A Brief Presentation To

The British Columbia Utilities Commission

For the Public Hearing On The

Kemano Completion Project

Prepared For

The Nechako Environmental Coalition

By

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(Sustainable Ecology & Evolution of Montane Ecosystems)

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Introduction

The Kemano Completion Project (KCP) proposes to remove most of the water (up to 88%) from the Nechako River. Envirocon (1984) has made predictions on the effect of that removal. Here we independently examine some of the same factors Envirocon (1984) examined and make predictions on the effect of Nechako River water removal.

Preservation of Biodiversity

A partial list of 159 birds and 48 mammals which presently use the habitats along the Nechako River appear in Tables 1 and 2. Those who, in our opinion, will be impacted by water flow reductions and other changes to their habitats resulting from KCP are starred. Those species that are expected to be severely impacted, so that population sizes decrease, received two stars. Those species that are endangered, threatened, sensitive, or vulnerable and expected to have reductions in population sizes due to waterflow reductions and other changes to their habitats have four stars. Each endangered, threatened, sensitive, or vulnerable species impacted by KCP can be viewed as being severely impacted since these species populations are already low from rareness, restricted distribution, habitat destruction, and the like, so that even a small change in their habitats, for only a few individuals can be devastating to the species population. Those species not expected to be at risk, or those enhanced from waterflow reductions or other habitat changes resulting from KCP, received no stars. It is clear from Tables 1 and 2 that contrary to Envirocon (1984), the preservation of biodiversity, in our opinion, will be highly at risk in the lower Nechako River Basin if KCP proceeds as planned.

Contrary to Envirocon (1984), in our opinion, a high risk of habitat loss for wintering moose, deer, and elk is inevitable. Water temperature, water volume, and vegetation along rivers are directly related to ungulate winter survival and these variables will all change to favor winter mortality, especially during cold spells in January when animals are already weak from the long winter. The predators that normally come to the river during winter (cougar, wolf, lynx, wolverine) will eventually decrease as their prey will no longer be concentrated along the river.

Habitat losses for many of these species will occur as oxbows, marshy areas, wet meadows, back channels, side channels, and other wet areas along the edge of the river begin to dry out without their normal seasonal replenishment from high water marks, subirrigation flows and flooding flows. It may take 5-20 years after KCP for some of these habitats to display noticeable, significant changes in water depths or vegetation distributions, but the changes will be ongoing and devastating. Many of these wet habitats will be

Table 1. **PARTIAL LIST OF BIRDS OF THE NECHAKO RIVER BASIN**
*Impacted by KCP; **Severely Impacted by KCP;
****Endangered, Threatened, Sensitive, or
Vulnerable, and Severely Impacted by KCP.

1) **Common Loon (Gavia immer)
2) ****Western Grebe (Aechmophorus occidentalis)
3) **Red Necked Grebe (Podiceps grisegena)
4) **Horned Grebe (Podiceps auritus)
5) **Eared Grebe (Podiceps nigricollis)
6) *Pied-Billed Grebe (Podilymbus podiceps)
7) ****American White Pelican (Pelecanus erythrorhynchos)
8) ****Great Blue Heron (Ardea herodias)
9) ****Trumpeter Swan (Cygnus buccinator)
10) **Tundra Swan (Cygnus columbianus)
11) **Canada Goose (Branta canadensis)
12) **Mallard (Anas platyrhynchos)
13) **Northern Pintail (Anas acuta)
14) **Gadwall (Anas strepera)
15) **American Wigeon (Anas americana)
16) **Northern Shoveler (Anas clypeata)
17) **Blue-Winged Teal (Anas discors)
18) **Green-Winged Teal (Anas crecca)
19) **Cinnamon Teal (Anas cyanoptera)
20) **Redhead (Aythya americana)
21) **Ring-Necked Duck (Aythya collaris)
22) **Canvasback (Aythya valisineria)
23) **Lesser Scaup (Aythya affinis)
24) **Barrow's Goldeneye (Bucephala islandica)
25) **Common Goldeneye (Bucephala clangula)
26) **Bufflehead (Bucephala albeola)
27) **Harlequin Duck (Histrionicus histrionicus)
28) **White-Winged Scoter (Melanitta fusca)
29) ****Surf Scoter (Melanitta perspicillata)
30) **Hooded Merganser (Lophodytes cucullatus)
31) **Common Merganser (Mergus merganser)
32) ****Northern Goshawk (Accipiter gentilis)
33) **Sharp-Shinned Hawk (Accipiter striatus)
34) ****Northern Harrier (Circus cyaneus)
35) **Red-Tailed Hawk (Buteo jamaicensis)
36) ****Swainson's Hawk (Buteo swainsoni)
37) **Golden Eagle (Aquila chrysaetos)
38) ****Bald Eagle (Haliaeetus leucocephalus)
39) **Osprey (Pandion haliaetus)
40) ****Peregrine Falcon (Falco peregrinus)
41) *Merlin (Falco columbarius)
42) *American Kestrel (Falco sparverius)
43) Blue Grouse (Dendragapus obscurus)
44) Spruce Grouse (Dendragapus canadensis)
45) **Ruffed Grouse (Bonasa umbellus)
46) *Sharp-Tailed Grouse (Tympanuchus phasianellus)
47) ****Sandhill Crane (Grus canadensis)
48) **Sora (Porzana carolina)
49) **American Coot (Fulica americana)
50) Killdeer (Charadrius vociferus)

51) **Greater Yellowlegs (Tringa melanoleuca)
52) **Lesser Yellowlegs (Tringa flavipes)
53) **Upland Sandpiper (Bartramia longicauda)
54) **Spotted Sandpiper (Actitis macularia)
55) **Common Snipe (Gallinago gallinago)
56) ****California Gull (Larus californicus)
57) **Herring Gull (Larus argentatus)
58) **Ring-Billed Gull (Larus delawarensis)
59) **Bonaparte's Gull (Larus philadelphia)
60) **Great Horned Owl (Bubo virginianus)
61) *Long-Eared Owl (Asio otus)
62) ****Short-Eared Owl (Asio flammeus)
63) *Snowy Owl (Nyctea scandiaca)
64) **Barred Owl (Strix varia)
65) **Great Gray Owl (Strix nebulosa)
66) *Boreal Owl (Aegolius funereus)
67) *Northern Saw-Whet Owl (Aegolius acadicus)
68) ****Northern Pygmy-Owl (Glaucidium gnoma)
69) Common Nighthawk (Chordeiles minor)
70) *Rufous Hummingbird (Selasphorus rufus)
71) **Belted Kingfisher (Ceryle alcyon)
72) *Common Flicker (Colaptes auratus)
73) **Pileated Woodpecker (Dryocopus pileatus)
74) *Yellow-Bellied Sapsucker (Sphyrapicus varius)
75) **Hairy Woodpecker (Picoides villosus)
76) **Downy Woodpecker (Picoides pubescens)
77) *Black-Backed Woodpecker (Picoides arcticus)
78) *Three-Toed Woodpecker (Picoides tridactylus)
79) **Western Kingbird (Tyrannus verticalis)
80) **Eastern Phoebe (Sayornis phoebe)
81) **Say's Phoebe (Sayornis saya)
82) **Alder Flycatcher (Empidonax alnorum)
83) ****Least Flycatcher (Empidonax minimus)
84) **Dusky Flycatcher (Empidonax oberholseri)
85) **Western Wood-Pewee (Contopus sordidulus)
86) **Olive-Sided Flycatcher (Contopus borealis)
87) ****Horned Lark (Eremophila alpestris)
88) **Barn Swallow (Hirundo rustica)
89) **Cliff Swallow (Hirundo pyrrhonota)
90) **Violet-Green Swallow (Tachycineta thalassina)
91) **Tree Swallow (Tachycineta bicolor)
92) **Bank Swallow (Riparia riparia)
93) **N. Rough-Winged Swallow (Stelgidopteryx serripennis)
94) **Stellar's Jay (Cyanocitta stelleri)
95) **Gray Jay (Perisoreus canadensis)
96) **Black-Billed Magpie (Pica pica)
97) **Common Raven (Corvus corax)
98) *American Crow (Corvus brachyrhynchos)
99) *Black-capped Chickadee (Parus atricapillus)
100) *Mountain Chickadee (Parus gambeli)
101) **Boreal Chickadee (Parus hudsonicus)
102) **American Dipper (Cinclus mexicanus)
103) *Red-Breasted Nuthatch (Sitta canadensis)
104) *Brown Creeper (Certhia americana)
105) *House Wren (Troglodytes aedon)

106) **Winter Wren (Troglodytes troglodytes)
107) **Long-Billed Marsh Wren (Cistothorus palustris)
108) *American Robin (Turdus migratorius)
109) Varied Thrush (Ixoreus naevius)
110) Townsend's Solitaire (Myadestes townsendi)
111) Swainson's Thrush (Catharus ustulatus)
112) **Veery (Catharus fuscescens)
113) *Mountain Bluebird (Sialia currucoides)
114) *Golden-Crowned Kinglet (Regulus satrapa)
115) **Ruby-Crowned Kinglet (Regulus calendula)
116) **Water Pipit (Anthus spinoletta)
117) *Bohemian Waxwing (Bombycilla garrulus)
118) *Cedar Waxwing (Bombycilla cedrorum)
119) ****Northern Shrike (Lanius excubitor)
120) *Solitary Vireo (Vireo solitarius)
121) **Red-Eyed Vireo (Vireo olivaceus)
122) ****Philadelphia Vireo (Vireo philadelphicus)
123) **Warbling Vireo (Vireo gilvus)
124) *Tennessee Warbler (Vermivora peregrina)
125) *Orange-Crowned Warbler (Vermivora celata)
126) **Yellow Warbler (Dendroica petechia)
127) *Magnolia Warbler (Dendroica magnolia)
128) ****Cape May Warbler (Dendroica tigrina)
129) Yellow-Rumped Warbler (Dendroica coronata)
130) Townsend's Warbler (Dendroica townsendi)
131) Blackpoll Warbler (Dendroica striata)
132) **Northern Waterthrush (Seiurus noveboracensis)
133) **Common Yellowthroat (Geothlpis trichas)
134) **MacGillivray's Warbler (Oporornis tolmiei)
135) *Wilson's Warbler (Wilsonia pusilla)
136) *American Redstart (Setophaga ruticilla)
137) **Yellow-Headed Blackbird (Xanthocephalus xanthocephalus)
138) **Red-Winged Blackbird (Agelaius phoeniceus)
139) *Rusty Blackbird (Euphagus carolinus)
140) *Brewer's Blackbird (Euphagus cyanocephalus)
141) **Western Tanager (Piranga ludoviciana)
142) **Evening Grosbeak (Coccothraustes vespertinus)
143) Purple Finch (Carpodacus purpureus)
144) *Pine Grosbeak (Pinicola enucleator)
145) **Common Redpoll (Carduelis flammea)
146) *Pine Siskin (Carduelis pinus)
147) *Red Crossbill (Loxia curvirostra)
148) *White-Winged Crossbill (Loxia leucoptera)
149) Savannah Sparrow (Passerculus sandwichensis)
150) ****Vesper Sparrow (Pooecetes gramineus)
151) Junco (Junco hyemalis)
152) Chipping Sparrow (Spizella passerina)
153) Clay-Colored Sparrow (Spizella pallida)
154) *White-Crowned Sparrow (Zonotrichia leucophrys)
155) *White-Throated Sparrow (Zonotrichia albicollis)
156) Fox Sparrow (Passerella iliaca)
157) *Lincoln's Sparrow (Melospiza lincolnii)
158) **Swamp Sparrow (Melospiza georgiana)
159) **Song Sparrow (Melospiza melodia)

Table 2. **PARTIAL LIST OF MAMMALS OF THE NECHAKO RIVER BASIN**
*Impacted by KCP; **Severely Impacted by KCP;
****Endangered, Threatened, Sensitive, or
Vulnerable, and Severely Impacted by KCP.

1) *Masked Shrew (Sorex cinerus)
2) Dusky Shrew (Sorex obscurus)
3) **Northern Water Shrew (Sorex palustris)
4) Pygmy Shrew (Mocrosorex hoyi)
5) **Little Brown Myotis (Myotis lucifugus)
6) ****Keen Myotis (Myotis keeni)
7) **Long-Eared Myotis (Myotis evotis)
8) **California Myotis (Myotis californicus)
9) **Silver-Haired Bat (Lasionycteris noctivagans)
10) **Big Brown Bat (Eptesicus fuscus)
11) ****Grizzly Bear (Ursus horribilis)
12) **Black Bear (Ursus americanus)
13) *Marten (Martes americana)
14) ****Fisher (Martes pennanti)
15) **Shorttail Weasel (Mustela erminea)
16) *Least Weasel (Mustela rixosa)
17) **Longtail Weasel (Mustela frenata)
18) ****Wolverine (Gulo luscus)
19) **River Otter (Lutra canadensis)
20) **Mink (Mustela vison)
21) Striped Skunk (Mephitis mephitis)
22) Coyote (Canis latrans)
23) **Gray Wolf (Canis lupus)
24) *Red Fox (Vulpes fulva)
25) **Cougar (Felis concolor)
26) *Lynx (Lynx canadensis)
27) *Bobcat (Lynx rufus)
28) *Woodchuck (Marmota monax)
29) Yellow Pine Chipmunk (Eutamias amoenus)
30) *Red Squirrel (Tamiasciurus hudsonicus)
31) **Northern Flying Squirrel (Glaucomys sabrinus)
32) **Beaver (Castor canadensis)
33) *Deer Mouse (Peromyscus maniculatus)
34) Bushytail Woodrat (Neotoma cinerea)
35) ****Northern Bog Lemming (Synaptomys borealis)
36) *Brown Lemming (Lemmus trimucronatus)
37) *Mountain Phenacomys (Phenacomys intermedius)
38) *Redback Vole (Clethrionomys gapperi)
39) *Meadow Vole (Microtus pennsylvanicus)
40) **Muskrat (Ondatra zibethica)
41) ****Meadow Jumping Mouse (Zapus hudsonius)
42) **Western Jumping Mouse (Zapus princeps)
43) *Porcupine (Erethizon dorsatum)
44) **Snowshoe Hare (Lepus americanus)
45) **Mule Deer (Odocoileus hemionus)
46) **Whitetail Deer (Odocoileus virginianus)
47) **Elk (Cervus canadensis)
48) **Moose (Alces alces)

eliminated altogether, since they are mostly shallow waters, already being maintained by natural flooding each season, or each decade.

Island habitats will decrease in size and become connected to the mainland to become continuous with the mainland. Predation will increase, migration patterns will change, ungulate calving grounds will loose their special habitat characteristics, and island habitats will become unusable by many species. Older islands will shift their vegetation patterns so that the patterns of nutrient flows, ecological succession, and habitat types will drastically change from pre-KCP natural patterns. The capability of the Nechako River to support many species will be severely diminished.

Ducks, geese, swans, sandhill crane, beaver, muskrat, mink, otter, flycatchers, shorebirds, swallows, sparrows, warblers, and others will experience devastating feeding and nesting habitat losses, and bats and predators will loose their primary food sources. The relationships between predators and prey will change causing elimination of some species and plagues from others. Contrary to Envirocon (1984), we find the evolutionary importance of the Nechako River riparian corridor critical for continued migration and survival of many species (World Wildlife Fund 1993).

Riparian life exists along the river as a direct consequence of water flowing on that river. Lower the water level, some life must also decrease because of the physical change. Envirocon and Alcan have failed to address the physical, structural, and biological complexities involved with water flow reductions.

Sustainability, Tourism, Economy, Deep Ecology

As wildlife species populations are reduced trapping, hunting, wildlife viewing, guiding, and the recreational value of wildlife will also be reduced. Wildlife Habitat Management Areas, bird sanctuaries and protected areas along the river will have habitat and recreational losses. Conventional economic models (GNP, GDP, input-output, multiple accounts) do not account for the long term loss of these resources, losses of species or habitat, because monetary values are difficult to calculate. However, it can be shown that the destruction by humans of the intrinsic value of nature can cause psychological feedback on societal values leading to depressed human beings and concomitant depressed socio-economy (Naess 1989). Additionally, conventional economic models show enhanced economies from natural disasters, and no losses from depletion of biodiversity even though long-term human survival depends on high biodiversity (Naess 1989). Sportfishing, boating, canoeing, camping, and other recreational activities will be severely reduced with low water levels. More than ¼ million visitors spend $50-100 million coming to the Nechako Valley each year, and 75% or more come for recreation, scenery, camping, fishing, wildlife

viewing (=97% Filion et al. 1983), and other activities (Ministry of Tourism 1988). However, long-term trapping, outfitting, guiding, sportfishing, wildlife-viewing, jet-boating, and other recreational losses are considered negligible by Envirocon (1984). We find these activities are much more important and the KCP-effects on them more devastating than Envirocon (1984) claims.

In our opinion, tourism and recreational uses of the Nechako River are sustainable year after year, and increase present land-use values of the region, whereas KCP makes the land-use values change in Alcan's favor, at the expense of the long-term, sustainable, public-use of these lands.

Vegetation, Soils, Climate, Agriculture, Geology

The diversity and distribution of aquatic plants will be changed with reduced flows. Some species (algae) will increase, others will decrease (rooted aquatics) in number and distribution. Concomitant upsets will exist for O_2 levels and the distribution and biomass of aquatic, benthic, and foliar invertebrates fed upon by fish and wildlife. The edge of the river will change its plant communities in the water and on the land. Shrub patches, stable cottonwood and aspen stands, and other riparian vegetation, used by a large variety of species (beaver, woodpeckers, grouse, deer, moose, etc.), will have their distributions entirely shifted. The age structure of plant communities and flow of nutrients will become unstable upsetting the phenological patterns of plants, and the patterns of energy flowing through the ecosystems (McLennan, 1990).

Changes will also occur in soils since they are formed from the vegetation. Soils that will be drying out will be more susceptable to wind, ice, and rain erosion. Grazing land, crop land, and soils along the river will become dryer so that productivity will be reduced. Rainfall patterns, dew patterns, and fog patterns will be upset, reducing the amount of water delivered to pastures, forests, farm crops, wetlands, soils, fields, and vegetation. Many riparian soil organisms along the length of the river that depend upon river moisture will be eliminated by water level changes along with the animals that prey upon them.

Fish Ecology, NFCP, Water Volume and Pollution

Life history changes or extinction will occur for sockeye and chinook salmon after KCP since the length of stream or effort needed for migration is associated with age and size of spawning and the number of viable eggs (Schaffer 1972, 1974). Effort needed for migration will increase with KCP as new objects (rocks, gravel bars) need negotiating with lower water levels. Water temperatures above 16°C begin to cause physiological problems with migrating salmon and other fish and can cause prespawning mortality in salmon (Brett 1971,

Beltz et. al. 1974, Cooper 1982). Therefore, we oppose arguments made throughout KCP documents accepting water temperatures above 20°C. Life history patterns will necessarily change for continued survival of salmon after KCP.

Physical habitats needed for rearing of young salmon and habitats for other fish species such as instream logs, brush piles, marshy edges, and side channels will all be reduced in number when water levels fall. Juvenile salmon need instream structures, specific substrate size, shallow backwaters and side channels to avoid fish predators but need deeper water to avoid aerial predators. Most of these needed habitats will be significantly changed or eliminated by KCP and will cost millions of dollars to restore. The Nechako Fisheries Conservation Program has experimented and planned to increase some instream structures to replace some of the fish habitats lost by KCP, but these studies only work on small scales for limited time periods, and with massive expenses (NFCP 1994). For example, in our opinion, thousands of structures costing $3-$5000 each will need annual replacements to maintain fish habitats after KCP, costing at least $25-50 million every year. That results in a $10-$30,000 cost for each returning chinook salmon. This absurd cost per fish will allow non-enforcement of the habitat management proposed by Alcan and NFCP.

Pollution from sewerage systems, pulpmills, municipal effluent, and agriculture pesticides will be absorbed by river water at a much lower rate since the amount of water, plants, microorganisms, and invertebrates needed to dilute these substances will be reduced or eliminated. The quality and quantity of well water will deteriorate and many wells along the river will dry up altogether.

Conclusion

Our data strongly oppose implementation of KCP. Additionally, the mitigation plans proposed to create lost fish habitat (NFCP 1994) will either fail or be so costly they will be unrealistic to execute. Our findings warn of an ecological disaster if KCP goes ahead as planned.

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