

Leadership Team Call: LCD

3/30/21 | 11:00am -12:30am

Attendees: Sean Finn, Natalie Poremba, Alisa Wade, Anna McIndoe, Anne Carlson, Harvey Locke, Aubin Douglas, Ben, Brooke Kapeller, Constanza, Erin Sexton, Kathy Zeller, Kim Pearson, Kris Tempel, Linh Hoang, Mary McFazden, Mary T McClelland, Phil Matson, Tara Collin

Fire Forum

- CMP virtual conference that led us to reschedule this Leadership team meeting
- 120 registered attendees - 20 presentations, breakout sessions, poster sessions

2020 Summary

- 30x30 Quick Analysis; How much of the Crown is protected?
 - In evaluating 6 types of protected areas as defined by IUCN in the LCD Crown Boundary, only 17.1% is under conservation protection in MT and 11.3% in US and CA - that number is not 30
 - Adjustments to be made:
 - Canadian adjustments flagged by Adam Collingwood
 - Private land protections in US
 - The wilderness Society
 - Blackfoot Clearwater Stewardship act
 - Lincoln prosperity proposal
 - Can we develop an inventory of what might be pending?
 - Erin Sexton: We have good datasets for the protected areas from our jurisdictional complexity layer for the Crown of the Continent. I am pretty sure those datasets have the Castle protected areas in AB and the NCC and other conservation lands in BC. As well as the private land that has been put under easement in MT.
 - World Database on protected areas
 - CA has done a whole protocol on classifying areas
 - Canada also has 30x30 policy
 - Here is Canada' protected areas database.
 - <https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html>
- Conceptual Models
 - As we draft out the conceptual models, they get posted to the website

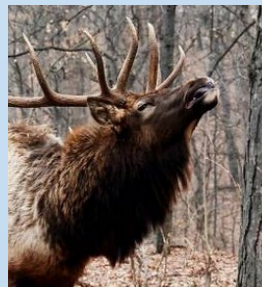
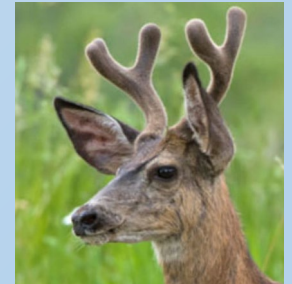
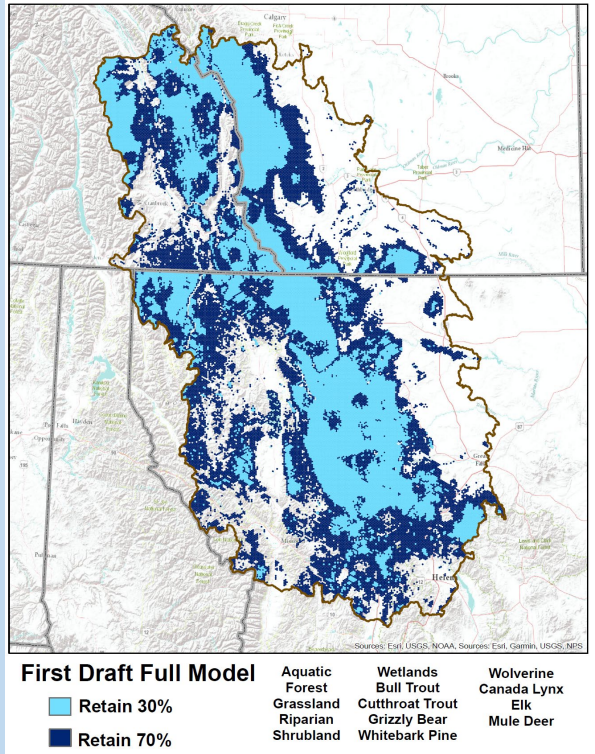
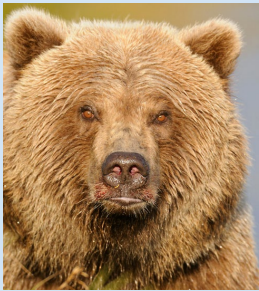
Phase 1 Null models

- About the Spatial Design
 - Systematic conservation planning - conserve the most priority resources possible in the most efficient way possible
 - Project area and planning units
 - We divide the landscape into planning units (2km² hexagons)

- 3 parallel optimization models - AB, MT, and BC
 - These are disparate data! - wanted to understand the input data before combining into single layer
- Considered features
 - Priority fine features (8) and Guilds (3)
 - Wolverine, lynx (mesocarnivores); elk, mule deer (ungulates); Whitebark, grizzly, bull trout, Westslope cutthroat (native salmonids)
 - Coarse Features as well
- What goes into Marxan?
 - Sum of Planning unit costs + perimeter of planning units + sum of planning unit value for priority features = marxan score
 - For now, the only cost layer we are using is the Human Modification Index in the Crown (just to keep things simple for now)
 - Objective: where can we conserve most priority resources possible in the most efficient way possible
- Considerations and caveats
 - Feature Representation Target
 - The target amount of each conservation feature to be included in the solutions (ie. 30% or 70%)
 - We will need to set this value eventually.
 - They don't have to be the same for each feature - may be a legislative target, or perceived conservation importance or goals for representation
 - Harvey Locke: I note the data sets using 30% run avoid gravel bed rivers which have the highest values for many (five) of the focal species. See Hauer et al 2016; Gravel-bed river floodplains are the ecological nexus of glaciated mountain landscapes June 2016 Science Advances 2(e1600026) DOI: 10.1126/sciadv.1600026
 - Learning to work with the data
 - Bull trout example
 - Data sources that we had were varied for BC and AB
 - These are not congruent datasets
 - WSCT
 - Initial model runs are different than they are for BT - why are the outputs so different for fairly related species
 - Have you looked at the DFO data for critical habitat for bull trout & westslope? I assume it covers both the AB & BC sides of the border consistently, but I've only looked at AB. Might solve that issue?
 - Here's the link for DFO's critical habitat data: <https://open.canada.ca/data/en/dataset/db177a8c-5d7d-49eb-8290-31e6a45d786c>

- Canada Lynx
 - Data very different across international boundary - in US, we have way more data - the result is
- Comments and Qs from the LT
 - On most, 30% area avoids riparian and 70% includes those areas
 - Some 'core' conservation areas in this map come out as islands without connectivity corridors to other 'core' areas Your thoughts?
 - Goes back to boundary area modifier in Marxan - you can force marxan to clump your solutions into larger geographies
 - Human Modification Map shows the Elk Valley as having an almost 0 score - Elk Valley is basically written off with this Human Mod layer - it ends up as a white hole - there is more value in Elk Valley than is being shown
 - Because Marxan is being run in 3 chunks, can you use different datasets in each chunk?
 - Yes - this is what we will do because data is so variable - don't have reliable consistent datasets that cover the whole geography
- Next steps
 - Leadership Team Subcommittee to help consider cultural, social, and economic features
 - What is the framing of this - building political will might change the way this is thought about
 - Next Leadership team meeting: April 27th from 11am -12:30pm MT
 - Tech Team: April 13 from 1-2pm

Crown of the Continent Landscape Conservation Design



Leadership Team call

30 March 2021

Crown Managers Partnership 2021 Fire Forum:

- Virtual Conference: March 22-26, 2021
- ~120 registered attendees – largest Forum in 20 yr history!
- 20 presentations; 5 Facilitated Breakout Sessions; Poster Session
- Fully Recorded; Extensive Notes
- Outcomes posted to:

[https://www.crownmanagers.org/
what-is-the-forum](https://www.crownmanagers.org/what-is-the-forum)



Agenda

Each day of the forum will feature a new fire related topic:

March 22nd, 8:30am - 12:10pm: *Fire Past and Future: Fact, Fiction, and Uncertainty*

March 23rd, 8:30am - 12:30pm: *Traditional Knowledge and Active Fire Use in the Crown*

March 24th, 8:30am - 12:00pm: *Fire in the Human Environment*

March 25th, 8:30am - 11:45am: *Fire Management in Practice: Obstacles, Implementation and Successes*

March 26th, 8:30am - 12:30pm: *Fire in Terrestrial and Aquatic Systems*

Today's Agenda:

- 2020 Summary
 - PDF & StoryMap
- 30 x 30 Quick Analysis
- Conceptual Models
- Phase 1 NULL Models
 - Considerations and Caveats
 - Data Sources and Data Handling
 - Lessons Learned & next Steps

2020 Update

- All 2020 Meeting Notes posted to Website
- Designing for the Future
 - 2-page 2020 summary
 - StoryMap



Team Meeting Resources

LEADERSHIP TEAM



The Crown LCD Leadership Team is intended to represent the diversity of stakeholders living in the Crown of the Continent ecosystem including relevant social, economic, and environmental disciplines and local, traditional, and indigenous groups. The Leadership Team is charged with making coarse decisions that guide Design development as well as identifying and forging connections across the broad Crown landscape to ensure the LCD retains a holistic approach. Participation is open to persons interested who can meaningfully contribute to the LCD. Team members are expected to participate in a monthly phone call and to effectively communicate LCD objectives, process and progress with staff of their home organization, as well as to colleagues and partners across the Crown ecosystem.

Meeting Notes/Presentation Slides

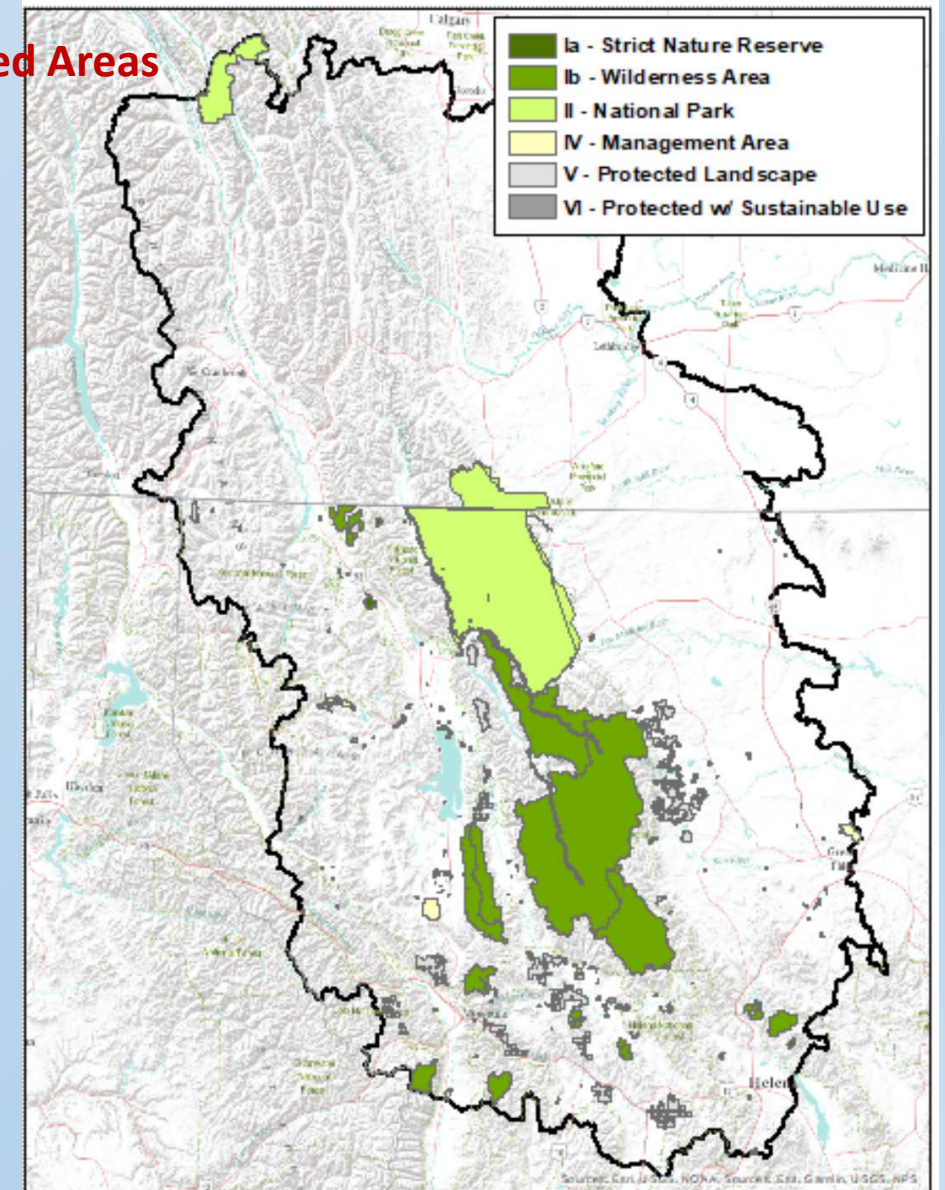
- December 15, 2020: Models/Cost Layers
- November 24, 2020: Data/Models
- August 25, 2020: Vision/Features Poll
- June 23, 2020: Slides
- May 26, 2020: Features Selection
- April 28, 2020: Project Area Decision
- March 24, 2020: Project Area
- February 25, 2020: Initiating LCD
- June 19, 2019: Forming; Phase 1

How Much of the Crown is Protected?

Crown of the Continent Landscape Conservation Design Project Area Land under Conservation (US Portion only)

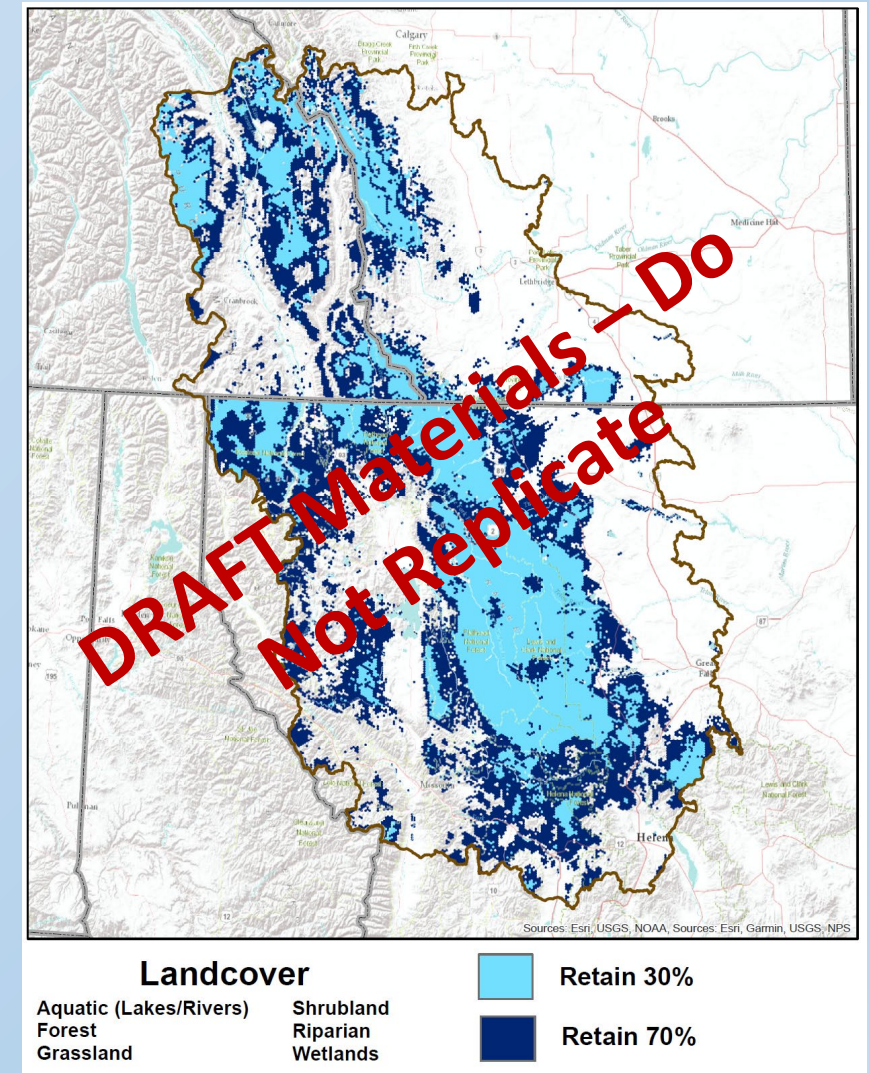
Data Source:
World Database on Protected Areas

IUCN Category	IUCN Class	Specific Designations	Area (ha)	Percent
Ia	Strict Nature Reserve	Research Natural Area	9,157	0.1%
Ib	Wilderness Area	Wilderness Area, Wilderness Study Area	770,364	9.9%
II	National Park	National Park	408,768	5.2%
IV	Habitat/Species Management Area	National Wildlife Refuge	17,862	0.2%
V	Protected Landscape	National Wild and Scenic River, Wildlife Management Area, Wildlife Habitat Area, Experimental Forest, Scenic Area, Private Conservation Land	151,105	1.9%
VI	Protected Area with sustainable use of natural resources	Waterfowl Production Area, Open Space	8,857	0.1%
Total Area under Conservation in Montana			1,365,323	17.1%
Total Crown LCD Project Area in Montana			7,796,186	100.0%
Total Area under Conservation (US & CA)			1,473,396	11.3%
Total Crown LCD Project Area (US & CA)			13,150,880	



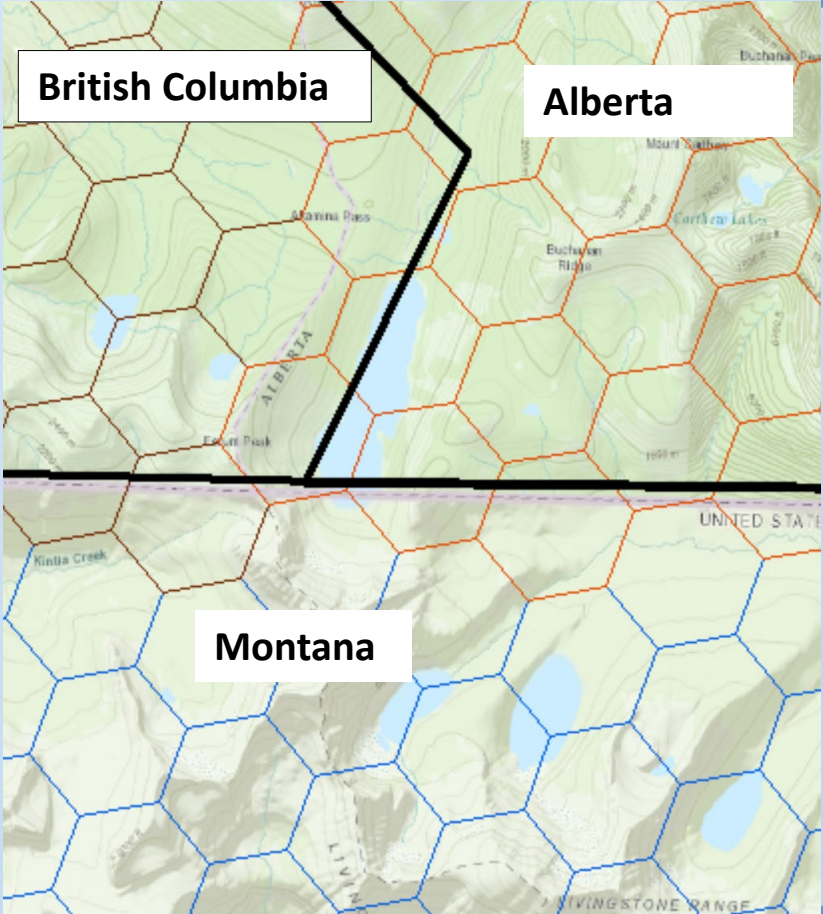
A **Spatial Design** using Optimization Modeling

- An implementation of Systematic Conservation Planning (Pressy and Bottrill 2009)
- A 'Minimum Set Problem' ... **conserve the most priority resources possible in the most efficient way possible**
- Marxan software (Game and Grantham 2008) supports spatial optimization for selected features in a given landscape
- Features, functions and software extensions support model validation, sensitivity analysis and knowledge-based iteration



Project Area & Planning Units

For optimization modeling, we divide the Project Area into sub-units called Planning Units

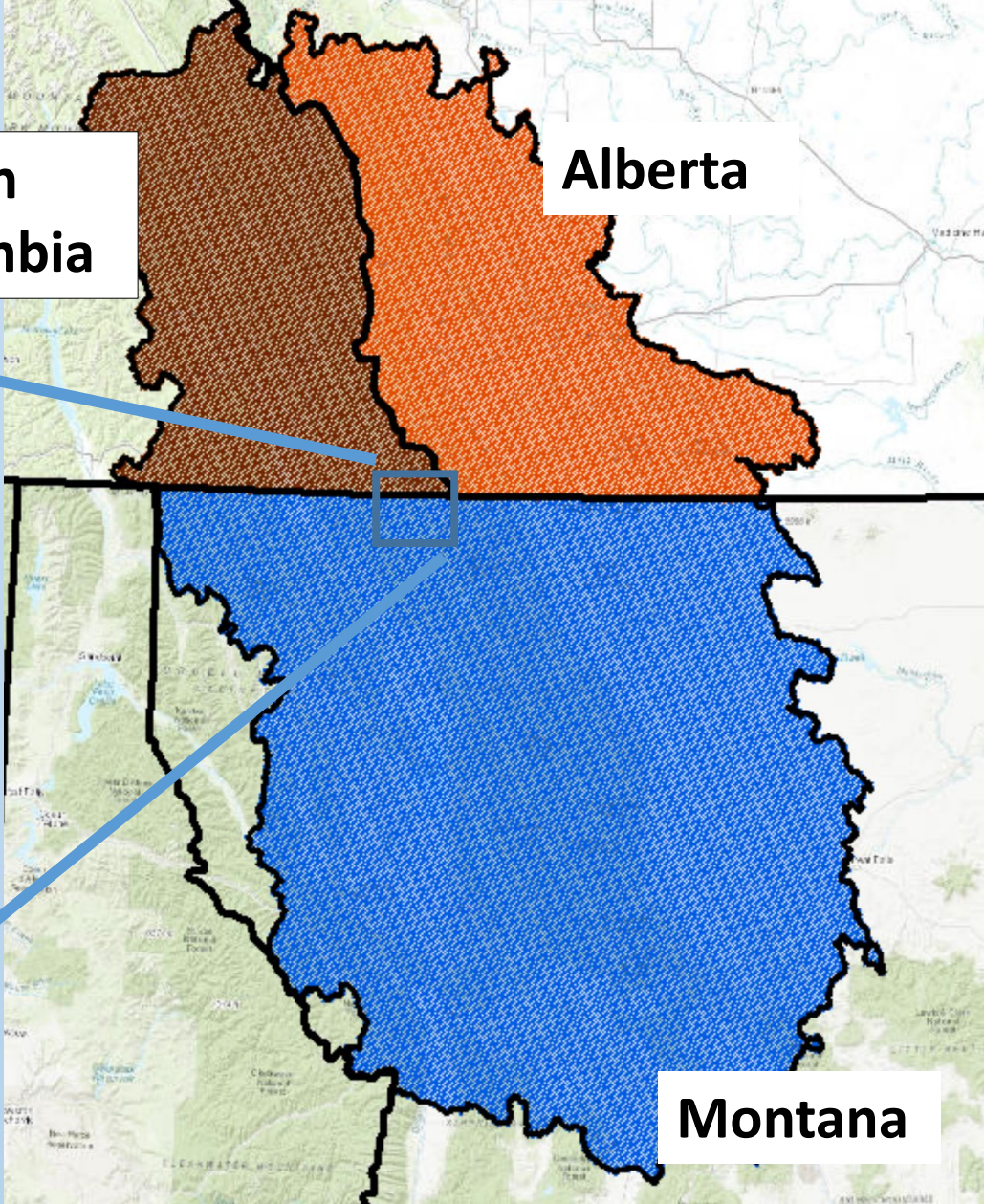


**Planning Unit:
2km²
each**

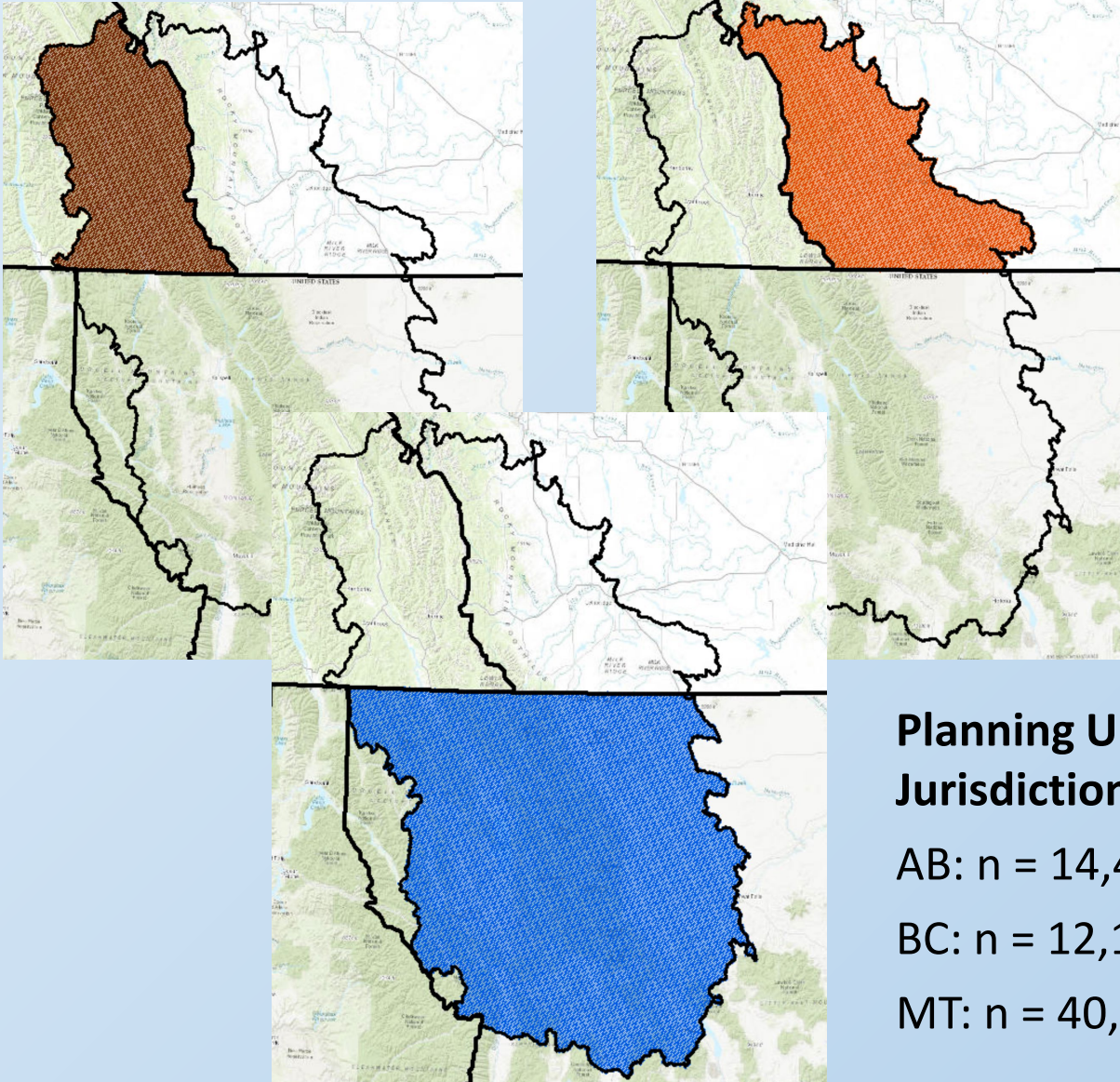
Crown LCD Project Area

British Columbia

Alberta



For Starters: Three Parallel Optimization Models



Planning Units by Jurisdiction

AB: $n = 14,471$

BC: $n = 12,193$

MT: $n = 40,692$

Why?

- Primarily disparate data & sources
- Explore data handling techniques

Benefits

- Finer resolution planning units
- More efficient iterations
- Can always 'scale up' when appropriate

Drawbacks

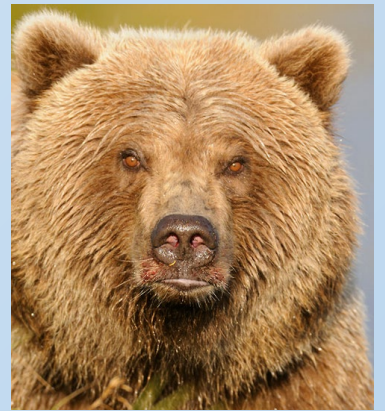
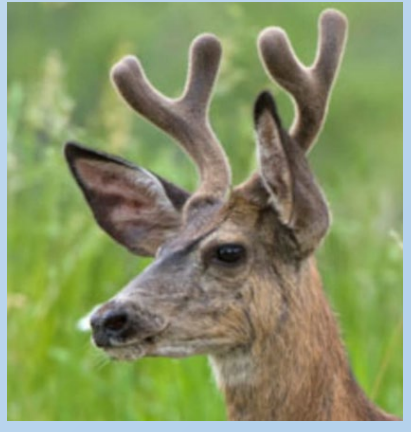
- More onerous data & processing documentation

Priority Fine Features (8) and Guilds (3)

Mesocarnivores



Ungulates



Cold Water Salmonids



Priority Coarse Features



Forest



Shrubland



Grassland



Riparian



Aquatic



Wetland

Setting the Marxan Environment

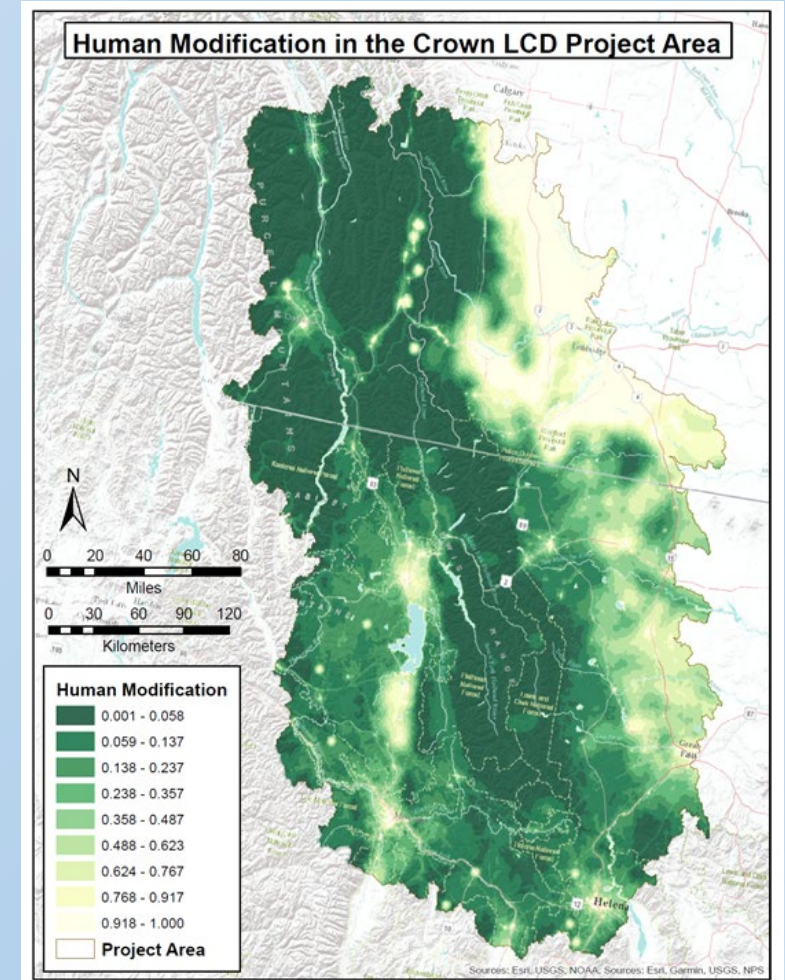
NULL Cost: [Global Human Modification](#) (Theobald et al. 2020)

Sum of selected
Planning Unit Costs

Sum of Planning Unit
Value for priority features

Total perimeter of
selected Planning Units

$$\sum_{PUS} Cost + BLM \sum_{PUS} Boundary + \sum_{Con.Targ.} SPFxPenalty = \text{Marxan Score}$$



Features + Cost

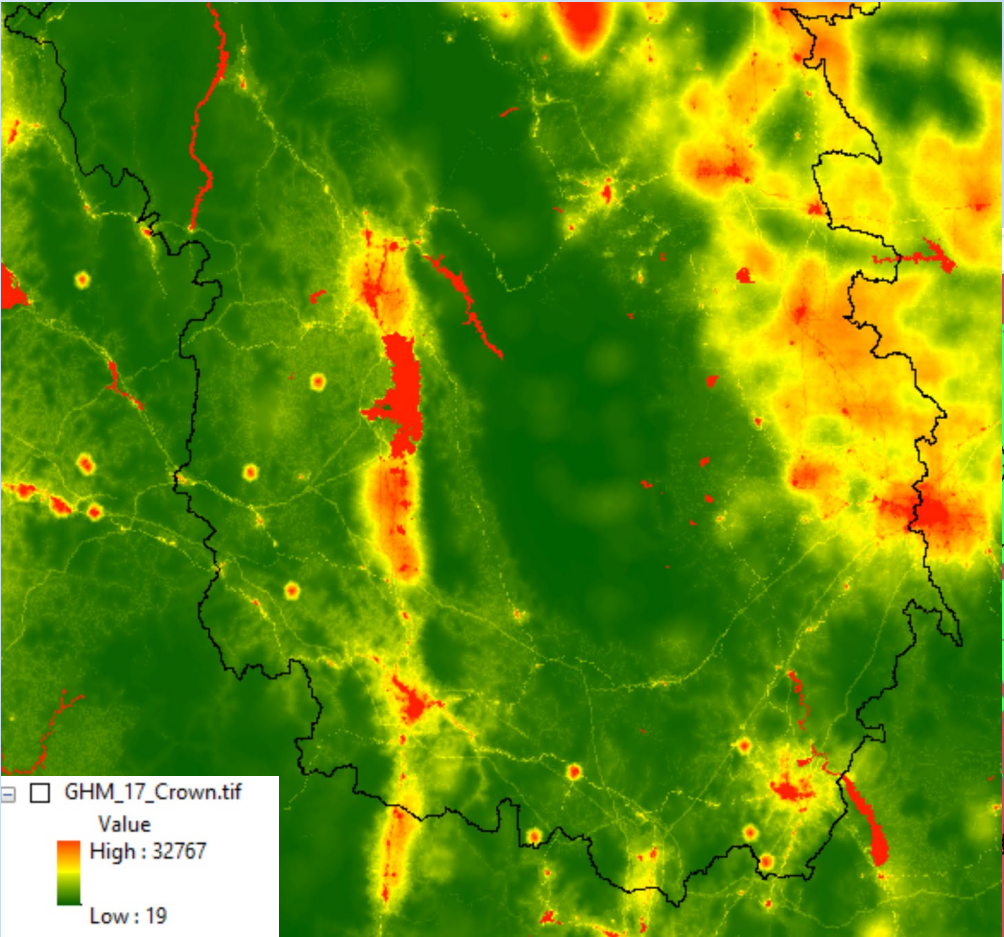
Example Geography: Montana portion of Crown LCD Project Area

Example Features: Carnivores

Example Cost: [Global Human Modification](#) (Theobald et al. 2020)

Human Modification
"Cost"

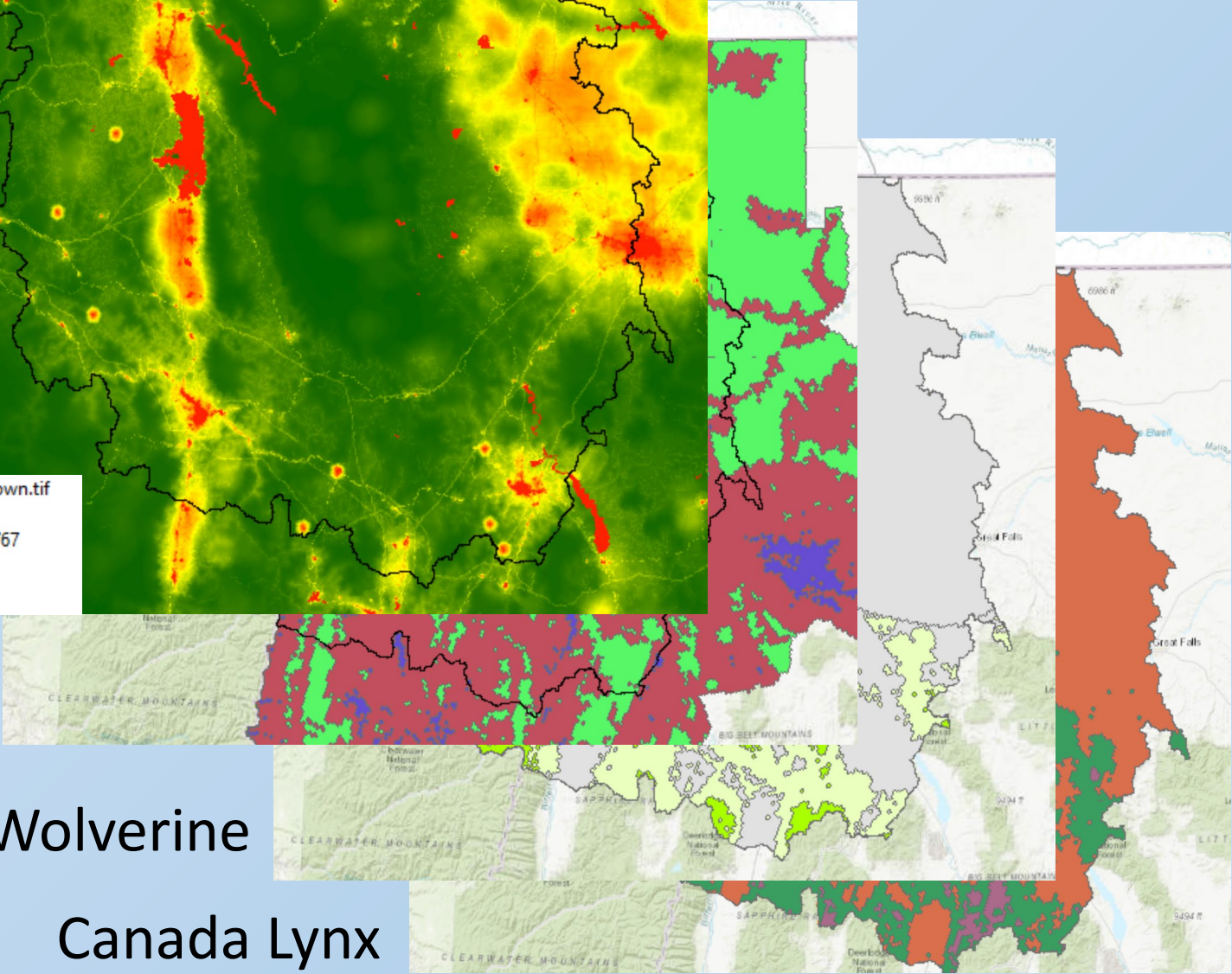
conserve the most priority resources possible in the most efficient way possible



Grizzly Bear

Wolverine

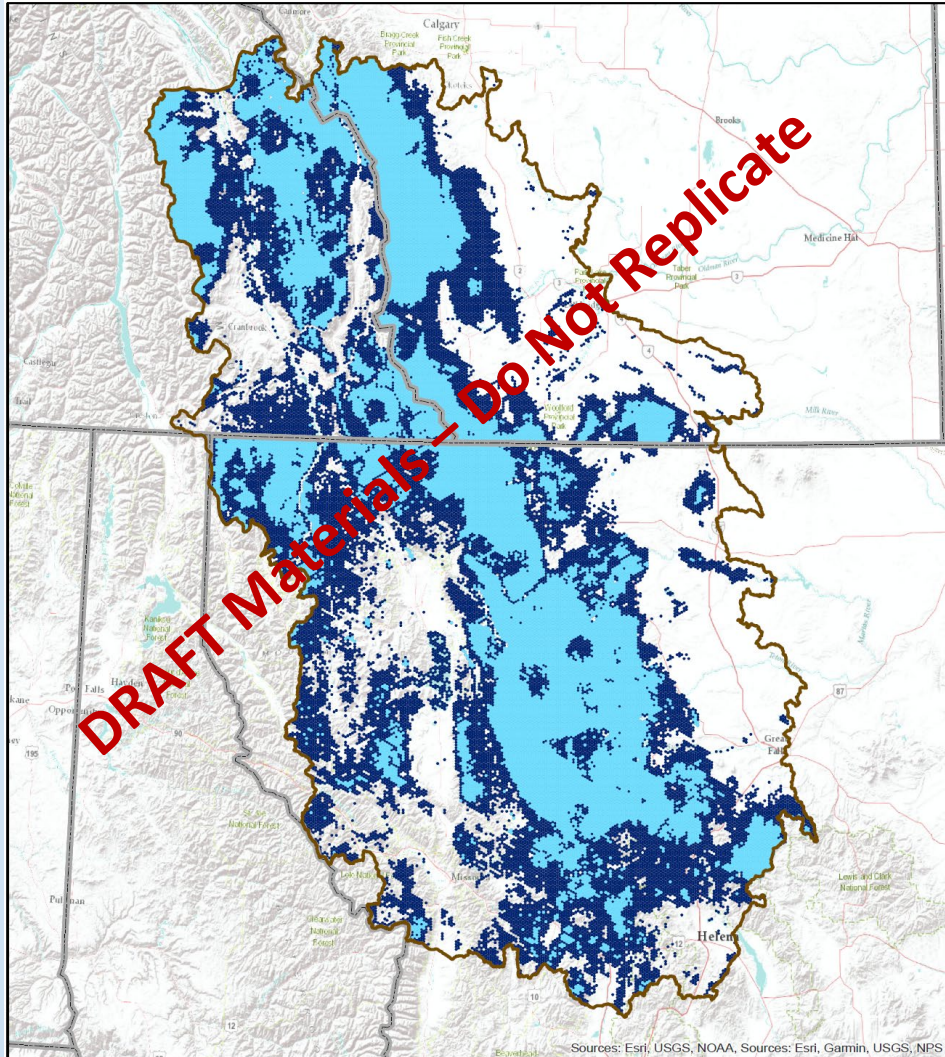
Canada Lynx



$$\sum_{PUS} Cost + BLM \sum_{PUS} Boundary + \sum_{Con.Targ.} SPF \times Penalty = \text{Marxan Score}$$

NULL Model: All Conservation Features

*Except ecological connectivity



	Total	AB	BC	MT
Datasets	80	27	24	29
Sources	25	13	13	8
Point	8	4	3	2
Poly	44	15	16	19
Raster	18	9	6	9

Feature data sources:

- MT Natural Heritage Program
- US Fish and Wildlife Service
- Crown Managers Partnership
- Hi 5 Working Group
- MT Fish Wildlife & Parks
- Glacier National Park
- Alberta Environment & Parks
- Comm. Environmental Coop.
- Gov't of Canada
- Gov't of Alberta
- Gov't of BC
- T. Cleavenger
- C. Lamb
- P. Matson

First Draft Full Model

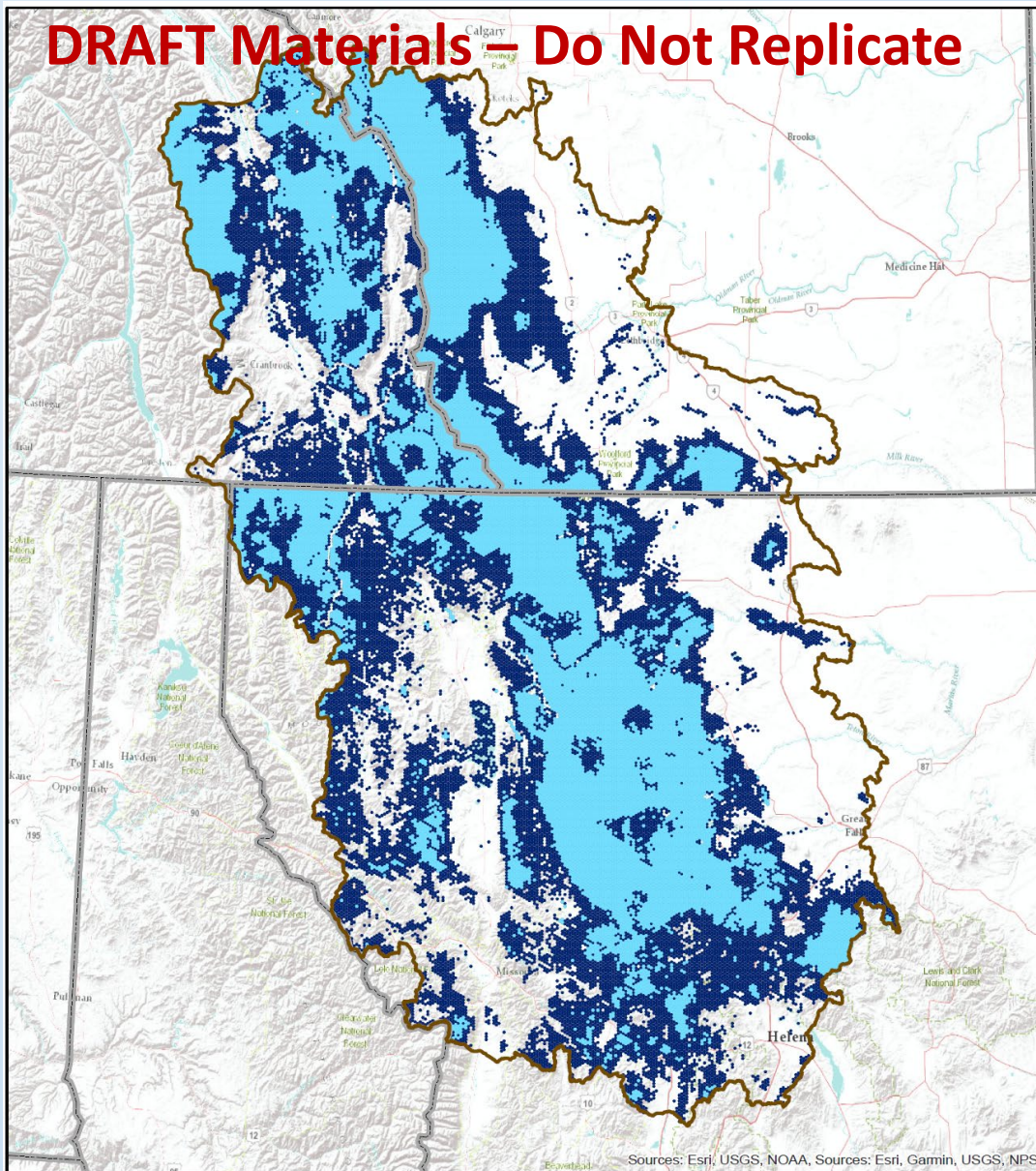
- Retain 30%
- Retain 70%

- | | | |
|------------------------------|---|-----------------------|
| Aquatic Forest | Wetlands Bull Trout | Wolverine Canada Lynx |
| Grassland Riparian Shrubland | Cutthroat Trout Grizzly Bear Whitebark Pine | Elk Mule Deer |

Cost or Resistance Layer:

Global Human Modification (Theobald et al. 2020)

DRAFT Materials – Do Not Replicate



First Draft Full Model

- Light Blue: Retain 30%
- Dark Blue: Retain 70%

- | | | |
|----------------|-----------------|-------------|
| Aquatic Forest | Wetlands | Wolverine |
| Grassland | Bull Trout | Canada Lynx |
| Riparian | Cutthroat Trout | Elk |
| Shrubland | Grizzly Bear | Mule Deer |
| | Whitebark Pine | |

“Feature Representation Target”

The target amount of each conservation feature to be included in the solutions

May represent:

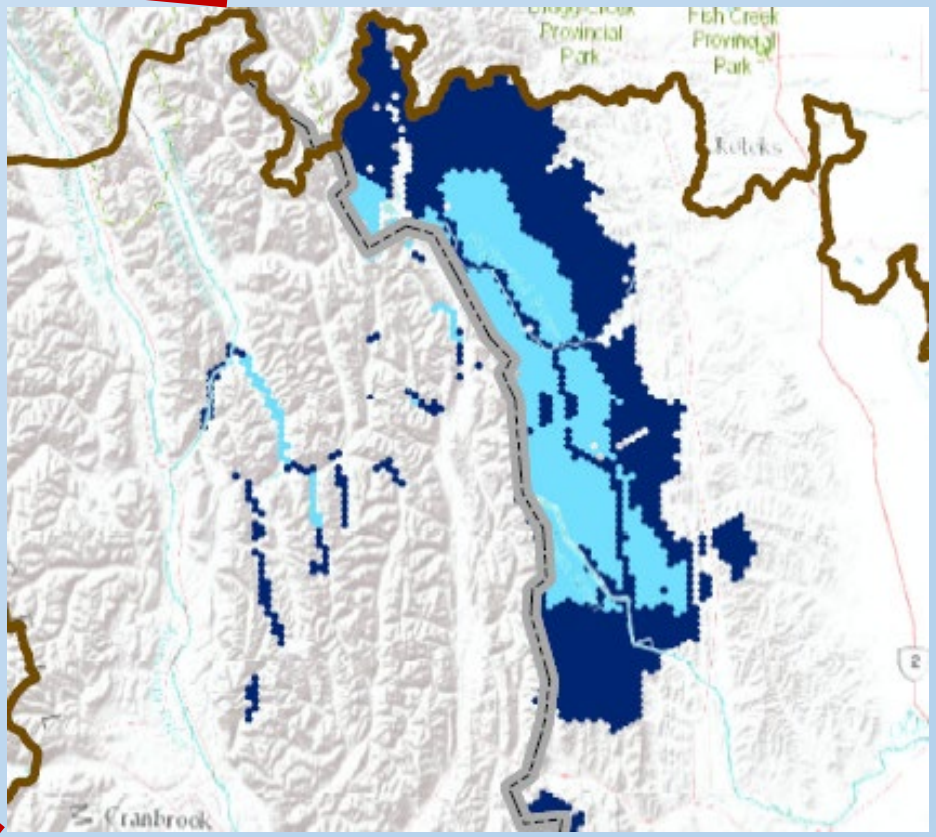
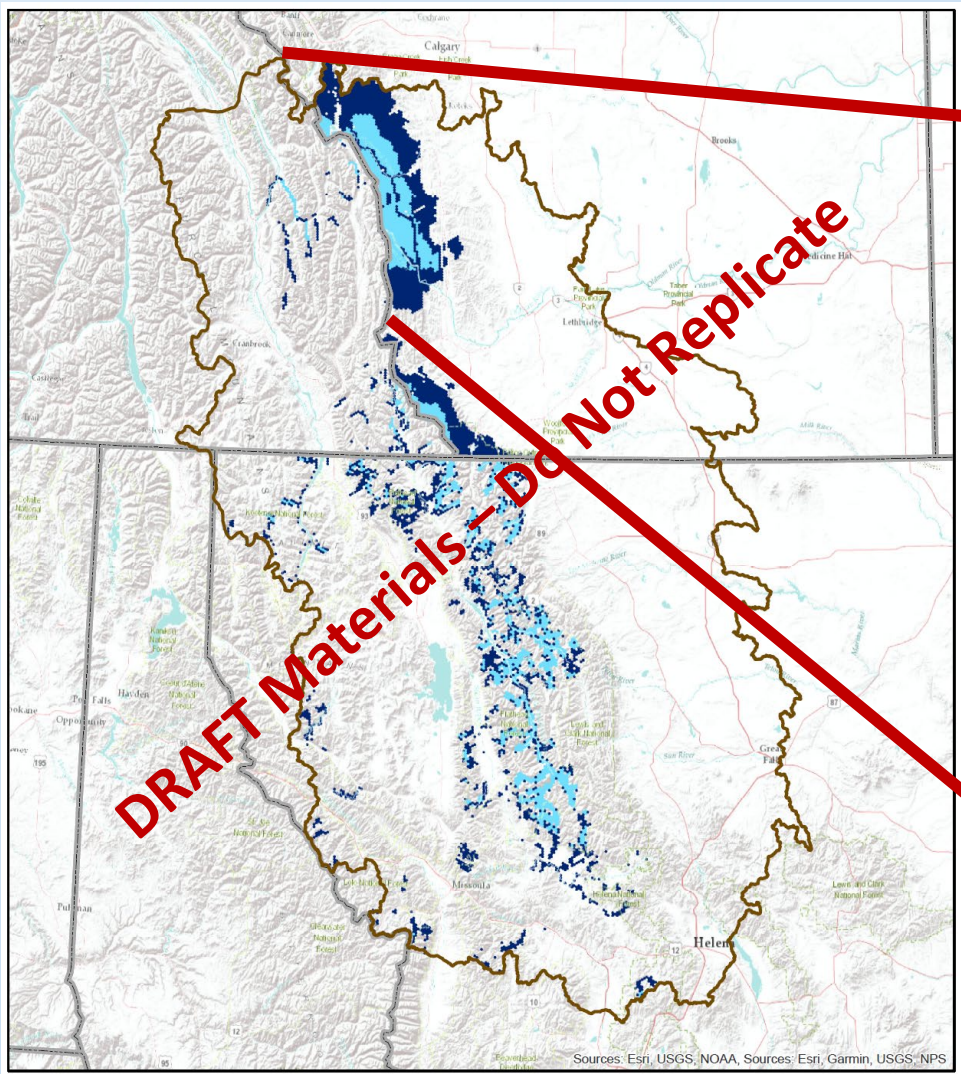
- goals for representation in protected areas
- perceived conservation importance of that feature
- legislation or recovery targets

Targets must be well-justified

For NULL Models all Targets set at 30% and at 70%

Learning to Work with the Data

NULL Model: Bull Trout



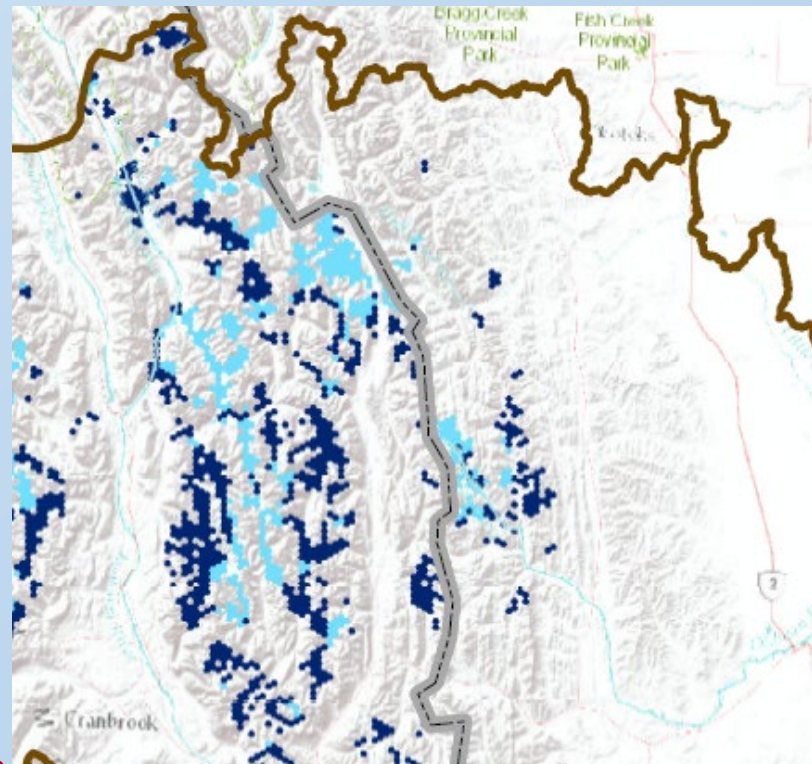
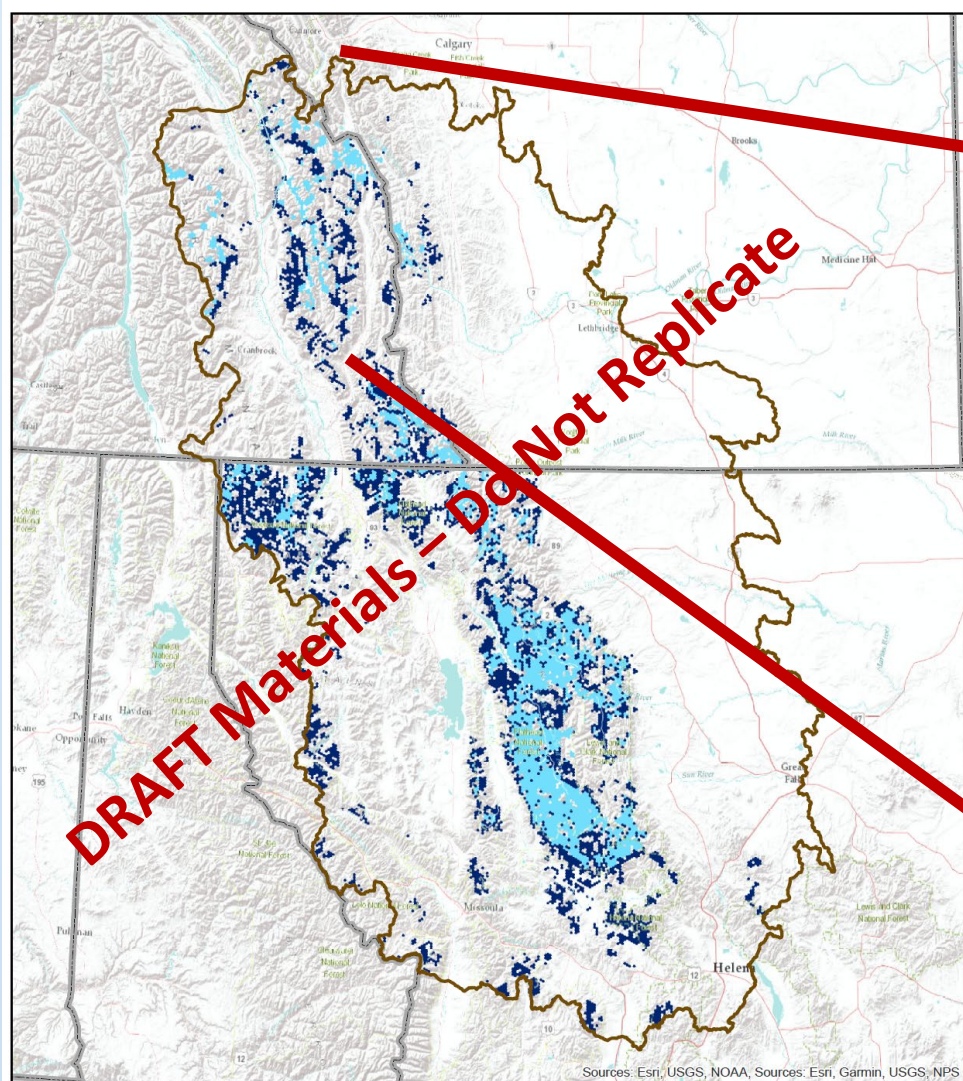
Bull Trout

- Retain 30%
- Retain 70%

Cost or Resistance Layer:
Global Human Modification (Theobald et al. 2020)

Learning to Work with the Data

NULL Model: Westslope Cutthroat Trout

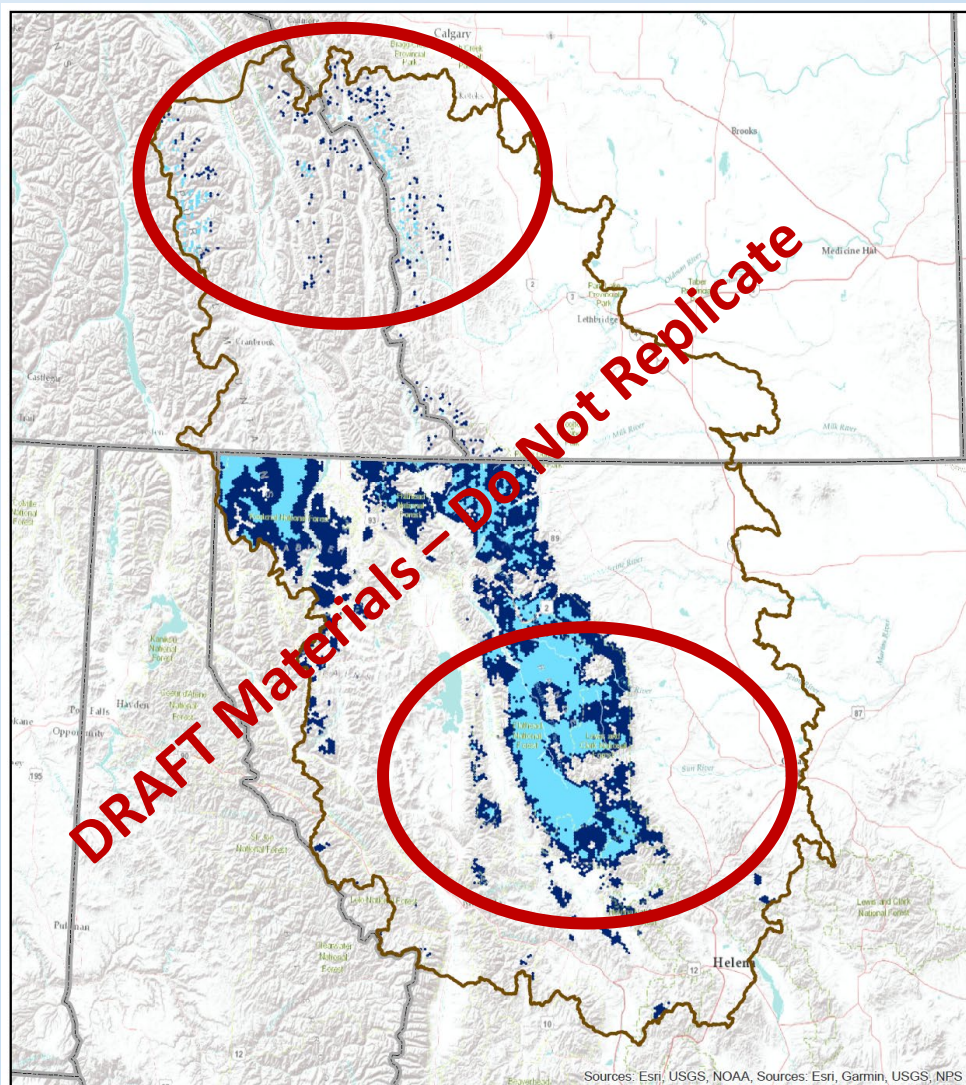


Westslope
Cutthroat
Trout



Cost or Resistance Layer:
Global Human Modification (Theobald et al. 2020)

Learning to Work with the Data



Canada Lynx



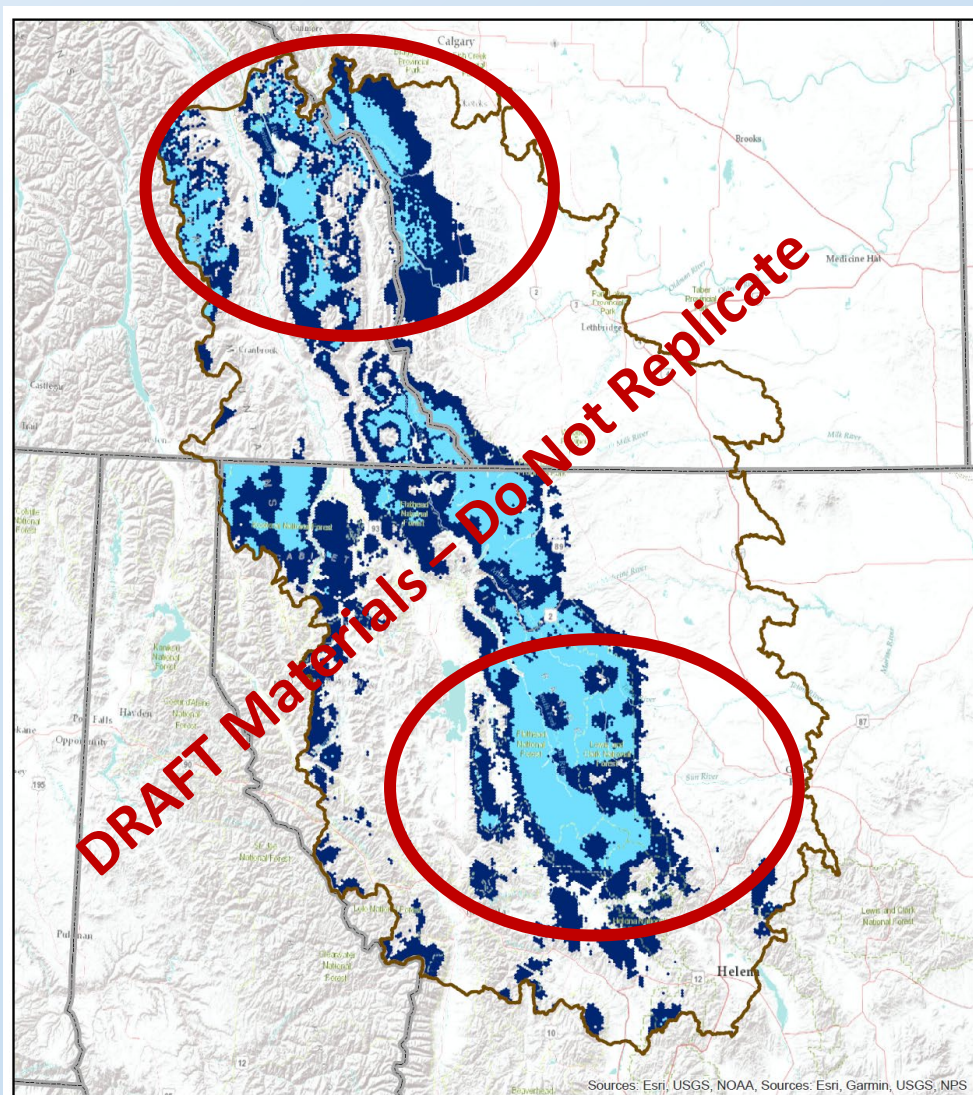
NULL Model: Canada Lynx

C29						
	A	H	I	J	K	L
1		Alberta				
2	Feature	Source Data Layer Name	Provider	Row Number	Output_Filename_1	Output_Filename_2
31	Canada Lynx	"Canadian Lynx Range Shift Model Agree	From C Gostout report t	134	gost_caly_alb	
32	Metadata File:	AB_Snow_layer\mosaic.tif	D. Pendlebury	304	AB_snow_rcl	
33	Canada Lynx data sources_2020.docx	Clevenger_CCoC_photo_data_14-16_co	Clevenger	15	Clevenger_Lynx_camera_detections_800m_buf.shp	
34						
35						
36	Wolverine	Gulo_Density_Surface.tif	Mowat	10	gulo_dens_rcl	
37	Metadata File:	Clevenger_camera_stations_AB_BC.shp	Clevenger	15	Clevenger_wolverine_detections_800m_buf.shp	
38	Wolverine data sources_2020.docx					
39						

Cost or Resistance Layer:

Global Human Modification (Theobald et al. 2020)

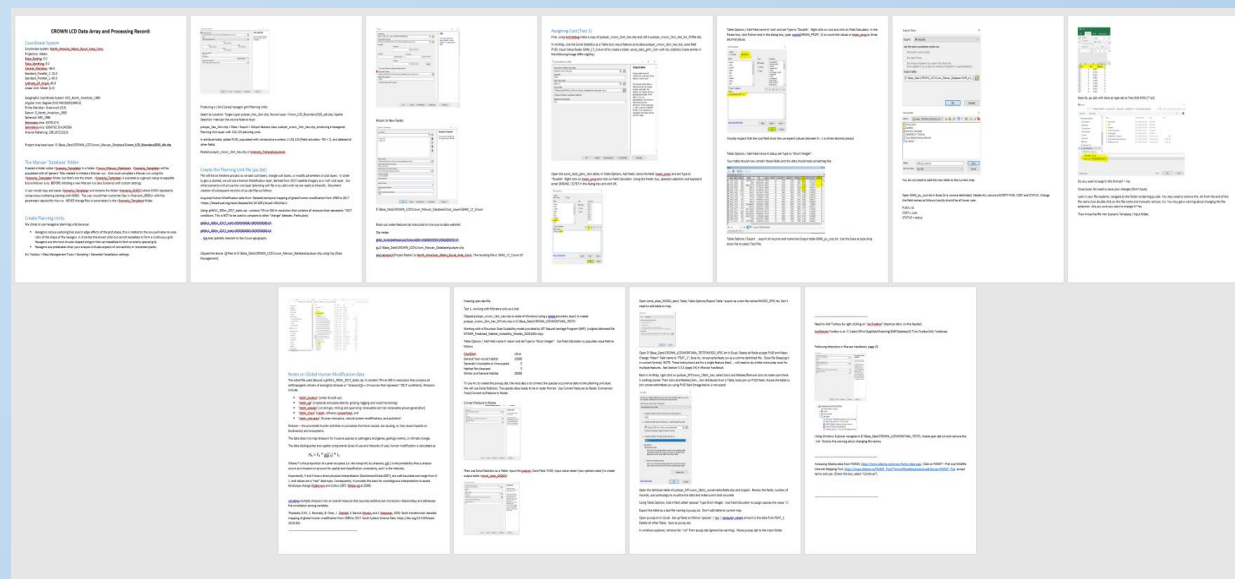
Learning to Work with the Data



Mesocarnivores
(Wolverine and Canada Lynx)



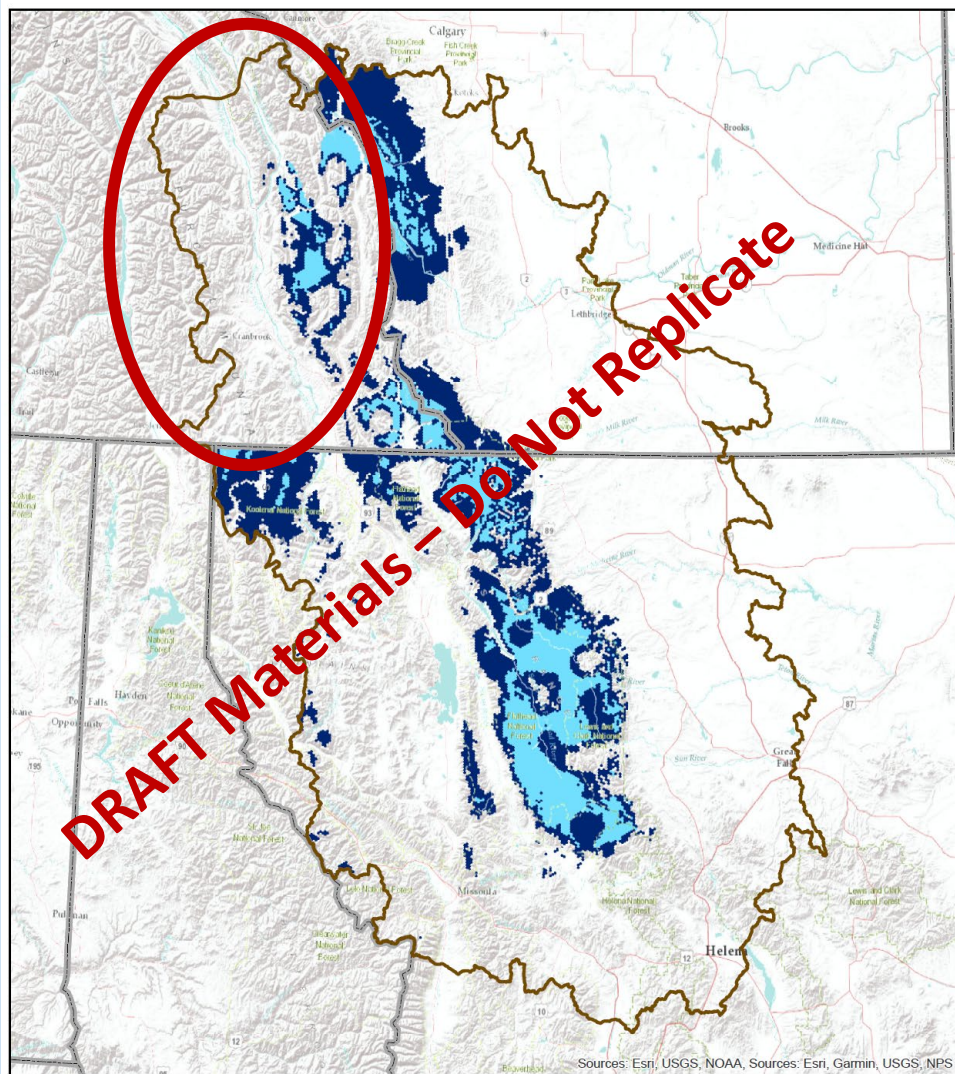
NULL Model: Mesocarnivores



Cost or Resistance Layer:
Global Human Modification (Theobald et al. 2020)

Learning to Work with the Data

NULL Model: Grizzly Bear



Grizzly Bear



Grizzly Bear Data Sources, Data Selection and Process Steps

Montana – Scenario #1

Source data with comments

MTNHP_Predicted_Habitat_Suitability_GBear.shp – covers entire MT portion of Crown LCD project area; 4 suitability classes (including ‘unsuitable’) created using Maximum Entropy software (Phillips et al. 2006, Ecological Modeling 190:231-259); Montana Natural Heritage Program. 2019. Grizzly Bear (*Ursus arctos*) predicted suitable habitat models created on September 12, 2019. Montana Natural Heritage Program, Helena, MT. 16pp.

MTNHP_ObsData_GBear.shp – The Montana Natural Heritage Program (MTNHP) maintains point observation data for plant and animal species in Montana. These databases include information on the location, status, characteristics, and dates of observation.

CMP Report on Estimating Grizzly Bear Occupancy (CMPGBMar21.shp; dated 21 March 2013); Grizzly bear detections were defined from taken hair traps to provide consistent coverage across the CCE and sampling methodology. Hair trap stations (at least those reported here) were constrained by the CMP spatial definition of the Crown of the Continent Ecosystem (CCE). NO data was reported for the peripheral areas of the Crown LCD project area.

Cost or Resistance Layer:

Global Human Modification (Theobald et al. 2020)

Spatial Design: What have we learned?

- Can We Do It? **YES, WE CAN!**



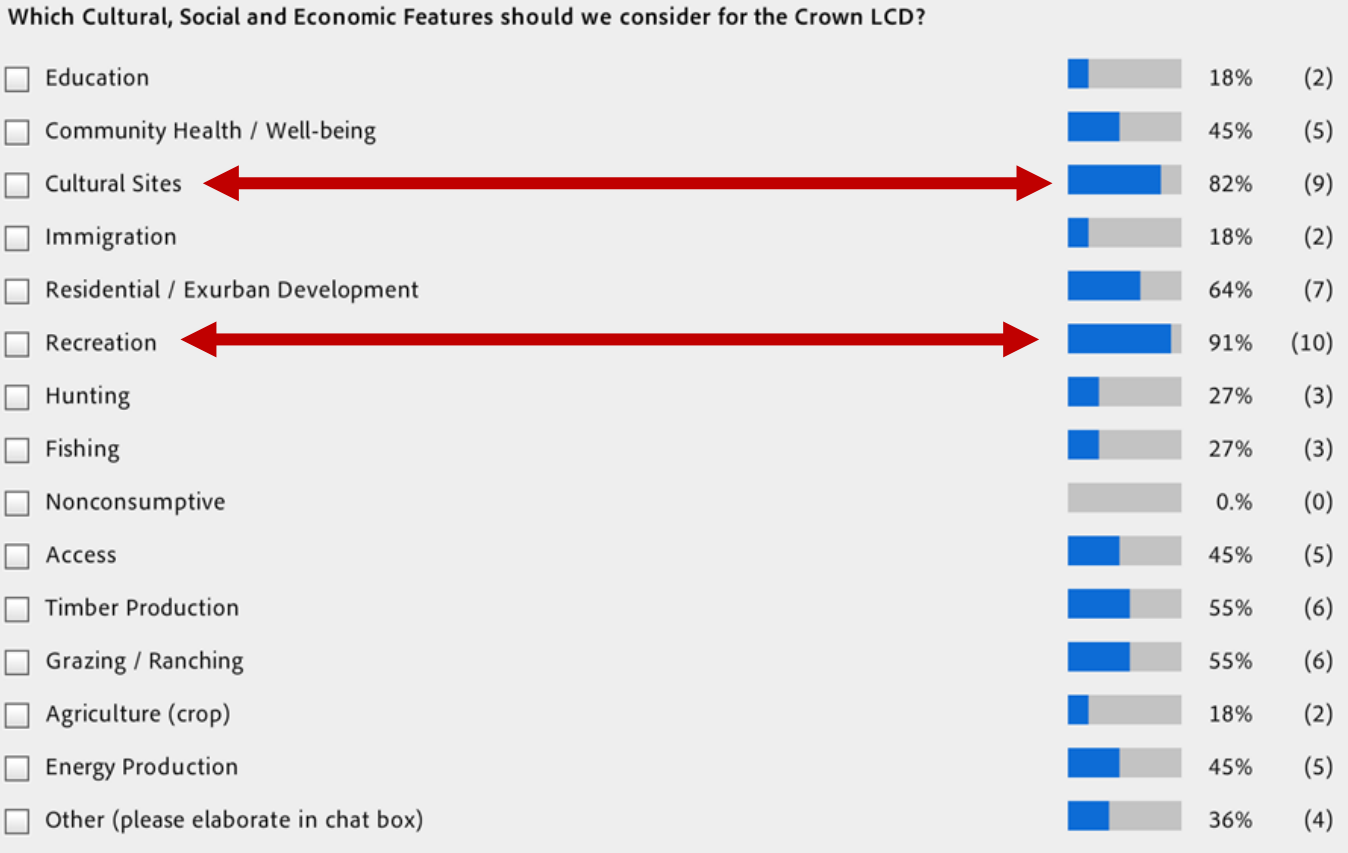
- Data variation presents challenges but not insurmountable ones
- A single, uniform cost layer (Global Human Modification) is not particularly useful – especially for features (species) that avoid humans anyway
- **Input from Subject Matter Expert teams** is critical to for a reliable spatial design
- We are prepared to integrate social, cultural and economic features
- **We still have A LOT of Work to do!!**

Next Steps

- Convene Subject Matter Experts
 - Additional Data
 - ‘Cost’ or Resistance (i.e., threats)
 - Current & Future (i.e., climate change)
 - Target estimations
- Build Out Remaining Conceptual Models
- **Select Cultural, Social, Economic Features**
- Initiate Strategic Design

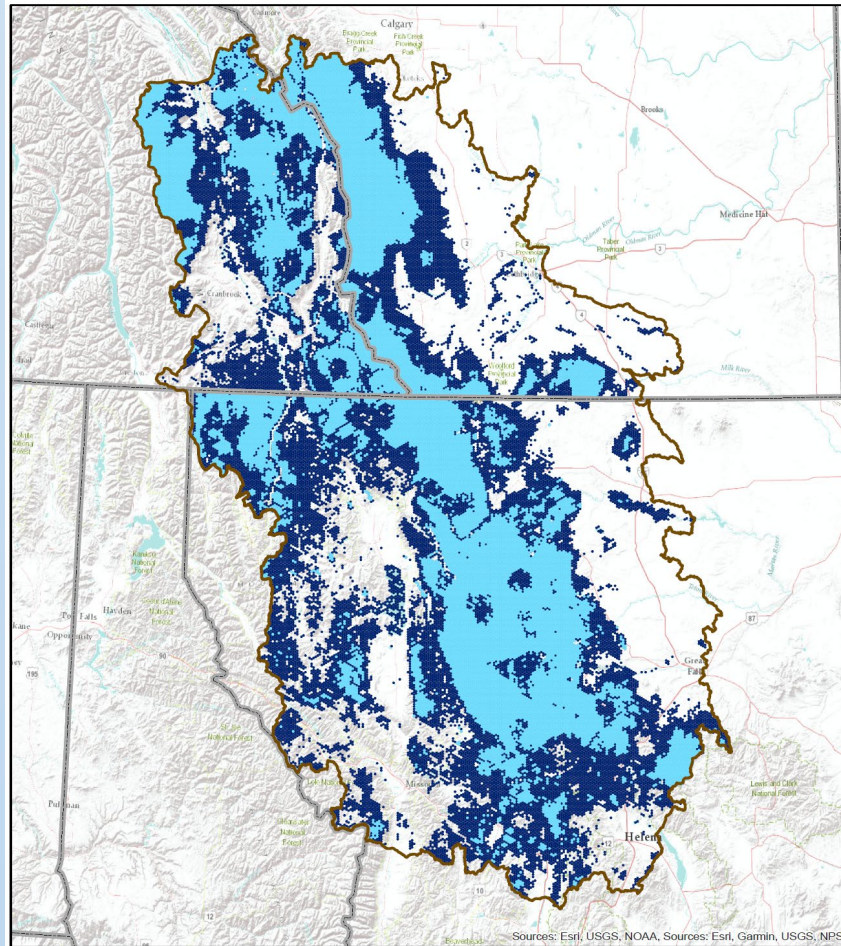
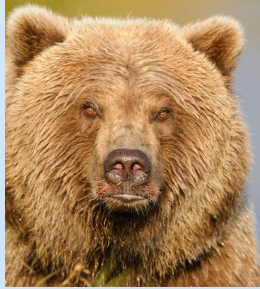
Cultural, Social, Economic Features

Leadership Team Poll: September 2020



• Leadership Team Subcommittee?

Discussion



First Draft Full Model

- Retain 30%
- Retain 70%

- | | | |
|----------------|-----------------|-------------|
| Aquatic Forest | Wetlands | Wolverine |
| Grassland | Bull Trout | Canada Lynx |
| Riparian | Cutthroat Trout | Elk |
| Shrubland | Grizzly Bear | Mule Deer |
| | Whitebark Pine | |

