, especially of females.

Maddox, J., 1984. Whale-watching: conservation goes commercial. *Nature* 310:445.

A small-scale cooperative agreement between boat captains and whale researchers based in the former whaling town of Provincetown, MA allows conservationists to use the boats to gather data for what they call the "best database on humpbacks in the world" in exchange for narrating tours for visitors. The Cetacean Research Program operates on $160,000 annually from the WWF and small foundation grants. Conservation activism among whale viewers and international organizations is a small pat of the program's activities.

McLellan, B. and D. Shackleton 1988. A comparison of grizzly bear harvest data from Montana and southeastern British Columbia. *Wild. Soc. Bull.* 16:371-375.

Harvest data for grizzly bears between two adjacent areas—the Northern Continental Divide Ecosystem (NCDE) in Montana and the East Kootenay Region (EKR) in British Columbia—suggests that similar factors in both study areas influence the fact that a greater proportion of 3- and 4-year-old males are taken by hunters than any other sex or age class. Seven- and 8-year-old females appeared least vulnerable to harvest. This method of using harvest data to estimate harvest rate, based on Chapman's (1955) change-in-ratio concept and adapted to hunter harvest of large mammals, can provide information on population trends for use in grizzly management.

McLellan, B. 1989. Dynamics of a grizzly bear population during a period of industrial resource extraction. I. Density and age-sex composition. *Can. J. Zool.* 67:1856-1860.

A study of a grizzly bear population in southeastern British Columbia indicated that average bear densities increased from 5.7/100 km^2 to 8.0/100 km^2 from 1979 to 1986, despite ongoing timber harvesting, gas exploration, and hunting during the time period.

McLellan, B. 1989. Dynamics of a grizzly bear population during a period of industrial resource extraction. II. Mortality rates and causes of death. *Can. J. Zool.* 67:1861-1864.

> A study of a grizzly bear population in southeastern British Columbia, involving 110 bear-years of radio tracking 55 radio-collared grizzly bears and their offspring, found that no animals were killed by causes directly related to the ongoing industrial activities. Of the eight animals that died from human intervention, two were legally harvested and five were killed by illegal harvest. Road access planning and post-operational vehicle controls are both recommended management actions to minimize the negative effect of road construction and usage on bears.

McLellan, B. 1989. Dynamics of a grizzly bear population during a period of industrial resource extraction. III. Natality and rate of increase. *Can. J. Zool.* 67:1865-1868.

> Estimated reproductive parameters and rate of increase according to the Lotka equation for a grizzly bear population indicated that timber harvest, gas exploration, and hunting did not appear to have a significant negative effect on a grizzly bear population in the Flathead Valley of British Columbia from 1979-1987.

Miller, S. 1990. Impact of increased bear hunting on survivorship of young bears. *Wildl. Soc. Bull.* 18:462-467.

> A review of the literature supporting the correlation between increased hunting and increased survivorship of subadult bears reveals that, although most authors suggest the possibility of a correlation, most have not concluded that one exists. Wildlife managers should not assume such a relationship when estimating sustainable harvest rates or estimating the effects of increasing exploitation rates, unless they have specific supporting data on hand. Otherwise, miscalculations could result in overexploitation.

Miller, S., S.D. Miller and D. McCollum. 1998. Attitudes toward and relative value of Alaskan brown and black bears to resident voters, resident hunters, and nonresident hunters. *Ursus* 10:357-376.

> A 1992 mail survey of Alaskan resident voters, resident hunters, and non-resident hunters revealed a high demand for bear viewing opportunities and mixed attitudes toward bear hunting. Trips on which viewing bears (brown and black) was the primary successful objective had higher total social benefit (actual expenditures plus willingness-to-pay) than for any other wildlife species. This amount exceeded the total social benefit from non-resident hunting of any species and from resident hunting of any species except moose, suggesting that enhancing

viewing opportunities would result in increased social benefit, even if this meant sacrificing some bear hunting opportunities.

Survey results also indicated that Alaska residents and visitors are willing to pay more to view or hunt bears than almost any other species. All three groups surveyed were willing to pay more to view brown bears, in a hypothetical day-trip scenario, than any other type of animal (even wolves, which are more difficult to view). Total expenditures on trips in which brown bears were seen were higher ($582) than for any other type of animal seen besides wolves ($611); however, when net economic value (willingness to pay more, hypothetically, than the trip actually cost) is factored in, trips in which bears were seen had the highest gross economic value. In addition, trips in which brown bears were a specific viewing target had the highest gross economic value of any type of target animal.

Navrud, S. and E. Mungatana, 1994. Environmental valuation in developing countries: the recreational value of wildlife viewing. *Ecol. Econ.* 11(2):135-151.

Several models of both the Travel Cost (TC) and Contingent Valuation (CV) methods were used to estimate the recreational value (a.k.a. use value) of wildlife viewing in Lake Nakuru National Park (LNNP) in Kenya. A survey of a random sample of 185 visitors to LNNP during peak tourist season in 1991 revealed a value of $7.5-15 million, or an average recreational value of $1,672 (1991 USD) per visit to Kenya. (One-third of this value is accounted for by the 1.4 million lesser and greater flamingos in the park). This is considered is a very conservative estimate of total economic value of the wildlife in question, since viewing is only part of overall recreational experience. These results suggest that LNNP has a largely unrealized economic potential, reflected in an estimated recreational value 10-20 times greater than total revenue fees collected. Attracting more visitors and charging them higher entrance fees would collect some but not all of the funds needed to realize this potential. In a broader sense the results also suggest sustainable management of wildlife resources could provide a significant and crucial revenue source for developing countries.

Nevin, O. T. and B. K. Gilbert. 2000. Evaluation of a model bear viewing program at Glendale River with policy recommendations. Logan, UT: Utah State University Department of Fisheries and Wildlife.

A study of a bear viewing program at Glendale Cove, Knight Inlet, British Columbia, revealed that viewed populations are highly skewed toward females with cubs. This suggests that large males and lone females avoid humans in bear-viewing scenarios, while females with cubs become habituated more easily. Bears spent a smaller proportion of time fishing when viewing tours were present, but fish capture rates and arrival and departure directions were unaffected by the presence of viewing tours.

Pierce, C., and M. Manfredo, 1997. A profile of North American wildlife agencies' viewing programs. *Hum. Dimens. Wildl.* 2(3):27-41.

> A survey of 95% of U.S. and Canadian state and provincial wildlife agencies indicates that wildlife-viewing programs, though in high public demand, are generally (97%) understaffed and under-funded. Lack of agency support and credibility were reported as the next most significant challenge (55%). The average wildlife viewing program budget in 1994-5 ($309,000: $346,000 in the U.S. and $US 85,000 in Canada) was equivalent to 3% of the average annual hunting budget ($11.7 million) and 4% of the average fishing budget ($8.3 million). Non-consumptive trip expenditures totaled $18 billion in the U.S. and $2.4 billion in Canada. Seventy-six percent of U.S. agencies had wildlife viewing programs as compared to 50% of Canadian agencies.

Powell, R., J. Zimmerman, D. Seaman, and J. Gilliam. 1996. Demographic analyses of a hunted black bear population with access to a refuge. *Cons. Biol.* 10(1):224-234.

> Statistical analyses of black bear survivorship inside and outside the Pisgah Bear Sanctuary in North Carolina indicates that populations were significantly higher inside the sanctuary compared to outside and more frequently viewed along trails than along roads. Survivorship was higher for sanctuary bears alone than for sanctuary plus non-sanctuary bears. Further analyses suggest an ultimate population decline in the total bear population, including the sanctuary and the surrounding area. This suggests that the sanctuary may not be providing resident bears with enough protection to maintain a viable breeding population. Larger sanctuaries and reduced human access could counteract this trend.

Revenko, I. 1994. Brown bear (*Ursus arctos piscator*) reaction to humans on Kamchatka. *In. Conf. Bear Res. and Manage.* 9(1):107-108.

> An examination of 270 personal encounters between the author and a few of the 8-10,000 brown bears *(Ursus arctos piscator)* living in the Kamchatka region of Russia showed that avoidance was by far the most common reaction (70%). Other reactions included approaching, identification as human, and moving away (14%); indifference (12%); threat demonstration (3%); and attack (1%). Aggressive behavior seemed related to sudden, close-quarter encounters, especially those in which the animals were hunted, surprised, or defending young.

Samson, C. and J. Huot. 1995. Reproductive biology of female black bears in relation to body mass in early winter. *Journ. Mamm.* 76(1):68-77.

> Data from adult female bears in La Mauricie National Park (Quebec) suggests that larger females are most likely to reproduce, that early-winter body mass affects

litter size, and that heavier females tended to produce more male than female young. Management implications include the fact that larger females (most likely to reproduce) are also more likely to be hunted.

Stringham, S. 1986. Possible impacts of hunting on the grizzly/brown bear, a threatened species. *Proceed. 7th Intl. Conf. Bear Res. and Manage*. Pp 337-349.

A literature review finds insufficient data for conclusions to be drawn about the effects of hunting in grizzly bear populations. Research results support both positive (stimulating compensatory reproduction and decreasing natural mortality) and negative (detrimental to populations) sides of the controversy. Data indicates that factors affecting reproduction and mortality include habitat quality and the proportion of adult males in a population—offering limited evidence for the argument that the taking of mature males increases cub survivorship.

Titus, K., J. Trent, L. Aumiller, J. Westlund, and M. Sigman. 1994. Managing brown bears as both game and nongame: past experiences and future prospects. *Trans. 59th No. Am. Wildl. & Natur. Resour. Conf.* Pp 353-362.

Bear hunting and the growing popularity of bear viewing creates an increasing demand on bear populations as a wildlife resource. Bear viewing data collected at the McNeil State Game Sanctuary suggest that the limited hunting permitted at adjacent to the sanctuary has a dampening effect on bear numbers. This data and other data gathered at the Stan Price State Wildlife Sanctuary at Pack Creek suggests that hunting and viewing can coexist in the same area under current constraints. The primary policy question seems to be where to draw the boundary for hunting near the refuge in question.

Williamson, L. 1992. The moneymakers. *Outdoor Life* 190(6):40+.

The 1991 National Survey of Fishing, Hunting and Wildlife-Associated Recreation found non-consumptive recreation is on the rise, and that fishing and hunting are no longer the biggest components of overall use. Close to 100 million Americans 16 years and older—about half of the country's adult population—participated in recreation related to fish and wildlife in 1991, releasing $59.5 billion into the national economy. Hunting-related spending along injected from $12-14 million into the economy. Of the 13.9 million adults who hunted in 1991, 10.6 million (77%) were after big game. More than 76 million adults participated in non-consumptive wildlife recreation, including feeding, observing and photographing wildlife. Of these, at least 30 million left their homes to participate in those activities. As of 1992, according to the Commerce Department, outdoor recreation in general was among the top three industries in 39 of the 50 states.

Wilker, G.A. and V.G. Barnes, 1998. Responses of brown bear to human activity at O'Malley River, Kodiak Island, Alaska. *Ursus* 10:557-561.

The response of brown bears to directly encountered humans was stronger during years of general public use that in years of structured bear viewing. Bear reaction was moderate or strong to fixed-wing aircraft overflights below 100m in 48% (18 of 37) occasions, and strong to watercraft in 100% (9 of 9) of occasions. This data suggest that guided bear viewing groups, with their consistent and predictable patterns or activity, have less negative impact on the animals (reflected in running or walking away responses) than more random encounters during times of unstructured public use. Policy considerations include altitude limits for aircraft and control and limits of human activity such as travel routes and observation points.

Winning, B., 1984. The science and ethics of whale watching. *Oceans* 17:66.

The growing popularity of whale watching is raising ethical questions of the effects of viewing boats on the whales. Different countries have come up with different schemes to protect the animals at the focus of this lucrative business. In the U.S., defying whale protection laws such as the Marine Mammal Protection Act can result in civil and criminal penalties. The effect of vessel noise on whale behavior is a particular concern.

Appendix II: Knight Inlet Lodge guest survey results summary

Total respondents (N) = 136.

WILDLIFE VIEWING ATTITUDES AND EXPERIENCE

1. Have you ever been to Knight Inlet before?
   9.6% indicated "yes". Of these, 11 indicated when and how many times: 6.6% once before, 1.5% twice before. (n=135)

2. What was your most important reason for visiting Knight Inlet Lodge on this trip?
   93.4% indicated "to view bears", 14% indicated "to view other animals", 2.9% indicated "to relax" and 8.1% indicated "for other reasons" (photography, etc.). 17% indicated more than one reason. (n=136)

3. Have you ever taken a trip before this with the primary purpose of seeing wildlife?
   74.6% indicated "yes". (n=134)

4. If so, how often do you travel to view wildlife, on average?
   20.6% indicated "more than once a year", 43.1% answered "about once a year", 24.5% "less than once a year but more than once every five years", and 11.8% "less than once every five years". (n=102)

5. Have you ever visited another location specifically to view bears? Yes No
   27.9% indicated "yes", 72.1% "no". (n=129)

6. If so, when and where?
   27.2% indicated at least one other bear-viewing location, 7.4% indicated two, and 3% indicated three. 20 different locations were indicated. Churchill, Manitoba was the most common location (35.1%); followed by Jasper National Park (10.8%), Banff National Park (8.1%), and Katmai National Park (8.1%). Alaska as a whole was indicated in 35.1% of responses. (n=37)

7. How did your experience at Knight Inlet Lodge compare to your two most recent wildlife viewing experience(s)?
   60.3% indicated at least one other wildlife viewing location and 40.4% indicated two. 75 different locations were indicated, led by Kenya (11%), South Africa (11%), Churchill, Manitoba (9.8%), Yellowstone National Park (7.3%), and Zimbabwe (6.1%). (n=82) 60.3% of respondents indicated at least one specific animal viewed, and 36 different major animals were indicated, led by whales (22%), birds (20.7%), elephants (20.7%), bears (19.5%), and lions (18.3%). Average comparative response was 5.21 on a scale of 1 ("Knight Inlet was much worse") to 7 ("Knight Inlet was much better"). (n=128, sd=1.39)

HUNTING ATTITUDES AND EXPERIENCE

8. Have you ever hunted for sport and/or trophies?
   92.6% indicated "no". (n=136)

9. If so, do you regularly hunt more than once per year, on average?
   97.1% indicated "no". (n=136)

10. Have you ever hunted bears?
    100% indicated "no". (n=136)

11. What are your overall feelings towards sport/trophy hunting of bears?
    Average response was 1.36 on a scale of 1 ("very negative") to 7 ("very positive"). Only 3 responses were 5, 6, or 7 (positives), and 4 were 4 (neutral). (n=132, sd = 1.06)

12. How many nights did you stay at Knight Inlet Lodge?
    Average length of stay was 3 nights. (n=135, range 1-10; sd = 2.2)

QUALITY OF EXPERIENCE

13. How would you rate the overall quality of your experience at Knight Inlet Lodge?
    Average response was 8.75 on a scale of 1 ("terrible") to 10 ("outstanding"). 97% of answers were positive (6-10), and 39.3% were "outstanding" (10 out of 10). (n=135, range: 2-10, sd = 1.45)

14. How did your actual visit compare to your expectations for your visit?
    Average response was 5.52 on a scale of 1 ("fell far short") to 7 ("far exceeded"). 76.8% of answers were positive (5-7), and 16.8% were "far exceeded" (7 out of 7). (n=125, range = 1-7, sd = 1.25)

15. Looking back on your stay at Knight Inlet Lodge, do you think the price you paid was a fair value for your experience, or was it too high or too low?
    77.2% indicated the "price was fair – the experience was worth exactly what I paid for it". 11% answered the "price was too high – the experience was worth less than I actually paid", and 1.5% indicated the "price was too low - the experience was worth more than I actually paid". (n=122)

HYPOTHETICAL EFFECTS ON QUALITY OF EXPERIENCE

16. Suppose that you could have seen twice as many bears during your visit to Knight Inlet Lodge as you actually did see. Would this have affected the quality of your experience?
    Average response was 3.51 on a scale of 1 ("no effect") to 7 ("great effect"). (n=134, sd=2.03) 94.3% indicated the effect was "positive". (n=70)

17. Imagine that all the surrounding hillsides in Glendale Cove visible from the lodge had been clear-cut for timber (all trees removed). Would this have affected the quality of your experience at Knight Inlet Lodge?

    Average response was 6.27 on a scale of 1 ("no effect") to 7 ("great effect"). 57.8% of respondents answered "great effect" (7 out of 7). (n=135, sd=1.06, range 3-7) 95.7% indicated the effect was "negative" (n=115)

18. Some studies of animal behavior have suggested that wildlife viewing has a negative effect on animals. Suppose you knew for a fact that your presence as an observer had a negative effect on the bears — for example, that it frightened them away from feeding sites. Would this have affected your desire to come to Knight Inlet Lodge to view bears?

    Average response was 5.48 on a scale of 1 ("no effect") to 7 ("great effect"). 33.6% indicated "great effect" (7 out of 7). (n=134, sd=1.46) 98.4% indicated the of effect was "negative (less inclined to come)". (n=123)

19. Would you like to visit Knight Inlet or a similar type of wildlife viewing lodge again?

    97.8% answered "yes" (n=134)

20. If so, suppose that on this next trip you could be guaranteed to see twice as many bears. Would this affect your desire to take the next trip?

    Average response was 4.95 on a scale of 1 ("less desire to go") to 7 ("more desire to go"). (n=133, sd=1.22)

21. Imagine that the surrounding hillsides visible from the next lodge you visited were clear-cut for timber (all trees removed). Would this affect your desire to take the trip?

    Average response was 1.81 on a scale of 1 ("less desire to go") to 7 ("more desire to go"). 97% answered 1, 2, or 3. (n=134, sd=0.80; range 1-4)

22. Suppose you knew for a fact that your presence as an observer had a negative effect on the bears you viewed (for example, it would frighten them away from feeding sites). Would this affect your desire to take the trip?

    Average response was 1.90 on scale of 1 ("less desire to go") to 7 ("more desire to go"). 97.7% answered 1, 2, or 3 ("less desire to go"), and 37.6% 1 ("less desire to go"). (n=133, sd=0.83; range 1-4)

23. Did you come to Knight Inlet Lodge as part of a larger trip, or did you visit only Knight Inlet Lodge on this trip?

    74.2% (98) answered "part of a larger trip" (n=132)

24. How much did you pay to travel to Knight Inlet? Please fill in the appropriate amounts below, and indicate for whether each amount is for one-way or round-trip travel.

    Average response was $1949.36. (n=69, sd=2687.79)

RESPONDENT DEMOGRAPHICS

25. Where do you live?

50.8% (67) of respondents were from the United Kingdom, 27.3% (36) were from the United States, 11.4% (15) were from Australia or New Zealand, only 5.3% (7) were from Canada, and 5.3% (6) were from other countries (Italy, Netherlands, South Africa, Switzerland). (n=132)

26. How old are you?

Average respondent age was 53.78, with a range of 27-81. (n=133)

27. Are you: male female

59.2% (77) of respondents answered "male" (n=130)

28. Are you: single married/partner

78.3% (101) of respondents answered "married/partner" versus 21.7% "single" (28) (n=129)

29. What is your occupation?

36.2% (47) of respondents were "Professional, Paraprofessional, and Technical Occupations"; 19.2% (25) were "Managerial and Administrative Occupations"; 30.0% (39) were retired; and 8.5% (11) were "Other," including self-employed, homemaker, and student. Under 5% of respondents were either "Sales and Related Occupations", "Clerical and Administrative Support Occupations", "Agricultural, Forestry, Fishing, and Related Occupations", or "Production, Construction, Operating, Maintenance, and Material Handling Occupations". (n=130, categories from U.S. Bureau of Labor Statistics, Occupational Employment Statistics)

30. How many people are traveling with you?

Average group size was 1.82 other people in group, indicating most common group size was 2. 69.7% (83) answered "1" (n=119, range = 1-11)

31. What is your highest level of education completed?

46.6% (62) answered "College", 26.3% (35) answered "Graduate degree", 24.1% (32) answered "High School", and 3% (4) answered "Post-doctorate degree". (n=133)

32. What is your approximate annual income?

22.8% indicated "$50-75,000", 18.4% answered "$25-50,000", 16.7% answered "over $150,000", and 14.0% answered both "$75-100,000" and "$100-150,000" indicating an average income near $75,000 per year. (n=114)