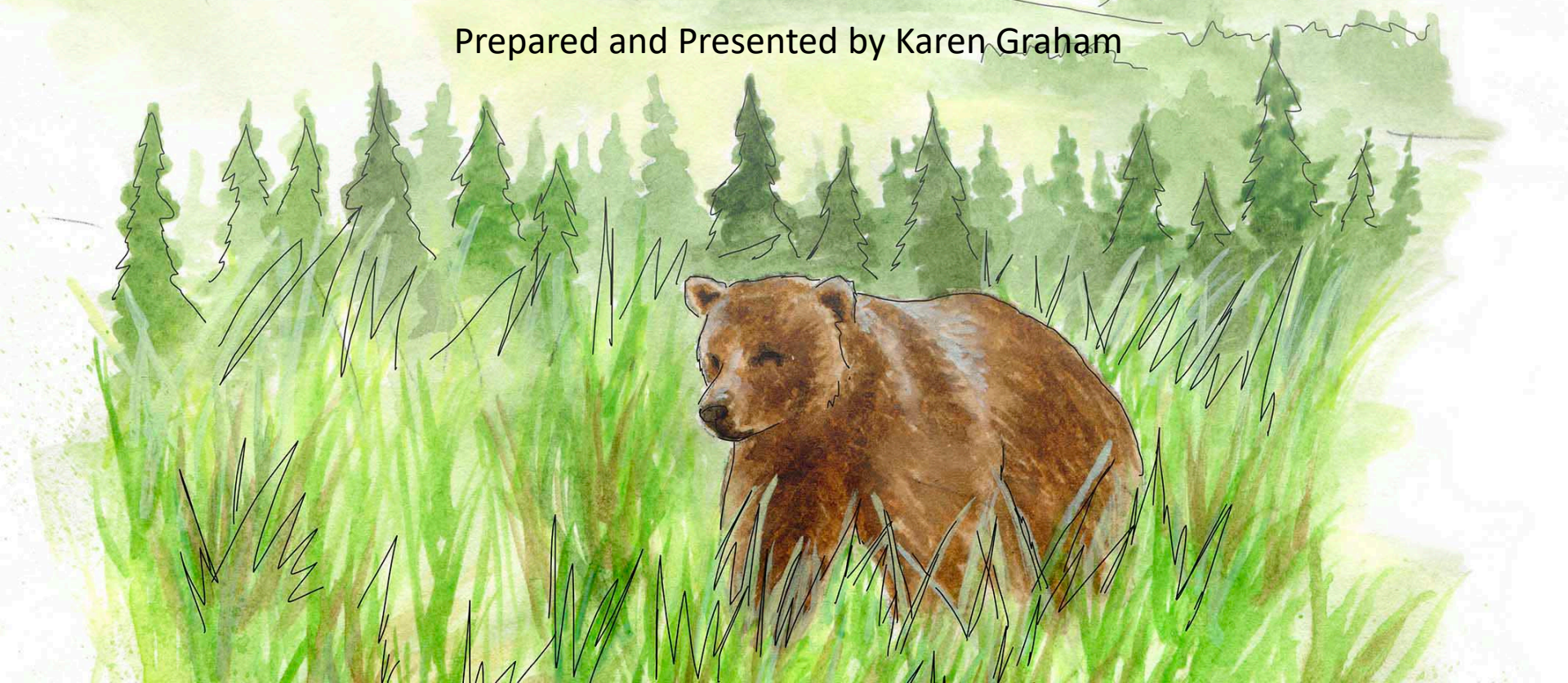




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Informing Land & Resource Management

# Grizzly Bear Denning Biology in West-Central Alberta

Prepared and Presented by Karen Graham





- Alberta Advance Education and Technology
- Alberta Conservation Association
- Alberta Energy Regulator
- Alberta Sustainable Resource Development
- Alberta Tourism and Parks
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- Friends of Kananaskis Country
- Gateway Pipeline
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- World Wildlife Fund Canada

**fRI Research Grizzly Bear Program  
PARTNERS 1998-2021 (23 Years!)**

# Purpose of Today's Presentation



- Why do GB den?
- Pre- and Post Den Behaviours
- Typical Den Chronology
- Pregnant Females
- Den Disturbance
- Denning Information specific for WC Alberta
  - ❖ Den Habitats and Den Sizes
- Steps to Avoid Disturbing Denning GB
- Grizzly vs Black Bears



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# Why Worry About Disturbing Denning GBs?



- Causes stress and depletes vital energy stores which can impact a bear's health and fitness
- Threatened in Alberta since 2010.
- More GB now compared with 15 years ago.
- Encounters with denning grizzly bears can have negative consequences to the bear, the people or both.
- Females give birth in their dens and are especially vulnerable to disturbances.



# Why Do Bears Den?

- To avoid periods when food resources are scarce.
- A place where females give birth in a safe and warm environment.



# Hibernation / Winter Dormancy / Torpor ??

From Science Direct:

**Torpor** or **dormancy** involves physiological changes related to body temperature, metabolism, and water balance.



**Hibernation** is when an organism spends the winter in a state of dormancy or torpor.

Both are ways to avoid unfavourable short- or long-term (seasonal) climatic conditions and conserve energy.



# Grizzly Bear

## Hibernation / Winter Dormancy / Torpor

(which ever you want to call it)



- Body temperature drops 3-5 C from 37 C.
- Heart rate drops to 8-26 bpm from 40-88 bpm.
- Metabolism decreases 25-30% of normal.
- Lose 22-40% of their mass.
- Can be alert within minutes.
- Will NOT eat, drink, defecate or urinate while in the den.



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# Pre- and Post- Denning

- Metabolic shift
- Reduced activity – **Walking Hibernation**
- Some spend days at the den site prior to entry and after exit.
- Do not eat immediately after den emergence....can take up to 3 weeks before they eat and drink at normal levels.

Sahlen 2015 - Sweden

Encounters where human injury occurred.

- happened at or near a winter den in the late fall.
- often involved a surprise encounter.

- Once a bear's physiology slows down, PERHAPS a flight response becomes more difficult; might resort to a defensive fight response.



# Pregnant Females



- Delayed implantation.
- Require 20% body fat prior to den entry for fertilized egg to implant in uterus.
- Give birth late January – early February.
- Cubs < 1 pound; unable to walk, eyes do not open until 1.5 months old and covered with very fine hair.
- Rely on fat reserves for milk production for remaining 2-3 months in den.
- Fatter females typically birth earlier and produce richer milk and larger cubs.
- Disturbances can result in cub mortality.



# Impacts of Den Disturbance

## Linnell et al. (2000)

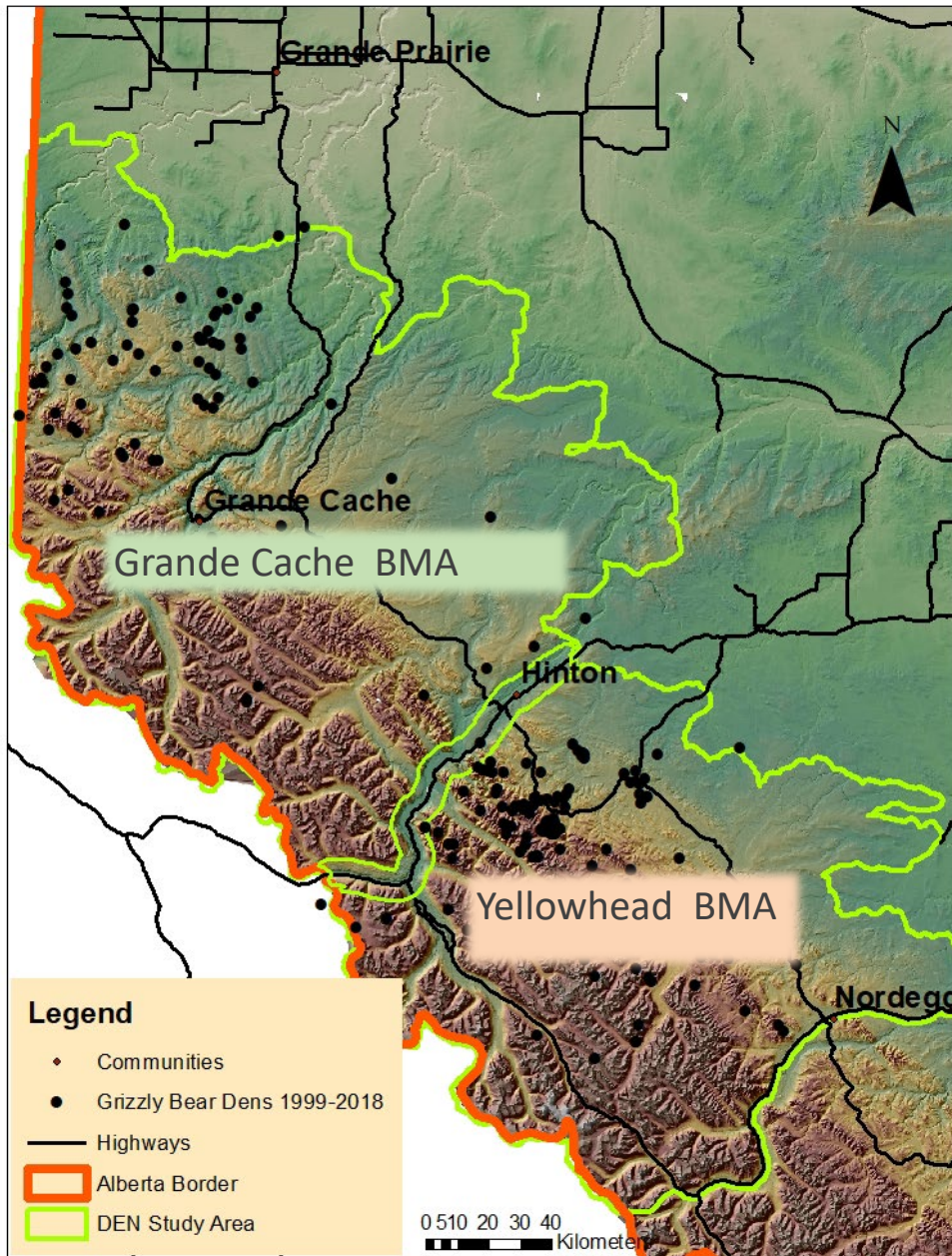
- Minor - GB wakens; slight increase in body temperature and heart rate.
- Moderate - GB moves inside the den, body temperature rises to normal and metabolism increases.
- Severe - GB abandons den; can result in an ADDITIONAL 56% loss in mass.

Minor disturbances that happens frequently can also result in accelerated loss of fat reserves.

## **Females with newborn cubs**

- A disturbance that causes the female to move inside the den can dislodge nursing cubs (less food and warmth).
- A disturbance that cause the female to abandon the den will likely result in cub mortality.





# Study Area

Den locations from collared grizzly bears in the Yellowhead and Grande Cache BMAs between 1999-2018 were examined.



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# What Triggers GB to Enter and Leave their Dens??

Pigeon et al. 2016

[https://www.researchgate.net/profile/Karine-Pigeon/publication/304990459\\_Drivers\\_of\\_hibernation\\_linking\\_food\\_and\\_weather\\_to\\_denning\\_behaviour\\_of\\_grizzly\\_bears/links/5ce58176299bf14d95b1c4d6/Drivers-of-hibernation-linking-food-and-weather-to-denning-behaviour-of-grizzly-bears.pdf](https://www.researchgate.net/profile/Karine-Pigeon/publication/304990459_Drivers_of_hibernation_linking_food_and_weather_to_denning_behaviour_of_grizzly_bears/links/5ce58176299bf14d95b1c4d6/Drivers-of-hibernation-linking-food-and-weather-to-denning-behaviour-of-grizzly-bears.pdf)

## Den Entry

- Gender (female = earlier entry)
- Reproductive status (pregnant female = earlier entry)
- Food availability (poor berry crop = earlier entry)

## Den Exit

- Gender (female = later exit)
- Reproductive status (pregnant female = later exit)
- Elevation (high elevation = later exit)
- Spring temperatures (colder = later exit)
- Winter precipitation (more snow = later exit)





# Pre- and Post- Denning in WC Alberta



- Spend an average of 7 days (up to 31 days) in the den area (within 500 m) before den entry and an average of 8 days (up to 45 days) after den exit.
- Arrived in the den area as early as **14 Oct** and as late as 11 Dec.
  - pregnant females typically arrived the earliest.
- Departed the den area as early as 20 March and as late as **24 May**.
  - Females with coy typically stayed the latest.

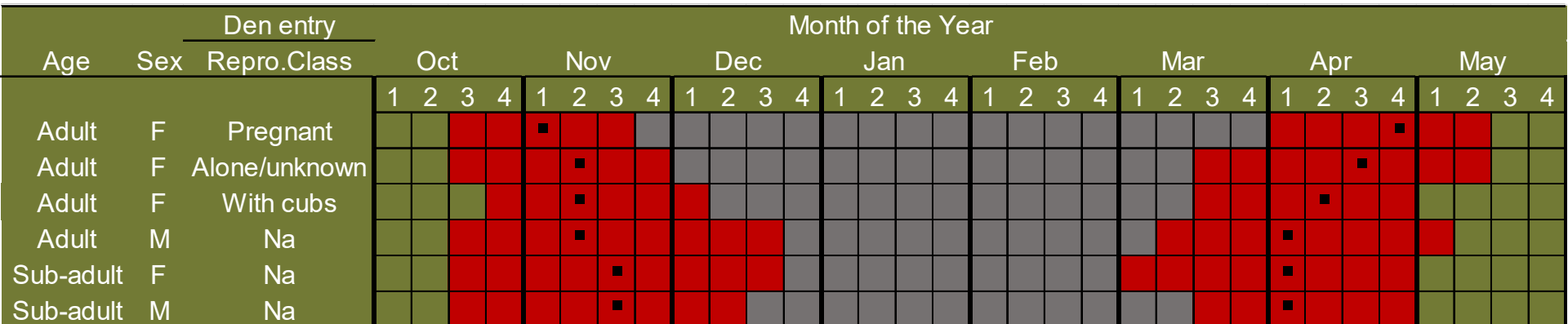


The Denning Period in WC Alberta is from **14 Oct – 24 May** but climate change might change this over time.

# Den Entry and Exit

- Pregnant females typically enter first and exit the last
- Adult males and subadult typically enter last and exit first

GB Den Entry and Exit in WC Alberta (Yellowhead and Grande Cache BMAs)



Range of den dates by age/sex/reproductive class



GB inside their dens by age/sex/reproductive class



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# Den Site Habitats — Pigeon et al. 2014

<https://academic.oup.com/jmammal/article/95/3/559/877570>



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- Looked at 79 dens (15 adult males and 35 adult females)
- Used GIS layers and remote sensing products at different scales
- Males and females selected similar habitats.
- Habitat linked to den insulation, remoteness and spring foods.

## Broad Scale (5-10 km)

- Avoided wetlands
- Selected dry open conifer stands
- Abundant sweet vetch (*Hedysarum alpinum*)

## Fine Scale (150-600m)

- Low road density
  - Dense conifers
  - Little fall food present
- Buffaloberry (*Sheperdia canadensis*)  
Huckleberries (*Vaccinium membranaceum*)

## In Addition

- No dens in young (0-5 yrs.) cutblocks.
- Did not select deciduous forests.
- Aspect varied but maximized snow accumulation and protection from wind.
- 12-50 degree slopes.
- > 300 m from a well site.
- > 150 m from a road - further supports keeping road densities  $\leq 0.6 \text{ km/km}^2$  in Core AMA as per the AGBRP 2020.

[https://www.wildflower.org/plants/result.php?id\\_plant=SHCA](https://www.wildflower.org/plants/result.php?id_plant=SHCA)



<https://www.dangerrangerbear.com/the-huckleberry/>

<http://arcadianabe.blogspot.com/2019/08/>



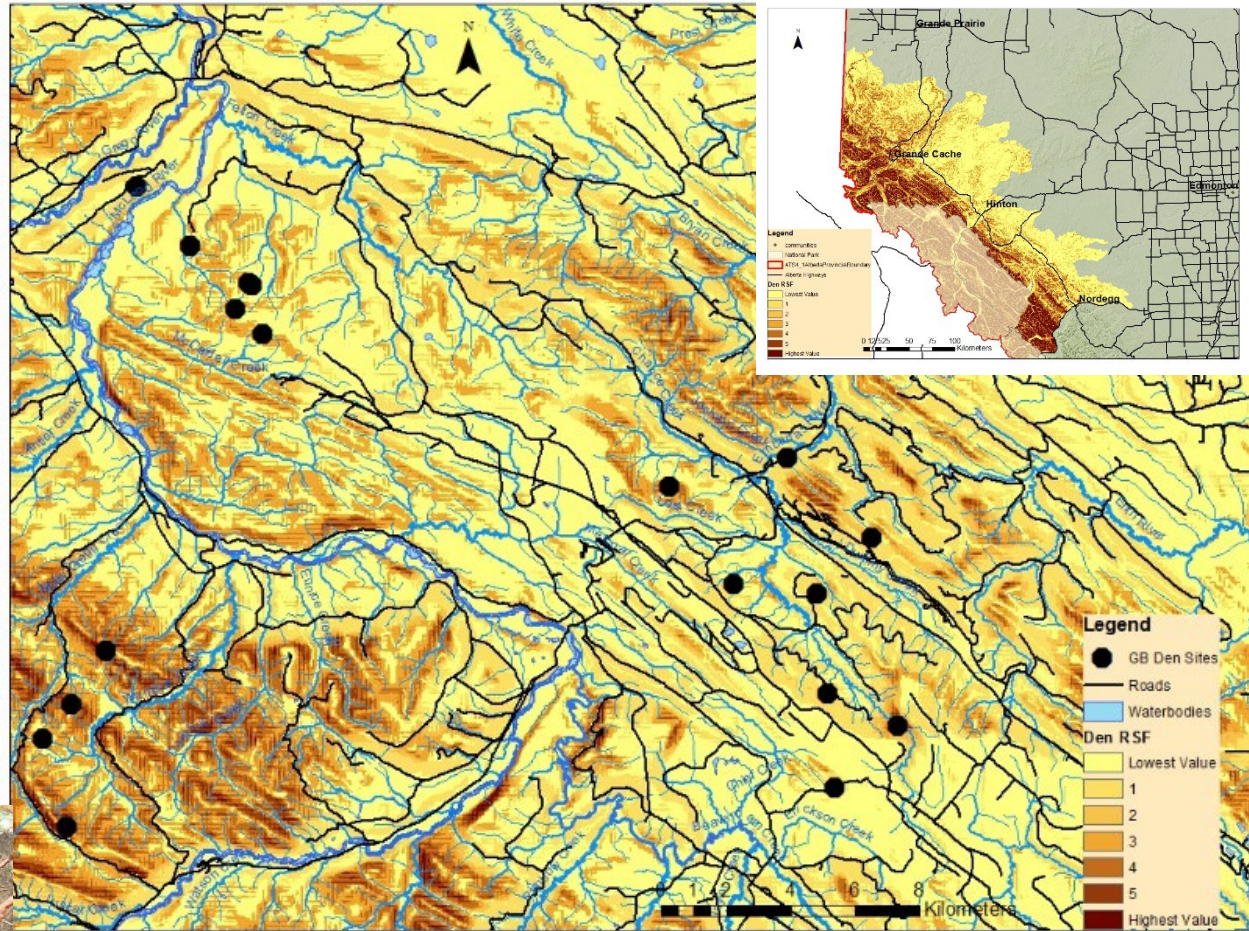
[https://earth.callutheran.edu/Academic\\_Programs/Departments/Biology/Wildflowers/cr/images/mtn/can-477.jpg](https://earth.callutheran.edu/Academic_Programs/Departments/Biology/Wildflowers/cr/images/mtn/can-477.jpg)

[https://www.yukonu.ca/sites/default/files/inline-files/Headysarum\\_alpinum\\_F.pdf](https://www.yukonu.ca/sites/default/files/inline-files/Headysarum_alpinum_F.pdf)



# Den Resource Selection Function Model (RSF) - Pigeon et al. 2014

- Shows where dens are likely to occur.
- Created for the Grande Cache and Yellowhead BMAs.
- The darker the orange, the higher the chance a den will occur there.
- Can be used when planning fall, winter and spring work.



Dens were 11 times more likely to be in the highest value score than areas in the lowest value

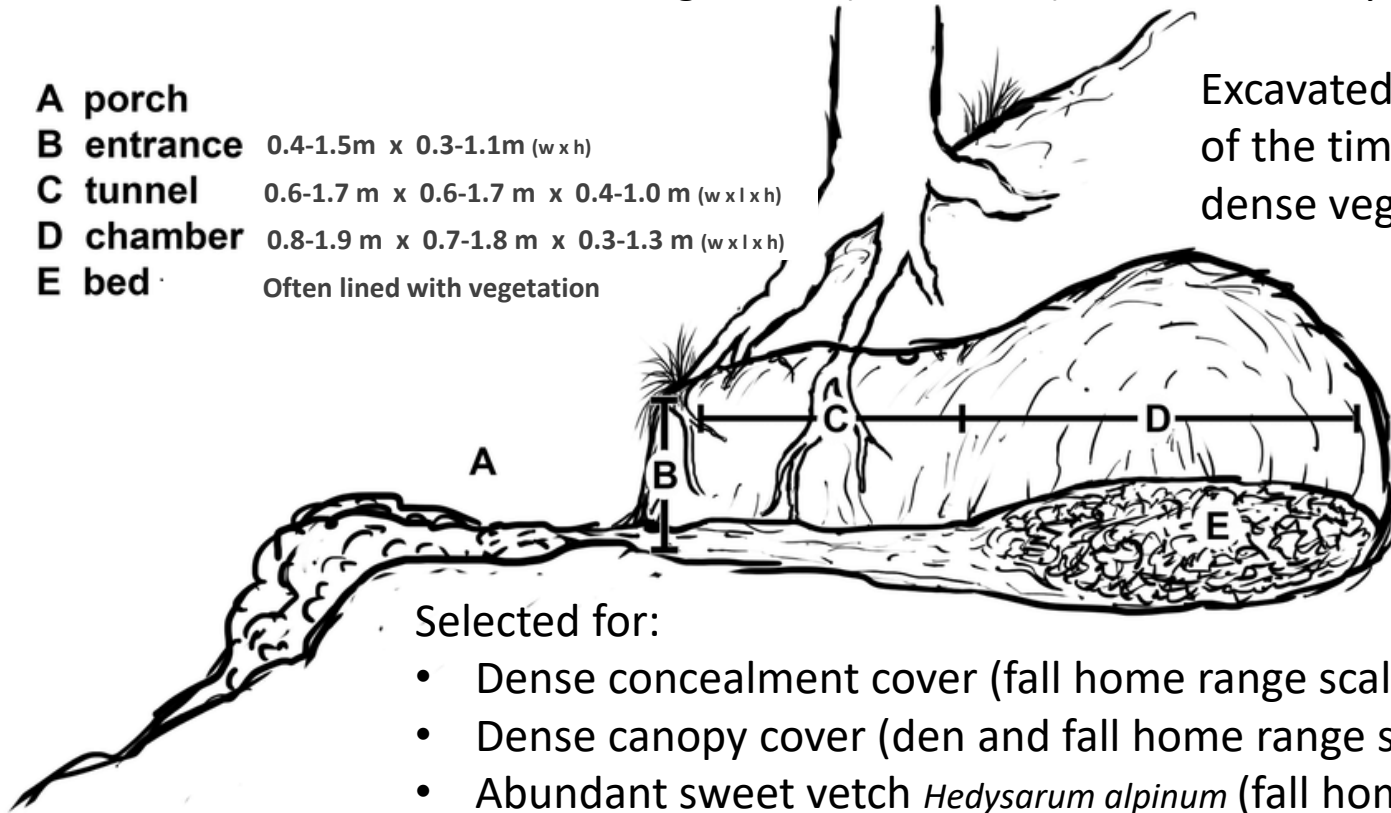
# Den Site Habitats – Pigeon et al. 2016 and Pigeon 2015

Visited 42 GB dens in WC Alberta from 10 males and 21 females

Assessed selection at their fall home range scale (< 200 km<sup>2</sup>) and den vicinity scale (20m x 20m)

- A porch**
- B entrance** 0.4-1.5m x 0.3-1.1m (w x h)
- C tunnel** 0.6-1.7 m x 0.6-1.7 m x 0.4-1.0 m (w x l x h)
- D chamber** 0.8-1.9 m x 0.7-1.8 m x 0.3-1.3 m (w x l x h)
- E bed** Often lined with vegetation

Excavated below a tree 62% of the time; logs, roots and dense vegetation also used.



Selected for:

- Dense concealment cover (fall home range scale)
- Dense canopy cover (den and fall home range scale)
- Abundant sweet vetch *Hedysarum alpinum* (fall home range scale)

All were excavated (ie no caves or trees used).

No difference in den size between males and females.

No specific soil was preferred but no dens occurred in organic, clay or silt dominated soils.



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Typically below a tree, log, rock or roots





Look for excavated debris below the entrance





Look for bedding material near the entrance





Entrances can be quite narrow and cryptic



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Dens are often hidden behind dense vegetation



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Old dens often collapse



# Steps to Avoid Disturbing a Denning GB

- 1) Use Den RSF map to find high value den habitats or use table below.
- 2) Can winter activities (logging) begin in early October (before 14 Oct) in high value areas?

Attribute	Den Site Details
Concealment	Dense canopy / lateral cover
Roads/Truck Trail	>150 m
Well Sites	>300 m
Forest Stand	Dry open conifer stands with pockets of dense conifers
Spring and Fall Foods	Abundant sweet vetch within 10 km and very little huckleberries within 150 m
Soils	Not saturated and not organic
Slope	Mean=34°; range=12-50°
Aspect	Likely to accumulate snow
Elevation	795 m -2284 m

3) Conduct ground surveys in summer for old dens in high value areas.

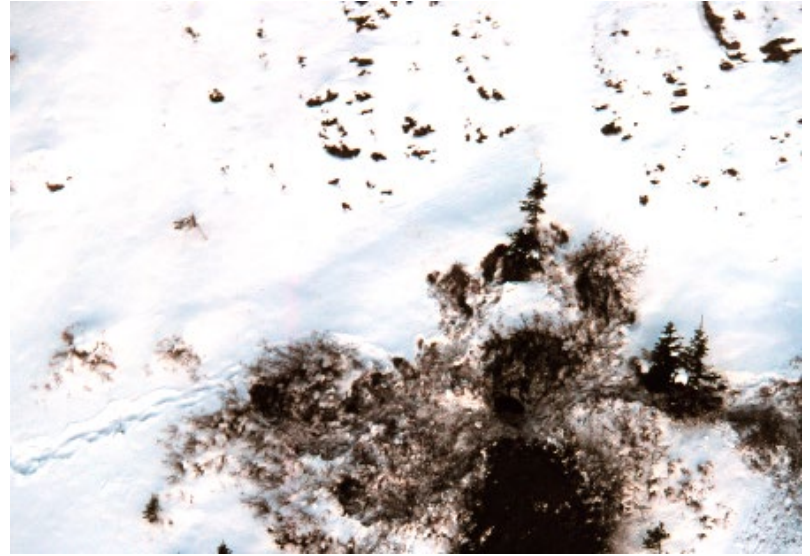
4) Conduct aerial surveys during early stages of denning (after mid Oct) and/or in early stages of emergence (after early March) in areas with old dens and high value areas. Den entrances and tracks MAY be more visible at these times.

5) If an active den is found, maintain a 1 km buffer until late May.

6) Once the bear is gone, den survey data should be collected.



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# Steps to Avoid Disturbing a Denning GB (continued)

## ADDITIONALLY

- Temporary road closures in high value areas from mid-Oct to late May.
- Avoid plowing roads into high value areas.



Still a chance that a GB will den in areas other than in the high valued areas;

- Field workers should be trained to recognize den habitat, and den sites and be trained in the use of bear spray.
- Field workers should work in pairs.

# Grizzly vs Black Bears

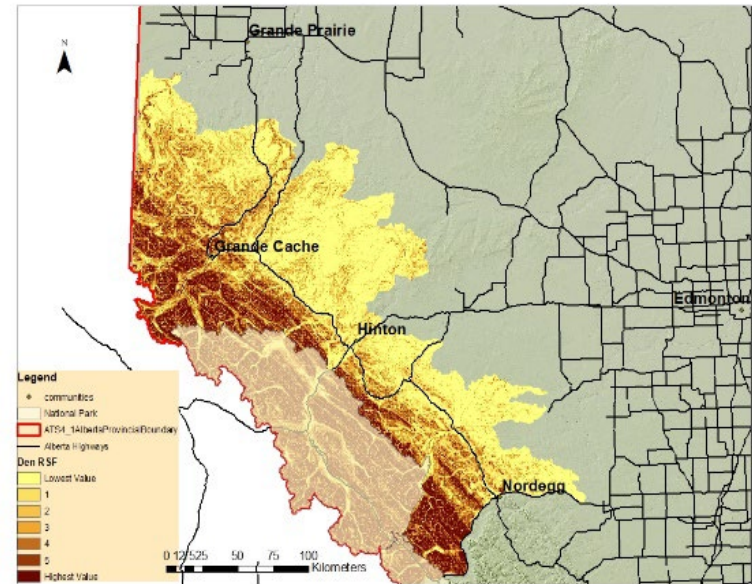
No black bear den data for WC Alberta but other areas have found...

- In Alaska black bears entered dens earlier than grizzlies but emerged about the same time whereas in Montana den entry and exit were similar.
- Black bears den at lower elevations, on lower slopes and more likely to use hollow logs, tree cavities or under rocks, logs or stumps rather than excavated.
- Black bears commonly reused a den.
- In some areas, black bears had smaller entrance heights, but other areas found no difference in den entrance size between black and grizzly bears.
- Black bears show little aggression when disturbed while grizzly bears can be aggressive.



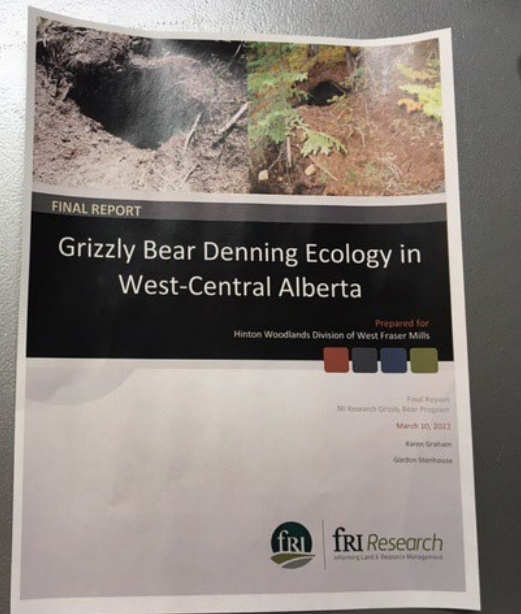
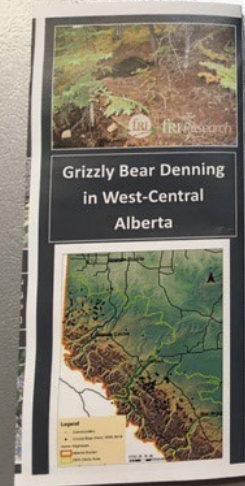
# Summary

- Disturbing a denning pregnant female or a female with new cubs could reduce the survival of the cubs.
- The denning period in WC Alberta is from 14 Oct – 24 May (climate change might change this over time).
- Our Den RSF map is a useful tool to show where on the landscape grizzly bear dens are likely to occur in WC Alberta.
- Dens are most likely to occur within dry, open conifer stands that have sweet vetch and pockets with dense canopy and lateral cover; from 795 - 2284m in elevation and slopes between 12-50° that are likely to accumulate snow and in soils that are not organic, or clay/silt dominated.
- Dens are typically > 150m from a road or trail and > 300m from a well site



- Start winter activities in early October (before 14 Oct) if occurring in high value areas.
- Conduct summer ground surveys for old dens in high value areas.
- Conduct aerial surveys starting mid Oct and/or early March in areas with old dens and high value areas as tracks and entrances are more visible at this time.
- If a den is found maintain a 1 km buffer until end of May.





Questions??







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