

LCD Leadership Team Meeting

4/27/21 | 11am - 12:30 pm

Attendees: Natalie, Sean, Mary, Alisa Wade, Anne Carlson, Brooke Kapeller, Connie Simmons, Constanza, Erin CArey, Harvey Locke, Kathy Zeller, Kelly Cooley, Kris Temple, Linh Hoang, Mary T McClelland, Mike Durglo, Aubin Douglas, Amy, Kim Pearson

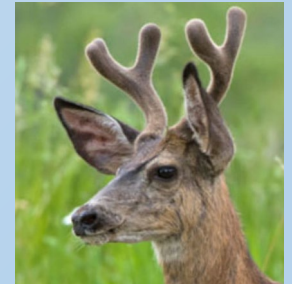
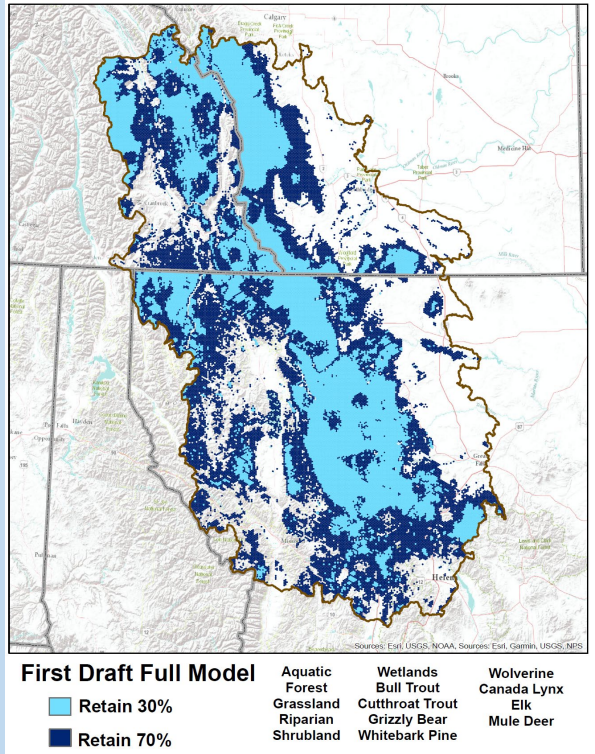
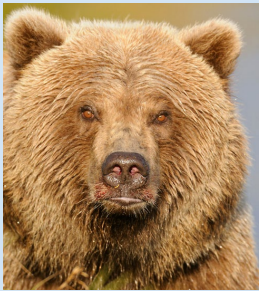
[Session Recording](#)

- Brief Phase 1 Wrap Up
 - How much of the Crown is protected?
 - Sean re-ran analysis with Canadian protected and conserved areas database
 - Still missing some private conservation lands
 - Constanza: Wildlife management area is repeated in sections IV and V
 - Harvey: Canada has a clear policy of protecting 25% by 2025 and 30 x 30. Alberta and BC have not engaged yet. Last week's federal budget appropriated \$2.2 billion to get to 25 by 2025. The approach is based on the Three Conditions with strategies that vary for the south, middle and north of Canada. This area is a blend of Middle Canada and Southern Canada
 - Harvey: Here is the data source for the Three Global Conditions: <https://dataverse.harvard.edu/dataverse/3GC>
 - Mix of human input and anthromes - Theobald data isn't taking into account logging - 2 global databases merged
 - Review of what we are doing
 - Minimum set problem: Conserve the most priority resources possible in the most efficient way possible
 - Marxan software - optimization modeling
 - Knowledge based iteration - Marxan is not the final step- what works is when we iterate on our collective knowledge
 - Null Models
 - Some of the data is point (observation), polygon (habitat suitability), raster (land cover)
 - DAta came from a variety of sources - mostly agency data
 - Lessons learned:
 - Data variation is a big challenge
 - Scoring data for marxan needs careful consideration
 - Document everything
 - Human modification being used as the sole cost layer
 - Feedback from LT and Tech Team
 - Bull trout data
 - AB used polygon data, BC used line data - solution is to merge data with hydro network for AB

- Brooke: I was also wondering if private land/easements would be counted
 - Only a few would qualify as protected areas - most easements are valuable, but most are not dedicated nature sanctuaries - you'd have to look into the easements to see if they qualify
 - Linh:
 - Feature representation targets and the percentage that we select
 - What does that percentage represent? - can it represent many different things based on what the resource is?
 - Answer: this is a modeling input - you can have a different value for each conservation feature
 - What does this percentage actually represent? Where grasslands should be? Or places that there is concern about what is going on in those places and we have to do work?
 - This is the spatial design - the next step is strategy design - Marxan is used for the spatial design
 - Marxan isn't about single features - it's telling us that if you work in the areas that are colored blue, you're more likely to have conservation benefit for multiple features
 - Strategy design is when we get together and say "what do we do about it"
 - does tech team have data set FS R1 mesocarnivore monitoring from last three yrs? - contact there is Jessie Golding if you do not have this data
 - Sean will follow up with Jessie Golding - jessie.golding@usda.gov
 - Constanza: Are you capturing birds by various core habitats? If so, it would appear as if some low elevation wetland/grassland areas in the Flathead Valley (north and south of Flathead Lake) are being missed. Maybe because of the significant human impact around them..
 - We didn't select birds as a leadership team, but we have selected wetlands
 - Sean will continue to improve the wetlands data
- Tasks for Phase 2
 - NExt steps:
 - BUild out remaining conceptual models
 - Convene subject matter experts
 - Evaluate data
 - Select cultural, social, and economic features

- Initiate strategic design - who is poised to do it, where is the expertise, where do we get the money, etc
 - Assembling a cultural/social/economic sub-team
 - Our vision is equal parts biology and sociocultural
 - Step 1. We need to select focal features that represent cultural, social and economics of this landscape
 - How did we select other features? - Analysis team reviewed 60 plans -> created a list of features identified as priorities by >10% of reviewed plans -> leadership team reviewed the short list -> leadership team voted
 - We are seeking a subcommittee from the leadership team to guide us through a selection process for cultural, social, and economic features
 - Volunteer Expectations:
 - Guidance from analysis team
 - 3 - 1hr phone calls May-July
 - 1-2 hours of homework
 - Select 3-4 features for analysis
 - Comments and questions from the LT
 - Harvey: Consult Indigenous folks about Bison restoration - this should not just be a biological consideration, but a social one as well
 - Connie: Further to Harvey's comment on Bison conservation is the opportunity for Indigenous Protected Areas. There has been interest expressed to look at this in the Oldman headwaters. A nascent idea only... but it is there.
 - Connie: Recent research on social-cultural-economic foci that would be helpful: <https://iopscience.iop.org/article/10.1088/1748-9326/abc121/pdf> is an important research project that looks at carbon storage, outdoor recreation and freshwater in Canada. The second project is the Y2Y's upcoming 'Emerging Economies in SW Alberta' an economic diversification research project to explore, with local community input, if/how the Castle Parks supports local businesses and economies. If you would like further information on the EE project - happy to provide this to all.
 - Brooke: I think a discussion will be needed on how these features will be integrated into the model, and how (if?) we want to differentiate extractive industries with disproportionate impacts on the landscape
 - Volunteers:
 - Brooke K.
 - Kelly C
 - Connie S.
 - Mary R. - maybe
 - Linh will ask USFS social scientist

Crown of the Continent Landscape Conservation Design



Leadership Team call

27 April 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:

- Brief Phase 1 wrap up
 - Feedback & response from March 30 LT call
 - Additional opportunity for questions and critique
- Tasks for Phase 2
- Assembling a Cultural/Social/Economic Sub-Team

2020 Update

- All 2020 Meeting Notes posted to Website
- Designing for the Future
 - 2-page 2020 summary
 - [Story Map](#)



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.

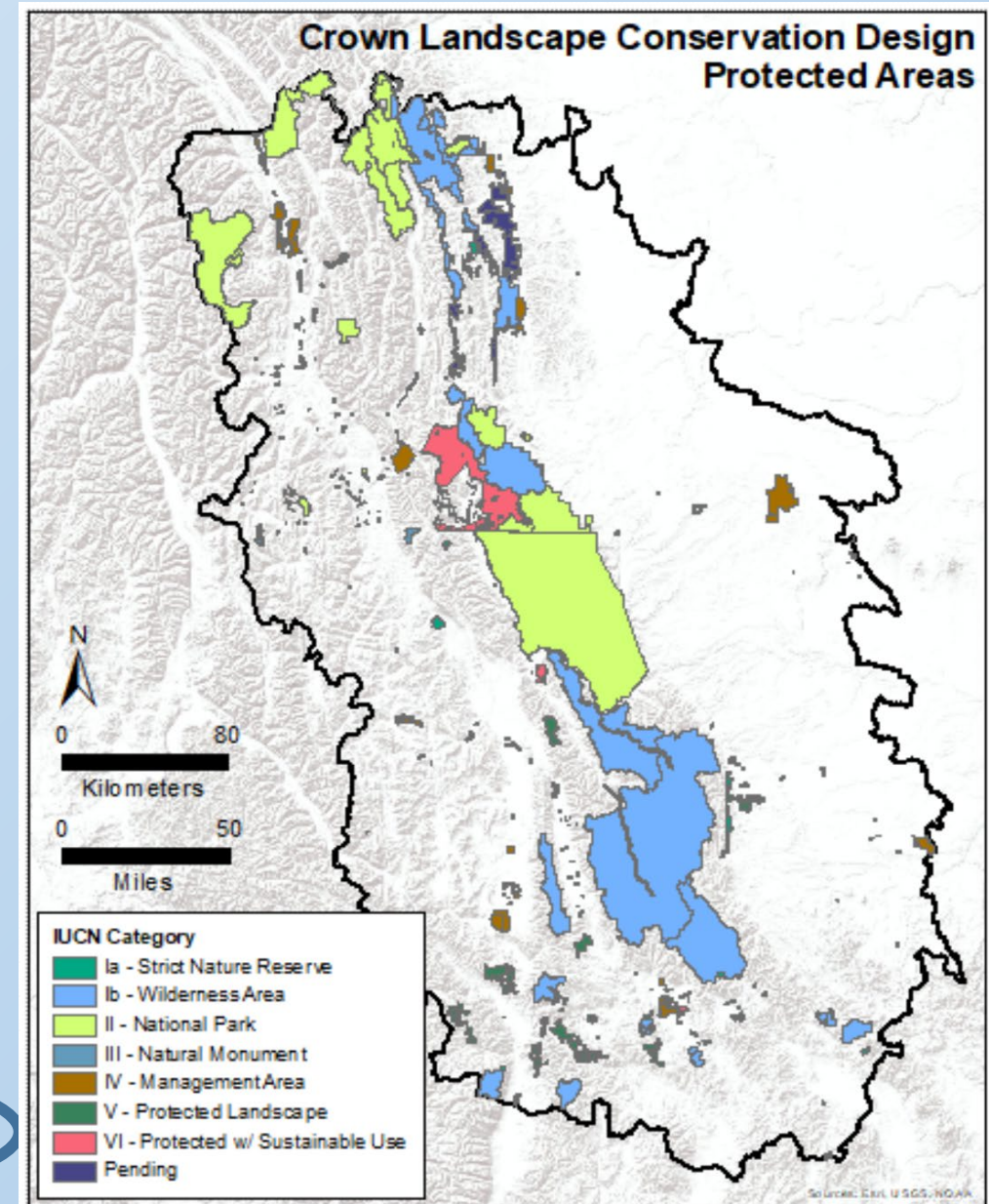
Meeting Notes/Presentation Slides

- 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? ... in progress

Crown of the Continent Landscape Conservation Design Project Area Area Under Conservation

IUCN Category	IUCN Class	Specific Designations	Area (ha)	Percent
Ia	Strict Nature Reserve	Research Natural Area Ecological Reserve	17,526	0.1%
Ib	Wilderness Area	Wilderness Area, Wilderness Study Area, Provincial Park	922,832	9.9%
II	National Park	National Park, Provincial Park	799,405	5.2%
III	Natural Monument or Feature	Scenic Area, Park	5,734	<0.1%
IV	Habitat/Species Management Area	National Wildlife Refuge, Wildlife Management Area, Heritage Conservation Area	91,324	0.2%
V	Protected Landscape	National Wild and Scenic River, Wildlife Management Area, Wildlife Habitat Area, Experimental Forest, Scenic Area, Private Conservation Land	68,589	1.9%
VI	Protected Area with sustainable use of natural resources	Waterfowl Production Area, Open Space, Habitat Area	99,896	0.1%
Pending			54,557	<0.1%
Total Area under Conservation (US & CA)			2,059,863	15.7%
Total Crown LCD Project Area (US & CA)			13,150,880	100.0%



Ecological Features (14) and Guilds (3)

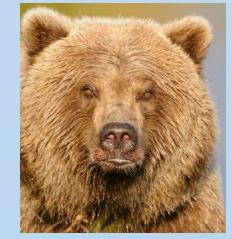
Mesocarnivores



Ungulates



Cold Water Salmonids



Grizzly Bear



Whitebark Pine



Forest



Shrubland



Grassland



Riparian



Wetland



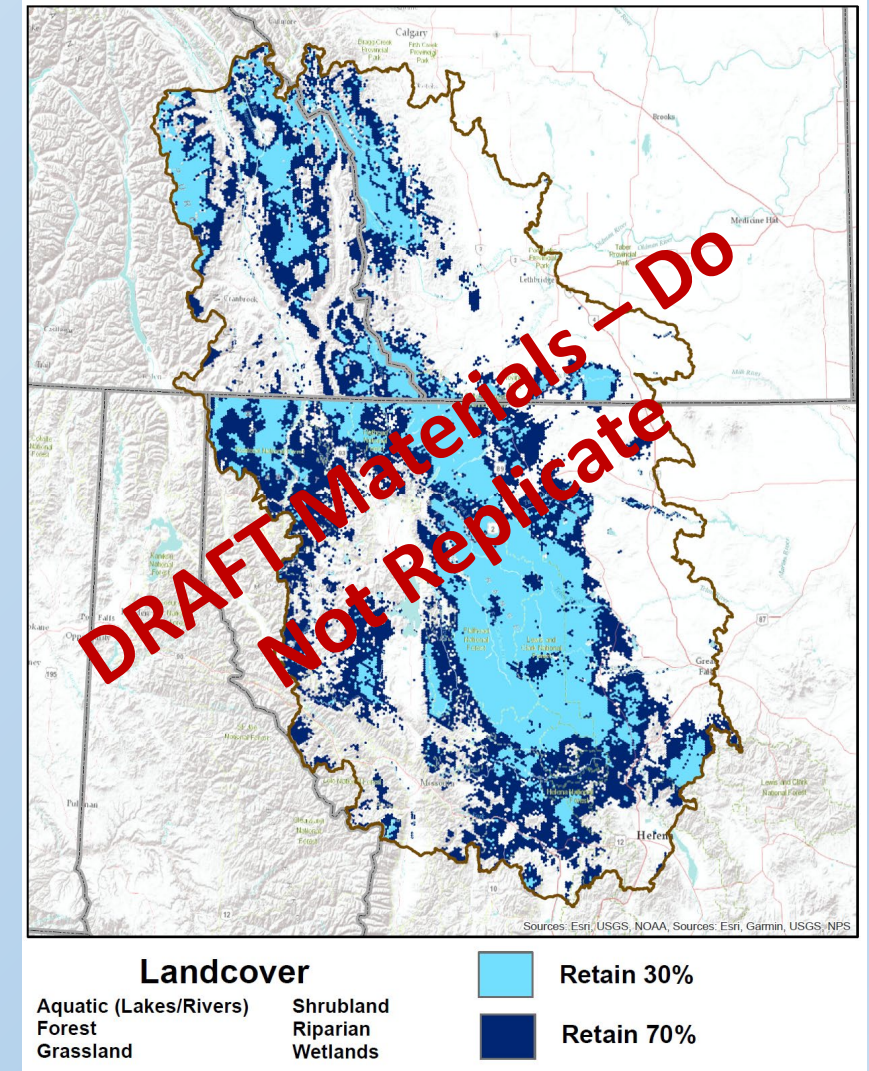
Aquatic

Social, Cultural, Economic Features (TBD)



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**



Setting the Marxan Environment

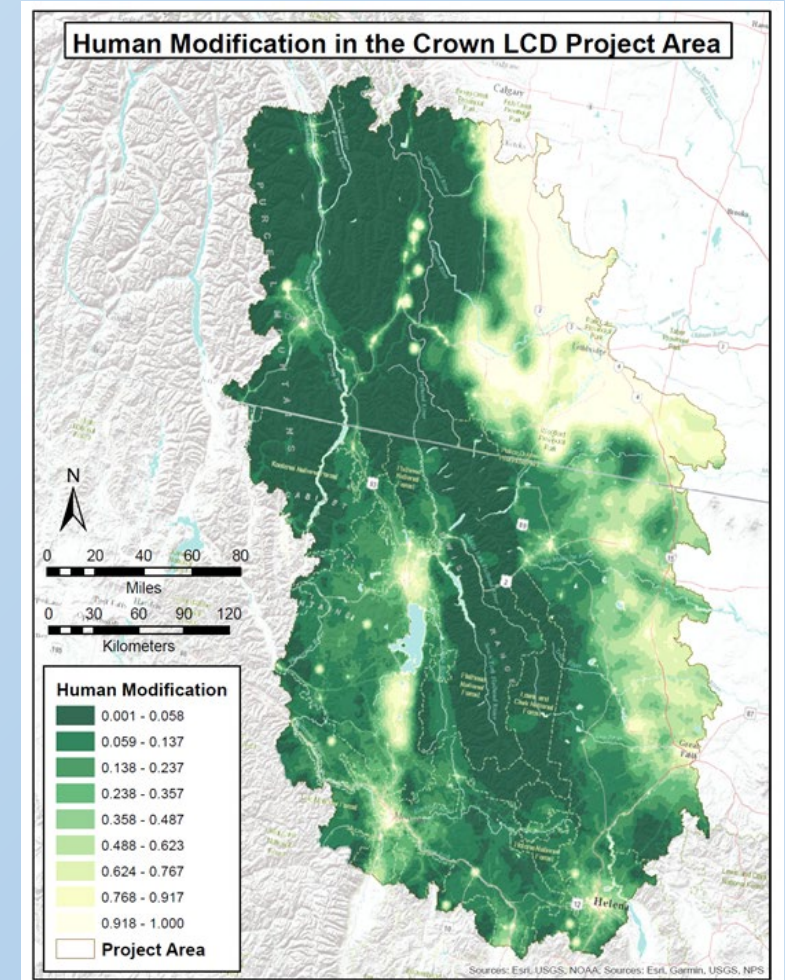
NULL Cost: [Global Human Modification](#) (Theobald et al. 2020)

Sum of selected
Planning Unit Costs

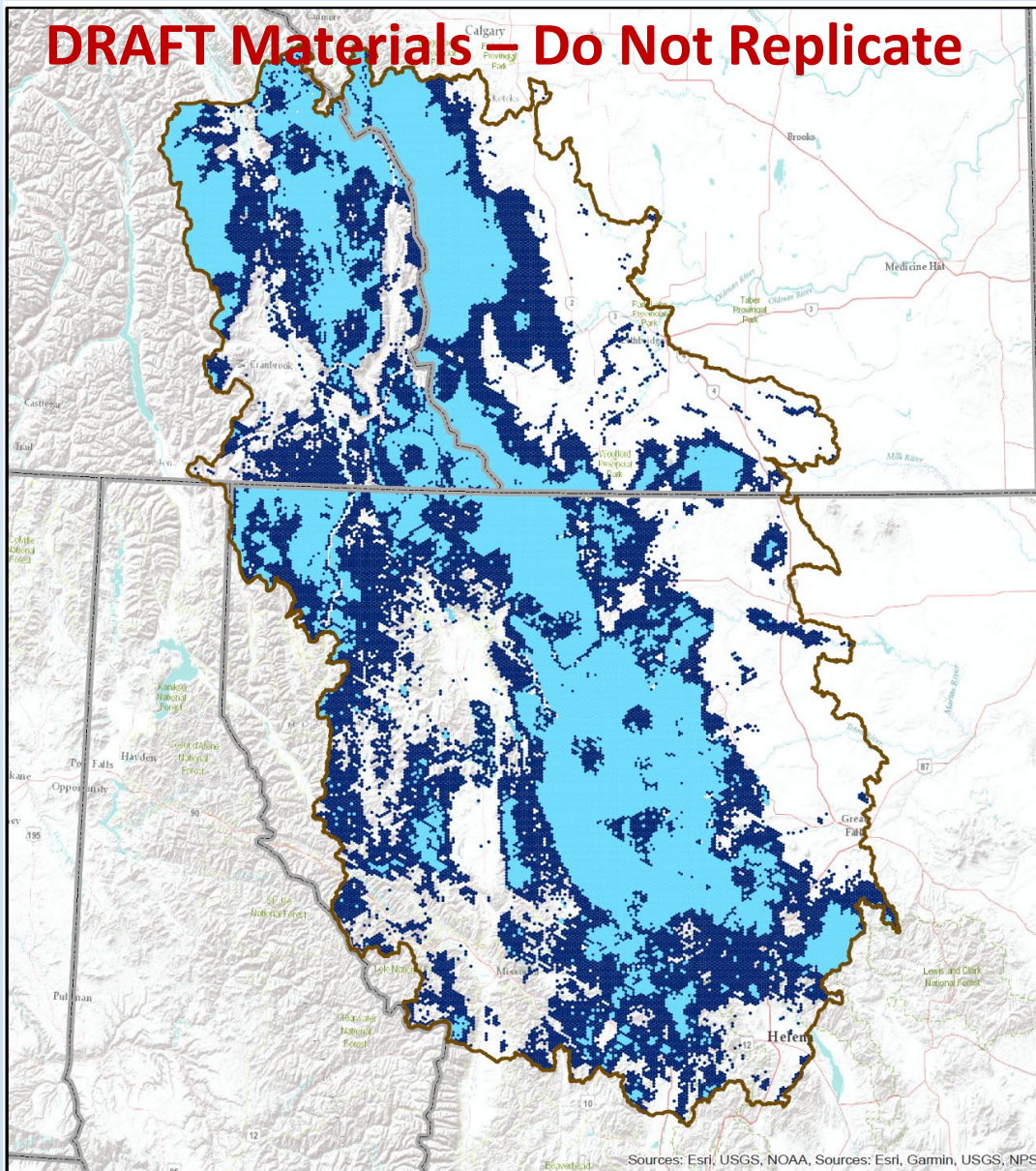
Sum of Planning Unit
Value for priority features

Total perimeter of
selected Planning Units

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



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:

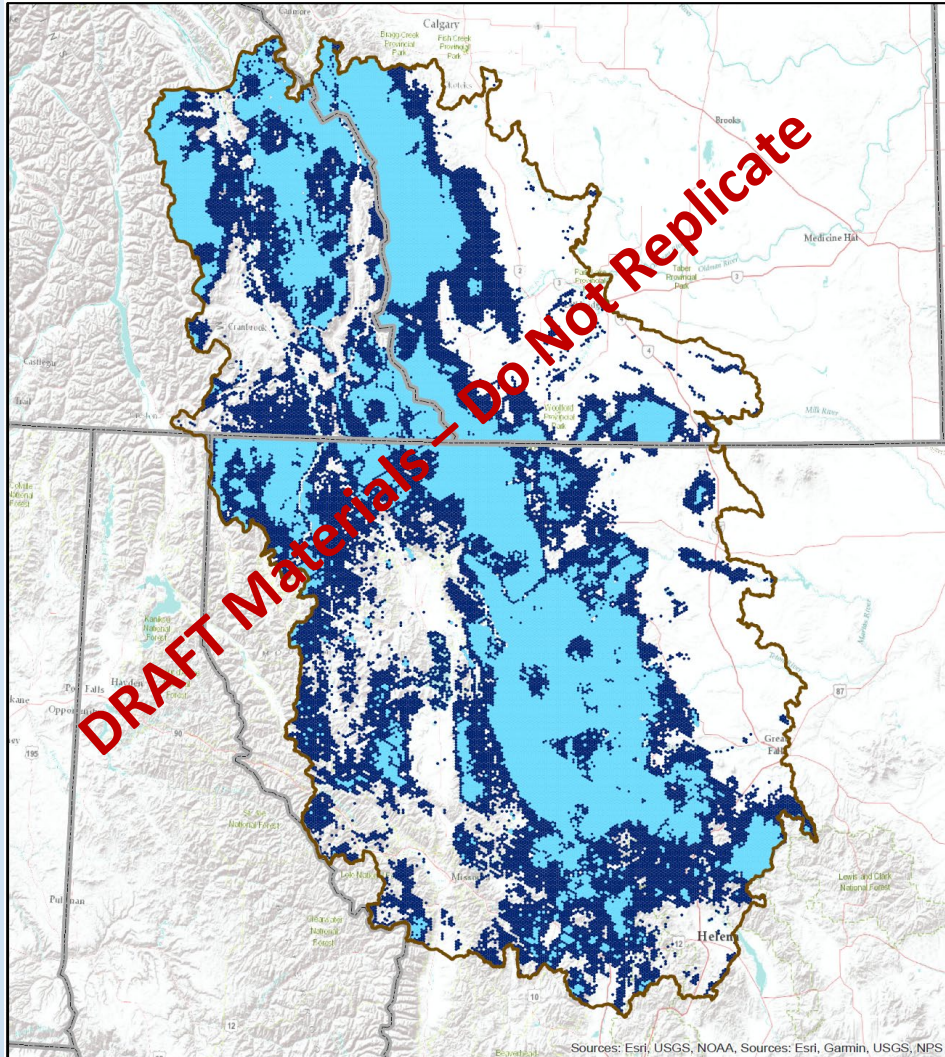
- goals for representation in protected areas
- perceived conservation importance of that feature
- legislation or recovery targets

Targets must be well-justified

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

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

Some 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%

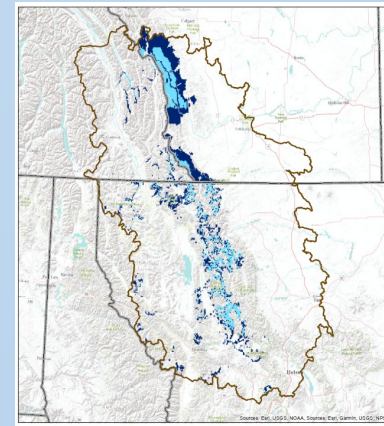
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| Shrubland | Whitebark Pine | Mule Deer |

Cost or Resistance Layer:

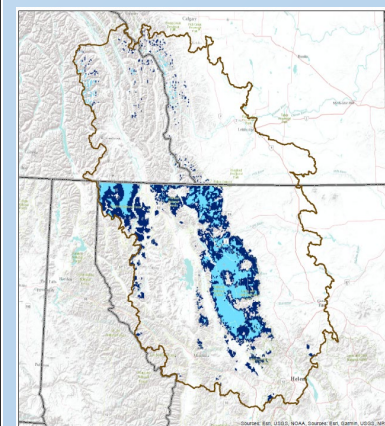
Global Human Modification (Theobald et al. 2020)

NULL Model: All Conservation Features

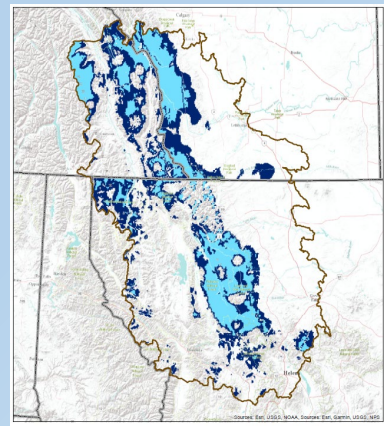
*Except ecological connectivity



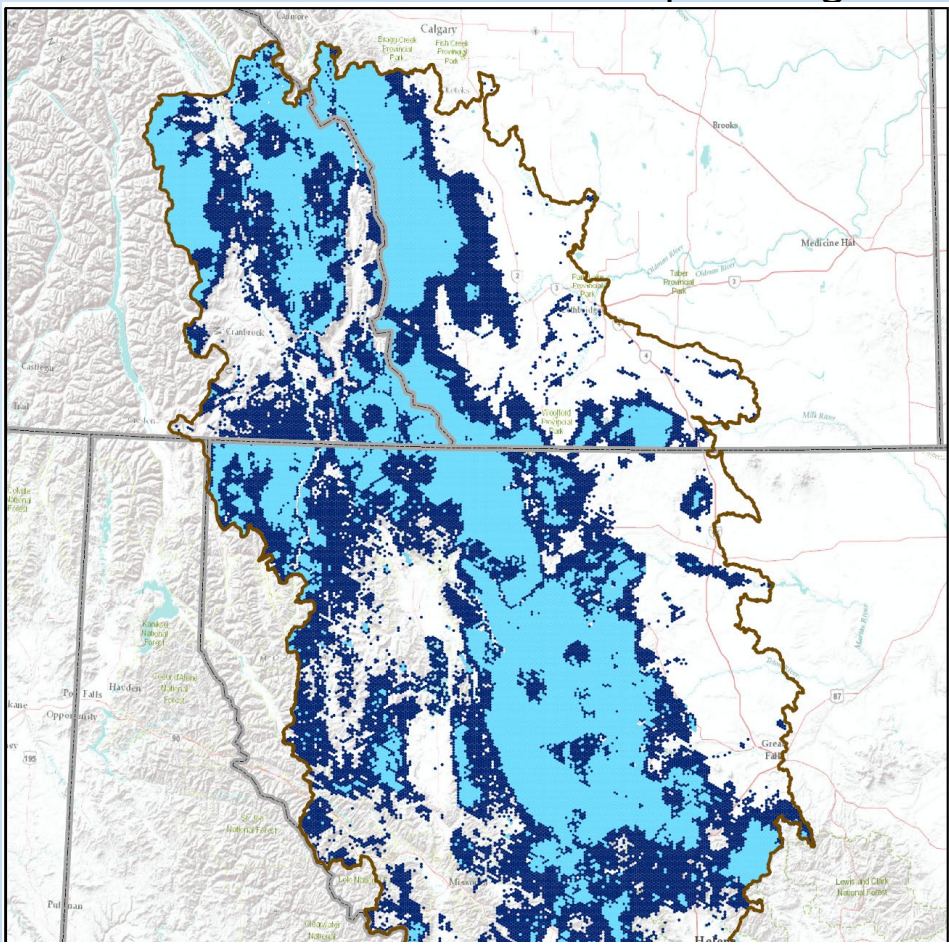
Bull Trout
■ Retain 30%
■ Retain 70%



Canada Lynx
■ Retain 30%
■ Retain 70%



Rocky Mountain Elk
■ Retain 30%
■ Retain 70%



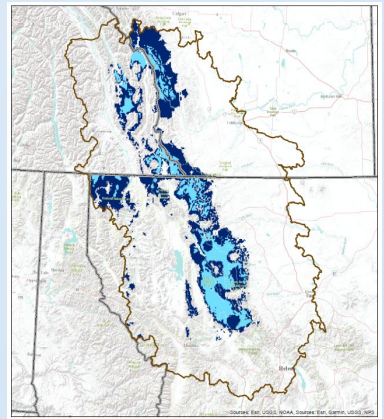
DRAFT Materials – Do Not Replicate

Sources: Esri, USGS, NOAA, Sources: Esri, Garmin, USGS, NPS

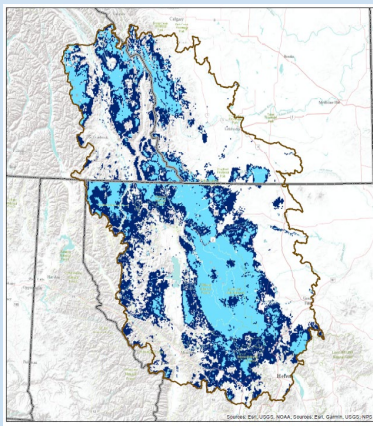
First Draft Full Model

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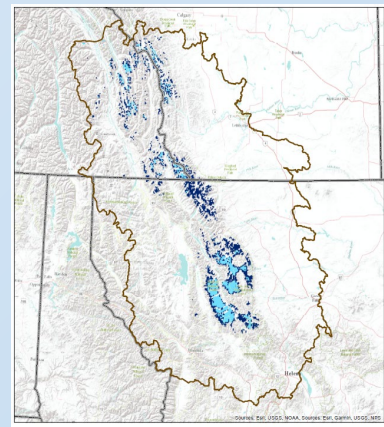
Aquatic Forest	Wetlands	Wolverine
Grassland	Bull Trout	Canada Lynx
Riparian	Cutthroat Trout	Elk
Shrubland	Grizzly Bear	Mule Deer
	Whitebark Pine	



Grizzly Bear
■ Retain 30%
■ Retain 70%



Landcover
 Aquatic (Lakes/Rivers) Forest
 Grassland
 Shrubland
 Riparian
 Wetlands
■ Retain 30%
■ Retain 70%



Whitebark Pine
■ Retain 30%
■ Retain 70%

Learning to Work with the Data

Analysis Team Lessons Learned through Phase 1

- Data variation a big challenge
- Scoring data for Marxan input needs careful consideration and sensitivity analyses
- Document Everything!!!!
- Human Modification as sole Cost Layer w/ only limited value
- Iterate with Leadership Team, Technical Team and Subject Matter Experts

Alberta – Scenario #3

Source data with comments

C:\Users\SFinn\Documents\ArcGIS\Packages\Canadian Lynx Range Shift is part of the data describing CALY climate response in the Gostout report “Implications of a shifting climate for lynx and wolverine in the Crown of the Continent” (Christian Gostout, 2019, Wilderness Society). This data doesn’t not cover the full extent of AB on the LCD Project Area. Unless augmented with additional data it is not useful for AB.

D:\Base_Data\CROWN_LCD\Features\Wolverine\AB_Snow_layer\mosaic.tif – a snow retention layer provided by Danielle Pendelbury. Has been used by Alberta Parks as a proxy for lynx and wolverine distribution in AB.

Clevenger_CCoC_photo_data_14-16_complete2.xlsx

Step 1: Use Reclassify on < C:\Users\SFinn\Documents\ArcGIS\Packages\Canadian Lynx Range Shift> to create a raster output < D:\Base_Data\CROWN_LCD\Features\CanadaLynx\Gost_CALY_rcl> **scored 4000 [contraction (2 models), contraction (1 model) and stable] or 0 (zero)**. Reproject Gost_CALY_rcl to project projection, creating Gost_CALY_alb.

Repair: used Reclassify to reclass the 4000 values to 8000; (Gost_CALY5_ab)

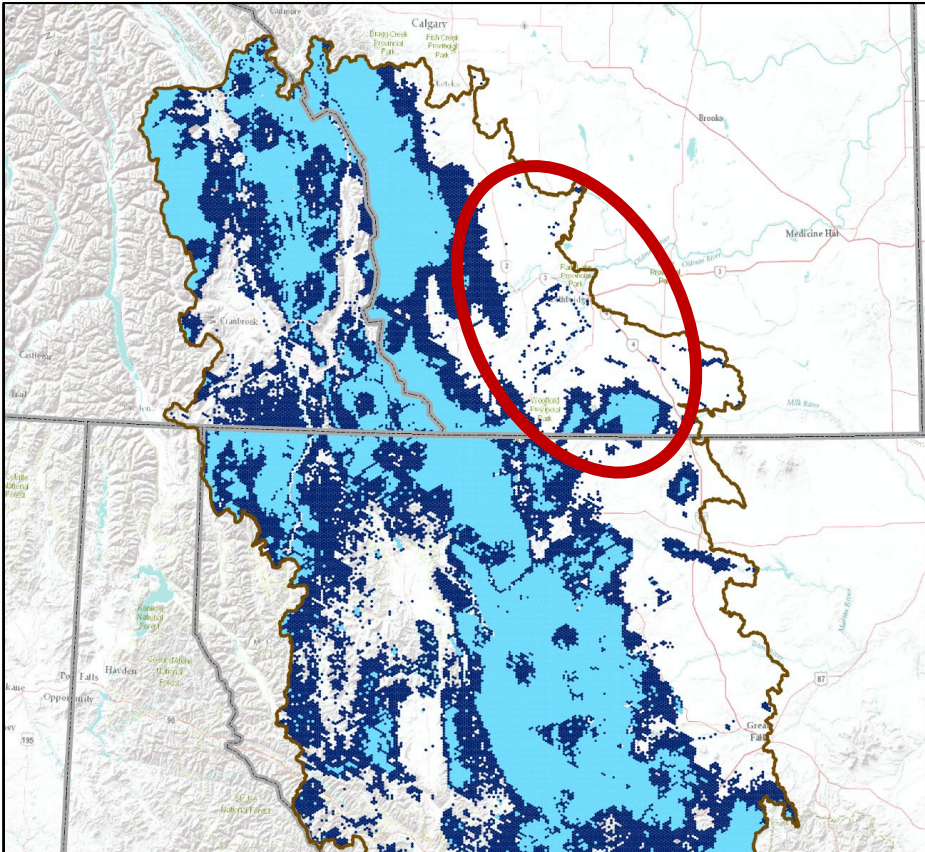
Learning to Work with the Data

General Comments from Leadership Team (30 March) and Technical Team (13 April)

- Riparian Areas appear underrepresented (LT)
 - Especially in the 'Retain 30%' models (TT)
- Some 'Core' conservation areas are not connected (LT)
- Need to run models & test sensitivity with Boundary Length Modifier (TT)
- Elk Valley is very undervalued in these model outputs (LT)
- General discomfort running parallel models for each jurisdiction (LT)
- Bull Trout:
 - New Critical Habitat Report for bull trout with critical habitat data (TT)
 - Join Alberta bull trout priority with National Hydro Network (TT)

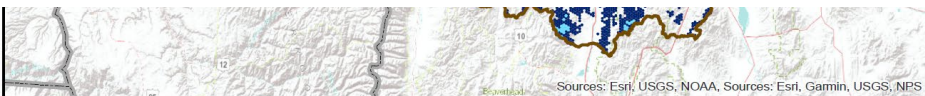
Learning to Work with the Data

NULL Model: Riparian



Riparian corridors underrepresented – especially in ‘Retain 30%’ models

DRAFT Materials – Do Not Replicate



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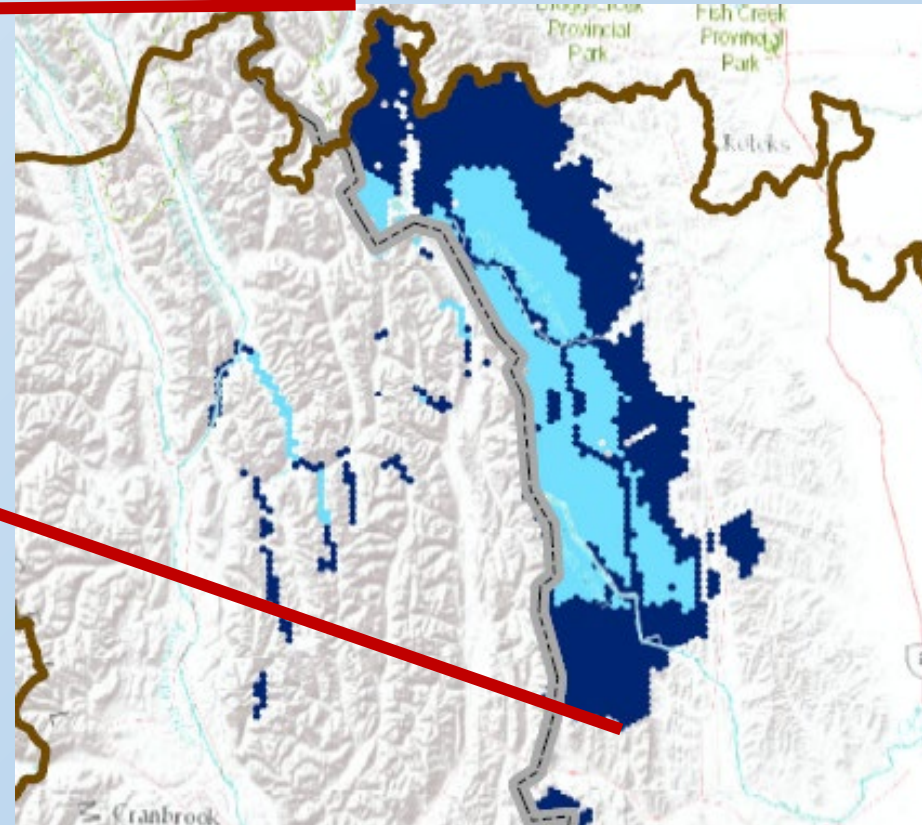
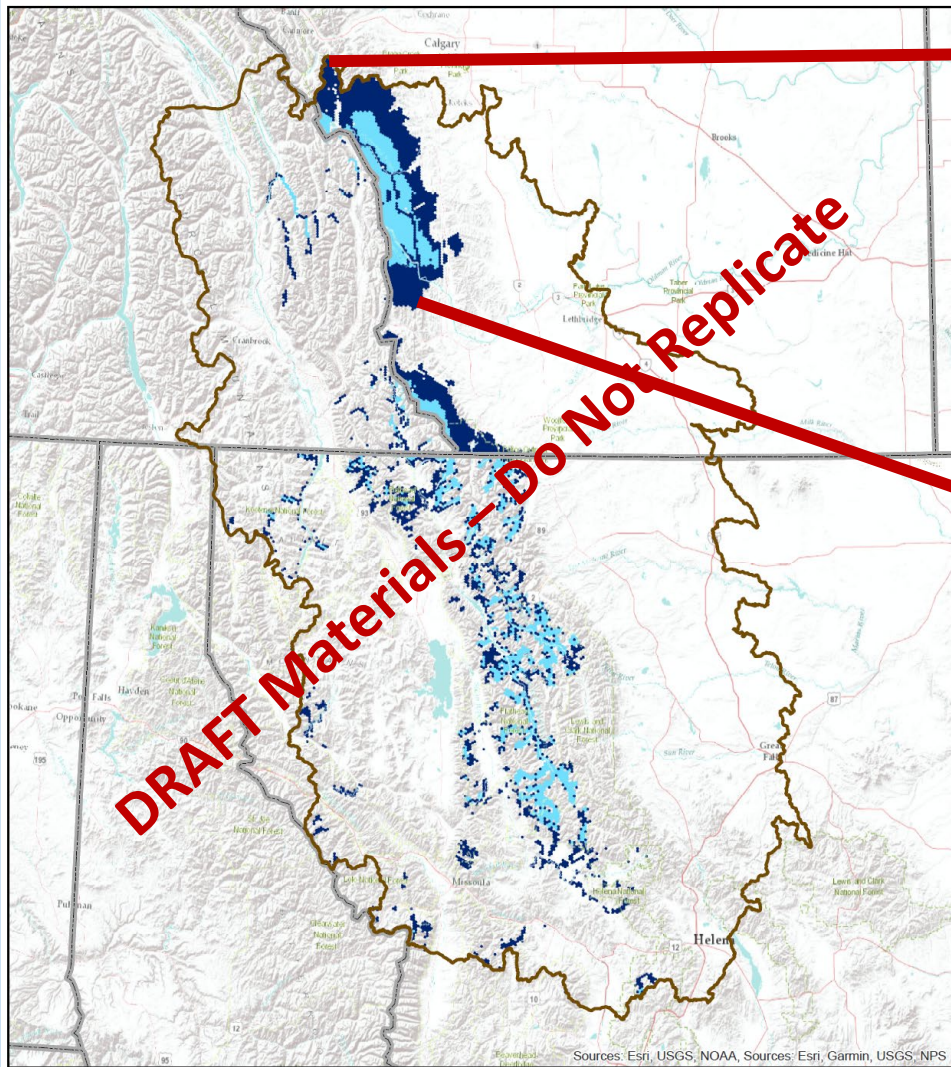
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Guidance (LT and TT): reevaluate riparian input data; sensitivity analysis on scoring



Learning to Work with the Data

NULL Model: Bull Trout



Bull Trout

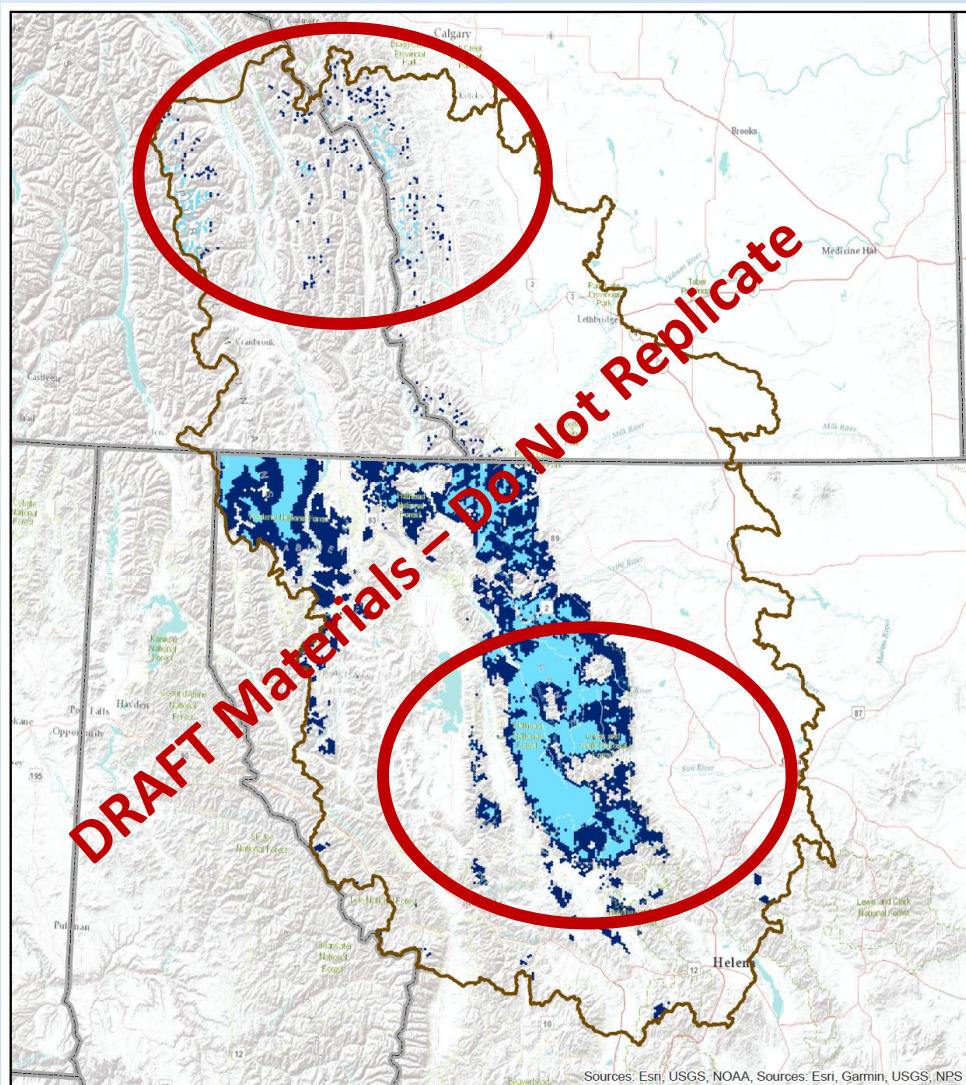


Guidance (Adam Collingwood): integrate bull trout habitat (AB) and critical habitat (CA) with National Hydro Network



Learning to Work with the Data

NULL Model: Canada Lynx



Canada Lynx



C29						
fx FWP						
	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 Agreee From C Gostout report k		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						

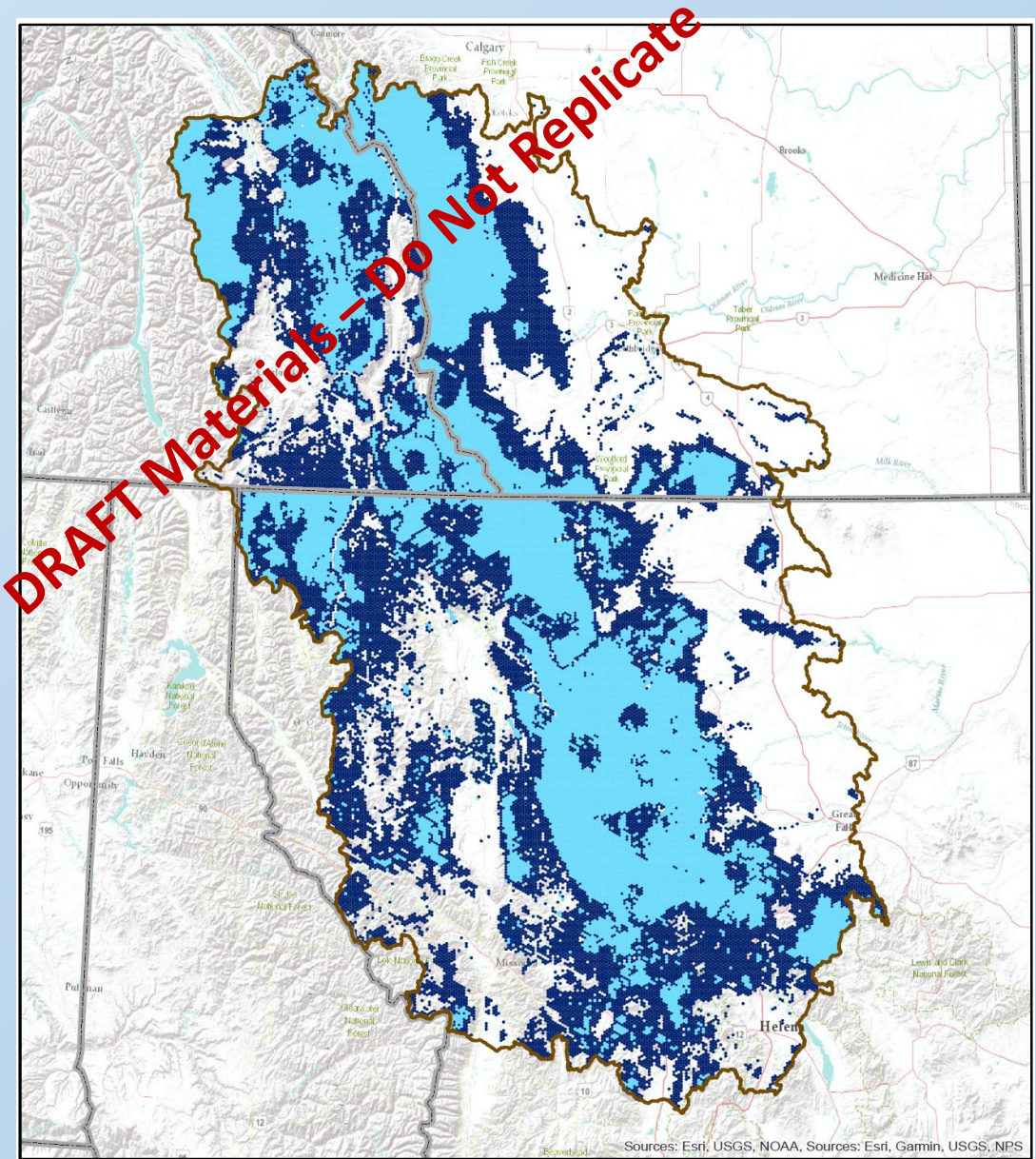
Adjust (Sean Finn):
Reevaluate source data; review scoring; normalize scoring

Learning to Work with the Data

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Additional Comments, Critique, Recommendations?



First Draft Full Model

- Retain 30%
- Retain 70%

- | | | |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> Aquatic Forest Grassland Riparian Shrubland | <ul style="list-style-type: none"> Wetlands Bull Trout Cutthroat Trout Grizzly Bear Whitebark Pine | <ul style="list-style-type: none"> Wolverine Canada Lynx Elk Mule Deer |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

Spatial Design: What have we learned?

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



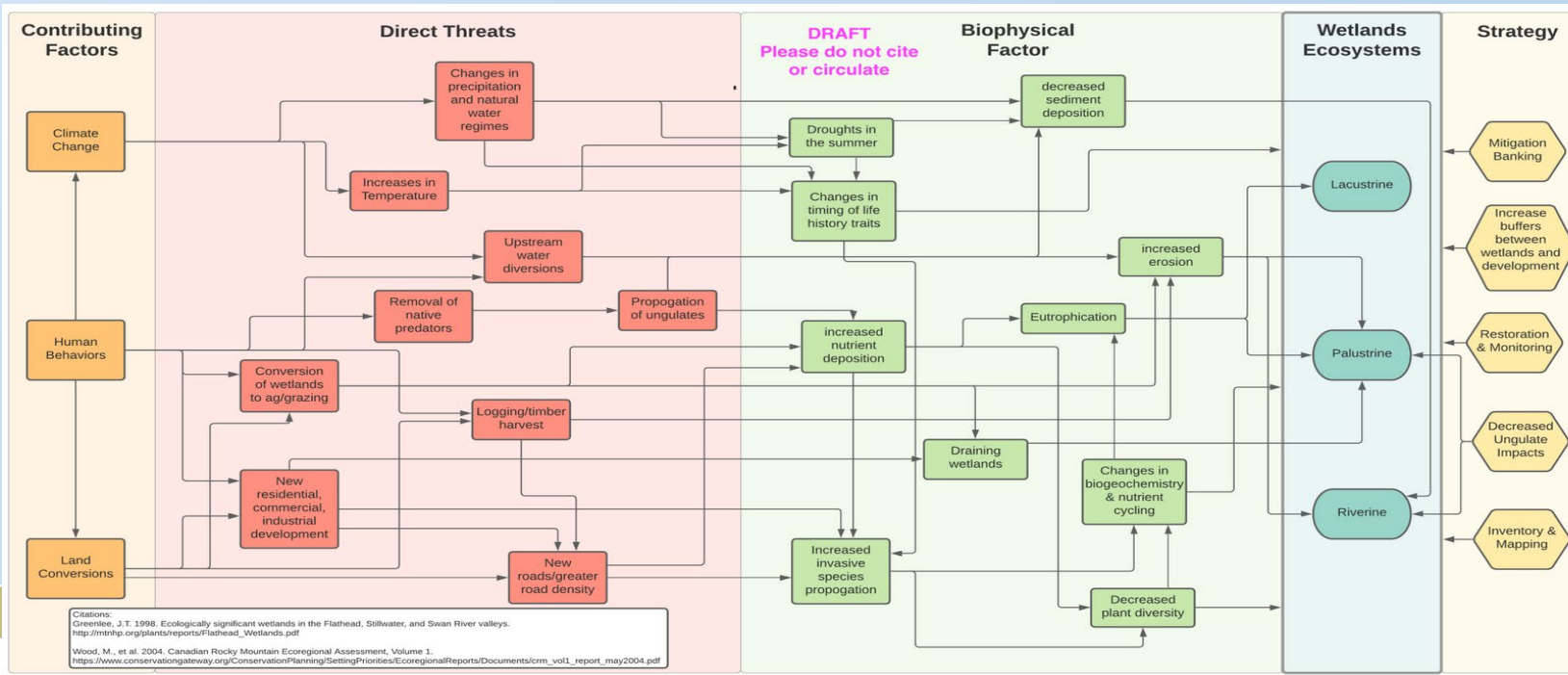
- Data variation presents challenges but not insurmountable ones
- A single, uniform cost layer (Global Human Modification) is not particularly useful – especially for features (species) that avoid humans anyway
- **Input from Subject Matter Expert teams** is critical to for a reliable spatial design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

Next Steps in 2021

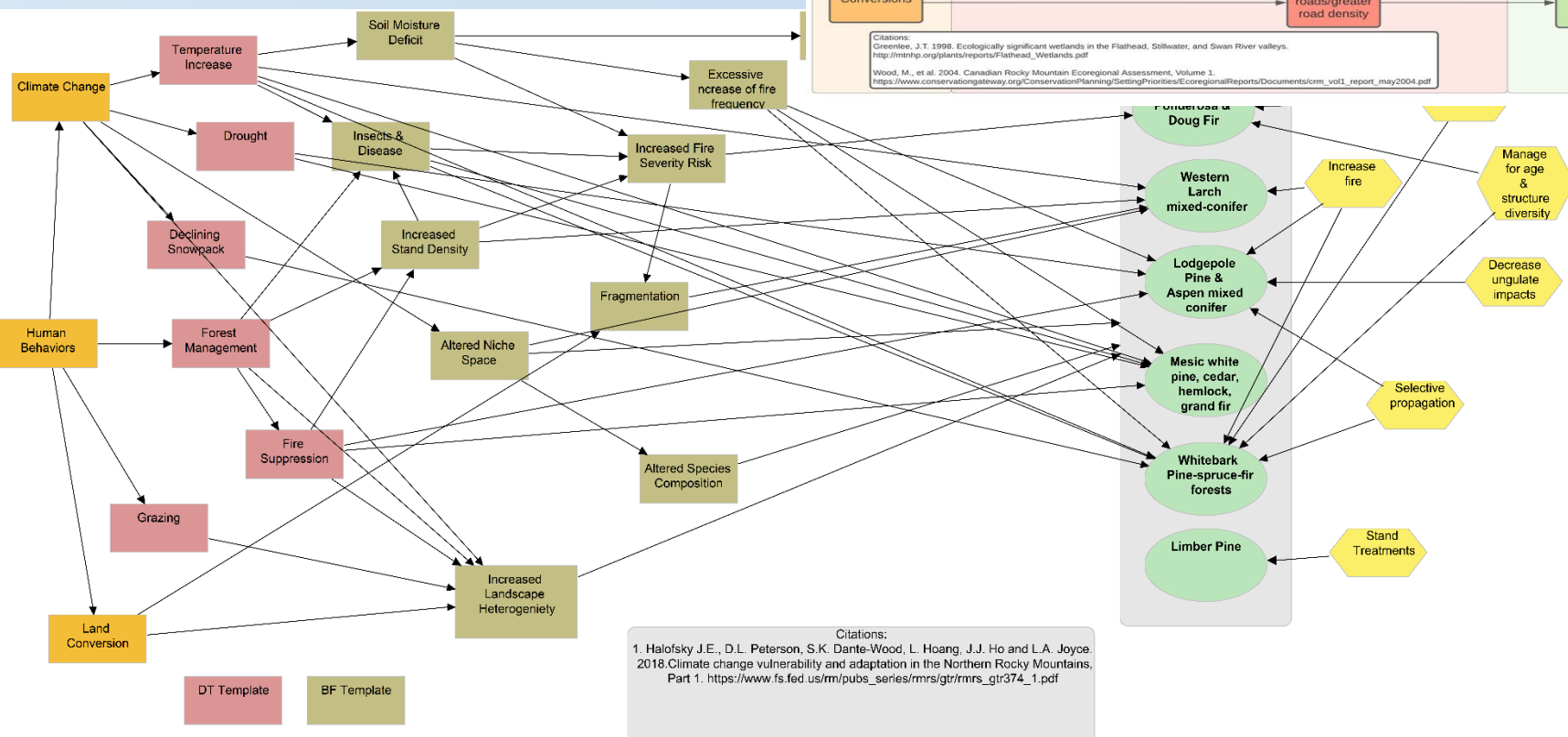
- Build Out Remaining Conceptual Models
- Evaluate Data – Dataset by Dataset
- Convene Subject Matter Experts
 - Additional Data
 - ‘Cost’ or Resistance (i.e., threats) Data
 - Current & Future (i.e., climate change)
 - Target estimations
- **Select Cultural, Social, Economic Features**
- Initiate Strategic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

Conceptual Models

Wetlands



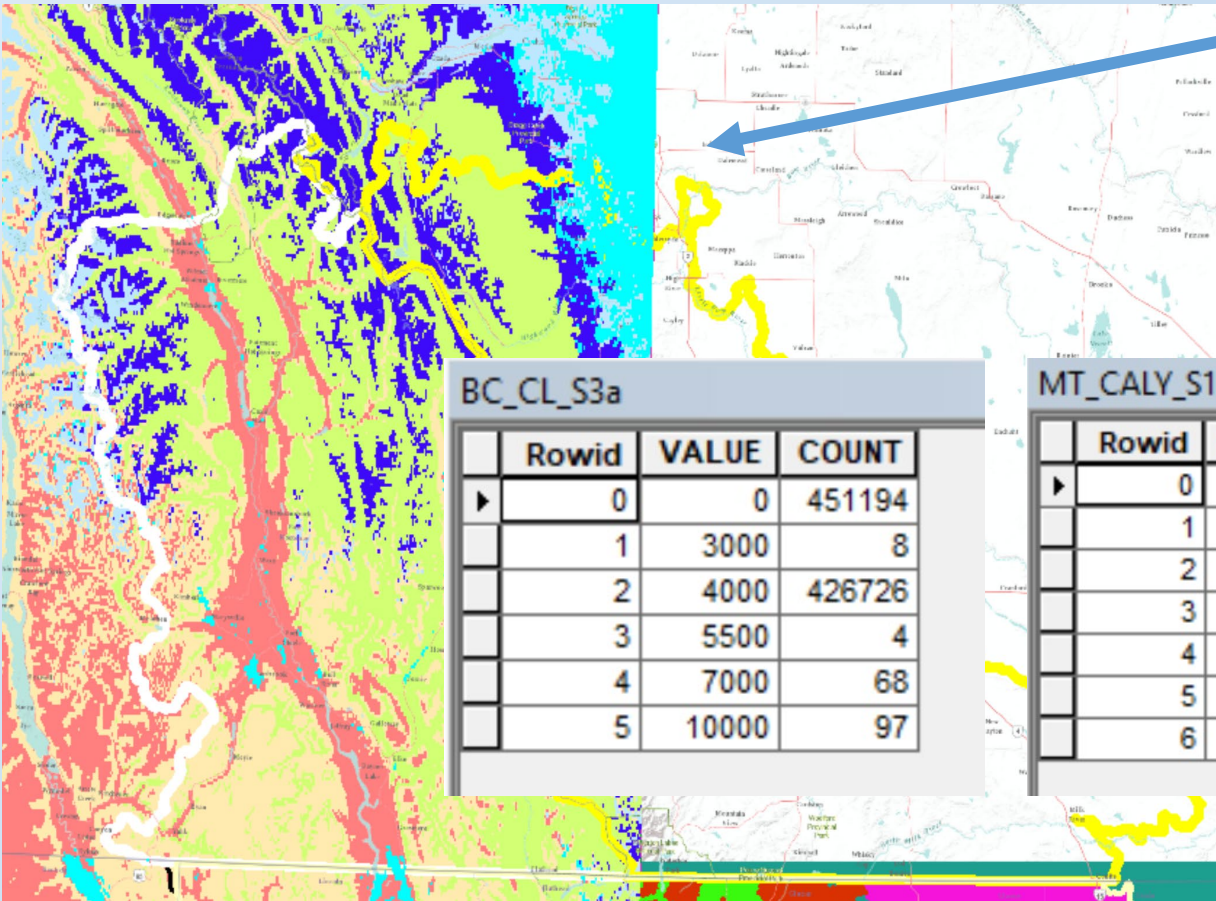
Forest



Source Data Evaluation

Lynx Range Shift Model

Alberta Snow Layer

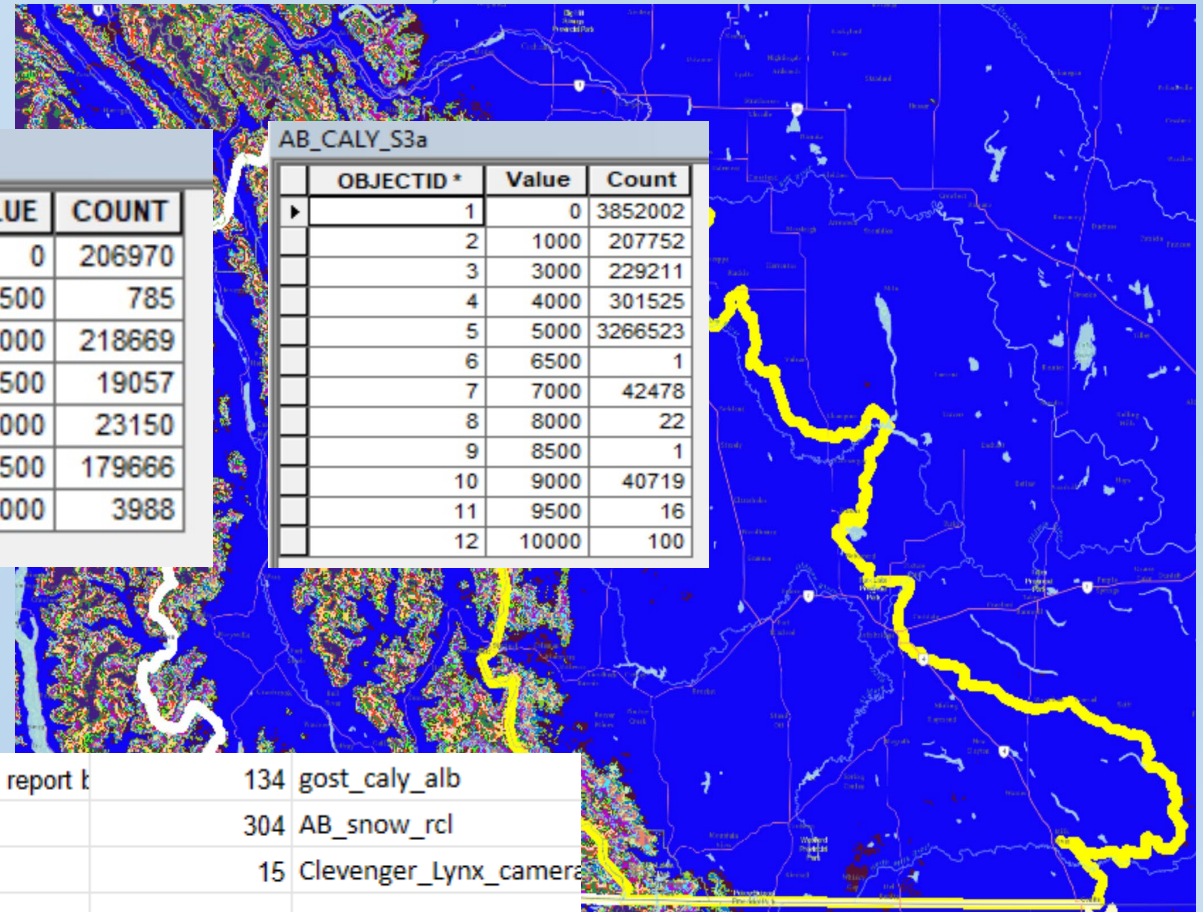


MT_CALY_S1

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2	2000	218669
3	3500	19057
4	5000	23150
5	6500	179666
6	10000	3988

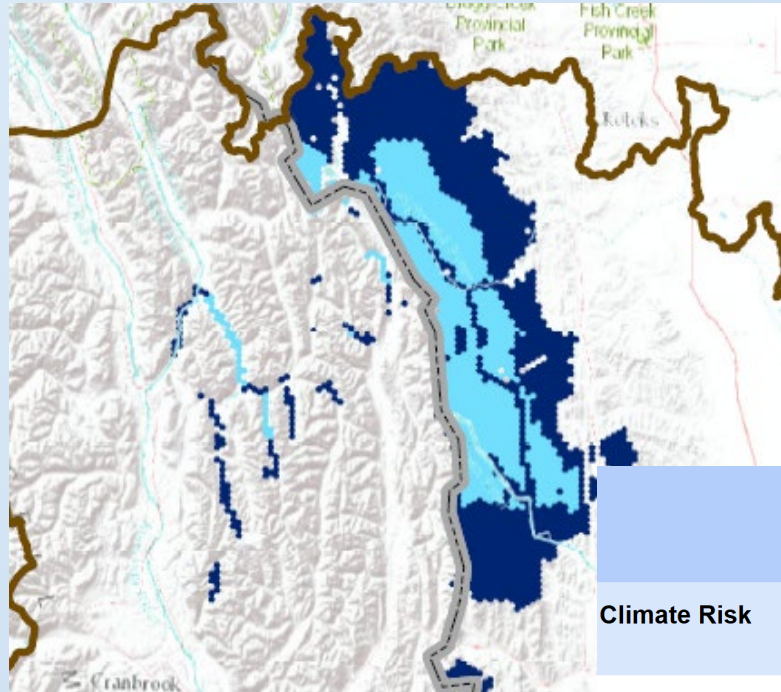
AB_CALY_S3a

OBJECTID *	Value	Count
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3	3000	229211
4	4000	301525
5	5000	3266523
6	6500	1
7	7000	42478
8	8000	22
9	8500	1
10	9000	40719
11	9500	16
12	10000	100



31	Canada Lynx	"Canadian Lynx Range Shift Model Agree From C Gostout report k	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
34					
35					

Subject Matter Teams

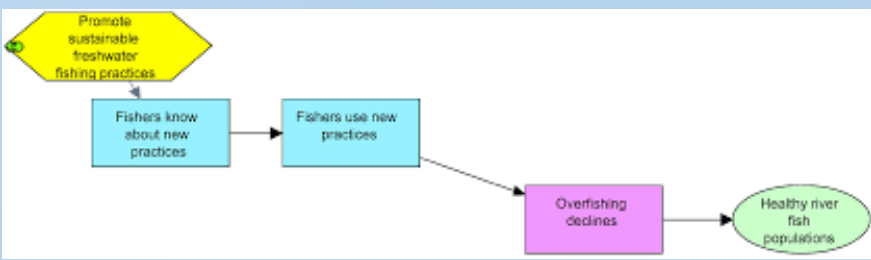


Evaluate Data

Estimate Cost

		West Slope Cutthroat Trout		Desired Conditions		Information Source/Documentation	
KEY ECOLOGICAL ATTRIBUTE	INDICATOR (METRIC)	RELATIVE CONDITION					
		Poor	Fair	Good	Very Good		
Climate Risk	Stream Temperature	Mean Aug. Stream Temp (degC)	20+	15-20	13-15	<13	Conservation playbook 2.0 (cites sources within); EcoSheds (Muhlfeld et al.)
		Max Aug. Stream Temp (degC)	23+	17-22	15-17	<15	
Demographic Risk	Demographic Connectivity	Number of other populations connected (#)	<10	11-43	44-69	>70	EcoSheds (Muhlfeld et al.)
Genetic Risk	Hybridization Threat	Weighted (by fluvial distance) summation of admixture among all interconnected populations (Index)					EcoSheds (Muhlfeld et al.); brook trout and rainbow trout - CM: "leading threat for salmonids"
	Rainbow Trout Admixture	Rainbow trout observed (0 to 100)					

Initiate Strategy Development



Cultural, Social, Economic Features

Our Vision

*Ensuring a resilient, connected landscape that supports healthy ecosystems and
human communities*

Goals:

- To rely upon cutting-edge science, **Indigenous knowledge**, and modeling to collectively increase the resilience of waters, forests, and grasslands
- To sustain healthy ecosystems, **communities, and economies through working lands partnerships**
- To recognize the leadership, **history, culture, and traditional territories** of Indigenous peoples as we plan for the future

Selecting Cultural, Social, Economic Features

Social/Cultural feature: A representation of cultural diversity on the landscape

Economic feature: A representation of economic diversity on the landscape

Focal Landscape Features:

the sum of features (ecological, social, cultural and economic) we select to represent the Crown socio-ecological system for use in modeling and design of desired future conditions. The set of features selected should, in aggregate, provide:

- Representation of the whole system, which is too complex to model
- Comprehensiveness, to the extent possible
- Extent / Range: be widely distributed across the Project Area
- Impact, Importance – relevant to broad sets of stakeholders
- Context (do we know enough?)
- Contentiousness (low)
- Data Available

Selecting Cultural, Social, Economic Features

Social/Cultural feature: A representation of cultural diversity on the landscape

Economic feature: A representation of economic diversity on the landscape

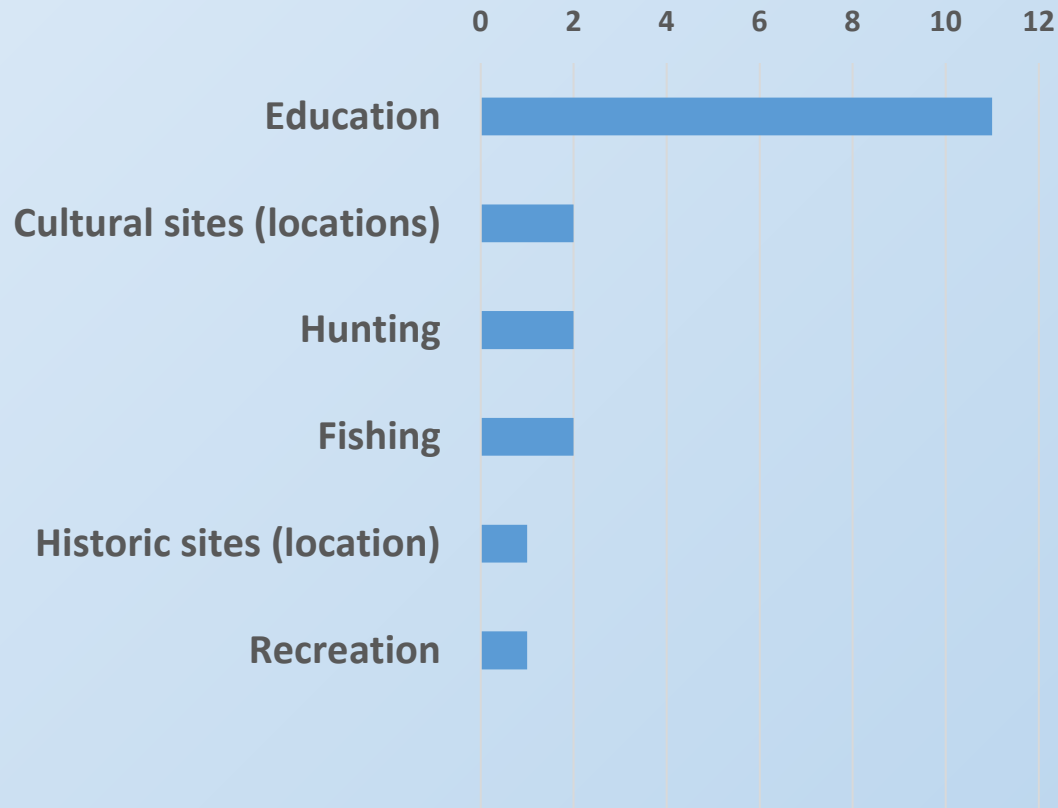
How do we select?

1. Analysis Team reviewed 60 plans and summarized priorities expressed in the plans.
2. Analysis Team summarized spatial information for ecological features identified as priorities by $\geq 10\%$ of reviewed plans and evaluated inter-feature comparisons.
3. Leadership Team reviewed the short list and spatial summary evaluation and deliberated the information.
4. Leadership Team selected a final list of focal ecological features through a vote and final deliberation.

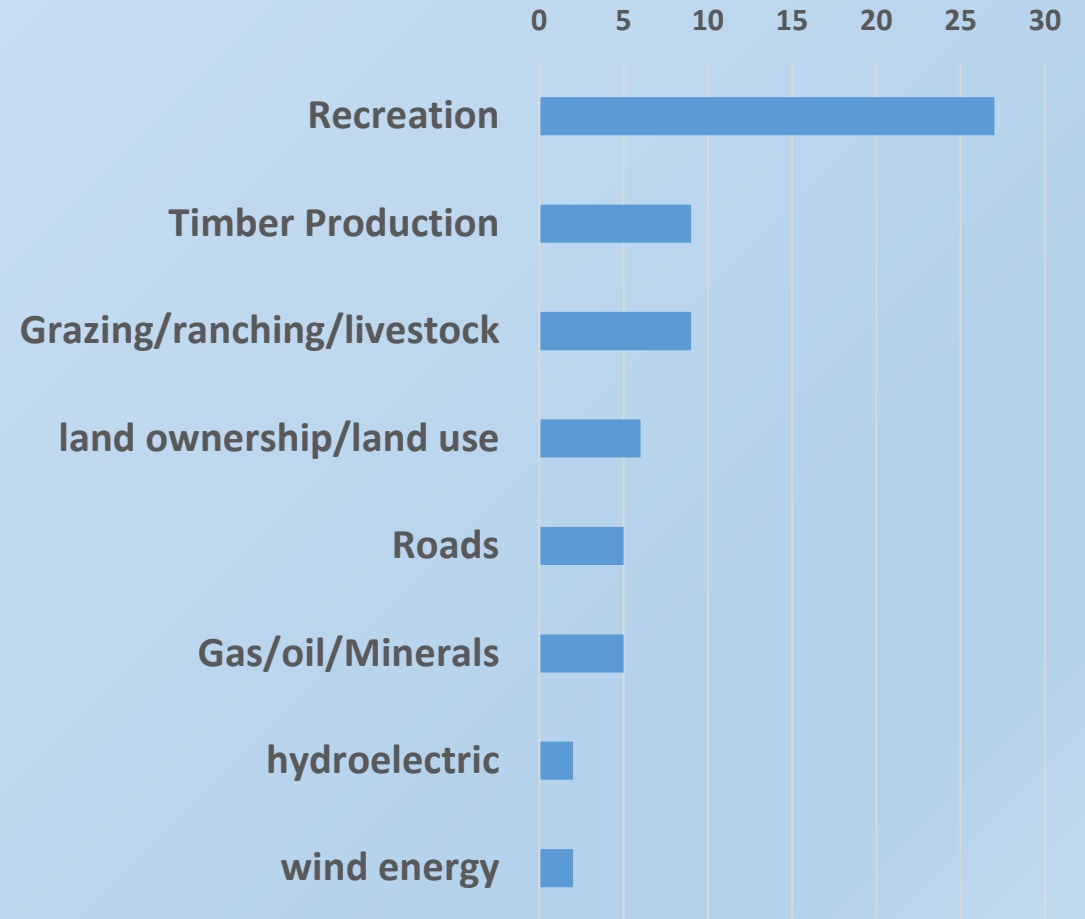
Seeking a Sub-committee to guide us through a selection process

Selecting Cultural, Social, Economic Features

Cultural Features identified in plans

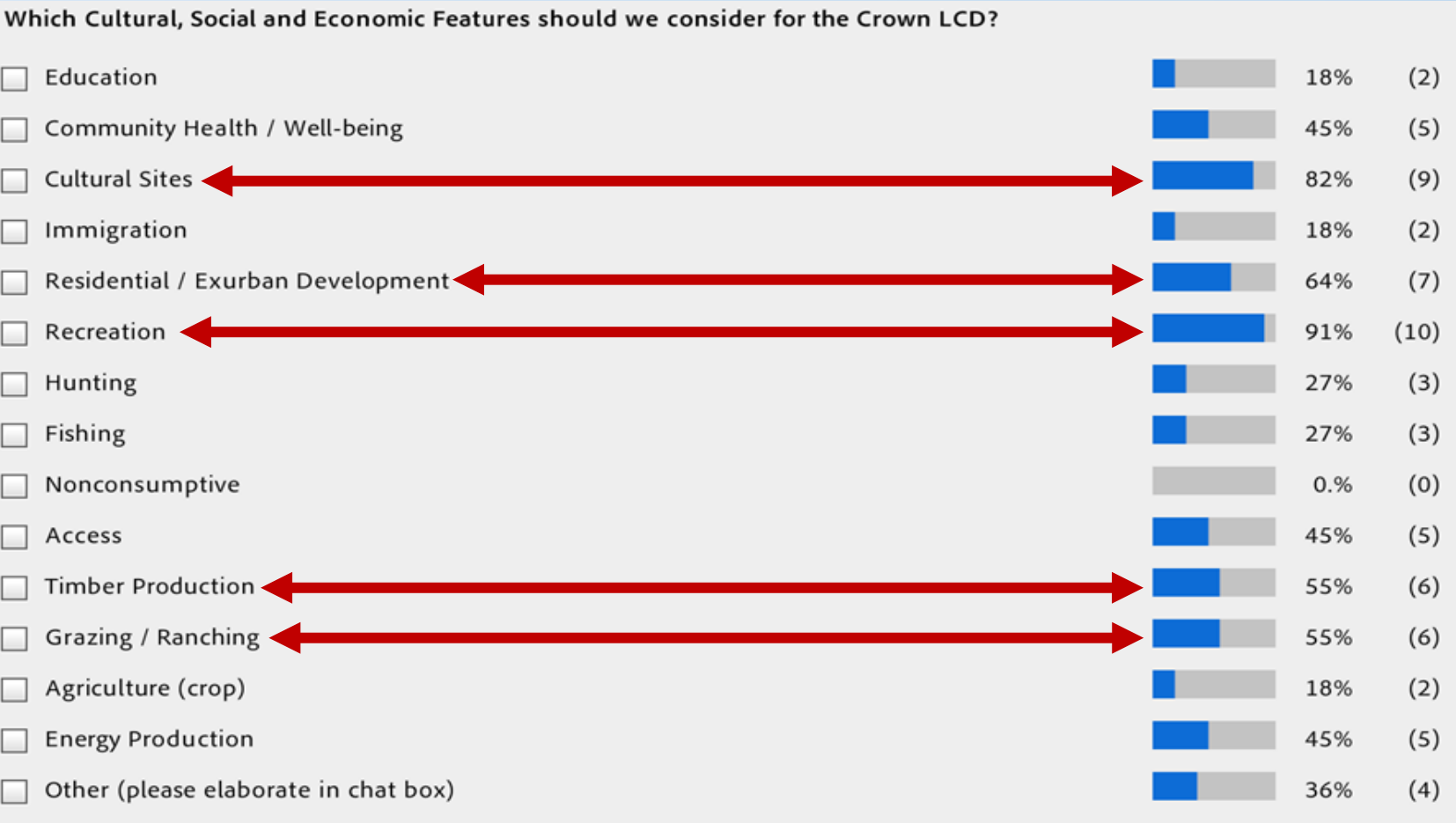


Economic Features identified in plans



Selecting Cultural, Social, Economic Features

Leadership Team Poll: September 2020

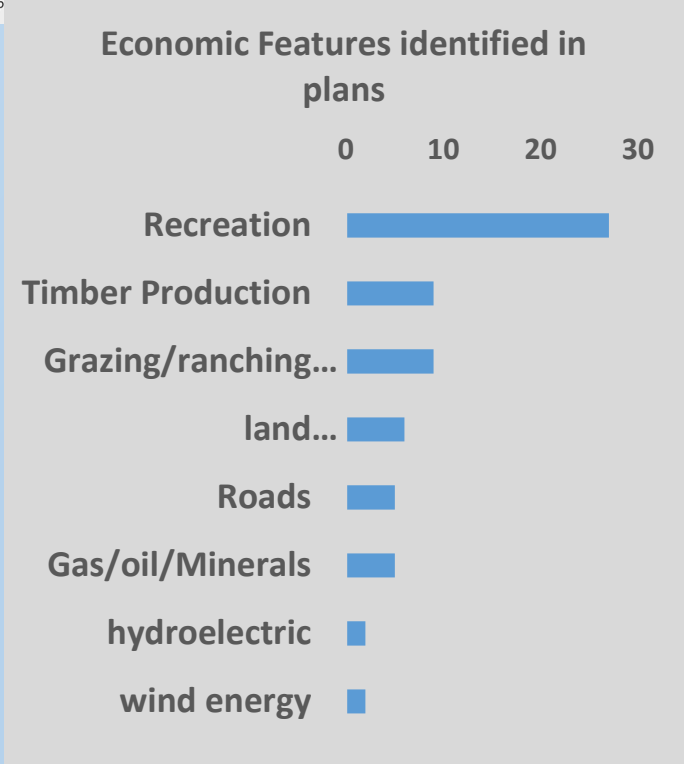
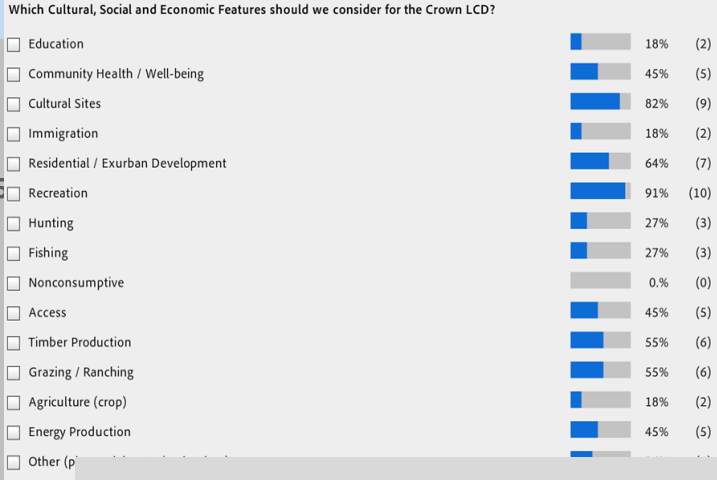
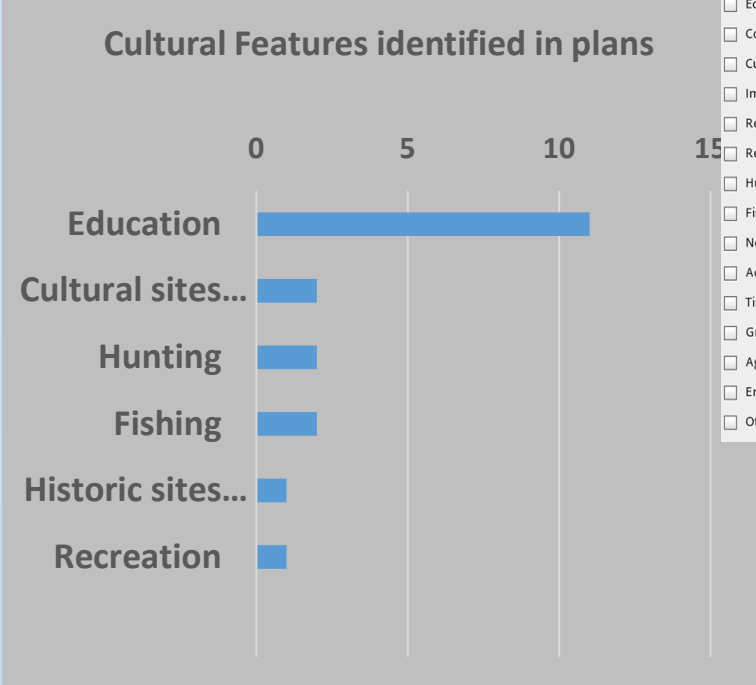


Representative?
Comprehensive?
Widely Distributed?
Importance?
Context?
Contentious?
Data Available?

Selecting Cultural, Social, Economic Features

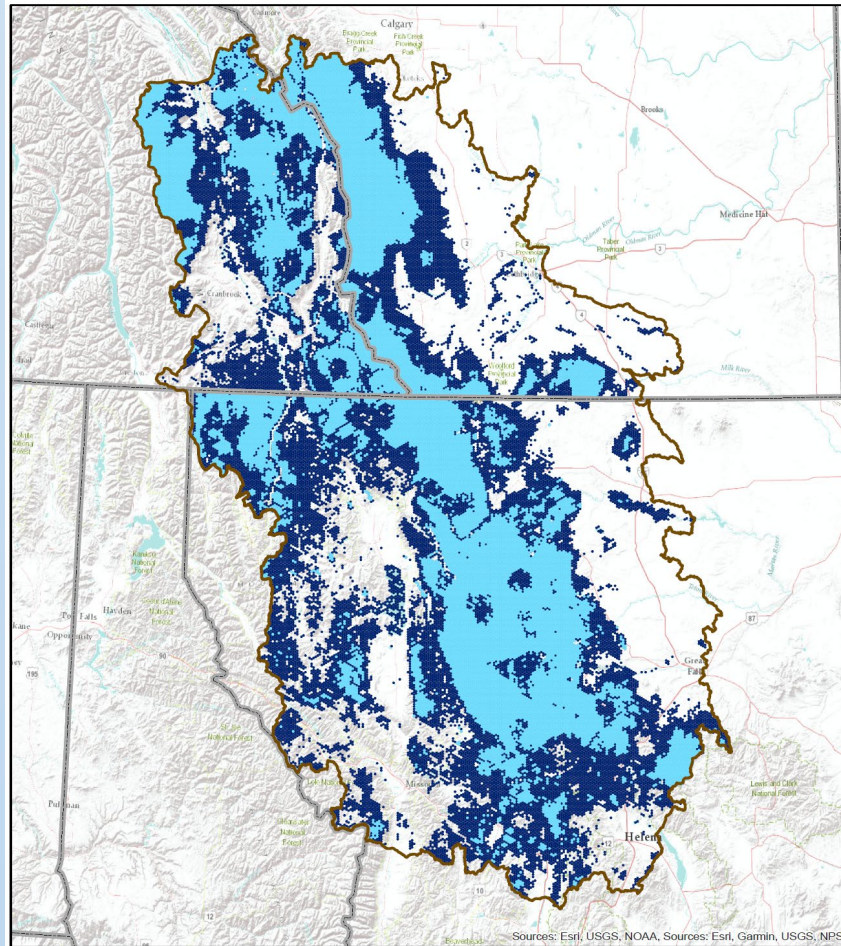
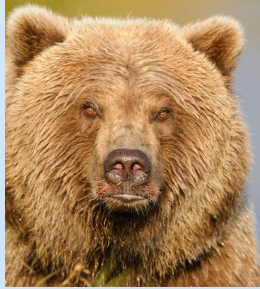
Volunteer Expectations:

- Guidance by Analysis Team staff
- 3 1-hour phone calls May-July
- 1-2 hours of 'homework'
- Select 3-4 Features for Analysis
- Report recommendations at July 27 Leadership Team call



- **Representative?**
- **Comprehensive?**
- **Widely Distributed?**
- **Importance?**
- **Context?**
- **Contentious?**
- **Data Available?**

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 | |

