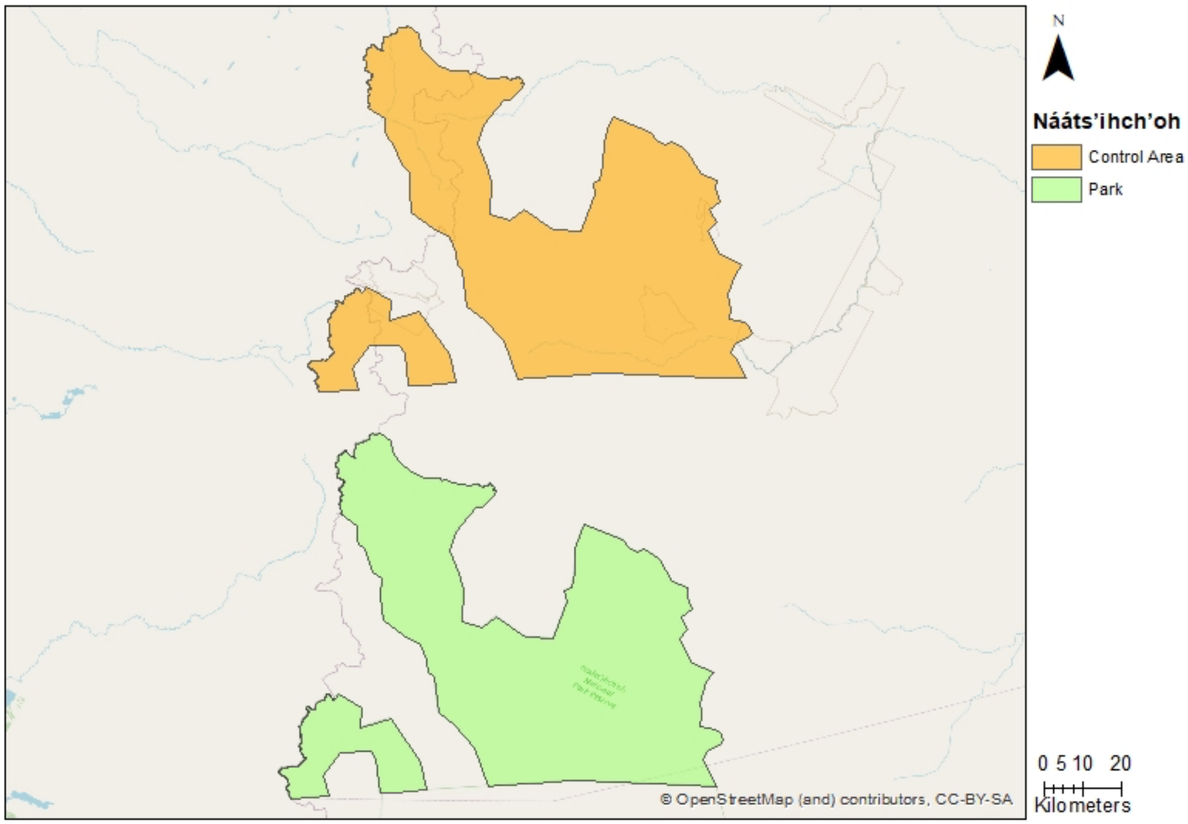
Supplementary material for

“How effective have Canadian national parks been at preventing landscape fragmentation?”

S1 – Map showing the location of the control area for Náátsʼįhchʼoh NPR in comparison to the park reserve



S2 – Data suitability table

Data	Suitable time-step?	Complete coverage of NPs and CAs?	Consistent definitions of fragmenting elements?	Consistent resolution?	Inclusion of data for all FGs?
CanVec Series	2021	Yes	Yes	Yes	Yes
Open Database of Buildings	2020	Yes	Yes	Yes	NA[1]
Annual Crop Inventory	2009-2020	Yes	Yes	Yes	NA
CanVec Series	2013	Yes	Yes	Yes	Yes
CanMatrix Series	1944-2012	Yes	Yes	Yes	Yes
Surveys and Mapping Branch. Energy, Mines and Resources Canada	1954-1987	Yes	Yes	Yes	Yes
Department of the Interior	1921-1931	No[2]	Yes	Yes	Yes

S3- CBC buffer zone creation process using literature about caribou movement

Range of daily movement (km)	Source
2.3-9.1	Poole et al., 2010
2	Pedersen et al., 2021
0.26-0.69	Wakkinen & Sloane, 2010
2.8-18	Person et al., 2007
5.8-15.9	Gunn et al., 2013
2-11.5	Russell & Gunn, 2019
Mean of ranges: 9.13km	

[1] Data denoted as NA is not needed in any or all fragmentation geometries related to human impacts (i.e. FGs 1 & 2)
[2] Gaps in geographic coverage filled with alternative maps – see S8 for map list

S4 - CUT and CBC procedure: Fragmentation near the boundaries of national parks

Overall, the CBC procedure is more appropriate for this study because it does not consider the boundaries of the parks and control areas as physical barriers. This is particularly useful for inland parks that have multiple sections to them, such as Grasslands and Nááts'ihch'oh. However, the CUT and CBC results can be compared to gauge the effect of fragmentation adjacent to the parks and park reserves. Studying the land adjacent to protected areas gives an idea of how a park can be affected by processes that occur outside its boundaries, and how isolated the wildlife populations might be from any surrounding natural area (Soverel et al., 2010; Parks Canada 2023b). Pairs that have a greater negative effect size for the CBC procedure than the CUT indicate that there is more fragmentation in the 10 km buffer zone of the park in comparison to within the park boundary, and vice versa, since the divergence of effective mesh size can be compared between the CUT and CBC. This is the case for almost all park-control pairs with the exception of Prince Albert (Figure S4a). The fragmentation level change is greater within the boundaries of Prince Albert NP than in the buffer zone. The parks with the strongest indication of increased fragmentation just outside their boundaries in the greater park ecosystem are primarily in south-eastern Canada: Kouchibouguac, La Mauricie, Gros Morne, Pukaskwa, and Bruce Peninsula. This generally follows the findings of Leroux & Kerr (2013), that small park sizes and proximity to urban areas in the south of Canada encourage development close to and into the boundaries of protected areas.

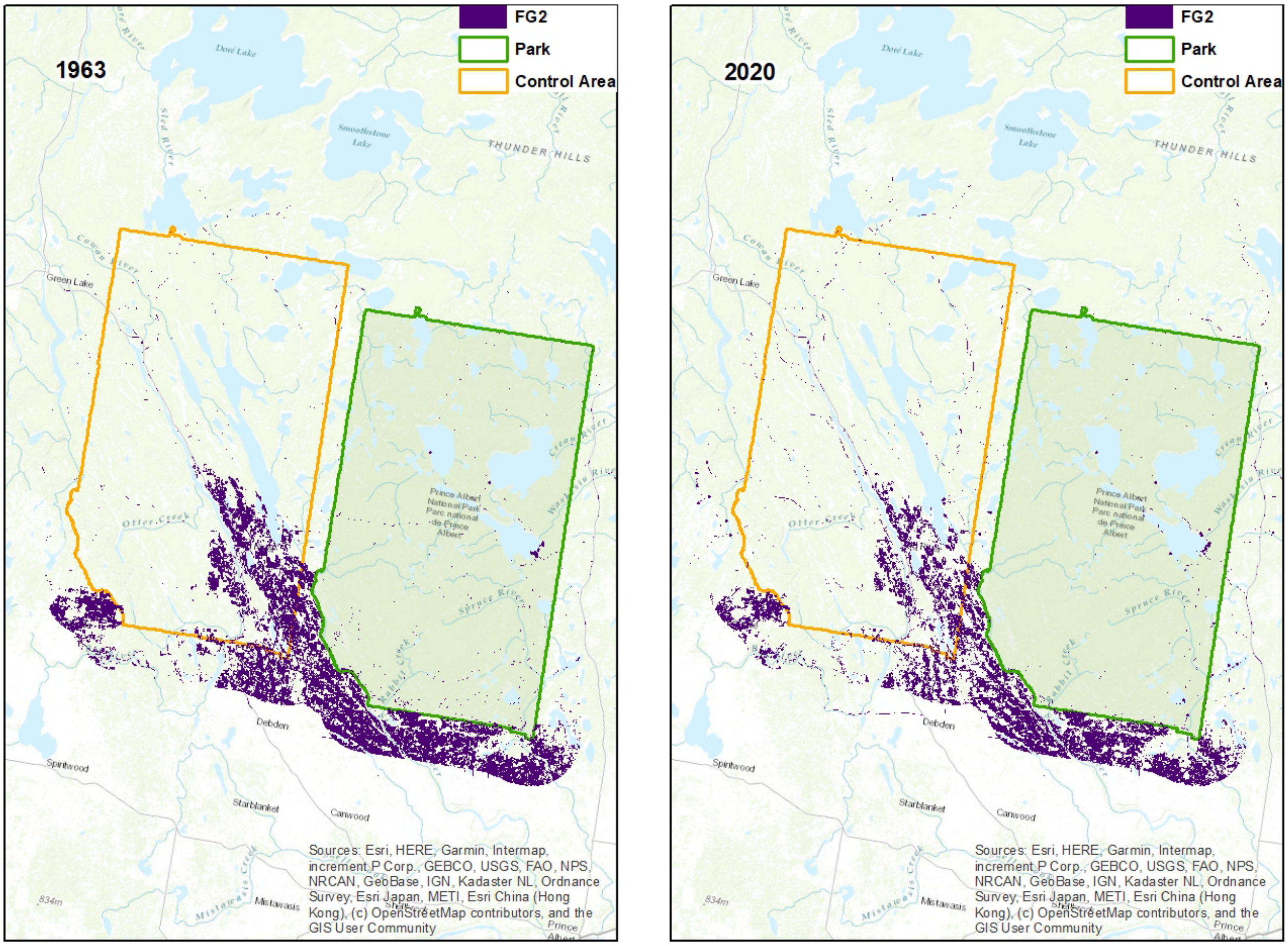


Figure S4a- *FG2 for Prince Albert NP and its associated control area, in 1963 and 2020. There is a greater reduction of fragmenting barriers in the park's buffer zone than within its boundaries, along with a large reduction of fragmenting barriers in the control area and its buffer zone. Therefore, the effect size for the CUT procedure (-0.874 km²/yr) is larger than for the CBC (-0.816 km²/yr).*

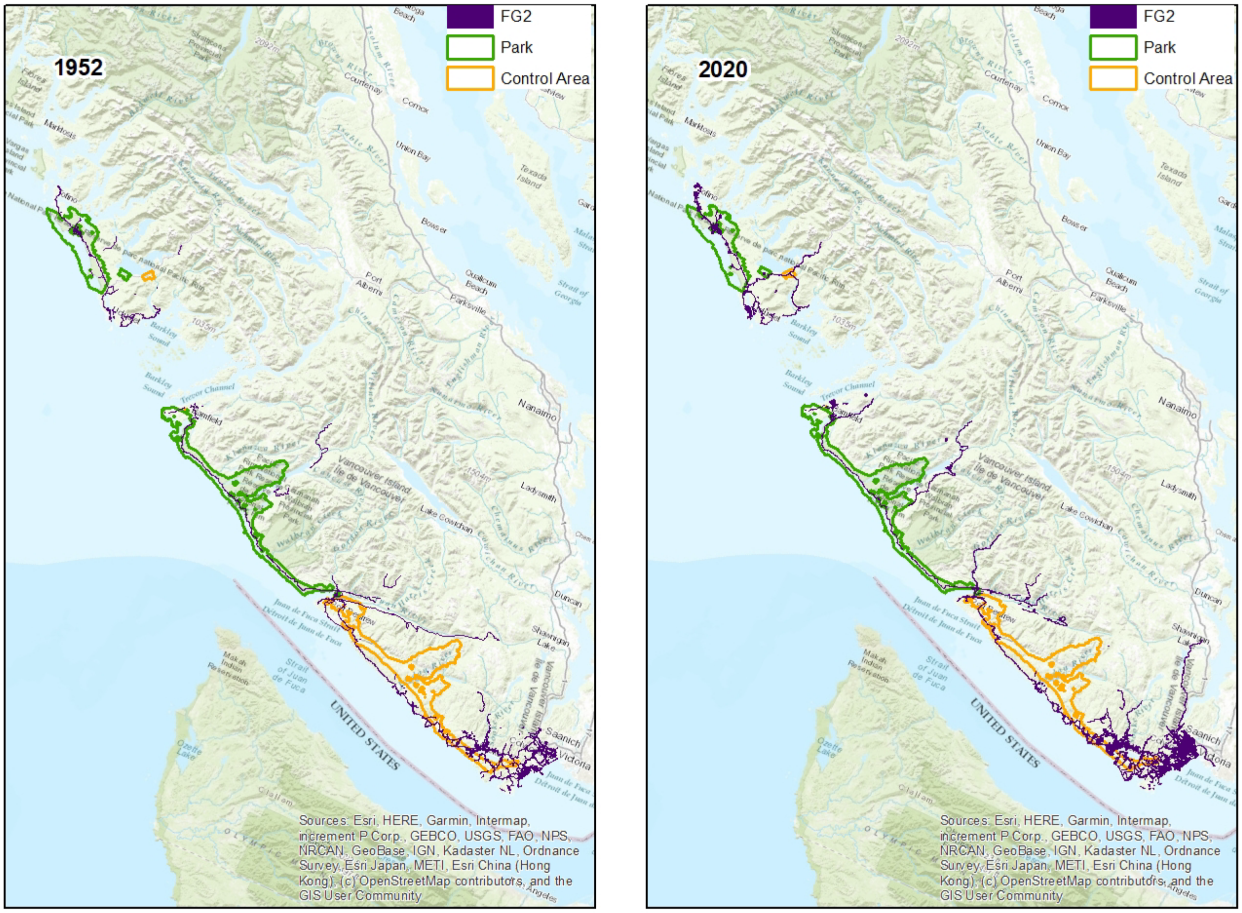


Figure S4b- *FG2 for Pacific Rim NPR and part of its associated control area, in 1952 and 2020. There is a greater increase of fragmenting barriers in the NPR than in its buffer zone, and a greater increase of fragmenting barriers in the buffer zone of the control area in comparison to within its boundaries. Therefore, there is a negative effect size for the CUT procedure (-0.0437 km^2/yr) and a positive effect size for the CBC (0.168 km^2/yr).*

For the majority of park-control pairs, trends in effective mesh size change for both the CUT and CBC procedures were similar, indicating that fragmentation around the parks may increase pressure for fragmentation and development within the park boundaries (Leroux & Kerr, 2013). However, the Pacific Rim park-control pair (Figure S4b) has a negative direction of effect size for the CUT procedure, and positive for the CBC procedure. The CUT results show that Pacific Rim NPR has had more fragmentation over time than its control area, and vice versa with the CBC results. This is due to an increase in tourist facilities within Pacific Rim NPR but not adjacent to its boundaries, and a significant increase in the suburban built-up areas of Victoria in the buffer zone of the control area in comparison to the smaller effect of the expansion of Tofino and Ucluelet near the park.

S5 - Examples: Keystone species and species at particular risk from fragmentation, and their history in the park-control pairs

Many parks have keystone species significantly affected by landscape fragmentation in the protected areas and greater park ecosystems of the park buffer zones and control areas. For example, Banff has undertaken a Plains Bison Reintroduction Pilot, to support Parks Canada's goals in maintaining and restoring ecological integrity. Free roaming plains bison (*Bison bison bison*) became locally extinct in Banff by the 1870s due to overhunting, but are important to the native ecosystem of the park as their presence affects the landscape in ways that benefit other species (Parks Canada, 2018; Parks Canada, n.d.). The new bison herd movement has been influenced by interventions such as drift fences in order to keep the herd within their reintroduction zone, however their movement in the first five years of reintroduction shows their attraction to areas outside of Banff NP at Ya Ha Tinda and the Panther River valley (Parks Canada, 2023a). Keeping landscape fragmentation low in and around the eastern slopes of Banff NP will be crucial in future range and population management for the herd. A similar reintroduction program for plains bison has occurred at Grasslands NP, with the herd originating from Elk Island NP. Elk Island is the only entirely fenced national park, in order to maintain the disease-free status of the plains bison and wood bison (*Bison bison athabascae*) population. This fencing, and the traffic on Highway 16 split the park into two blocks that are ecologically independent of one another and independent of the surrounding buffer zone, and it contributes to the park's challenges of overabundant bison, elk (*Cervus canadensis manitobensis*) and moose (*Alces alces andersoni*) (Parks Canada, 2023c).

Another keystone species that is native to a wide range of park-control pairs is the caribou. The caribou's keystone status and its sensitivity to landscape fragmentation and human disturbance led to the creation of the 10km buffer zone for the parks and control areas in the present study. Logging, road development and associated industrial and recreational access bring increased hunter access, and altered predator-prey balances have displaced Mountain, Boreal, Atlantic and Newfoundland caribou (*Rangifer tarandus caribou*), affected their habitats and retracted their ranges (Adamczewski et al., 2003; Apps & McLellan, 2006; Arlt & Manseau, 2011). The study shows the increasing landscape fragmentation and human pressures on the Rocky Mountain national parks and eastern national parks, which affect caribou access to undisturbed ranges. Actions taken by Parks Canada to reduce harm to caribou include mitigation measures and closures of roads, recreation areas, and trails in Gros Morne, Jasper, Glacier and Mount Revelstoke (Parks Canada, 2023d). The Peary Caribou (*Rangifer tarandus arcticus*) historical habitat that includes Quttinirpaaq, Qausuittuq and Aulavik is essentially all available and has not been lost or fragmented by anthropogenic developments (COSEWIC, 2015). This can be seen by the small effect sizes in both the CUT and CBC procedures for these parks. This is also mostly the case for other Barren-ground caribou, with their range covering Ivvavik, Vuntut, Tuktut Nogait, Thaidene Nënë, Ukkusiksalik, Sirmilik and Auyuittuq.

Mammals are not the only animals affected by landscape fragmentation in the park-control pairs. The wood turtles (*Glyptemys insculpta*) native in and around La Mauricie NP are particularly sensitive to the human-induced landscape fragmentation that has increased over time, and its status in the park is considered poor (Parks Canada, 2024). The southern part of the greater park ecosystem contains increasing urbanization concentrated around Trois-Rivières (Habitat, 2022). Due to these fragmenting barriers encroaching into the wood turtle's habitat in the control area and the park buffer zone, actions taken by Parks Canada in the park include installing structures to guide turtles off the road and plant rehabilitation to make medians less attractive to turtles (Parks Canada, 2024).

Table S5 *- Parks that consider landscape fragmentation or related indicators in their ecological integrity monitoring, as found in the most recent State of Park reports or Park Management Plans.*

Park	Indicator
Banff	Winter wildlife corridors
Waterton Lakes	Sensitive species-secure habitat
Jasper	Motorized access density
Mount Revelstoke	Wildlife cameras & wildlife tracks
Point Pelee	Forest ecosystem monitoring
Kootenay	Wildlife cameras & wildlife tracks
Fundy	Carnivore habitat connectivity
Terra Nova	Wildlife cameras
La Mauricie	Forest landscape monitoring, black bear movement corridors
Pacific Rim	Wildlife habitat fragmentation & anthropogenic development
Bruce Peninsula	Forest & wetland connectivity & abundance
Wapusk	Maintaining natural physical processes

S6 - Landscape fragmentation monitoring within the greater park ecosystems

For the greater park ecosystems (including unprotected land adjacent to the protected areas and control areas), landscape fragmentation monitoring is important but missing in many regions. Remaining natural land cover between protected areas are vulnerable to ongoing landscape fragmentation, as seen in many of the control areas in this study, leaving the parks and park reserves as increasingly isolated stepping-stones of natural areas within a wider human-influenced landscape (Roch & Jaeger, 2014; Cole et al., 2023). To combat this process, in some parks, Parks Canada is working with other organizations to connect the surrounding landscape. One of the most significant of these is the Landscape Resiliency Program, a collaboration with the Nature Conservancy of Canada, where buffer zones and wildlife corridors adjacent to national parks will be protected by working with local communities. Parks included in this program are Gulf Islands, Waterton Lakes, Grasslands, Bruce Peninsula, Point Pelee, La Mauricie, Kouchibouguac, and Kejimkujik (Nature Conservancy of Canada, 2023).

Other NGOs such as the Y2Y and Staying Connected Initiatives look to protect large swathes of intact habitat, with the NPS acting as cornerstones of the connected landscapes (Staying Connected Initiative, 2023; Yellowstone to Yukon Conservation Initiative, 2024). By focusing on conservation with the wide variety of stakeholders and levels of governance present in a multi-functional landscape outside of a park, these initiatives find success in preventing landscape fragmentation both within and between protected areas (Parrott et al., 2019). Additionally, some provinces are working on monitoring fragmentation and/or connectivity. For example, the government of Alberta and the Alberta Biodiversity Monitoring Institute developed an indicator based on Equivalent Connected Area (Alberta Government, 2024). In Quebec, the Quebec Ecological Corridors Initiative champions ecological corridors in land use planning and advises governments, farmers, and other stakeholders (Nature Conservancy of Canada, 2017).

S7 – Data used in study

S7a - Vector datasets

Name	
National Park boundaries	Parks Canada Agency, G. of C. (2020). *Places administered by Parks Canada—Open Government Portal* (Version 1) [.shp]. https://open.canada.ca/data/en/dataset/e1f0c975-f40c-4313-9be2-beb951e35f4e
CanVec – 50k topographic	Natural Resources Canada. (2020). *Topographic Data of Canada—CanVec Series—Open Government Portal* [.shp]. https://ouvert.canada.ca/data/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409fe056
CanVec – 250k hydrographic features	Natural Resources Canada. (2020). *Topographic Data of Canada—CanVec Series—Open Government Portal* [.shp]. https://ouvert.canada.ca/data/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409fe056

Agriculture – Annual Crop Inventory 2020 & 2013	Agriculture and Agri-food Canada. (2020). *Annual Crop Inventory—Open Government Portal* (Version 1) [.shp]. https://open.canada.ca/data/en/dataset/ba2645d5-4458-414d-b196-6303ac06c1c9 Agriculture and Agri-food Canada. (2013). *Annual Crop Inventory—Open Government Portal* (Version 1) [.shp]. https://open.canada.ca/data/en/dataset/ba2645d5-4458-414d-b196-6303ac06c1c9
Pre-2000s agriculture – Land Cover for Agricultural Regions of Canada	Agriculture and Agri-food Canada. (2009). *Land Cover for Agricultural Regions of Canada, circa 2000—Open Government Portal* (Version 1) [Raster]. https://open.canada.ca/data/en/dataset/16d2f828-96bb-468d-9b7d-1307c81e17b8?_ga=2.1988981.515457352.1493845476-1970616929.1493845475
Open Database of Buildings	Statistics Canada, G. of C. (2019). *The Open Database of Buildings* [.shp]. https://www.statcan.gc.ca/en/lode/databases/odb
Alaska hydrographic features - 100k	U.S. Geological Survey. (2022). *National Hydrography Dataset (NHD). State—Alaska* [.shp]. https://www.sciencebase.gov/catalog/item/5136012ce4b03b8ec4025bf7
Montana hydrographic features -24k	U.S. Geological Survey, & Montana State Library. (2003). *Montana Hydrography Framework (National Hydrography Dataset)* [.shp]. https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did=%7bdb6c41bd-1f29-48ab-b4aa-2c1890f317e6%7d
Provincial – 2000s	Natural Resources Canada. (2014). Topographic Data of Canada—CanVec 1:50,000, 1944-2013—Open Government Portal [.shp]. https://open.canada.ca/data/en/dataset/be0165a8-ad5d-4adb-a27a-2d4117c3967c

S7b - CanMatrix maps for time-step 1970-1999

Natural Resources Canada. (2014). *Digital Topographic Raster Maps—Archived* (Version 4) [Raster]. https://ftp.maps.canada.ca/pub/nrcan_rncan/raster/topographic

For full list of maps per park-control pair, please see associated spreadsheet.

S7c - Topographic NTS maps for time-step 1931-1969

Army Survey Establishment, G. of C., & Borealis. (2022). *Historical National Topographic System (NTS): 1:50,000 Scale Maps, Data and GIS* [Raster]. https://borealisdata.ca/dataverse/topomaps

Army Survey Establishment, G. of C., & Natural Resources Canada. (2020). Historical Topographic Maps: 1:50,000 Index [Raster]. https://geo2.scholarsportal.info

S7c - Sectional Maps collection at the University of Calgary (SANDS) for time-step pre-1930

SANDS, U. of C. (n.d.). *Sectional Maps, 1 to 3 Mile. 1902 to 1955* [Raster]. https://sands.ucalgary.ca/App/SectionalMaps/index.html

S7d - Other maps used from external collections

Name	Year	Scale	Source	Collection
Waterton Lakes National Park	1914	1:62,500	Office of the Surveyor General	Historical Maps Collection, Libraries and Cultural Resources Digital Collections, University of Calgary
Crowsnest Forest and Waterton Lakes Park sheet 4	1914	1:62,5000	Office of the Surveyor General	Historical Maps Collection, Libraries and Cultural Resources Digital Collections, University of Calgary
Crowsnest Forest and Waterton Lakes Park sheet 5	1914	1:62,5000	Office of the Surveyor General	Historical Maps Collection, Libraries and Cultural Resources Digital Collections, University of Calgary
Yoho Park	1921	1:125,000	Department of the Interior	University of Alberta William C. Wonders Map collection
Mount Revelstoke Park	1923	1:125,000	Department of the Interior	UBC Koerner Library
Prince Albert National Park	1923	na	Department of the Interior	Canadiana Heritage Reel T-10406
Jasper National Park	1926	na	Department of the Interior, Engineering Service Canadian National Parks	UBC Koerner Library
Kootenay National Park	1926	1:126,720	Department of the Interior	Canadiana Heritage Reel T-12420
Pelee	1926	1:63,360	Department of National Defence, Geographical Section, General Staff	McMaster University Map collections - Ontario Historical Topographic Maps
Waterton Lakes Park	1928	1:63,360	Department of the Interior	UBC Koerner Library
Wood Buffalo Park	1931	1:506,880	Department of the Interior	U of T Libraries scanned maps
Kootenay National Park	1938	1:126,720	Mines and Technical Surveys. Surveys and mapping branch	Topographic map cabinets
Waterton Lakes	1940	1:63,360	Mines and Technical Surveys. Surveys and mapping branch	University of Alberta William C. Wonders Map collection
Wood Buffalo Park	1947	1:506,880	Department of Mines and Resources. Surveys and Engineering Branch.	U of T Libraries scanned maps
Prince Albert Park	1951	1:150,000	Mines and Technical Surveys. Surveys and mapping branch	University of Alberta William C. Wonders Map collection
Riding Mountain Park	1954	1:190,080	Surveys and Mapping Branch. Energy, Mines and Resources Canada	UBC Koerner Library
Banff National Park	1955	1:190,080	Mines and Technical Surveys. Surveys and mapping branch	National Park Files – Concordia University
Waterton Lakes	1955	1:50,000	Mines and Technical Surveys. Surveys and mapping branch	www.canadiana.ca

Waterton Lakes Park	1958	1:63,360	Mines and Technical Surveys. Surveys and mapping branch	UBC Koerner Library
Sage Creek	1960	1:50,000	Mines and Technical Surveys. Surveys and mapping branch	www.canadiana.ca
Beaver Mines AB/BC	1960	1:50,000	Mines and Technical Surveys. Surveys and mapping branch	www.canadiana.ca
Beaver Mines AB	1960	1:50,000	Mines and Technical Surveys. Surveys and mapping branch	www.canadiana.ca
Yoho Park	1961	1:126,720	Mines and Technical Surveys. Surveys and mapping branch	National Park Files – Concordia University
Mount Revelstoke Park	1963	1:50,000	Department of Mines and Resources. Surveys and Engineering Branch.	National Park Files – Concordia University
Blairmore AB	1967	1:50,000	Surveys and Mapping Branch. Energy, Mines and Resources Canada	www.canadiana.ca
Pelee Point	1969	1:25,000	Surveys and Mapping Branch. Energy, Mines and Resources Canada	McMaster University Map collections - Ontario Historical Topographic Maps

S8 – R packages used in study

Ben-Shachar, M. S., Makowski, D., Lüdecke, D.,, I., Wiernik, B. M., Thériault, R., Kelley, K., Stanley, D., Caldwell, A., Burnett, J., Karreth, J., & Waggoner, P. (2024). *effectsize: Indices of Effect Size* (0.8.9) [Computer software]. https://cran.r-project.org/web/packages/effectsize/index.html

Elzhov, T. V., Mullen, K. M., Spiess, A.-N., & Bolker, B. (2023). *minpack.lm: R Interface to the Levenberg-Marquardt Nonlinear Least-Squares Algorithm Found in MINPACK, Plus Support for Bounds* (1.2-4) [Computer software]. https://cran.r-project.org/web/packages/minpack.lm/index.html

Grothendieck, G., & Team (nls), R. C. (2024). *nls2: Non-Linear Regression with Brute Force* (0.3-4) [Computer software]. https://cran.r-project.org/web/packages/nls2/index.html

Mazerolle, M. J. (2023). *AICcmodavg: Model Selection and Multimodel Inference Based on (Q)AIC(c)* (2.3-3) [Computer software]. https://cran.r-project.org/web/packages/AICcmodavg/index.html

S9 – R code

```
# Load packages
require(minpack.lm) # Fitting non-linear models
require(nls2) # Fitting non-linear models
require(AICcmodavg) # calculate second order AIC (AICc)
require(effectsize)


#set wd to folder with data
setwd()


### Create the ProgressiveChangeBACIPS function
ProgressiveChangeBACIPS<-function(control, impact, time.true, time.model)
{
  ### STEP 2 - Calculate the delta at each sampling date
  delta <- impact - control
  print(delta)

  # Plot delta against time.true ORIGINAL
  dev.new(width=10, height=5)
  par(mfrow=c(1,2))
  plot(delta~time.true, type="n")
  time.model.of.impact=max(which(time.model==0))
  rect(time.model.of.impact-100, min(delta)-100, time.model.of.impact+1, max(delta)+100, col = "grey")
  points(delta~time.true, pch=24, bg="white", cex=2)

  ### STEP 3 - Fit and compete models
  ## Create a 'period' variable
  period <- ifelse(time.model==0, "Before","After")

  ## Fit a step model
  step.Model<-aov(delta ~ period)

  ## Fit a linear model
  linear.Model<-lm(delta ~ time.model)

  ## Fit an asymptotic model
  # Create an asymptotic function
  myASYfun<-function(delta, time.model)
  {
    funAsy<-function(parS, time.model)  (parS$M * time.model) / (parS$L + time.model) + parS$B
    residFun<-function(p, observed, time.model) observed + funAsy(p,time.model)
    parStart <- list(M=mean(delta[time.model.of.impact:length(time.true)]), B=mean(delta[1:time.model.of.impact]), L=1)
    nls_ASY_out <- nls.lm(par=parStart, fn= residFun, observed=delta, time.model=time.model, control = nls.lm.control(maxfev = integer(), maxiter = 1000))
    foAsy<-delta~(M * time.model) / (L + time.model) + B
    startPar<-c(-coef(nls_ASY_out)[1], coef(nls_ASY_out)[2], coef(nls_ASY_out)[3])
    asyFit<-nls2(foAsy, start=startPar, algorithm="brute-force") # nls2 enables to calculate AICc
    asyFit
  }
  # Fit the asymptotic model
  asymptotic.Model<-myASYfun(delta=delta,time.model=time.model)
```

```
## Fit a sigmoid model
## Create a sigmoid function
mySIGfun<-function(delta, time.model)
{
  funSIG<-function(parS, time.model)  (parS$M * (time.model/parS$L)^parS$K) / (1 + (time.model/parS$L) ^ parS$K) + parS$B
  residFun<-function(p, observed, time.model) observed + funSIG(p,time.model)
  parStart <- list(M=mean(delta[time.model.of.impact:length(time.true)]), B=mean(delta[1:time.model.of.impact]), L=mean(time.model), K=5)
  nls_SIG_out <- nls.lm(par=parStart, fn= residFun, observed=delta, time.model=time.model, control=nls.lm.control(maxfev = integer(), maxiter = 1000))
  foSIG<-delta~(M * (time.model/L) ^ K) / (1 + (time.model/L) ^ K) + B
  startPar<-c(-coef(nls_SIG_out)[1],-coef(nls_SIG_out)[2],coef(nls_SIG_out)[3],coef(nls_SIG_out)[4])
  sigFit<-nls2(foSIG, start=startPar, algorithm="brute-force") # nls2 enables to calculate AICc
  sigFit
}
# Fit the sigmoid model
sigmoid.Model<-mySIGfun(delta=delta,time.model=time.model)


## Compare models
# Perform AIC tests
AIC.test<-AIC(step.Model, linear.Model, asymptotic.Model, sigmoid.Model)
AICc.test<-as.data.frame(cbind(AIC.test[,1], c(AICc(step.Model), AICc(linear.Model), AICc(asymptotic.Model), AICc(sigmoid.Model))))
rownames(AICc.test)<-rownames(AIC.test)
names(AICc.test)<-names(AIC.test)

# Calculate AICc weight and select the best model
for(i in 1:dim(AICc.test)[1])
{
  AICc.test$diff[i]<-AICc.test$AIC[i]-min(AICc.test$AIC)
}
AICc.test$RL<-exp(-0.5* AICc.test$diff)
RL_sum<-sum(AICc.test$RL)
AICc.test$aicWeights<-(AICc.test$RL/RL_sum)*100
w<-AICc.test$aicWeights
names(w)<-rownames(AICc.test)

# Display AICc weights
print(w)
barplot(w, col="white", ylab="Relative likelihood (%)", cex.names = 0.9, names.arg =c("Step","Linear","Asymptotic","Sigmoid"))
best.Model<-which(w==max(w))
```

```r
#example: Taiga region
# import dataframe
  Site<-read.csv("Taiga.csv")

# attach dataframe DON'T FORGET
attach(Site)

#Test assumptions
#Uses graphical techniques due to small sample sizes for individual parks.
summary(Site)

#Normality
par(mfrow=c(1,2))
qqnorm(control)
qqline(control)

qqnorm(impact)
qqline(impact)

#If p-value <= 0.05, data is likely normally distributed.
#DO NOT USE FOR SMALL SAMPLE SIZES. Exploratory graphical techniques best here
shapiro.test(control)
shapiro.test(impact)

#Homoscedasticity. #if box widths are equal, it supports the assumption of homoscedasticity.
boxplot(control)
boxplot(impact)

#Autocorrelation
acf(control)
acf(impact)
#If the values are within confidence intervals, suggests that the autocorrelation is not statistically significant.

# Run ProgressiveChangeBacips function
ProgressiveChangeBACIPS(control, impact, time.true, time.model)

detach(Site)
```

Supplementary material references

1. Adamczewski, J. Z., Florkiewicz, R. F., & Loewen, V. (2003). *Habitat Management in the Yukon Winter Range of the Little Rancheria Caribou Herd* (TR-03-02). Department of Environment, Government of the Yukon.
2. Alberta Government. (2024). *Landscape Connectivity Indicator for Alberta—Open Government*. https://open.alberta.ca/opendata/gda-0f23e47d-fce1-4636-8760-02df5f83c18e. Accessed 18th June 2024.;'
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5. Cole, J. R., Kross, A., & Jaeger, J. A. G. (2023). Monitoring changes in landscape structure in the Adirondack-to-Laurentians (A2L) transboundary wildlife linkage between 1992 and 2018: Identifying priority areas for conservation and restoration. *Landscape Ecology*, *38*(2), 383–408. https://doi.org/10.1007/s10980-022-01561-2
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