

Canadian Heritage River Monitoring Report

Kicking Horse River: 1999-2010

March 2011

Parks Canada Parcs Canada

Canada

Table of Contents

1.0 Executive Summary....2
2.0 Introduction....2
3.0 Background....3
3.1 Policy Context....5
3.2 Nomination Values....9
4.0 Chronology of Events....12
5.0 Natural Heritage Values....13
5.1 Background & Status....13
5.2 Conditions of Natural Heritage Values since Designation....25
6.0 Cultural Heritage Values....29
6.1 Background & Status....29
6.2 Conditions of Natural Heritage Values since Designation....33
7.0 Recreational Values....33
7.1 Background & Status....33
7.2 Conditions of Natural Heritage Values since Designation....42
8.0 Integrity Guidelines....46
8.1 Background & Status....46
8.2 Conditions of Natural Heritage Values since Designation....50
9.0 Summary and Conclusions....56
10.0 References....58
11.0 Further Contacts....59

Figure 1. Location of the Kicking Horse Canadian Heritage River....4
Figure 2. Nominated Area and Significant Features....8
Figure 3. Water consumption in Field, 1998-2006, by cubic meters (State of the Community Report – Field – 2006)....52

Table 1. Nomination Values for the Kicking Horse River (1985)....9
Table 2. Fishes of the Kicking Horse River in Yoho National Park....15
Table 3. Natural Heritage Values since Designation....16
Table 4. Cultural Heritage Values since Designation....29
Table 5. Recreational Values of the Kicking Horse River....34
Table 6. Integrity Guidelines since Designation....47
Table 7. Status of Achievement of Leadership Targets for Effluent....52
Table 8. Overall Site Scores and Water Quality Ratings for Sites in Yoho National Park (from 2008 State of the Park Report for Yoho National Park)....53

Front Cover: Kicking Horse Valley and Trans-Canada Highway, Natural Bridge and Wapta Falls.

Photos: Parks Canada

1.0 Executive Summary

In 1989, the 49-km section of the Kicking Horse River located within Yoho National Park along with its' 18.5-km Yoho River tributary was designated a Canadian Heritage River for its outstanding natural, cultural and recreational values. Every ten years, Parks Canada reports to the board of the Canadian Heritage Rivers System (CHRS) on the condition of the river with respect to those values. This report documents major events, management actions, research, monitoring and policy developments that have taken place in and around the Kicking Horse River over the past decade. It assesses the natural heritage, cultural heritage, recreational and integrity values of the river using criteria developed by the CHRS, and describes changes to those values.

The report concludes that there have been no significant changes to the values for which the river was designated. There have been improvements in several areas, notably water quality, and interpretation of the river's natural and human history. Appropriate tools are in place for managing recreational and other uses, and policy decisions taken in the past 10 years support the maintenance of the river's ecological and cultural integrity and the facilitation of exceptional visitor experiences.

2.0Introduction

Kicking Horse River and the town of Field, BC .
Parks Canada

The section of the Kicking Horse River located within Yoho National Park was nominated to the Canadian Heritage Rivers System (CHRS) by Parks Canada in 1985. In 1989 it was designated a Canadian Heritage River for all three value sets of the CHRS program. Twenty two years later these natural, cultural and recreational values have been sustained. The 1988 Yoho National Park Management Plan was the instrument through which designation to the System was achieved in 1989. The unveiling of a commemorative plaque the following year at the Field Visitor Information Centre completed the formalities of including the 67 kilometre river section in the System.

The Canadian Heritage River System (CHRS) is a national program that promotes river heritage conservation through the recognition of rivers deemed to be of outstanding Canadian value. A cooperative effort of federal, provincial and territorial governments,

the CHRS promotes, protects and enhances Canada's river heritage, and ensures that Canada's leading rivers are managed in a sustainable manner. Designated rivers must retain the heritage and integrity values for which they were originally nominated.

Within the national system, the Kicking Horse River provides: representation of western mountain river environments, representation of transportation history in western Canada, viewing and learning opportunities for travellers, and outstanding recreational experiences for intermediate and advanced canoeists and kayakers.

Every ten years, the agency responsible for managing a heritage river must produce a monitoring report that evaluates the condition of the river with respect to the values for which it was nominated. The first monitoring report for the Kicking Horse River was written in 1999, and covered the time period from 1989 to 1998**.** It concluded **"...** , Parks Canada can report that both the Kicking Horse and Yoho rivers remain in good condition in spite of the stresses to which they have been subjected over the past decade."

This report will cover the subsequent time period, from 1999 to 2010. It has two main objectives; firstly, to provide a summary of: major events that have affected the river; significant river-based research, monitoring and inventories conducted by Parks Canada and other agencies or institutions; major management actions implemented by Parks Canada in the watershed; and policy developments related to river management. Secondly, the report assesses the natural heritage, cultural heritage, recreational and integrity values of the river against criteria developed by the CHRS and documents any significant changes to these values.

3.0 Background

The section of the river system designated a Canadian Heritage River consists of the 49 km headwaters section which lies within Yoho National Park, along with the 18.5 km Yoho River, the Kicking Horse's primary upstream tributary.

Management of the entire 67.5 km of the designated section is the responsibility of Parks Canada, the federal government agency that manages Yoho National Park. The river's watershed within the park occupies 1285 km2 or 99.5% of the park. The river's nomination values are impacted by elements within a roughly defined corridor that runs along the river from its source at Wapta Lake, and the Yoho River's source at Wapta Glacier, to the point where the river leaves the park on its south-western boundary. Management of these values on a watershed-wide level is made possible through Parks Canada's jurisdiction over the river's headwaters.

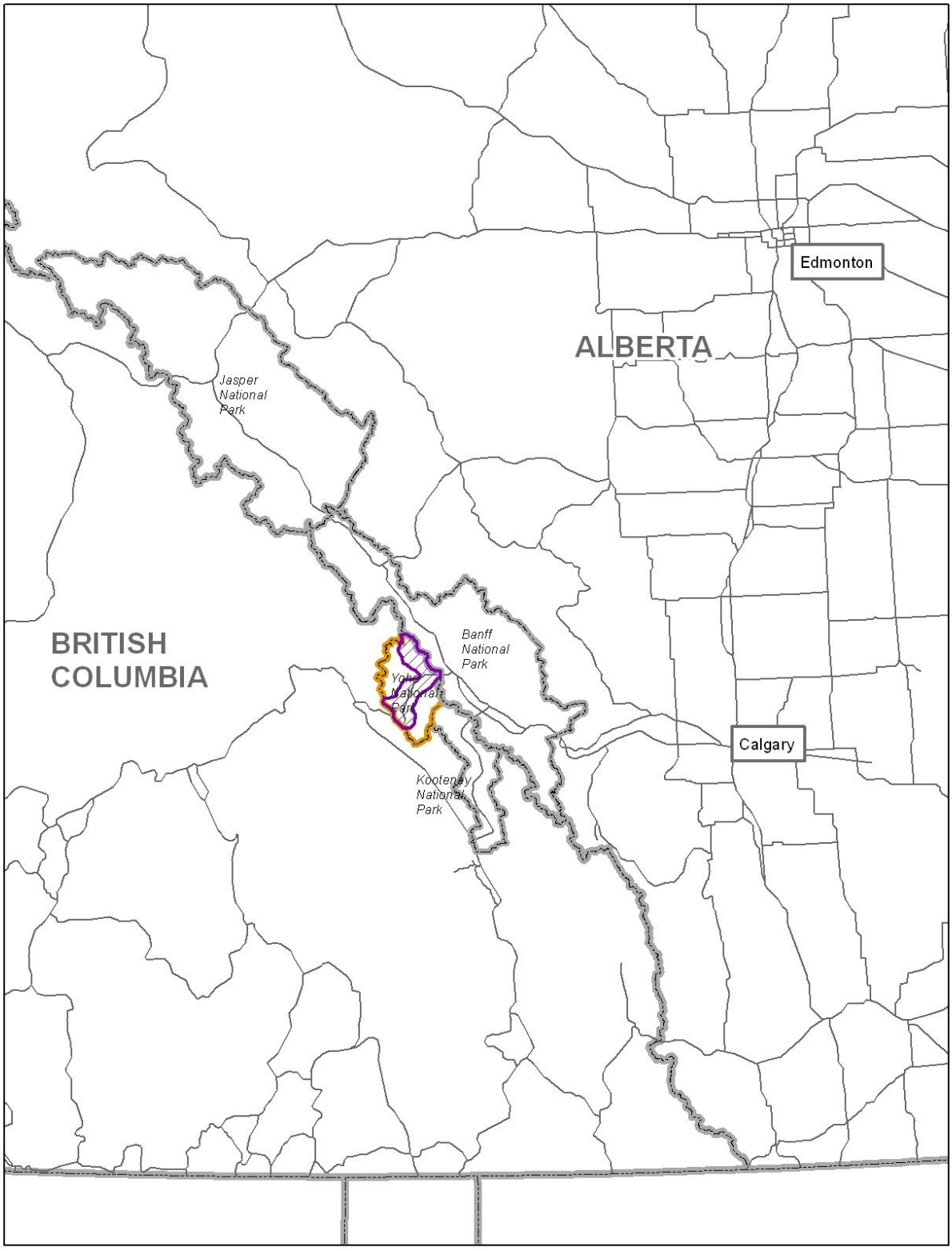


Figure 1. Location of the Kicking Horse Canadian Heritage River

3.1 Policy Context

The Kicking Horse Heritage River is managed under the Yoho National Park Management Plan and the overarching policy and statutory framework of Parks Canada. The *Canada National Parks Act,* last amended in 2010, continues to be the primary piece of legislation governing management of the national parks. The Parks Canada Agency is the decision-making authority for the Kicking Horse River within Yoho National Park.

In the last twelve years, key work has occurred in the creation and implementation of community and park management plans.

Bridge over Kicking Horse River into Field Townsite.
Photo: Parks Canada, S.Morris 2005

The 1999 Field Community Plan outlines a clear vision of the future of Field, sets limits to residential and commercial growth, and provides strategies to safeguard the ecological and cultural resources of Yoho National Park. The Community Plan also directed that no new commercial or institutional development could proceed until improvements to the wastewater treatment system were completed in order to ensure that increased demand related to expansion could be treated to the Banff National Park standards for effluent quality. The plant was upgraded in 2003-2004 and now meets the highest effluent standards economically achievable in North America. The 1999 plan also included a number of additional measures to improve water quality in the Kicking Horse River: continued sampling of water quality downstream from Field; a water conservation program; and reclamation of contaminated sites. Water conservation efforts in Field have been spectacularly successful, with an 80% reduction in water consumption in the last 10 years, largely due to the repair of some major leaks and the installation of water meters. A State of the Community Report for Field, prepared in 2006, confirmed that the direction in the community plan has significantly improved the health of the aquatic ecosystem of the Kicking Horse River. A 2010 review of the Field Community Plan confirmed the direction in the 1999 plan with respect to aquatics.

The 2000 park management plan contained a number of key actions related to aquatic health (e.g. collect baseline data, improve aquatic connectivity, ensure necessary modifications of stream channel avoids siltation, loss of habitat and changes to natural flow, increase public awareness of aquatic ecosystems). The plan also contained direction to enhance the profile of the Kicking Horse as a Canadian Heritage River and to maintain

the historical, natural, and recreational values that led to the nomination of the Kicking Horse as a Canadian Heritage River**.**

Another important development in the early part of the decade was the declaration, in regulation, of approximately 97.6 % of the park as wilderness areas. This provided Canadians with certainty that uses and development would be consistent with the parks wilderness character.

The Western Asset Management Service Centre developed a Salt Management Plan in 2004. The Salt Management Plan strives to minimize the amount of salt entering the environment by including best salt handling practices, and using new technologies to ensure its most effective use over the road system.

The Yoho National Park Management Plan (2000) was reviewed in 2005, but no amendments were required.

The completion in 2007 of site-specific redevelopment guidelines for outlying commercial accommodations, including one located along the Kicking Horse River ensured that development of the site happened in a way that maintained important ecological, cultural and aesthetic values and improved ecological integrity (through, for example, implementation of Heritage Tourism and Environmental Management programs).

Kicking Horse Pass National Historic Site is directly related to the river and its nomination values. In 2007, a management plan for the site was written for the first time. It provides a strong framework for improved protection and presentation of the site. Some deficiencies related to the "Old Bridge on the Big Hill" were noted in the 2008 cultural integrity evaluation for the site. This bridge which crosses the Kicking Horse on its upper reach just below Wapta Lake dates from the early period of railway construction on the big hill railway route. An engineering report has been prepared and some in stream work will need to occur to the western stone abutment which sits partially in the stream.

The park released its first State of the Park Report (SoPR) in 2008. A set of measures common to the mountain national parks (Banff, Yoho, Kootenay, Waterton Lakes, Mount Revelstoke, Glacier) was used to rate the state of the parks. The report contained several measures of ecological conditions that relate to the Kicking Horse River. Water quality in the Kicking Horse River had generally been good over the five years preceding the report. The report noted that "upgrades to the Field wastewater treatment plant completed in 2004 ensure that this situation continues." The aquatic connectivity measure provided a snapshot of how park management practices, such as culvert installation, have altered the aquatic environment. Aquatic connectivity condition was rated as fair with a declining trend. Seventy-eight percent of culverts in Yoho National Park are hindering or blocking

fish movement. Aging culverts, some of which no longer perform as intended, contribute to the declining trend of this measure.

Yoho's park management plan was updated in 2010. The limits to development established over the past decade were reaffirmed in the new plan, as was existing direction concerning ecological integrity and cultural resources. Plan content related to visitor experience was strengthened. The Ottertail Flats and Leanchoil Marsh, the two largest montane wetlands on the Kicking Horse River, have been designated as Zone I – Special Preservation Areas in the plan. These areas were previously identified as environmentally sensitive sites, and the Zone I designation strengthens recognition of the important value of these habitats. The plan provided direction to engage the paddling community to consider ways to improve access to the Kicking Horse River for canoes and kayaks. The new plan also contains direction to raise the profile of the Kicking Horse as a Canadian Heritage River.

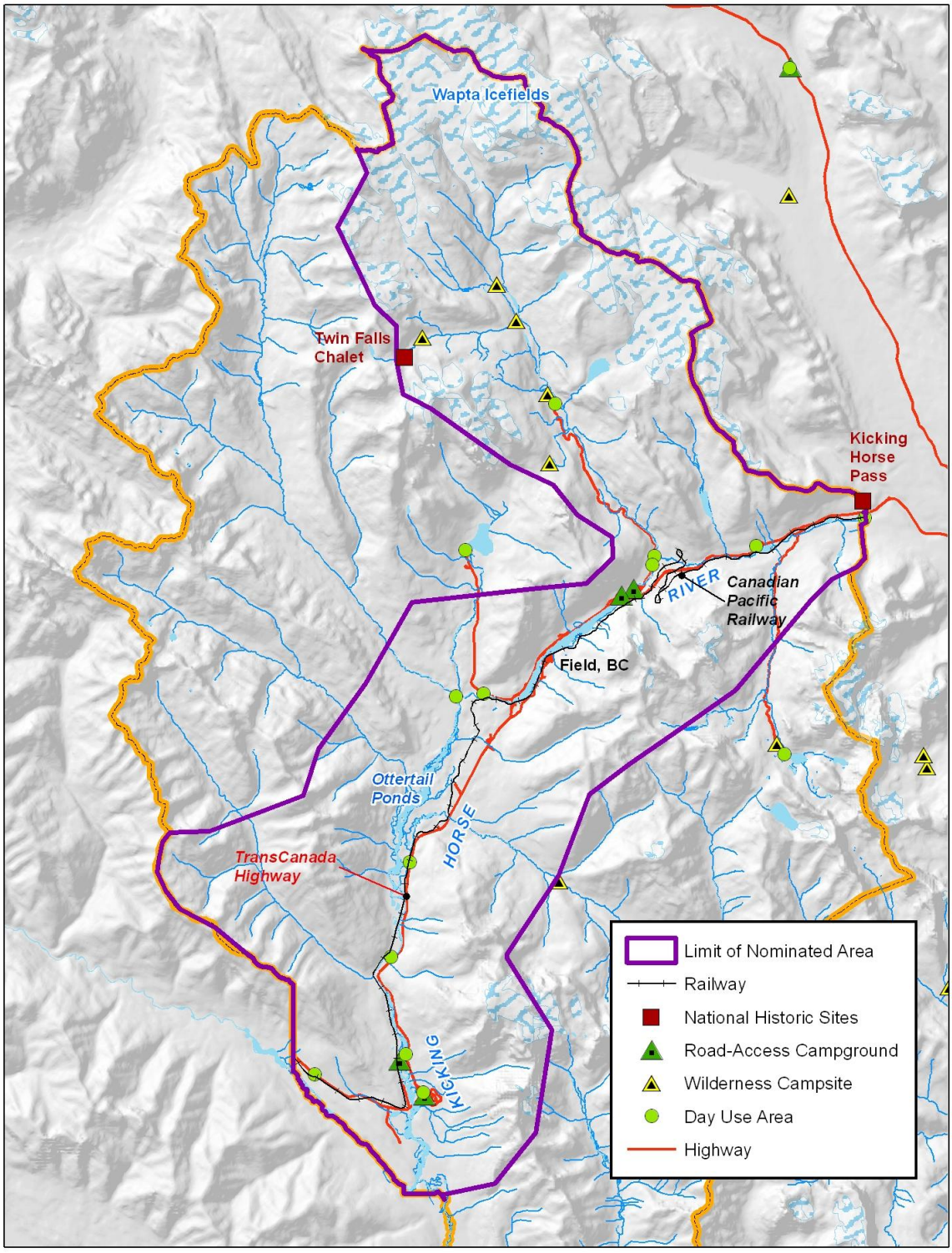


Figure 2. Nominated Area and Significant Features

3.2 Nomination Values

The Kicking Horse River's nomination values reflect its rich natural and human history, abundant examples of the geological and ecological processes that define the Rocky Mountains, its important historic role as the route through the Rockies of Canada's first Trans-Canada railway - fulfilling Canada's promise to British Columbia of a national transportation link**,** its outstanding scenic values, and the array of recreational opportunities it supports. Table 1 lists the values for which the river was nominated in 1985. New CHRS frameworks for natural, cultural and recreational values have been developed since the Kicking Horse River was first nominated. In Sections 4 to 7, the river is assessed based on the new frameworks and values. The results of the assessment are summarized and presented in Section 8.

Table 1. Nomination Values for the Kicking Horse River (1985)

Natural Heritage Values	
Representation of Earth History	The Kicking Horse contains several outstanding features related to the earth's evolutionary history including: • Representative geological and geomorphologic processes from a 800 million year period of Rocky Mountain evolution • Examples of folding, faulting, thrusting and uplifting resulting from large- scale tectonic movements are visible along the river corridor • Excellent examples of glacial activities in the Wapta and Waputik Icefields, and post-glacial landforms • Borders on the site of the Burgess Shale fossil site
Representation of Ongoing Processes	The Kicking Horse contains outstanding features that represent ongoing fluvial and Aeolian processes including: • On-going glacial activities associated with the hanging tributaries of the Yoho Valley, the rock glaciers of the Van Horne Range and potential for periodic, glacial outburst floods, landslides and avalanches • Fluvial activity in the entire headwater drainage of the river, an exceptionally fine example of an outwash plain (Kicking Horse River flats), classical examples of a large range of geomorphic channel types • A natural bridge and spectacular waterfalls.
Physiographic and Landscape Uniqueness	The river contains along its course outstanding examples of natural exceptional beauty including: • Twenty-eight mountain peaks exceeding 2900 m, • Three spectacular waterfalls (Twin, Takakkaw and Wapta) • The Yoho Valley, a natural bridge and scenic gorge, the Kicking Horse River Flats, the Ottertail Flats and Washout Rapids

Historical Heritage Values	
Canadian Development	The Kicking Horse played a key and continuous role in Canadian development: • As the first trans-continental rail line • For its role in the creation and evolution of Yoho National Park • For its selection for the trans-Canada Highway route through the Rockies
Cultural Associations	The Kicking Horse River valley is strongly associated with several persons and events of Canadian significance including: • The conservation movement in Canada being one of the major foci for the creation of Yoho National Park • Edouard Gaston Deville, Canada's Surveyor General from 1885 to 1924 (the upper end of Kicking Horse Flats contains a plaque in recognition of him as a person of national historic significance –recognizing his work in developing his photogrammetric mapping technique) • Dr. James Hector of the Palliser Expedition of 1857-60 who surveyed and explored the river and the pass, and whose expedition provided the origin of the river's name.
Uniqueness of Resources	Unique resources including: • A diversity of historical resources with more than 119 historical and 5 pre-contact archaeological sites. More than three quarters in the designated area • The construction of the upper and lower spiral tunnels was the first application of air-compressed steam shovelling operations in Canada and the introduction of the spiral tunnelling technique in North America • First transcontinental rail and road routes developed in Canada
Theme Representation	Three major historic themes: • Transportation • Surveying and mapping • Conservation and recreation history
Preservation of Historical Appearance	• The valley landscape – the mountains, river channels, waterfalls, the visible backcountry area, and the area's historical landscape – "The Big Hill" and the original bridge: the mine portals" the Spiral Tunnels; and the scenic road network – are being maintained in-situ by Parks Canada in a condition which reflects their appropriate historical appearance and in a setting which is typical of Rocky Mountain Park environments.
Recreational Values	
Recreational Experience	The river system and facilities provides for superior recreational opportunities including: • River touring, natural heritage appreciation, human heritage appreciation and shore-based activities such as hiking, camping and picnicking • Excellent views of outstanding features such as the Spiral Tunnels, Burgess Shale, Takakkaw and Twin Falls

	• Major facilities and services such as bus and rail tours, scenic lookout points complete with interpretive exhibits
Environmental Impact	The presence of the Trans-Canada Highway and Railway detracts from the visual and natural qualities along the Kicking Horse and Yoho rivers; nevertheless, these routes provide access for recreationists who use the nominated area. No serious environmental impacts are expected from these types of recreational uses in the future and any planned or proposed developments are being directed toward enhancing the area's historical and natural resources.
Integrity	
Size	The designated area contains the river's source and headwaters, its two large, outwash plains, the majority of its outstanding natural, historical and recreational features and access for viewing the river system's most spectacular landscapes, a good representation of the Kicking Horse's Rocky Mountain environmental component, and several outstanding examples of western mountain river processes and products.
Viability	The Kicking Horse river fulfills the requirements of this guideline primarily because almost the entire headwaters are protected within Yoho National Park and the natural environment ensures the continuing function of the corridor as a self-regulating and contained natural ecological unit. The CPR mainline and trans-Canada highway both adversely affect the CHRS values, but also are the primary reason for the areas historical significance and people's access.
Water Quality	The water quality of the river is extremely turbid with a very low level of biological productivity. This is reflected in the fact that only seven species of fish have been recorded in the river and lake systems of Yoho National Park. The high turbidity is the natural result of glacial "rock flour" being added to the system at its source. Some pollution is added from user activities. While of some management concern, the impact from these sources is primarily local and of minor significance. (Please note – The above is from the 1985 nomination paper. We now know there are at least 10 species of fish and there may be more sucker species).

4.0 Chronology of Events

The following section summarizes major river-related natural events, projects and actions, research and monitoring, and policy developments from 1999 to 2010.

1999

- Community Plan for Field complete, including limits to growth and measures to improve water quality in the Kicking Horse River

2000

- New Yoho National Park Management Plan approved, including new wastewater effluent treatment standards
- Most of the park (97.6%) is declared wilderness under the National Parks Declared Wilderness Area Regulations
- Takakkaw Falls Warden Patrol Cabin becomes recognized federal heritage building

2001

- Dr. Erin Kelly samples several lakes for mercury in biota (Kelly 2007)

2004

- New Wastewater treatment plant was built in 2003-2004 and now meets the highest effluent standards economically achievable in North America

2005

- Five year review of park management plan conducted; no amendments required

2006

- Park-wide inventory of culverts and assessment of aquatic connectivity begins
- DNA level inventory for westslope cutthroat trout, a federal species at risk
- Cultural Integrity Statement signed for Kicking Horse Pass National Historic Site (NHS)

2007

- Little Yoho Warden Station – Cabin becomes recognized federal heritage building

- New national historic sites management plans approved
- Vault toilets installed at Emerald Lake Day Use Area

2008

- First State of the Park Report released
- Cultural Integrity Evaluation conducted for Kicking Horse Pass NHS

2009

- Superintendent's order for zero possession limit of westslope cutthroat trout for Yoho
- Emerald Lake Lodge upgrades their wastewater treatment plant
- Vault toilets installed at Takakkaw Falls Day Use Area

2010

- New Yoho National Park Management Plan approved which provides strategic direction for the management of the park, including the Kicking Horse River for the next 10-15 years
- An amendment to the 1999 Field Community Plan has been presented to the Minister for approval. The amendment focuses on zoning changes to improve the economic viability of the community. The amendment proposes no changes to the direction for aquatic ecosystems outlined in the 1999 Community Plan with respect to management of sewage effluent, sub-surface contamination, and surface run-off. Water quality will continue to be monitored and measures implemented as required to ensure the ecological integrity of the Kicking Horse River.

5.0 Natural Heritage Values

5.1 Background & Status

Visitors have been drawn to Yoho National Park for over a century to view glaciers, mountains, rivers, lakes and waterfalls. The three natural heritage values for which the Kicking Horse River was nominated—outstanding features which provide evidence of the earth's evolutionary history, representation of ongoing geological processes and several unique landscapes—have changed little in that timeframe. The ecological processes that have shaped the landscape for millennia still function largely as they once did.

Although the river was not originally designated for habitats of rare or endangered plants or animals, or for areas containing outstanding concentrations of plants or animals of Canadian significance, it does provide habitat for both common and rare animals.

The river is home to ten species of fish (see Table 2), one of which has been designated a species-at-risk federally. Westslope cutthroat trout were historically thought to occupy the Kicking Horse River, Emerald Lake and some associated tributaries. The British Columbia designatable unit was added to the *Species at Risk Act* (SARA) schedule 1 as special concern in 2010. This species is no longer thought to be present in its historic range in Yoho. It was locally extirpated through historic fisheries management practices. It is still present outside its historic distribution in the upper Lake O'Hara drainage as a result of stocking. The Kicking Horse River at Field BC is the type locality for Pygmy Whitefish, first described here in 1892.

Four species of amphibian can be found in wetlands associated with the river. The Western Boreal Toad (*Anaxyrus boreas*) is a species of special concern. Less is known about aquatic invertebrates, an important community used to monitor water quality

The river also provides habitat for many land-based wildlife species. River users may catch a glimpse of a grizzly bear, a species that symbolizes wilderness for many Canadians and the driver for many management decisions in the mountain national parks. Or they may discover the tracks of a wolf. Yoho National Park has a complete complement of carnivores, a trait that is becoming rarer in many parts of western North America. Elk are seen. Since the State of the Park Report, described in Section 3, provides a comprehensive overview of the status of many terrestrial species, this report focuses on aquatic species.

The river runs through all three ecoregions of the park: the montane, subalpine, and alpine. The montane forest, characterized by white spruce, Douglas fir and lodgepole pine is found in the lower elevations of the Kicking Horse River valley toward the west park boundary and covers roughly 20 per cent of the entire park area. The subalpine fir-Engelmann spruce forest is represented east of Field as the valley elevation increases with the Yoho Valley providing a particularly good example of this association. Alpine tundra associations are exemplified in the icefield areas bordering the Upper Yoho River corridor.

The Kicking Horse River is assessed against the 2001 CHRS natural heritage values framework. Table 3 outlines the themes and sub-themes that comprise the values, changes or threats to those values that have emerged since designation, and significant actions, research or studies related to each theme.

Table 2. Fishes of the Kicking Horse River in Yoho National Park

Slimy Sculpin	native
Torrent Sculpin	native
Pygmy Whitefish	native
Rocky Mountain Whitefish	native
Bull Trout	native
Westslope Cutthroat Trout	native
Long Nose Sucker	native
Brook Trout	introduced
Rainbow Trout	introduced
Lake Trout	introduced

Note: There may be other suckers. The Large Scale Sucker was reported historically.

Table 3 - Natural Heritage Values since Designation

CHRS Natural Framework (2001) Themes & Sub-Themes	Natural Heritage Elements Description	Significant Actions, Research or Studies	Changes or Threats to Nomination Value(s)
1. HYDROLOGY			
1.1 Drainage Basins	Major Pacific Ocean basin (Columbia) Source generally considered Wapta Lake although the Yoho River rises at higher elevation and is glacier fed as is the Lake O'Hara drainage that feeds Wapta Lake and the Sherbrooke Basin		No change
1.2 Seasonal Variation	Summer melt Glacial melt water via Yoho River is the most significant contributor in summer	Parks Canada will continue to monitor climate and ecosystem variables that may lead to a better understanding of potential environmental effects related to global climate change	Water quality, levels and flows generally reflect the expected range of variability. The condition and trend of these measures is rated good and stable. Some weak trends have been observed in flows in the Kicking Horse. The Hanbury and Wapta Glaciers have receded 32 % and 12 % respectively since

			1975
1.3 Water Content	Moderate sedimentation, moderate diss. solids Yoho River carries glacial silt into the Kicking Horse at Meeting of the Waters. Much of sediment is deposited in lower part of designated section.		No Change
1.4 River Size	Large river, stream order >2 and is 6th order when it leaves the park 1:50000 Strahler stream order Major contributor to upper KHR is Yoho R - 80% at Meeting of Waters		No change
2. PHYSIOGRAPHY			
2.1 Physiographic Regions	Cordilleran Plateau/Mountains River represents the Eastern and Western Main Ranges of Rocky Mountains		No change
2.2 Geological Processes			
Sedimentary layering	World famous Burgess Shale fossil beds; similar fossils found on Mount Stephen	Designated as World Heritage Site in 1981. Now part of the larger Rocky Mountain Parks World	Illegal collection of fossils

		Heritage Site. Access to fossil site is only with a licensed guide Ongoing - Fossil site is monitored and *National Parks Act* enforced	
Faulting	Cathedral Escarpment		No change
Folding	Eastern and Western Main Ranges of Rocky Mountains		No change
Glacial scouring	"Glacial stairway" along KHR. Many U-shaped and hanging valleys with waterfall outlets esp. Yoho valley. Ongoing glaciation in Wapta and Waputik Icefields		No change
Glacial melting	See section 1.2 above Seasonal Variation Damming and reversal of flow of KH River by Yoho valley glacier during deglaciation contributed to creation of Kicking Horse Pass Evidence of recent ice damming on Cathedral Crags.	See section 1.2 above Seasonal Variation	In recession See section 1.2 above Seasonal Variation No change

2.3 Hydrogeology	Pervious Sedimentary shale and limestone		No change
2.4 Topography	Alpine gradient 13.22 metres per km. Very irregular gradient with three steep sections, Yoho headwaters, Meeting of the Waters and Natural Bridge		No change
3. RIVER MORPHOLOGY			
3.1 Valley Types	U-shaped with peaked interfluves Entire designated section. Avalanche and scree slopes on higher slopes of some sections.		No change
3.2 Channel Types			
Lakes and Ponds	Pond influenced Numerous small lakes. Wapta Lake at source is largest on river		No change
Waterfalls and Rapids	Upstream of Ottertail Flats		No change

Riffles	Boulder Rapids		No change
Rapids	Washout Creek rapids		No change
Waterfalls	Takakkaw Falls 294m is 3rd highest in Canada. Laughing Falls, Hamilton Falls and Wapta Falls (27m)		No change
Divided falls	Twin Falls near head of Yoho River		No change
3.3 Channel Profile			
3.4 Fluvial Landforms			
Outwash fans	Several excellent examples in lower KH valley, incl. mouths of Ottertail and Hoodoo creeks		No change
Braided channels	Field Flats, Ottertail Flats are excellent examples		Constant change due to natural possesses
Springs	Cool spring in Field Flats area locally prevents winter freeze-up.		No change
Undercutting	Hoodoos in Hoodoo Creek valley		No change
Slumps and	Mt. Dennis and Cathedral Range. Major		No change, mud slides are a natural

Landslides	mudslide in 1995 blocked TCH. Mudslides again occurred in 2003 and 2008. The TCH was again closed on the Big Hill due to the latter debris flow		occurrence. Occasionally they reach river and cause siltation.
Gorges	Natural bridge in limestone downstream of Field Flats. Gorge below Natural Bridge has 80m walls. Upper canyon above 'Meeting of the Waters'		No change
4. BIOTIC ENVIRONMENTS			
4.1 Aquatic Ecosystems			
Headwaters zone	Not a typical headwaters zone. Stepped flow regime provides for sections of silt-laden cold water, flats and marshes, as well as fast water aquatic environments.		Road and rail infrastructure limits natural river erosion in many locations, especially when the river is in flood. However, this has not changed since nomination. Fish stocking no longer occurs, since 1975
Marshes	Leanchoil Marsh, Wapta Marsh and Ottertail	Ottertail Flats and Leanchoil	Wapta Marsh and Ottertail Flats are

	Flats	Marsh are now Zone I Special Preservation Areas. Wapta march remains Environmentally Sensitive Site	adjacent to TCH and CP Railway
4.2 Terrestrial Ecosystems Montane Cordillera River flows predominantly through montane ecosystem, although alpine and subalpine systems are clearly evident on valley slopes		Fire history study and fire management plan completed. Hoodoo Creek prescribed fire. Plans for prescribed fire at Mt. King and Ottertail	No known threats to specific species but absence of natural fire regime has altered the ecosystem
5. VEGETATION			
5.1 Significant Plant Communities			
Significance: Number of species representations	646 vascular plants in park	Non-native plant inventory completed and control ongoing	No known threats to specific species but absence of natural fire regime have altered balance of plant species
Age of community	450 yr-old spruce/fir stands in upper Yoho valley	Fire management plan recognizes this value	Exotic species introduced by road and rail movement within river corridor

Dynamic Nature of communities	Re-growth of vegetation on avalanche slopes		Risk of infections by micro-organisms is high due to transportation corridor and visitation levels
5.2 Rare Plant Species	A liverwort (*Cephal-oziella brinkmani*) is unkown elsewhere in the world. A lichen (*Collema callopismum*) is unknown elsewhere in N. America Prairie golden bean listed in BC as threatened/endangered	Non-native plant inventory completed and control ongoing	As above No change
6. FAUNA			
6.1 Significant Animal Populations			
Large populations of mammals	Black and grizzly bear, elk, coyote, lynx, mule deer, mountain goat, hoary marmot, marten	Field community plan contains measures for wildlife corridor improvement	Ongoing - movement corridor obstructed by transportation routes Road and rail collisions, trans-boundary hunting, esp. of trophy species, are ongoing
6.2 Rare Fauna			

Mammals	Vulnerable - wolverine, grizzly bear	Continued protection under *National Parks Act*. Road and rail collision an ongoing concern. (Rail research underway and lessons may be applied), Grain clean-up and improvements to grain cars to avoid leaks are ongoing. Bear awareness programs and communications in place to reduce habituation of wildlife	Road and rail collisions, trans-boundary hunting, especially of trophy species, are ongoing
Birds	Vulnerable - peregrine falcon, short-eared owl, and some sitings of ferruginous hawk. Great gray owl, trumpeter swan and Cooper's hawk previously listed as vulnerable Numerous other species listed as rare in BC.		

5.2 Condition of Natural Heritage Values Since Designation

View of the Kicking Horse Valley
Photo: Paks Canada, JMorris

Overall there has been little change with respect to the natural heritage values since designation. Some issues such as railway and highway mortality related to wildlife and wildlife habituation are ongoing although Parks Canada continues to take mitigating actions and use educational programs to influence these issues. Significant world leading progress on highway wildlife mortality has been addressed through fencing and creation of wildlife crossing structures in Banff National Park leading to an improved situation at the mountain park scale. There has been an improvement to the terrestrial ecosystem processes through the reintroduction of fire within the park and in particular within the designated area for the heritage river with the Hoodoo Creek fire and planned prescribed fires at Ottertail and Mount King. The river remains protected by virtue of its location within a national park. Portions of the river are adjacent to the Trans Canada Highway and therefore sometimes managed, especially to control flood damage to the road and verge.

Longer term, Parks Canada will continue to monitor climate and ecosystem variables that may lead to a better understanding of potential environmental effects related to global climate change.

Slope measurement part of water sampling of the Yoho River Photo: Parks Canada, S. Humphries

Hydrology and Physiography

The river is a dynamic environment. Its fundamental physical characteristics, such as river morphology, erosion and depositional dynamics and hydrological processes have changed little since designation. One area of interest concerning the river's hydrological cycle is the impact of climate change. The 2008 State of the Park Report states "Parks Canada has been taking manual measurements of the

Skier on Cathedral Glacier overlooking the Wapta Icefield.
Both headwaters of the Kicking Horse River.
Photo: Parks Canada, K. Schroeder

snowpack at two snow courses in the park for over 50 years and good datasets for this measure are available. The Field snow course is located near the village of Field, and the Kicking Horse snow course is situated near Wapta Lake. Two variables, snow depth and snow water equivalent (the amount of water in a given volume of snow), were analyzed to determine how the snowpack is changing over time. On average, snow depth and snow water equivalent have both decreased at the Kicking Horse snow course since 1947. The snowpack is declining by approximately 4 % to 6 % per decade. Similar trends have been observed at three snow courses in Kootenay National Park. At the Field snow course, the decrease in snow depth was less pronounced and snow water equivalent increased slightly. This may be due to changes in winter temperatures at lower elevations. As temperatures warm, more winter precipitation is likely to fall as heavy, wet snow, and the snowpack may also be compacted by rain or melting. Glaciers are internationally recognized as key indicators of climate and environmental change occurring on a regional and global level. In Yoho National Park, glaciers are important elements of the park landscape that appear to be responding to changing climate. The Hanbury and Wapta Glaciers have receded 32% and 12 % respectively since 1975. (State of Park report pgs 12-13)."

Parks Canada will continue to monitor climate and ecosystem variables that may lead to a better understanding of potential environmental effects related to global climate change. A mass balance study has been initiated on the Yoho Glacier.

Major Ecological Events

There were no major wildfires in the Kicking Horse Valley in the last ten years. Since Rocky Mountain ecosystems are fire-adapted, Parks Canada has been actively reintroducing fire into the park to ensure that vegetation patterns, and consequently wildlife abundance and distribution, fall within the range of natural variability. The Hoodoo Creek prescribed burn helped to achieve management objectives for the restoration of fire to the landscape. Two additional burns are planned for 2011 if conditions permit.

Native Fish Populations

Significant knowledge gaps exist pertaining to the river and lake populations of fish in Yoho National Park. Limited sampling for cutthroat trout DNA has been done. In addition, confirmation of the continued presence of pygmy whitefish has been done, but without any population estimates. No work has been done on bull trout.

Westslope Cutthroat Trout
Photo: Parks Canada, S. Humphries

Yoho was believed to have had disjunct populations of westslope cutthroat trout prior to 1900. Extensive river and stream sampling in the 1980's and the mid 2000's have not detected any remaining fish within historic waters. Cutthroat persist in the lakes and streams above Wapta Lake as a result of stocking. DNA studies revealed that fish in Vera and the three Morning Glory Lakes are genetically pure. Fish within Cataract Brook and Lake O'Hara show some signs of genetic introgression with rainbow trout. Linda Lake contains fish with a high degree of rainbow trout introgression. The pure fish could represent a genetic source for future restoration activity. Cutthroat in BC were added to the SARA schedule 1 in 2010. Parks Canada is participating in a management plan. Significant investment to remove introduced brook trout and rainbow trout will be needed in order for cutthroat trout to exist within historic waters of the Kicking Horse River.

The pygmy whitefish species is a high priority candidate for assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In other areas of North America this elusive fish is associated with cold deep lakes. Alberta has attempted to assess this fish. Past results have been data deficient (Sullivan 2011). The Kicking Horse River is important to this fish as this is the first place the fish was described in North America in 1892. Similar to the Athabasca river populations, the fish in the Kicking Horse have no large deep lake refuge. We have no data on spawning habitats and overwintering requirements. In 2008 extensive efforts were made to confirm the continued presence of pygmy whitefish in Yoho National Park and the Kicking Horse River. Two adults were captured below the natural bridge waterfall. No adults were found captured above the waterfall where historic accounts indicated that they would be abundant and easily captured. One adult was captured above the natural bridge in the fall of 2010. This species is likely very sensitive to human activities. Adult fish are small (less than 15 centimetres fork length) and are not thought to be good jumpers. Therefore poorly installed culverts on many tributaries in Yoho may have a disproportional impact on this species. Also, the fish is a late fall broadcast spawner. Eggs sitting on the river bottom

may be more prone to salt and sediment effects from road and rail activities than other species.

Bull trout are also found in the Kicking Horse River. Little is known about this population. All three life histories, adfluvial, fluvial and stream resident were thought to be historically present. Now it is rare to encounter stream resident or adfluvial fish. They have been replaced by non native species. Fluvial fish are still present and are very susceptible to early season angler pressure. They are protected by zero possession limits. No estimates of population or genetic integrity are available. This species is currently being assessed by COSEWIC. We can only confirm their presence in Yoho.

Due to the presence of Wapta Falls and the Natural Bridge, no rescue effect from outside Yoho National Park is possible. In park efforts to remove introduced species, in particular from headwater lakes is one of the few limited fisheries management options available.

Invasive Species

In the last 10 years, the presence of an aggressive species of freshwater algae in water bodies in many parts of Alberta has generated concern. A survey of park water bodies shed some light on the prevalence of didymo (*Didymosphenia geminata*), a species of algae that can form large mats on the bottom of lakes, rivers and streams. The mats reduce habitat for fish, invertebrates and plants, can threaten fish populations and diminish the aesthetic appeal of streams. Three sites were surveyed by Parks Canada staff and a University of Calgary researcher, including a site on the Kicking Horse River. Didymo is present in Yoho National Park, particularly on the Emerald River. Efforts to educate river users to avoid transporting didymo from one location to another are underway.

A non-native vegetation inventory by Parks Canada personnel is ongoing. Several species of concern are known to occur. They are primarily co-located with transportation corridors. To limit the populations of these priority non-native species, control efforts are ongoing. While focussed on mechanical methods there is some very limited herbicide application.

In conclusion, scientific knowledge of aquatic ecosystems has increased over the past ten years, but many gaps remain. Progress has been made in some areas, such as the reintroduction of fire to park landscapes and control work of invasive plants. However large challenges remain in addressing longstanding issues such as the many culverts that create barriers to fish movement and the existence of non-native fish species. These will take decades to address as new construction allows for culvert replacement and as

research and methods are developed. See section 8 for more information on progress in mitigating direct human impacts on the river.

6.0 Cultural Heritage Values

6.1 Background & Status

The Kicking Horse River has a rich human history, with strong ties to Kicking Horse Pass National Historic Site. While it appears that Kicking Horse Pass was little used by Aboriginal people, the western end of the park including the Kicking Horse river valley from the Beaverfoot River near Wapta Falls to the Amiswki River confluence was part of the Kootenay trail, a route taken by Ktunaxa and perhaps other aboriginal people as they made their way to the prairies via Howse Pass. Later Kicking Horse Pass would be chosen as the corridor for the first transnational railway by the Canadian Pacific Railway (CPR). The Trans-Canada Highway also follows its course. A century of protection as a national park has ensured that the views and experiences that attracted the early CPR tourists have changed little.

Table 4. Cultural Heritage Values since Designation

CHRS Cultural Framework (2000)	Cultural Heritage Value(s)	Significant Actions, Research or Studies	Changes or Threats to Nomination Value(s)
1. RESOURCE HARVESTING			
1.1 Fishing	No direct evidence for pre-contact fishing in the rivers and lakes within YNP, either in the form of fish bones, fish hooks or stone net sinkers		No change
1.2 Shoreline Resource Harvesting	Pre-contact archeological sites have been located in the vicinity of the		No change

	river.		
1.3 Extraction of Water	Not Applicable verify,		No change
2. WATER TRANSPORT			
2.1 Commercial Transportation	Not applicable		No change
2.2 Transportation Services	Not Applicable		No change
2.3 Exploration & Surveying	Palliser Expedition 1858 Edouard Gaston Deville photogrammetric mapping		No change
3. RIPARIAN SETTLEMENT			
3.1 Siting of Dwellings	5 minor aboriginal campsites incl. above confluence of Emerald River		No Change.
3.2 River-based Communities	Field, BC – established as railway construction camp, repair centre and switching yard, the community is now a home to those involved in park or service industries and it serves as a visitor service centre. Beautifully set in the mountains and	Major renovation of Level II federal heritage building brings it to good condition. Inventory of all cultural properties in Field has been completed. Protection of cultural resources a condition of all redevelopment in Field. Built heritage is highlighted in Friends of	Improved with caution that third parties are responsible for most built heritage in the community.

	adjacent to the river.	Yoho walking tour and in information panels throughout the community.	
Quarrying/mining	Lead, zinc, silver mines on Mt. Field and Mt. Stephen. Monarch Mine is one of oldest in Canada (1883-1952).	Sites and artefacts included in archaeological inventory	No change Remnants of metal and cans have no direct impact on the river. Testing was done in 2005 at Monarch Campground and indicated no need for concern or further testing.
3.3 River-influenced Transportation	Roads and railways whose structure or position is dictated by the river.	Commemoration of KHP as NHS for its role as a transportation corridor, and development of Commemorative Integrity Statement. Periodic monitoring of sites associated with the NHS, most recently in 2010	
4. CULTURE & RECREATION			
4.1 Spiritual Associations	Not known except on a landscape scale the area is part of the traditional territory of the Ktunaxa, Shuswap and perhaps other First Nations and all parts are considered	None	No change

	sacred		
4.2 Cultural Expression	Not described at the time of designation		
4.3 Early Recreation	Field was visitor centre from the time of Yoho National Park establishment in 1886. Mountaineering, trail riding and site seeing were all important park activities.	In 2010 displays concerning early park history including recreation and park management were erected in Field outside the Visitor Reception Centre	Improved interpretation of early recreation theme.
5. JURISDICTIONAL USES			
5.1 Conflict & Military Associations	Not applicable		
5.2 Boundaries	Not applicable		
5.3 Environmental Regulation Early protected area	Establishment of Yoho NP in 1886. See a History of Canada's National Parks Vol. I (1976) by W.F. Lothian for a comprehensive overview of the establishment of national parks,	New interpretive displays installed in 2010 in Field and at the Visitor Reception Centre provide the public with an opportunity to understand early park management history. Establishment of KHP NHS, to protect the cultural landscape	No change, ongoing adaptive protected area management.

	including Yoho)	associated with the transportation corridor	

6.2 Condition of Cultural Heritage Values Since Designation

There has been little change since designation in the condition of the majority of the cultural resources that contribute to the cultural heritage values of the Kicking Horse River. Deer Lodge Warden Cabin is the oldest in Canada's national parks and remains in good condition after a 1998 restoration. A major project to restore an historic picnic shelter in Kicking Horse Campground was completed in 2010. In addition two patrol cabins, Little Yoho and Takakkaw Falls have been recognized as Federal Heritage Buildings by the Federal Heritage Buildings Review Office (FHBRO). As such they are protected as level II cultural resources under national parks policies for FHBRO and cultural resources. Increased concern with respect to the management of national historic sites has meant an improvement in management of Kicking Horse Pass National Historic Site including increased attention to monitoring. In 2010 an engineered study of the condition of the 'old bridge on the big hill' was completed. This is a resource associated with the heritage river and the national historic site. It is an example of early railway construction. Although rated as fair, investment will be required to conserve this important historic resource and ensure its conservation well into the future.

Perhaps the main change to the cultural heritage values of the river has been an increase in the interpretation of its human history. New projects that are raising awareness of that history are outlined in section seven of the report.

7.0 Recreational Values

7.1 Background & Status

Although the river outside of the national park is highly used by rafters and kayakers, the portion inside the designated area is little used by boaters. On the other hand, hikers and people seeing the sights abound. Biking and Nordic skiing are also popular on some segments of the waterway. On average more than one half million visitors come to Yoho National Park and visit the many sights associated with the Kicking Horse River. They hike to Twin Falls or perhaps enjoy spectacular views of Wapta Lake or the Kicking Horse Valley while they hike to Paget Fire Lookout. Backcountry campers may stay at Laughing Falls or Twin Falls campground on their way to view the Yoho Glacier or Glacier des Poilus. Perhaps, they'll only carry their packs a few hundred metres and enjoy views of Takakkaw Falls from the nearby 'walk in' campground. They may complete the circuit and

hike the Iceline trail high above the Yoho Valley where they can view Takakkaw Falls from above and see its source, the Daly Glacier, dwarfed only by the nearby rocky peaks. Those on a less rugged trip may visit day use sites such as Takakkaw Falls, Meeting of the Waters, the Natural Bridge all river based sites, or they stay at Kicking Horse or Chancellor Peak Campground where they drive to their site and stay right beside the river. Persons wanting roofed accommodation may choose something in the town of Field, Emerald Lake Lodge or Cathedral Lodge, where they are never very far from the river and its resources.

People stopping at the Field Visitor Reception Centre can read the CHRS plaque and enjoy displays about associated themes, the Burgess Shale and railway right there. Knowledgeable staff help people prepare for their day and can show paddlers the river guide, although it is no longer in print. In addition, people can learn how to enjoy the river environs or perhaps purchase a fishing license.

Prior to and post visit people can learn about the river, its associated resources and the park by visiting the web site for Yoho National Park, Kicking Horse Pass NHS, Twin Falls NHS or the CHRS web site. They can also mail in a request for information or phone the information centre directly.

In summary, river recreation is supported by infrastructure and staff which makes enjoyment of the river and its environs both enjoyable and interesting.

Table 5. Recreational Values of the Kicking Horse River

Recreational Capability Themes and Sub-themes	Description of Current Situation	Significant Actions, Research or Studies	Changes or Threats to Nomination Value(s)
1. BOATING			
1.1 Whitewater Canoe, Kayak & Raft	KHR below Meeting of the Water is navigable (except Natural Bridge reach) in summer by experienced canoeists - intermediate to very difficult. Expert kayakers also paddle the Yoho River above Meeting of the Waters. Use levels	Road to the Amiskwi confluence is closed to vehicles 2010 Park Management Plan	Reduced river use due to the need to portage boat or raft to the main put in below the Natural Bridge

	are low, and parties are private, and mostly do not stay overnight on the river	includes direction to engage the paddling community to consider ways to improve access for canoes and kayaks	
1.2 Extended Canoe Tripping (motor & non-motor)	Not applicable as the river is short.		No change
1.3 Day Paddling & Rowing	See 1.1		See 1.1
1.4 High Speed Boating	Not permitted		No change
1.5 Motorized Pleasure Cruising/Houseboats	Not permitted		No Change
1.6 Commercial Tour Boats	Not permitted		No Change
2. ANGLING			
2.1 Day Angling	Fishing is generally poor, due to the cold, turbid water conditions associated with the swift, glacially-derived mountain streams. Native bull trout and introduced brook and rainbow trout are found in the river.	Fishing is regulated under national park regulations Catch limits on native species such as bull trout and Westslope cutthroat trout have been reduced	Change Superintendent's order for zero possession of cutthroat trout introduced in 2009

		to zero	
2.2 Weekend Angling	As above		No change
2.3 Extended Angling Vacation	As above		No change
2.4 Fly Fishing	As above		No change
2.5 Ice Fishing	Not applicable (out of season for lakes on or near the river and river remains open)		No change
2.6 Specific Fish Species	See 2.1		No change
3. WATER CONTACT/CONTENT			
3.1 Swimming	River is too swift and cold.		No change
3.2 Water Skiing	Not permitted		No change
3.3 Snorkel/Scuba	Not popular.		No change
4. WATER-ASSOCIATED ACTIVITIES			

4.1 Trail Use (hiking, walking, cycling)	Numerous spectacular trails within river corridor, surrounded by spectacular scenery. Many views of rivers from mountain trails.		No change
4.2 Camping	Five developed campgrounds located along designated river - Kicking Horse, Hoodoo Ck., Chancellor Peak, Monarch Ck., and Takakkaw Falls. Backcountry camping at Twin Falls and Laughing Falls in the Yoho Valley	Some channelization of KHR by e.g. flood control boulders at Chancellor Peak. While Chancellor was closed during the early part of the 10 year period it is now open again. Hoodoo Creek campground is closed for rehabilitation after fire smart program otherwise no change.	Reduction in camping experience both seasonally and through closure of campgrounds in the west end of Yoho National Park.
4.3 Hunting	Not permitted		
5. WINTER ACTIVITIES			
5.1 Snowmobiling/Dog Sledding	Not permitted/Extremely rare		No change

5.2 Cross-country Skiing	Multiple opportunities		No change
5.3 Skating	Generally no skating on the river, but opportunity in the town of Field. Occasionally on the flats above Field when conditions are right		No change
6. NATURAL HERITAGE APPRECIATION			
6.1 Wildlife	Outstanding opportunities complemented by interpretive programs, media, publications that focus on natural history.		No change
6.2 Vegetation	Outstanding opportunities to view a variety of native vegetation communities	Efforts to eradicate non-native invasive species are ongoing.	No change
6.3 Vistas/Scenic Quality	Outstanding vistas at many points along the river. Limits to development and stringent redevelopment guidelines ensure that scenic qualities will remain unimpaired	Spiral Tunnels Viewpoint redeveloped including clearing trees to enhance the views.	Improvement at related site, most views have experienced no change.
7. HUMAN HERITAGE			

APPRECIATION			
7.1 Historic Sites Kicking Horse Pass National Historic Site	Rail route over Great Divide through KH pass chosen in 1881. Designated National Historic Site in 1971. Site extends for 200 metres on each side of the CPR rail line between Lake Louise, Alberta and Field BC. Spiral tunnels built in 1907-09, a world famous engineering feat, overcame 4.5% gradient of Big Hill. Official Plaque Text KICKING HORSE PASS First recorded in the report of the Palliser expedition of 1857-60, this pass takes its name rom an incident in which Dr. James Hector, surgeon to the expedition, was kicked by his horse while exploring in this vicinity. The pass was virtually unused until after 1881when the Canadian Pacific Railway decided to adopt it as their new route through the Rockies, foregoing the earlier preference for the more northerly Yellowhead Pass. This decision altered the location of the line across western Canada and	New exhibits Spiral Tunnels Day Use Area Cultural Integrity Statement July 2006 NHS Management Plan October 2007 New information and interpretive material prepared and placed on the web. New brochure prepared for 'Walk in the Past' trail 1930's Picnic Shelter rebuilt 2010. Monitoring trip and salvage archaeology 2010 New spiral tunnels model to be installed in 2011 by Friends of Yoho at Visitor Reception Centre and interpretive elements to be provided by Parks	Improved attention to monitoring of resources, communications of historic site themes and condition of important cultural resources.

Twin Falls Tea House National Historic Site	dramatically affected the development of the West. The Twin Falls Teahouse is a well-preserved example of the small back country lodges built by the Canadian Pacific Railway in Banff and Yoho National Parks before 1930. Tea houses provided meals and rudimentary shelter for hikers and trail riders taking excursion from the railway's network of hotels and bungalow camps. The facility, unchanged in function and appearance, represents a rare surviving example of the rustic tourist facilities that were built in the mountain parks in association with the growth of back-country recreation during the first three decades of the twentieth century.	Canada. Engineer led inspection of "Old Bridge on Big Hill" 2010. Cultural Integrity Statement approved in January 2002 Major rehabilitation including new foundation and sill log replacement NHS Management Plan October 2007 Site plaque and new interpretive media installed at site and at trailhead. New information and interpretive material prepared and placed on the web.	Significant improvement.

7.2 Cultural Landscapes			
Kicking Horse Pass (See Kicking Horse Pass NHS above)	Railway influences local development and leads to establishment of the town of Field and Yoho National Park.	Centennial of Spiral Tunnels in 2009	See national historic site above
Yoho National Park – Functions as protected area with major trans-continental railway and highway running through it. Landscape includes: System of roads linking Lake Louise to Golden, B.C. completed in 1927. Yoho valley road constructed in 1909.	Protected area within Canada's national parks system.	Yoho National Park is 125 years old in 2011 Ongoing maintenance and upgrading of roads 2009 re-paving and guide rail replacement on Yoho valley road.	Ongoing and evolving protected area management. Adaptive management. No change Improvement
There are also many cultural resources associated with the history of the Park and its' landscape.	Archaeological resources have been inventoried and are monitored.		No change
Federal Heritage Buildings	Deer Lodge Warden Patrol Cabin, oldest patrol cabin in system, Little Yoho Warden Station-Cabin,	Protected by national park polices related to federal heritage	Improvements as noted in other parts of this document and as

	Takakkaw Falls Warden Patrol Cabin, Superintendent's Residence, Stanley Mitchell Hut, Twin Falls Teahouse (also NHS), Yoho Ranch cabin and barn	buildings and cultural resource management Interventions must meet Standards and Guidelines for the Conservation of Historic Places in Canada Takakkaw Falls cabin has new roof	in column to left Otherwise no change
Level II buildings	Several examples exist, but haven't yet been inventoried: Mt. Paget Fire Lookout, Mount Hunter lookout and cabin, Tocher Fire Lookout, Chief Park Warden's residence- Field Caretaker Cabin Kicking Horse Campground, 1930's era Kitchen Shelter Kicking Horse Campground, 1940's era Kicking Horse Campground all considered level II under Cultural Integrity Statement for Kicking Horse Pass National Historic Site	These resources are enjoyed by hikers, walkers, and campers Interpretive panels are new at Paget Lookout and Chief Park Warden's residence Significant recent investment to restore Chief Park Warden's residence in Field Fire towers and associated cabin have been maintained by volunteer efforts with direction and involvement of PC	Improved Improvement related to 1930's era Kitchen Shelter was noted above in Kicking Horse Pass NHS section of the table.

		staff The three Kicking Horse Campground buildings are level II resources as per the commemorative integrity statement The other buildings have been captured in Built Heritage Resource Descriptions as important, but have not been formally recognized as level II resources. Draft policy for the Mountain Parks has suggested an approach for inventorying these buildings as level II resources.	
Other old buildings/structures, dumps, etc.	In general other old structures and materials are treated as ruins and included on the archaeological inventory.		No change, natural processes are allowed to take place so sites are

	Placement on these inventories means that they are monitored from time to time. These resources are allowed to weather and decay over time as a natural process.		slowly changing
Quarrying/mining	There are several mine portals high on the cliffs of Mount Field and Mount Stephen. In addition there are remnants of metal and cans near the Monarch campground. Testing was done in 2005 no concerns or need for further testing was noted	Sites and artefacts included in archaeological inventory and recorded. Chemical testing was done in 2005.	No change
7.3 Sporting Events/Activities	Little to no use of the river for sporting events.		No change.
7.4 Cultural Events/Activities	Regular interpretive programming in the campgrounds by Parks Canada and in the community of Field by the Friends of Yoho highlight the natural and cultural history of the park including common themes associated with the river and the park.	Summer programming at Kicking Horse Campground and evening walks in Field. 100 Year celebrations related to the centennial of Spiral Tunnels and the Discovery of the Burgess Shale took place in 2009 125 Year	No change.

		celebrations of Yoho National Park establishment planned for 2011.	

7.2 Condition of Recreational Values since Designation

While there have been improvements to the infrastructure, facilities and services that support visitor experiences along the river, the majority of the recreational opportunities associated with the river have not changed substantially over the last decade. Improvements noted mainly relate to the provision of renewed interpretation in the form of web content or panels, related to recreational history, park history, heritage buildings and the national historic sites. In the case of the Spiral Tunnels viewpoint, the area has been renewed with new interpretive material and both the Lower and Upper Spiral Tunnel viewpoints have had views opened up by the clearing of trees near the sites and at the portals for the tunnels.

Canoeists on the Kicking Horse River Photo: Parks Canada

Since prior to nomination, enjoyment of the Kicking Horse River within the park has been largely achieved by car or on foot. This remains true. One area of concern in recent years has been the closure of the road to the Amiskwi confluence. This was done because of the condition of the bridge and deteriorating conditions of the road in regard to heavier vehicles near the animal salt lick. While this affects only a small number of persons, it appears that the downhill portage, even though it could be accomplished relatively easily with a canoe cart, is a significant barrier to river use. The 2010 Park Management Plan includes direction to engage the paddling community to consider ways to improve access for canoes and kayaks.

While there have been improvements to heritage interpretation of many of the themes related to the designation there are opportunities to improve awareness of the Kicking Horse as a Canadian Heritage River. Web content on the parks site could be developed to link to the CHRS site. In addition, one could look for ways to include mention of the CHRS and designated rivers in the Mountain Guide.

8.0 Integrity Guidelines

8.1 Background & Status

The Kicking Horse River's location within a national park affords it a high level of protection. The maintenance or restoration of ecological integrity is a priority in decision-making about the river and recreation is the only human use on the river. However, high numbers of visitors and the historic development of a transnational railway and highway, a community and outlying facilities to support tourism, have substantially altered aquatic environments**.** There are many sites along the Kicking Horse River where the railway and highway have altered water flow, making aquatic connectivity a key challenge for Parks Canada.

Despite its relatively pristine setting, the nomination report and first ten-year monitoring report noted that water quality is affected by effluent from Field townsite, road salt and spills. More recently, awareness of the potential effects of stormwater has increased**.** Despite localized water quality issues, the previous reports affirmed that the river as a whole appeared to be meeting integrity guidelines for water quality.

The Kicking Horse River has a high degree of integrity with respect to cultural resources. The river's natural appearance has changed little since pre-contact use by Aboriginal people and even less since use by early railway tourists. With the exception of the highway and railway, there has been minimal development along most stretches of the designated area. Development supports recreation values and includes the very facilities most people use to enjoy the river. Where development has occurred, it is governed by stringent architectural and redevelopment guidelines to ensure that it respects the character of the park.

Archaeological investigations generally precede any major ground disturbing projects. If any cultural resources are unearthed during a project, Parks Canada archaeologists are consulted on the course of action to be taken before work resumes.

Table 6. Integrity Guidelines since Designation

CHRS Principles, Procedures and Operational Guidelines (2000)	Significant Actions, Research or Studies	Changes or Threats to Integrity Value(s) since Nomination
1. NATURAL INTEGRITY GUIDELINES		
1.1 The nominated area is of sufficient size and contains all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the natural processes, features, or other phenomena which give the river its outstanding natural value.		No change.
1.2 The nominated area contains those ecosystem components required for the continuity of the species, features or objects to be protected.	Progress made in reintroducing fire to the landscape. Ongoing monitoring and control of non-native plants.	Slight improvement in restoration of the natural fire regime.
1.3 There are no human-made impoundments within the nominated area.		No change The Yoho and Kicking Horse rivers are large watercourses. The Kicking Horse River is only directly affected by one culvert just near the top of Kicking Horse Pass. However most tributaries to the Kicking

		Horse and Yoho rivers have culverts that impede fish passage
1.4 All key elements and ecosystem components are unaffected by impoundments located outside the nominated area.		No change
1.5 Natural values for which the river is nominated have not been created by impoundments.		No change
1.6 The water of the nominated area of the river is uncontaminated to the extent that its natural aquatic ecosystem is intact.	Town of Field wastewater treatment plant has been replaced and improved. Emerald Lake Lodge Wastewater Treatment Plant recently upgraded. "Stormceptor" system is used in Field to capture pollutants in storm water system. Ongoing monitoring and removal of bunker C oil at CPR rail yard	Improvement in water quality Water quality may be affected intermittently by road salt and accidental spills.
1.7 The natural aesthetic value of the river is not compromised by human developments.		No change
2. CULTURAL INTEGRITY VALUES		
2.1 The nominated area is of sufficient size and contains all or most of the key interrelated and interdependent elements to demonstrate the key aspects of the features, activities or other phenomena which give the river		No change

its outstanding cultural value.		
2.2 The visual appearance of the nominated area of river enables uninterrupted appreciation of at least one of the periods of the river's historical importance.		No change
2.3 The key artifacts and sites comprising the cultural values for which the river is nominated are unimpaired by impoundments and human land uses.		No change
2.4 The water quality of the nominated area does not detract from the visual character or the cultural experience provided by its cultural values.		No change
3. RECREATIONAL INTEGRITY VALUES		
3.1 The river possesses water of a quality suitable for contact recreational activities, including those recreational opportunities for which it is nominated.		No change
3.2 The river's visual appearance is capable of providing river travelers with a continuous natural experience, or a combined natural and cultural experience, without significant interruption by modern human intrusions.		Minor change - Highway and railroad infrastructure have been in place since prior to the time of nomination. Power lines installed since the nomination follow the railway right of way and like the railway are occasionally visible from the river or while viewing the river.

		The railway is a significant element of the cultural experience within the nominated area.
3.3 The river is capable of supporting recreational uses without significant loss or impact on its natural, cultural or aesthetic values.		No change

8.2 Condition of Integrity Values since Designation

Aquatic Connectivity

Steep or hanging culverts hinder the passage of fish and other aquatic species and fragment aquatic ecosystems. Parks Canada initiated a culvert inventory in 2006. Fifty culverts were assessed for fish passage in Yoho National Park. Only eleven met full fish passage criteria. Culverts along the CPR line remain to be surveyed. Work to remediate culverts on two tributaries is scheduled. These are Boulder Creek in 2011 and Monarch Creek (three culverts) in 2012.

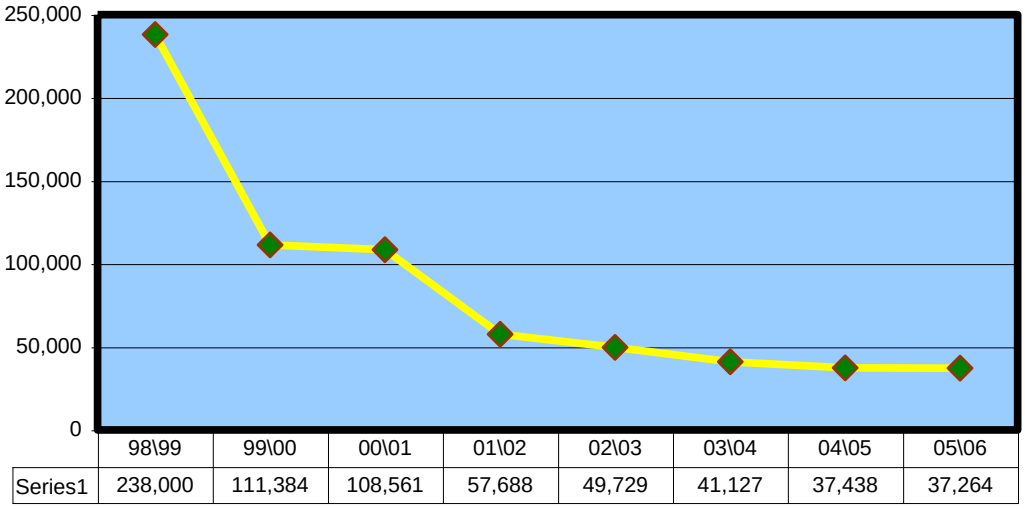
Since the time of designation culverts were built to maintain connection between an area of small ponds and the Kicking Horse River at the Emerald Lake intersection. New construction must take into account fish movement**.**

Water Management and Wastewater Treatment

Perhaps the most substantial change in the integrity of the river has been with respect to water quality. Nutrient loading of the river's nutrient-poor waters by the Field wastewater treatment plant (WWTP) has been identified as an issue requiring corrective action. In response Parks Canada set out leadership targets for the cold and nutrient poor waters in the mountain national parks in the 2000 park management plans. The leadership targets emphasize control of nutrients including nitrogen and phosphorus. Investments have been made to meet these higher targets. The 2006 State of the Community Report for Field indicated that the leadership targets were essentially met. A two pronged approach was aimed at both water conservation and improving the quality of effluent.

Water consumption decreased 90% since 1999. This was the result of the installation of water meters in 2000, the implementation of an aggressive leak detection program, and the community's water conservation efforts.

Figure 3. Water consumption in Field, 1998-2006, by cubic meters (State of the Community Report – Field – 2006)



	98\99	99\00	00\01	01\02	02\03	03\04	04\05	05\06
Series1	238,000	111,384	108,561	57,688	49,729	41,127	37,438	37,264

Sewage effluent quality improved dramatically as well. In 2004, a $3.2 million upgrade to the Field plant was completed. The plant was designed and constructed to meet Parks Canada's leadership targets for effluent quality. Effluent quality is measured against the target level for certain chemicals (phosphorus and ammonia), bacterial counts (fecal coliform), levels of solids in the effluent, and five-day oxygen level. In 2005-2006, the Parks Canada targets for phosphorus and ammonia were not met, due to a failure of the membranes at the plant which required turning off of the alum delivery system. Redesign of the system took place in September 2005. Since that time the targets have been met (see table below).

Table 7. Achievement of Leadership Target in Wastewater

Parks Canada Leadership Guidelines	Parameter	2005	2006	2007	2008	2009	2010
<0.15	**Total Phosphorus (mg/l**	0.61	0.15	0.14	0.14	0.10	0.10
<20 (End of pipe)	**Fecal Coliforms (CFU/100ml)**	nil	nil	nil	nil	nil	nil
<10	**Total Suspended Solids (mg/l)**	0.2	0.1	0.1	0.2	0.2	0.1
<10 (Summer)	**5 Day Biochemical Oxygen Demand**	1.2	0.5	1.0	1.1	0.9	1.2
<20 (Winter)	**(CBOD5) (mg/l)**	1.1	0.6	1.0	1.2	1.1	1.2
<1 (Summer)	**Ammonia (NH_3-N) (mg/l)**	5.2	0.12	0.48	0.44	0.19	0.08
<5 (Winter)		0.19	0.11	0.05	0.16	0.65	0.08

Surface Water Quality

In order to evaluate the impacts of wastewater treatment facilities on aquatic ecosystems, monitoring sites above and below the wastewater treatment plants on the Kicking Horse and Emerald Rivers were established. Water chemistry, algae and benthic macro invertebrate variables were measured. The measurements were then combined to produce an overall score for each site. Target ranges for site scores representing good, fair, poor and very poor water quality were also developed, based on the range of values observed for each variable.

"Each site is monitored annually and assigned a rating based on the overall site score. Water quality in the Kicking Horse River has generally been good over the past five years. Upgrades to the wastewater treatment plant completed in 2004 will ensure that this situation continues." (2008 State of the Park Report pg 16)

"Water quality in the Emerald River, a tributary of the Kicking Horse, is more often fair to poor, although its condition appears to be gradually improving." (2008 State of Parks pg 17) The public washroom facilities at Emerald Lake and Takakkaw Falls have been

upgraded to a contained vault system, and the Emerald Lake Lodge has upgraded its wastewater treatment facility. In addition, a horse riding operation with the potential to affect water quality has been discontinued. "This area will continue to be monitored. Based on the results of this assessment, water quality is rated as fair with an improving trend." (2008 State of the Park pg 17)

Table 8. Overall Site Scores and Water Quality Ratings for Sites in Yoho National Park (from 2008 State of the Park Report for Yoho National Park)

Year	Kicking Horse Upstream	Kicking Horse Downstream	Emerald Upstream	Emerald Downstream
1999	3.8	-	-	-
2000	3.5	-	-	-
2001	3.9	2.8	-	-
2002	4.0	3.5	3.2	2.8
2003	3.4	3.5	3.0	2.7
2004	3.5	3.2	2.8	2.9
2005	3.7	3.7	3.3	3.2
2006	3.6	3.8	3.5	3.3

Good	Fair	Poor	Very Poor
4.0 – 3.5	3.4 – 3.1	3.0 – 2.5	2.4 – 2.0

Surface water quality of the Kicking Horse River is monitored in a second way. Environment Canada, in partnership with Parks Canada, maintains a water quality monitoring station on the Kicking Horse River at the village of Field. Established in 1987, this station monitors long-term trends in water quality.

"Water quality at the Environment Canada station is assessed using the Canadian Water Quality Index (CWQI). This index tracks key water quality variables such as turbidity, temperature and major ions. Each is measured and the results compared to established guidelines for the protection of aquatic life. Five rankings are possible: excellent, good,

fair, marginal and poor. Water quality condition is rated as good with a stable trend. Several weak trends were identified that may be related to climate change (e.g. increased nitrate, total dissolved nitrogen, sodium and chloride). Increased sodium and chloride may be related to salt management practices along the Trans-Canada Highway. More monitoring is required to better understand these trends." (2008 State of Park pg 16)

Other Water Quality Issues

With about 2.43 km of the Trans-Canada Highway located within 50 m of the Kicking Horse River, the use of salt and abrasives to make the road surface safer in winter and spills of pollutants from motor vehicle accidents can have direct impacts on water quality.

Truck slid on thefrozen Kicking Horse River in 2010
Photo: Parks Canada, K.Schroeder

Spill containment on creek by the Field backroad caused by a motor vehicle accident Photo: Parks Canada, K.Schroeder

There are several accidents annually along the Kicking Horse River that result in spills of fuel, oil and other engine fluids onto the ground and occasionally into water. Parks Canada employees and the Field Fire Department respond to these incidents and do initial work to contain the spills. Beyond first response, containment and removal of contaminated materials is contracted out.

Environment Canada declared road salt a toxic substance in 2001. In 2004 Environment Canada released it Code of Practice for the Environmental Management of Road Salts. This Code of Practice encourages public road authorities that use more than 500 tonnes of salt annually to develop their own salt management plans. In 2004 the Western Asset Management Service Centre of Parks Canada introduced a new Salt Management Plan which strives to minimize the amount of salt entering the environment. Efforts include measures to manage salt from the time it is delivered to distribution on the park roadways. In order to ensure the appropriate rate of application given road and climate conditions, the fleet is calibrated each fall. Year end clean up of the highway with a

sweeper is ongoing and rather than the old practice of flushing leftover material from bridges with water it is now being removed with a small sweeping machine and by hand. The material is moved away from the river physically. Notwithstanding these activities, the present report identifies salt and sedimentation as an ongoing concern with respect to how it may be the cause of increased sodium and chloride in water samples (section 8.2) and how it may affect pygmy whitefish (section 5.2).

Historic contamination from Bunker C oil used to power steam locomotives remains a concern in the Canadian Pacific Railway yard in Field. Extensive remediation in 1996 removed contaminated soil adjacent to the Kicking Horse River but a plume of the oil remains under the tracks within 200 metres of the river. Monitoring has shown the plume to be stationary and on-going recovery is slowly reducing the volume of oil in the plume. Recovery of the Bunker C oil is slowed by the thickness of the oil. It can only be recovered during the summer months as it becomes semi-solid during the winter.

In September 2010, a small contaminated site was remediated at the intersection of the Emerald Lake Road and the Trans Canada Highway. This intersection, near the Kicking Horse River, was the location of a maintenance yard from the 1930's to 1960, and a work camp for the construction of the Trans-Canada Highway from approximately 1955 - 1958. Two hundred cubic metres (about 20 truck loads) of hydrocarbon contaminated soil was excavated and removed, eliminating contamination at the site. This follows the removal of four hundred cubic metres of contaminated soil in 1995 during the construction of the current intersection. The contamination had dispersed through the soil to the water table and removal of the soil prevents any further impacts on groundwater and the Kicking Horse River. Groundwater at the excavation was pumped and treated to remove any hydrocarbons.

In the community of Field, the replacement of water and sewage lines in 1999 and a separate storm sewer system, which collects oils and silts, greatly reduced contamination of run-off into the river. This system uses ‘Stormceptor’ technology to capture pollutants. A new installation of storm water lines in 2010 near Stephen Creek also utilizes ‘Stormceptor’ and it is estimated that more than ninety % of storm water now goes through a properly built storm water system.

In summary, water quality as it relates to maintaining or restoring aquatic communities has improved downstream of the wastewater treatment plant. Water quality meets the standards required for recreational activities and does not detract from the cultural experience offered by the river.

Aesthetics and Recreational Capacity

The river's visual appearance continues to provide visitors with a sense of what it looked like historically and a continuous natural experience; aesthetics are carefully considered when riverside facilities are developed for the first time or redeveloped.

Picnicking beside the Kicking Horse River near the Canadian Heritage System Plaque. Photo: Parks Canada, C.Siddal 2005

In terms of the amount of use the river can sustain, much depends on the timing, location, amount and type of use proposed. Current levels and types of use appear to be sustainable. The new park management plan contains a goal to increase visitation to the park by urban Canadians, new Canadians and youth. Increased visitation will be directed to ecologically robust areas and facilities designed for that use.

9.0 Summary and Conclusions

There has been little change over the past 10 years in the values for which the Kicking Horse River was designated. Its location in a national park ensures a level of protection found in few jurisdictions. The condition of ecological integrity; cultural resources and visitor experiences in Yoho National Park is assessed every five years in a State of the Park Report.

There has been little change in the hydrology, physiography and morphology of the river since it was designated. It is probable that climate change is influencing these aspects of the natural heritage of the river, but on a time scale that is beyond the scope of this report. Parks Canada and other government agencies are monitoring key variables (e.g. glacier mass balance, water flows) that, in future, may tell us more about the effect of climate change on these values.

We know more about the biotic environment than we did ten years ago, and important steps have been taken to improve its integrity, however aquatic and terrestrial ecosystems are still being stressed by longstanding issues, such as impoundments created by the highway and railway, invasive non-native species (e.g. brook trout introduced through stocking), and contaminants introduced into the river by human activity. Nonetheless, water quality and the management of deleterious substances has improved, and

management actions have been undertaken to control the spread of some invasive species. However, sustained efforts are required to maintain or restore the integrity of aquatic ecosystems.

Cultural heritage values have changed little since designation. River travellers experience a landscape that is similar to that experienced in the past by railway workers and early park visitors. Important cultural resources found within the designated area are receiving increased attention. Twin Falls Teahouse National Historic Site, for example, has seen a large investment and is restored. The 'Old Bridge on the Big Hill' has undergone an engineer led inspection and while in fair condition will need investment. Other resources such as fire lookouts, still need to be inventoried to be recognized as cultural resources. Although Aboriginal use is not highly documented, improvement can be made in communicating what we do know.

Recreational use of the river by boaters has remained low and likely has dropped as a result of the closure of the road to the Amiskwi confluence. However, the majority of visitors, over 500 thousand a year, continue to enjoy the river and environs from their vehicle, at a day use area or while hiking. There have been upgrades to several facilities that allow visitors to experience the river environment and learn about its natural and cultural heritage. Appropriate tools are in place to manage recreational use and foster enjoyable visitor experiences, from angling regulations to community plans and Guidelines for Outlying Commercial Accommodation in the Rocky Mountains National Parks.

The river continues to meet such fundamental statements of integrity as:

- The nominated section includes those ecosystem components which contribute significantly to the provision of habitat for species in need of protection.

- The key artefacts and sites comprising the values for which the river is nominated are unimpaired by impoundments and human land uses.

- The river's visual appearance is capable of providing river travellers with a continuous natural experience, or a combined natural and cultural experience, without significant interruption by modern human intrusions.

10.0 References

Canadian Heritage Rivers System. 1984. Nomination Document for the North Saskatchewan River. Banff National Park, Banff, Alberta.

Canadian Heritage Rivers System. 2000. A Cultural Framework for Canadian Heritage Rivers. 2nd Edition. Minister of Public Works and Government Services Canada, Ottawa, Ontario.

Canadian Heritage Rivers System. 2001. A Framework for the Natural Values of Canadian Heritage Rivers. 2nd Edition. Minister of Public Works and Government Services Canada, Ottawa, Ontario.

Canadian Heritage Rivers System. 2001. Principles, Procedures and Operational Guidelines.

Parks Canada. 1999. Yoho National Park of Canada Management Plan. Minister of Public Works and Government Services Canada, Hull, Quebec.

Parks Canada , 2000, A Decade in the Canadian Heritage Rivers System – Ten Year Monitoring Report on the Kicking Horse River, Yoho National Park 1989-1998

Parks Canada, 2006, State of the Community Report-Field- Yoho National Park of Canada Lake Louise, Yoho and Kootenay Field Unit, Lake Louise, Alberta

Parks Canada. 2008. State of the Park Report: Banff National Park of Canada. Banff Field Unit, Banff, Alberta.

Parks Canada. 2010. Banff National Park of Canada Management Plan. Parks Canada, Gatineau, Quebec.

Parks Canada. 2011. Canadian Heritage River Monitoring Report
Athabasca River: 1999-2010, Jasper National Park of Canada, Jasper, Alberta

Sullivan, M. 2011. Status of the Pygmy Whitefish, *Prosopium coulterii* in Alberta, Draft 2, January 2011.

11.0 Further Contacts

Name	Position	Contact Information
David Cairns	Manager Aborginal Relations Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	250-343-6110 dave.cairns@pc.gc.ca
Shelley Humphries	Aquatics Specialist, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	250-343-6108 shelley.humphries@pc.gc.ca
Todd Keith	Land Use Planner, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	250-343-6101 todd.keith@pc.gc.ca
Caroline Marion	Townsite Manager, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	403-522-1205 caroline.marion@pc.gc.ca
Bill Leonard	Visitor Experience Manager, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	403-522-1206 bill.leonard@pc.gc.ca
Derek Petersen	Conservation Biologist, Lake Louise, Yoho and Kootenay Field Unit, Parks Canada	250-347-6171 derek.petersen@pc.gc.ca