

Losing Ground: The decline in fish and wildlife law enforcement capability in British Columbia and Alaska

Brian L. Horejsi

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RAINCOAST CONSERVATION SOCIETY

Raincoast Conservation Society is a non-profit research and public education organization. In partnership with scientists, First Nations and non-governmental organizations, they carry out research and generate public awareness to build support for decisions that protect bear, wolf, salmon and ancient forest habitat in British Columbia's Great Bear Rainforest.

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EXECUTIVE SUMMARY

Wildlife holds great social, ecological, economic and recreational value for Canadians and Americans. Governments and regulatory agencies find themselves under intense scrutiny with expectations that they will respond to a vastly broadened and much more inclusive public interest in wildlife. Part of the expected response is effective fish and wildlife law enforcement. This report compares fish and wildlife law enforcement and protection capability in British Columbia and Alaska. The broad focus was enforcement and protection capability on a province and statewide basis. These political jurisdictions have in common a biogeographic region known as the coastal rainforest; a second level of study, encompassing 88,296 km² in British Columbia and 84,553 km² in Alaska, compared some aspects of fish and wildlife law enforcement capability in this ecologically distinct area.

- **HUMAN POPULATION GROWTH**

Growth in the number of people residing in British Columbia and Alaska is one of the major pressures on fish and wildlife law enforcement and protection capability. British Columbia and Alaska experienced a 51% and 53% increase, respectively, in human population between 1980 and 2002. There are now 4.1 million British Columbians and 640,000 Alaskans. The increase in the total number of people in British Columbia adds a component of enforcement responsibility that complicates enforcement well beyond rate of growth. The same rate of growth that saw Alaska add 221,032 people to its population saw British Columbia add a staggering 1,390,779 persons.

Human population change in coastal British Columbia and Alaska was distinctly different in two respects from that at the provincial and state level. In this region both the rate of human population growth and total population in Alaska exceeded that in B.C., increasing 19% from 61,162 people in 1983 to 73,888 in 2002. The B.C. coastal population has grown marginally, increasing from 66,672 in 1985 to 69,380 persons in 2002.

- **THE REGULATED USERS OF FISH AND WILDLIFE**

These users consist of hunters and anglers that require authorization to legally carry on their pursuits. As of 2000 resident and nonresident hunting and fishing license sales numbered 319,727 in B.C. and 489,351 in Alaska. Per capita participation by residents in Alaska is 4.4 times that of B.C. (31% vs. 7%). The total number of licenses sold declined 24% in B.C. in the 1990s while it increased 17% in Alaska. In B.C. residents and nonresidents are abandoning these activities on a relatively large scale. The pattern is somewhat different in Alaska. Resident participation is relatively stable but nonresident participation has skyrocketed 173%!

- **THE REGULATORY LOAD**

This is a measure of the number of authorizations required by traditional sport fish and wildlife resources users. In 2000 there were 932,199 authorizations issued in B.C. and 732,863 in Alaska. The regulatory load in B.C. has been declining since 1990 (-5%) but it has increased noticeably in Alaska (+39%). Enforcement

requirements relative to the regulated population continue to increase in complexity. The number of fishing and hunting license categories has increased from 26 to 73 in B.C. and from 27 to 51 in Alaska.

- **ENFORCEMENT BUDGETS, CURRENT DOLLARS**

In 2002 B.C. is projected to spend about \$9.0 million on fish and wildlife law enforcement and Alaska will spend about \$13.9 million without marine enforcement. Since 1983 budgets have increased 22% in B.C. and 30% in Alaska. B.C.'s budget has declined 19% from its 1995 high of \$11.1 million while Alaska's budget increased 9% in that period. B.C.'s budget will sink to a historical low by 2004 while Alaska continues to increase support. By 2004 it appears B.C.'s budget will be less than 50% of Alaska's.

Coastal B.C.'s enforcement budget today is essentially the same as in 1983 but it has declined 37% since 1996. Coastal Alaska's protection budget is up 18% since 1983 but it was out of step with the rest of the state in the 1990's when it was stable.

- **EROSION BY INFLATION**

A major setback to enforcement capability in British Columbia and Alaska has been the erosion of budgets by inflation. Between 1983 and 2002 the enforcement services budget in British Columbia deteriorated to 35% below expected. This represents a deficiency of \$4.8 million or 54% of the existing budget. By 2002 the gap in B.C. will widen to more than 104% of the existing budget. Alaska's Fish and Wildlife Protection budget has also suffered a setback; a deficiency of \$5.1 million has developed between current and inflation-adjusted dollars, a sum equal to 37% of the existing budget.

Coastal B.C.'s enforcement budget lost 10% to inflation in the 1990s, a deficiency of \$142,000 in 2002. The gap will grow to 58% and \$276,000 in just two years. Alaska's protection budget, with

marine enforcement, lost 34% to inflation, a deficiency of \$1.1 million by 2001.

- **ENFORCEMENT BUDGET PRIORITY**

British Columbia began the second year of the 21st century with a fish and wildlife enforcement budget essentially unchanged from 20 years previous. Over that period total provincial expenditures had grown by \$16.3 billion (+200%). Enforcement spending as a percent of total government spending fell to 0.00039% (1/26th of 1%) in 2001. In 2004 Enforcement services will receive 1/29th of 1% of provincial expenditures. Fish and Wildlife enforcement has suffered from government neglect for 20 years and its stature continues to erode.

Alaska's fish and wildlife protection budget has declined to 2/5ths of 1% of the state budget, down 32% since 1983. In that time the state's entire budget increased by \$2.2 billion (+90%). State expenditure on fish and wildlife protection reflects a priority that is out of synchrony with overall growth in state expenditures. Even at these low levels of support Alaska's fish and wildlife protection budget priority is ten times greater than enforcement priority in B.C.

- **PER CAPITA ENFORCEMENT EXPENDITURE**

British Columbia's per capita expenditure on fish and wildlife law enforcement is \$2.17. By 2004 it is forecast it will be \$1.71. At \$21.64 per capita Alaska spends 10.6 times as much as British Columbia. Coastal area expenditures are greater for both jurisdictions, particularly in B.C. which spends \$7.15 per person; AK spends \$27.85 per person. Per capita fish and wildlife enforcement budgets in both jurisdictions have lost ground to inflation; -54% in B.C. and -43% in AK. Coastal B.C. and AK are 25% and 44%, respectively, below expected expenditure.

- **ENFORCEMENT STAFF LEVELS**

The recent trend in fish and wildlife enforcement and protection staffing in British Columbia is

opposite that seen in Alaska. There was a sharp decrease (-15%) in the number of conservation officers (CO's) in B.C. in 2002 while Alaska has slowly been adding troopers (+6% since 1994).

In 1990 there were six conservation officers with responsibilities in the B.C. coastal area. This increased to eight in 1992 and it remains at this level. Alaska Detachment A (S.E. Alaska) had 18 troopers in place in 2002.

- **SUPPORT PER OFFICER AND TROOPER**

Support per officer and trooper: B.C. budgeted \$74,890 per officer in 2002, which represents no change since 1992. Alaska budgeted \$152,401 per trooper, an increase of \$21,114 per trooper since 1992 and more than two times the support provided B.C. officers. By 2004 B.C. will have cut officer support to a historical low and will be providing barely one third the officer support Alaska does.

Coastal per officer support in B.C. has been the same as province-wide but by 2004 it will be 20% lower. Alaska spends about \$30,000 less per trooper for the coastal area than it did statewide but it still supports coastal troopers at a level 2.5 times that of B.C.

- **POPULATION RESPONSIBILITY PER OFFICER AND TROOPER**

A significant percentage of the unregulated population interacts with wildlife on a regular basis. It was estimated that in 1996 60% of the B.C. populace was involved in wildlife-related activities. The ability of enforcement services to monitor and regulate interaction between residents and fish and wildlife can be partly measured by the ratio of residents to officers or troopers. B.C. has 43,441 residents per conservation officer and Alaska has 7042 residents per trooper. In the coastal study area B.C. has reduced historical officer per capita responsibility by 22% whereas it increased 39% in

Alaska. B.C. officers are still responsible for twice as many residents as Alaska troopers; 8667 vs. 4104, respectively.

- **GEOGRAPHIC AREA OF RESPONSIBILITY**

Alaska is much larger (+57%) than British Columbia but both are physically impressive jurisdictions. The size of the land base officers and troopers are responsible for in B.C. and Alaska presents a picture that has changed little in the last decade. Alaska troopers on a statewide basis are faced with a huge landscape; each is responsible for 16,234 km², an area larger than some states. B.C. conservation officers are responsible for 7854 km² each, an area 48% the size of AK's per trooper area. On a coastal basis, the above relationship is reversed. The land mass responsibility is 11,037 km² for each B.C. officer and 4697 km² for each Alaska trooper. This is a highly significant difference given the richness of fish and wildlife values associated with coastal rainforest regions.

- **ENFORCEMENT OPERABILITY**

The ability of enforcement officers and troopers to make contact with and monitor the activities of regulated and unregulated users of public lands in much of B.C. and Alaska, particularly in coastal areas, depends heavily on aircraft and boat access. For example, on the coastal mainland of Alaska 70% of successful brown bear hunters used boat (63%) or air access (7%) and 80% of the deer kill is estimated to be associated with boat access. On the Queen Charlotte Islands in the B.C. coastal study area it is estimated that 25% of bear and deer kill is related to boat access.

There is an extreme contrast in air and vessel enforcement capability between B.C. and Alaska on a province and statewide basis and in the coastal study area. The Alaska Department of Fish and Wildlife Protection owns and operates 17 vessels (>25 ft.), 38 aircraft and five helicopters. B.C. conservation

officers must charter private aircraft. Aircraft hours used and vessel days at sea for coastal Alaska (average 430 aircraft hours and 380 vessel days annually; 1999, 2000 and 2001) are estimated to be 400 to 500% greater than in coastal B.C. (<100 hours annually for each mode).

Even though logistical capability in Alaska far exceeds that available in B.C. the Division of Fish and Wildlife Protection lists 24 sport fish and 30 hunting areas that receive little or no patrol effort, areas that have been labeled “islands of neglect.”

- **DILUTION OF EFFORT**

A significant dilution of traditional wildlife enforcement practices occurred in British Columbia in 1995 with the introduction of the Forest Practices Code Act (FPC). When the FPC became law, the government added enforcement of its provisions to the existing responsibilities of the Conservation Officers. The role of conservation officers and the FPC in protecting fish and wildlife habitat and populations is negligible in the context of enforcement actions. After four years in existence the FPC resulted in 89 administrative rulings, charges and warnings being laid by CO's in 1999-2001; 3715 were laid using the federal Fisheries Act. The province's own enforcement staff recognize the inadequacy of the FPC and rely heavily on the Federal Fisheries Act to deal with violations affecting fish and their habitat.

As of 2002 the FPC diverted between 10 and 20% of conservation officer time that was formerly (pre-1995) available for fish and wildlife law enforcement.

- **COMPLICATIONS OF ESCALATING ROAD ACCESS**

Enforcement and protection services in British Columbia and Alaska are at the mercy of government programs that increase the vulnerability of fish and wildlife and their habitat to human impact. The major cause of elevated fish

and wildlife vulnerability is road access and road density both of which are intimately related to legal and illegal human-caused wildlife mortality and disturbance, harassment and displacement of wildlife. Government resource policies that promote road construction are closely linked with extractive industries, special interests that have a long history of overriding the public's interest in protecting wildlife and its habitat. It is conservatively estimated that there are 345,000 km of logging industry-related roads on British Columbia's public lands and more than 3200 km are being built annually. There are now 6400 km of roads, almost all resulting from logging, in the coastal study area of Alaska.

- **CONTACT BETWEEN THE PUBLIC AND ENFORCEMENT AND PROTECTION STAFF**

Compliance promotion is defined as any activity that prevents violation of fish and wildlife law and results in protection of fish and wildlife populations. Contact between officers and troopers and the regulated and unregulated population are a key element in achieving or elevating compliance with regulations and policy. Each trooper with the Alaska Department of Fish and Wildlife Protection made between 784 and 910 contacts yearly over a four-year period. B.C. officers are estimated to have averaged 423 contacts each in 1999, 54% fewer than Alaska troopers (910). Officers in B.C. each dealt with an average of 48 violations annually while Alaska troopers handled 80.

A strong swing to issuing more warnings than citations has accelerated sharply in Alaska and B.C. since 1990. Warning per 100 citations/charges rose from 46 to 144:100 in Alaska (2000) and 74 to 136:100 in B.C. (2001). This suggests that 1) enforcement is increasingly discretionary, i.e., has “softened” its approach, 2) staff capabilities at existing staff and budget levels are overloaded by the administrative demands of following citations and charges through the legal system, 3) dilution of

responsibility is consuming enforcement effort in areas where violations are more difficult to detect, investigate and prosecute, 4) growth in the unregulated population and the subsequent protection of human safety and property issues resulting from its interaction with wildlife is consuming a greater portion of enforcement effort, and/or 5) increasing volume and complexity of regulations requires greater effort on awareness and education, leading to utilization of less formal action against less serious violators. These are unsettling trends even though the overall high level of involvement in Alaska is encouraging. In B.C. particularly, they suggest a high-level strategy of formalized non involvement, imposed through long-term budget and staff limitations, leading to highly suspect fish and wildlife law enforcement on an institutional level.

• **AN INDEX OF ENFORCEMENT CAPABILITY**

An index was produced using nine components of fish and wildlife law enforcement capability. They included: 1) total enforcement or protection budget, 2) budget priority, measured as enforcement or protection budget as a percent of total provincial or state budget, 3) per capita expenditure on enforcement, 4) expenditure per officer or trooper, 5) human population size, 6) the number of officers and troopers, 7) human population per officer or trooper, 8) geographic area of responsibility per officer or trooper, and 9) the size of the regulatory load. The component values relevant to the index are shown in Table ES. A number of the components are likely to have a synergistic effect upon one another therefore the index should be considered a best-case estimate of capability.

TABLE ES Important components of effective fish and wildlife law enforcement and protection in British Columbia and Alaska, 2002.

	Province/State		Coastal	
	BC	AK	BC	AK
Officers and troopers, current/expected	120/161	91/150	8	18
Area (km ²) responsibility per officer/trooper (2002)	7,854	13,986	11,037	4,696
Residents per officer/trooper	34,442	7,042	8,672	4,104
Regulatory load (2000), authorizations x 1,000	932	732	—	—
Enforcement/protection budget, current/expected \$ x 1,000	8,986/13,811	13,868/19,052 ¹	496	2,047 ^{1,2}
Budget priority, 2002/1983	4/100 ³	32/100 ^{1,3}	—	—
Expenditure per capita (\$)	2.17	21.64	7.16 ²	27.85
Budget support per officer/trooper (\$)	74,890	152,401	62,050	113,700 ²
Enforcement capability index, percent of best case	69	69	—	—

¹Without marine enforcement ²Based on 2001 ³Fraction of one percent

Fish and wildlife law enforcement capability in British Columbia and Alaska has declined under consistent and widespread pressure from a wide range of influences. It has declined to 69% of historical level in B.C. and Alaska, and is forecast to sink to 56% of historical capability in B.C. by 2004. If dilution by Forest Practices Code activities was considered in B.C., capability would be less than half of what it was in 1983. A serious gap has developed between previously established enforcement standards and existing fish and wildlife law enforcement capability in British Columbia and Alaska.

A comparison of the two jurisdictions reveals an enormous gap in enforcement capability between British Columbia and Alaska; B.C. is in an unenviable class by itself, struggling at 49% of Alaska's present-day capability and 34% ($0.49 \times 0.69 = 34\%$) of Alaska's historical capability.

In every component compared fish and wildlife enforcement capability in coastal B.C. did not measure up to Alaska fish and wildlife protection standards. At only 41% of coastal Alaska's capability in 2002, and a forecast decline to 36% of Alaska's capability by 2004, fish and wildlife enforcement capability in coastal B.C. is severely compromised.

- **CONCLUSIONS**

Wildlife populations and biological diversity are endangered by chronic underfunding and marginalization of wildlife conservation-oriented enforcement programs in British Columbia and, to a lesser degree, in Alaska. This period of measurable political disinterest and low and declining priority now approaches 20 years in duration.

There is little evidence available to the British Columbia or Alaska public to indicate that current enforcement capabilities are sufficient to provide

effective compliance with fish and wildlife regulations, a problem being aggravated by escalating and uncoordinated land use activities. In every capability measure examined, capability today is significantly lower than it has been previously. Enforcement and protection staff are presently unable to effect widespread and long-lasting changes in resource user behavior in either Alaska or B.C.

While fish and wildlife protection capability in Alaska has slipped (-31%) the evidence indicates that B.C. has now crossed the threshold at which protection of fish and wildlife populations and their habitat by enforcement services has effectively and materially been abandoned.

1 INTRODUCTION

Wildlife and fish hold great economic, recreational, social and ecological value for Canadians and Americans. This value¹ has grown significantly in recent years as scientists and the public expand their understanding and recognition of the role of biological diversity in maintaining the planet's ecological integrity. As habitat is lost and fragmented and fish and wildlife populations are extirpated or endangered, public expectations for fish and wildlife population and habitat conservation have shifted dramatically (Kellert 1996). Governments and regulatory agencies find themselves under intense scrutiny with expectations that they will respond to a vastly broadened and much more inclusive public interest (Brown and Harris 1992).

It is within this ever broadening and shifting context that the value of wildlife and fish in British Columbia and Alaska must be viewed. At the same time it should be recognized that the value of wildlife and fish and their habitat extends well beyond political borders. Citizens legally entitled to have their opinion considered when fish and wildlife issues are being decided and both active and vicarious visitors are part of the public equation.

In British Columbia more than 2,300,000 people participated in non-consumptive wildlife-related activities² in 1996. They contributed about \$622 million to the economy. The economic benefits to participants were estimated at \$986 million (Reid 1998). About 7% of residents (292,432) were involved in sport fishing and hunting in 2000 and visitors contributed another 27,295 licensed users. Hunters are estimated to have spent \$150 million in the province in 1985 (B.C. MELP no date).

Alaska experienced 513,000 participants in non-consumptive wildlife-associated recreation in 2001; 454,000 were state residents. They spent about \$538 million on activity related equipment and services. About 31% of the resident population (194,841 persons) was involved in sport fishing and hunting and visitors contributed another 294,510 licensed users in 2000. Fishers and hunters spent \$536 million and \$217 million, respectively, in the state (U.S. Fish and Wildlife Service 2002).³

¹ Kellert (1996) defines human association with the natural world (biological diversity) as arising from one or more of nine basic relationships. These are utilitarian, naturalist, ecological-scientific, aesthetic, symbolic, domination, humanistic, moral and negative relationships. These values play a significant part in society's expectations of the role of fish and wildlife law enforcement in the conservation of biological diversity.

² Consists of three categories: home-, cabin- and cottage-based (2.3 million participants); indirect activities (1.6 million people and over 73 million days) and direct activities (863,430 people and 8.5 million days). The number of people participating in direct wildlife activities (where the main purpose was to watch, feed, photograph or study wildlife) has increased from 472,700 in 1983 to 863,000 in 1996, an increase from 23.5% to greater than 29% of the population (Reid 1998).

³ In 1999 sport fishers spent \$548 million in the state and were active about 5 million user days. Hunters spent \$200 million and over one million days hunting (Glass 1998). It was estimated that in 2001, 16% and 41% of Alaskans 16 years old or older hunted and fished, respectively (U.S. Fish and Wildlife Service 2002).

Wildlife-related recreation other than hunting in the overall Pacific Coast region⁴ of the U.S., which includes Alaska, shows a recent short-term decline in participation but predictions are for a 77% increase by the year 2050 (Flather *et al.* 1999). While sport fishing participation is expected to continue to decline in the general Pacific Coast region over the foreseeable future (Loftus and Flather 2000) participation in coastal Alaska has grown from 60,000 to 150,000 user days between 1979 and 1994. Other non consumptive forms of recreational use of the coastal Alaska study area are projected to reach 4700 recreational visitor days annually by 2010 (U.S. Forest Service 1997a).⁵

Part of protecting and maintaining the resources that these activities and expectations depend upon rests with fish and wildlife enforcement and protection services. They are faced with a relatively complex set of issues involving integration of provincial or state and federal responsibilities ranging from law enforcement to fish and wildlife resource management, land management, legislative accountability and public accountability. To play an effective role fish and wildlife law enforcement programs must:

1. protect fish and wildlife populations and their habitat to ensure the sustainability of native biodiversity and the viability of wildlife populations,
2. achieve a level of compliance with regulations and practices designed to ensure that sustainable mortality thresholds are not exceeded,
3. provide for a level of presence and public interaction by officers and troopers sufficient to effectively deter would-be violators, reduce wildlife-human conflicts and build contacts and acceptance,
4. meet the expectations of the public for *conservation*, and
5. meet the legal and international obligations established in law or policy by governments.

This study looked at some aspects of the capability of the British Columbia Ministry of Water, Land and Air Protection (WLAP), Enforcement Services⁶, and the Alaska Department of Public Safety, Division of Fish and Wildlife Protection, to contribute to the objectives of a wildlife law enforcement program as defined above. They are largely in the realm of commitments to enforcement by government and the burden placed on the enforcement body by government actions and mandates.

⁴ Includes CA, OR and WA as well as Alaska.

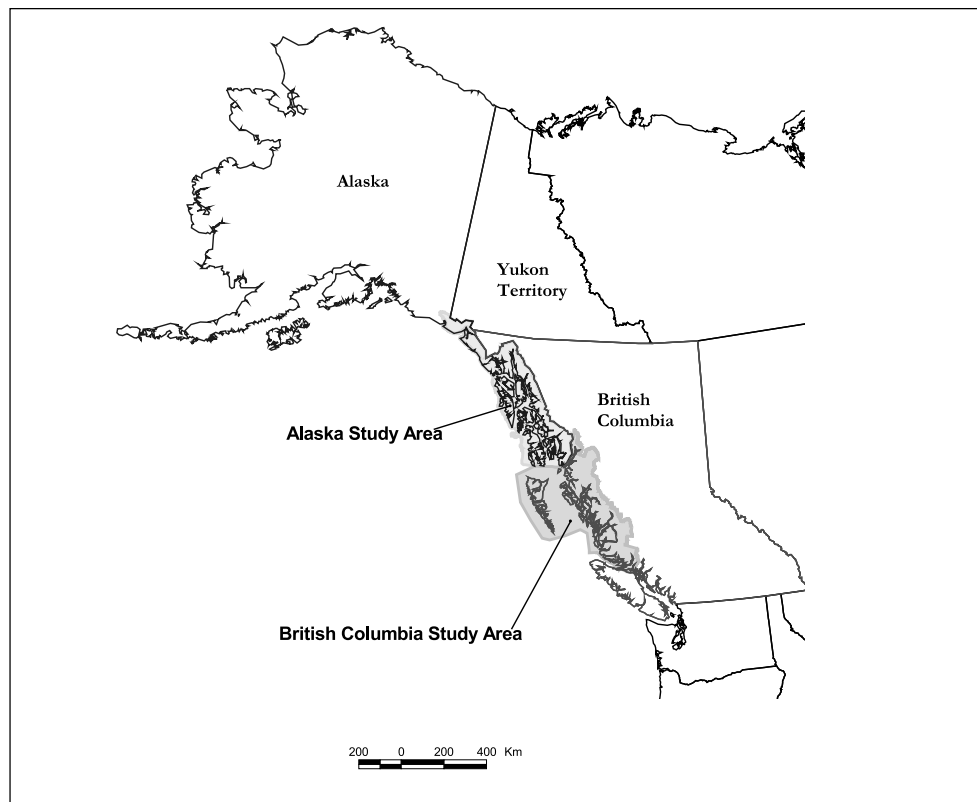
⁵ This information is for the Tongass National Forest which forms the vast majority of the coastal study area.

⁶ WLAP was created in mid 2001 as a result of restructuring the Ministry of Environment, Lands and Parks (MELP). What was formerly the Conservation Officer Service is now known as Inspection and Enforcement Services.

2 TWO LEVELS OF STUDY

Fish and wildlife law enforcement and protection capability in the province of British Columbia and the state of Alaska was the broad focus of interest in this study. These political jurisdictions have in common a biogeographic region known as the coastal rainforest (Figure 1). A second level of study compared some aspects of fish and wildlife law enforcement capability in this ecologically distinct area.

FIGURE 1
Coastal regions of
Alaska and British
Columbia included in
this study.



The Alaska coastal study area included the Alaska panhandle encompassed within Game Management Units one to five. This is Detachment A within the Division of Fish and Wildlife Protection. The British Columbia coastal study area was defined by identifying Wildlife Management Units (WMU) that had direct Pacific Ocean exposure or were immediately adjacent to these WMUs and were still part of a drainage flowing to the nearby coast (Figure 2). It includes parts of the former Ministry of Environment, Lands and Parks management regions one, two, five and six.

Some relevant characteristics of the two study areas include land mass,

jurisdictional ownership, and human population (Table 1). In both jurisdictions land surface and enclosed water bodies are included in area calculations.

TABLE 1
Basic features of
the study areas as
of 2002.

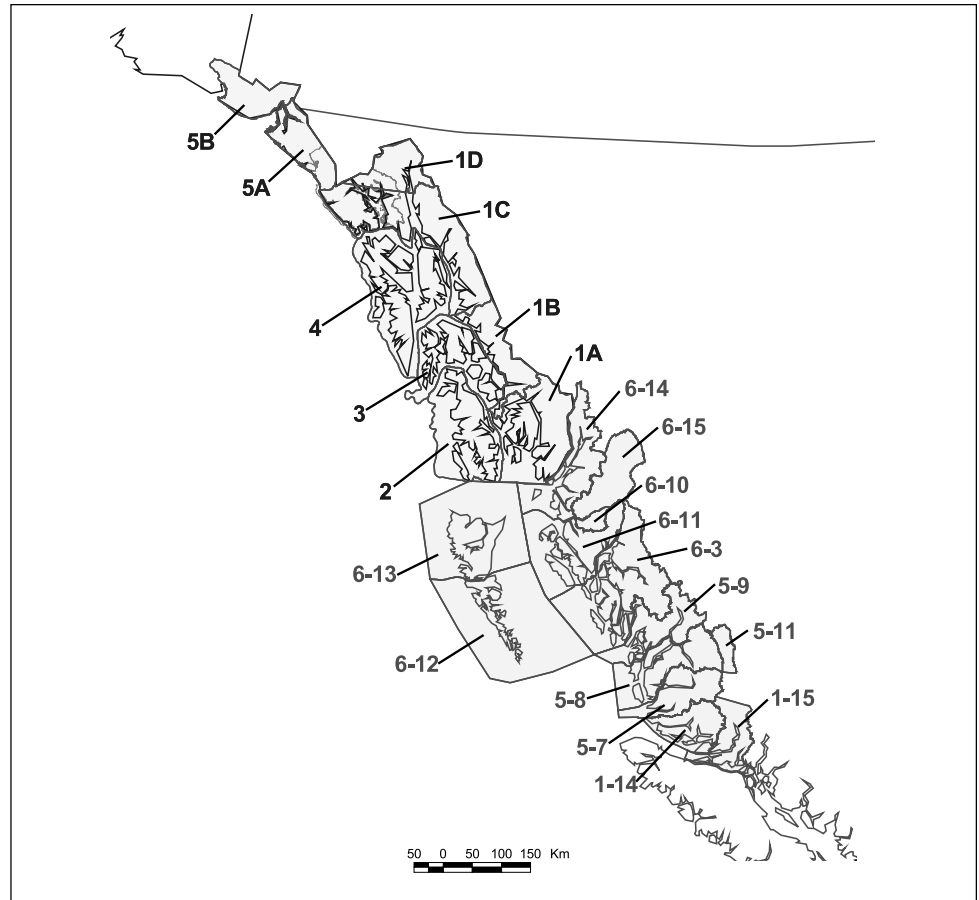
	Province and State		Coastal Area	
	British Columbia	Alaska	British Columbia	Alaska
Land Mass (km ²)	942,580	1,477,268	88,296	84,553
Under Federal Mgt. (%)	<1 ¹	68 ²	<2	95
Human Population ³	4,133,035	640,832	69,380	73,888

¹ from B.C. MOF 1994.

² Includes the Tongass National Forest and Glacier Bay National Park.

³ See Table 2, Appendix A, for sources.

FIGURE 2
British Columbia
and Alaska Game
Management Units
included in the
Study Area.



3 METHODS

The majority of the information in this report was extracted from government files or was available in public documents; some was provided by cooperative government employees. Certain British Columbia data was obtained through formal freedom of information requests.

Defining the Coastal Study Area

Coastal Alaska is an area confined by a political boundary and therefore human population and Fish and Wildlife Trooper activities and districts are clearly defined. In coastal British Columbia administrative and census districts include inland areas. Human population was determined by interpreting statistical profiles from Municipal and Regional District estimates (B.C. Stats 1998).⁷

The Unregulated Population

The unregulated population is defined as those many British Columbians and Alaskans who interact with wildlife directly or indirectly, whether it is deliberate or inadvertent, in a manner which does not require them to obtain authorization from a regulatory body. It includes, for example, the agricultural community, campers, hikers, property owners, and the many residents who own firearms⁸ but don't specifically set out to interact with wildlife. Some of these same individuals constitute part of the regulated community.

The Regulated Community

The regulated community for this analysis consists of the combined total of sport fishing and hunting participants. The regulated sport fishing and hunting community is but a subset of the entire regulated population for which wildlife enforcement and protection personnel in British Columbia and Alaska are responsible.⁹

The Regulatory Load

The regulatory load is distinguished from the regulated community. The regulated community is a measure of the number of persons involved while

⁷ Based on the study area boundary parts of Regional Districts 49 (about 40% of Kitimat - Stikine, excluding New Hazelton and including 60% of subdivision C, 14% of subdivision B, 17% of subdivision A and all of subdivision D), 25 (mainland of Comox-Strathcona) and 43 (mainland of Mount Waddington) and all of Regional Districts 45 (Central Coast) and 47 (Skeena-Queen Charlotte) were included.

⁸ In British Columbia approximately 600,000 adults reportedly own firearms (Canada Firearms Center 1999).

⁹ In British Columbia the total regulated population is expanding rapidly. As of 1998 it included about 191 forest companies holding close to 300 licenses to log and build roads on public land (Marchak *et al.* 1999). It includes corporations and individuals that are regulated under the Waste Management Act, boat users, and commercial river rafters, amongst others. In Alaska a major component of the regulated population consists of the commercial fisheries industry.

the regulatory load is a measure of the total number of sport fishing and hunting authorizations issued; the rationale is that each additional permit issued increases the monitoring and enforcement requirement. A single user may now be required to have the correct license, be in a designated area, within a specified time period, and have the necessary permits and tags, all of which can be authenticated only by enforcement contact. Change in the regulatory load in a given jurisdiction spanning 10 or 20 years is complicated by substantial variation in both the number of participants and the range of authorizations (permits, licenses, tags) required by law.

Enforcement Staffing

The number and location of conservation officers in British Columbia were obtained from a combination of the Conservation Officers on-line Reporting System (COORS) database and in-service personnel directories. Alaska data were obtained from Personal Services Positions History, Classification Summary by fiscal year, for FY 1983 through 2001.

Conservation officers were assigned to the B.C. coastal study area if their office was in the study area or adjacent to it and their geographic responsibility included the study area (Figure 3).¹⁰ The coastal study area intersected four operating districts (see Figure 4, Appendix).

Funding

The Alaska Department of Public Safety reports its Fish and Wildlife Protection budget in some detail at the state (1983-2001) and coastal (Detachment A) level (1991-2000). On a state level it distinguishes the marine enforcement component of the budget which routinely amounts to 16 to 20% of the total budget. Typically more than 70% of the marine enforcement budget is committed to commercial fisheries patrol and investigation. This component was excluded from the Alaska budget for comparison of annual expenditures with British Columbia.

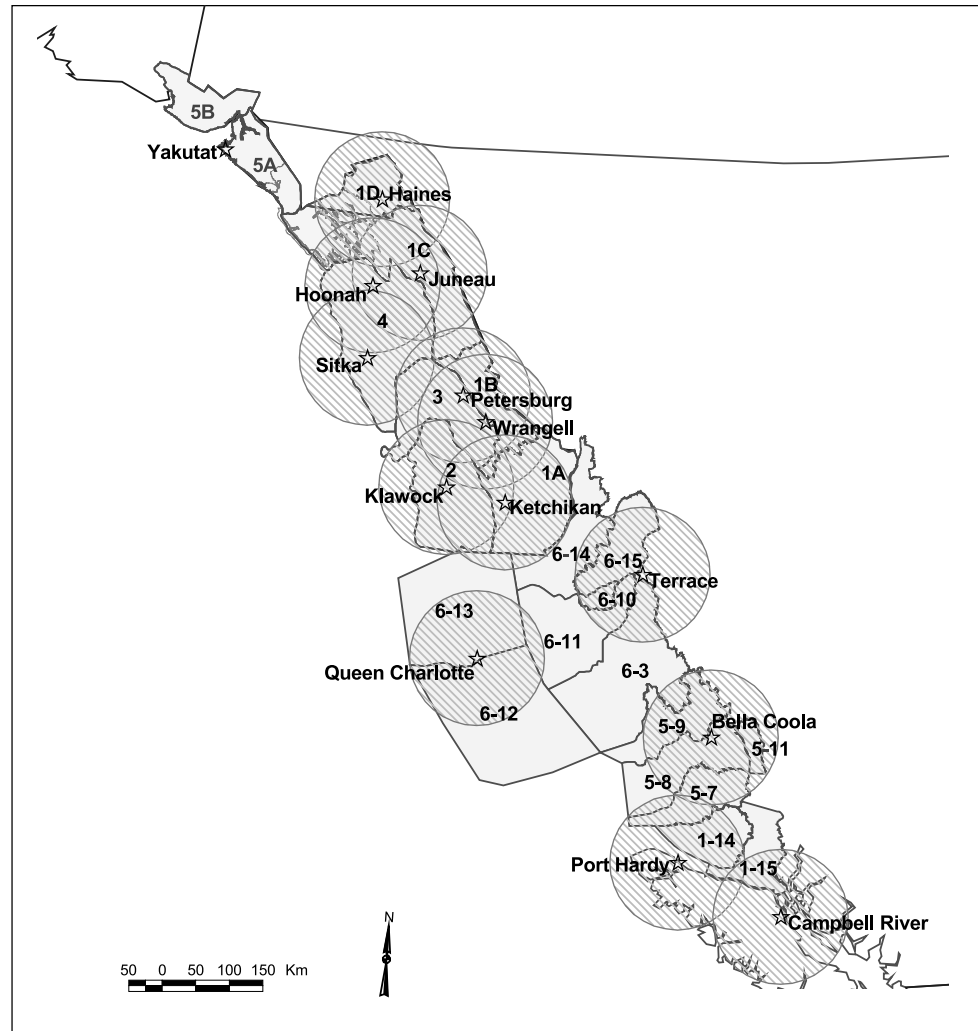
British Columbia does not report its enforcement budget. Recent year information was obtained through direct request to staff of the former Ministry of Environment, Lands and Parks (now Water, Land and Air Protection). Budget totals and regional apportionment for 1992-1996 were obtained through Freedom of Information requests that remain incompletely filled.¹¹

The 1983 enforcement budget for B.C. was estimated to be \$8 million. Using this starting point the corrected 1994 budget was very similar in current dollars and

¹⁰ These include two officers from Campbell River (marine patrol), three from Terrace, two from Bella Coola and one from Queen Charlotte.

¹¹ The original request was made to the Chief of Enforcement on 27 July 2000. A request to the B.C. Archives for pre-1992 data produced the response that no budget data have been archived. A request to the Auditor General's office produced no data.

FIGURE 3
 Wildlife law enforcement and protection offices and posts in and near the coastal study area. Circle = 100 km radius.



expected dollars (inflation corrected) suggesting that \$8 million was a reasonable assumption if budgets had kept pace with inflation. Based on 1990s history, budgets have not kept pace with inflation. In this context, the \$8 million 1983 budget estimate could be viewed as generous since it indicated the enforcement services budget had roughly kept pace with inflation up until 1994, near the period when actual budget numbers became available.

The budget for enforcement services in the coastal region of B.C. was derived from the former Region Six (Skeena) budget by dividing the regional budget by the total number of officers in the region and allocating the per-officer budget to the coastal study area based on the number of officers with responsibility in the study area.

Expected budgets were calculated using 1983 dollars corrected for inflation using the Consumer Price Index where 1983 = 100 (Statistics Canada 2002; U.S. Dept. Labor 2002). British Columbia is reported in Canadian dollars and Alaska in U.S. dollars.

Enforcement Capability Index

In order to incorporate and compare the various aspects of fish and wildlife law enforcement and protection, an index of capability was established. Nine components of capability were combined to produce the provincial and state index. Component scores were derived by comparing today's value with the earliest value available (reference measure) for a given component. The index contribution of each component was 100 if that component was equal to the reference measure, indicating no change. If the component changed, it was reduced or increased by the difference between the reference measure and today's measure.

Components measured were: 1) total enforcement or protection budget, current versus expected dollars, 2) budget priority, measured as enforcement or protection budget as a percent of total provincial or state budget, current dollars versus 1983, 3) per capita expenditure on enforcement, current versus expected dollars, 4) expenditure per officer or trooper, current versus expected dollars, 5) human population size, present versus 1983, 6) the number of officers and troopers, current versus expected today based on troopers/officers per capita extrapolated using human population change, 7) human population per officer or trooper, current versus 1983, 8) geographic area of responsibility per officer or trooper, current versus 1983, and 9) the size of the regulatory load.

The capability index is a percent of the component total and reflects combined change or difference in the nine components of the index. A critical assumption underlying the index is that wildlife enforcement effectiveness and capability was at an acceptable level at the time of the earliest data used. There exists little evidence to determine whether this was or was not the case. If this position is correct, it helps put today's wildlife enforcement capabilities in perspective. If it is unfounded, and enforcement was less than adequate in, for example, 1983, it places today's wildlife enforcement capabilities in a more substandard category than the index indicates.

In several components (1,2,3, and 4, above) the position taken is that the highest proportion of expenditures is equivalent to the overall highest level of enforcement and protection capability. In the budget comparison index this is interpreted to mean that more resources relative to a given responsibility leads, in all probability, to a higher level of effectiveness measured as ability to accomplish a given set of tasks (see Introduction).

Both intra and inter-jurisdictional evaluations have been made. A standard of capability established in one jurisdiction, be it Alaska or British Columbia, was used as a basis for a relative capability index.

The index of enforcement capability comparing the coastal study area of British Columbia and Alaska used six components; they were 1), 3), 4), 6), 7), and 8) above. A lack of historical data restricted the index to a comparison of present day capability.

4 RESULTS AND DISCUSSION

4.1 Growth of the Unregulated Human Population

British Columbia and Alaska

The unregulated population places significant, and I think generally underestimated, stress on wildlife enforcement services. The widespread interaction between humans and fish and wildlife is also the major cause of the dilemma created by a conflicting enforcement and protection mandate which places public safety and protection of property ahead of the well-being of wildlife. Yet the public expects, and wildlife enforcement and protection services promote themselves as, a “conservation”-based service for solving human-wildlife conflicts. It is a tug-of-war with severe consequences for wild animals and wildlife populations as well as for the “conservation”-based reputation of wildlife enforcement and protection services.

Growth in the size of the largely unregulated human population in British Columbia and Alaska (Figure 5) is one of the major pressures on wildlife law enforcement capability. The percent increase in the human population in British Columbia and Alaska between 1980 and 2002 is near identical (51% vs. 53%, respectively). However, the absolute increase in human numbers in British Columbia adds a component of enforcement responsibility that complicates enforcement well beyond rate of growth. The same rate of growth that saw Alaska add 221,032 people to the unregulated population saw British Columbia add a staggering 1,390,779 persons (see Table 2, Appendix.).

Coastal Region

A comparison of coastal British Columbia and Alaska is distinctly different in two respects from one at the provincial and state level. First, both regions have benefitted from substantially lower growth rates than their mother jurisdiction (Figure 6). Second, in this region both the rate of human population growth and total population in Alaska exceeded that in B.C., increasing 19% from 61,162 people in 1983 to 73,888 in 2002. The B.C. coastal population has grown marginally, increasing from 66,672 in 1985 to 69,380 persons in 2002.

The impact of the unregulated population on wildlife is substantial. It occurs in an least two significant forms:

1. illegal and deliberate killing of wildlife (poaching) which can be stimulated by subsequent trafficking of parts and meat, and
2. conflict between humans, their property and wildlife.

Activities involving illegal killing of fish and wildlife take every imaginable form. One aspect of this activity, however, stands out clearly: almost all of it is dependent on motorized access whether it is traditional road-vehicle access or, in coastal areas, access by aircraft and boats on waterways.

FIGURE 5
Human population growth in British Columbia and Alaska, 1980-2002.

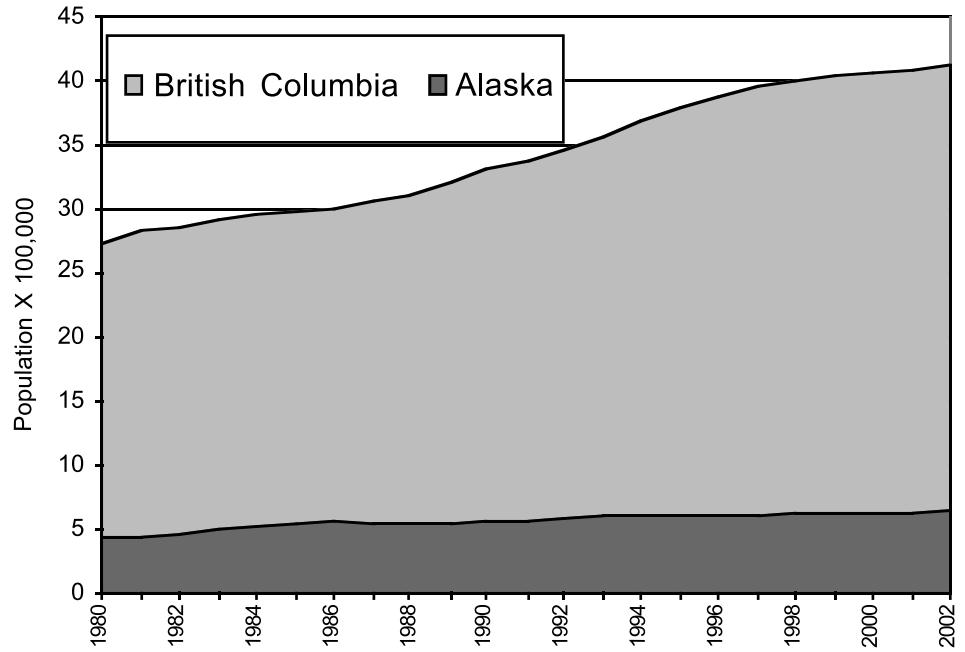
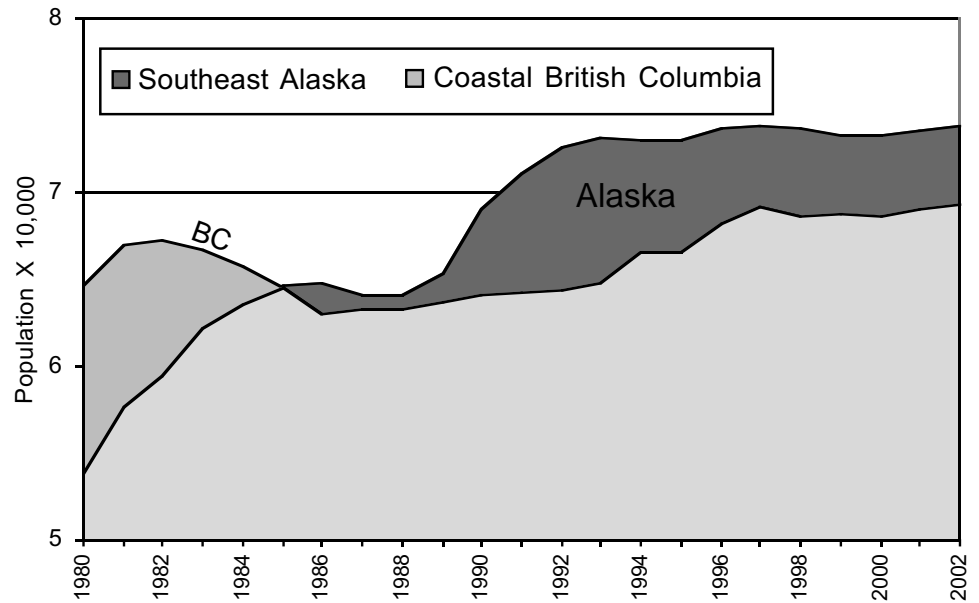


FIGURE 6
Human population growth of coastal British Columbia and southeast Alaska, 1980-2002.



Land use strategies that increase contact between humans and wildlife place an unmanageable burden on enforcement staff.

Illegal activity is widespread,¹² and can have a substantial incremental and cumulative effect on wildlife populations (Smith *et al.* 1994). From a law enforcement perspective the significant issue is that the control or reduction of this activity requires a widely distributed and relatively consistent enforcement presence. Illegal activities are spread throughout the year although they intensify during the licensed hunting and fishing season. Control of illegal activities places a consistently high demand on enforcement services, often during a period when the second major demand, conflict between unregulated users and wildlife, reaches a high level of activity.

Conflicts between people and wildlife involving human property (i.e., livestock, fowl, bee yard), crops (gardens, orchards, grain) and sanitation (garbage, food storage) extend year-round but they intensify in the spring-fall period when wildlife enforcement capacity is already spread thin by

1. increased human access to wildlife habitat (roads become snow-free and use increases), and
2. increased human activity associated with seasonal climate and holidays.

One of the most diversionary and costly aspects of conflict between unregulated users and wildlife is that it is typically driven by independent individual events, i.e., it is unplanned. This makes it relatively difficult to incorporate into a wildlife protection and enforcement strategy except to recognize that it will occur and therefore enforcement capability must be made available as a reactionary force. When governments chose to de-emphasize or to not manage the human side of the interaction of people with wildlife and their habitat, then the consequences of “management” fall disproportionately on wildlife. These are the all-too familiar “management actions” undertaken by government agents.

Land use strategies that increase contact between humans and wildlife place an unmanageable burden on enforcement staff in terms of frequency of conflict and the intensity of response required under a mandate whose first order is to try and ensure human safety and protect property. Not only does wildlife “pay the price” but the actions of conservation officers and protection troopers push or exceed the threshold at which their actions can be considered as conserving or protecting wildlife. They also threaten the public’s perception that officers and troopers are acting in a conservation role, which I define as the short term protection of wild animals and their habitat and the long-term defense of population viability and habitat effectiveness. At the very least, management actions which take place under the umbrella of wildlife

¹² Although most hunters live in urban centers wildlife law violators are significantly over-represented in rural areas (Melnik 1977). On a geographic basis most of British Columbia and Alaska is rural.

Management action directed at removal of animals...either limits population growth or causes population decline and reduces its distribution.

Agencies with inadequate staff levels or resources cannot function effectively across the landscape when they are constantly diverted to conflicts at the perimeter of the urban and agricultural zone.

conservation, are questionable acts of “conservation” when they occur outside of a regulatory foundation to eliminate avoidable conflict resulting from human actions that can be altered or eliminated in favor of wildlife survival. Management action directed at removing animals that some members of society will not tolerate¹³ almost always, most often sooner than later¹⁴, either limits population growth or causes population decline and reduces its distribution.

Since dealing with conflicts falls within the primary mandate of wildlife enforcement (protection of human safety and property) it receives preferential allocation of resources (personnel and support). Other enforcement activities are relegated to a lower level and, in some cases, are simply abandoned. There is evidence that the sheer volume of events can outstrip enforcement capability. For example, in British Columbia between 1992 and 1996 there were 1577 and 41,402 complaints from the public about grizzly and black bears, respectively (Ciarniello 1997). Many others are not reported or not recorded by the Conservation Officer Service (COS). The COS attended to 61% and 31% of the reported grizzly and black bear calls, respectively, leaving 619 human-grizzly bear incidents and 28,500 black bear incidents unattended. Almost all of these involve the unregulated human population.¹⁵

The diversion of enforcement staff to deal with conflicts created by agricultural and human habitation may intensify lawless activities or conflicts that are dispersed across the landscape if lawbreakers are cognizant of the diversion. Agencies with inadequate staff levels or resources cannot function effectively across the landscape when they are consistently diverted to conflicts at the perimeter of the urban and agricultural zone.

As “reaction” enforcement grows as a consequence of increasing human population and encroachment of country-residential housing development into wildlife habitat, and in keeping with the imperative of defense of life and property, there is a decline in the capacity of wildlife enforcement agencies to deal with the more predictable regulated (= licensed) population. This triage approach greatly limits enforcement efforts dedicated to the traditional roles of promoting compliance by and monitoring regulated users (in this discussion, the licensed hunter or angler).

¹³ While the common argument is that this intervention builds tolerance and acceptance of wildlife in the human population, these qualities have not been demonstrated to prevent long term-decline in wildlife numbers and distribution resulting from management actions.

¹⁴ For example, a grizzly bear may be relocated once, possibly even twice, but there is only sparse evidence that there are positive consequences for the source population as a result of these actions.

¹⁵ The response rate of the Conservation Officer Service (now Enforcement Services) is expected to be even lower as its fish and wildlife-directed effort continues to be reduced by Forest Practices Code-related monitoring activity, which consumed 15% of effort in recent years.

4.2 The Regulated Community

British Columbia and Alaska

The regulated community includes hunters and anglers that require authorization to legally carry on their pursuits. They are a smaller group than the unregulated population but the nature of their activities is such that they have, in many regions, a disproportionate influence on fish and wildlife populations and wildlife enforcement and protection services. This is a group of users whose tacit intention is to impact fish and wild animals. Their activities routinely alter fish and wildlife population characteristics and they therefore demand a great deal of enforcement attention. Whether they receive that attention is the subject of this report.

Residents are abandoning hunting and fishing activities on a relatively large scale.

Since 1983 the number of basic hunting and fishing licenses sold declined noticeably in B.C. (-35%) while it increased substantially in Alaska (+59%) (Table 3). The decline in B.C. occurred in the total number of fishing and hunting licenses which masked an increase of 1097 (+20%) nonresident hunters. It reflects a decline of almost 70,000 resident anglers (-26%) and 74,500 resident hunters (-44%). Residents have been abandoning these activities on a relatively large scale.

Alaska has experienced a dramatic increase (+590%) in short term nonresident fishing license sales (+225,500), a situation that masks stability in the number of resident sport fishing licenses and a decline of about 6600 resident basic hunting licenses (-24%). This has produced a dramatic shift in the ratio of nonresident to resident license numbers; from 53:100 in 1983 to 151:100 today. The comparable ratios for B.C. are 12:100 (1983) and 9:100.

TABLE 3
Basic hunting and fishing licenses sold, resident and nonresident, British Columbia and Alaska.

Year	Residents		Non Residents		Total	
	Number ¹	% of Pop.	Number ²	As % of Pop.	No.	As % of pop.
<i>British Columbia</i> ³						
1983	437,012	15.0	53,383	1.8	490,054	17
1985	375,963	13.0	39,394	1.3	415,069	14
1990	382,425	12.0	40,562	1.2	422,602	13
1995	357,115	9.4	33,031	0.9	390,054	10
1999	293,281	7.3	25,699	0.6	318,375	8
2000	292,432	7.2	27,295	0.7	319,727	8
<i>Alaska</i>						
1983	199,779	40	107,742 ⁴	22	307,521	62
1985	205,279	38	133,367	24	338,646	62
1990	230,750	42	187,892	34	418,642	76
1995	200,067	33	245,200 ⁵	41	445,267	74
1999	187,117	30	291,695	47	478,809	77
2000	194,841	31	294,510	47	489,351	78

¹ Does not include native subsistence hunters or fishermen. Consists of basic res. hunt + Senior + Junior basic hunt + Res. basic fishing categories. ² Includes Resident, Senior Citizen, Junior nonresident (NR) basic and NR alien basic hunting as per 1999/2000 categories. Does not include subsistence hunters.

³ Includes NR basic hunt + NR alien hunt + NR basic fishing categories. ⁴ 1983-85-90 from 10 year recap, January 28/1993 (Alaska DF&G 1993). ⁵ 1995-99-2000 from 10 year recap, Jan.5/2001 (Alaska DF&G 2001).

4.3 The Regulatory Load

The hunting and fishing regulatory load far exceeds the number of participants in the regulated community because of the number of approvals (licenses, tags, permits) required. In both B.C. and Alaska the number of licensed user categories has increased greatly (Table 4). In spite of this the regulatory load in B.C. has declined since 1995 (-7%) although it remains greater than in 1983 (+14%). In Alaska the regulatory load has increased sharply (+101%) and consistently (Figure 7). (See also Table 5, Appendix.)

TABLE 4
Factors contributing to an increasing fish and wildlife enforcement regulatory load in British Columbia and Alaska.

Year	Fishing ¹ and Hunting License Categories		No. of Statutes (=Legislation)		No. Sets of Regulations	
	B.C.	AK	B.C.	AK	B.C.	AK
1983	26 ²	27	-	-	-	-
1985	30 ²	27	-	-	-	-
1990	56 ³	29	-	-	-	-
1995	66	45	-	-	-	-
1999	73	51	34 ⁴	11 ⁵	129	-

¹ Fresh water sport fishing only

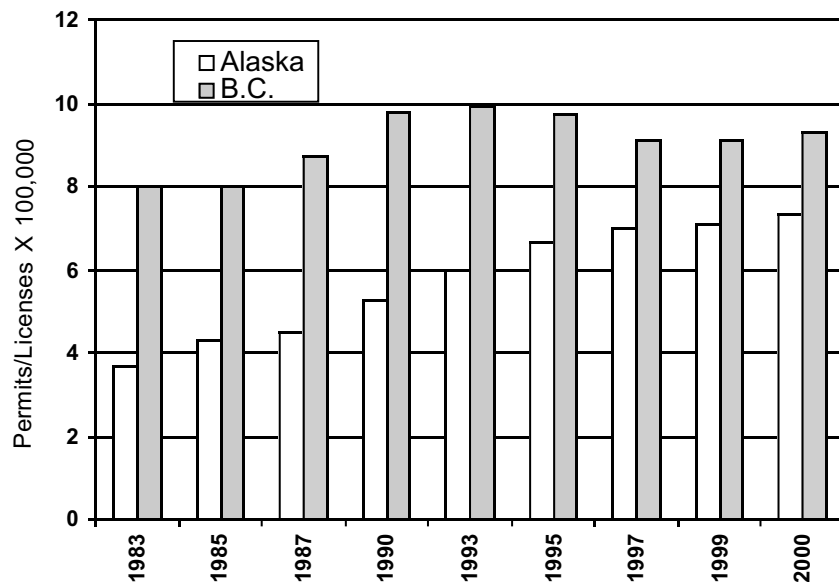
² Hunting related only.

³ Hunting and Sport Fishing, this column only, for the years 1990-95-99.

⁴ Includes legislation parts of which may not be directly related to fish and wildlife enforcement, for example, Transport of Dangerous Goods Act, Land Act, Waste Management Act, and Commercial River Rafting Safety Act.

⁵ Includes administrative codes.

FIGURE 7
Hunting and sport fishing regulatory load in British Columbia and Alaska (1983-2000).



As a resource is threatened...users... intensify their efforts to keep their “piece of the pie.” British Columbia and Alaska are both experiencing the pains of this tragedy now.

Most resource managers have heard of the “tragedy of the commons” (Hardin 1993), one element of which is particularly relevant to wildlife law enforcement. As a resource is threatened, or perceived to be threatened, whether it is through fish and wildlife population decline or regulatory change that might redistribute access to that resource, users, particularly traditional or historic ones, intensify their efforts to keep their “piece of the pie.” Examples are guided/outfitted bear hunting, commercial fishing, tenured rights to log old growth forests, and motorized access to existing roads and trails. British Columbia and Alaska are both experiencing the pains of this tragedy now and dealing with the target activity draws heavily on enforcement resources.

4.4 Budget Support for Enforcement Services

4.4.1 Current Dollars

The annual budget for Conservation Officers Services in British Columbia has been in steady decline since 1993 (Figure 8). It is now the lowest it has been since 1983 and budget forecasts for the next two years (B.C. WLAP 2002a) reveal a severe decline will reduce the enforcement services budget to a crippling \$7 million; 12% lower than it was 20 years ago and an astonishing half of Alaska’s budget (See Table 6, Appendix).

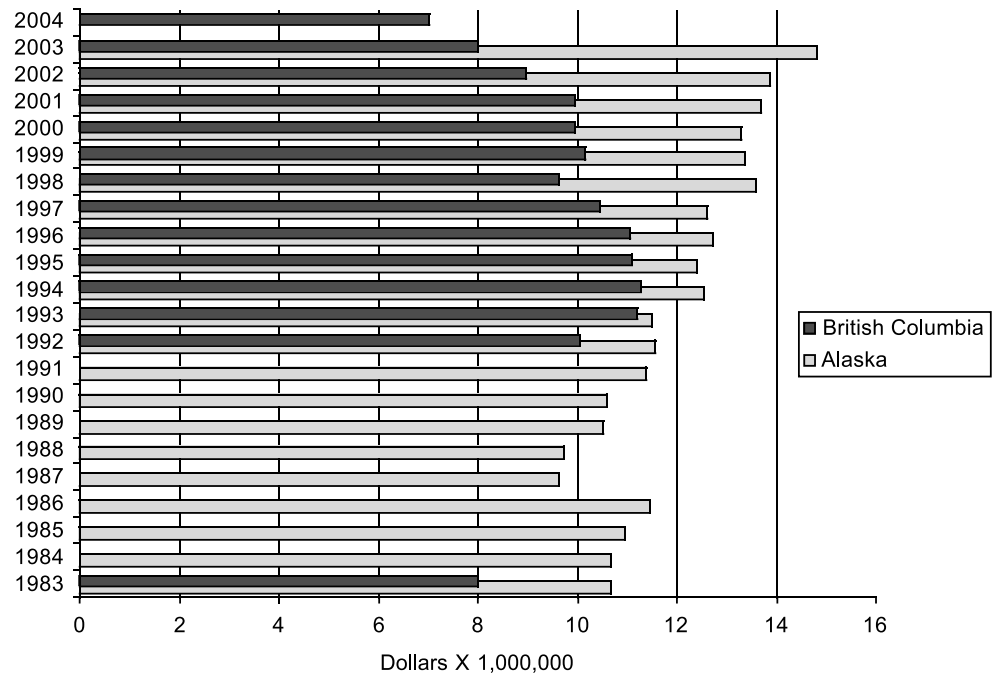
Alaska’s Fish and Wildlife Protection budget has increased steadily since 1987 when it suffered a 16% loss from which it took six years to recover. Today it is 39% greater than 20 years ago.

Coastal

Budget trend in the coastal study areas does not reflect the broader provincial or state pattern. Coastal B.C. receives 5.5% of the provincial enforcement budget, down from 7.1% in 1996. The coastal British Columbia enforcement budget in 2001 was lower than it had been for 10 years, having undergone a significant decline in recent years to 30% below the reporting period high. Even more threatening is the accelerated decline now underway; it will reduce the coastal enforcement budget to near 1983 levels (see Table 6, Appendix).

The budget for Alaska’s coastal study area (Detachment A) has shown a marginal increase since 1994 but it has not kept pace with the state wide increase. Up only 18% since 1983, coastal allocation had fallen from 16% to 14% of the total state budget by 2001.

FIGURE 8
Annual expenditures for fish and wildlife Enforcement Services, British Columbia, 1983 and 1992-2004 (Cdn. \$), and Fish and Wildlife Protection, Alaska, 1983-2003 (U.S. \$). Current dollars.



4.4.2
Expected Budget
(Corrected for
Inflation)

Inflation has produced a gap of 35% and 29% between current and expected budgets in B.C. and Alaska, respectively.

A major setback to enforcement capability in British Columbia and Alaska has been the erosion of budgets by inflation (Figure 9). Enforcement budgets in B.C. and Alaska have not kept pace with inflation, resulting in substantial decline in enforcement budget servicing (purchasing) power.

Between 1983 and 2002, B.C.'s enforcement budget deteriorated to 35% below expected, dropping sharply since 1996 (8% below expected). By 2004 the enforcement budget will sink to 51% of its historical purchasing power, a deficiency of \$7,351,881. This gap will exceed (+104%) the existing budget.

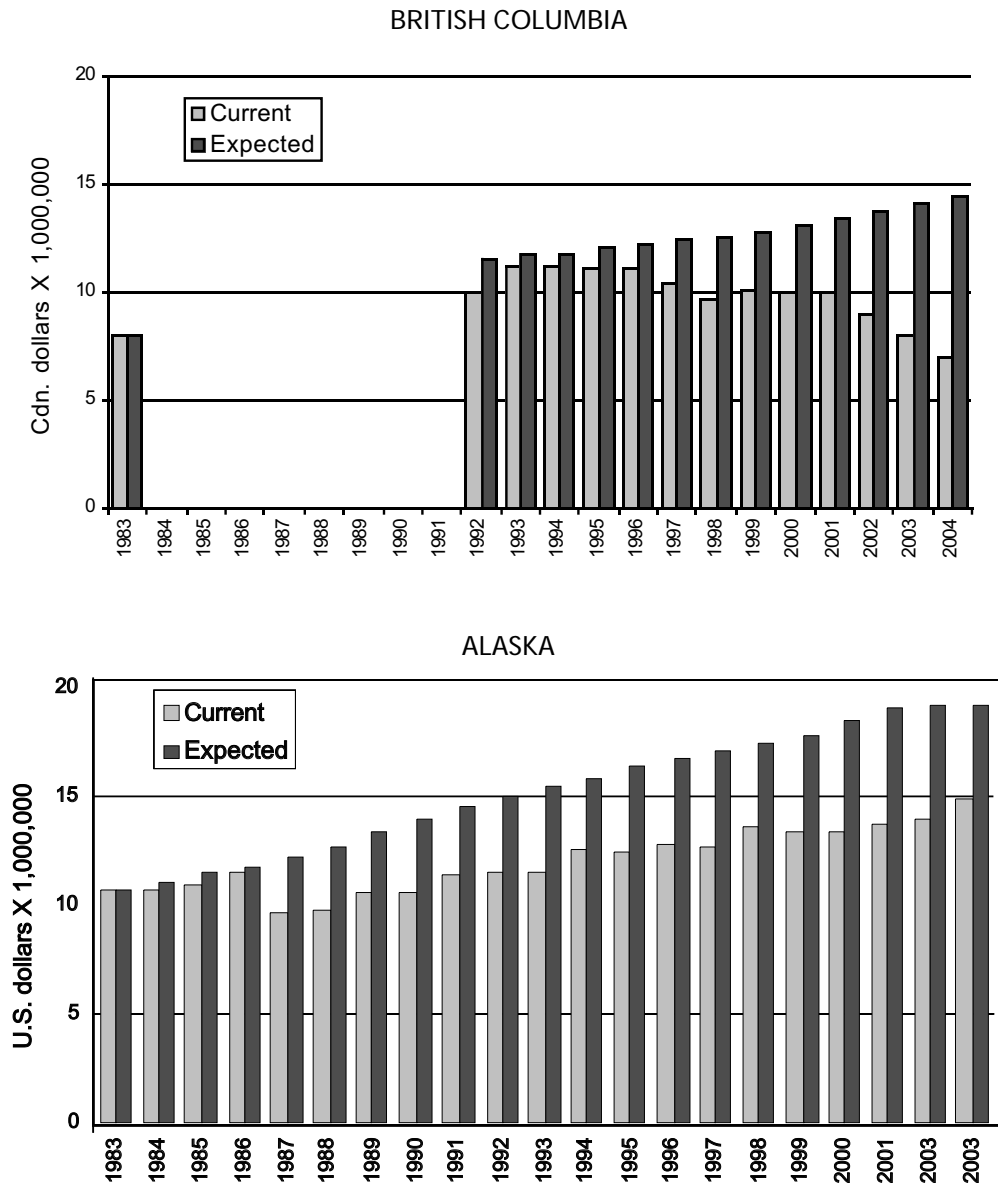
Alaska's Fish and Wildlife Protection budget has fared better; it had deteriorated to 28% below expected by 2002 but had recovered noticeably in recent years and will gain more ground in 2003. The state's protection budget in 2003 will still reflect a gap of \$4,295,637, equal to 29% of the current budget.

Coastal

The coastal B.C. enforcement budget dropped by 37% between 2002 and its peak in 1996; by 2002 it had lost \$142,000 to inflation. It is scheduled to decline an additional 14% by 2004 (B.C. WLAP 2002a) when it will be essentially the same as it was in 1983. This will open a gap of 71% between the existing and expected budget.

Alaska's coastal protection budget has been stable since 1994; in doing so it lost \$1,047,700 to inflation, developing a gap of 51% between current and expected support.

FIGURE 9
 Current and expected annual budget for Enforcement Services (B.C.) and Fish and Wildlife Protection (Alaska). Current = today's dollars; expected = inflation adjusted (1983 = 100).



4.5 Priority of Fish and Wildlife Enforcement and Protection Budgets

With few exceptions government priorities reflect budget commitments. The general understanding is that priority is determined by relative funding level combined with changes (additions or deletions) to absolute funding level. Thus a comparison of fish and wildlife enforcement funding should reflect its priority within a government. British Columbia and Alaska differ in this regard but both fare poorly.

B.C.'s Fish and Wildlife Enforcement budget dropped (Figure 10), as a percent of the provincial budget, from 0.00106% (1/10 of 1%) in 1983 to 0.00039% (1/26 of 1%) in 2001, a decline of 56%.

Fish and wildlife enforcement in British Columbia has suffered from government neglect for 20 years.

In recent years Alaska's fish and wildlife protection budget has not kept pace with state expenditures.

In that period total provincial spending grew by \$16.3 billion (+200%). The province began the 21st century with an enforcement budget essentially unchanged from 1992 (see Figure 8) even though provincial expenditures grew by \$4.3 billion (+24%). Additional deterioration of the enforcement budget by 2004 reflects a reduction in priority of 43% since 1992. At that point enforcement will receive 1/29th of one percent (0.00032%) of provincial expenditures. Fish and wildlife enforcement has suffered from government neglect for over 20 years and its stature continues to erode.

Alaska's fish and wildlife protection budget (excluding marine enforcement) priority declined 32% between 1983 and 2002 (Figure 10). In that time the state budget increased \$2.2 billion (+90%). By 2003 the protection budget will amount to 3/10ths of one percent (0.00292 %) of state expenditure. State expenditure on fish and wildlife protection reflects a priority that is out of synchrony with overall growth in state expenditures. Even at these low and declining levels of support Alaska's fish and wildlife protection budget has noticeably greater stature within government than is the case in B.C. (Figure 10).

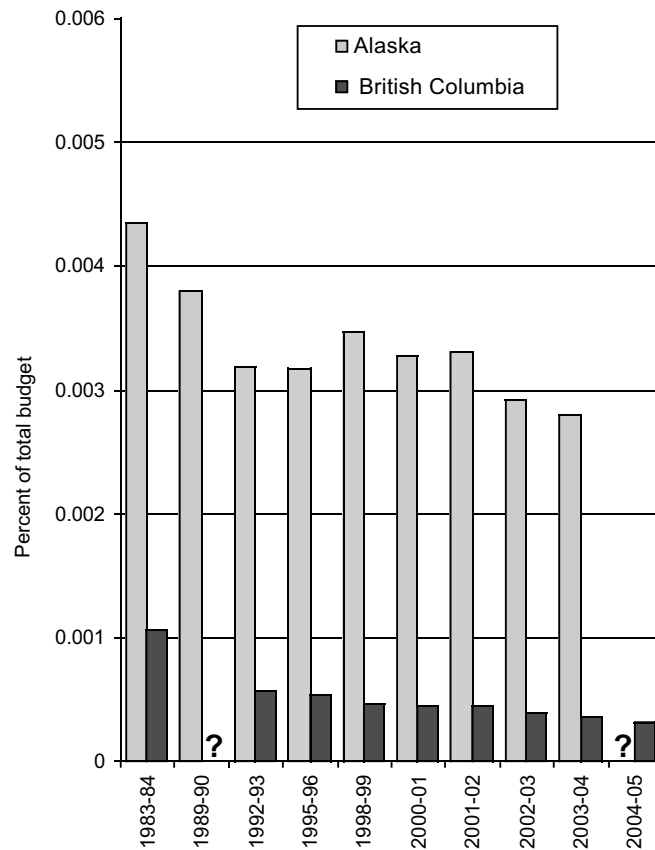
While this suggests that Alaskans and other Americans have a stronger association with and dependence on fish and wildlife as a contribution to their quality of life¹⁶ than do British Columbians, this is only a partial explanation. The Alaska governments higher priority for fish and wildlife conservation also reflects more inclusive and effective participation by Alaskans in government decision making and the large degree of federal involvement in Alaska (see Table 1), which brings with it an impressive and effective display of democratic involvement in land and wildlife conservation issues by Americans from across the country. However, even in the face of administrative and legal procedures initially intended to ensure public involvement and direction in fish and wildlife management and protection, Alaska is losing ground.

Fish and wildlife protection in both Alaska and B.C. has generally experienced the same fate over the last decade: decline in government budgeting priority.

¹⁶ See Table 3 for a partial understanding of why. It shows that the regulated hunting and fishing population in Alaska is 3.3 times greater as a percent of total population than in British Columbia. For example, 30.5% of Alaskan residents purchased hunting or fishing licenses in 1999 while only 9.2% of British Columbians did. In Alaska license fees paid by these users to the state totaled \$21,278,931 in 1999, up from \$9,656,914 in 1990 (Alaska Department of Fish and Game 2000).

The influence, through contributions to the economy and through taxes, of the unregulated population, which includes the majority of residents and operations such as ecotourism, is unmeasured but can be put in the following context. In Alaska in 1999 they contributed about 80% of the annual budget for the combined Fish and Game Department and Fish and Wildlife Troopers Division while the licensed users identified above contributed the other 20%. Data for B.C. is incomplete, but the proportional contribution of the two sectors may be skewed in favor of an even greater contribution from the unregulated population.

FIGURE 10
Priority of fish and wildlife enforcement and protection services in British Columbia and Alaska as a proportion of total provincial or state operating budget, 1983/84 to 2004/05. Alaska=without marine enforcement.



This trend, however, is occurring at substantially different levels; Alaska’s budget priority is almost ten times as great as B.C.’s priority.

4.6 Enforcement and Protection Dollars per Resident

4.6.1 Current Dollars, British Columbia and Alaska

The ability of enforcement services to monitor activities that place residents in contact with fish and wildlife can be partly measured by per capita funding for officers and troopers. Per capita enforcement expenditure in B.C. has declined from a high in 1995 to a historical low (Table 7). By 2004 it will be 38% below the 1983 level. Alaska has provided consistent current dollar per capita funding to fish and wildlife protection. It will reach a historical high in 2003. Alaska’s current fish and wildlife protection per capita funding is 10 times greater than that of B.C.; by 2004, if Alaska maintains its funding, it will increase its advantage to 13.5 times that of British Columbia.

TABLE 7
Expenditure per capita
for fish and wildlife
enforcement (B.C.) and
protection (Alaska)
on a province and state
wide basis and for the
coastal study area.

Year	<i>Province and State-wide</i>			
	British Columbia		Alaska ¹	
	Current \$	Expected ² \$	Current \$	Expected ³ \$
1983	2.75	2.75	21.38	21.38
1985	-	2.95	20.15	21.68
1990	-	3.57	19.14	27.77
1991	-	3.74	19.99	29.08
1992	2.89	4.05	19.66	29.97
1995	2.93	4.15	20.61	32.60
1999	2.52	4.40	21.47	35.53
2000	2.45	4.52	21.18	36.96
2001	2.43	4.63	21.16	38.02
2002	2.17	4.75	21.64	38.16
2003	1.93 ⁴	4.85	23.11 ⁴	-
2004	1.71 ⁴	4.95	-	-
	<i>Coastal</i>			
	British Columbia		Alaska	
1983	5.55	5.55	27.99	27.99
1991	-	-	-	36.35
1992	8.62	8.03	-	39.24
1994	-	8.19	27.55	41.42
1995	9.79	8.37	26.21	42.68
1998	-	8.72	26.75	45.62
1999	8.45	8.87	28.91	46.52
2000	8.00	9.12	28.36	48.39
2001	7.96	9.35	27.85	49.77
2002	7.15	9.58	-	-
2003	6.36 ⁴	9.78	-	-
2004	5.60 ⁴	9.98	-	-

¹ Without marine enforcement.

² Using estimated 1983 per capita expenditure as base line.

³ Using calculated 1983 per capita expenditure as baseline.

⁴ Using 2002 population.

Coastal

British Columbia's per capita enforcement expenditure in the coastal study area has declined sharply since 1995 and will sink to 1983 levels by 2004. Coastal per capita enforcement is three times the provincial average but continues to suffer an overall low level of support; Alaska expenditure is 3.5 times greater and will be over five times greater by 2004. Southeast Alaska has received above state-average per capita support and has done so consistently for 20 years.

4.6.2
Expected Dollars,
British Columbia
and Alaska

The gap in per capita enforcement support between current and expected dollars continues to widen in both B.C. and Alaska and their respective coastal areas (Table 7). B.C., Alaska, and coastal Alaska had suffered a 43% or greater decline by 2002 and coastal B.C. will reach that low by 2004. Per capita expenditure for enforcement and protection services has been substantially compromised by inflation.

Coastal

The gap between current dollars spent and those necessary to maintain per capita services level with inflation is \$2.43 in B.C. (2002) and \$21.92 in Alaska (2001). By 2004 that difference will expand to \$4.38 for B.C., a gap equal to 74% of current expenditure.

4.7 Enforcement Staffing

The long-term trend in fish and wildlife enforcement staffing in British Columbia is opposite to that seen in Alaska (Table 8). There had been an incremental increase in the number of conservation officers in B.C. until 1995 (+26% in 16 years) while Alaska suffered a severe setback in the number of troopers in the mid 1980s (-24%). They have not recovered from that setback. B.C. has been dealt a similar setback as of 2002; it will lose 24 positions (B.C. WLAP 2002b).

By 2003 B.C.
enforcement services
will be essentially
nonfunctional
as a regulatory body.

Historical information on the number of fish and wildlife enforcement personnel in the coastal study area was obtained only for the 1990s. In 1990 there were six conservation officers with responsibilities in the B.C. coastal area; this increased to eight in 1992 and it remained at this level as of 2002. Alaska Detachment A had 18 positions available in 1991, 17 of which were filled. A position was lost in the 90's but regained in FY 2002. In 2001 there were 17 troopers in place; by 2002 the detachment had returned to a full compliment of 18 troopers.

The capacity of officers and troopers to accomplish a job is dependant on the support staff available. In 2001 there was a ratio of 3.0 and 6.3 full-time support staff per 10 officers or troopers in B.C. and Alaska, respectively. Including part time staff, the ratio in Alaska was 8.4. By 2003 B.C. will lose 61% of its support staff, resulting in a ratio of 1.4 support staff per 10 officers. Based on this comparison, Alaska troopers are substantially more effective than officers in B.C. By 2003 B.C. enforcement services will be essentially nonfunctional as a regulatory body.

TABLE 8
Number of
conservation officers
in British Columbia
and fish and wildlife
troopers in Alaska
and number of
support staff.

Year	British Columbia		Troopers	Alaska	
	Officers	Support ¹		Support ²	
1983	-	-	117	34 - 87	
1984	-	-	118	35 - 73	
1985	116	-	113	32 - 69	
1986	-	-	111	28 - 64	
1987	-	-	88	30 - 82	
1988	-	-	85	32 - 82	
1989	-	-	88	34 - 84	
1990	135	-	88	36 - 84	
1991	-	-	88	37 - 84	
1992	138	-	88	38 - 78	
1993	-	-	86	38 - 78	
1994	-	-	86	39 - 79	
1995	145	39	91	39 - 74	
1996	-	-	91	40 - 74	
1997	-	-	93	42 - 75	
1998	-	-	93	45 - 75	
1999	139	43	93	48 - 75	
2000	141	43	91	50 - 75	
2001	139	43 ³	89	56 - 75	
2002	120	30 ⁴	91	56 - 75	
2003	120	17 ⁵	91	56 - 75	

¹ Full-time.

² First column = Full-time; second column = total (full + part-time).

³ Records indicate that four of these individuals share two full-time positions.

⁴ Estimate; at least 3 positions lost in district office closures. See note 5, below.

⁵ Expected 60% cut in support staff by 2003/04 (BC WLAP 2002a).

4.8 Budget Support per Officer or Trooper

A critical measure of enforcement capability is the commitment of financial resources to support an officer or trooper (Table 9).

Current Dollars

B.C. does not provide the same level of financial resources for its officers as AK does for its troopers.

Between 1983 and 2002 B.C. had marginally increased (+8%) the dollar resources available to each conservation officer on a provincial basis; during the same period Alaska increased per trooper support by 68% (Table 9). In the next two years support will drop sharply in B.C. (-22%) to a level below that seen 20 years ago while support in Alaska continues to grow. If the trend in increasing support continues in Alaska, by 2004 Alaska per trooper support will be 2.8 times the level of support in B.C. The difference between Alaska and B.C. reflects, in part, the clear advantage in logistical support available to the Alaska Division of Fish and Wildlife Protection (see Section 4.11).

Per officer or trooper support for coastal B.C. and southeast Alaska continues to diverge. B.C. had sunk to 1983 levels by 2002 and will decline to a level unknown in recent history. Per trooper support in Alaska has bounced around but overall remains stable as of 2002 however it will increase for 2003. Most notable is the gap developing between southeast Alaska and the rest of the state. The latter no longer benefits from having more resources than the state-wide average.

TABLE 9

Financial resources available to Enforcement Services (B.C.) and Fish and Wildlife Protection (Alaska) per conservation officer or trooper, respectively.

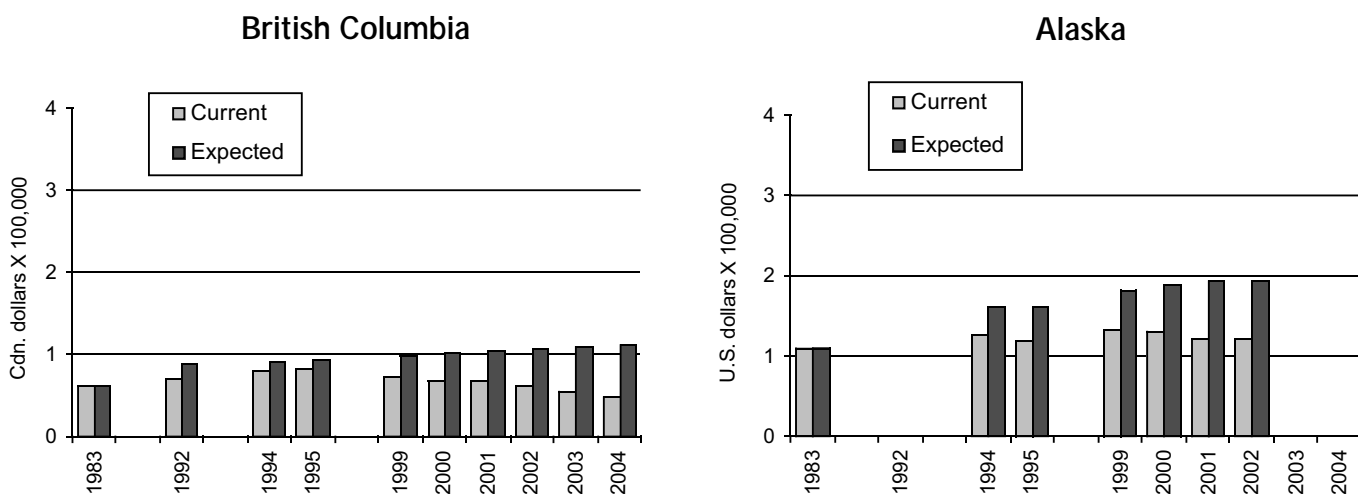
Province and State-wide

Year	British Columbia		Alaska ¹	
	Current \$	Expected \$ ²	Current \$	Expected \$
1983	68,965 ³	68,965	91,222	91,222
1985	-	74,854	96,990	98,158
1990	-	93,116	120,334	118,497
1992	72,798	99,806	131,287	127,893
1995	76,447	103,992	136,257	139,113
1999	73,137	110,281	143,617	151,610
2000	70,583	113,281	145,948	157,714
2001	71,599 ⁴	110,171	153,893	162,201
2002	74,890 ⁵	119,061	152,401	162,840
2003	66,653	121,557 ⁶	162,748	-
2004	58,564	124,054 ⁶	-	-
<i>Coastal B.C and Southeast Alaska⁷</i>				
1983	61,647	61,647	108,764 ⁸	108,764
1992	69,394	89,215	-	-
1994	80,496	90,997	125,788	160,970
1995	81,516	92,957	119,679	165,865
1999	72,578	98,579	132,438	180,765
2000	68,719	101,261	129,562	188,042
2001	68,719 ⁹	103,844	120,387	193,393
2002	62,053 ⁵	106,427	121,299	194,154
2003	55,227	108,659 ⁶	128,856	-
2004	48,600	110,890 ⁶	-	-

¹ Without marine enforcement. ² Expected annual budget/no. officers or troopers.
³ Use 116 officers from 1985. ⁴ Based on the 2000 budget with 2001 number of officers.
⁵ Budget data for 2002-03-02 based on B.C. WLAP 2002a. ⁶ Based on recent average inflation rate.
⁷ Coastal Alaska with marine enforcement.
⁸ Estimated 116 troopers. ⁹ Estimated same as 2000.

FIGURE 11

Expenditures per officer (B.C.) and trooper (Alaska) for the coastal study area. Current = today's dollars; expected = inflation adjusted (1982-1984=100).



Expected Dollars or Loss to Inflation

The gap between current dollars and expected dollars in B.C. will increase from 59% in 2002 to 112% in 2004 when it will be \$65,400. Contrary to the negative trend in B.C., Alaska per trooper resources have generally kept pace with inflation on a state wide level (-\$10,439).

Coastal B.C. will suffer the same fate as the province, with the gap between actual and expected dollars growing from 72% in 2002 to 129% in 2004 (-\$62,290) (Figure 11). Southeast Alaska per trooper resources have lost ground to inflation and to the state wide trend. A gap of \$72,855 has developed, setting coastal protection back substantially.

4.9 People per Officer or Trooper

A significant percentage of the unregulated population interacts with wildlife on a regular basis, whether it is by choice (e.g., defending a bird feeder against a squirrel or a planned trip to use public land) or inadvertently (e.g., defense of the family Pekinese against a resident coyote). It was estimated that in 1996 in B.C. 60% of the populace was involved in wildlife-related activities. The number directly and deliberately interacting with wildlife exceeded the regulated population (see footnote 2) (Reid 1998). The ability of enforcement services to monitor and regulate interaction between residents and fish and wildlife can be partly measured by the ratio of residents to officers or troopers. B.C. conservation officers have to deal with almost a 500% greater human presence per officer than do Alaska troopers (Table 10).

Although British Columbia had added conservation officers in the early 1990's, population growth outstripped these additions to the extent of 3453 people per officer (1990 to 2001), a loss of 14% in contact capability. Alaska troopers are in a far more favorable overall position than officers in B.C. even

TABLE 10
Residents per conservation officer and fish and wildlife protection trooper in British Columbia and Alaska, respectively, and in the coastal study area.

Year	People per Officer or Trooper			
	Province and State		Coastal	
	British Columbia	Alaska	British Columbia	Alaska
1983	-	4,266	-	2,960 ¹
1985	25,640	-	11,112	-
1990	24,380	8,019 ²	8,019	-
1991	-	6,667	-	4,443 ³
1992	25,147	-	8,048	4,538
1995	26,069	6,651	8,328	4,566
1999	28,979	6,835	8,590	4,581
2000	28,820	7,044	8,585	4,567
2001	27,833	7,122	8,629	4,322
2002	34,441	7,042	8,667 ²	4,104
2003	34,441 ²	7,042 ²	8,667 ²	-

¹ Extrapolated from 117 troopers state-wide, estimate 21. ² Based on 2002 population estimate. ³ 16 troopers, down from 18 in 1990.

thought they gained responsibility for an additional 610 (+8%) persons between 1990 and 2001. Since 2001 B.C. officers each have another 6608 people to potentially deal with (+24%) while Alaska has essentially stabilized trooper per capita responsibility.

Coastal

Coastal B.C. has a 3.9 times more favorable ratio of officers to residents than the province generally. This has increased from about 2.3 in 1985. B.C. cut the resident per officer responsibility by 4205 persons between 1985 and 1990, a sharp improvement. However, since 1990 that improvement has been eroded (-648 people). Coastal Alaska has a 1.7 times more favorable trooper per resident ratio than statewide. Between 1983 and 1991 this part of Alaska experienced significant population growth and a reduction in trooper presence. In the last decade, however, the per capita trooper responsibility has improved 8% (-339 people).

4.10 Land Mass (Area) Responsibility per Officer or Trooper

Alaska is much larger (+57%) than British Columbia but both are physically impressive jurisdictions. The coastal study areas, however, are similar in size (see Table 1). The size of the land base an officer or trooper is responsible for is a component of enforcement capability even though the issue is complicated by road, boat and aircraft access, enforcement mobility, and officer and human population distribution.

The size of the land base officers and troopers are responsible for in B.C. and Alaska presents a paradoxical picture that has changed little in the last decade (Table 11). Alaska troopers on a state-wide basis are faced with a huge landscape:

TABLE 11
Geographic responsibility (km² of land) per officer or trooper.

Year	British Columbia		Alaska	
	Province	Coastal	State	Coastal
1985	8,125	-	13,073	-
1990	6,982	11,077	16,787	4,697
2001	6,781	11,037	16,598	4,973
2002	7,854	11,037	16,234	4,697
<i>Coastal Alaska</i>				
Area (km ²)	Human Population	No. Troopers	Residents/ Trooper	Area (km ²)/ Trooper
<i>Three High Density Posts (Juneau, Ketchikan, Sitka)</i>				
31,195	52,831	11	4,802	2,835
<i>Rest of southeast Alaska</i>				
53,358	20,471	7	2,924	7,622

each is responsible for an area larger than some states.¹⁷ They are faced with an area 2.1 times the size of B.C.'s per conservation officer area.

Coastal

Given the relative seclusion of parts of the coastal region, logistical difficulties...become an impediment to effective fish and wildlife law enforcement that is particularly relevant in British Columbia.

On a coastal basis, the above relationship is reversed; B.C. officers are responsible for an area that is two times larger than the area that each Alaska trooper is potentially assigned. Given the relative seclusion of parts of the coastal region, logistical difficulties created by lack of mobility and difficulty of access become an impediment to effective fish and wildlife law enforcement that is particularly relevant in British Columbia.

In the Alaska coastal study area the three boroughs¹⁸ of Juneau, Ketchikan-Gateway and Sitka contain the region's three largest cities. They account for only 18% of the land area¹⁹ but contain 72% of the population (52,831 people). Eleven of A Detachment's 18 trooper positions (61%) are located in posts that incorporate these high density population centers, where human density is 11.0, 11.4 and 3.0 persons/mi² (4.3, 4.4 and 1.2 persons per km²) (Table 11).

In the remainder of the study area, where human population is 0.66 persons/mi² (0.26 people/km²) there are seven trooper positions²⁰ in five posts. Under 2002 staffing levels urban (high density) posts have a 25% greater population load than rural (low density) posts but rural troopers are faced with 2.5 times the logistical challenge in terms of area responsibility.

Enforcement personnel are obviously not confined to their home base area. It is common and essential practice to deploy troopers and officers to select areas on a seasonal or issue basis. However, it is an interesting paradox, given similarity in land status and management, that wildlife populations are more viable as distance to human population centers increases and thus the potential for illegal exploitation may be greatest where wildlife is most abundant. While urban-based officers and troopers must attempt to "keep peace" in the high contact zone between the urban-based unregulated population and wildlife and its habitat, they are also faced with the obligation to maintain some presence in adjacent rural and less inhabited areas. To do so they face logistical limitations; driving 100 km on secondary roads or trails or traveling two hours by boat to conduct operations in a target area cuts sharply into area-specific activities.

The straight-line distance in the coastal study area among the seven enforcement posts in Alaska and the four offices in B.C. illustrates a problem of

Limited or absent protection and enforcement where logistics stress enforcement services, has led to the label "islands of neglect."

¹⁷ Connecticut, for example, is 14,358 km² in size.

¹⁸ Roughly equivalent to counties or municipalities in British Columbia.

¹⁹ 6834 mi² = 17,704 km².

²⁰ Two positions were vacant in spring 2001.

scale that differs between B.C. and Alaska (Table 12). In this area boats and aircraft and rivers logistically replace vehicles and roads, thus coastal areas where access is on water from the west present a unique enforcement problem. These are areas that may support unique and vulnerable biological features, such as salmon runs and bear fishing concentrations, that attract intense use by the regulated and unregulated population. Limited or absent protection and enforcement in these areas, where logistics stress enforcement services, has led to the label “islands of neglect” (Thompson and Taylor 1993).

TABLE 12
Distance (km) between coastal area enforcement offices in British Columbia and trooper posts in Alaska. Measured as straight line between closest office or post.

British Columbia		Alaska	
Terrace-Queen Charlotte	270	Haines-Juneau	120
Terrace-Bella Coola	260	Juneau-Hoonah	70
Bella Coola-Port Hardy ¹	190	Hoonah-Sitka	110
Port Hardy-Campbell R	170	Sitka-Petersburg	150
		Petersburg-Wrangell	50
		Wrangell-Klawock	110
		Klawock-Ketchikan	90
Average Distance in km	222		110 ²

¹ Port Hardy is on the edge of but outside the area and enforcement from there does not routinely include the coastal study area. It is included to present a best case scenario.

² When Yakutat was occupied the average distance between posts was 118 km. At present the north end of the region continues to be without a permanent post.

4.11 Logistical Support

The ability of enforcement officers and troopers to make contact with and monitor the activities of the regulated and unregulated users of public lands in coastal B.C. and Alaska depends heavily on aircraft and boat access. Aircraft are considered “an indispensable tool for patrol and investigations work” in Alaska (Alaska DF&WP 1998).

On the coastal mainland of Alaska 70% of successful brown bear (*Ursus arctos*) hunters²¹ used boat (63%) or air access (7%) (Porter 1999). On the Admiralty-Baranof-Chichagof island complex 580 of 600 brown bears (97%) were killed by hunters using boat and aircraft transportation²² (Whitman 1999). About 80% of the deer kill on coastal Alaska is estimated to be associated with boat access (Folger 2001). On the Queen Charlotte islands in the B.C. coastal study area it is estimated that 25% of the bear and deer kill is related to boat access (Hilgemann 2000). This estimate can be extrapolated to the B.C. mainland

²¹ A 13-year average, 1985/86 to 1997/98.

²² Boats – 7.5%; aircraft – 89%; motorized vehicles – 2%. Rounded values account for the variance from 97%.

only as a minimum since, according to a senior conservation officer, the Conservation Officer Service had “not a clue” about human activity on the coast (personal communication, name withheld by request, June 18, 1998). A reasonable expectation is that method of transportation associated with hunter kills on coastal B.C. is similar to that of Alaska.

There is an extreme contrast in air and vessel enforcement capability between B.C. and Alaska on a province and state wide basis and in the coastal study area (Table 13). In 2001 the Division of Fish and Wildlife Protection operated 46 aircraft²³.

TABLE 13
Air and vessel fish and wildlife protection and enforcement support in Alaska and British Columbia and in the coastal study area.

	British Columbia ¹		Alaska			
	Province-wide	Coastal	State-wide	Coastal		
Number of Vessels						
> 25 ft.	2+?	2	17 ²	7		
< 25 ft.	2+?	2	-	9		
Number of aircraft	0	0	46 ^{3,4}	2		
Number of helicopters	0	0	5	-		
	Coastal British Columbia ⁵			Coastal Alaska		
	1999	2000	2001	1999	2000	2001
Aircraft hours used	<100	<100	<100	487	590	214
Vessel days at sea	<100	<100	<100	349	404	388

¹ B.C. Ministry of Environment charters aircraft when possible.

² One additional under construction.

³ These aircraft are also used by Alaska State Troopers .

⁴ These aircraft flew 8547 hours in FY 2000; 66% (5679 hrs) of these were used by the Fish and Wildlife Protection Division. In 2001 FWP flew 5602 hours.

⁵ These numbers were not provided by the Ministry of Environment. They are estimates made by the author based on “off-the-record” conversations with conservation officers.

Logistical capability in Alaska is well beyond that available in B.C. but with a geographic demand of over 16,000 km² per trooper Alaska also has its “islands of neglect.”

While logistical capability in Alaska is well beyond that available in B.C. the Division of Fish and Wildlife Protection still lists 24 sport fishing and 30 hunting areas that receive little or no patrol effort (Alaska DF&WP 2000). With a geographic demand of more than 16,000 km² per trooper Alaska also has its “islands of neglect.”

The large geographic area of commitment for each officer in coastal B.C., in the absence of logistical support for monitoring and investigating fish and wildlife-related activities and impacts, and for contacting the public, is a

²³The Department of Public Safety, which includes the Division of Alaska State Troopers and the Division of Fish and Wildlife Protection, owns its aircraft. They had been selling aircraft in recent years to support aircraft upgrade and maintain operational capability.

critical issue. Capability declines sharply with widely spaced operational bases, limited budgetary support, dilution of regulatory emphasis, and an expected medium to high level of use of coastal waterways and river access by regulated and unregulated users. Although Alaska Fish and Wildlife Protection trooper capability is in decline they have substantially more resources available than B.C. officers. It is now evident that enforcement services in coastal B.C. have very limited overall capability with large areas suffering from no enforcement presence; these are the aforementioned “islands of neglect.”

4.12 Dilution of Enforcement Responsibility

Redistribution of effort has detracted from protective aspects of fish and wildlife law enforcement by shifting resources from prevention to reaction strategies.

Fish and wildlife enforcement capability in British Columbia now has a long history of dilution associated with growing responsibility outside of strict fish and wildlife protection. Less than 20 years ago Conservation Officer Services' responsibility was largely confined to protecting public safety and enforcing the Wildlife Act. Since that time there has been a proliferation of responsibility and while much of it remains, at least at arms length, associated with fish and wildlife its impact on “protective” measures relating to fish and wildlife has been to dilute effort. The impact of a broader range of responsibility for field staff on wildlife control efforts relative to human-wildlife conflict within the unregulated population has been less severe than in other areas of activity because of the high profile and primary mandate of protection of property and public safety. Redistribution of effort has detracted from protective aspects of fish and wildlife law enforcement by shifting resources from prevention to reaction strategies.

Forest Practices Code

A significant dilution of traditional wildlife enforcement practices occurred in British Columbia in 1995 with the introduction of the Forest Practices Code Act (RSBC 1996, Chapter 159). The FPC was drafted and implemented to protect existing timber harvest levels from public initiatives to protect fish and wildlife resources and roadless areas. It was designed to “establish certainty around fiber flow” (B.C. MELP & MOF 1997). In order to accomplish this goal, the code had to reject any and all contemporary conservation strategies based on the best available science (Horejsi *et al.* 1998) and it subsequently contained only minimal fish habitat protection provisions and token wildlife habitat protection measures.

Conservation measures within the FPC are confined to “the specific cutblock that has been logged and roads that have been built” (Forest Practices Board 1999a). When the FPC became law the government added enforcement of its

The Conservation Officer Service has been conscripted into the conflict between government policy direction designed to maintain unsustainable short-term timber supply and escalating impacts resulting from inadequate and unenforceable measures to protect fish and wildlife.

provisions to the existing responsibilities of the Conservation Officer Service. The FPC has extremely limited landscape-wide planning and protection measures. Specifically, it has no capacity to prevent ecosystem fragmentation since it cannot restrict road construction and specifies no thresholds that could limit road density or influence road location. These are critical issues for fish and wildlife law enforcement.

Those very site-specific, largely engineering measures that conservation officers became partially responsible for policing are necessary but they constitute a minor component of the conservation measures required to protect fish and wildlife populations and habitat. The broader values associated with conservation of biological diversity “are still not adequately protected in British Columbia” and where measures are identified in the FPC “in most parts of the province, government has failed to implement these provisions of the code” (Forest Practices Board 1999a). The Conservation Officer Service has been conscripted into this conflict between government policy direction designed to maintain unsustainable short-term timber supply and escalating impacts resulting from inadequate and unenforceable measures to protect fish and wildlife.

Participation by the Conservation Officer Service in the protection of fish and wildlife habitat using the FPC could have been beneficial if the FPC had

- 1) entrenched ecological sustainability and protection and recovery of biological diversity as its legal, social and scientific mandate,
- 2) obligated government and industrial land users to employ the best available science, and
- 3) provided for expansion of enforcement and protection activities and responsibility *without* diverting time and resources from existing and continuing responsibilities.

These fundamental criteria have not been met. Information contained in this report reveals no positive response to the additional regulatory load imposed by the FPC. Further, the role of conservation officers and the FPC in protecting fish and wildlife habitat and populations appears negligible in the context of enforcement actions (Table 14).

TABLE 14
Role of conservation officers in Forest Practices Code implementation as reflected by enforcement actions.

Legislation used:	Year	Admin. Ruling	Charges	Warnings	Total	% of Prov. Total
Forest Practices Code:	1995	2	0	1	3	<0.5 of 1%
	1999	7	11	10	28	<0.5 of 1%
	2000	4	5	21	30	<0.7 of 1%
	2001	1	10	20	31	<0.7 of 1%
Federal Fisheries Act:	1995	22	1023	771	1816	26
	1999	0	532	821	1353	25
	2000	1	432	652	1085	24
	2001	2	504	773	1277	28

The FPC has virtually no enforceable wildlife habitat and population protection provisions, thus enforcement actions relative to these values are non-existent under this legislation.

Table 14 demonstrates that enforcement staff in B.C. recognize the inadequacy of the FPC and rely heavily on the Federal Fisheries Act to deal with violations affecting fish and their habitat, a view endorsed by the Forest Practices Board (1999b). This inadequacy extends to enforceable wildlife habitat and population protection provisions, thus enforcement actions relative to these values are non-existent under this legislation.²⁴ The Forest Practices Board (1999), intended initially to act as a forest industry watchdog, has expressed concern “about the number of small and zero penalties being imposed for unauthorized logging in riparian zones.”²⁵

By 2000 the FPC diverted between 10 and 20% of conservation officer time²⁶ that was formerly (pre-1995) available for fish and wildlife law enforcement. The absence of correlation between the number of charges and warnings and enforcement time commitment is alarming, particularly in the face of intensive industrial logging activity (M’Gonigle and Parfitt 1994; Horejsi 1999; Marchak *et al.* 1999) and leads to the conclusions that enforcement of the Forest Practices Code by conservation officers is

- 1) largely ineffective and essentially irrelevant to fish and wildlife habitat and population protection,

²⁴ A senior conservation officer, when asked if it would be useful to have a wildlife equivalent of the Federal Fisheries Act, replied in the affirmative, and added it “would mean shutting over half the logging industry down.” He then added “resources and manpower were simply not available” to support legislation that would “significantly” protect wildlife.”

The Forest Practices Board (1999b) points out that important environmental resources, such as wildlife, “need to be managed and conserved over larger areas of land than individual cutblocks and roads”, that “in most parts of the province, government has failed to implement these provisions of the code”, and that “government has limited ability to enforce the code provisions.”

²⁵ They went on to add that “at the very least penalties should remove all logging in riparian zones.”

²⁶ Until March 1997 the Conservation Officer Service maintained an activity-time reporting system. This has been a casualty of expanding work load, inadequate support staff and declining budgets, possibly aided by officer resistance to record keeping.

This time reporting system showed, in a partial analysis, that FPC issues drew between 5 and 9% of reported conservation officer time in the years 1995-1997 (Rhodes 1998). In 2000, without the benefit of time-expended reports, senior enforcement staff estimate FPC issues consume up to 20% of enforcement effort.

A major cause of escalating fish and wildlife vulnerability is road access; government resource policies that promote road construction have a long history of overriding the public interest in wildlife.

- 2) diverting important time and resources from other enforcement issues, activities that are
- 3) proceeding without provision of additional resources to handle the expanded regulatory burden, and
- 4) impairing the ability of Enforcement Services (Conservation officers) to meet public expectations for resource conservation.

Enforcement and protection services in British Columbia and Alaska are at the mercy of government policies that increase the vulnerability of fish and wildlife and their habitat to human impact. They are in the increasingly demanding position of attempting to manage the intensifying conflict between the regulated and unregulated human population and fish and wildlife populations and habitat. A major cause of escalating fish and wildlife vulnerability is road access. Government land use policies that promote road construction and associated habitat degradation are closely linked with extractive industries (primarily logging and oil and gas exploration and exploitation) and these special interests have a long history of overriding the public interest in wildlife. The consequences have been massive proliferation of access to fish and wildlife habitat without an enforcement response.

4.13 Fragmentation by Road Access; A Critical Law Enforcement Issue

In B.C. road construction is fueled by a province-wide logging agenda accommodated by the Forest Practices Code. It is conservatively estimated²⁷ that there are 345,000 km of logging-industry-related roads on public lands and over 3200 km are being built annually (B.C. MELP 2000).

It is estimated that there are now 6400 km of road (Hard *et al.* 2001), almost all resulting from logging, in the coastal study area of Alaska. If the preferred alternative in the Tongass National Forest plan²⁸ is implemented, logging activity would add 1800 km of road in the next 10 years (U.S. Forest Service 1997). Road density information for the coastal area of B.C. is not available.

²⁷ There exists considerable disparity in estimates and reporting of the extent of road access on B.C. public lands. For example, using 1988 data in 2000, the Ministry of Environment, Land and Parks estimates that road density in the Boundary Forest district along the Washington border is in the 1-1.5 km/km² range. Horejsi (1999), using a 1998 Ministry of Forests data base, supplemented with field proofing, calculated overall road density in a major portion of the district at 1.6 km/km², with 32% of the area fragmented by over 2 km/km² of road.

²⁸ The Tongass National Forest includes about 80% of the Alaska panhandle which is the coastal study area in this report.

Road access and road density are intimately related to legal and illegal human-caused wildlife mortality. Most grizzly bears (*Ursus arctos*) die within one km of a road (Servheen 1994; Benn 1998; Nagy *et al.* 1989) and most elk (*Cervus elaphus*) die within 500m of a road (Smith *et al.* 1994). The illegal kill (poaching) of wildlife has been shown to be even more closely associated with road access than legal kill. In a Washington study where road density ranged from 0.77 to 4.47 km/km², radio telemetry revealed 85% of elk poaching kills were within 300m of a road. The body count in that state was almost 2000 illegal elk kills annually. Investigators concluded that increased enforcement “would have little impact on the numbers of elk poached unless there were significantly fewer miles of open, drive-able road (Smith *et al.* 1994). B.C. and Alaska are not immune to this kind of road associated impact on wildlife and it will intensify as road systems proliferate.

The coastal areas of B.C. and Alaska are both accessible by means of aircraft and boat. This kind of access allows humans to impact fish and wildlife populations in much the same manner as does road access but it is much more difficult to police. Overall visitation rate via boat and aircraft access may be much lower than is typically seen via road access but an organized and direct effort to exploit an area, as can occur in commercial guiding and outfitting and market poaching, can have significant and long-term implications for a wildlife population.

4.14 Compliance Promotion: Public Contacts versus Charges, Citations and Warnings

Compliance promotion is defined as any activity that prevents violation of the law. Contact between officers and troopers and the regulated community and unregulated population is a key element in achieving or elevating compliance with regulations and policy. The ideal compliance strategy is direct contact with the regulated and unregulated population that preempts violation of the law. This is more easily achieved with the regulated community partly because the latter can be more readily identified. However, certain sectors of the unregulated population, such as campers, hikers and agricultural operators, can also be identified. Both programs require the commitment of adequate personnel and resources in a consistent manner and in a planned, as opposed to a reactive, strategy.

Alaska Fish and Wildlife Protection troopers each made between 784 and 910 contacts annually over a four-year period (Table 15) (Hard *et al.* 2001) or 3.3 to 3.9 per working day.

Fish and wildlife enforcement in B.C. is failing to adequately reach the public.

The number of public contacts made by B.C. conservation officers is not systematically reported; it was estimated by extrapolating the ratio of 10.7 contacts-per-violation from Alaska to B.C.²⁹ Each officer in B.C. dealt with an average of 48 violations annually while Alaska troopers handled 80. Using this measure B.C. officers averaged between 340 and 525 contacts annually (1997-2000). This equaled 36% to 60% fewer than Alaska troopers. The difference is huge given the number of officers and particularly when placed in context; with a larger regulated community, a vastly greater unregulated population, less than half the resources per officer, one tenth the resources per capita and a greater number of regulations to administer, fish and wildlife enforcement in B.C. is failing to adequately reach the public and rates significantly below Alaska standards.

TABLE 15
Compliance and enforcement actions by conservation officers and troopers in British Columbia (1985-2001) and Alaska (1994-2000).

Year	Violations ^{1,2}			Total	Warnings per 100 citations	Contacts per violation
	Contacts	Citations	Warnings			
<i>Alaska</i>						
FY 1994	-	4020	1867	5887	46	-
1995	-	3610	1492	5102	41	-
1996	-	3321	1710	5031	51	-
1997	72,874	3947	2007	5954	51	12.2
1998	76,429	3664	3586	7250	98	10.5
1999	84,353	4668	3817	8485	82	9.9
2000	79,639	3145	4534	7679	144	10.4
<i>British Columbia</i>						
1985	-	3486	598	0 ³ 4084	17	-
1990	-	4195	3116	1 7311	74	-
1995	-	4152	3297	115 7449	79	-
1996	-	4021	3348	58 7369	83	-
1997	73,220 ⁴	3253	3230	47 6843	99	10.7 ⁵
1998	76,119	3430	3684	43 7114	107	10.7
1999	58,828	2646	2852	46 5498	108	10.7
2000	47,903	1993	2462	22 4477	123	10.7
2001	49,551	1953	2648	30 4631	136	10.7

¹ FY 1994, 1995 & 1996 from table generated by Alaska Division of F&W Protection, 11 Nov. 2000.

² Other years from Hard *et al.* 2001.

³ This column = Administrative rulings; they do not involve fines or penalties. They are essentially a “we’re going to overlook this as long as you promise you won’t do it again” strategy.

⁴ Estimated using mean of 10.7 contacts/violation extrapolated from Alaska 1997-2000.

⁵ Mean extrapolated from Alaska 1997-2000 average.

²⁹ This may be a considerable overestimate given the greater efficiency of the Alaska Fish and Wildlife Protection Division and its troopers, as indicated in this report.

Trends in B.C. suggest influence by a high level strategy of non intervention resulting in a substantially lower level of fish and wildlife law enforcement.

Compliance promotion includes warnings which, even though usually issued after an infraction has taken place, can act to prevent recurrence. In Alaska and B.C. there is a strong trend toward issuing more warnings than citations (Table 15). Since 1995 this trend has accelerated sharply in Alaska (+180%) and substantially in B.C. (+72%). This suggests that 1) enforcement is increasingly discretionary, i.e., has consciously “softened” its approach, 2) staff capabilities at existing staff and budget levels are overloaded by the administrative demands of following citations and charges through the legal system, 3) dilution of responsibility is consuming enforcement effort in areas where violations are more difficult to detect, investigate and prosecute, 4) growth in the unregulated population and the subsequent protection of human safety and property issues resulting from its interaction with wildlife is consuming a greater portion of enforcement effort and/or 5) the increasing volume and complexity of regulations requires greater effort on awareness and education, leading to reduction in the use of formal action against some categories of violators. These are unsettling trends even though the overall high level of activity in Alaska is encouraging from an involvement perspective. In B.C. particularly they suggest influence by a high level strategy, leading to formalized nonintervention by conservation officers, resulting in a substantially lower level of fish and wildlife law enforcement. Recent government policies which fail to address losses to inflation and inadequate staff levels continue to escalate an already grave situation.

5 A CAPABILITY INDEX FOR FISH AND WILDLIFE LAW ENFORCEMENT

I constructed an index of fish and wildlife law enforcement capability composed of nine components. It is a simple linear additive relationship in which each component is given equal weight. Capability may be overestimated by this index since a number of the components are likely to have a synergistic effect upon one another. For example, B.C. has cut the number of conservation officers 14% and per officer budget support has been eroded 37% by inflation in the face of a 40% increase in human population. The decline in the number of officers is compounded by fewer resources per officer and growing per capita responsibility, a relationship that is likely to have a greater functional impact than the 31% decline reflected in the linear capability index (Table 16). Alaska has suffered a long term 22% decline in the number of troopers, a situation exacerbated by a 28% increase in total population during that period. The end result is a sharp increase in the number of residents per trooper. Budget support per officer has declined 38% due to inflation and the workload for a corps of far fewer troopers has ballooned in the face of population pressure and a 59% increase in the regulated community. This situation is likely to have a greater impact than the 31% decline reflected by the linear capability index. Given the interaction of components the index should be considered a best-case estimate of capability.

Capability is declining under consistent and widespread pressure from a wide range of influences (Figure 12). Within-jurisdiction comparison reveals that fish and wildlife law enforcement capability in B.C. in 2002 is only 69% of historical capability.³⁰ Forecast erosion of enforcement services budgets between 2002 and 2004 will reduce capability to 56% of historic levels. Alaska fish and wildlife protection is also operating at only 69% of historical capability.

Enforcement capability in B.C. has consistently been significantly below that in Alaska even though both jurisdictions have suffered equal decline in the last 17 years. A comparison of B.C. to Alaska shows that B.C. Enforcement Services in 2002 had only one half (49%) the capability of Alaska Fish and Wildlife Protection Division even though Alaska has suffered a 31% decline in capability since 1983. B.C. capability is now only 34% of Alaska's historical capability.

³⁰ Dilution of fish and wildlife enforcement efforts, based on time redirected by Forest Practices Code monitoring (10 to 20%), would force the fish and wildlife enforcement capability index in B.C. downward to 62 to 55% of historical capability as of 2002 (.69 - (.10 or .20). See section 4.12

TABLE 16
Index of capability;
fish and wildlife
enforcement and
protection in British
Columbia and Alaska.
Within B.C. and Alaska
baseline, 1983 = 100.
The index of B.C./
Alaska compares
components in year 2002
where Alaska = 100.
B.C./Alaska budget
comparisons are current
dollars and are local
currency.

Component	Within B.C.		within AK	B.C./ AK 2002
	2002	2004		
Total Budget	65	49	73	65
Current \$ / 1983 Expected \$				
Budget Priority	37	30	67	13
% of Province/State Expenditure				
Per Capita Enforcement Expenditure	46	35	57	10
Current \$ / 1983 Expected \$				
Expenditure per Officer/Trooper	63	47	94	49
Current \$ / 1983 Expected \$				
Total Human Population Change	70	70 ¹	78	16
1983 = 100				
Number of Officers/Troopers ²	74	74 ¹	61	12
Today/1983 Expected				
Geographic Responsibility	103	103	78	178
Per Officer/Trooper				
Human Population ²	74 ³	74	61	20
Per Officer and Trooper				
Regulatory Load ⁴	86	86	50	79
Component Total	618	505	619	442
CAPABILITY INDEX	69	56	69	49

¹ Based on 2002 population.

² B.C. baseline = 1985.

³ On a per capita officer basis B.C. would require 455 officers to equal AK's enforcement per capita ratio. Using this comparison the B.C. component rating would be 20.

⁴ B.C. and Alaska = 2000 data. All permits, licenses and tags related to hunting and sport fishing.

The index of enforcement capability in the coastal study area used six components to compare present day capability in British Columbia and Alaska (Table 17). In every component compared fish and wildlife enforcement capability in coastal B.C. did not measure up to Alaska fish and wildlife protection standards. Keeping this in the context of an overall 31% decline in Alaska capability it is evident that, at only 41% of coastal Alaska's capability, fish and wildlife enforcement in coastal B.C. is already severely compromised.

TABLE 17
Enforcement and
protection capability
index in the coastal
study area, British
Columbia compared
with Alaska, 2002 and
2004. Alaska = 100.

	2002	2004
Coastal Enforcement/Protection Budget ¹	27	19
Per Capita Enforcement Expenditure	29	20 ^{2,3}
Expenditure per Officer/Trooper	55	43 ⁴
Number of Officers/Troopers	44	44 ⁵
Geographic Responsibility per Officer/Trooper	42	42 ⁵
Human Population per Officer/Trooper	47	47 ⁵
Component Total/600	244	215
COASTAL B.C. CAPABILITY INDEX	41	36

¹ Alaska without marine enforcement.

² Based on 2002 population.

³ Based on Alaska 2001.

⁴ Based on 2001 Alaska budget and 2002 number of troopers.

⁵ Based on 2002.

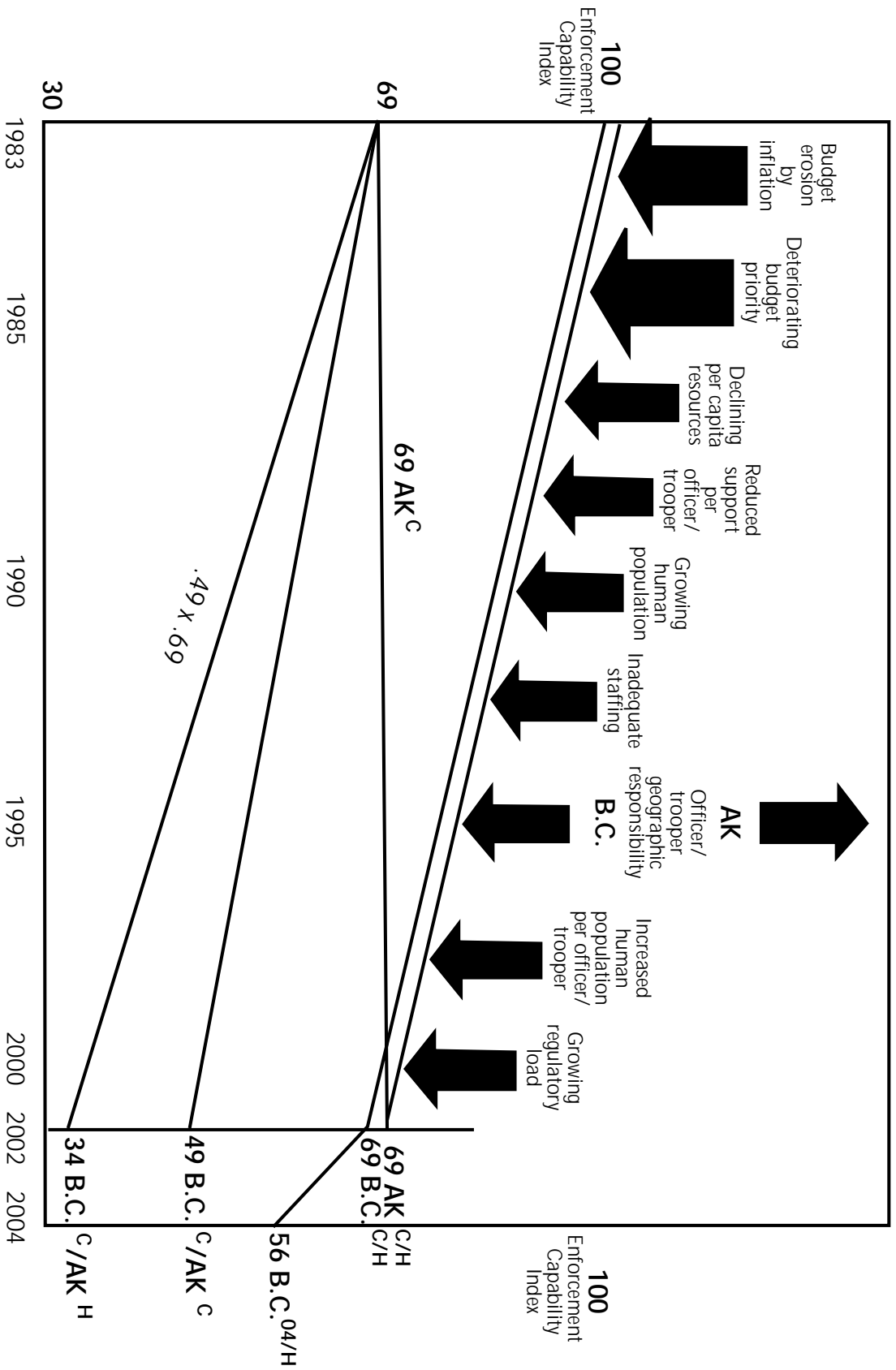


FIGURE 12
 Index of structural decline in fish and wildlife law enforcement and protection capability in British Columbia and Alaska.
 C=current; H=historical; 04=2004

6 CONCLUSIONS

A Relevant Definition of Enforcement Efficiency

There is an obvious connection between fish and wildlife law enforcement capability and efficiency. Efficiency is most often defined by governments as operating with a reduced budget; rarely, however, does this measure of efficiency include a definition of the public interest either as an asset or a value. Administrations and managers routinely defend this definition of efficiency by arguing that they and their staff are “just as efficient” as when they had more resources at their disposal. Another definition of efficiency is getting more output per unit of input. This definition, however, is also one-dimensional and tends to de-emphasize the efficacy of fish and wildlife law enforcement; is it capable of producing an intended result and is that result the same or better than that previously achieved? Analyses that incorporate an objective measure of reduced-support efficiency that include the role of officer/trooper public presence and interaction in deterrence and intelligence-gathering and include a measure of public compliance with fish and wildlife laws and regulations have not been found. Of great concern is an absence of evidence that fish and wildlife populations and their habitat are being as effectively served by enforcement services today as they were in 1983. Assigning additional regulatory responsibility is a secondary measure of efficiency but in reality it diverts resources away from pre-change enforcement activities. As officers and troopers are conscripted into an oversight role for forest practices in British Columbia and traffic enforcement and search and rescue in Alaska their efficiency and adequacy in the role of fish and wildlife law enforcement declines.

Low Priority

Wildlife populations and biological diversity are seriously threatened by chronic under-funding and marginalization of wildlife conservation-oriented enforcement programs in British Columbia and, to a lesser but still significant extent, in Alaska. This period of measurable political indifference is reflected by extremely low budget priority and now approaches 20 years in duration. Under-funding of enforcement in B.C. and Alaska has been aggravated by land use agendas and wildlife management programs that proceed without enforcement impact assessment and in isolation from enforcement funding issues. For example; in Alaska federal funding for wildlife programs in the Department of Fish and Game is divorced from the Department of Public Safety, resulting in an absence of coordination and a growing gap between complexity of management programs and fish and wildlife protection capability; in British Columbia a province wide road construction program

This period of measurable political disinterest and low priority now approaches 20 years in duration.

fueled by the government's promotion of logging and oil and gas extraction has added substantial complexity to enforcement requirements for a program already suffering from limited capability.

Declining Enforcement Capability

There is little evidence available to the British Columbia or Alaska public to indicate that current enforcement capabilities are sufficient to provide effective compliance with fish and wildlife regulations. Furthermore, in every capability measure examined in this report, capability today is significantly lower than it has been previously (Table 16). "We are simply unable to effect overall (widespread and long lasting) changes in resource user behavior. Rather we select priorities regionally, season to season, and apply our resources in an effort to effect some behavior change in that region. Unfortunately, with every priority we select, we ignore other areas" (Hard, J., personal communication, May 2001).

It is evident that a serious gap is developing between previously established enforcement standards and existing fish and wildlife law enforcement capability in British Columbia and Alaska. This gap, based on a comparison of capability within a jurisdiction, is now conservatively estimated at 31% in B.C. and Alaska. By 2004 B.C. will lose another 13% of its capability and be operating at 56% of historical capability (Table 16).

A comparison of the two jurisdictions reveals an enormous gap in enforcement capability between British Columbia and Alaska; B.C. is in an unenviable class by itself, struggling at 49% of Alaska's present day capability and only one third ($0.49 \times 0.69 = 34\%$) of Alaska's historical capability. In just two years B.C. is forecast to sink to near one quarter of Alaska's historical protection and enforcement capability.

At 41% of coastal Alaska's current capability, fish and wildlife enforcement capability in coastal B.C. in 2002 is even more severely compromised than capability on a province wide basis.

British Columbia has few laws and regulations that were designed to or have any prospect of protecting fish and wildlife populations and their habitat. The prospects that even these skeletal attempts at protecting provincial ecosystems will be respected and enforced continue to dwindle. The evidence indicates that B.C. has now crossed the threshold at which protection of fish and wildlife populations and their habitat by enforcement services has effectively and materially been abandoned.

7 LITERATURE CITED

- Alaska DF&G. 1993. Sport fishing and game licenses and big game tags sold. 10 year recap. Department of Fish and Game, Juneau, AK.
- Alaska DF&G. 1993. Division of Administration, Department of Fish and Game, Juneau, AK. January 28, 1993.
- Alaska DF&G. 2001. Sport fishing and game licenses and big game tags sold. 10 year recap. Department of Fish and Game, Juneau, AK.
- Alaska DF&G. 2001. Division of Administration, Department of Fish and Game, Juneau, AK. January 05, 2001.
- Alaska DF&WP. 1998. History of fish and wildlife protection in Alaska. Unpublished manuscript. Alaska Division of Fish and Wildlife Protection, Department of Public Safety, Juneau, AK.
- Alaska DF&WP. 2000. Areas of concern in resource protection. Alaska Division of Fish and Wildlife Protection, Dept. of Public Safety, Anchorage, AK. 1p.
- B.C. MELP. 2000. Environmental trends in British Columbia 2000. Ministry of Environment, Lands, and Parks, State of Environment reporting. Victoria, B.C. 54p.
- B.C. MELP. No date. Managing wildlife to 2001: A discussion paper. Planning for the future, British Columbia's environment. B.C. Environment, Victoria, B.C.
- B.C. MELP & MOF. 1997. Key elements of the Forest Practices Code changes. Background, attached to joint news release of June 9, 1997. Ministry of Environment, Lands and Parks and Ministry of Forests.
- B.C. MOF. 1994. Forest, Range and Recreation Resource Analysis, B.C. Ministry of Forests, Victoria, B.C. 308 p. + append.
- B.C. Stats. 1998. British Columbia Municipal and Regional District intercensal population estimates. December 1998 and December 2000. Ministry of Finance and Corporate Relations, Victoria, B.C.
- B.C. WLAP. 2002a. Ministry three year budgets, 2002/03 - 2004/05. Ministry of Water, Land and Air Protection., Victoria, B.C. 1p.
- B.C. WLAP. 2002b. Conservation Officer Positions. Fax, Feb. 01/2002. Inspection and Enforcement Branch, Ministry of Water, Land and Air Protection, Victoria, B.C. 2 p.
- Benn, B. 1998. Grizzly bear mortality in the Central Rockies Ecosystem, Canada. M.S. Degree thesis, Univ. of Calgary, Calgary, Alberta. 151 p.
- Brown, G. and C.C. Harris. 1992. The U.S. Forest Service: Toward the new resource management paradigm? *Society and Natural Resources* 5: 231-245.
- Canada Firearms Center 1999. Focus on firearms. Brochure. Ottawa, ON.
- Ciarniello, L.M. 1997. Reducing human-bear conflicts: Solutions through better management of nonnatural foods. Westworth, Brusnyk & Associates Ltd., Edmonton, AB.
- Flather, C.H., S.J. Brady, and M.S. Knowles. 1999. Wildlife resource trends in the United States: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen.Tech. Rep. RMRS-GTR-33. Fort Collins, CO; U.S. Dept. Agriculture, Forest Service, Rocky Mountain Res. Station. 79 p.
- Folger, G. 2001. Commander, Detachment A, Division of Fish and Wildlife Protection, Juneau, AK., Response to questions; fax to B. Horejsi. 2 p.
- Forest Practices Board. 1999a. Annual Report. Victoria, B.C. 46 p.
- Forest Practices Board. 1999b. An audit of the government of British Columbia's framework for enforcement of the forest practices code. Victoria, B.C. 30 p.
- Glass, J. 1999. Annual report to the Legislature. Division of Fish and Wildlife Protection, Dept. of Public Safety, Juneau, AK.
- Hard, J.L., G. Folger, H. Starbard, J. Masters, D. Loring, F. D'Angelo, and S. Elwell. 2001. State troopers; protecting Alaska's wildlife resources. Division of Fish and Wildlife Protection, Dept. Public Safety, Anchorage, AK. 33p.
- Hardin, G. 1993. Living within limits: Ecology, Economics and Population Taboos. Oxford Univ. Press, New York, NY. 339 p.
- Hilgemann, J. 2000. Conservation Officer, Ministry of Environment, Lands and Parks, Queen Charlotte Islands, B.C. Response to questions; fax to B. Horejsi. 2 p.
- Horejsi, B.L. 1999. The endangered Granby-Gladstone grizzly bear population: A conservation biology analysis for recovery. Western Wildlife Environments Consulting Ltd., Calgary, AB. 87 p.
- Horejsi, B.L., B.K. Gilbert, and L. Craighead. 1998. British Columbia's grizzly bear conservation strategy; An independent review of science and policy. Western Wildlife Environments Consulting Ltd., Calgary, AB. 64 p.
- Kellert, S.R. 1996. The Value of Life; Biological Diversity and Human Society. Island Press, WA, D.C. 263 p.
- Loftus, A.J. and C.H. Flather. 2000. Fish and other aquatic resource trends in the United States: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-53. Fort Collins, CO; U.S. Dept. Agriculture, Forest Service, Rocky Mountain Res. Station. 50 p.
- Marchak, M.P., S.L. Aycock, and D.M. Hebert. 1999. Falldown: Forest Policy in British Columbia. David Suzuki Foundation and Ecotrust Canada, Vancouver, B.C. 199 p.
- Melnik, M.J. 1977. Hunter attitudes toward Alberta's wildlife laws and wildlife officers. Technical Report No. 1, Alberta Energy and Natural Resources, Fish and Wildlife Division, Edmonton, AB. 26 p.
- M'Gonigle, M. and B. Parfitt. 1994. Forestopia: A Practical Guide to the New Forest Economy. Harbour Publishing, Madeira Park, B.C. 119 p.
- Nagy, J.A., A.W. Hawley, M.W. Barrett, and J.W. Nolan. 1989. Population characteristics of grizzly and black bears in westcentral Alberta. Alberta Environmental Center, Vegreville, AB. Report AECU88-R1. 33 p.
- Porter, B. 1999. Unit 1. *in* Brown bear, survey - inventory activities, federal aid in wildlife restoration management report, July 1996 - 30 June 1998. Pp. 1-15, Study 4.0, AK Dept. Fish and Game, Juneau, AK.
- Reid, R. 1998. The economic value of wildlife activities in British Columbia, 1996. Wildlife Program, Ministry of Environment, Lands and Parks, Victoria, B.C. 52 p.
- Rhodes, F.A. 1998. Report on fisheries. Far Pacific Management Consulting Ltd. and Spence Consulting Ltd. Report to Ministry of Environment, Land and Parks, Victoria, B.C. 28 p. + append.
- Servheen, C. 1994. Responses to issues raised concerning the grizzly bear recovery plan. U.S. Fish and Wildlife Service, Missoula, Montana. 14 p.
- Smith, J.L., A. Michaelis, K. Sloan, J. Musser, and D.J. Pierce. 1994. An analysis of elk poaching losses, and other mortality sources in Washington using biotelemetry. WA Dept. Fish and Game, Olympia, WA. 79 p.
- Statistics Canada. 2002. Consumer Price index. Annual averages, all items. Prices Division, Statistics Canada 62-001, and associated faxes and e-mails. Statistics Canada, Ottawa, ONT.

- Thompson, J. and J. Taylor. 1993. Islands of neglect: Rangers can't keep up with crime. *Kansas City Star*, October 26. 2 p.
- U.S. Dept. Labor. 2002. Consumer Price index. All urban consumers, all items. U.S. Dept. of Labor, Bureau of Labor Statistics, Washington, D.C. and <ftp://ftp.bls.gov/pub/special.requests/cpi/cpi.txt>.
- U.S. Forest Service. 1997. Tongass land management plan revision. Final environmental impact statement. Part 1. USDA Forest Service, R10-MB-338b. Juneau, AK.
- U.S. Forest Service. 1997a. Tongass land management plan revision. Final environmental impact statement. Part 2. USDA Forest Service, R10-MB-338b. Juneau, AK.
- U.S. Fish and Wildlife Service. 2002. 2001 National survey of fishing, hunting, and wildlife-associated recreation. State Overview, Preliminary findings. U.S. Fish and Wildlife Service, WA, D.C. 34p.
- Whitman, J.S. 1999. Unit 4. *in* Brown bear, survey-inventory activities, federal aid in wildlife restoration management report, July 1996-30 June 1998. Pp.16-30, Study 4.0, AK Dept. Fish and Game, Juneau, AK.
- Williams, J.G. 1999. Alaska's population to 2018. News release, Labor Department projects. Alaska Dept. Labor and Workforce Development, Research and Analysis Section, Juneau, AK. 3p.
- Williams, J.G. 2000. Alaska population overview, 1999 estimates. Alaska Dept. Labor and Workforce Development, Research and Analysis Section, Juneau, AK. 152 p.

8 APPENDIX

TABLE 2	Year	Number of People ^{1,2}			
		Province and State		Coastal	
		British Columbia	Alaska	British Columbia	Alaska
Human population growth in British Columbia and Alaska, 1980 to 2002.	1980	2,743,256	419,800	-	53,794
	81	2,823,000	434,000	-	57,670
	82	2,872,000	464,300	-	59,512
	83	2,905,000	499,100	-	62,162
	84	2,945,000	524,000	-	63,514
	85	2,974,000	543,900	66,672	64,688
	86	3,004,000	550,700	-	64,858
	87	3,050,000	541,300	-	64,156
	88	3,115,000	535,000	-	64,174
	89	3,198,000	538,900	-	65,386
	1990	3,291,000	553,171	64,149	68,989
	91	3,373,000	569,054	-	71,077
	92	3,470,000	586,722	64,388	72,612
	93	3,571,000	596,906	-	73,188
	94	3,681,000	600,622	-	73,054
	95	3,784,000	601,581	66,629	73,061
	96	3,882,000	605,212	-	73,706
	97	3,959,000	609,655	-	73,830
	98	3,997,000	617,082	-	73,759
	99	4,028,000	622,000	68,725	73,302
	2000	4,063,760	626,932	68,686	73,082
	01	4,095,934	633,882 ³	69,033	73,485 ³
	2002	4,133,035 ⁴	640,832 ³	69,380 ⁴	73,888 ³

¹ For B.C.: Intercensal British Columbia Municipal and Regional District population estimates, B.C. Stats, Ministry of Finance and Corporate Relations, December, 2001.

² For Alaska: from Alaska population overview, 1999 estimates, Alaska Dept. of Labor and Workforce Development, Research and Analysis Section. (Williams 2000).

³ Estimated from Projected Population (Williams 1999).

⁴ Estimate based on 2000 to 2001 change.

TABLE 5	Year	B.C. Total Hunt ¹ Authorizations	Total Fish and Hunt Authorizations	
			British Columbia	Alaska
The regulatory load; the number of authorizations issued for hunting and fishing in British Columbia and Alaska, 1980-2000.	1980	427,896	-	-
	1981	453,780	-	-
	1982	440,243	-	-
	1983	421,812	799,463	364,948
	1984	429,347	803,855	401,987
	1985	423,172	783,928	430,064
	1986	427,007	802,034	452,677
	1987	458,162	847,353	450,368
	1988	481,680	927,746	480,971
	1989	492,379	952,209	496,338
	1990	507,455	977,108	527,050
	1991	508,539	979,093	506,997
	1992	520,769	987,642	528,993
	1993	505,562	993,573	595,829
	1994	487,214	994,582	661,136
	1995	482,972	975,667	667,200
	1996	483,996	950,062	685,232
	1997	473,115	909,986	701,060
	1998	458,954	925,941	682,390
	1999	452,091	909,509	706,818
2000	455,666	932,199	732,863	

¹ Includes resident and nonresident hunting licenses, limited entry hunt permits, total permits, Gulf and Queen Charlotte Islands and Fraser Valley permits. One person may hold several licenses and permits.

TABLE 6
Budget for fish and
wildlife enforcement
and protection in
British Columbia and
Alaska and the coastal
study area. Expected
dollars = inflation
corrected, 1983 = 100.

Year	British Columbia		Alaska ¹	
	Current \$ (000s)	Expected \$ (000s)	Current \$ (000s)	Expected \$
<i>Province and State</i>				
1983	8,000.0 ²	8,000.0	10,673.0	10,673.0
1984	-	-	10,660.0	11,054.4
1985	-	-	10,960.0	11,484.2
1986	-	-	11,455.0	11,686.9
1987	-	-	9,639.0	12,113.8
1988	-	-	9,731.4	12,594.1
1989	-	-	10,517.5	13,245.2
1990	-	-	10,589.4	13,864.2
1991	-	-	11,374.4	14,515.3
1992	10,046.1	11,577.6	11,553.3	14,963.5
1993	11,196.5	11,785.6	11,510.3	15,411.8
1994	11,266.4	11,808.8	12,524.7	15,796.0
1995	11,084.9	12,063.2	12,399.4	16,276.3
1996	11,059.1	12,260.8	12,717.7	16,724.6
1997	10,467.9	12,457.6	12,626.1	17,108.8
1998	9,628.0	12,572.8	13,586.3	17,396.9
1999	10,165.0	12,792.8	13,356.4	17,738.5
2000	9,952.2	13,140.8	13,203.4	18,400.4
2001	9,952.2 ³	13,476.0	13,709.2	18,976.4
2002	8,986.9 ⁴	13,811.2	13,868.5	19,052.3
2003	7,998.3 ⁴	14,100.8	14,810.1	19,105.7
2004	7,038.5 ⁴	14,390.4	-	-
<i>Coastal Study Areas</i> ⁵				
1983	369.9	369.9	1,740.2 ²	1,740.2
1992	555.1	535.3	-	-
1993	546.6	544.9	-	-
1994	643.9	545.9	2,012.6	2,575.5
1995	652.1	557.7	1,914.9	2,653.8
1996	787.4	566.9	1,990.9	2,726.9
1997	639.8	576.2	2,019.2	2,789.6
1998	598.9	581.3	1,972.8	2,836.6
1999	580.6	591.5	2,119.0	2,892.2
2000	549.8	607.6	2,072.9	3,008.7
2001	549.8 ³	623.1	2,046.6	3,094.3
2002	496.4 ⁴	638.6	-	-
2003	441.8 ⁴	651.9	-	-
2004	388.8 ⁴	665.3	-	-

¹ Without marine enforcement. Alaska State totals are from FY Operating Budget Expended, except FY 02, which is from Component Summary, Operating Budget, Dept. Public Safety.

² Estimated.

³ Estimated same as 2000.

⁴ From BC WLAP 2002a.

⁵ Coastal Alaska includes marine enforcement.

FIGURE 4 Conservation officer districts (B.C.) and Fish and Wildlife Protection patrol areas (Alaska).

