Heli-skiing and Mountain Goat Habitat Management Model: *A Visual and Audio Analysis*

BC Mountain Goat Workshop
Karina Andrus, M.Sc.
March 1, 2005

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Introduction…

- MWLAP Skeena Region developed region-specific guidelines for helicopter accessed commercial recreation.
- Modified existing Provincial guidelines to 1500 m horizontal separation.
- 750 m horizontal separation if topographical barrier utilized to reduce disturbance to adjacent mountain goats or mountain sheep.
- 2000 m separation for areas subject to frequent and repeated use.

Habitat Management Model…

- The Habitat Management Model (HMM) developed in conjunction with:
  - MWLAP Skeena Region
  - Cascade Environmental Resource Group Ltd.
  - Last Frontier Heliskiing
  - Land and Water BC
- Union of a predictive habitat model results, viewshed analysis and a noise model simulation.
- Analyzes mountain goat “disturbance space” from helicopter access to heli-ski runs.

Purpose…

- To improve mountain goat mitigation strategies for heli-recreation operations.
- 3-D approach to further the understanding of "disturbance space".
- Addresses the ability of topographical land features to be utilized to reduce disturbance to mountain goats.
- Adaptive management for site specific mitigation strategies, design of confirmation studies and monitoring programs for success.

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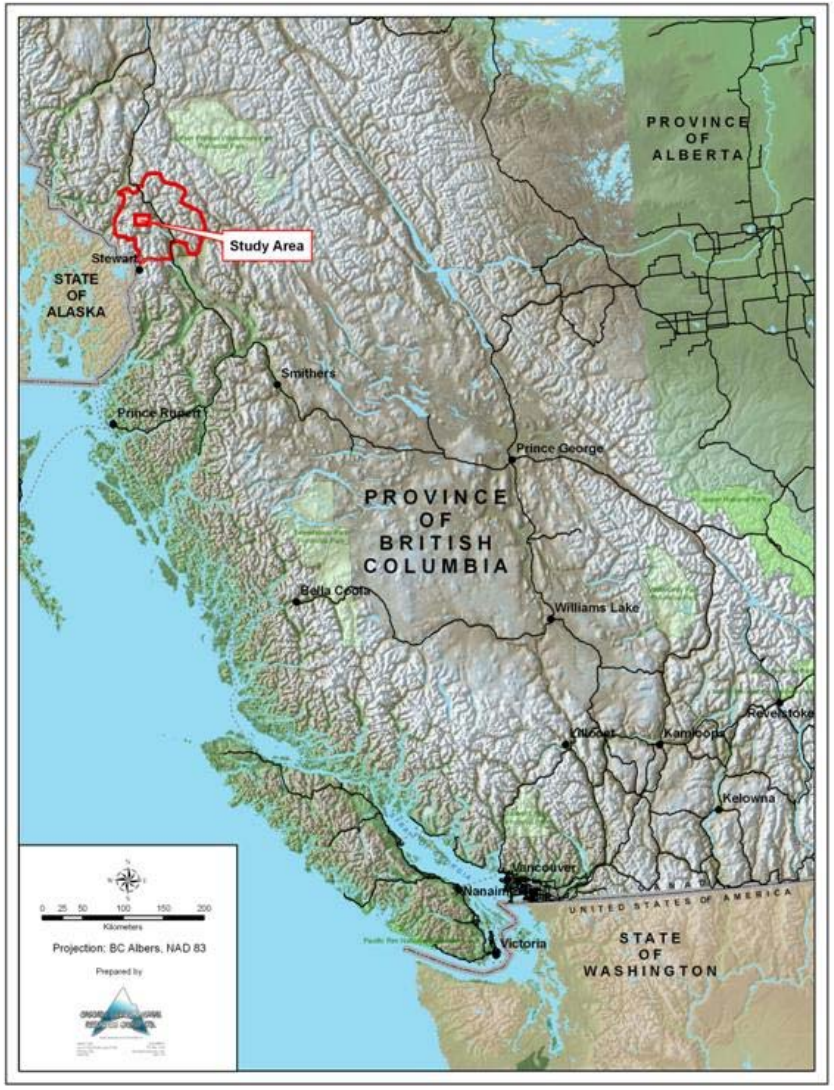
Study Area...

- Approximately 2064 ha in size, 0.2% of Last Frontier Heliskiing existing operating area.
- Southwest of base facilities at Bell II Lodge.
- Located approximately 260 km north of Smithers in the Skeena Region.



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Development of the HMM…

- Keim's predictive habitat modeling results:
  - Confirmed GWR polygons.
  - Unconfirmed GWR polygons.
- Cascade Environmental Resource Group's (CERG) viewshed analysis methodology.
- Wyle Laboratories noise model simulation (NMSim).

Keim's Predictive Habitat Modeling…

- Developed to identify core winter habitat for mountain goats.
- Created confirmed and unconfirmed GWR polygons for the study area.
- Existing management strategies in the Skeena Region are based on these polygons and a proximity analysis to existing ski runs.

Photos taken by Jonah Keim as part of ***Confirming Winter Mountain Goat Habitats from a Habitat Suitability Model*** *In The Bell II Study Area*

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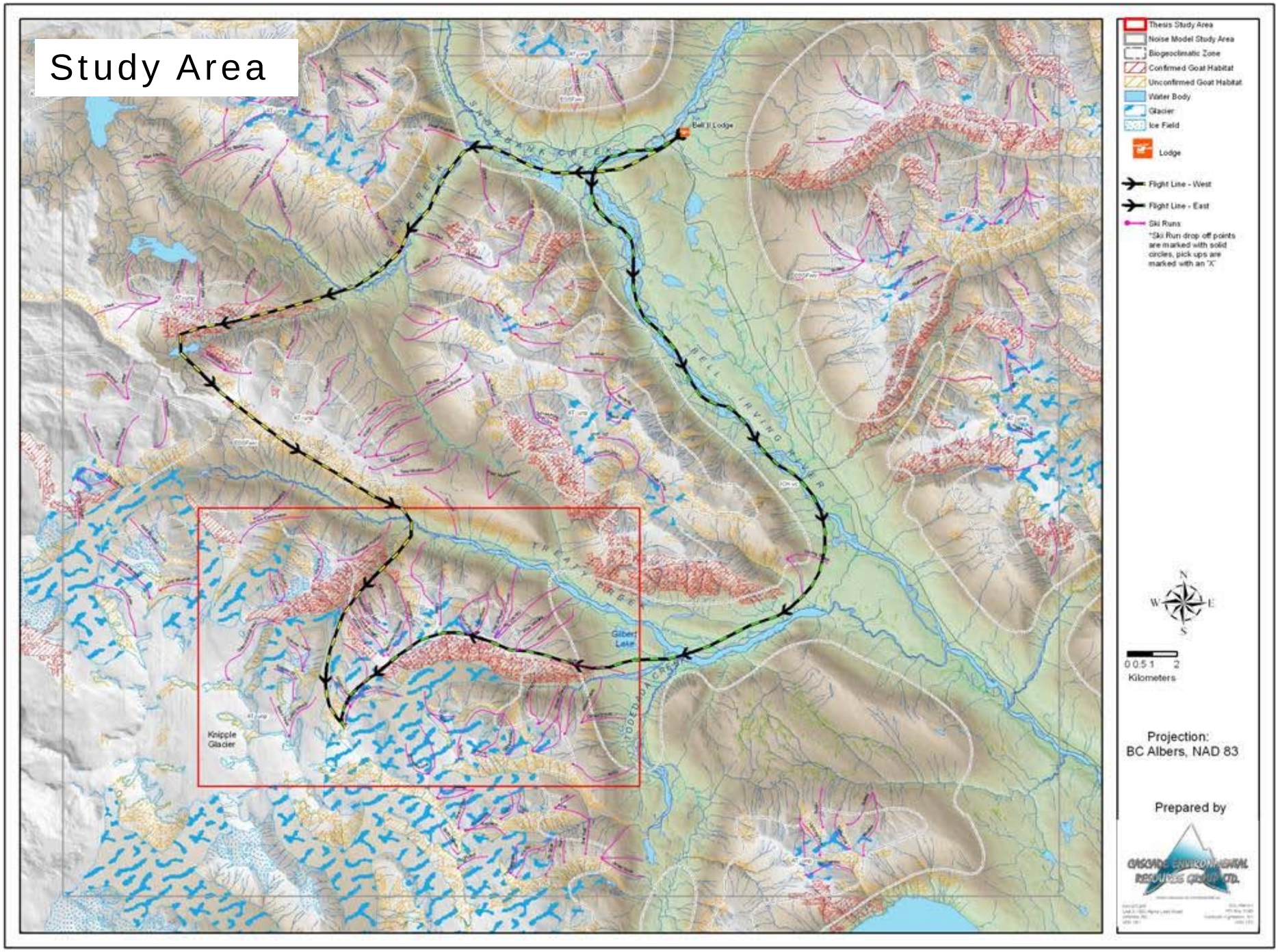
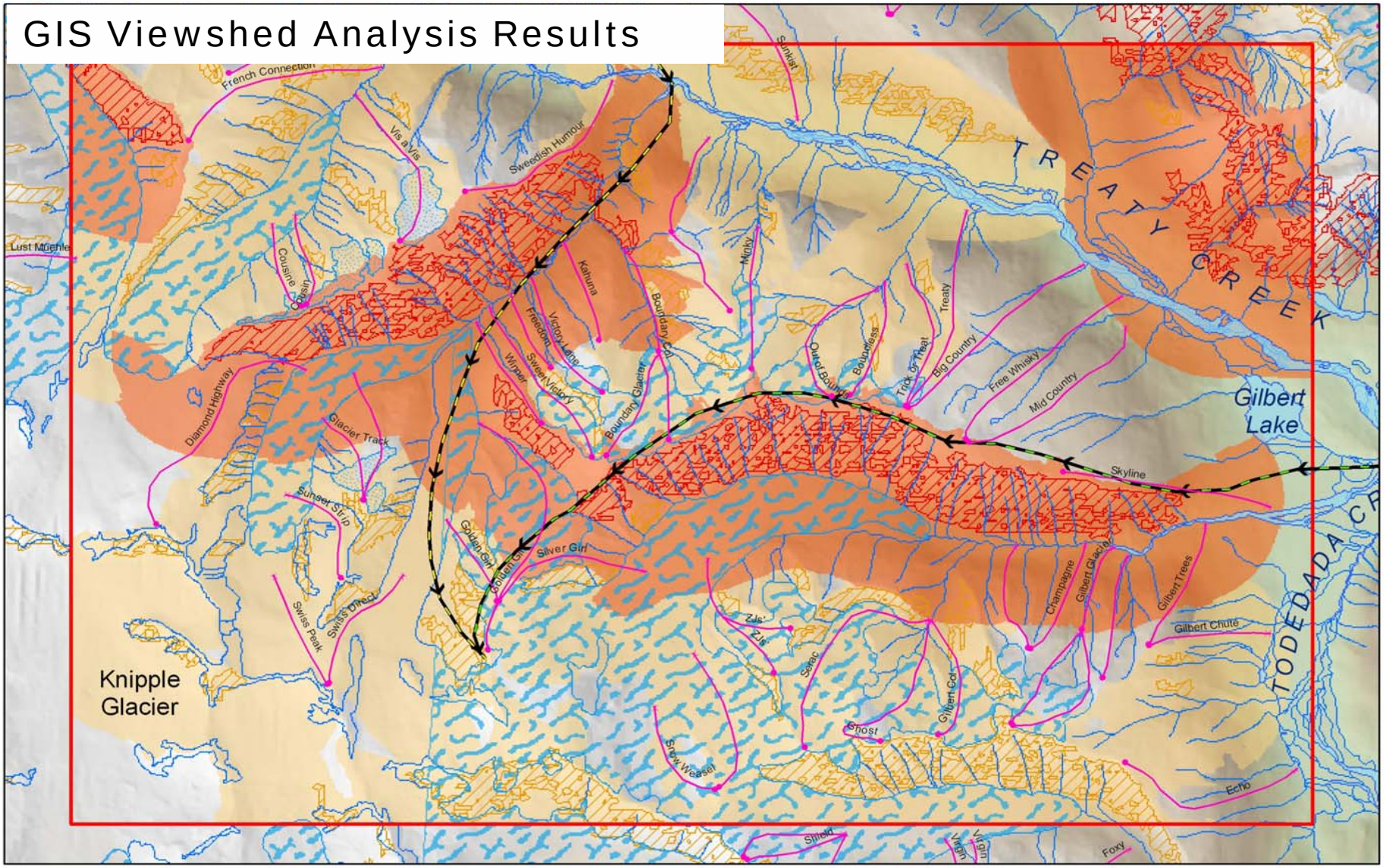
CERG Viewshed Analysis…

- Developed to modify flight paths to mitigate impacts to mountain goats within the Provincial Guideline 2000 m buffer.
- Utilized semi-random population (1 goat per ha) of mountain goats within GWR polygons.
- A Triangular Irregular Network (TIN) with 1:20000 contours was prepared and the point file (mountain goats) was overlaid for visual disturbance analysis within 500m, 1000m, 1500m and 2000m.
- Limitations:
  - Does not address noise from helicopters.

Study Area


Thesis Study Area
Noise Model Study Area
Biogeoclimatic Zone
Confirmed Goat Habitat
Unconfirmed Goat Habitat
Water Body
Glacier
Ice Field
Lodge
Flight Line - West
Flight Line - East
Ski Runs
*Ski Run drop off points are marked with solid circles, pick ups are marked with an "X"
Bell 2 Lodge
SNOWBANK CREEK
BELL IRVING RIVER
TREATY CREEK
TODEDNJA CREEK
Gilbert Lake
Knipple Glacier
N
W
E
S
0 0.5 1 2
Kilometers
Projection:
BC Albers, NAD 83
Prepared by

GIS Viewshed Analysis Results



Thesis Study Area
Flight Line - West
Flight Line - East
Ski Runs
*Ski Run drop off points are marked with solid circles, pick ups are marked with an "X"

Confirmed Goat Habitat
Unconfirmed Goat Habitat
Visible from Confirmed Habitat
Visible from Unconfirmed Habitat

Water Body
Glacier
Ice Field

N
W
E
S

0 0.5 1 2 3 4
Kilometers

Projection: BC Albers, NAD 83

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Noise Model Simulation …

- Developed for helicopter sightseeing activities over National Parks in the United States, particularly the Grand Canyon.
- User defined data input:
  - flight path trajectory, helicopter speed, helicopter power, helicopter above ground level (AGL), humidity, temperature and impedance or ground cover.
- Time history for source (helicopter overflight) and calculates the noise levels associated with the chosen aircraft (A-Star 350).
- HMM utilized the flat Sound Exposure Level (SEL) to analyze noise exposure to mountain goats from helicopter overflights.
- Limitations:
  - Single power setting (noise difference between forward flying, descending or takeoff can not be analyzed).
  - User defined data input variable within CR operations…but a risk based approach can be used.

Noise Model Simulation...

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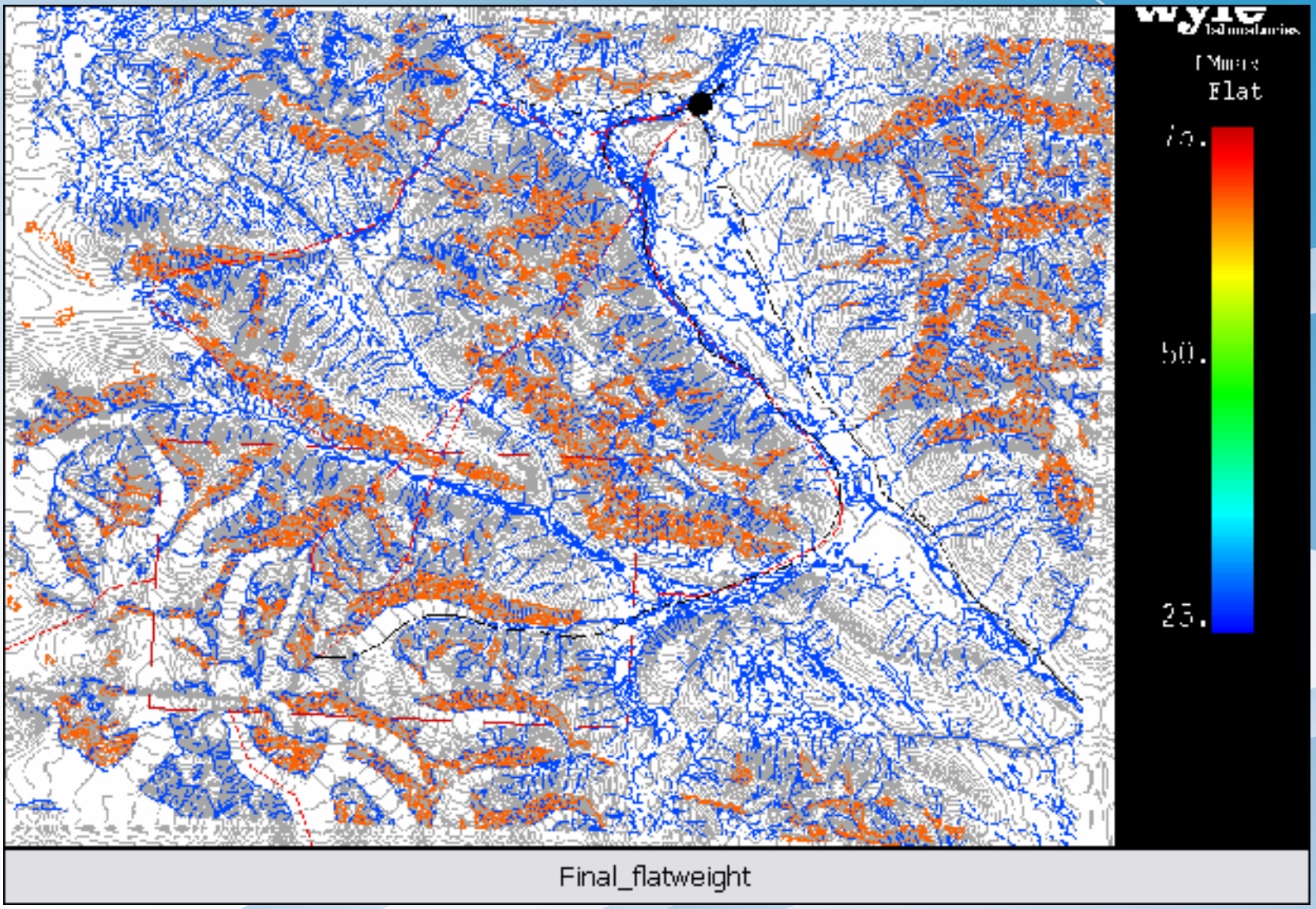

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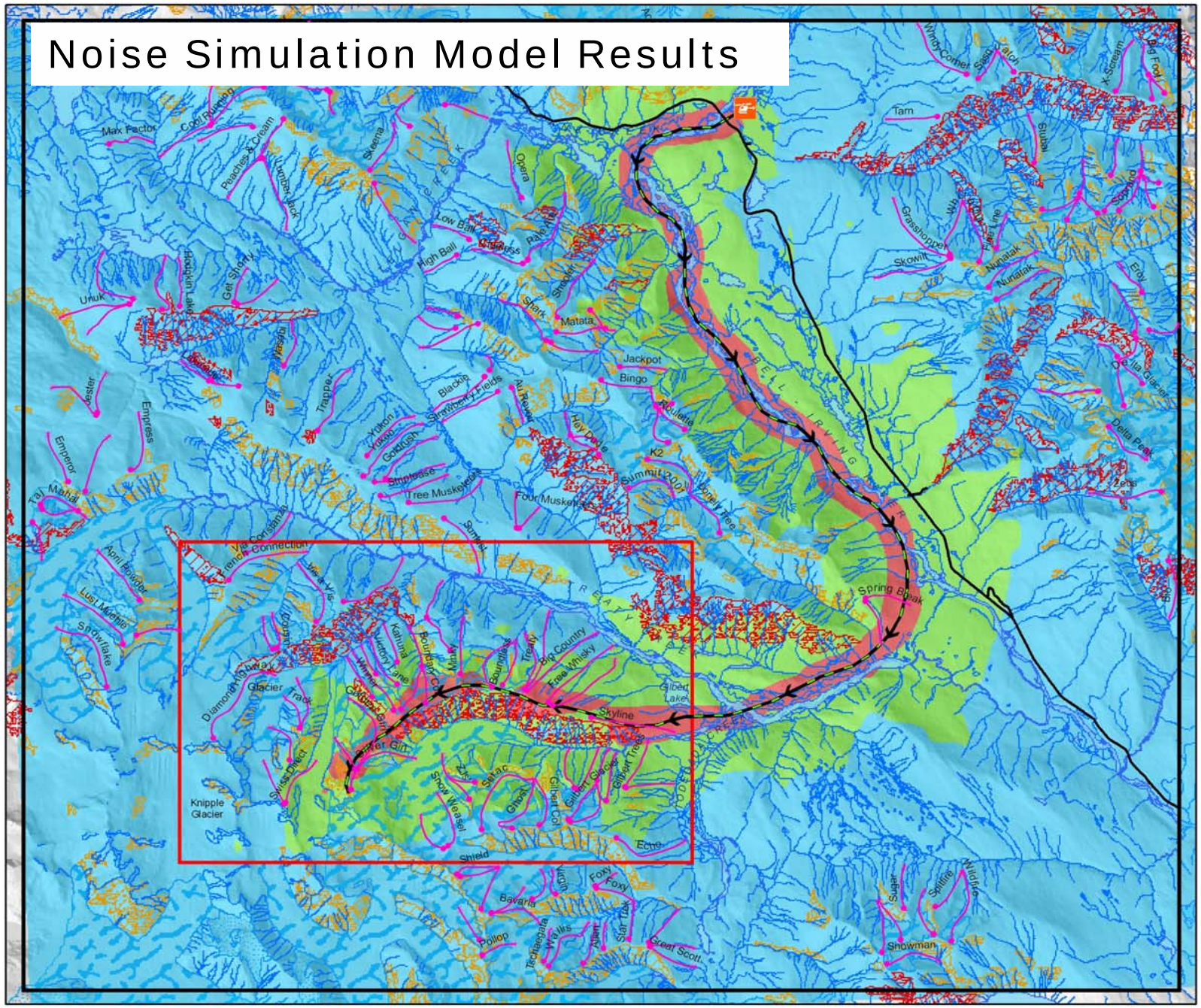
Noise Simulation Model Results



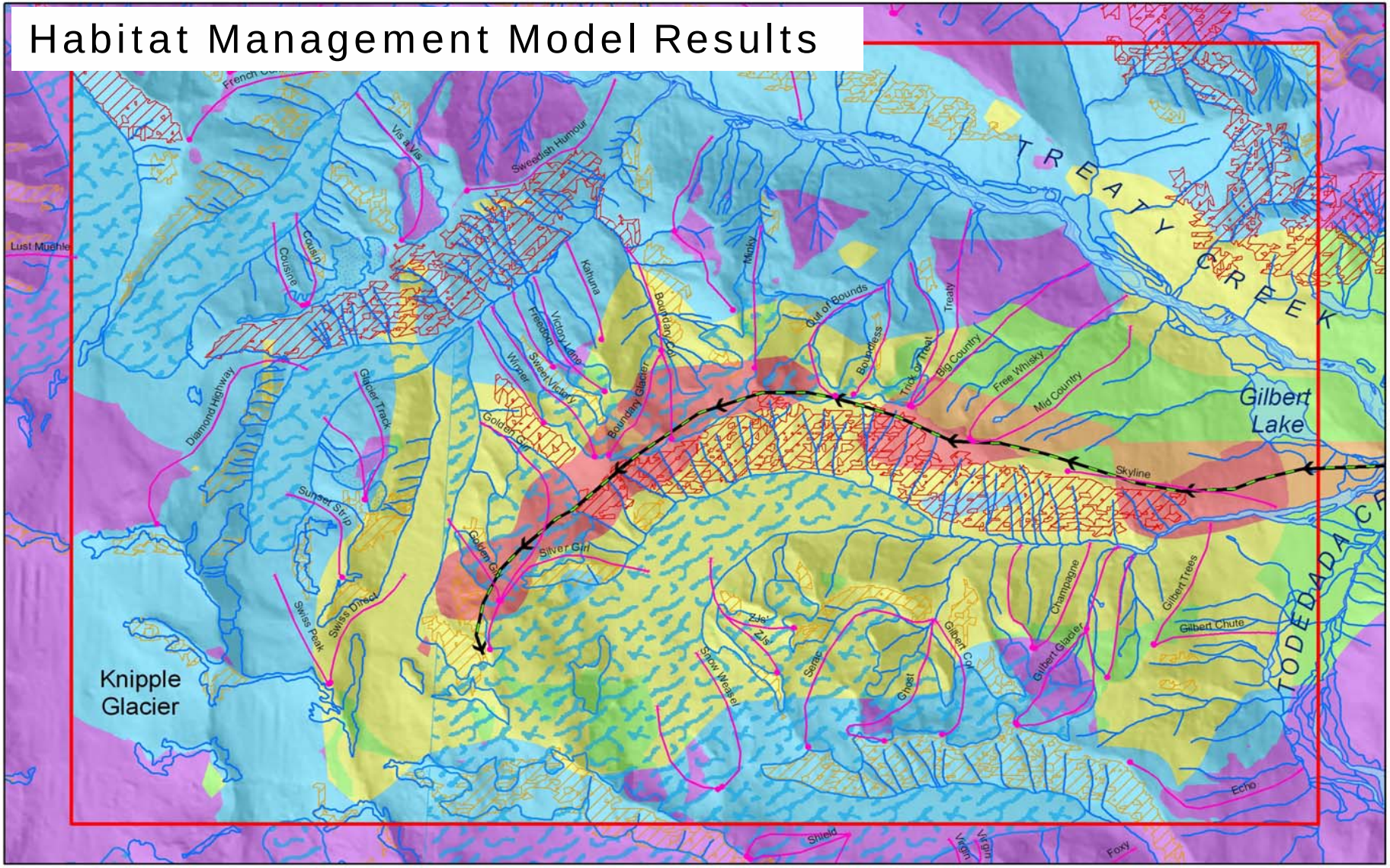
Union of Viewshed and NMSim…

Viewshed Ranking	Description
1	visible to potential mountain goats within confirmed mountain goat polygon
2	visible to potential mountain goats within unconfirmed mountain goat polygon
0	not visible to potential mountain goats
Audio Ranking	**Description**
1	>70 dBA
2	55-70 dBA
3	<55 dBA

Union of Viewshed and NMSim Con't…

Final HMM Ranking	Viewshed Ranking	Audio Ranking
1	1	1
1	2	1
2	0	1
3	1	2
3	2	2
4	0	2
5	1	3
5	2	3
6	0	3

Habitat Management Model Results



Thesis Study Area
Lodge
Flight Line - East
Ski Runs
Water Body
Glacier
Ice Field
Confirmed Goat Habitat
Unconfirmed Goat Habitat

Final Analysis Results Class
1 4
2 5
3 6

Final Analysis results are draped over a Triangular Irregular Network derived from 20m contour intervals. This TIN creates the 3D shading

N W E S

0 0.5 1 2 3 4
Kilometers

Projection: BC Albers, NAD 83

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Conclusion…

- West Flight Path (HMM 1 and 2):
  - No change in HMM 1 and HMM 2 from 1500 m to 2000 m.
  - No change in HMM 2 and 0.25% area increase in HMM 1 from 1000m to 1500m

- East Flight Path (HMM 1 and 2):
  - Minimal change (0.37% in area) for 1500m to 2000m
  - HMM 1 increase and HMM 2 decrease of 0.51% from 1000 to 1500m.

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Recommendations…

- Further refinement of the model:
  - Keim's predictive habitat model.
  - Probability analysis for viewshed semi-random population high habitat value areas.
  - Site specific flight trajectories, speed variation, heights, impedance, temperature, humidity etc.
- Undertake field analysis to refine disturbance level criteria and results.
- Use as a tool to further adapt and refine existing policies.
- Adaptive mitigation strategies for existing and new commercial operations.
- Training tool for heli-ski pilots and guides.

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Questions???

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