CANADIAN INTERMOUNTAIN JOINT VENTURE

IMPLEMENTATION PLAN
2020-2030

Columbia Valley National Wildlife Area/Andrew Huang

Canadian Intermountain Joint Venture

www.cijv.ca

VISION AND MISSION

Vision *The Canadian Intermountain region is a landscape that supports healthy populations of birds, maintains biodiversity and fosters sustainable resource use.*

Mission The partners believe in an approach to conservation that meets the economic needs of those living and working in this unique area. This is embodied in the mission statement: *Working together to maintain, enhance, restore and manage habitat for the benefit of wildlife and people in the Canadian Intermountain region*.

The CIJV Implementation Plan 2020-2030 was prepared by members of the PBHJV-BC and CIJV Science and Technical Committee, 2021.

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Cover Sidebar Photo: Long-billed Curlew/Alyssa Hollyoake

TERRITORIAL LAND ACKNOWLEDGEMENT

The Canadian Intermountain Joint Venture (CIJV) acknowledges that the lands on which we work are the traditional lands of many different Indigenous nations across British Columbia and Alberta. The act of acknowledging these lands, and the signed treaties where applicable, is an act of reconciliation with Indigenous peoples and expression of respect and gratitude for the land. This action is to remind us that our places of work, where we live and where we gather, are on the traditional lands of First Nations, Inuit and Métis people who historically resided here and still presently do. It is also a recognition that all of us are accountable to these relationships on a daily basis. The aims of the CIJV through this Implementation Plan involve the conservation, protection and enhancement of wildlife and habitat that directly impacts Indigenous communities. We acknowledge the need for meaningful consultation with Indigenous communities throughout the implementation of this plan.

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LIST OF ACRONYMS

ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
BBS	Breeding Bird Survey
BC	British Columbia
BCR	Bird Conservation Region
BMP	Beneficial Management Practices
CAD	Conservation Areas Database
CIJV	Canadian Intermountain Joint Venture
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DUC	Ducks Unlimited Canada
ECCC	Environment and Climate Change Canada
ENGO	Environmental Non-governmental Organization
EFP	Environmental Farm Plan
ERA	Ecoregional Assessment
GIS	Geographic Information System
HD	Human Dimensions
HS models	Habitat-Species Models
IP	Implementation Plan
IPCA	Indigenous Protected and Conserved Areas
MFLNRORD	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development
NABCI	North American Bird Conservation Initiative
NACP	Natural Area Conservation Plan
NAWCA	*North American Wetlands Conservation Act*
NAWMP	North American Waterfowl Management Plan
NCC	Nature Conservancy Canada
NTBC	Nature Trust of British Columbia
NTS	National Tracking System
NWA	National Wildlife Area
PBHJV	Pacific Birds Habitat Joint Venture
PECP	Pacific Estuary Conservation Program
PIF	Partners in Flight
SARA	*Species at Risk Act*
SARPAL	Species at Risk Partnerships on Agricultural Lands
USFWS	U.S. Fish and Wildlife Service
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

The Canadian Intermountain Joint Venture (CIJV) is a partnership between government and non-governmental organizations established to conserve breeding, staging and migratory bird habitats in the Canadian Intermountain regions of southern and central British Columbia (BC) and the Rocky Mountain portion of Alberta. The overall direction of the CIJV is determined and coordinated by a Steering Committee comprised of major partner representatives.

The Canadian Intermountain region is bounded by the Coast and Cascade Mountains to the west, the Rocky Mountains to the east, the international boundary to the south and the boreal forest to the north. The region covers almost 50% of the area of BC, and is one of the most ecologically diverse in Canada, with elevation rising from 200 metres to almost 4,000 metres above sea level.

Riparian forest and wetland habitat in the CIJV Columbia River Valley/K. Barry

This range in elevation and climatic conditions creates a tremendous diversity of habitat types including desert, grasslands, shrub-steppe, riparian, wetlands, dry and moist coniferous forests and alpine tundra. The most productive wetlands are found in fertile floodplain valley bottoms and grassland plateaus at mid and low elevations. The Canadian Intermountain region hosts significant proportions of Pacific Flyway duck, goose and swan populations at various stages of their life cycles, but is most important as breeding habitat. Twenty-four species of waterfowl breed in the CIJV with an estimated population of 1.45 million birds, representing 70% of the provincial waterfowl breeding population and roughly 4% of the breeding waterfowl population in Canada. The CIJV contains some of the most diverse breeding bird fauna in Canada—373 bird species have been recorded in the region. It also has the highest owl, woodpecker, swift and hummingbird diversity of any ecozone in Canada.

American Avocet/©Ducks Unlimited Canada

The CIJV partners identified 12 priority waterfowl species (Trumpeter Swan, 11 Duck Species) from various primary sources. The population objective for each species is based on "no net loss" in the breeding season and partners must conserve enough habitat to meet their needs during this time period. Seventy-two priority non-waterfowl species were also identified; Partners-in-Flight's (PIF) Avian Conservation Assessment Database (ACAD) was a critical source of information used in this prioritization process. Partners also identified four priority habitat types in CIJV: 1) freshwater wetlands, 2) wetland-associated uplands, 3) riparian forests and 4) grasslands. In general, these habitat types were selected due to their high potential to support the current populations of priority waterfowl and non-waterfowl species. Conservation activities are therefore focused on these habitat types.

Through a series of "Open Standards" workshops, CIJV partners co-developed a list of limiting factors for birds and bird habitat in the Canadian Intermountain region, and subsequently identified key strategies for 5- and 10-year objectives. These include habitat securement, restoration and management objectives to guide conservation actions in priority habitats and for the conservation of priority species. Human Dimensions objectives were also developed to address knowledge gaps related to private landowners, governments, general public, recreational users and Indigenous communities.

CIJV partners use several conservation planning tools and models to direct management actions and investments, including the Regionally Significant Wetland Areas in BC, Ducks Unlimited Canada's (DUC) Waterfowl Priority Areas and Conservation Plans, Nature Conservancy of Canada's (NCC) Conservation Planning System and the Nature Trust of BC's (NTBC) Relative Ecological Assessment. CIJV partners will continue to evaluate progress through various habitat and population monitoring programs. To complete the adaptive management cycle, data analysis and tracking will then further refine conservation planning tools to better inform strategies and investment decisions.

CHAPTER 1 – OVERVIEW OF THE CANADIAN INTERMOUNTAIN JOINT VENTURE

INTRODUCTION

The Canadian Intermountain Joint Venture (CIJV) is an "all-bird" habitat joint venture that primarily targets the habitat needs of breeding, staging and migrating birds. Located in the Interior of British Columbia (BC) and the Rocky Mountain portion of Alberta (**Figure 1**), the CIJV was formally established in 2003 as a partnership of government agencies, Indigenous groups, non-governmental conservation organizations, universities, industry and landowners. Despite this recent provenance, the CIJV was built on a foundation of many years of cooperative conservation activities among its major partners.

In addition to conserving waterfowl and wetlands as part of the North American Waterfowl Management Plan (NAWMP), the CIJV addresses the challenges of sustaining healthy populations of other bird groups as well, including shorebirds, landbirds and waterbirds. The CIJV facilitates and augments existing conservation initiatives and partnerships in the Province, and complements adjacent Joint Ventures (e.g., Pacific Birds Habitat Joint Venture, Intermountain West Joint Venture) to conserve shared bird populations.

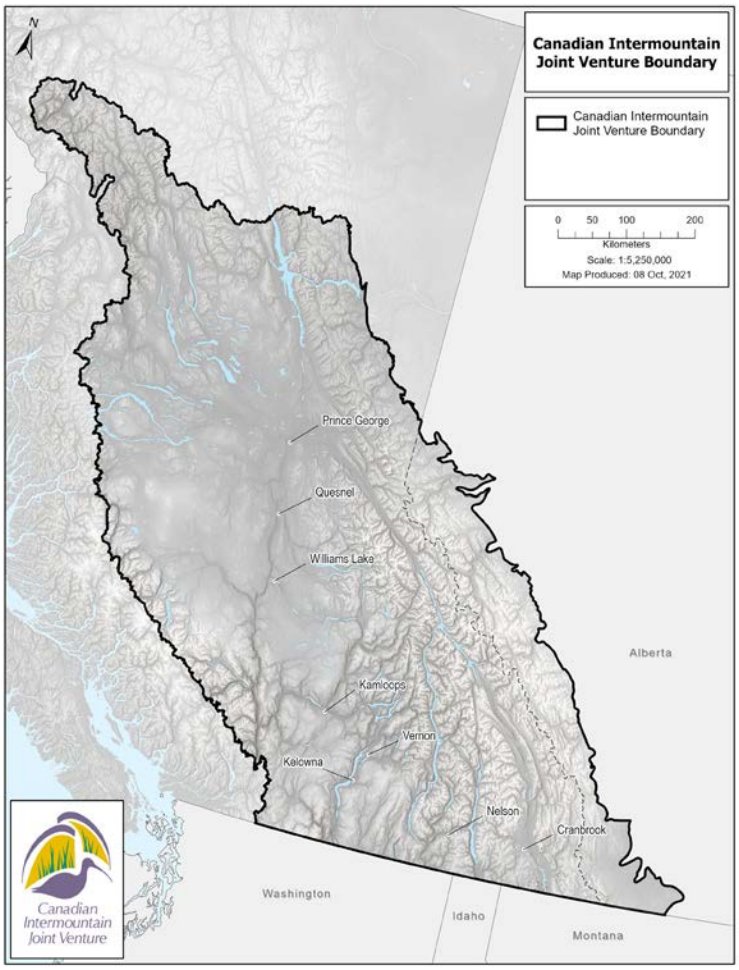

Figure 1. CIJV boundary

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Vision *The Canadian Intermountain region is a landscape that supports healthy populations of birds, maintains biodiversity and fosters sustainable resource use.*

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HISTORY

When the CIJV was established in November 2003, it joined NAWMP's network of 21 habitat-based and 3 species-based Joint Ventures stretching across Canada and the United States and dozens of regional partnerships in Mexico. As NAWMP's first "all-bird" Joint Venture, the CIJV united government agencies, Indigenous groups, non-governmental conservation organizations, universities, industry and landowners, to build on existing and ongoing cooperative conservation work.

The partners came together in 2003 to produce the CIJV Prospectus, which outlined the biological foundation of the Joint Venture (CIJV 2003). Over its 18-year lifespan, the CIJV has been receptive to guidance proposed by the NAWMP Plan Committee, refocussing its efforts towards program evaluation and adaptive management after a continental assessment was conducted in 2005. Updates to the CIJV Implementation Plan and Prospectus have empowered partners to engage in conservation activities that address renewed priorities. In recent years, the CIJV has also shifted its focus towards landowner engagement to promote wildlife-friendly management practices on private lands.

The formation of the CIJV has been an important step in addressing some of the major threats facing bird populations in the BC Interior. The loss of wetland habitat due to development, agriculture and ranching was greatest in the late 1800s and early 1900s, but impacts continue as the region's human population continues to grow and rely heavily on resource-based industries. These, together with disturbances from poorly managed recreational uses, often infringe upon wildlife habitat and influence the sustainability of bird populations. Other prominent issues, such as wildfires, Mountain Pine Beetle, climate change and strain on water quality and supply, highlight the need for CIJV landowner stewardship activities. The implementation of the CIJV ensured greater protection of bird populations from these threats, while continuing to advance pre-existing conservation initiatives and partnerships. The CIJV has established greater habitat connectivity for migratory birds by complementing adjacent Joint Ventures, such as the Pacific Birds Habitat Joint Venture and the Intermountain West Joint Venture; these partnerships are instrumental in sustaining the region's rich biodiversity.

Accomplishments

Since 2003, CIJV partners have secured, enhanced or supported stewardship on nearly 400,000 hectares (1 million acres) (**Table 1**), and developed a strong science foundation. The majority of financial contributions have come from Canadian non-profit organizations (37%), followed by the U.S. government (24%) and U.S. non-federal sources (11%) (**Table 2**). Much of the CIJV's funding is from the *North American Wetlands Conservation Act* (NAWCA). The Act provides a mechanism to leverage funds with non-federal U.S. funds as well as Canadian funding.

According to the Canadian NAWMP National Tracking System (NTS), as of December 2020, over $100 million CAD has been invested in the CIJV since its launch in 2003. This total, which includes both cash and in-kind contributions, has resulted in 146,444 hectares (361,871 acres) secured for birds and other wildlife. Over 82,508 hectares (203,881 acres) have subsequently been restored and 155,755 hectares (384,878 acres) of habitat managed to improve their ecological value. In addition to securing high priority habitat areas and conducting site-specific restoration and enhancement, the CIJV engages with resource and agricultural sectors, provides stewardship education and outreach and influences legislation, policy and planning. While the NTS does not provide a spatial depiction of the areas conserved by CIJV partners in BC, it is a mechanism for all Joint Ventures in Canada to broadly track their investments under various NAWMP initiatives and activities.

Table 1. CIJV partner conservation accomplishments (2003-2020)				
Activity	**Expenditures ($)**	**Percentage of Amount Invested (%)**	**Hectares**	**Acres**
Communications & Education	1,064,412	1.03	n/a	n/a
Conservation Planning	5,299,963	5.12	n/a	n/a
Habitat JV Science	2,632,823	2.55	n/a	n/a
Habitat Retention-Medium (10-99 years)	1,577,609	1.53	23,808	58,831
Habitat Retention-Permanent	62,630,112	60.54	122,636	303,040
Habitat Retention-Short Term (<10 years)	1,696,073	1.64	20,600	50,904
Land & Water Policy	104,667	0.10	n/a	n/a
Management (Habitat Assets)	15,632,665	15.11	155,755	384,878
Upland Restoration	2,396,895	2.32	68,008	168,051
Wetland Restoration	10,410,908	10.06	14,500	35,830
Total	**103,446,127**		**405,307**	**1,001,534**

Source: Canadian NAWMP National Tracking System

ADMINISTRATIVE STRUCTURE

The CIJV's activities are coordinated by a Steering Committee that includes representatives from its major partners. The CIJV Steering Committee is currently chaired by a representative from Environment and Climate Change Canada (ECCC). ECCC also supports the partnership by funding and housing a CIJV Coordinator to coordinate activities.

Table 2. CIJV partner contributions (2003-2020)		
Source	**Contributions ($)**	**Percentage of Contributions (%)**
Canadian Federal Government	9,208,317	9.89
Canadian Provincial & Territorial Governments	3,067,533	3.30
Canadian Regional & Local Governments	1,298,791	1.40
Canadian Non-profit Organizations	34,064,700	36.59
Canadian Corporations	7,319,134	7.86
Canadian Educational Institutions	3,000	0.003
Canada-Private	5,038,954	5.41
U.S. Federal Government	22,357,978	24.02
U.S. Non-federal Sources	10,729,341	11.53
Total	**93,087,748**	

Source: Canadian NAWMP National Tracking System

CHAPTER 2 – THE CIJV LANDSCAPE AND DESCRIPTION OF THREATS

LANDSCAPE/HABITAT CHARACTERIZATION AND ASSESSMENT

The Canadian Intermountain region is bounded by the Pacific Coast and Cascade Mountains to the west, the Rocky Mountains to the east, the international boundary to the south and the Western Boreal Forest to the north (**Figure 1**). The region covers almost 50% of BC's total area, as well as the Rocky Mountains of Alberta. It is one of the most ecologically diverse regions in Canada, with elevation rising from 200 metres to almost 4,000 metres above sea level. This range in elevation and climatic conditions creates a tremendous diversity of habitat types including desert, grasslands, shrub-steppe, riparian, wetlands, dry and moist coniferous forests and alpine tundra (**Figure 2**). It is estimated that 55% of the area is forested, 9% is covered by open grasslands and over 4% is comprised of freshwater bodies and wetlands (**Figure 2; Table 3**). The most productive wetlands are found in fertile floodplain valley bottoms and grassland plateaus at mid and low elevations. The remaining area contains other non-forested habitat (including urban, agriculture, alpine, rock and ice).

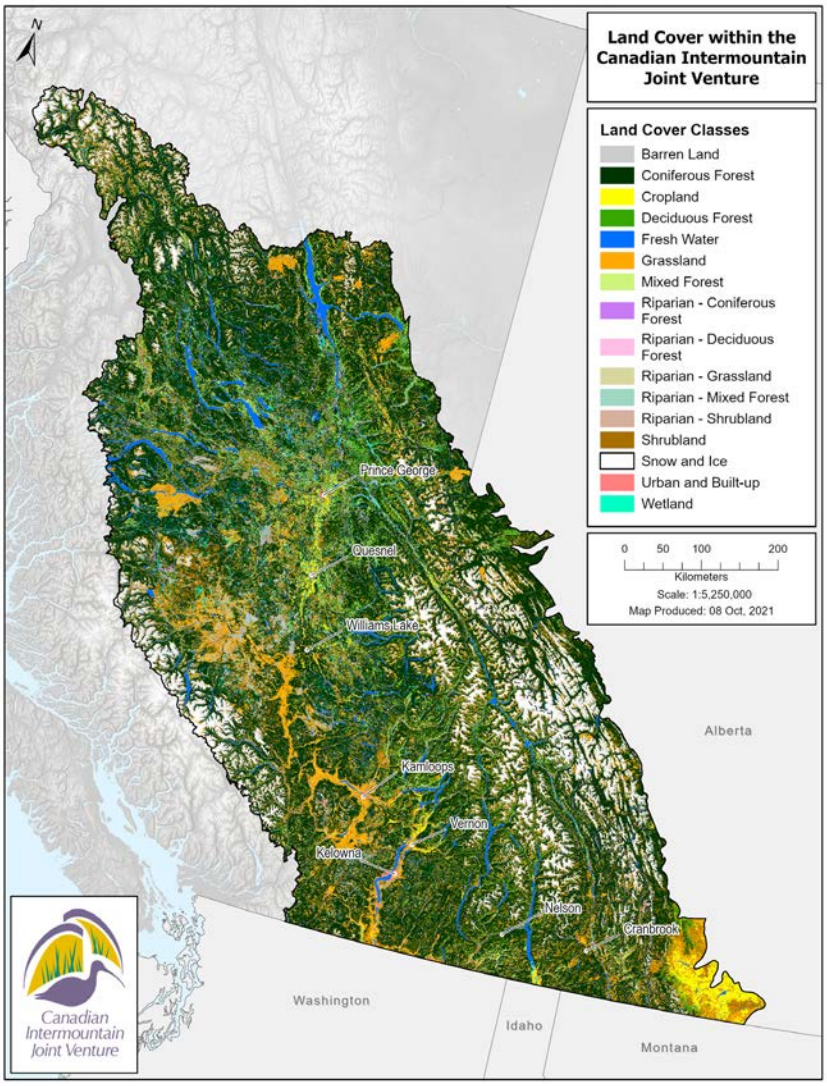


Figure 2. CIJV land cover types

Ecological Setting

As a result of the range of habitats found within the CIJV, varying in elevation from 200 metres to almost 4,000 metres above sea level, the region contains some of the most diverse breeding bird communities found anywhere in Canada. Three hundred and seventy-three bird species have been recorded. Of this number, 254 species are known to have bred in the area, while 83 species occur regularly during migration and/or in winter (CIJV 2016).

The region has the highest owl, woodpecker, swift and hummingbird diversity of any ecozone in Canada, and hosts significant proportions of Pacific Flyway duck, goose and swan populations at various stages of their life cycles. In addition to its importance to birds, the Canadian Intermountain region has diverse range of other taxa with over 1,500 species of native vascular plants, 43 species of native freshwater fish, 29 species of amphibians and reptiles and 94 species of native terrestrial mammals (CIJV 2016).

The Canadian Intermountain region is also a managed 'working' landscape that sustains growing human populations. Resource-based industries, including agriculture, ranching, forestry, mining, tourism and recreation, form the economic foundation of most communities within the CIJV. The cumulative activities that support local and regional economies and urban communities can have a profound influence on bird and other wildlife populations.

Table 3. Land cover types within the CIJV (BC and AB portions)

Land Cover Type	Area (ha)	Percentage
Barrenland	1,817,840	20.53%
Coniferous Forest	4,333,566	48.94%
Cropland	3,022	0.03%
Deciduous Forest	141,159	1.59%
Fresh Water	263,875	2.98%
Grassland	852,372	9.63%
Mixed Forest	247,950	2.80%
Riparian: Coniferous Forest	143,613	1.62%
Riparian: Deciduous Forest	8,211	0.09%
Riparian: Grassland	14,555	0.16%
Riparian: Mixed Forest	18,609	0.21%
Riparian: Shrubland	17,435	0.20%
Shrubland	497,680	5.62%
Snow and Ice	376,863	4.26%
Urban and Built-up	12,537	0.14%
Wetland	105,703	1.19%
Total	**8,854,991**	**100.00%**

This Implementation Plan's land cover data for coniferous, deciduous and mixed forests, grasslands, crop lands, barren lands, urban and built-up areas and snow and ice areas is derived from the 2015 Commission for Environmental Cooperation (CEC) Land Cover Map. The land cover data has a spatial resolution of 30 metres. Additional grassland data from the Grassland Conservation Council (GCC) was used, derived at a scale of 1:20,000 using the most up-to-date imagery as of 2015. Land cover classes were defined using the Land Cover Classification System developed by the Food and Agriculture Organization (FAO) of the United Nations. The wetland and water classes, the latter of which lumps together lakes, rivers, bays, channels and manmade waterbodies, were drawn from the BC Government 1:20,000 Freshwater Atlas (developed using aerial photography). All of these datasets represent a snapshot in time.

Despite the somewhat patchwork approach for estimating habitat structure at the CIJV scale, the partners are satisfied that it represents the best available data.

PRIORITY HABITAT TYPES

The CIJV partners have identified four priority habitat types:

1) freshwater wetlands
2) wetland-associated uplands
3) riparian forests
4) grasslands

In general, these habitat types were selected due to their high potential to support current populations of priority waterfowl species (**Chapter 3**) as well as non-waterfowl species (**Chapter 4**). Conservation activities—whether it be land acquisition, restoration, enhancement and/or stewardship—should therefore be focused on these habitat types to benefit the priority species. For details on how the habitat types were defined, see **Appendix 1**.

Freshwater Wetlands

Chilanko Marsh/©Ducks Unlimited Canada

Wetlands cover over 105,703 hectares (261,198 acres), or about 1.2% of the CIJV's land mass. The highest densities of wetlands are found at low and middle elevations in the Central Interior of BC. Wetlands are proportionately rarer in the Southern Interior, and the lowest densities of wetlands are found in mountainous terrain.

Wetlands occur in eight different biogeoclimatic zones in a variety of sizes and forms. Wetlands commonly found in the drier Bunchgrass and Interior Douglas-fir zones and, to a more limited extent, in the Ponderosa Pine zone are represented by cattail or bulrush marshes, willow-dominated fens and saline meadows or ponds dominated by Alkali Saltgrass. Wetlands within the Bunchgrass zone typically occur within agricultural landscapes or livestock ranges (grazed grassland or grazed open dry forest), with some wetlands adjacent to urban development. Due to commonly steep terrain in the Interior Cedar-Hemlock and Montane Spruce zones, wetlands in these regions are typically restricted to small fens, bogs and Skunk Cabbage swamps within forested landscapes. The most abundant wetlands are found in the forested landscapes of the Sub-Boreal Pine-Spruce and Sub-Boreal Spruce zones. Wetland communities here are dominated by Scrub Birch, willow and several sedge species. Many of the wetlands of the Sub-Boreal Pine-Spruce zone are managed for hay production or grazing. The most productive wetlands are found in the fertile floodplain valley bottoms and grassland plateaus at mid and low elevations.

Ponderosa Pine/Darcy Henderson

Wetland-associated Uplands

Wetland-associated uplands include agricultural land, grassland, shrubland and deciduous, coniferous and mixed forests within a 300-metre buffer of a wetland. Adjacent land use and/or management is a critical component of wetland conservation. Houlahan et al. (2006) showed that in wetlands where forest cover was reduced on adjacent lands at a distance of 250-300 metres, plant species richness was significantly lower. The composition of bird communities can also be drastically altered by forest and vegetation loss around wetlands. Morisette et al. (2019) demonstrated that species that depend on forest cover responded negatively to agricultural conversion within 500 metres of a wetland. Similarly, Alsfeld et al. (2010) also found that avian diversity increased with forest area within 5,000 metres from a wetland. In that context, wetland functions can be impaired not only by modification of the wetland itself, but also by adjacent land use. The conservation of both wetlands and adjacent uplands will therefore have the greatest benefit for the bird species that depend on these habitats.

Riparian Forests

Riparian forests occur throughout the CIJV, from low-elevation floodplains to high mountain streams, grasslands and dry forest landscapes, to moist coniferous and cold subalpine forests. Although they account for a small proportion of the CIJV's land mass (1.9%), the density of coniferous and deciduous trees and their proximity to water accounts for their disproportionately high use by birds, particularly in arid regions.

Riparian forest in the South Okanagan Wildlife Management Area/ Matthias Bieber

In general, lowland riparian forests tend to be associated with low-velocity flows, gentle topography and wide floodplains. These riparian areas are highly productive and tend to have complex vegetative structures. In grasslands, riparian areas may be the only source of trees and snags, providing habitat for many species

such as cavity-nesting birds that would otherwise not be present. In the drier grasslands and Ponderosa Pine/Douglas-fir woodlands, riparian areas are characterized by tree species such as Hybrid Spruce, Water Birch and Black Cottonwood on floodplains, along with willow swamps and cattail, bulrush and alkaline marshes.

In addition to the large number of species that regularly use riparian habitats, several aquatic and landbird species are highly dependent on these areas for nesting, foraging and as migratory corridors. Critical attributes of these habitats include aquatic habitat, a dense shrub understory and large diameter trees and snags, especially Black Cottonwood.

Grasslands

Chilcotin Grassland/K. DeGroot

The CIJV contains almost 90% of BC's grasslands (Wikeem and Wikeem 2004). Grasslands cover only 9.6% of the CIJV landscape (**Table 3**). While more than 90% of the CIJV is publicly owned provincial Crown land, private ownership of lowland grasslands is disproportionately high. Nearly half of the grasslands in the CIJV (44%) are privately owned. Private ownership is particularly high in the Okanagan Valley (50%, which includes First Nation Reserves) and the Southern Thompson Upland (70%).

Within the CIJV, grasslands and other herbaceous habitats are found along valley bottoms, and associated benches of the Kootenay, Kettle, Okanagan, Similkameen, Thompson, Nicola, Chilcotin and Fraser Rivers. They are located almost entirely within the Bunchgrass, Ponderosa Pine and Interior Douglas-fir biogeoclimatic zones. Small, localized grasslands can occur in other biogeoclimatic zones where factors such as steep slopes, aspect and soil conditions prevent tree establishment. BC's grasslands are the northernmost extension of the Palouse Prairie bunchgrass and shrub-steppe which occupies the northern intermountain region of the United States. Most grasslands in the CIJV are hot and dry, are characterized widely spaced shrubs (e.g., Big Sagebrush and Common Rabbit-brush, bunchgrasses Bluebunch Wheatgrass, Rough Fescue) and often have a well-developed cryptogram crust.

KEY THREATS AND HABITAT TRENDS

Declining bird populations have been well-documented across North America, most notably the publication by Rosenberg et al. (2019): *Decline of the North American Avifauna*. The study quantified for the first time the total decline in bird populations in the United States and Canada, and revealed an alarming net loss of 2.9 billion breeding adult birds since the 1970s. The declines were found across almost all major biomes, including western forest—the major biome found in the CIJV—which showed a 29% decrease in overall bird abundance (the third steepest decline after boreal forest and grassland). In addition, 64% of bird species in the western forest are in decline. The major cause of bird declines is habitat loss, particularly due to agricultural intensification and urbanization. Other factors include domestic cats acting as predators, bird/window collisions and a decline in insects due to overuse of pesticides across the landscape. The study calls for a radical shift in conservation strategies.

During a joint CIJV and Pacific Birds Habitat Joint Venture technical committee workshop held in February 2020, partners developed a list of key threats and limiting factors for the priority habitat types. These habitats were subsequently ranked based on severity, duration, persistence and extent of negative impact. As a result, the following overarching threats were identified for the CIJV region.

Residential and Commercial Development

Wetland ecosystems, lakes, other water features and herbaceous habitats that occur in low-lying areas suitable for agriculture and settlement are subject to many stressors associated with human activities. Draining or infilling wetlands located near human developments (urban or industrial areas, roadways, etc.), or in areas suitable for agriculture, results in permanent loss. The CIJV region experienced extensive wetland habitat loss in the late 1800s and early 1900s, particularly in valley bottoms where development has been intense. For example, since 1800, 63% of Black Cottonwood/Red-osier Dogwood forests and 92% of Water Birch/Red-osier Dogwood riparian forests in the Okanagan Valley have been lost (Lea 2008). The growth in

population and subsequent settlement expansion continue to encroach on remaining wetlands, reducing their abundance and often significantly decreasing their quality and carrying capacity—this encroachment is negatively impacting adjacent upland habitats as well. Human populations are expected to continue to increase, particularly in BC's Southern Interior.

A lack of replicated inventory data means that trends in wetland abundance are not well documented for much of the CIJV. There is some regional information which documents large historic losses in some areas, such as the South Okanagan (Lea 2008) and the Columbia Valley (BC Commission on Resources and the Environment 1994). Compared to historic losses, the rate of wetland loss has likely decelerated in recent years due to a general slowing of agricultural expansion and recognition of the value of stable long-term water supplies that wetlands provide.

BC's grasslands have undergone extensive urbanization and agricultural development. European settlers were drawn to the grasslands as they provided a forage supply for livestock, had great potential as farmland and often had a steady supply of water from nearby rivers. Developments grew around these earliest-settled areas, and even today, many towns and cities in the CIJV are centered around grasslands. Losses of historic grasslands to agricultural conversion and urban/industrial development have been substantial, and vary from a low of 5.2% in the Cariboo-Chilcotin area, to a massive 43% in the Okanagan Valley (GCC 2015). In the Okanagan Valley, historical mapping indicates that since 1800, urban, rural and agricultural development has resulted in the loss of 33% of big sagebrush shrub-steppe, 68% of Antelope Brush-needle-and-thread Grass and 77% of Idaho Fescue-Bluebunch Wheatgrass ecosystems (Lea 2008). These losses continue today and are particularly intense in the Okanagan and Thompson Valleys. Ongoing updates to the GCC Grassland Mapping Project are needed to track trends. Finer scale mapping of agriculture is also needed; fallow fields, hayfields and pastures that may provide habitat value to grassland birds may be undergoing losses from more intensive forms of agriculture, such as row crops, orchards and vineyards (Lea 2008). Recent analysis showed that 1,565 hectares (3,867 acres) of grassland has been lost in BC since 2015, of which 830 hectares (2,051 acres) was due to forest encroachment in the Southern Interior (Zhang et al. 2021).

Climate Change and Severe Weather

Climate change is expected to have widespread and severe impacts on wetlands throughout the CIJV. Models predict that for the period up to the 2050s, winter minimum and summer maximum temperatures will continue to rise, snowpacks will continue to decrease, despite increased winter precipitation, and glaciers will continue to lose volume (Rodenhuis et al. 2007; Murdock et al. 2007).

A predictive model for wetland response in central and southern BC indicates that wetlands will decline in area and number, and small or shallow wetlands at low elevations will dry the most (Bunnell et al. 2010). In addition to the drying trend, changes in water levels on ponds and lakes (e.g., increases in spring flooding, more pronounced summer drawdowns) may impact habitat quality and flood, strand or expose waterbird nests. For instance, Bunnell et al. (2011) showed that the ratio of September water depth to May water depth in wetlands at Riske Creek—where high densities of breeding waterfowl are found in BC—has decreased significantly since 1997. Likewise, using remote-sensing, Hopkinson (2021) found that wetlands in the upper Columbia River changed from permanent waterbodies during 1984-2002 to seasonally inundated during 2003-2019. While the long-term effects of climate change are expected to be profound on wetland-obligate birds, Drever and Clark (2007) found no evidence that increases in spring temperatures alone negatively affected the nest success of breeding ducks, such as Mallard, Northern Pintail, Blue-winged Teal, Northern Shoveler and Gadwall.

Non-Compatible Agriculture

Development and non-compatible agriculture are the greatest threats to grassland and shrub-steppe birds. BC's grasslands are limited in extent and have already lost a significant portion of their area to agriculture and urban/suburban development. Losses are ongoing, as more habitat in the valley bottom continues to be subdivided and developed or converted to intensive forms of agriculture, including row crops, orchards and vineyards.

Poorly managed cattle grazing can degrade grassland and shrub-steppe habitat by reducing ground cover, removing litter and altering vegetative structure and species composition. Overgrazing has enabled the establishment and spread of many invasive plant species, some of which have become dense, persistent stands over wide areas. While range health has generally improved since the mid-1900s, many areas of grassland and shrub-steppe remain in an early seral stage and in poor range condition due to ongoing intense grazing pressure (Lea 2008). Excessive use of riparian areas by livestock can

degrade or completely remove vegetation through grazing, browsing and trampling. In addition to removing vegetation, cattle can trample and flatten banks, widen streams and make them shallower. Grazing can also limit the recruitment of young trees in riparian areas—this means that old, established trees are not replaced when they die. Cattle are typically attracted to, and linger in, riparian areas due to the presence of water, shade, palatable forage and gentler terrain. Their attraction is more pronounced in arid areas, such as dry Ponderosa Pine or Douglas-fir forests, grasslands and shrub-steppe, where intact riparian areas are often of great ecological value. However, careful management of cattle access to riparian areas and controlling the grazing timing (e.g., riparian fencing), amount and frequency can maintain the health of riparian areas and allow degraded areas to recover.

Fire and Fire Suppression

Fire is critical to the maintenance of grasslands—recurrent fires sustain grassland-forest ecotones and prevent forest encroachment. Fire also prevents the ingrowth of shrubs, such as Big Sagebrush and Common Rabbit-brush, and the subsequent conversion of grassland to shrub-steppe. Frequent small fires allow the grassland to develop as a mosaic of successional stages, increasing the diversity of habitats for grassland plants and animals.

Prescribed burns, like this one pictured at Creston Valley, BC, help regenerate grasslands./©Ducks Unlimited Canada

The frequency of grassland fires in the CIJV was greatly reduced after European settlement because of a combination of excessive grazing (which reduced fuel loads) and active fire suppression. Substantial forest ingrowth and grassland habitat loss has been documented, with some areas losing 20-40% of their grassland cover in as little as 40-50 years. While there are no range-wide estimates on the effects of fire suppression on overall grassland habitat availability, there is no doubt that forest encroachment contributes to significant local losses. In contrast, wildfires in BC and across Canada are becoming increasingly intense and lasting longer in duration. In 2017, 1.2 million hectares (3.0 million acres) burned in BC, 10 times the 10-year average. In 2018, the area burned broke the record at 13,000 square kilometers, prompting the government to extend a provincial state of emergency (Li 2019). Increases in both intensity and frequency of forest fires are known to negatively impact canopy-nesting birds—in particular nesting foliage gleaners and pine seed consumers (Latif et al. 2016).

Dam and Water Management / Use

Water extraction to irrigate hay or other crops can dramatically change wetland hydrology and nutrient flow. In addition, damming and flood control measures have already significantly altered the hydrology of many lakes and rivers in the CIJV. Large hydroelectric dams in particular, have resulted in wetland loss in the CIJV by flooding significant amounts of valley-bottom aquatic habitat, such as the Columbia Valley (Utzig and Schmidt 2011). Alterations to stream flow can also result from Mountain Pine Beetle infestation (Wehner and Stednick 2017) and salvage logging. Further, with the increasing cost of compliance with water licensing and dam safety regulations, maintaining managed wetlands on the landscape has become increasingly more challenging. Increases in human water use will only exacerbate the impacts of water regulation and climate change on natural hydrological cycles and the quality of wetland, lake and riparian habitats.

Other Key Threats and Bird Groups of Conservation Concern

For many landbirds, in addition to direct habitat loss across breeding, wintering and migration stopover habitats, cat predation and bird-window collisions are major contributors to population declines—these are the two main causes of human-related bird mortality in North America. In Canada alone, an estimated 140 million birds are killed by cats (Calvert et al. 2013), with an additional 16-42 million birds killed via window strikes (Machtans et al. 2013) every year.

Birds exposed to pesticides in agricultural settings results in direct mortality, depression in energy expenditure, rapid weight loss and/or disorientation during migration (Eng et al. 2019; English et al. 2021). Grassland bird populations have collectively declined by 53% (or 720 million individual birds) across North America since 1970, making them one of the fastest and most consistently declining groups (Rosenberg et al. 2019). Many of these species found in the CIJV, like Brewer's Sparrow, Sage Thrasher, Burrowing Owl, Long-billed Curlew and Upland Sandpiper, are grassland or shrub-steppe obligates and face myriad

of stressors including pesticide exposure and habitat loss and degradation (CIJV 2016). Aerial insectivores similarly have been dwindling across North America since 1980. These population declines are likely driven by the cumulative effects of several threats, including broad-scale ecosystem modifications and widespread pesticide use affecting prey abundance and impacting the insect community at a continental scale. The common diet of this diverse group of species suggests that their decreasing population trends are attributed to the reduction in insect prey availability across their breeding, migratory or wintering ranges (Nebel et al. 2020; Hallmann et al. 2014; Imlay et al. 2018; Smith et al. 2015).

ASSESSING THE CONSERVATION ESTATE

The high biological value and increasing vulnerability of the Canadian Intermountain region has long been recognized. Many organizations, working alone and in partnerships, have invested significant resources and time in conservation efforts across the region. Conservation achievements include a range of habitat acquisitions, protection and stewardship programs, development and implementation of strategies and tools to guide conservation efforts and communications and outreach programs.

Conservation Areas Database

CIJV and PBHJV partners have collaborated for a number of years as part of the British Columbia Nongovernmental Organization (BC NGO) Conservation Areas Database (CAD) Working Group to develop a comprehensive, standardized inventory of BC's NGO areas (also known as private conservation lands). These areas include properties designated as Fee Simple, Registerable Interests and Unregisterable Interests and complement the inventories created by federal and provincial governments for federal and provincial protected areas. The BC NGO CAD is a province-wide database consisting of spatial boundaries and attributes, and allows for the precise and accurate tracking of JV conservation areas. NGO conservation areas where full title is held by a conservation organization ("fee simple") as of 2019 are included in the Canadian Protected and Conserved Areas Database (CPCAD) to allow for national reporting.

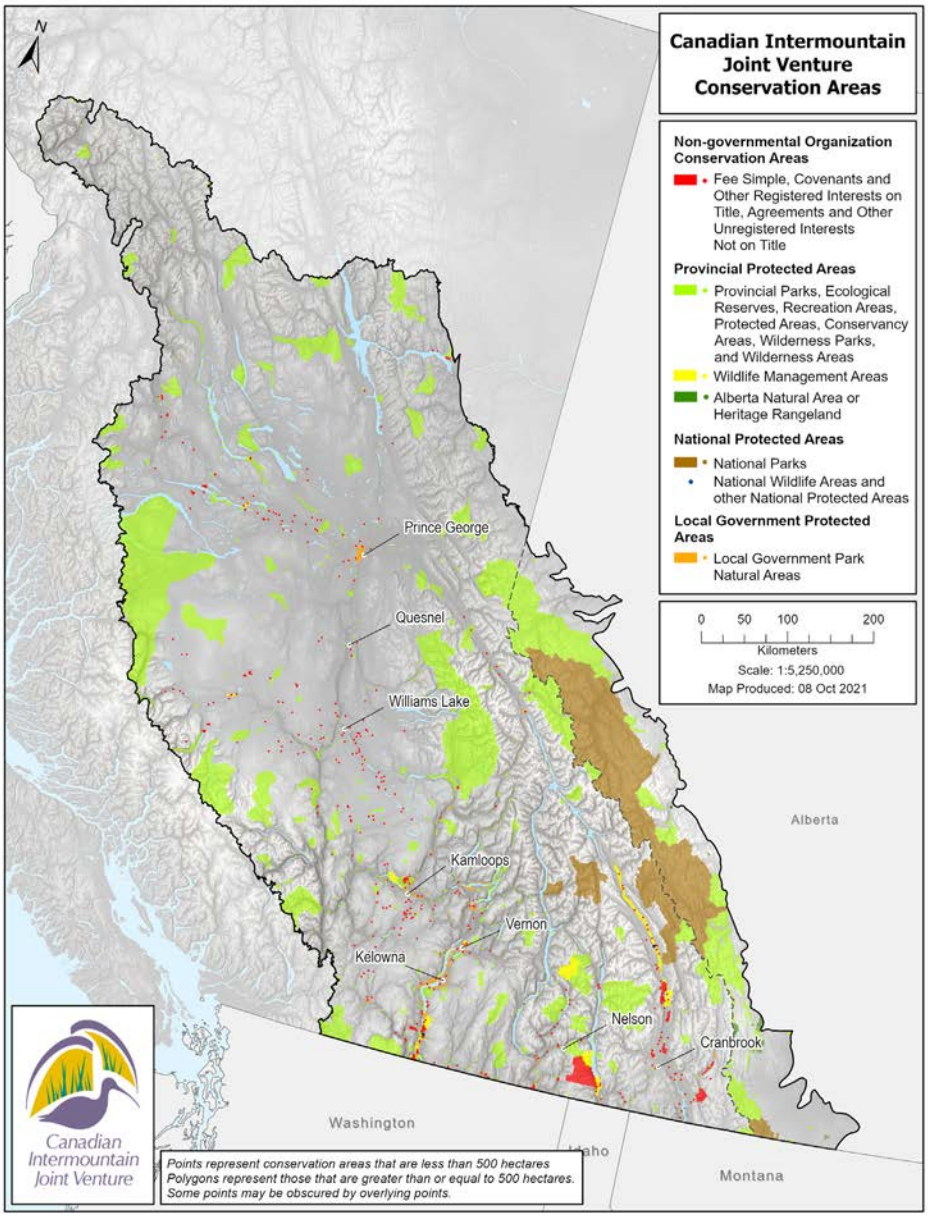


Figure 3. CIJV conservation areas

Since 2013, CIJV partners have produced a yearly summary report outlining the full conservation estate of BC. The summary includes lands owned by non-governmental organizations (for full list, see **Appendix 2**), National Wildlife Areas, provincial protected areas (e.g., provincial parks, conservancies), provincial Wildlife Management Areas, National Parks and the undeveloped portions of municipal and regional government parks. A large majority of the conservation estate within the CIJV is made up of various types of provincial designations (**Figure 4**). The remaining lands are made up of federal designations, local government park natural areas and NGO securements. While the NGO-protected lands in particular, represent a small overall percentage of the conserved landscape in CIJV, they consist of numerous smaller properties and often protect features of very high ecological significance. Overlaying the government and NGO conservation areas with a land cover dataset in a GIS yields the hectare breakdown by category (**Table 4**). The total area in the CIJV designated for conservation purposes is 8.9 million hectares (22 million acres); this equates to 17.8% of the land base protected in the JV, which is higher than the percentage of protected areas in all of BC (**Table 4**).

Partners have recently improved the functionality of the CAD so the area conserved can be tracked over time for most securement types, by including information on the date of securement with each parcel. Currently, securement data information is available for national protected areas (National Parks and National Wildlife Areas), some provincial protected areas and NGO categories (fee simple acquisitions, encumbrances and land-use agreements). There is currently spatial

Table 4. All conservation areas in the CIJV (pre-2004-December 2020)

	CIJV		Province of BC	
Conservation Area Type	*Area Conserved (Hectares)*	*% of JV Landbase Protected*	*Area Conserved (Hectares)*	*% of BC Landbase Protected*
Federal				
National Park	2,287,656	4.59%	614,187	0.62%
National Wildlife Area or Other National Protected Areas	1,806	<0.01%	1,159,618	0.00%
Provincial				
Provincial Park, Protected Area, Ecological Reserve, Recreation Area, Conservancy Area, Wilderness Park or Wilderness Area	6,323,157	12.68%	14,132,747	14.45%
BC Wildlife Management Area	92,005	0.18%	253,656	0.24%
Alberta Natural Area and Heritage Rangeland	26,695	0.05%	0	0.00%
BC Local Government				
LGPNA[1] Regional District	4,041	0.01%	42,137	0.04%
LGNPA Municipality	6,347	0.01%	33,593	0.04%
BC Non-Government Organizations[2]				
NGO Fee Simple	101,447	0.20%	115,504	0.12%
NGO Registerable Interest	13,738	0.03%	22,233	0.02%
NGO Unregisterable Interest[3]	63,815	0.13%	90,045	0.09%
Total[4]	**8,874,682**	17.80%	**45,898,301**	15.52%

1 LGPNA = Local Government Park Natural Area
2 NGO lands within the Albertan NWFM Planning Area have not been included in this analysis
3 This area value contains some uncertainty as it contains values sourced directly from Ducks Unlimited Canada and may change as geometries for these securements are refined within the BC NGO Conservation Areas Database. Only those Unregistered Interests of 10-year term or longer have been included in the database.
4 As there can be more than one Conservation Area Subtype with interest in a conservation area, summing the area values for all conservation tenure types would lead to an overvaluation in the total conserved area. The "Total" area values remove the overvaluation and reflect the true conserved area. Total area values may change as uncertainty is reduced for NGO Unregisterable Interests.

Data Sources: BC Gov DataBC; Canadian Protected and Conserved Areas Database; BC Non-governmental Organizations Conservation Areas Database

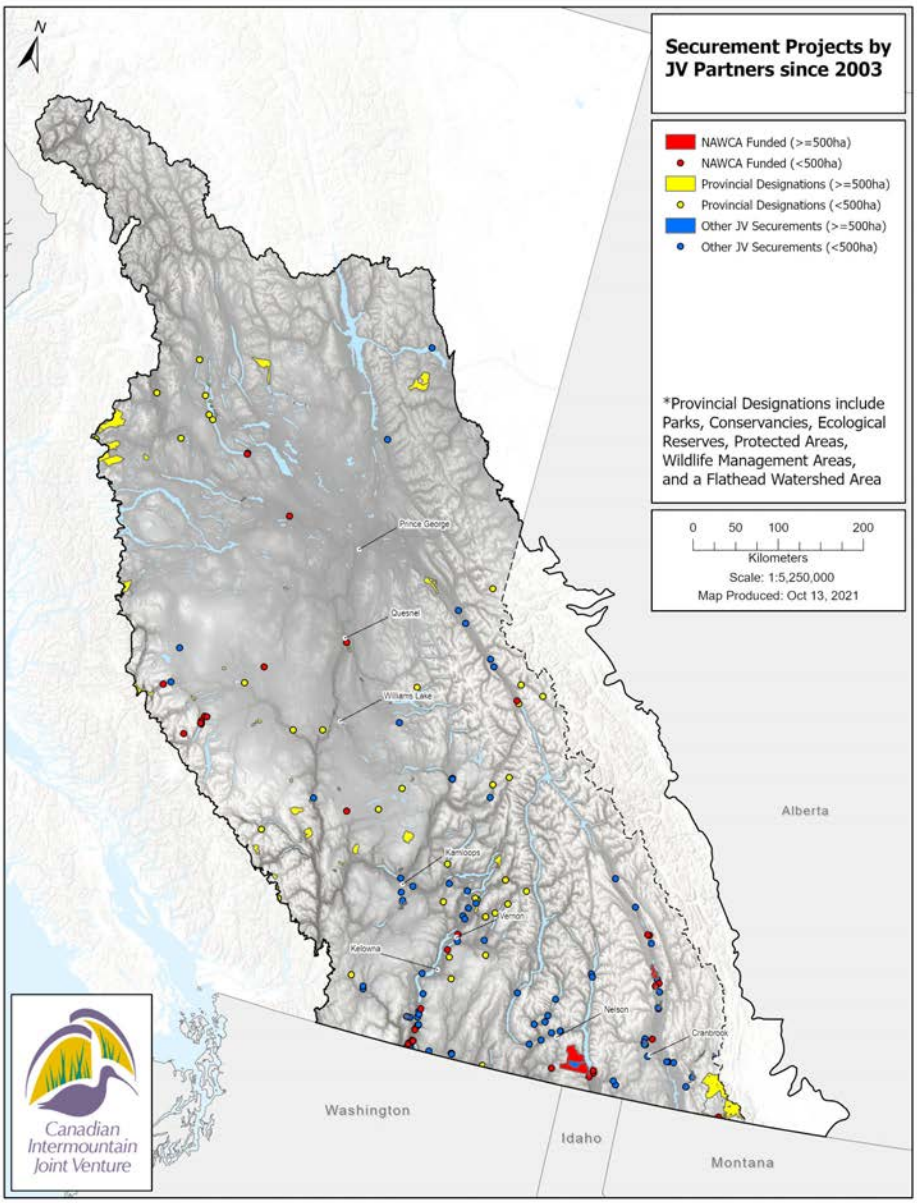


Figure 4. Securement Projects in the CIJV

Note that no federal designations were secured after 2003

data showing PBHJV and CIJV properties secured by JV partners from the commencement of the JV which also includes features such as *North American Wetlands Conservation Act*- (NAWCA) funded projects and landcover (**Figure 4; Table 5**). Currently, three of the partners (DUC, NCC and NTBC) are the recipients of grants under NAWCA. The use of NAWCA funding is dictated solely by the individual grantees and monies must be used for the benefit of wetlands and waterfowl according to the terms of the grant agreements.

Table 5. Land cover types (hectares) on CIJV properties secured since 2003

CIJV Priority Habitat Type*	NAWCA Funded	Provincial Designations**	Other JV Securements
Freshwater Wetlands	958	7,058	274
Wetland Associated Uplands	7,856	46,102	2,207
Riparian	1,465	13,569	1,239
Grasslands	14,439	40,093	5,602

* No federal designations after 2003
** Provincial designations include: Parks, Conservancies, Ecological Reserves, Protected Areas and Wildlife Management Areas

CHAPTER 3 – PRIORITY WATERFOWL SPECIES

The Canadian Intermountain region hosts significant proportions of Pacific Flyway duck, goose and swan populations at various stages of their life cycles, but is most important as breeding habitat. Twenty-four species of waterfowl breed in the CIJV with an estimated population of 1.45 million birds, representing 70% of the provincial waterfowl breeding population and roughly 4% of Canada's breeding waterfowl population.

The significance of the CIJV to over-wintering, moulting and staging ducks is poorly understood. However, it is believed that several million birds stage in the region during spring migration and prior to moving to southern wintering areas in the western United States. Thousands of waterfowl are also believed to over-winter on the large lakes in southern BC.

Barrow's Goldeneye/©Ducks Unlimited Canada

PRIORITY WATERFOWL SPECIES

In 2010, priority waterfowl species were identified based on four sources of information:

1) Minimum "high" continental or breeding importance/need in the 2004 NAWMP Implementation Framework (NAWMP 2004)
2) Ranked as 1-3 in any of the first three goals of the Province of BC's Conservation Framework
3) Declining or suspected declining population trend from the BC Central Interior Breeding Waterfowl Helicopter Survey (2006-2009)
4) Of special interest due to the proportion of their continental population breeding locally

The CIJV supports 20-25% of the world's breeding population of Barrow's Goldeneye, over 15% of the continental breeding population of Hooded Merganser, 5% of the continental breeding population of Ruddy Duck and 1-2% of the continental population of Mallard.

Note that although the CIJV supports 5-10% of the world's breeding population of Harlequin Duck, the species is not a CIJV priority due to its dependence on high-elevation streams which are not considered to be at high risk and are not a conservation priority at this time.

In this document the population trend assessment (Number 3 above) was updated to incorporate data up to 2019 with the following additional considerations:

5) Meets threshold for inclusion in NAWMP 2012 Map of Areas of Continental Significance to Waterfowl
6) Population status and habitat conservation actions can be linked (i.e., can conservation benefit their frequented habitat?)

On the basis of numbers 5 and 6, two species were removed from the 2010 list: Cinnamon Teal and Gadwall (**Table 6**).

Table 6. CIJV priority waterfowl

Order	Family	Priority Waterfowl Species	Priority Habitat Type			
			Freshwater Wetlands	*Wetland-Associated Uplands*[1]	*Grasslands*	*Riparian Shrub/ Forest*[2]
Waterfowl	Swans	Trumpeter Swan	x			
	Ducks	American Wigeon	x	x		
		Barrow's Goldeneye	x			x
		Bufflehead	x			x
		Green-winged Teal	x	x		
		Hooded Merganser	x			x
		Lesser Scaup	x			
		Mallard	x	x		
		Redhead	x			
		Ring-necked Duck	x			
		Ruddy Duck	x			
		White-winged Scoter	x			

1 Upland habitats, such as meadows, grass fields and shrubs, within 1 kilometre of a freshwater wetland or small lake (<50 hectares), provide nesting opportunities for three priority species of ground-nesting waterfowl
2 Riparian forests, such as deciduous aspen or poplar, provide nesting opportunities for three priority species of cavity-nesting waterfowl

POPULATION ESTIMATES AND OBJECTIVES

Table 7 shows population estimates and objectives for priority waterfowl species. The CIJV goal is to maintain the current average breeding population of 1.45 million waterfowl. This represents the most current estimate of the CIJV breeding population, of which Mallard are the most abundant (14%).

The population objective for each species is based on "no net loss" in the breeding season and partners must conserve enough habitat to meet their needs during this time period, with the assumption that migration needs will be accounted for by the same habitat program. Other Joint Venture approaches to setting objectives were considered (Petrie et al. 2011). The CIJV lacked the data to use the more common 'historical baseline' approach (Sanderson 2006), and believe the level of information justified this 'status quo' approach. This objective is assumed to reflect near-historic (e.g., 1970s) population levels for most species and habitats except for agricultural and urban landscapes where habitat losses and degradation have been the most severe since the 1970s. Although waterfowl populations are assumed to be at near-1970s levels in rangelands, they are likely at lower numbers compared to historic levels due to the land-use practices that began in the mid-1800s. These objectives have not yet been explicitly captured in the NAWMP continental population objectives (NAWMP 2018).

Table 7. Population objectives and trends for CIJV priority waterfowl species

Priority Species	Breeding Population Estimate[1,2]
American Wigeon	120,000
Barrow's Goldeneye	60,000
Bufflehead	186,000
Green-winged Teal	80,000
Hooded Merganser	50,000
Lesser Scaup	50,000
Mallard	200,000
Redhead	50,000
Ring-necked Duck	140,000
Ruddy Duck	30,000
Trumpeter Swan	2,850
White-winged Scoter	5,000

1 Waterfowl population objectives are based on "no net loss" and therefore, population objectives are set to equal to current breeding population estimates as of 2019

2 Data sources: BC May Cooperative Ground Surveys, BC Waterfowl Breeding Population Survey of the Central Interior Plateau and Campbell et al. 1990

Estimates were derived from current or historic aerial and ground surveys that have been modeled at the landscape level, bird atlases, published (McKelvey and Munro 1983; British Columbia Waterfowl Technical Committee 1989) and unpublished literature on waterfowl distribution, abundance and status and expert opinion.

LIMITING FACTORS FOR WATERFOWL

Waterfowl population abundance in the CIJV is primarily limited by breeding habitat rather than by staging and wintering habitat values. The extent to which various components of waterfowl breeding habitat are limiting (e.g., water levels, invertebrate productivity, nesting habitat) is unclear, as is the understanding of the most limiting elements of the breeding cycle (e.g., nesting success, duckling survival).

Overall, wetland availability and productivity for waterfowl are the most important predictors of breeding waterfowl abundance. Observations on past DUC marsh restoration projects suggest that wetland quality characteristics (e.g., productivity and condition) are more limiting than wetland quantity (Biological Services Group 1990). But given the diversity in CIJV habitats and landscape types, the underlying factor may not be constant. Many mid- and higher-elevation habitats in the CIJV are still relatively unaltered, and helicopter survey observations indicate that quality limitations may be natural for many wetlands, perhaps due to factors such as the length of the 'ice-off' season and low food abundance (Gunnarsson et al. 2004). Conversely, on more productive lower elevation wetlands, quality limitations are more likely a function of anthropogenic factors such as cattle grazing (Marty 2005).

Not all species are necessarily limited by the same elements of breeding habitat. For example, in the Riske Creek area, wetland nitrogen content was found to be a determinant of wetland selection for Green-winged Teal (Paquette and Ankney 1996), although the authors did not examine the quality of adjacent nesting areas in wetland selection. Research in the same area found that density-dependent factors (such as the availability of cavity nesting sites) were limiting for Barrow's Goldeneye (Boyd et al. 2009). Annual survival rates of adults and ducklings were relatively high (e.g., 60% or greater), indicating that the permanent waterbodies used by these birds post-nesting were less of a limitation for this species.

Waterfowl hunting within the CIJV is relatively low. However, harvest rates on CIJV waterfowl can be high for birds wintering along the Pacific Coast, and the majority of waterfowl populations in the CIJV mix at the Flyway level. For Mallard, harvest rates are assumed to be similar to the rest of the Pacific Flyway. Other potential limiting factors, such as disease and environmental contaminants, are assumed to have minor impacts on regional waterfowl populations (Breault 2021).

CHAPTER 4 – PRIORITY NON-WATERFOWL SPECIES

The CIJV has some of the most diverse breeding bird fauna in Canada—373 bird species have been recorded in the Canadian Intermountain region (CIJV 2016). The region has the highest owl, woodpecker, swift and hummingbird diversity of any ecozone in Canada. The CIJV is also host to a high number of Species at Risk birds in Canada. Of the 75 bird species, subspecies, or populations listed under the *Species at Risk Act* as Endangered, Threatened or Special Concern, 21 occur in the CIJV. Five of these species (Flammulated Owl, Lewis' Woodpecker, Western Screech-Owl, White-headed Woodpecker, Williamson's Sapsucker) occur nowhere else in Canada.

Non-waterfowl bird species were categorized based on the *2019 State of Canada's Birds* report (NABCI Canada 2019) into the following seven groups:

1) Forest Birds
2) Birds of Prey
3) Aerial Insectivores
4) Grassland Birds
5) Shorebirds
6) Wetland Birds
7) Other Birds (includes species found in urban and shrub habitats)

PRIORITY NON-WATERFOWL SPECIES

All birds were originally prioritized at the Bird Conservation Region (BCR) level for the CIJV Prospectus in 2003. In the Prospectus, priority species were grouped under general habitat categories and, for each species, the nature and level of conservation threat (e.g., habitat loss or degradation, change in water regimes, weed invasion) was assessed.

In this Implementation Plan, non-waterfowl priority species were identified using a wide range of existing information for species found in BCRs 9 and 10 which encompasses the approximate geographic area as the CIJV-BC. In an effort to better align with Partners in Flight's (PIF) overall conservation strategies, the prioritization process relied heavily on species-specific information drawn from PIF's 2020 Avian Conservation Assessment Database (ACAD), including population trends, action codes and continental/regional importance. The ACAD was a critical source for the data used in Rosenberg et al. (2019), the renowned study that showed an alarming decline of 2.9 billion birds across North America since the 1970s. As such, the CIJV's selected list of non-waterfowl priority species is part of a larger effort to address these significant, continental-wide losses of birds and bird habitat. The resulting priority list contains a total of 72 species occupying a wide array of habitat types, from freshwater wetlands to montane pine forests.

The process of selecting the list of non-waterfowl priority bird species was conducted as follows:

- Step 1: Extract the list of BCRs 9 and 10 bird species from the 2020 PIF Avian Conservation Assessment Database (ACAD).
- Step 2: Include only species with meaningful occurrence in the BC portion of the CIJV, based on eBird records and distribution maps from Birds of the World.
- Step 3: Include all species federally listed as a Species at Risk (Special Concern, Threatened, Endangered or Extirpated).
- Step 4: Include all species with a PIF Action Code of either Critical Recovery, Immediate Management or Management Attention.
- Step 5: For species with a PIF Action Code of Planning and Responsibility, include only if the species meets one of the following criteria: a) designated as a Common Bird in Steep Decline by PIF; b) is on the PIF Watchlist (red or yellow) or c) has >50% of continental distribution found in BC (either breeding or wintering). In addition, Planning and Responsibility species with threats that CIJV partners have little to no influence on are excluded.

Through this process, a list of 72 priority species for all bird groups in all habitats across the CIJV was developed (**Table 8**). The majority of priority species identified were forest birds, totaling 30 species (42%). This is unsurprising as many passerines occupy forested habitats in the CIJV, and Passeriformes is the largest order of birds and among the most diverse orders of terrestrial vertebrates. In addition, many forest-dwelling birds have undergone steep population declines (Rosenberg et al. 2019), including Cassin's Finch, Rufous Hummingbird, Evening Grosbeak and Olive-sided Flycatcher, and therefore are on PIF's list of species of high conservation concern. Wetland birds were the second most prominent group (13%), followed by grassland birds (9%) and aerial insectivores (8%).

Rufous Hummingbird/Gordon Hatusupy

Of the 72 priority non-waterfowl species, some are resident species found year-round in the montane coniferous forests (e.g., Evening Grosbeak), while others are neotropical long-distance migrant species, breeding in the valley-bottoms of Interior BC and wintering in Mexico or even further south in Brazil (e.g., Bank Swallow, Grasshopper Sparrow). For some species, Southern BC encompasses the northern periphery of their continental distribution (e.g., Yellow-breasted Chat, Williamson's Sapsucker).

In terms of conservation status, 20 species (35%) are federally listed as a Species at Risk, including Sage Thrasher, Bank Swallow and Bobolink. Fourteen species are on the PIF Watchlist, including Calliope Hummingbird (Red Watchlist) and Cassin's Finch (Yellow Watchlist). Common Birds in Steep Decline include many forest and grassland birds such as Western Wood-Pewee, Least Flycatcher and Horned Lark.

Table 8. List of CIJV non-waterfowl priority species, their associated bird group and Conservation Action as defined by Partners in Flight Action Codes		
Species Name	**Bird Group**	**Conservation Action**
Black Swift	Aerial Insectivores	Immediate Management / Recovery Objectives
Common Poorwill	Aerial Insectivores	Management Attention
Northern Rough-winged Swallow	Aerial Insectivores	Management Attention
Common Nighthawk	Aerial Insectivores	Management Attention / Recovery Objectives
Bank Swallow	Aerial Insectivores	Planning and Responsibility / Recovery Objectives
Barn Swallow	Aerial Insectivores	Recovery Objectives
American Kestrel	Birds of Prey	Management Attention
Northern Goshawk	Birds of Prey	Management Attention
Northern Harrier	Birds of Prey	Management Attention
Peregrine Falcon	Birds of Prey	Recovery Objectives
Townsend's Warbler	Forest Birds	Immediate Management
Lewis's Woodpecker	Forest Birds	Immediate Management / Recovery Objectives
Cassin's Finch	Forest Birds	Management Attention
Golden-crowned Kinglet	Forest Birds	Management Attention
MacGillivray's Warbler	Forest Birds	Management Attention
Mountain Chickadee	Forest Birds	Management Attention
Pine Siskin	Forest Birds	Management Attention
Red Crossbill	Forest Birds	Management Attention
Red-naped Sapsucker	Forest Birds	Management Attention
Rufous Hummingbird	Forest Birds	Management Attention
Varied Thrush	Forest Birds	Management Attention
Veery	Forest Birds	Management Attention
Willow Flycatcher	Forest Birds	Management Attention
Black-throated Gray Warbler	Forest Birds	Management Attention
Evening Grosbeak	Forest Birds	Management Attention / Recovery Objectives
Olive-sided Flycatcher	Forest Birds	Management Attention / Recovery Objectives
White-headed Woodpecker	Forest Birds	Management Attention / Recovery Objectives
Williamson's Sapsucker	Forest Birds	Management Attention / Recovery Objectives
Blackpoll Warbler	Forest Birds	Planning and Responsibility
Calliope Hummingbird	Forest Birds	Planning and Responsibility
Least Flycatcher	Forest Birds	Planning and Responsibility
Wilson's Warbler	Forest Birds	Planning and Responsibility
Hammond's Flycatcher	Forest Birds	Planning and Responsibility
Band-tailed Pigeon	Forest Birds	Planning and Responsibility / Recovery Objectives
Flammulated Owl	Forest Birds	Planning and Responsibility / Recovery Objectives
Rusty Blackbird	Forest Birds	Planning and Responsibility / Recovery Objectives
Western Screech-Owl	Forest Birds	Recovery Objectives

Table 8. *Continued*		
Species Name	**Bird Group**	**Conservation Action**
Vaux's Swift	Forest Birds / Aerial Insectivores	Management Attention
Western Wood-Pewee	Forest Birds / Aerial Insectivores	Management Attention
Lesser Yellowlegs	Forest Birds / Shorebirds	Planning and Responsibility
Sharp-tailed Grouse	Grassland Birds	Immediate Management
Bobolink	Grassland Birds	Immediate Management / Recovery Objectives
Vesper Sparrow	Grassland Birds	Management Attention
Short-eared Owl	Grassland Birds	Management Attention / Recovery Objectives
Horned Lark	Grassland Birds	Planning and Responsibility
Grasshopper Sparrow	Grassland Birds	Planning and Responsibility / Recovery Objectives
Barn Owl	Grassland Birds	Recovery Objectives
Burrowing Owl	Grassland Birds	Recovery Objectives
Long-billed Curlew	Grassland Birds / Shorebirds	Management Attention
Yellow-breasted Chat	Other Birds	Recovery Objectives
Brewer's Sparrow	Other Birds	Management Attention
Chipping Sparrow	Other Birds	Management Attention
White-tailed Ptarmigan	Other Birds	Management Attention
Sage Thrasher	Other Birds	Management Attention / Recovery Objectives
Brewer's Blackbird	Other Birds	Planning and Responsibility
American Avocet	Shorebirds	Management Attention
Killdeer	Shorebirds	Management Attention
Wilson's Phalarope	Shorebirds	Management Attention
Red-necked Phalarope	Shorebirds	Recovery Objectives
Black Tern	Wetland Birds	Immediate Management
American Bittern	Wetland Birds	Management Attention
American Coot	Wetland Birds	Management Attention
American White Pelican	Wetland Birds	Management Attention
Belted Kingfisher	Wetland Birds	Management Attention
Black-crowned Night-Heron	Wetland Birds	Management Attention
Clark's Grebe	Wetland Birds	Management Attention
Forster's Tern	Wetland Birds	Management Attention
Yellow-headed Blackbird	Wetland Birds	Management Attention
Yellow Rail	Wetland Birds	Management Attention / Recovery Objectives
California Gull	Wetland Birds	Planning and Responsibility
Western Grebe	Wetland Birds	Planning and Responsibility / Recovery Objectives
Horned Grebe	Wetland Birds	Recovery Objectives

NON-WATERFOWL OBJECTIVES

For this Implementation Plan, population objectives were not set for priority non-waterfowl species. Instead, conservation actions were determined by adopting the Action Codes determined by PIF for each species:

- IM (Immediate Management): Conservation action is needed to reverse or stabilize significant, long-term population declines in species where lack of action may put species at risk of extirpation.
- MA (Management Attention): Management or other on-the-ground conservation actions are needed to reverse or stabilize significant, long-term population declines where threats are moderate, or to reverse high threats in species that are not currently experiencing steep long-term declines.
- PR (Planning and Responsibility): Long-term planning actions are needed to ensure that sustainable populations are maintained in regions with high responsibility for these species.

Black Tern fledgling/©Ducks Unlimited Canada/Bruce Harrison

For any species listed under the federal *Species at Risk Act* (SARA), in addition to the PIF Action Codes, conservation actions also include recovery objectives stated in Recovery Strategies or Management Plans, when available. See **Chapter 7** for overall CIJV strategies and delivery.

CHAPTER 5 – HABITAT CONSERVATION DESIGN

CONSERVATION PLANNING TOOLS AND MODELS

CIJV partners use several conservation planning tools to direct management actions and investments to address the limiting factors affecting waterfowl and other bird species. Some tools have been developed by independent organizations and shared with the partners, while other tools have been developed cooperatively (**Table 9**).

Table 9. Summary of CIJV conservation planning tools and models

Decision Tool	Purpose
Regionally Significant Wetland Areas in BC	Prioritizes areas with regional and continental significance for waterfowl, as well as areas with wetlands and associated uplands that hold high ecological values for birds.
Helicopter-derived Habitat Suitability Breeding Model	A waterfowl breeding population survey is conducted via helicopter in the Central Interior Plateau and two ecosections in the East Kootenay. The Habitat Suitability models are extrapolated to develop waterfowl population estimates according to the amount of wetland, river and stream habitat available in each ecosection.
Ducks Unlimited Canada (DUC) Waterfowl Priority Areas and Conservation Plans	Prioritizes areas with highest waterfowl values and highest habitat loss to secure foraging habitat. Sets habitat-specific objectives.
Nature Conservancy of Canada (NCC) Conservation Planning System	A three-phase conservation planning system used by NCC to identify the highest-priority areas for conservation and to guide conservation actions.
Nature Trust of British Columbia (NTBC) Relative Ecological Assessment	A spatial evaluation of provincial ecological values that form seven criteria used by NTBC to identify the highest priority properties for conservation. One of the seven criteria focuses on wetlands.

Regionally Significant Wetland Areas

Regionally Significant Wetland Areas are updates to broad planning areas used in previous JV Implementation Plans and augmented with recent new information (**Figure 5**). The inputs include:

- "Areas of Continental Significance to Waterfowl" – contain wetlands and associated uplands that meet continental waterfowl population thresholds and have been used in NAWMP planning since 2012.
- "Areas of Regional Significance to Waterfowl" – contain wetlands and associated uplands that CIJV partners have identified as supporting regionally significant waterfowl populations and/or have documented high historic wetland loss in BC.
- "Thompson-Nicola ecosection" – contains high ecological values for waterfowl and connects the Okanagan with the Cariboo-Chilcotin region.
- "Pacific Estuary Conservation Program Ranked Estuaries" – include Classes 1, 2 and 3 out of a possible 5, based on various ecological and physical parameters as well as documented waterbird populations.

While the actual number of birds using any individual wetland within these broad areas will vary depending on site conditions, generally wetlands and their associated uplands (grasslands, trees, shrubs, riparian vegetation, etc.) in these areas have higher use by wetland birds than other areas in the CIJV. Wetlands and their associated uplands form complexes that support wetland birds but also many other species of wildlife, including species at risk. A high percentage of migratory birds and other wildlife in BC rely on wetlands and associated uplands for all or part of their life cycle, and therefore conservation of these habitats by CIJV partners have multiple enduring benefits.

CIJV partners target the majority of their conservation efforts and funding into these broad planning areas in order to have the greatest benefit to waterfowl and other wetland species. However, conservation opportunities outside of these areas are considered on a case-by-case basis to allow for sites with exceptional local ecological values to be included.

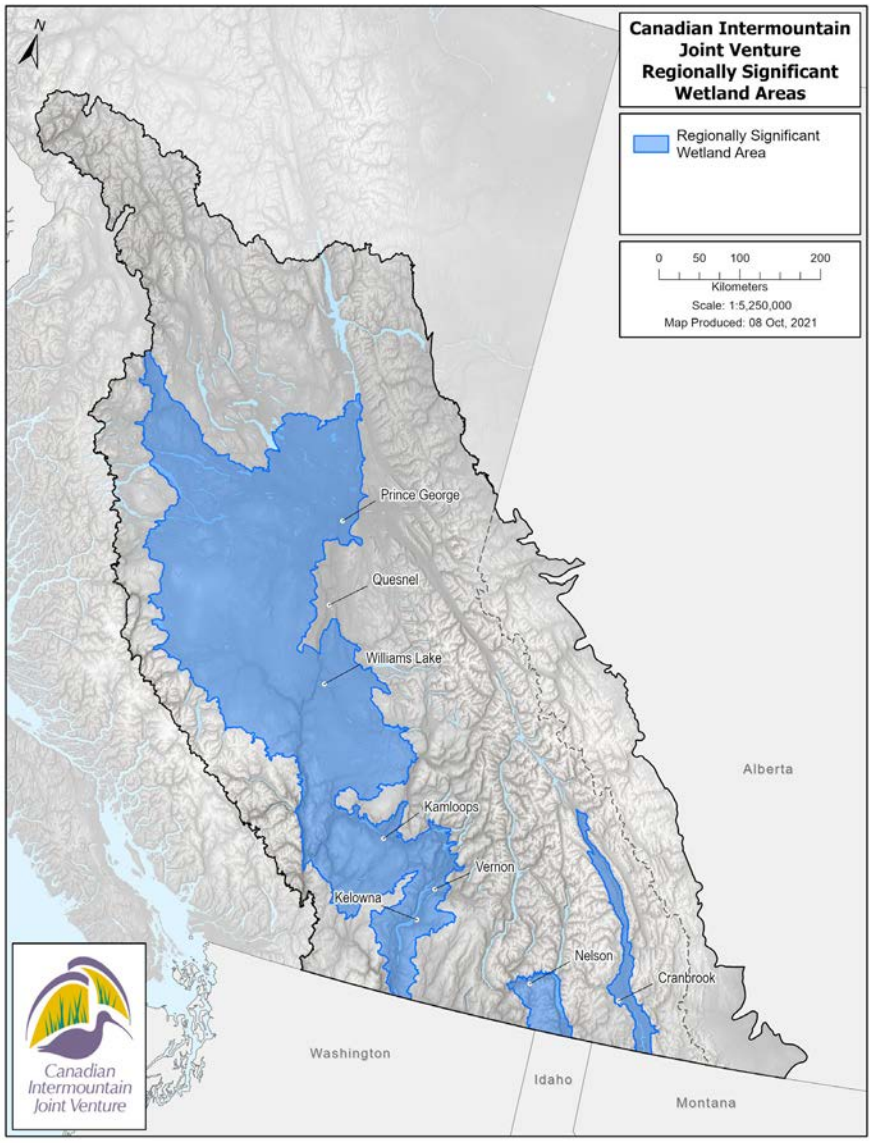


Figure 5. Regionally significant wetland areas in BC

Helicopter-derived Breeding Habitat-Species Model

Population levels have been consistently estimated for a relatively large (10+ million hectares or 24+ million acres); 8 different 'ecosections') portion of the CIJV (**Figure 6**), using Habitat-Species models derived from the helicopter-based Waterfowl Breeding Population Surveys of the Central Interior Plateau. Data has been collected annually from a single survey area from 2006-2019. It was paused for 2020-21 due to the COVID pandemic. The repetition of the surveys has enabled researchers to better quantify variations in bird numbers, bird distribution and abundance across habitats for a broad suite of waterfowl species.

Data and planning efforts also feed into the Western Mallard Model used by the U.S. Fish and Wildlife Service and the Pacific Flyway Council.

Surveys sample waterfowl breeding pair density for each waterfowl species by geographic location (ecosection), habitat type (wetland, stream, river) and habitat subcategory (wetland size class and river/stream order) (**Table 10**). Data are summarized in a model, and then extrapolated to develop waterfowl population estimates according to the amount of wetland, river and stream habitat available in each ecosection.

Rivers and streams are often overlooked in terms of their importance to waterfowl production. The survey program has shown that these systems support a larger-than-expected proportion of the breeding waterfowl population. Waterfowl are most commonly found in low-flow rivers and streams. Beavers are common in stream systems, and provide significant amounts of habitat for waterfowl in flooded reaches. Beaver ponds are particularly important for species such as Mallard, Ring-necked Duck, Bufflehead and Green-winged Teal.

There are also helicopter-derived models for two ecosections in the East Kootenay, dating from 2001 and 2004. There are no wintering waterfowl models due to a lack of data, although it is known that the wintering value of some landscapes can be high (e.g., Okanagan) where the mild climate and abundance of open water and feeding areas allow birds to shorten their southward migration. Limited information is available on the distribution and abundance of moulting waterfowl in the CIJV, but occasional surveys indicate the presence of thousands of moulting waterfowl (primarily females) representing 13 species in specific portions of the CIJV. The most abundant moulters are Bufflehead, Lesser Scaup, Ruddy Duck, Ring-necked Duck, Barrow's Goldeneye and Gadwall.

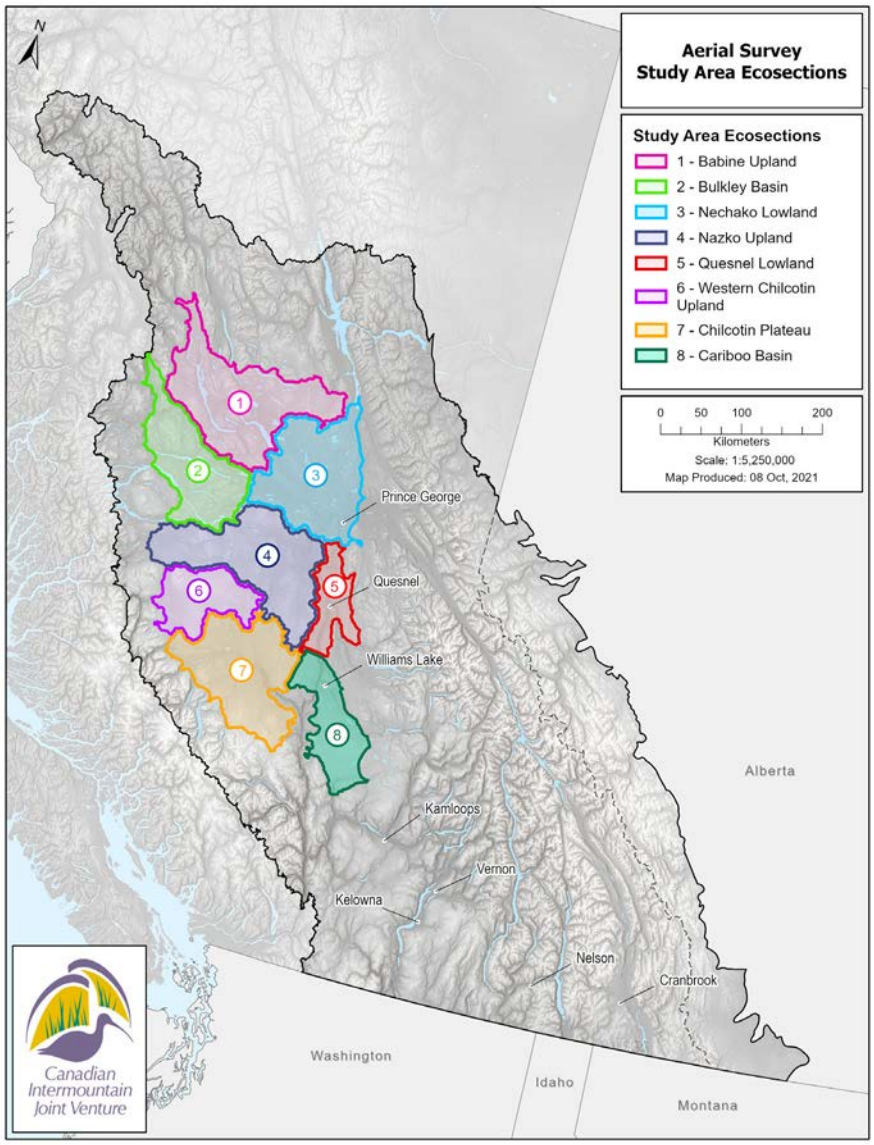


Figure 6. Ecosections sampled by helicopter in the Waterfowl Breeding Population Survey of the Central Interior Plateau

Major Assumptions:

- Existing helicopter-based breeding surveys generate an unbiased estimate of population abundance, species distribution, diversity and habitat use for the entire CIJV study area. These data are sufficient to produce scalable population goals (e.g., population goals that vary depending on overall habitat conditions).
- Indicated Breeding Pair (IBP) densities are an accurate predictor of the value of a wetland to waterfowl, and are the best measure available to the CIJV at most scales. This assumes IBP values are directly related to waterfowl recruitment and the prevalence of "ecological traps" (e.g., high pair density but low productivity due to a concentration of predators) is minor.
- Wetland characteristics are more limiting to waterfowl production than upland context and productivity does not differ among wetland classes (which researchers were unable to characterize at the landscape scale).
- The distribution of wetlands, rivers and streams in available GIS datasets is representative of the habitats that are available for bird use in an average year.

Table 10. Example of breeding Habitat-Species model for Mallard (*Anas platyrhynchos*) in the Chilcotin Plateau ecosection

Habitat Category	Habitat Subcategory	Indicated Breeding Pair (IBP) Density	Indicated Breeding Pairs (IBPs)
Wetlands	*Size Class (hectares)*	*IBP/hectares of wetland*	*IBPs*
	0-1	1.23	2,206
	1-2	0.27	349
	2-3	0.09	165
	3-5	0.13	460
	5-10	0.13	868
	10-20	0.13	1,062
	20-50	0.21	2,915
	50+	0.04	1,312
	ALL		**9,335**
Rivers	*Order a*	*IBP/hectares of river*	*IBP*
	1	0.00	0
	2	0.00	0
	3	4.88	58
	4	0.88	27
	5	0.00	0
	6	0.08	103
	7	0.00	00
	8	0.00	0
	9	0.00	0
	ALL		**189**
Streams	*Order a*	*IBP/kilometres of stream*	*IBP*
	1	0.05	164
	2	0.60	912
	3	0.26	221
	4	0.23	133
	5	0.56	117
	6	0.00	0
	7	0.00	0
	8	0.00	0
	9	0.00	0
	ALL		**1,546**

Order "a" denotes the relative position of river or stream segments in a drainage network, where headwater segments are 1st order, a segment fed by two headwater streams is 2nd order, etc.

Addressing Key Uncertainties:

- Habitat-Species models lack a covariate related to water availability in the landscape in any given year. Interannual variation in wetland distribution appears considerable. Environment and Climate Change Canada is working on a satellite-based estimate of annual wetland occurrence for incorporation into the models. The inclusion of a moisture index using historic weather data would make the models more representative of stochastic environmental conditions and give insight into the relative effect of moisture conditions (and climate change) on wetlands and waterfowl populations.
- This initiative is also examining the possibility of including wetland classification which could be added as an additional covariate.
- Climate change elements are not yet integrated into the Habitat-Species models. Models can project climate change impacts by generating predictions for various landscapes associated with climate change scenarios (e.g., decreased wetland abundance, wetland productivity etc.), but reliable post-climate change landscapes need to be developed first.
- Waterfowl Habitat-Species models do not yet incorporate information on upland habitat features. The CIJV Technical Team attempted to add upland cover type to the models, but found that this did improve model performance significantly. Recent advances in remote sensing and classification of upland cover types may necessitate a re-examination of this modeling attempt.

Ducks Unlimited Canada Waterfowl Priority Areas and Conservation Plans

Ducks Unlimited Canada (DUC) Waterfowl Priority Areas target their resources to areas with the highest need and where activities will benefit the most birds. Two Waterfowl Priority Areas were selected in the CIJV based in part on the results of the Waterfowl Decision Support System (DSS): the Cariboo-Chilcotin and the Okanagan Valley (**Figure 7**). Other factors considered in setting Priority Areas were wetland density, risk and/or degree of habitat loss and partnership opportunities. For both Priority Areas, DUC has prepared comprehensive landscape plans to identify habitat threats, set habitat objectives and outline a conservation program for meeting objectives (DUC 2005; DUC 2008).

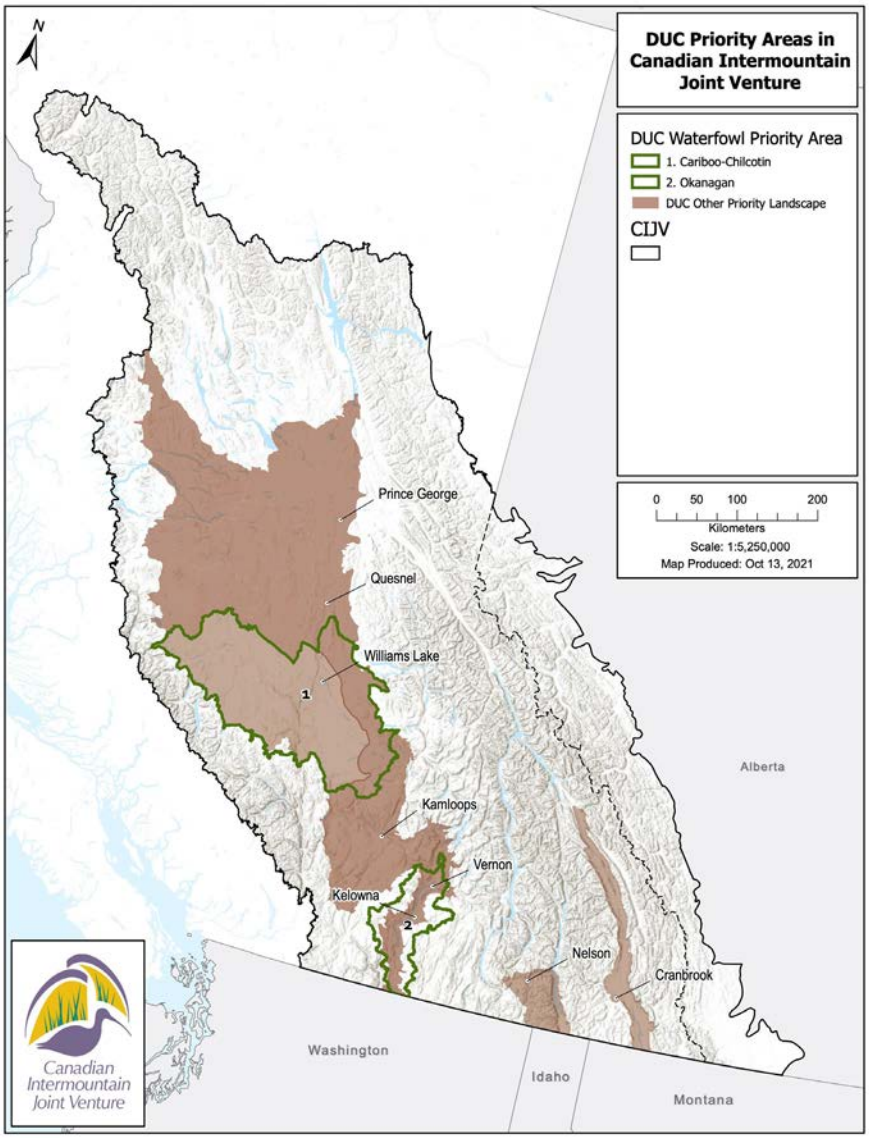


Figure 7. DUC Waterfowl Priority Areas in the CIJV

Within Priority Areas, programs are targeted towards areas where there is a strong overlap of high waterfowl values and high risk of habitat degradation due to the above factors. Specific "delivery watersheds" are then selected after consideration is given to public profile, landowner receptiveness and concurrent partner stewardship programs.

Nature Conservancy of Canada Conservation Planning System

Guided by the best available conservation science, NCC seeks to protect areas of natural diversity for their intrinsic value and for the benefit of future generations. Work is focused on various landscapes throughout Canada that have been specifically identified as important for biodiversity conservation, in part through Conservation Blueprints (CBs) and Ecoregional Assessments (ERAs).

The ERA identifies a suite of conservation sites that could contribute to the long-term survival of all viable plant and animal species and natural communities in an ecoregion, including wetlands. The ERA follows a methodology of portfolio design described in Designing a Geography of Hope (Groves et al. 2000). One of the outcomes is a spatial matrix of biodiversity value versus threats, highlighting the urgency for conservation action. Ecoregional plans cross political boundaries and are in place for the entire CIJV.

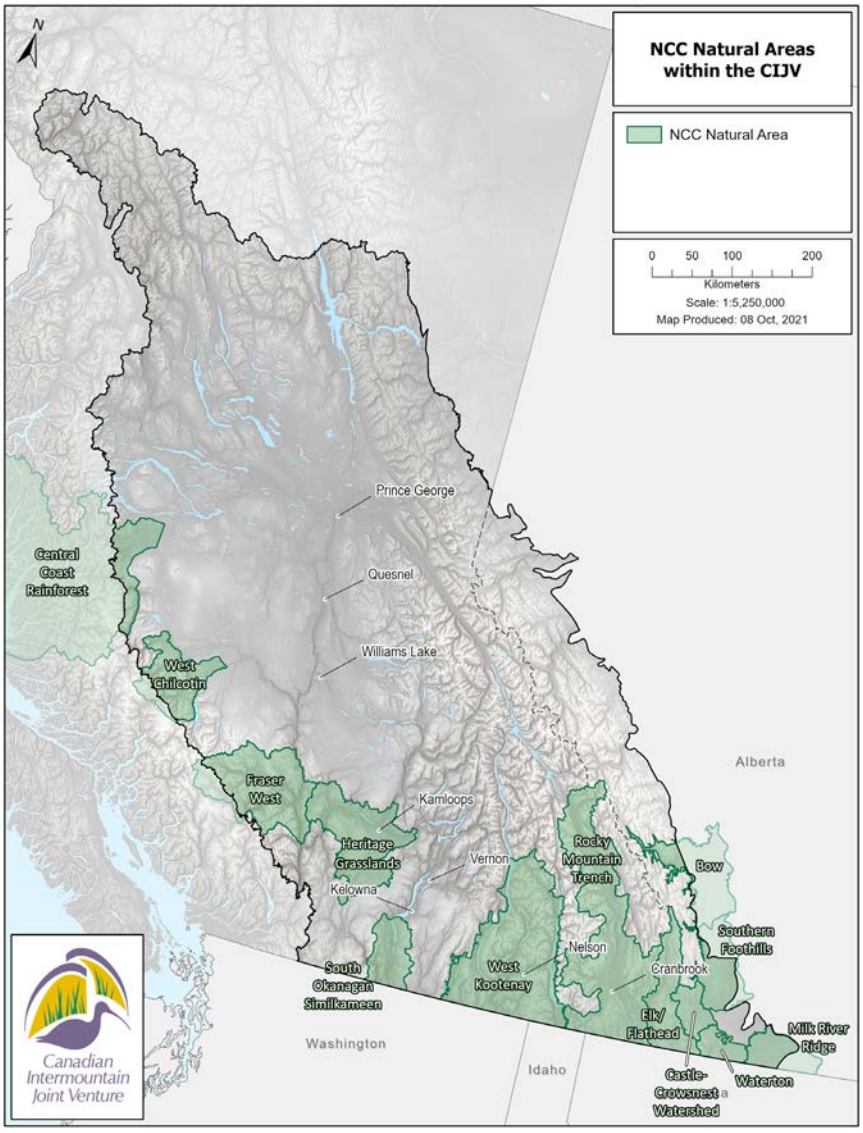


Figure 8. Nature Conservancy of Canada Natural Areas within the CIJV boundary

The results of the ERA aid in the identification of specific focal areas, which in addition to a combination of other priority conservation considerations, such as watershed boundaries and protected area corridors, help guide NCC in identifying natural areas. Beginning in 2007, NCC developed Natural Area Conservation Plans for those areas. These plans identify NCC conservation goals for that particular geography and support strategic decision making to ensure efficiency of resources at all levels. Conservation goals are identified and prioritized, then developed followed by implementation and tracking to allow for adaptation. NCC staff and partners view the planning process as iterative and ongoing, rather than a once-a-decade exercise. At the Natural Area scale, conservation actions include securement, management, restoration, enhancement, outreach and communications. NCC has defined 8 Natural Areas within the CIJV: 1) Central Coast Rainforest 2) West Chilcotin 3) Fraser West 4) Heritage Grasslands 5) South Okanagan Similkameen 6) West Kootenay 7) Rocky Mountain Trench 8) Elk Flathead (**Figure 8**).

One of the major conservation actions is the protection of key lands that capture biodiversity targets and help alleviate threats. For each property secured, NCC creates a management plan that links goals, a subset of targets, threat analyses and a set of conservation actions to address major threats. At all planning levels, threats and conservation actions are defined according to a standardized classification developed by the International Union for Conservation of Nature (IUCN). Conservation targets have been defined for wetland habitats (along with individual bird species at risk or bird groups such as waterfowl). Waterfowl and wetland-related information is incorporated within other CIJV planning documents where relevant.

Nature Trust of British Columbia Relative Ecological Assessment

The Nature Trust of BC's (NTBC) Relative Ecological Assessment (REA) is a tool for evaluating the relative ecological value of conservation opportunities across the varied landscapes in BC (**Figure 9**). The criteria used to evaluate ecological value informs effective conservation planning decisions. The ecological values are used to identify how a potential conservation acquisition ranks relative to NTBC's current portfolio of conservation properties. The tool has been continuously improved as new conservation concepts, associated spatial data with provincial coverage and technological advances become available. Currently, this automated tool runs using ArcGIS programming (Python & ArcPy), R statistical software and the Google Maps web mapping platform.

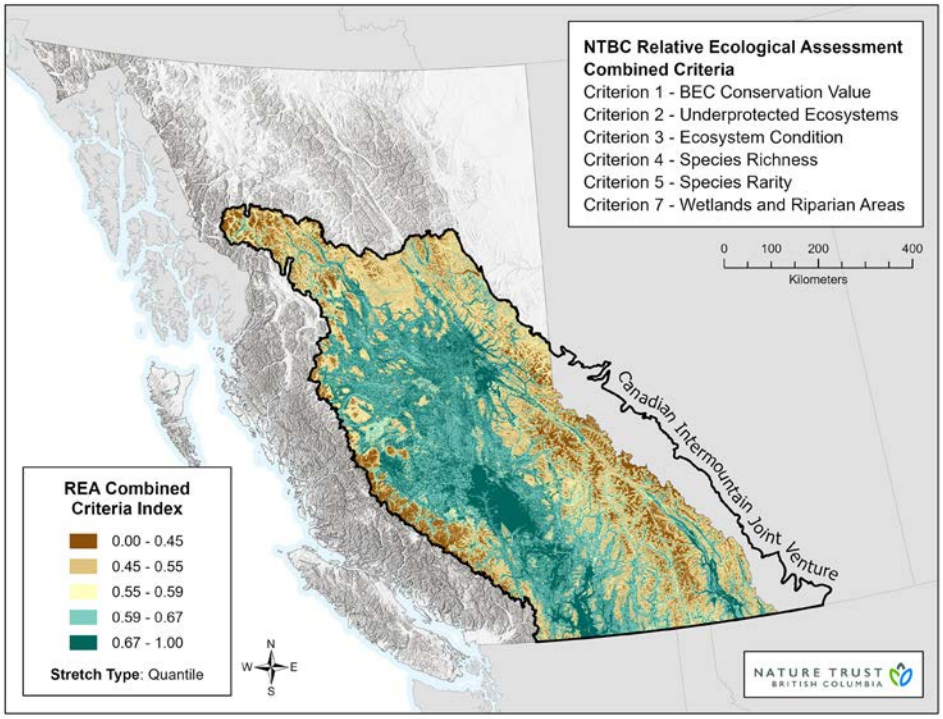


Figure 9. Nature Trust of BC's relative ecological assessment combined criteria values within the CIJV

The REA tool applies seven criteria to evaluate potential conservation acquisitions. These criteria are based on a series of spatial datasets that have been mapped for the entire Province of BC. The approach provides a common set of values to evaluate conservation acquisitions across BC. Many of these values are derived from *Taking Nature's Pulse: The Status of Biodiversity in British Columbia*, developed by conservation NGOs, and provincial, federal and local governments focused on developing a science-based foundation for biodiversity action (Austin et al. 2008).

The seven ecological REA criteria are biogeoclimatic zone conservation values, under-protected ecosystems, ecosystem condition, species richness, presence of rare species and ecosystems, viability or connectivity with other protected areas and wetland and riparian ecological values. An index is calculated for each criterion based on the spatial ecological values associated with the conservation acquisition (i.e., parcels or polygons). Individual potential conservation acquisitions are given an overall score by summing the index values and then comparing them to the values for existing conservation lands. The results provide a relevant scale for evaluating conservation value in BC.

SENSITIVITY AND SPATIAL DATA ANALYSES

Statistical analysis of key parameters (to examine their influence on model results) is a longer-term priority for the CIJV. Key parameters likely to influence population response variables or habitat objectives include:

1. Population vital rates
2. Rates of habitat conversion
3. Degree of intactness of habitats
4. Effects of climate change on wetland habitat availability

Although there is minimal baseline information for the key vital rate parameters most likely to influence waterfowl population measures, such as productivity, it assumes that in the CIJV, as in Prairie Canada, "reproductive rates" have more influence on duck productivity than "survival rates". Across the Prairies, DUC's Institute for Wetland & Waterfowl Research found that nest success is the primary determinant of annual waterfowl recruitment, although breeding season survival rates are also important. Without a more fundamental knowledge of how vital rates are expressed here, it is assumed that the CIJV region exhibits a similar pattern.

From a habitat perspective, in accordance with the assumed main factors limiting waterfowl (wetland availability and wetland quality), achieving CIJV objectives will depend most upon addressing two main habitat drivers:

i) wetland loss due to environmental factors such as long-term drought and climate change and
ii) wetland degradation such as that caused by unmanaged agricultural grazing

The CIJV's conservation planning may be limited by the following aspects of the spatial databases currently available:

- The static nature of available datasets limits the ability to track trends in wetland distribution.
- There is a lack of fine scale coverage for most of the CIJV.
- The predictive capability for modelling the effects of climate change on wetlands is still developing.
- The condition of habitats on conservation lands is still not well known due to limitations in the capacity to monitor site-specific conditions.
- Wetland condition is not specifically addressed by any of the available datasets, although inferences may be drawn from some of the sources (e.g., CAD).
- Small and ephemeral wetlands are still not well-inventoried, even by fine-scale Sensitive Ecosystem Inventory (SEI).
- Biologically based wetland classification (e.g., according to the Canadian Wetland Classification System) cannot currently be reliably derived from any of the datasets. It is expected that this information would improve the performance of Habitat-Species models.

CHAPTER 6 – HUMAN DIMENSIONS AND COMMUNICATIONS

INTRODUCTION

Human dimensions (HD) is a field of study that applies the social sciences to examine human-wildlife relationships to provide information to inform the effective application of wildlife conservation efforts (Manfredo 2008; Dayer et al. 2019). HD explores what people think and do related to conservation, incorporates that understanding into decision-making about conservation policies and programs and evaluates the impact of those efforts on both human behavior and conservation targets much like biological data is integrated into conservation (Dayer et al. 2019). Combining expertise from the fields of HD with insights from biological science can improve conservation approaches and outcomes, and lead to a better understanding of why people engage or do not engage in conservation. When it is incorporated into conservation design and planning by conservation programs such as Joint Ventures, HD research can help to efficiently mobilize resources (Dayer et al. 2019).

NAWMP HUMAN DIMENSIONS UPDATES

The 2012 NAWMP Revision included, for the first time, the role of people in the conservation of waterfowl and wetlands with the inclusion of a third goal. Goal 3 aims for: "growing numbers of waterfowl hunters, other conservationists and citizens who enjoy and actively support waterfowl and wetlands conservation" (NAWMP 2012). The recently revised "supporter objective" calls for increased waterfowl conservation support among various constituencies to at least the levels experienced during the last two decades. While challenging the NAWMP community to broaden and increase its base of conservation support, the 2012 Revision extended a further call-to-action to waterfowl management practitioners to integrate waterfowl management decisions by more fully understanding how they contribute to all NAWMP goals and objectives. Although the incorporation of people-centred objectives adds complexity to integrated decision making, gaining an understanding of the HD within the CIJV provides a powerful, versatile and far-reaching tool to make progress on all objectives.

The 2014 NAWMP Addendum established the following objective: "Increase waterfowl conservation support among various constituencies to at least the levels experienced during the last two decades" (NAWMP 2014). The 2014 Addendum distributed this objective among three constituent groups: active waterfowl hunters, North American citizens who appreciate and take action to support wetlands and waterfowl conservation and landowners participating in habitat conservation programs. The Addendum identified initial quantifiable objectives for these groups based on:

- average number of hunters in the U.S. and Canada from 1999-2013 (1.2 million and 178,000, respectively)
- average number of waterfowl viewers traveling more than 1.6 kilometres (1 mile) from home from 1996-2011 (14.4 million; comparable data not available for Canada or Mexico) or out of state (4.6 million)
- number of birdwatchers in Canada (4.7 million; 18% of the population)
- 1999-2013 sales of Migratory Bird Hunting and Conservation Stamp (commonly referred to as the Federal Duck Stamp) in the United States (1.6 million; $23.5 million revenue)
- Migratory Game Bird Hunting Permit sales in Canada (~178,000; $3.2 million revenue)

The 2018 NAWMP update reiterated the importance of incorporating social sciences to realize the third goal of increasing the numbers of waterfowl hunters and other conservationists across North America—to effectively connect people with waterfowl habitat. Delivering on public expectations and applying HD principles will facilitate the application of adaptive frameworks and integration decisions to conservation challenges across all the JVs (NAWMP 2018). This recognizes that HD insights are required to effectively address most waterfowl management challenges, from understanding factors contributing to both habitat loss and conservation, to managing harvest, to dealing with issues surrounding human conflicts with overabundant species.

HUMAN DIMENSIONS WORKING GROUP

The HD Working Group, formed in response to the 2012 NAWMP Revision, is developing the scientific and technical foundations to define objectives for hunters, birders and other potential supporters. The CIJV Coordinator sits on this committee along with Dr. Howard Harshaw from the University of Alberta—both participate as CIJV representatives. In 2017 the Working Group finalized and conducted a survey of waterfowl hunters and viewers to understand motivations for wildlife conservation and factors influencing recruitment and retention of waterfowl hunters and viewers (Harshaw 2018a). In 2018, the Working Group and a Public Engagement Team merged to better coordinate JV HD capacity and provide specific guidelines for HD in subsequent Implementation Plans.

METHODS FOR CURRENT CHAPTER DEVELOPMENT

Many CIJV partners have already embarked on activities that help to achieve Goal 3. However, these activities have never been explicitly included in CIJV reporting, nor have these activities always been focused on the specific outcome of bird conservation. In this Implementation Plan, CIJV partners have refined their activities to include a HD vision through a series of workshops and webinars, and worked with the Working Group and HD experts to develop this chapter.

In 2020, the two-year Mitacs Project was initiated and led by Drs. Howard Harshaw and Katherine Sainsbury at the University of Alberta. The project objectives are to increase the HD capacity of the CIJV community and to develop and measure repeatable indicators of conservation and nature-based recreation involvement among the Canadian public. The project involves three studies that will (1) identify relevant stakeholders with interests in waterfowl and wetlands conservation, (2) identify measures of conservation and nature-based recreation involvement and (3) test and implement these measures in a national web-based survey of waterfowl and wetlands conservation stakeholders. The project results will be incorporated into ongoing CIJV plans and planning.

HUMAN DIMENSIONS LANDSCAPE

The CIJV is one of Canada's most biodiversity-rich regions that supports growing populations within its boundaries. People have lived in the regions of the CIJV for more than 10,000 years, including Ktunaxa, Secwepemc, Sinixt, Okanagan, Chilcotin, Lheidli T'enneh, Dakelh, Lhatko Dene, Wet'suwet'en, Nlaka'pamux and Treaty 8 First Nations (College of New Caledonia 2020). Presently, about one million people live and work in the CIJV region relying on resource-based industries such as crop agriculture, ranching, forestry, mining, tourism and recreation for their livelihoods and lifestyles primarily around the largest urban centres in the Okanagan (Kelowna, pop. 127,380 and Kamloops, pop. 90,280) and the Chilcotin (Prince George, pop. 74,003) (Statistics Canada 2017). The Okanagan's diverse economy provides the largest trading opportunities with Metro Vancouver and Alberta (SOSCP 2020).

Land and water availability have influenced the location of communities since the establishment of seasonal First Nations camps and there has been little shift in settlement patterns as there is very little land available for both food production and settlement within the CIJV (CBT 2021). Settlement and intensive land use across the CIJV are focused mainly in valley bottoms (ECCC 2013a; ECCC 2013b). Despite the smaller population size of the CIJV (7% of all people in BC) and the relatively high percentage of the CIJV lands conserved through national, provincial and other types of protected areas (about 17.80%, or 8.9 million hectares or 22 million acres), the cumulative impacts of development, agricultural conversion, livestock grazing, fire suppression and invasion of non-native plants has severely degraded habitat for bird species (ECCC 2013a; ECCC 2013b).

The proximity of the CIJV to the City of Calgary, and the abundant recreational opportunities that the Columbia Valley offers, draws many visitors to purchase a second home in the area. For example, 27% of East Kootenay homeowners were second home owners with some areas (Columbia Valley) measuring as high as 56% second home owners (CBT 2012). Roughly 55% of the Columbia Valley's population consists of part-time seasonal residents (Chicanot 2013). Large farms and ranches also occur throughout the CIJV. According to the 2016 Census, there are approximately 9,400 farms in the CIJV covering a total of 1.7 million hectares (4.2 million acres), or 88% of all farm land-use in BC (including crops, summer fallow and tame or seeded pasture). The Okanagan's growing population includes an active retiree demographic as well as increasing numbers of people under the age of 19 (SOSCP 2020). When important waterfowl areas overlap with population centres or agricultural areas, there are opportunities to build stronger relationships among waterfowl, agricultural, hunting and urban audiences.

ENGAGEMENT WITH INDIGENOUS GROUPS

For decades, conservation practices in Canada have been heavily influenced by European colonialism. They continue to shape the way we protect biodiversity to this day. Conservation initiatives have been known to force outside values on Indigenous peoples, promote inequity and prevent Indigenous peoples from using the land to sustain their livelihoods and practice their traditional ways of life (Gooden and 't Sas-Rolfes 2020). Meaningful engagement with Indigenous communities can be an effective way to advance reconciliation. Indigenous knowledge is currently an under-used resource that can inform CIJV conservation planning, implementation and evaluation. To that end, CIJV partners are striving to achieve conservation through collaboration and reconciliation with Indigenous peoples.

Ktunaxa dancer Martina Shovar at Columbia Lake—Lot 48 Conservation Area, which forms part of a large network of conservation lands that includes continentally significant wetlands; this area is an important cultural site for the Ktunaxa Nation./Cole Lord May

A recently published report offered myriad of recommendations for NCC to effectively engage with Indigenous groups in its conservation planning processes (Kennedy et al. 2021). These recommendations are applicable to other JV partners' conservation practices as well, ranging from the initial outreach, to relationship building, to the project implementation level. They include:

- conducting preliminary research to help identify appropriate ways to reach out to Indigenous communities for a given project
- co-creating conservation plans to ensure that Indigenous values and knowledge play a central role in the project
- ensuring that benefits to partnership are reciprocal; ensuring adequate funding is allocated for relationship building
- ensuring that the Indigenous Knowledge collected truly represents the community member's varied beliefs and experiences
- creating the space for both Indigenous and Western science knowledge systems to contribute equally and in parallel to better understand the system of interest

Given the comprehensive list of recommendations, CIJV partners will prioritize and incorporate the most relevant into their conservation practices, whether it be land securement, habitat restoration/enhancement, monitoring or conservation planning.

CONNECTING PEOPLE TO NATURE

The CIJV's HD priorities are currently focused on maintaining and growing awareness among partners and the public. This priority is supported by expanding the CIJV's conservation circle to include non-traditional constituents through outreach and awareness programs, beneficial management practices and stewardship partnership programs, citizen/community science and volunteer programs, research, policy and government initiatives. Presented below are some current examples of CIJV HD activities being undertaken.

Outreach and Public Awareness

CIJV partners are increasingly gaining knowledge on the public's general perception of engagement with CIJV-relevant conservation initiatives. For instance, in 2016-2018 a U.S./Canada public opinion survey was conducted to understand the social and recreational activities of birders and hunters in relation to wetland and migratory bird conservation in the Pacific Flyway (Harshaw 2018a; Harshaw 2018b). The survey results found that identity as "conservationist" is strong in both communities, and that >50% of birders are willing to pay fees to access lands for bird watching. However, involvement in social/political activities related to conservation is low. The survey also showed that barriers to pursuing recreational activities in nature include distance, crowdedness, abundance and diversity of birds. Furthermore, according to a 2020 survey conducted by Canada's Privy Council Office, it was found that 48% of the surveyed Canadians said they value nature more now than before the pandemic, and that the vast majority (84%) of Canadians agree that they must take care of nature in order to take care of themselves. However, CIJV partners recognize that more specific, fine-grained information is needed on this topic, including public support for bird conservation, wildlife value orientations, pro-environmental behaviours, participation in types of nature-based recreational activities, awareness of wetland benefits (e.g., ecological goods and services) and use of wetlands and other CIJV priority habitat types.

Currently, each CIJV partner conducts outreach or public education according to their own mandate. Many partners already have extensive outreach networks. For example, Birds Canada runs several citizen/community science programs in the CIJV including the Christmas Bird Count, Project FeederWatch and (jointly with BC Nature) the Important Bird Area Caretaker Program. These programs engage volunteers in various ways to support bird conservation, often by collecting data on bird distributions and population trends.

The CIJV relies on these partner-led networks as well as other sources to gather and disseminate critical data. A key objective identified by the 2018 NAWMP Addendum is to ensure that information gathered and messages distributed go beyond current JV partner spheres of influence to reach non-traditional constituents. Supporters of current partners (e.g., DUC members, Birds Canada volunteers) are typically already engaged and supportive of bird conservation, and are not representative of the general public.

The CIJV Board will determine if there is a need to reach out to a broader audience, including birdwatchers, nature photographers, nature-based recreationists of all types, Indigenous groups and those concerned about other environmental issues such as climate change and sustainability. If such a need is supported, the CIJV will need to actively engage and work with additional partners with connections to these broader groups, particularly those with experience in public outreach and education.

Engaging the Agricultural Sector

The agricultural and ranching sector overlap significantly with bird habitat in the CIJV (CIJV 2003). In regions such as the Okanagan, agriculture is a major economic contributor and integral part of the social heritage (SOSCP 2020). The cultivation of crops, tree fruits, livestock and processed and high value products, including organics and alcohol, provide jobs across the Okanagan, access to locally grown foods and enhance local food security. The CIJV encourages and facilitates wildlife-friendly agricultural practices in the CIJV area through regional partnership conservation initiatives, such as the South Okanagan Similkameen Conservation Program and the Columbia Basin Trust.

The CIJV partnership has strong, ongoing engagement from the ranching community through partnerships with the B.C. Cattleman's Association and Environment and Climate Change Canada. This includes delivery of the Species at Risk Partnerships on Agricultural Lands (SARPAL) program. SARPAL is an industry-led stewardship program with a focus on conserving species at risk including two bird species: Lewis's Woodpecker and Yellow-breasted Chat. In 2018-2019, the SARPAL program worked with ranchers to complete four on-farm projects which restored and conserved 15 hectares (37 acres) of riparian habitat and 40 hectares (100 acres) of grassland habitat on private ranch lands for Lewis's Woodpecker and other wildlife.

Equity, Diversity, Justice and Inclusion in Birding

Wildlife recreation is associated with greater engagement in conservation behaviours (Cooper et al. 2015). For example, recreationists in the United States who identified as both birders and hunters were more involved in conservation behaviours than people who identified as only a birder or hunter (Cooper et al. 2015). Furthermore, people who identified as outdoor recreationists participate in more conservation behaviours than non-recreationists (Cooper et al. 2015).

Diversity is also a key component in conservation because the more diverse the participants in conservation, the greater portion of society has a stake in how conservation is implemented. Wildlife and habitat are held in public trust according to the North American model of wildlife conservation which implies equitable access to it (Rutter 2020); however, research has shown that barriers for accessing nature or viewing wildlife exist for marginalized groups, whether it be language, cultural, discrimination, social connection or socio-economic barriers (Rutter 2020; Krymkowski et al. 2014; Scott and Tenneti 2021). Based on recent research conducted in Eastern Canada on systemic barriers in nature spaces (Scott and Tennneti 2021), it was recommended that organizations should increase the comfort level for participants through guided activities and education, and to create more diverse cultural spaces.

In response to this marginalization and increased understanding of Diversity, Equity, Justice and Inclusion (DEJI) research, in fall of 2020 and 2021 Birds Canada and the CWS hosted a series of bird walks in the PBHJV for diverse communities in partnership with local partners (BC Bird Trail and Stanley Park Ecology Society). The bird walks were held in the Lower Mainland and Fraser River Valley, each catered to marginalized groups including the Chinese-speaking and Arab-speaking communities, People of Colour, LGBTQ+ and Women and Femme. The high level of participation and positive results from a post-walk questionnaire whereby participants felt their awareness for birds increased in the supportive environment suggests great interest from these communities. Based on this interest and success, PBHJV and CIJV partners will be pursuing the development of DEJI-related projects and events to build a more inclusive and diverse human engagement environment.

Other Joint Venture Partner Public Outreach

Many CIJV partners, like NCC and Birds Canada, have demonstrated the power of engaging with people through direct conservation and stewardship actions for the benefit of waterfowl habitat conservation. Through community specific conservation projects, CIJV partners can engage with the public, increase an awareness of the importance of habitat and generate a social investment at the same time as physically improving the quality of waterfowl habitat. Examples of these socio-ecologically beneficial projects are captured annually in NAWMP Habitat Matters reports.

Opportunities for Hunters

CIJV partners will continue efforts to maintain hunting opportunities currently available in the Canadian Intermountain region. Both provincial and federal wildlife agencies are supportive of continued waterfowl hunting in the BC Interior. Many of the areas most suitable for waterfowl and open to hunting are privately owned agricultural properties where hunters require landowner permission to access lands. However, publicly owned Crown lands have hundreds of wetlands, rivers and lakes with good waterfowl-hunting opportunities, notably in the Central Interior (Vanderhoof area) and in parts of the Thompson-Okanagan and Columbia/Kootenay River lowlands. In the Creston Valley Wildlife Management Area, a special permitting system has been developed to maintain hunting opportunities in designated areas, and to maintain safe interactions between hunters and recreationalists. Revenue generated from hunting license sales goes towards Wildlife Habitat Canada and Habitat Conservation Trust Foundation, which are two key funding partners for all NAWMP JV partners.

Over the past several decades there has been a decline in participation and retention of waterfowl hunters across the continent (Watson and Boxall 2005). This is partly due to increased urbanization and the resulting shift in social structures around traditional hunting. In order to address NAWMP's Goal 3: "Growing the numbers of waterfowl hunters, other conservationists and citizens who enjoy and actively support waterfowl and wetlands conservation" and to better understand the shifting motivations, behaviours, attitudes and priorities of Canadian hunters (NAWMP 2012), a continental survey was conducted in 2017 to help inform waterfowl hunting and wetland management policies. The core team to develop and deliver the North American Waterfowl Hunting Survey included the NAWMP HD Working Group members from the Atlantic, Mississippi, Central and Pacific Flyways.

The study surveyed Canadian adult waterfowl hunters and integrated several fields of research, including outdoor recreation, environmental sociology and wildlife management. The survey elicited waterfowl hunter participation characteristics, information about identity and knowledge about, interest in, and preferences for waterfowl and wetland conservation. The results of the survey were compiled into technical reports for each flyway sampled (Harshaw 2018a). The results serve as a baseline for future studies, such as the 2021 Canadian public survey that is part of the Mitacs Project described previously.

NEW DIRECTIONS FOR HUMAN DIMENSIONS

Increasingly the CIJV is focusing on engaging the broader public in CIJV conservation activities./Grasslands Conservation Council of BC

For the development of the HD chapter, CIJV partners identified potential short- and long-term directions for HD applications.

Canadian Public Preferences Survey

A national public survey will be administered to test indicators of conservation and nature-based recreation involvement and preferences. The new data collected by this survey will incorporate measures of stakeholder involvement in pro-conservation behaviours and nature-based recreation in order to establish a baseline for these measures. The data collected to inform this objective will directly inform the priorities of all JVs, and provide an opportunity to engage with new stakeholder groups to explore whether their interests are compatible with those of the JVs.

Results from national surveys, such as the Importance of Nature to Canadians survey (1999, 2000), Canadian Nature Survey (2012), NAWMP hunter bird water surveys (2016) and the Canadian Public Opinion Poll on support for protecting natural ecosystems (2020), provide insight into broad-scale support and attitudes for conservation. HD data collection conducted at the regional scale, while much more limited, would help identify new constituencies and more effectively engage with traditional constituents living in the JVs. Incorporating conservation-value-related questions into regional polls through partners such as Birds Canada and municipalities could help shape a stronger understanding of the support, attitudes, interest and awareness in CIJV conservation actions, priority species and habitat areas. Regional results outlining finer scale human conservation awareness and importance could also be connected to spatial datasets to enhance the depth of conservation planning and incorporate social values in prioritization of CIJV projects. Building on regional knowledge will direct CIJV partner activities more effectively. This will highlight the need for new tools or methods of engagement, and/or the opportunity to renew existing engagement tools and streams.

KNOWLEDGE GAPS

The CIJV partners identified several knowledge gaps that will shape short- and medium-term HD priorities. The general theme of HD knowledge gaps is to develop a deeper understanding of the motivations for various current and potential constituents in the region. As the more rigorous applications of the social sciences is relatively recent for the CIJV, partners must look to literature, existing research and information and pathways to engage with the communities in the region and build on this knowledge throughout this Implementation Plan. A draft research plan which prioritizes and informs a rough timeline on how the JV will address knowledge gaps is currently being developed. Knowledge gaps include:

- *Landowners*: How can the CIJV better incentivize participation in programming such as Beneficial Management Practices (e.g., Wetland Stewardship Policy, Green By-law Toolkit) or farmer and rancher stewardship programs?
- *Governments*: How do the different levels of government and the general public they represent value the different lands, uses and ecosystem services (e.g., food security, biodiversity) provided by habitats important to waterfowl such as agricultural lands and wetlands? How do values align with the conservation of important bird habitats such as estuaries, agricultural lands and wetlands? What are the key messages and government priorities that could promote continuous funding for the CIJV? CIJV partners would benefit from increasing their understanding on how best to engage with provincial and federal governments on new and existing programs.
- *Corporations/Industry*: How can the CIJV better engage with industry (e.g., Teck) to encourage contributions to CIJV partners' conservation activities? Developing understanding of the tools and messages that could spark industry interest in CIJV partnerships and/or funding opportunities.
- *Citizen Scientists/Volunteers*: How can the CIJV expand the diversity of participation in citizen/community science and volunteer programs and link participation to positive conservation outcomes? The CIJV would like to better understand how to maximize repeat participation (e.g., incentives) while avoiding volunteer fatigue.
- *General Public*: The CIJV needs to collect baseline information on current trends in public use in priority habitat types. Addressing this knowledge gap could feed data into various other knowledge gap areas such as recreation users and support stronger engagement with different levels of government.
- *Recreational and Other Users*: How can the CIJV better understand the causes of land-management issues and engage with problematic recreational users (e.g., ATVs/mountain bikes/non-compliant hunters/dog walkers) and other users (e.g., homeless camps)? How can CIJV partners mitigate misuse impacts to conservation lands without relying on resource intensive measures?
- *Indigenous Communities*: The CIJV partners need to better understand potential best practices for engaging with Indigenous communities with the aims of gauging and supporting Indigenous community capacity for partnering with the JV, and developing opportunities for long-term/sustainable collaborations.
- *Non-Traditional Constituents*: How can JV partners better understand the motivations of non-traditional constituents to most effectively engage with new partners and grow the constituent base with limited JV resources? How can JV partners incorporate Diversity, Equity, Justice, and Inclusion principles into our HD work, such that diverse communities are engaged in meaningful ways?

HUMAN DIMENSIONS OBJECTIVES

Workshops held by CIJV and PBHJV partners in 2020 helped to inform this Implementation Plan. Keeping in line with Goal 3, partners are focused on maintaining current constituents, such as farmers, hunters, birders and recreationists, as well as growing support with non-traditional partners. The following is a summary of the objectives developed during the workshops. The complete table can be found in the appendices (**Appendix 3**) and more detailed information is provided under the chapters covering Delivery Methods (**Chapter 7**) and Monitoring and Evaluating Performance (**Chapter 8**).

1. *Address knowledge gaps identified at HD workshops by 2029*: Develop a deeper understanding of the motivations for various current and potential constituents in the PBHJV-BC/CIJV regions as discussed in the previous section.
2. *Effectively communicate and develop awareness of the importance of JV species and habitat by 2029*: Develop and distribute targeted communications materials about the importance of waterfowl and habitat (e.g., promoting the benefits of ecological goods and services). Determine, via knowledge gained through research and surveys, how to engage more effectively with the public, partners, stakeholders, funders and potential new partners.
3. *Increase waterfowl and wetland conservation support among various constituencies to at least the levels experienced during the last two decades by 2029*: Regional numbers of hunters and bird watchers in Canada needs to be determined as baseline. Engaging with and developing support in non-traditional constituencies is also included under this objective.
4. *Build HD capacity and understanding in the JVs by 2029*: Better document HD work of CIJV partners (e.g., identify HD tools and data already established and develop appropriate metrics) and incorporate new information/tools generated from ongoing projects into the current Implementation Plan.

CHAPTER 7 – CIJV STRATEGIES AND DELIVERY

The CIJV partnership is committed to translating this Implementation Plan into on-the-ground actions. To check that the conservation planning approach is effective for the most important issues affecting priority species in the CIJV, the technical team underwent training and applications in the Open Standards adaptive management conservation planning process and Miradi software. Open Standards for the Practice of Conservation is a widely adopted set of principles and practices that bring together common concepts, approaches and terminology for conservation project design, management and monitoring (CMP 2021). Developed by the Conservation Measures Partnership and regularly updated in collaboration with the broader community, this open-source, strategic process helps conservation teams achieve lasting impacts (CMP 2021). The Open Standards are organized into a number of steps which formalize the concept of an adaptive management planning and delivery cycle. The approach has been applied by the CIJV technical team throughout the development of this Implementation Plan with applicable components covered in **Chapters 7 and 8** whereby CIJV implementation can be initiated, monitored and evaluated to better direct and engage partners.

KEY STRATEGIES AND OBJECTIVES IDENTIFIED

The following section lays out key strategies and 5- and 10-year objectives and 5- and 20-year conservation costs developed by the CIJV technical team during Open Standards planning workshops and technical team review meetings from 2018-2021. Broad strategies were developed under each of the traditional NAWMP Initiatives with specific, measurable and priority objectives identified under each strategy. Indicators and available data sources were also developed and will be presented in **Chapter 8** – Monitoring and Evaluating Performance. Full strategy table and associated Miradi results chains for some strategies were developed during this conservation planning process. Specific waterfowl, non-waterfowl and HD objectives do not fall under the following initiatives and are presented in depth under each chapter (**Chapter 3** – Priority Waterfowl, **Chapter 4** – Priority Non-Waterfowl and **Chapter 6** – Human Dimensions).

As part of the process for determining habitat objectives under Habitat Retention (Permanent, Medium, and Short-term), Wetland Restoration, Upland Restoration and Management (Habitat Assets), CIJV partners calculated the total hectares of unconserved area within the CIJV region for each of the 4 priority habitat types. Except for Grasslands, multiple selection criteria were also applied to priority habitat types in order to narrow the geographical scope such that habitat objectives are focused on the most ecologically significant and/or priority areas. See Appendix 4 for maps showing the extent of each priority habitat type (conserved vs. unconserved) after selection criteria have been applied.

Habitat Retention – Permanent

Habitat retention is the protection or preservation of functional waterfowl habitat and the provision of suitable habitat for other bird species. Such protection may be either in perpetuity (i.e., is permanent) or for a defined time frame.

Strategy	JV Examples	Objective(s)
Land Acquisition Strategy	***Fee Simple Acquisition***: Purchase of lands for conservation ***Fee Simple Donation***: Receipt of donated lands for conservation ***Conservation Encumbrance – Paid***: Purchase of restrictive covenants for conservation ***Conservation Encumbrance – Donated***: Receipt of donated restrictive covenants for conservation ***Biodiversity and Carbon Sequestration Co-Benefits Strategy***: Acquire lands that have high carbon sequestration capacity while benefiting wildlife	Securement and crown designation of 45,534 hectares (112,517 acres) by 2024, including the following priority habitat types: • Freshwater Wetlands: 2,309 hectares (5,706 acres) • Wetland-associated Uplands: 11,540 hectares (28,516 acres) • Grasslands: 2,776 hectares (6,860 acres) • Riparian Forests: 714 hectares (1,764 acres)
Crown Designation Strategy	***Crown Designation***: Designation of Wildlife Management Areas, Ecological Reserves, National Wildlife Areas, IPCAs, Provincial Conservancies, etc.	

Habitat Retention – Medium Term

Non-permanent methods of securement may be for a medium-term (10-99 years) timeframe. These securement methods typically use various conservation land-use agreements.

Strategy	JV Examples	Objective(s)
Crown Conservation Agreement Strategy	***Conservation Cooperative Land-use Agreements***: 30-year Conservation Agreements for wetland/upland protection, wetland creation/enhancement; On-Farm Program; Grazing leases ***Crown Agreements***: Crown Land Agreements	Securement of 1,334 hectares (3,296 acres) by 2024, including the following priority habitat types: • Freshwater Wetlands: 886 hectares (2,189 acres) • Wetland-associated Uplands: 228 hectares (563 acres) • Grasslands: 200 hectares (494 acres) • Riparian Forests: 20 hectares (49 acres)

Habitat Retention – Short Term

Short-term habitat retention is the protection (or preservation) of functional waterfowl habitat and the provision of suitable habitat for other bird species for a period less than 10 years.

Strategy	JV Examples	Objective(s)
Stewardship Strategy	***Conservation Cooperative Land-use Agreements***: Grassland Set-asides; Beneficial Management Practices for soil conservation; farmer agreements to retain wildlife habitat through SARPAL and EFP.	Stewardship of 3,700 hectares (9,143 acres) by 2024, including the following priority habitat types: • Freshwater Wetlands: 1,900 hectares (4,695 acres) • Wetland-associated Uplands: 500 hectares (1,236 acres) • Riparian Forests: 100 hectares (247 acres)

Wetland and Upland Restoration

Restoration is the creation or improvement of wetland, riparian or upland habitat and the services it provides to waterfowl and other birds and wildlife. CIJV partners restore habitat on lands that have been degraded where it is efficient and effective to do so.

Strategy	JV Examples	Objective(s)
Wetland Restoration/ Enhancement Strategy	***Hydrological Restoration***: Engineered Wetland Program, e.g., installation of water controls to restore or enhance wetland habitat ***Ecological Restoration***: Vegetation control (e.g., control of willow, hardhack, cattail to maintain marsh conditions) ***Biodiversity and Carbon Sequestration Co-Benefits Strategy***: Restore habitat types that have high carbon sequestration capacity while benefiting wildlife	Restoration and enhancement of 1,224 hectares (3,025 acres) of freshwater wetlands by 2024
Upland Restoration/ Enhancement Strategy	***Ecological Restoration***: Vegetation control (e.g., mowing); Native vegetation plantings; Livestock fencing; Conduct/promote prescribed burning ***Extension***: Integrated Pest Management ***Incentive***: Grassland Set-asides; Funding for maintaining riparian buffers ***Biodiversity and Carbon Sequestration Co-Benefits Strategy***: Restore habitat types that have high carbon sequestration capacity while benefiting wildlife	Restoration and enhancement of 2,152 hectares (5,318 acres) of upland habitat by 2024, including the following priority habitat types: • Wetland-associated Uplands: 1,852 hectares (4,576 acres) • Grasslands: 250 hectares (618 acres) • Riparian Forests: 50 hectares (124 acres) Increased engagement with Health Canada (Pest Management Regulatory Agency) and partners involved in pesticide research and education by 2029 Increased CIJV awareness and support where applicable to other associations in pesticide research /education for reduced usage by 2029
Invasive Species (Wetland/Upland) Management Strategy	***Ecological Restoration***: Invasive species removal of wetland and upland habitats (e.g., Purple Loosestrife, Yellow Flag Iris, Canada Thistle, etc.) ***Incentive***: Funding support for Invasive Plant Species Council	Reduced invasive species populations on CIJV lands by 2029

Land and Water Policy

Land and Water Policy is the creation or alteration of policies (incentives or regulatory-based) that encourage more sustainable practices through science-based research. The CIJV coordinates much of its policy activities through the Wetland Stewardship Partnership, a complementary, collaborative association of three levels of government (federal, provincial, municipal), industry and several key environmental NGOs with the goal of conserving, restoring and managing wetland ecosystems throughout BC.

Strategy	**JV Examples** *indicates developed results chain	**Objective(s)**
Government Relations Strategy	***Agriculture Policy***: Influence range-use plans, prioritize more sensitive grassland areas; Science communications to inform development and rangeland planning; Grazing license regulations specific to grasslands and wetlands ***Wetland Policy***: Development & promotion of Wetland Ways guidelines; Wetland policy creation and implementation*; Development & promotion of Green Bylaws Toolkit; Streamline process for restoration on Crown and private lands; Address gaps in provincial water policy and regulations ***Integrated Land Use Planning***: Informing development planning - wetlands, etc.; Urban containment boundary; Support regional environmental planning*; CIJV involvement in forest certification; Engage with BC Council of Forest Industries; Determine how riparian area regulations can apply to more areas with timber harvest and agricultural areas (i.e., not just fish-bearing streams) ***Government & Industry Relations***: Work with the Province of BC to discontinue the selling of grasslands; Gain provincial support to reduce fuel build-up; Communicate to other gov/boards about the lack of funding for Natural Resource Officers; CWS Pacific Region notify National Capital Region of capacity needs; Increase collaboration with Indigenous groups;* Work with agriculture sector to plan for long-term water supply in the face of growing climate and industrial pressures	Increased use of conservation covenants on farmland by 2029 Maintain ALR boundaries by 2029 Increased engagement with the ALC by 2029 Government to move towards no net loss policy for wetlands by 2029 Broader uptake of stewardship principles at Local Government level by 2029 Increased provincial government engagement with the JV by 2029 Increased level of provincial government funding by 2029 Increased level of partnership with Indigenous Groups by 2029 Increased level of CIJV support for IPCA development by 2029

Management (Habitat Assets)

The management of all assets owned by JV partners, including infrastructure and interest, involves maintenance of the waterfowl productivity of existing projects and the provision of suitable habitat for other priority bird species.

Strategy	**JV Examples**	**Objective(s)**
Habitat Assets Management Strategy	***Engineered Wetlands***: Constructed and engineered wetland maintenance (e.g., vegetation management) ***Natural Wetlands***: Access management (e.g., signs, trails and livestock exclusion fencing) ***Wetland/Upland Rebuild***: Major repairs/project rebuilds (water controls) ***Biodiversity and Carbon Sequestration Co-Benefits Strategy***: Conduct habitat stewardship work to both sequester carbon and enhance wildlife value	Management of 222,563 hectares (549,965 acres) by 2024, including the following priority habitat types: • Freshwater Wetlands: 14,810 hectares (36,596 acres) • Wetland-associated Uplands: 47,590 hectares (117,598 acres) • Grasslands: 51,434 hectares (127,096 acres) • Riparian Forests: 7,611 hectares (18,807 acres) Achieve a long-term 'sustainable' conservation estate by 2029

Conservation Planning

The CIJV partners use a variety of tools to guide conservation actions and plan future activities. Some of these tools are developed independently by partners for specific purposes; others are developed jointly. The major CIJV conservation planning tools currently in use and those under development are presented more fully in Habitat Conservation Design (**Chapter 5**).

Strategy	JV Examples	Objective(s)
Conservation Planning Strategy	***Program Coordination***: CIJV Coordinator role, Implementation Plans, etc. ***Planning Tools***: Development of planning tools such as the Waterfowl Decision Support System; Helicopter-derived Breeding Habitat Suitability Model and all-bird priority areas	Implementation Plans and updates accepted by CIJV Board and the North American Wetlands Conservation Council (Canada) by 2021 Maintenance and update to planning tools used by CIJV partners by 2029

Science

Science is essential to adaptive management. It plays an integral part in the cyclical processes of planning, implementation and evaluation, and it helps ensure population and habitat goals are achieved in a cost-effective fashion. Scientific activities are undertaken for a number of reasons, including:

- To advance our level of knowledge of BC's wetlands, estuaries and water-associated birds
- To improve our understanding of waterfowl species distribution
- To inform planning processes and priorities by identifying new conservation threats and opportunities
- To test fundamental assumptions of models and conservation programs
- To measure progress towards goals, including evaluation of program effectiveness

See **Chapter 8** – Monitoring and Evaluating Performance for more information.

Strategy	JV Examples *indicates developed results chain	Objective(s)
Monitoring and Evaluation Strategy	***Habitat Program Evaluation***: Maintaining 2015 monitoring and evaluating activities; Assessment of the effectiveness of partner conservation activities ***Habitat/Landscape Inventory***: Mapping, inventory (use of existing habitat inventory information; GIS support, etc.); Update to Sensitive Ecosystem Inventories (SEIs) ***Waterfowl/Wildlife Science***: Christmas Bird Count, Breeding Bird Survey; Buffers/disturbance study	Increased science-related government funding by 2029 Maintain waterfowl monitoring program by 2029 Develop assessment of non-tradit ional conservation treatments (e.g., non-water controls) by 2029 Develop targeted habitat and species tracking program by 2029 Assess species response on conservation lands to show effectiveness of CIJV conservation lands by 2029
Knowledge Gaps	Collection of new information and filling of knowledge gaps; Research impacts of new pesticides on wildlife ***Economic Science***: Ecological Goods & Services research*	Better compilation and prioritization of important gaps for CIJV partners by 2029

Communications and Education

Inform and educate the partners and the public to demonstrate leadership on issues which relate to government or industry policies, and to encourage new partnerships and funding opportunities. Specific activities are associated with the promotion of the NAWMP Joint Ventures and associated programs under this Initiative.

Strategy	JV Examples	Objective(s)
Communications & Education Strategy	***Communications & Education***: General communications and marketing—social media, websites, project signage, news releases, etc.; Engage local communities to inform and promote abidance of Official Community Plans; Promote farm stewardship program to accommodate more birds; Raise awareness of ecosystem services/natural assets ***Outreach of Conservation Successes***: Promote value of farming/ranching	Increased profile, awareness of CIJV and partners by 2029 Increased internal reporting to the CIJV Board by 2029

Crop Damage

Not applicable to CIJV

Compensatory Mitigation

Compensatory mitigation involves the creation, preservation, restoration and/or enhancement of wetlands or uplands as compensation for impacts on other wetlands or uplands. It aligns with provincial, territorial, federal and/or other specific project requirements for mitigation.

Strategy	JV Examples	Objective(s)
Compensatory Mitigation Strategy	***Policy Application***: Work with provincial and federal Impact Assessment practitioners to ensure offset/mitigation policies/guidelines are followed (e.g., Environmental Mitigation Policy for BC, Federal Policy on Wetland Conservation) ***Compensation Programs***: Work with recipients of compensatory funds to ensure birds and bird habitats benefit from mitigation	Work with Impact Assessment stakeholders and recipients of compensatory funds to achieve no net loss of bird habitat, following mitigation hierarchy to avoid, minimize, restore and offset (**Figure 10**)

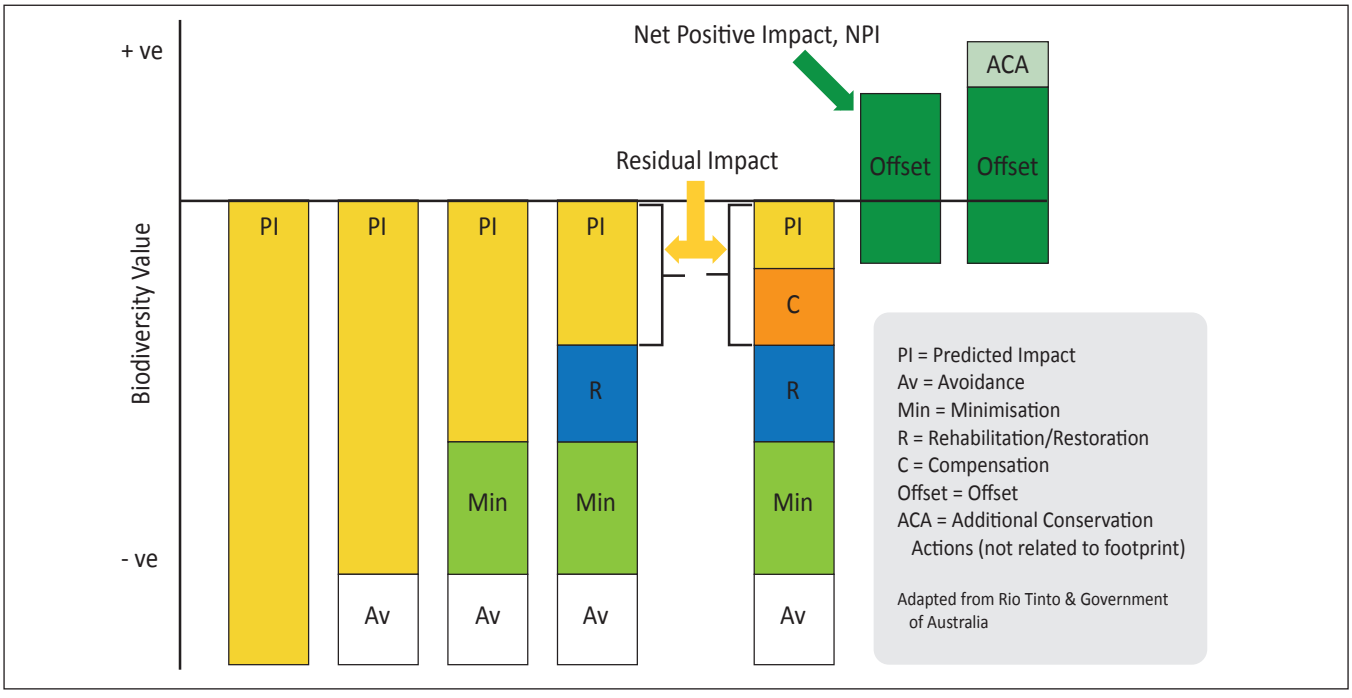


Figure 10. Mitigation hierarchy steps (Darbi 2020)

Predicted impact from projects decreases as mitigation steps are followed in the hierarchy of avoidance, minimization, restoration and compensation. When conducted appropriately, offset and additional conservation actions can result in a net positive impact on biodiversity value.

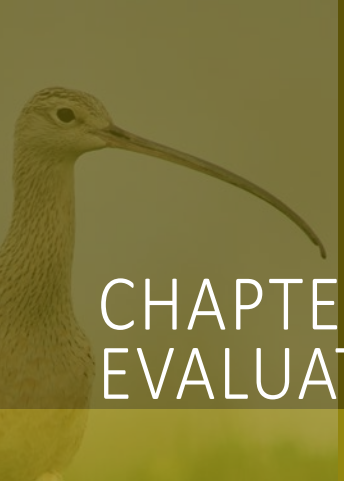
FIVE- AND TWENTY-YEAR COSTS FOR TOTAL CONSERVED HECTARES

Summary/disclaimer/description of budget preparations

Table 11. Five-year costs for total conserved hectares for CIJV activities

Activity	Projected 5-year Cost (CAD)	Comments
Habitat Retention – Permanent	$18,761,000	Cost estimated based on what CIJV partners expect to collectively accomplish until 2024, taking into account of cost per hectare ($/ha), anticipated funding, availability of resources and other factors
Habitat Retention – Medium Term (10-99 years)	$58,000	
Habitat Retention – Short Term (<10 years)	$100,000	
Wetland Restoration	$7,227,000	
Upland Restoration	$1,229,000	
Management (Habitat Assets)	$9,293,000	
Land & Water Policy	$73,848	Cost projected based on both PBHJV and CIJV 2015-2019 investments in this initiative according to the NAWMP NTS + 10%, then split in half between the two JVs. The two JVs share similar land and water policy objectives, many of which are Province-wide and span across both JVs
Conservation Planning	$2,592,124	Cost projected based on CIJV 2015-2019 investments in the three initiatives (Conservation Planning, Science and Human Dimensions) according to the NAWMP NTS + 10%
Science		
Human Dimensions		
Communications & Education	$23,051	Cost projected based on CIJV 2015-2019 investments in this initiative according to the NAWMP NTS + 10% Note that some communication costs may be nested within direct program expenditures (e.g., habitat retention, habitat restoration) and therefore not accounted here
Compensatory Mitigation	$0	Costs for JV staff time, contractors, consultation, planning and on-the-ground work are primarily covered by industry partners
Total Cost	**$39,427,023**	

The CIJV 20-year objective for total "Conserved Hectares" is 200,984 hectares (496,642 acres), which was roughly estimated by multiplying the sum of the 5-year habitat objectives of Securement (Habitat Retention - Permanent and Medium) and Restoration (Wetland and Upland Restoration) initiatives by 4. The 20-year cost for "Conserved Hectares" is projected to be $131,256,000, and likewise was roughly estimated by taking the total 5-year costs of these Securement and Restoration initiatives, multiplied by 4, plus an additional 20% to account for inflation cost. This is a rolling projection that will be updated every five years.



CHAPTER 8 – MONITORING AND EVALUATING PERFORMANCE

ADAPTIVE MANAGEMENT

As a result of the Open Standards workshops and technical team meetings from 2018-2021, CIJV partners have developed the previously discussed conservation strategies and objectives (**Chapter 7**). To monitor the progress and effectiveness of the implementation of this plan and provide positive feedback opportunities to adapt the plan as it is rolled out, CIJV partners have also connected indicators with relevant data sources for each strategy as well as results chains to expand on specific strategy themes. **Table 12** shows a high-level work and monitoring plan to guide the application of this Implementation Plan over the next 5-10 years.

Table 12. CIJV work plan and monitoring table

NAWMP Initiative	Objective	Actions required to achieve monitoring	Indicator(s)	Data Source(s)
Habitat Retention – Permanent	Securement and Crown designation of 45,534 hectares (112,517 acres) by 2024	Update spatial area (polygon) of newly secured land into provincial and national databases, e.g., BC NGO Conservation Areas Database (CAD), Canadian Protected and Conserved Areas Database (CPCAD)	Increase in hectares/acres conserved through purchase or donation of lands or through restrictive covenants	BC NGO Conservation Areas Database; Canadian Protected and Conserved Areas Database; NAWMP NTS
			Increase in hectares/acres conserved through Crown land designation	
Habitat Retention – Medium Term (10-99 years)	Securement of 1,334 hectares (3,296 acres) by 2024		Increase in hectares/ acres conserved through conservation and/or Crown land agreements	
Habitat Retention – Short Term (<10 years)	Stewardship of 3,700 hectares (9,143 acres) by 2024		Increase in hectares/ acres stewarded through conservation programs	See above; Environmental Farm Plan or Species at Risk Partnerships on Agricultural Lands reporting
Wetland Restoration	Restoration and enhancement of 1,224 hectares (3,025 acres) of wetlands by 2024	Develop proper restoration polygons to include in database	Change in hectares/acres restored/enhanced wetlands through CIJV partner conservation programs	NAWMP NTS; CIJV Internal Spatial Database; BC's Invasive Alien Plant Program
	Reduced invasive species populations on CIJV lands by 2029		Net decrease in invasive species populations on CIJV lands	

Table 12. *Continued*

NAWMP Initiative	Objective	Actions required to achieve monitoring	Indicator(s)	Data Source(s)
Upland Restoration	Restoration and enhancement of 1,707 hectares (4,218 acres) of upland habitat by 2024	Develop proper restoration polygons to include in database	Change in hectares/acres restored/enhanced uplands through CIJV partner conservation programs	NAWMP NTS; CIJV Internal Spatial Database; Invasive Alien Plant Program (IAPP)
	Increased engagement with Health Canada (Pest Management Regulatory Agency), the BC Ministry of Environment & Climate Change, and partners involved in pesticide research and education by 2029	Work with BC Ministry of Environment & Climate Change to develop an Integrated Pest Management (IPM)-based tracking system to compile CIJV work that can be reported on and identify areas for support	Change in risk of regional contamination by pesticides performance index to generate a CIJV baseline; Change in numbers of relevant agencies, projects and/or programs involved in pesticide management and outcomes of involvement; Change in risk of pesticide contamination of water on cropland according to Agriculture and Agri-Food Canada's Pesticides Indicator; Change in BC regulation on pesticides (including rodenticides); Change in number of municipality bans on pesticides (including rodenticides)	Census of agriculture; Internal CIJV tracking
	Increased CIJV awareness and support where applicable to other associations in pesticide research /education for reduced usage by 2029			
Land & Water Policy	Increased use of conservation covenants on farmland by 2029	Streamlined process for approval of covenants within ALC; Track ALC policy in all regions and engage with ALC staff to promote acceptance of conservation covenant; Also track new conservation covenants on farmland in polygon form in NGO CAD	Change in level of conservation covenants on farmland	BC NGO Conservation Areas Database
	Maintain ALR boundaries by 2029	Work with ALC staff to develop a JV-relevant ALR tracking system at regional and provincial scales	Change in number of hectares/acres of ALR	ALR Map: https://www.alc.gov.bc.ca/alc/content/alr-maps/maps-and-gis
	Increased engagement with the ALC by 2029	Track ALC policy in all regions and engage with ALC staff to promote conservation covenants; reporting out on favourable approvals by ALC placing covenants on agricultural lands; favourable reception by local farm community regarding covenants and adoption of wildlife-friendly agricultural practices	Change in JV partner participation in ALC programs, committees, initiatives	Internal CIJV tracking

Table 12. *Continued*

NAWMP Initiative	Objective	Actions required to achieve monitoring	Indicator(s)	Data Source(s)
Land & Water Policy *(Continued)*	Government to move towards no net loss policy for wetlands by 2029	Engage with provincial and federal government to request a tracking scheme as it relates to use of wetland offset/mitigation guidelines (e.g., Federal Policy on Wetland Conservation, Environmental Mitigation Policy for BC)	Increase in application of wetland offset/mitigation guidelines to government and industry	Canadian Wildlife Service; BC Ministry of FLNRORD; BC Ministry of ECC
	Broader uptake of stewardship principles at local government level by 2029	Work with municipalities to develop local government tracking system; Potential to update the IBA form to BC Nature to include a report on the local governments adoption of bird-friendly guidelines	Change in level of use of Green Bylaws Toolkit; Change in number of communities with bird advisory groups	Municipal Governments; Internal CIJV tracking
	Increased provincial government engagement with the CIJV by 2029	Secure dedicated provincial resources on CIJV technical team and/or board	Change in CIJV partner participation in provincial programs and initiatives (Coastal Douglas-fir Conservation Partnership, BC Coastal Marine Strategy)	Internal CIJV tracking
	Increased level of provincial government funding by 2029	Secure dedicated provincial resources on CIJV technical team and/or board	Change in provincial dollars for JV affecting provincial policies that pertain to priority habitat types	Internal CIJV tracking; Province of BC
	Increased level of partnership with Indigenous Groups by 2029	Develop an Indigenous engagement tracking system within the CIJV	Change in the number of active partnerships through programs, agreements and projects	Guardian Program, co-management agreements, partnership projects
	Increased level of CIJV support for IPCA development by 2029	Track IPCAs and development; Incorporate conservation planning into IPCA; Develop knowledge sharing agreement	Change in the level of engagement with respective IPCA committees	IPCA committees
Management (Habitat Assets)	Achieve a long-term 'sustainable' conservation estate by 2029	Rebuild priority aging water-control infrastructure as necessary	Maintenance or improvement of CIJV habitat functionality	Internal CIJV partner infrastructure tracking
	Management of 222,563 hectares (549,965 acres) by 2024	Track restoration projects as polygon in conservation databases	Change in hectares/acres restored/enhanced through CIJV partner programs	BC NGO Conservation Areas Database
Conservation Planning	Implementation Plans and updates accepted by CIJV Board and the North American Wetlands Conservation Council (Canada) by 2021	Annual reporting; Development of dashboard metrics to present to the CIJV Board and relevant partners	Acceptance of CIJV Implementation Plan including updates by board	CIJV Implementation Plan; Board updates and technical team documents
	Maintenance and update to planning tools used by CIJV partners by 2029		Change in integration and evaluation of CIJV partner planning tools	

Table 12. *Continued*

NAWMP Initiative	Objective	Actions required to achieve monitoring	Indicator(s)	Data Source(s)
Science	Increased science-related government funding money by 2029	Partner with ongoing initiatives / building on planning work of Conservation Land Partnership Program	Increase in science-related government funding	NAWMP NTS; CWS
	Maintain waterfowl monitoring program by 2029	CIJV partners to jointly develop a tracking system for waterfowl monitoring	Change/update in data for waterfowl population objectives	CWS; DUC
	Assess impacts of non-traditional conservation treatments (e.g., non-water controls) by 2029	Develop assessment of non-traditional conservation treatments; Compare with available research on traditional conservation treatments	Change in CIJV partner understanding of applications of non-traditional conservation treatments	CIJV technical team documents; Internal CIJV tracking
	Develop targeted habitat and species tracking program by 2029	Track CIJV lands/projects completed in areas that have been identified by a tool(s) as being important (i.e., identify the tool and score/ranking of the implemented/completed project/acquisition, etc.); Review available tools/ data looking at trends using remote sensing and satellite imagery	Change in CIJV partner effectiveness in integrating conservation planning tools for conservation planning	CIJV technical team documents; Academic publications; Birds Canada's NatureCounts
	Assess species response on conservation lands to show effectiveness of CIJV conservation lands by 2029	Conduct field surveys on CIJV properties targeting priority species; proper data management to allow for statistical analysis	Change in CIJV partner knowledge of effectiveness of habitat conservation work	CIJV technical team documents; Academic publications
	Better compilation and prioritization of important gaps for CIJV partners by 2029	Develop overall list of knowledge gaps; Prioritize knowledge gaps; Develop research plan that addresses priority knowledge gaps	Change in resource use to effectively address knowledge gaps by CIJV partners	CIJV Implementation Plan and technical team documents
Communications & Education	Increased profile, awareness of CIJV and partners by 2029	CIJV partners to jointly develop a 'standard' tracking system for communications and education	Increase in website, social media, news release hits; Change in results from polls or surveys	CIJV partner individual communications tracking systems
	Increased internal reporting to the CIJV board by 2029	Implement biannual reports to board; Develop dashboard metrics	Improved internal reporting processes and communications	CIJV Board meetings; CIJV technical team documents

Table 12. *Continued*

NAWMP Initiative	Objective	Actions required to achieve monitoring	Indicator(s)	Data Source(s)
Human Dimensions	Address knowledge gaps identified from the Human Dimensions workshops by 2029	Development/implementation of formal research plan to address knowledge gaps identified in Human Dimensions workshops	Change in number of knowledge gaps addressed	Internal CIJV tracking
	Effectively communicate and develop awareness of the importance of CIJV species and habitat by 2029	Development and distribution of effective communications materials to targeted audiences; Development of a CIJV communications plan as necessary	Change in awareness of CIJV species and habitat to targeted audiences	CIJV partner individual communications tracking systems
	Increase waterfowl conservation support among various constituencies to at least the levels experienced during the last two decades by 2029	Regional numbers to be generated; Metrics and tracking program to document constituents and partnerships across all CIJV partnerships	Number of CIJV constituents engaged in waterfowl conservation (hunters/ birdwatchers); Number of new or non-traditional partners; Change in revenue (CAD) in CIJV generated through Migratory Game Hunting Permits	Migratory Game Hunting Permits; JV partner engagement tracking
	Build Human Dimensions capacity and understanding in the JVs by 2029	CIJV partners to participate in MITACS webinars and development of national survey; Development of formal research plan to address knowledge gaps identified in Human Dimensions workshops with prioritization and timeframe for implementation; Incorporation of national survey results into CIJV programming where applicable	Change in level of awareness of HD by CIJV partners; Change in level of CIJV partner awareness/ understanding of the social science landscape in the CIJV; Change in the application of Human Dimensions and incorporation of social science results across CIJV programs	Mitacs Project; National Hunter/ Birdwatcher Survey
Crop Damage	N/A	N/A	N/A	N/A
Compensatory Mitigation	Work with Impact Assessment stakeholders and recipients of compensatory funds to achieve no net loss of bird habitat, following mitigation hierarchy to avoid, minimize, restore and offset	Engage with provincial and federal government to request a tracking scheme as it relates to use of bird habitat offset/mitigation guidelines (e.g., Federal Policy on Wetland Conservation, Environmental Mitigation Policy for BC)	Increase in application of bird habitat offset/mitigation guidelines to government and industry activities	Environment & Climate Change Canada, BC FLNRORD, Port of Vancouver, BC Wildlife Federation, South/West Coast Conservation Land Management Program

CONSERVATION TRACKING SYSTEM

The CIJV partnership tracks coarse funding and hectare accomplishments via the Canadian National Tracking System (NTS). However, because the NTS is not spatially explicit, it cannot be used to inform conservation decisions and planning. The BC NGO Conservation Areas Database (CAD) described in **Chapter 2** is more useful in making the link between conservation actions and progress toward objectives. The CAD is administered by two CIJV partners (NTBC and DUC), with all CIJV partners contributing information as needed to update it on a yearly basis. The database includes the conservation areas of nearly all NGOs in BC. A subset database has been created for those projects involving CIJV partners since the inception in 2003. This includes provincial or Canadian Wildlife Service designations since 2003. With a full list of all CIJV properties, the types of uses for this information include: coordinating land management activities on adjacent properties owned by different conservation organizations, identifying property encroachment violations and reporting on designations and ownership types.

By overlaying the CIJV properties database with other GIS datasets, partners can conduct a wide variety of spatial analyses such as determining amount of species at risk critical habitat protected by CIJV actions.

HABITAT INVENTORY AND MONITORING PROGRAMS

One of the CIJV's main objectives is to inventory and monitor net changes in essential habitat types to determine gains and losses (net change in landscape condition), as well as areal extent for some habitat types or influences. The CIJV will focus on those habitats where the limiting factors are of greatest concern (**Appendix 5**), and work to address the habitat drivers and information needs identified in previous sections. For example, monitoring land cover enables estimations of the types and amounts of habitat secured over time in a spatially explicit way. Monitoring wetlands improves the accuracy and applicability of Habitat-Species models in estimating population sizes and distributions. Monitoring the occurrence of invasive species can help to assess the effectiveness of intertidal restoration programs.

Habitat datasets that are updated on a regular basis to indicate trends vary in scale and frequency. As the costs of satellite imagery and processing have gone down, more land cover datasets are becoming available on a regular basis. These types of datasets have sufficient resolution and accuracy to provide broad trends. One example is the annual Agriculture Canada National Crop Inventory which indicates the general extent of wildlife-compatible crops across the CIJV. The Commission for Environmental Cooperation produces a land cover dataset every five years for all of North America that includes classes such as forests (deciduous, coniferous, mixed), shrubs and built-up areas. This can be compared to the Priority Habitat Types to indicate 5-year trends in gains and losses. A new wetland mapping program in Canada that uses satellite imagery, new processing algorithms and field data is being designed to fill gaps in wetland classes and trends.

While satellite-based mapping can provide broad trends, finer-scale habitat mapping and trend analysis based on orthophoto analysis is also useful, particularly in urban areas to detect smaller, incremental losses (e.g., highway widening, agricultural expansion).

POPULATION MONITORING PROGRAMS

The CIJV's main objective is to quantify bird numbers and assess population status to monitor trends and to evaluate the efficacy of habitat-based conservation efforts. Understanding population numbers and dynamics also supports Habitat-Species models, which in turn, inform conservation planning tools. CIJV population monitoring integrates results from various regional, national and international monitoring programs. These programs (**Appendix 6**) are mainly run by CWS and Birds Canada. Waterfowl are monitored in the course of two different survey programs. In all cases, CWS and DUC are the leading partner agencies. For waterfowl, the CIJV's capacity and commitment to track landscape-level population changes is mostly limited by the nature and availability of landscape-level biophysical data to interpret and model habitat use, not by monitoring programs.

INTEGRATION OF INFORMATION – CIJV DATA MONITORING SOURCES

Table 13 summarizes how CIJV monitoring programs are integrated to inform the monitoring and evaluating of target habitats and species, objectives and conservation planning tools. Details of habitat and population monitoring programs are found in the appendices.

Table 13. Integration of monitoring data sources for CIJV

Category	Monitoring Program/Study/ Tool Name	Purpose/Focus (habitat, species, conservation planning tools)	Responsible Organization(s)
Habitat Inventory & Monitoring	Land Cover Mapping	Grasslands, wetland-adjacent forests and other priority habitat types	Commission for Environmental Cooperation
	Vegetation Resource Inventory	Grasslands, wetland-adjacent forests and other priority habitat types	BC Ministry of Forests
	BC Freshwater Atlas	Wetlands	Province of BC
	Sensitive Ecosystem Inventories	Grasslands, wetland-adjacent forests and other priority habitat types	Various Organizations
	Canadian National Wetland Inventory	Freshwater wetlands	ECCC
	Grassland Mapping Program	Grasslands, wetland-adjacent grasslands	Grasslands Conservation Council of BC, ECCC
	Riparian topographic feature mapping	Riparian areas	ECCC
Population Monitoring	Waterfowl Aerial Surveys	Waterfowl, DSS	ECCC-CWS / DUC
	Pre-Season Duck Banding	Dabbling ducks	ECCC-CWS / DUC
	BC Breeding Bird Atlas	All bird groups	Birds Canada
	Breeding Bird Survey	All birds/Waterfowl and non-waterfowl objectives	ECCC-CWS
	Multi-species survey on CIJV properties	Priority habitat types / Landbirds, shorebirds, marsh birds and other bird groups	ECCC-CWS
	Marsh Monitoring Survey	Protected versus unprotected habitat, marsh birds	Birds Canada / WildResearch
	Lewis Woodpecker	Species at Risk	ECCC-CWS
	Williamson's Sapsucker	Species at Risk	ECCC-CWS

Figure 11 shows a conceptual diagram depicting the CIJV's adaptive management approach. Investments (1 - green) in various land-based strategies (e.g., land securement, habitat restoration) are informed by the implementation of other strategies (e.g., conservation planning tools, HD initiatives). Together these strategies address the key threats (2 - yellow) identified in this IP for birds and bird habitat. By removing or mitigating threats related to habitat loss and degradation, priority bird species would in principle respond positively (3 - red) as evaluated through the population monitoring programs (**Appendix 6**). Likewise, habitat trends and land base changes resulting from key habitat threats are evaluated through various habitat monitoring programs (**Appendix 5**). Through the analysis of data generated from habitat and species monitoring programs (4 - purple), progress can be tracked through reports and internal databases (5 - grey). These results would ultimately be communicated to the CIJV Board and other relevant partners, allowing them to make decisions to further inform strategic investments in JV initiatives.

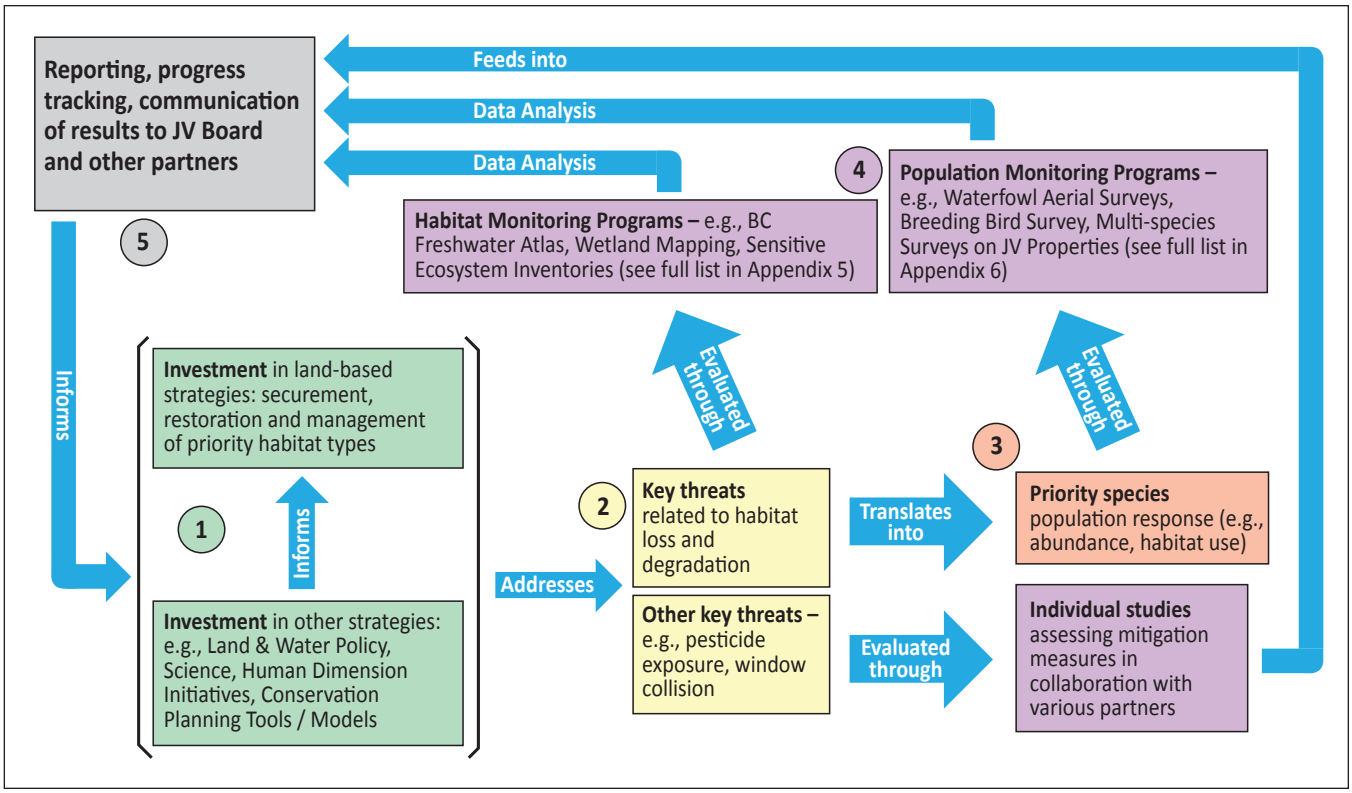


Figure 11. CIJV adaptive management approach

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APPENDICES

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Appendix 1: Definitions for CIJV Priority Habitat Types

Appendix 2: List of Non-governmental Organizations and their conservation hectares (acres) secured in CIJV

Appendix 3: Discussions from the 2020 PBHJV/CIJV Human Dimensions workshop

Appendix 4: Maps of CIJV Priority Habitat Types after applying selection criteria

Appendix 5: Habitat inventory/monitoring programs in the CIJV

Appendix 6: Population inventory/monitoring programs in the CIJV

CIJV FACTS

- Home to 373 bird species, 19 of which are Endangered, Threatened or of Special Concern under Canada's *Species at Risk Act*
- Harbours the highest diversity of owls, woodpeckers, swifts and hummingbirds in Canada
- Supports 1.45 million waterfowl in the breeding season
- Home to more than 1,500 species of native vascular plants, 43 species of fish, 29 species of amphibians and reptiles and 94 species of mammals

WHAT IS A JOINT VENTURE

A Joint Venture is a regional partnership of the North American Waterfowl Management Plan. Each Joint Venture relies on sound science and a partnership approach to conserve high-priority migratory bird wetland and associated upland habitat in Canada, Mexico and the United States. There are four Habitat Joint Ventures, including the CIJV, and three Species Joint Ventures within Canada.

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Canada's NAWMP Habitat Joint Ventures

CONNECTING PEOPLE
through
SOUND SCIENCE
at the
LANDSCAPE LEVEL
using a
PARTNERSHIP APPROACH
for long-term
CONSERVATION IMPACT

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