To: Dan Austin
From: Will Kwan
Date: January 28th, 2025
RE: GISC480 Lab #2

This memo summarizes the methods, discussions, and results from Lab #2. The analysis focuses on trends in the distribution of wildlife observations across the study area in southwestern Alberta, their species and the Biogeoclimatic Ecosystem Classification (BEC) zones within which they fell. Additional analysis explores the distribution of wildlife classes and the temporal distribution of observations.

Executive Summary:
A GIS analysis was conducted on the client's wildlife observation data. The aim was to compare the years of wildlife data against the BEC zone information that each observation fell within. The BEC ecosystem classification system uses climax vegetation communities to define distinct biogeoclimatic zones based on dominant vegetation species and geographic or climatic characteristics (University of British Columbia, 2025). This system is helpful for inferring patterns of ecosystem functions and plant and animal distribution. Observations are characterized by species name and wildlife class—ungulates, carnivores, birds, and rabbits—providing an informal grouping of species based on broad physical or ecological characteristics (Parks Canada, 2025). The analysis supports the understanding of the distributions of species, their classes, and how species observations align with ecosystem classifications, aiding in environmental impact assessments and facilitating land management decisions.

Methods:
A table with wildlife observation points and a subset of the BC Government's BEC data was provided. Initially, the data table required Excel preprocessing to correct integrity and formatting issues that prevented its use in the GIS. Errors included swapped easting and northing values and numeric values formatted as strings. Once amended, the wildlife observations were plotted as points within the GIS using their corresponding easting and northing values. A spatial join was computed to associate these points and the information from the BEC zones where they fell. Finally, the BEC zone polygons were dissolved to define the extent of the study area.

Results:
With the analysis complete, the data could be meaningfully represented figuratively and tabularly. Figure 1 shows the distribution of wildlife observations on the landscape. The study area covers some 6579.19 km$^2$, over which 11,701 wildlife observations were made between and before 1982 and 2011. These observations account for 70,459 individual animals, the species of which are summarized in Table 1. Table 2 summarizes the total count of species per BEC zone. Figure 2 visualizes the distribution of wildlife classes among the BEC zones in a subset of the study area. Table 3 provides an overview of the temporal distribution of wildlife observations and their corresponding classes.

References:

Parks Canada. (2025). Wildlife in Waterton National Park. Parks Canada.
    https://parks.canada.ca/pn-np/ab/waterton/nature/faune-wildlife

University of British Columbia. (n.d.). About BEC and BGC units. Forest Genetics Council
    of British Columbia. https://cfcg.forestry.ubc.ca/resources/cataloguing-in-situ-
    genetic-resources/about-bec-and-bgc-units/

Tables and Figures:

Table 1. Species name and corresponding observed species count.

| Species Name | Total Count |
|---|---|
| Billy Goat | 969 |
| Bison | 4683 |
| Condor | 61 |
| Dog | 1 |
| Fox | 1 |
| Gazelle | 4300 |
| Giraffe | 50365 |
| Grizzly Bear | 3 |
| Hyena | 441 |
| Impala | 7559 |
| Lion | 50 |
| Mallard | 9 |
| Manx | 8 |
| Owl | 36 |
| Panda Bear | 32 |
| Pigeon | 182 |
| Polar Bear | 1 |
| Rabbit | 5 |
| Tiger | 1 |
| Wolf | 13 |
| Zebra | 1739 |
| Grand Total | 70459 |

Table 2. Species name and total observed species count per BEC zone.

| Total Species Count | BEC Zone | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Species | ESSFdk1 | ESSFdk2 | ESSFdkp | ESSFdkw | ICHmk4 | IMAun | MSdk1 | MSdk2 | Grand Total |
| Billy Goat | 232 | 72 | 290 | 267 | | 76 | 32 | | 969 |
| Bison | 1688 | 113 | 46 | 294 | | | 2512 | 30 | 4683 |
| Condor | 4 | | | 4 | | | 42 | 11 | 61 |
| Dog | 1 | | | | | | | | 1 |
| Fox | 1 | | | | | | | | 1 |
| Gazelle | 1301 | 229 | 8 | 103 | 19 | 1 | 1904 | 735 | 4300 |
| Giraffe | 10057 | 373 | 559 | 2218 | 110 | 6 | 36939 | 103 | 50365 |
| Grizzly Bear | | | | | | | 3 | | 3 |
| Hyena | 202 | 3 | 14 | 33 | | | 174 | 15 | 441 |
| Impala | 2726 | 178 | 1679 | 2427 | | 122 | 328 | 99 | 7559 |
| Lion | 16 | 2 | | | | | 32 | | 50 |
| Mallard | 9 | | | | | | | | 9 |
| Manx | 3 | | | 2 | | | | 3 | 8 |
| Owl | 18 | 1 | | 7 | | 1 | 9 | | 36 |
| Panda Bear | 20 | | | | | | 12 | | 32 |
| Pigeon | 36 | 8 | 13 | 78 | 2 | | 45 | | 182 |
| Polar Bear | 1 | | | | | | | | 1 |
| Rabbit | 4 | | | | | | 1 | | 5 |
| Tiger | | | | | | | 1 | | 1 |
| Wolf | 8 | | | 2 | | | 3 | | 13 |
| Zebra | 57 | 3 | | | | | 1675 | 4 | 1739 |
| Grand Total | 16384 | 982 | 2609 | 5435 | 131 | 206 | 43712 | 1000 | 70459 |

Table 3. Total species count per wildlife class per year.

| Total Species Count | Class | | | | |
|---|---|---|---|---|---|
| Year Observed | Bird | Carnivore | Rabbit | Ungulate | Grand Total |
| <1982-02-01 | 71 | 147 | 1 | 5404 | 5623 |
| 1982 | | 4 | | 1947 | 1951 |
| 1983 | 3 | 29 | | 3934 | 3966 |
| 1984 | 5 | 20 | | 3308 | 3333 |
| 1985 | 2 | 14 | | 4168 | 4184 |
| 1986 | | 27 | | 1917 | 1944 |
| 1987 | 52 | 22 | | 3240 | 3314 |
| 1988 | 2 | 23 | | 2734 | 2759 |
| 1989 | 4 | 15 | | 2624 | 2643 |
| 1990 | 7 | 8 | | 3378 | 3393 |
| 1991 | 1 | 24 | | 2811 | 2836 |
| 1992 | | 3 | | 617 | 620 |
| 1993 | 1 | 9 | | 1099 | 1109 |
| 1994 | 1 | | | 722 | 723 |
| 1995 | | 7 | | 434 | 441 |
| 1996 | 84 | 58 | 1 | 2222 | 2365 |
| 1997 | 2 | 7 | | 769 | 778 |
| 1998 | | 4 | | 591 | 595 |
| 1999 | 2 | 4 | 1 | 335 | 342 |
| 2000 | | | | 618 | 618 |
| 2001 | 1 | 7 | | 818 | 826 |
| 2002 | | 3 | | 1108 | 1111 |
| 2003 | | 2 | | 975 | 977 |
| 2004 | | 3 | | 864 | 867 |
| 2005 | 1 | 4 | | 3065 | 3070 |
| 2006 | | 7 | | 1915 | 1922 |
| 2007 | | 9 | | 2196 | 2205 |
| 2008 | 5 | 11 | | 2782 | 2798 |
| 2009 | 18 | 56 | | 3361 | 3435 |
| 2010 | 7 | 2 | | 2903 | 2912 |
| 2011 | 19 | 22 | 2 | 6756 | 6799 |
| Grand Total | 288 | 551 | 5 | 69615 | 70459 |

Figure 1. Study and wildlife observations. Rendered below as "Wildlife Observations."
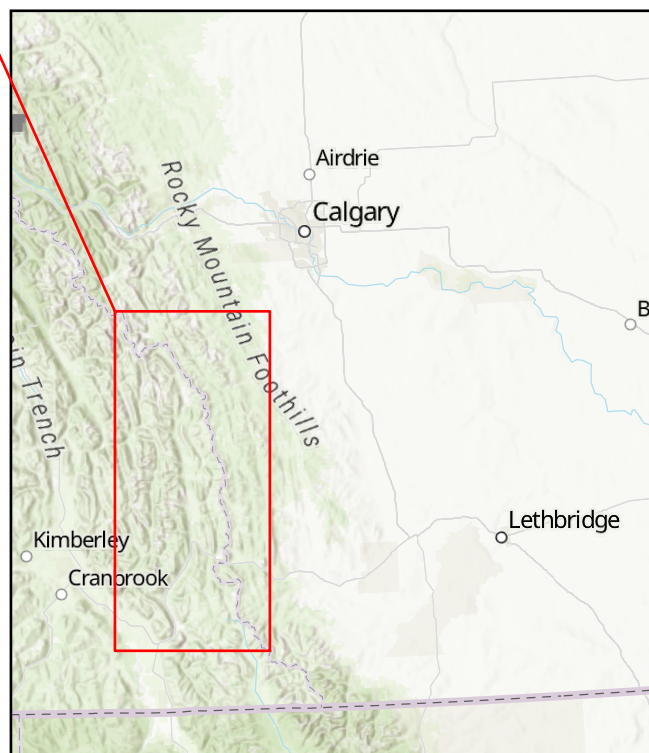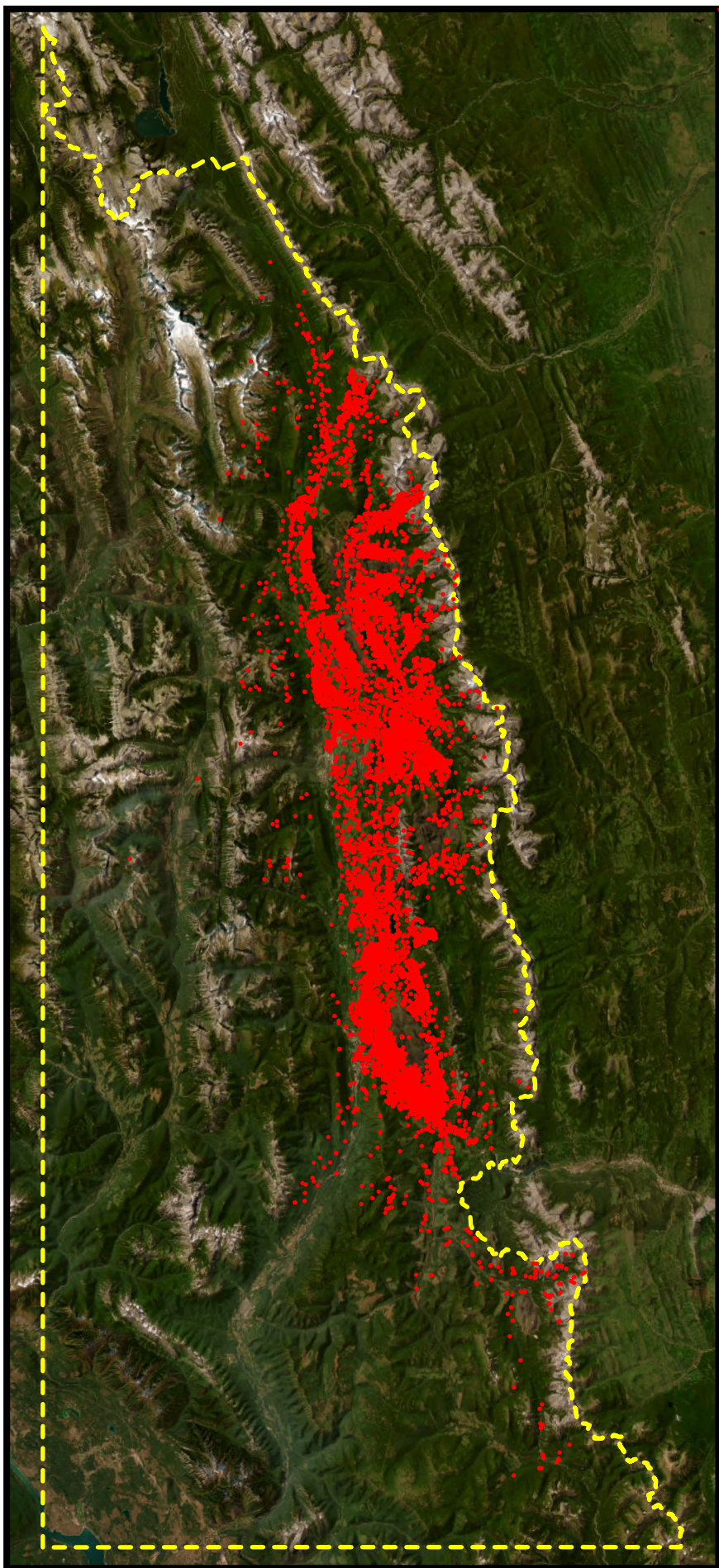
Figure 2. Wildlife observation class and BEC zones for a subset of the study area. Rendered below as "Wildlife Class and BEC Zone."

# Wildlife Observations

Created by: Will Kwan

N W E S

0 5 10 20 Kilometers



Airdrie

Calgary

Rocky Mountain Foothills

n Trench

Kimberley

Cranbrook

Lethbridge

Br

Study Area

Wildlife Observation (11701)

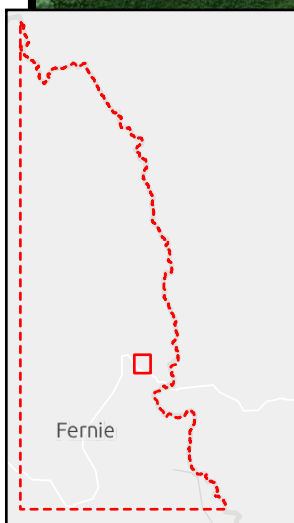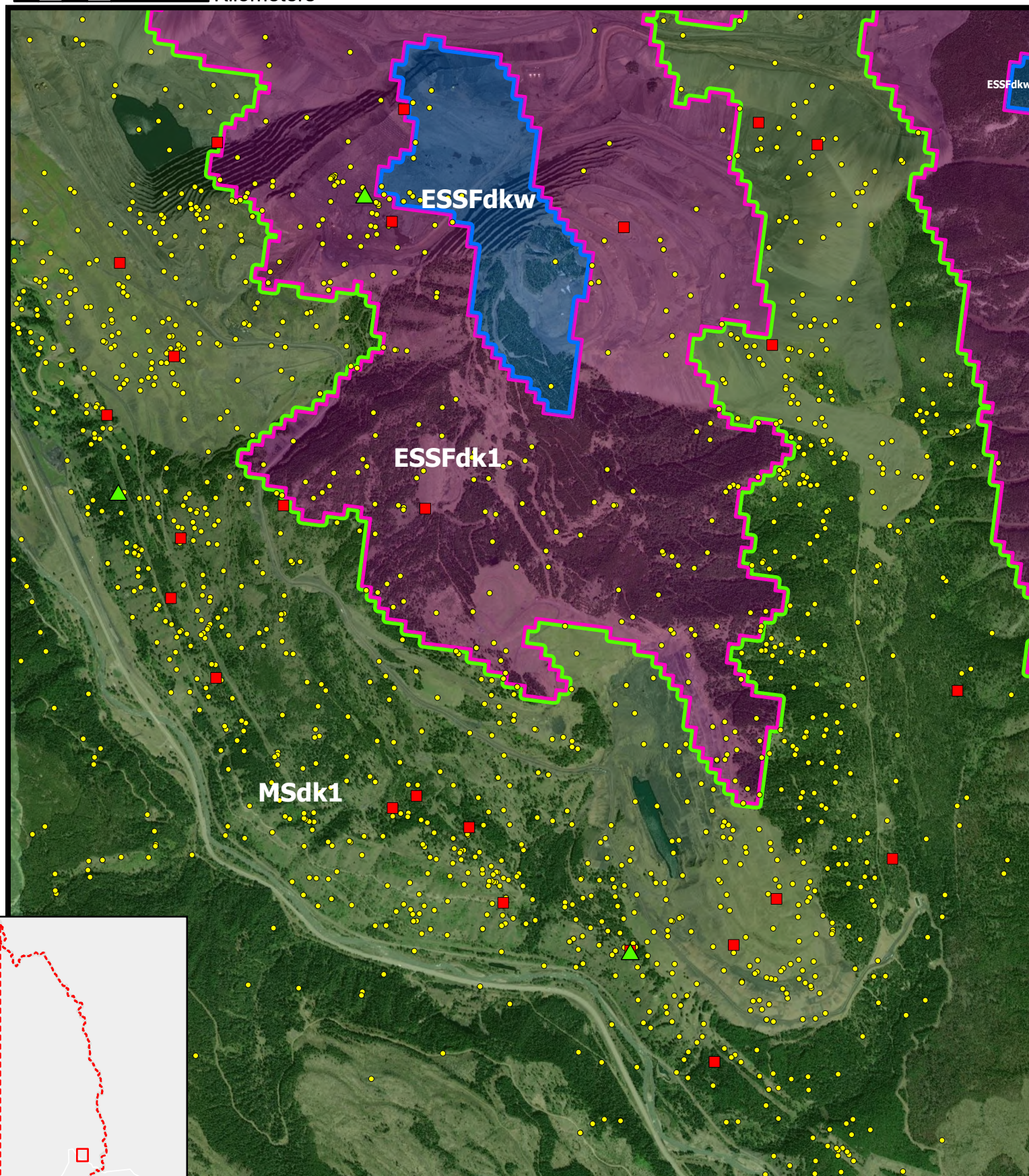Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Earthstar Geographics, Esri, USGS

Projection: NAD 1983 UTM Zone 11N

# Wildlife Class and BEC Zone

Created by: Will Kwan

N
W · E
S

0  0.25  0.5          1
Kilometers

ESSFdkw

ESSFdkw

ESSFdk1

MSdk1

Fernie

△ Bird (3)

■ Carnivore (27)

· Ungulate (1431)

Projection: NAD 1983 UTM Zone 11N