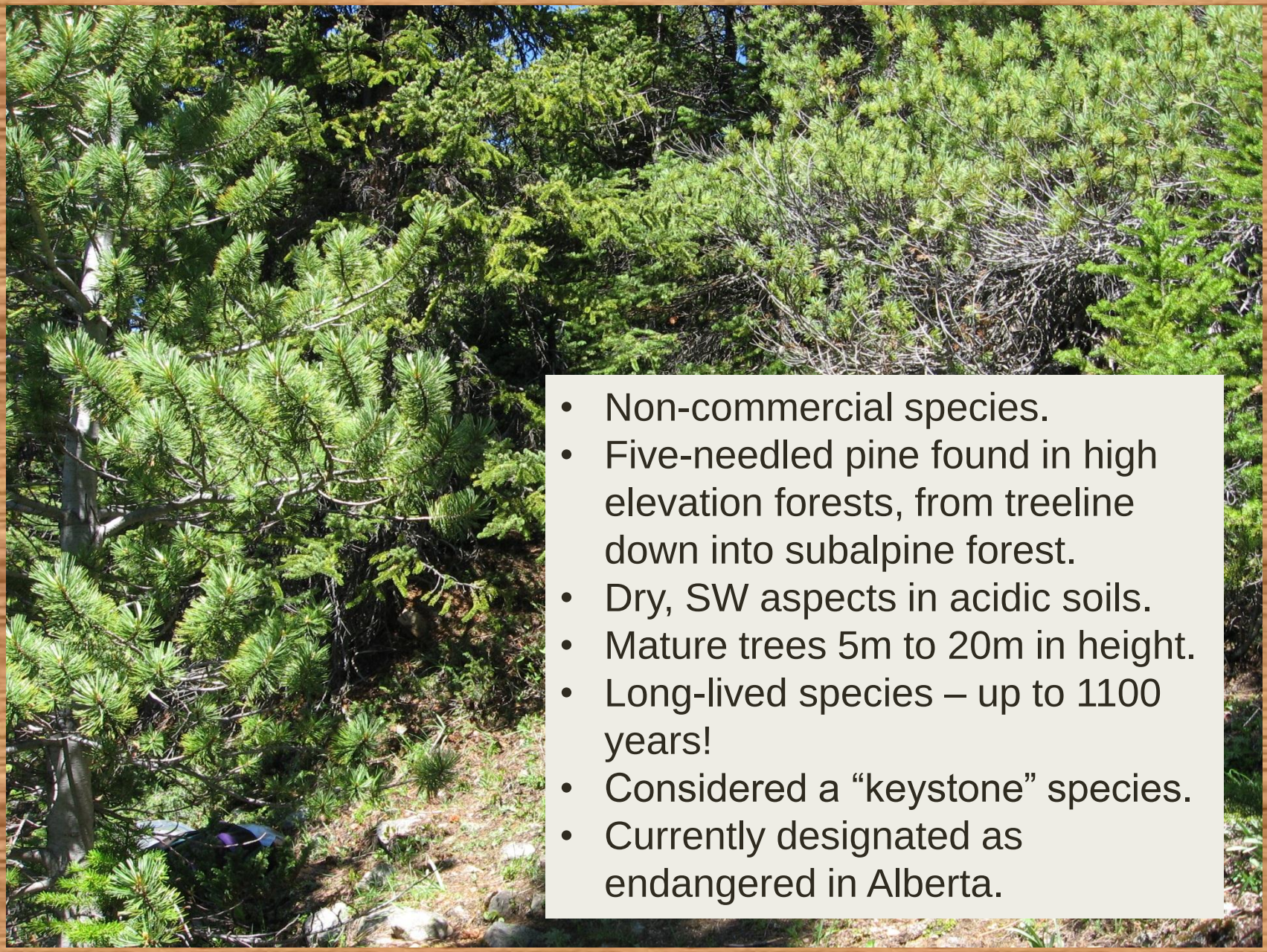
DO BEARS EAT SQUIRREL FOOD?!

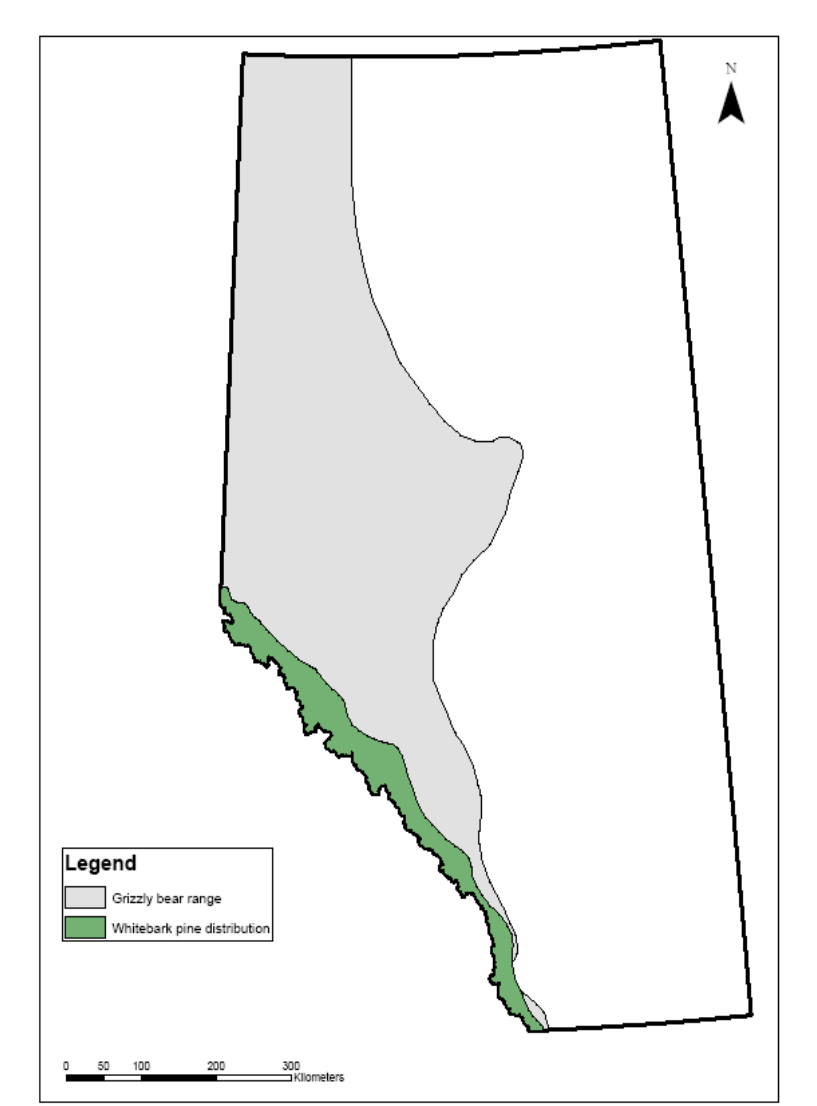
WHITEBARK PINE SEEDS
AS FOOD
FOR GRIZZLY BEARS
IN WEST CENTRAL ALBERTA

Whitebark pine (*Pinus albicaulis*)



- Non-commercial species.
- Five-needled pine found in high elevation forests, from treeline down into subalpine forest.
- Dry, SW aspects in acidic soils.
- Mature trees 5m to 20m in height.
- Long-lived species – up to 1100 years!
- Considered a “keystone” species.
- Currently designated as endangered in Alberta.

Whitebark pine distribution



Whitebark pine cones

- Late bloomer – starts producing cones at ~30 years.
- Cone crops are highly variable; “mast” (peak) cone crops occur every three to five years, with very low or no seed production in between.
- WBP are almost completely dependant upon Clark’s nutcrackers for seed dispersal.
- Seeds are much larger than other conifer seeds, and have a high fat content.
- Less digestible energy than meat, but at least twice that of most common plant foods.

Research request from Alberta Parks

In 2008, the GBP received a request to investigate a possible relationship between whitebark pine and grizzly bears in the Willmore Wilderness, based on:

- The status of whitebark pine and current threats,
- The presence of relatively large and healthy whitebark populations in the Willmore (compared to southern Alberta),
- The well-documented relationship between grizzly bears and whitebark pine in the Greater Yellowstone Ecosystem, and
- The need for a better understanding of the ecological significance of whitebark pine.

In 2009, we expanded our study area to include more of west-central Alberta.

Previous research:

- In the US, whitebark pine (WBP) seeds are a major source of energy for bears in the Greater Yellowstone Ecosystem (GYE) and the east slopes of the Montana Rocky Mountains.
- The use of whitebark seeds is seasonal and highly variable from year to year, depending on the cone crop.
- In the GYE, years with high cone crops (i.e. mast years) have fewer human-bear conflicts and a higher number of cubs per female the following spring.

RESEARCH IN ALBERTA

- Limited research regarding WBP and bears had been completed in Canada.
- WBP seeds have not been previously reported as a significant food source for bears in Alberta, but studies did not include whitebark pine stands.
- Grizzly bears consume a wide variety of foods, and foods consumed change according to seasonal availability and by region.

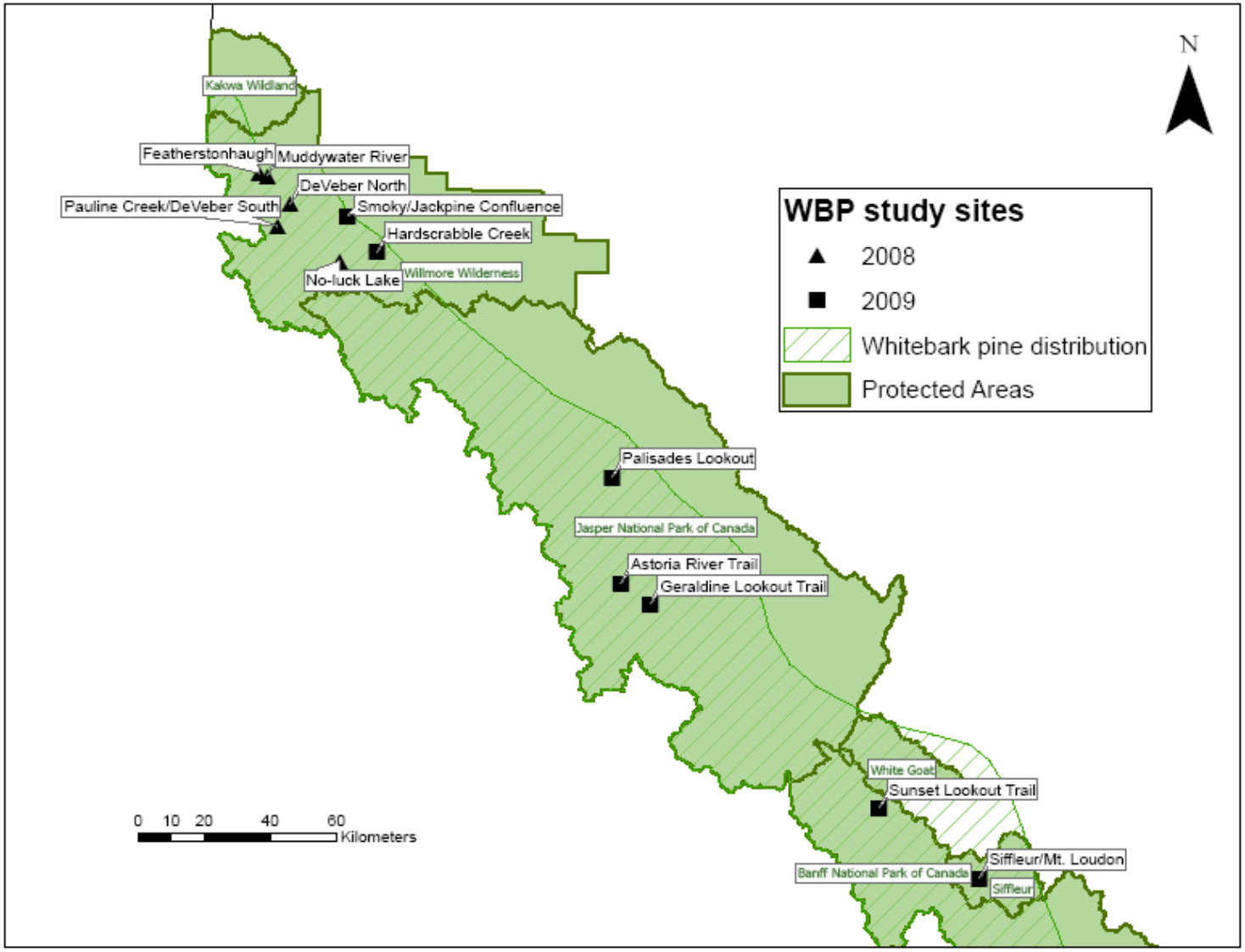
RATIONALE FOR RESEARCH

- Based on the relative abundance of whitebark pine in our study area, and the lack of specific research investigating use of WBP seeds in Alberta, it was conceivable that **a relationship could exist between WBP and grizzly bears in west-central Alberta.**
- Both whitebark pine and grizzly bears are species at risk; a relationship between the two could have significance for conservation.

Research questions

1. Are whitebark pine seeds available to bears within our study area?
   - What is the density/abundance of WBP trees?
   - Do red squirrels build middens in these WBP stands? What is the density of middens?
   - Do squirrels cache WBP cones in these stands?
2. Do grizzly bears eat whitebark pine seeds in the study area?
   - Is there evidence of bear activity and WBP use at squirrel middens? If so, how much? From when?
3. Is midden density and/or bear use of the seeds related to forest stand characteristics?

The 2008/2009 study area: the Willmore Wilderness Park, Jasper National Park, Banff National Park, and the Siffleur Wilderness Area



METHODS: IT'S ALL ABOUT SQUIRRELS

METHODS:

- **Transect surveys** to search for squirrel middens, estimate WBP densities, and measure forest stand characteristics (slope, aspect, densities of other species, canopy cover, bear foods, etc.).
- **Midden surveys** to measure middens, classify as active/inactive, document squirrel caching and previous use of WBP, relative use of WBP, and investigate grizzly bear activity (diggings and scat) at squirrel middens.
- **Scat sample** collection to confirm presence of WBP seed casings in scat.
- **Remote cameras** at previously excavated middens to try to photograph bears at the squirrel middens.

RESULTS: WBP TREES

- Density (basal areas) of WBP varied (from 0.23 to 7.33m^2/ha) between study sites, indicating different levels of availability in different regions of whitebark pine distribution within our study area.
- Basal areas in this study were in the lower range of those observed in other areas of documented bear WBP use (2.2 to 23.4m^2/ha in the Yellowstone).
- The lower basal areas in our study indicate a lower availability of whitebark pine seeds in Alberta as compared to Yellowstone.

RESULTS: SQUIRREL MIDDENS

- Squirrel middens were found in the high elevation WBP stands in our study area!!!
- Midden densities (0 to 0.88 middens per hectare) were similar to those previously reported in other studies of WBP stands (0.23 to 1.09 per hectare in the GYE, Mattson & Reinhart, 1996).
- Squirrels were eating and caching WBP cones!!! (WBP cone scales at 90% of the middens).
- For red squirrel populations in our study area, the overall density of conifer species may be more important than the densities of individual species.

RESULTS: BEARS

- Bear use of whitebark pine seeds was observed in six out of the eleven areas visited (excavations at middens and/or bear scat containing whitebark pine seed casings).
- All diggings and scat looked old (~2007); no new activity in 2008 or 2009.
- No pictures of bears on our remote cameras.

Predictors of bear use?

- Midden size significantly affected the probability that an individual midden was excavated.
- Analysis of forest stand composition (density and relative proportions of different tree species) as predictors of excavated midden density did not produce any statistically significant results.
- Basal area of whitebark pine surrounding the midden and midden density in the surrounding study area did not have significant effects on midden excavation.

CONCLUSIONS

- WBP seeds are available to bears in our study area.
- Bears did use WBP seeds as a food source.
- BUT, no evidence that bears used WBP in 2008 or 2009.
  - Inter-annual variation (low cone crops in 2008 and 2009).
- Role of stand characteristics in predicting midden densities and bear activity?
- How important is it???

SIGNIFICANCE OF FINDINGS?

- Bears are generalists - foods consumed depend on seasonal, annual, and regional availability. Peak production years for other important bear foods (e.g. berries) are thought to affect reproductive success.
- WBP seeds are a high quality food source, and could serve as an important energy source for grizzly bears in areas of WBP distribution in years of high cone production.
- Female bears in Yellowstone are reported to eat about twice as many pine seeds as males - accumulation of fat reserves, reproductive success, lactation?
  - Potential implications for reproduction and survival? More cubs after a good WBP year?

RELATIVE IMPORTANCE IN THE DIET?

- Pilot project: Sulfur isotope study of bear hair to estimate the relative use of WBP.
- If successful, will help determine the relative importance of WBP seeds (and other foods) in the overall diet.
- Future declines in WBP populations could affect grizzly bears.
- Better management of both species?

Acknowledgements

This research was funded by the Parks Division of Alberta Tourism, Parks and Recreation, with in-kind contributions from the Foothills Research Institute Grizzly Bear Program.


9/13/08 11:08 AM
Cuddleback


9/13/08 11:48 AM
Cuddleback


9/04/08 5:28 PM
Cuddeback


8/17/08 7:38 PM
Cuddleback


Questions?
9/26/08 2:12 PM
Cuddeback