



Avalanche Risk Management in Glacier National Park





Introduction

- Describe the avalanche problem
- Introduce you to the avalanche program
- Describe some of the challenges we face





Why do we have an avalanche problem?

- Terrain
- Climate
- Exposure

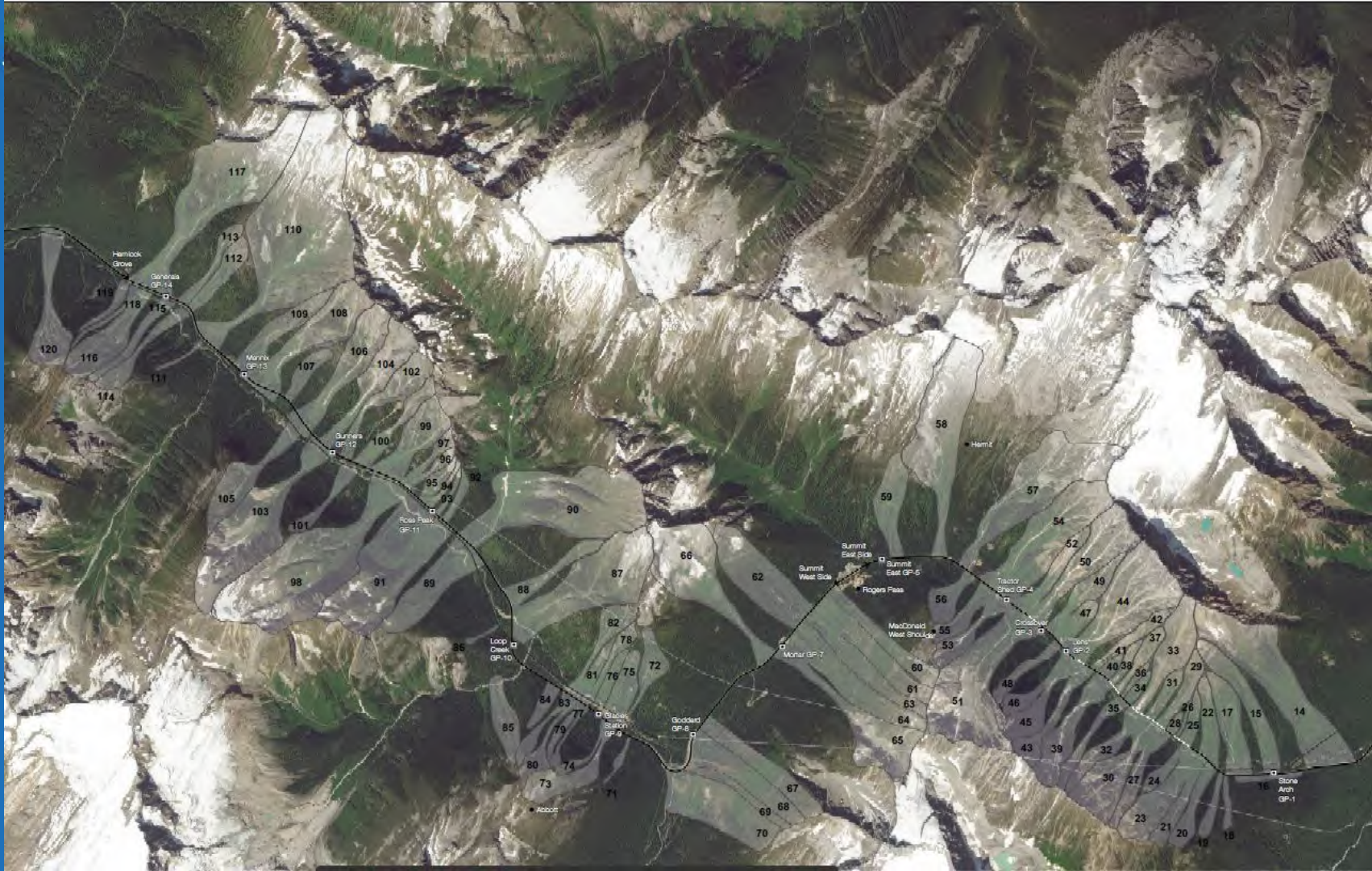




Terrain

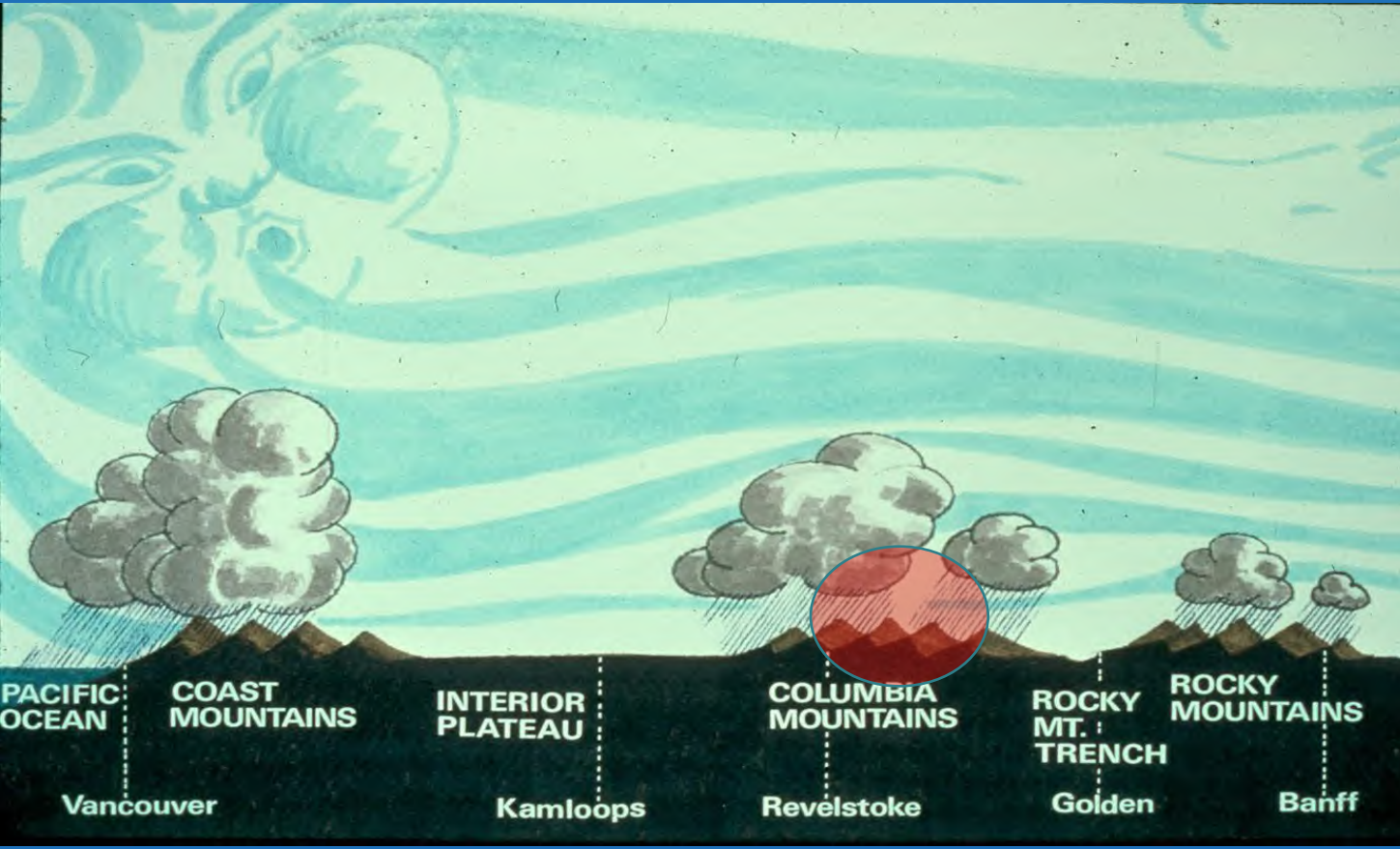
- Part of the Columbia mountain range
 - Steep V-shaped valleys
 - Vertical relief up to 1800m
 - Multiple start zones
 - Sections affected by overlapping paths
 - 134 paths over 41km road







Climate



- Mild, humid air
+ cooler temperatures
+ orographic lift
= high precipitation
- Snows ~140 days a year
- Average 14 m snowfall per winter at Mt Fidelity



Exposure

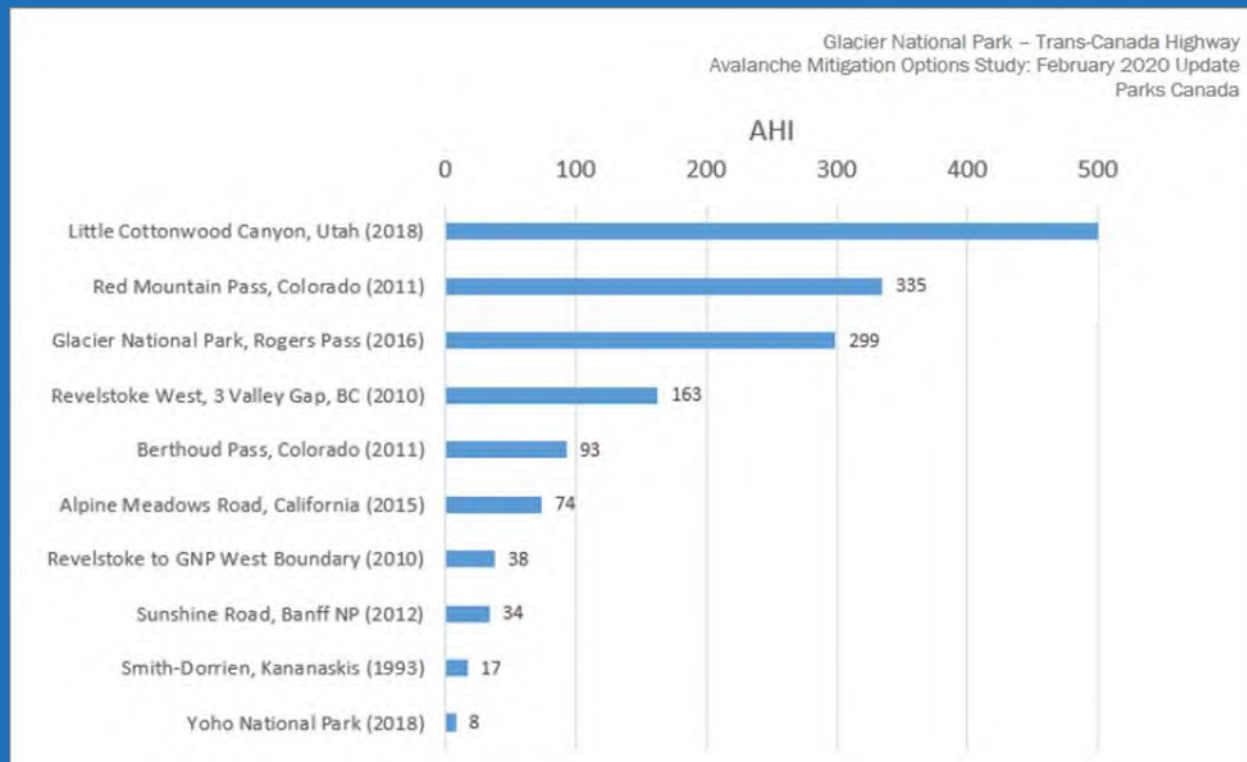
- Moderate to high traffic volumes
 - Over 3000 vehicles and 24-32 trains daily in the winter
 - increasing annually
- High percentage of transports
 - Take more space in traffic storage areas
- High collision areas
 - Often in areas exposed to avalanche danger





Avalanche Hazard Index

- AHI expresses the hazard that avalanches present to traffic.
- 3rd highest AHI in North America
- Canada's primary transportation corridor
- Increasing traffic = increasing AHI





Rogers Pass Avalanche Control Program Goals



Staff Safety



Transportation
Corridor Safety



Visitor Safety



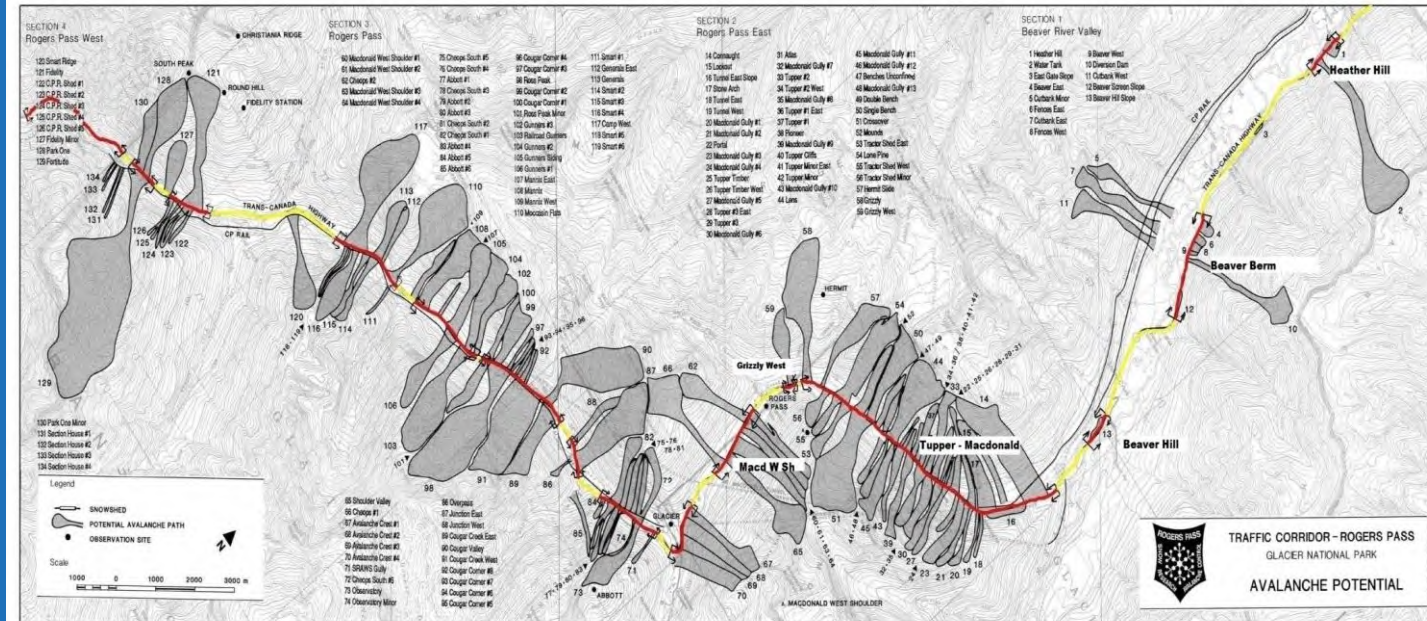
Reduce Impacts
to the Economy



How do we manage the avalanche problem?

Road Closures and Avalanche Zoning – manage exposure

- <2% closure rate over avalanche season





How do we manage the avalanche problem?

Static Defenses

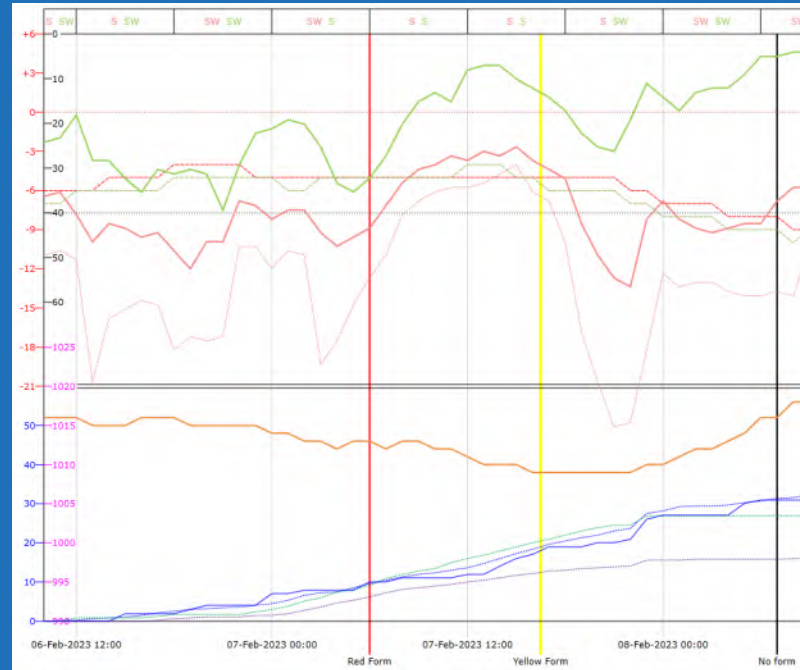




How do we manage the avalanche problem?

Avalanche Forecasting - To decide on timing and extent of control

- Weather actuals and forecasts
 - 8 remote weather stations
 - 2 manual weather plots
 - All data into database

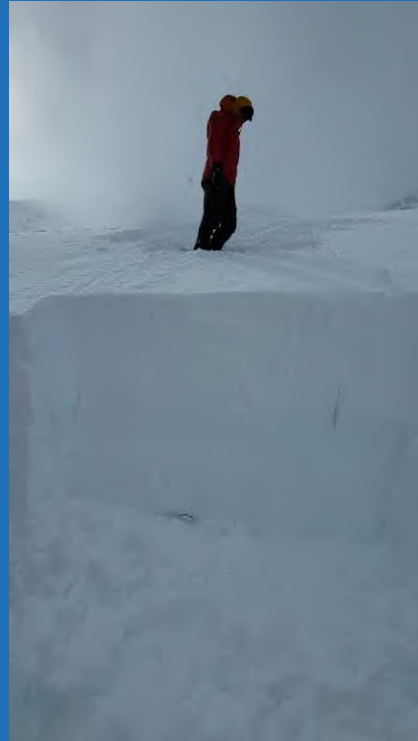




How do we manage the avalanche problem?

Avalanche Forecasting - To decide on timing and extent of control

- Snowpack observation and tests



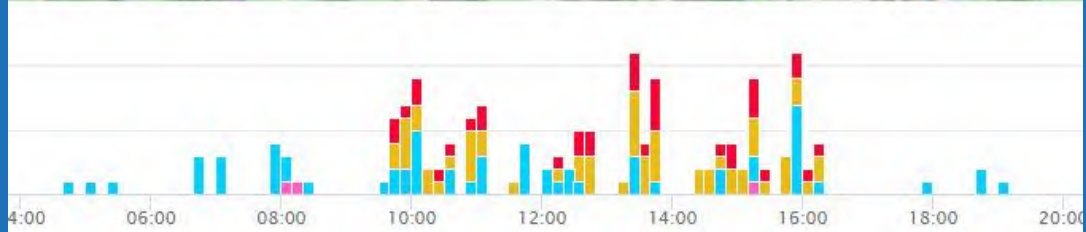
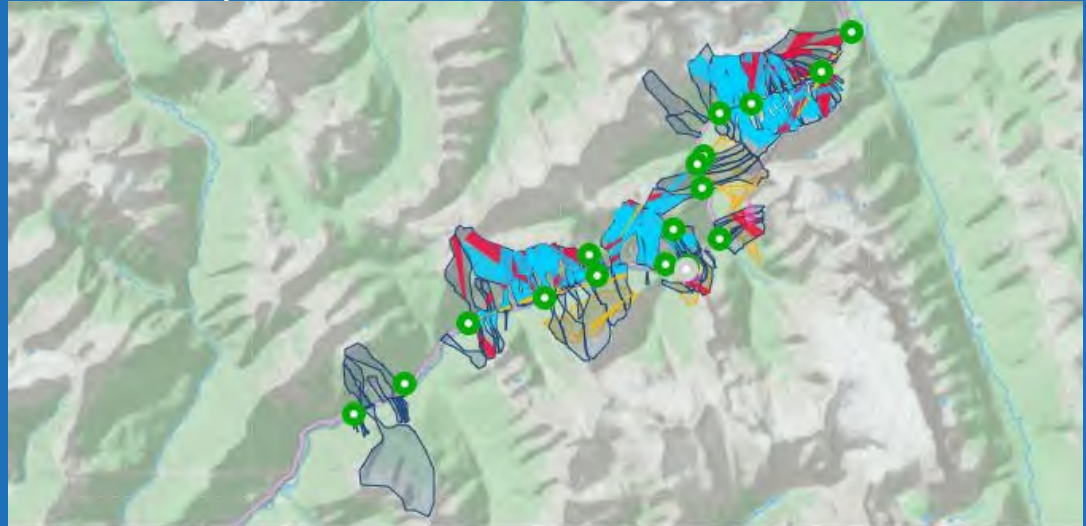


How do we manage the avalanche problem?

Avalanche Forecasting - To decide on timing and extent of control

Avalanche observations

- Avalanche patrols
- Avalanche Detection Network
 - Real time data- notifications
 - Confirmation during avalanche control
- Improved worker safety

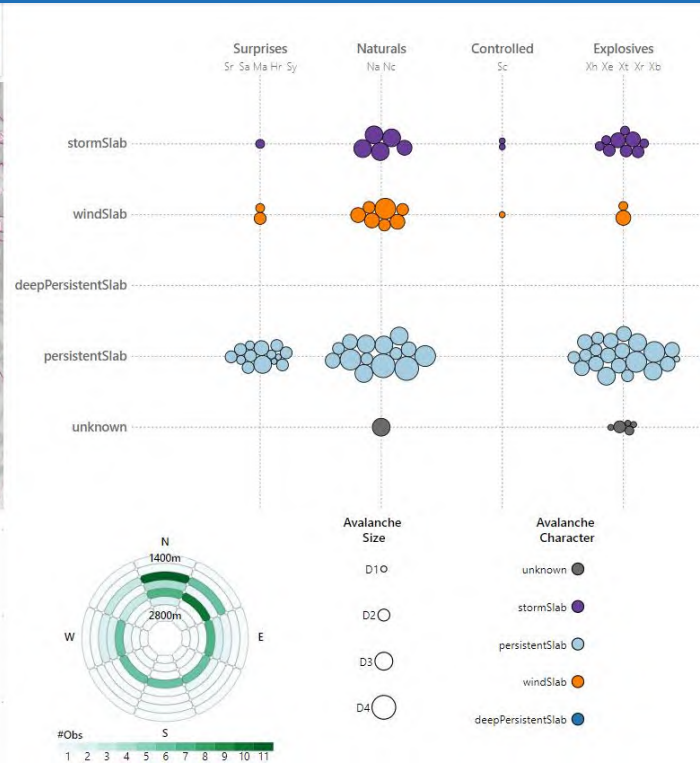
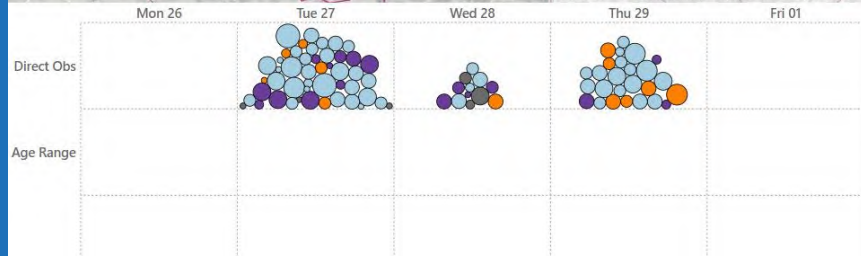
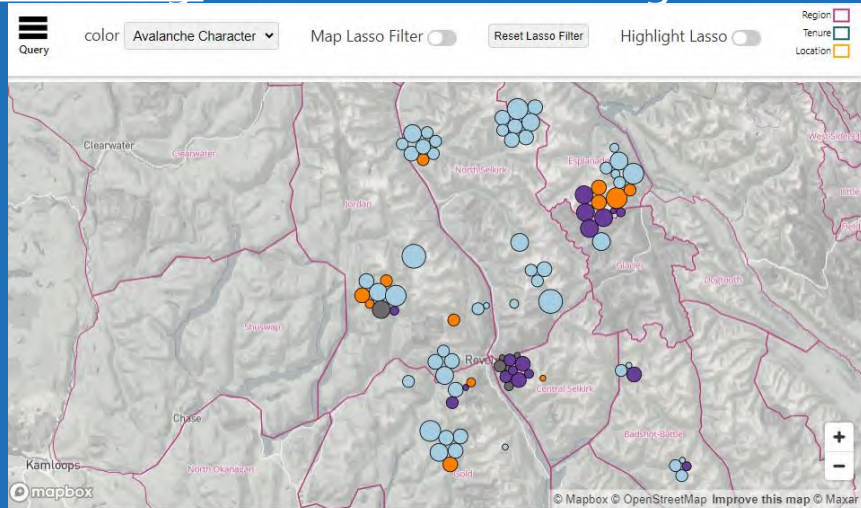




How do we manage the avalanche problem?

Avalanche Forecasting - To decide on timing and extent of control

• Regional information

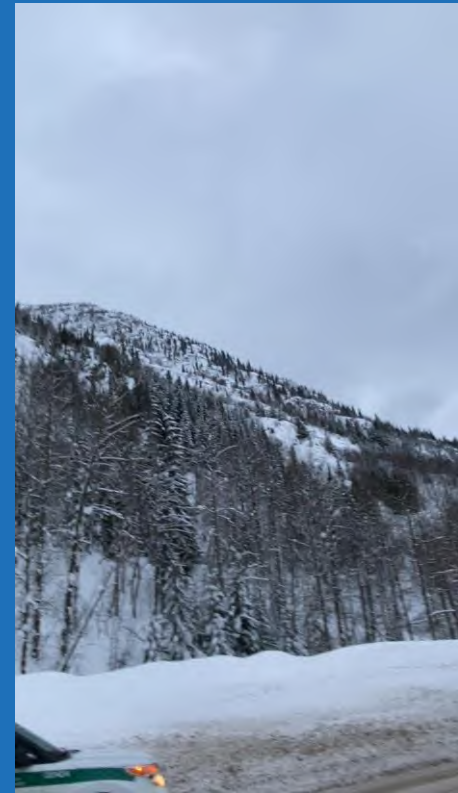




How do we manage the avalanche problem?

Explosive delivery- Artillery

- >80% with 105mm howitzer
- Effective, efficient and reliable
- Capable in all weather conditions





How do we manage the avalanche problem?

Explosive delivery

- RACS
- Helicopter control
- Daisy bell





Avalanche risk mitigation for workers

How do we protect ourselves?

- Training- ASP and Winter Orientation
- PPE- transceivers etc
- Operational Procedures

Avalanche Notices Issued by Glacier National Park:

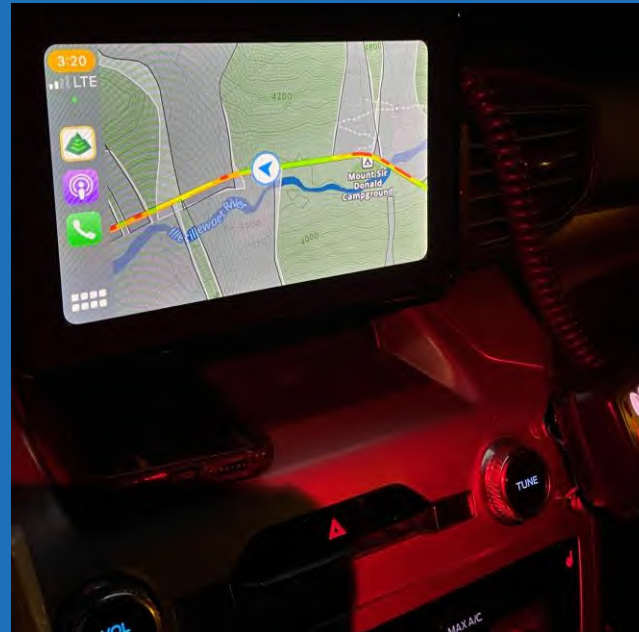
No Form in Effect	Routine Operations, Road is Open with normal winter protocols
Yellow Form	This is an Alert Notice and indicates an elevated avalanche danger
Orange Form	This is a Hazard Notice and represents a higher avalanche danger than a 'Yellow Form' in fact is the highest level on an open road.
Red Form	This notice designates that Avalanche Control is taking place or about to begin soon.



Avalanche risk mitigation for workers

How do we protect ourselves?

- Updated mapping





Challenges

- Increasing traffic volumes
 - Higher exposure
 - Increased traffic= increased AHI
 - Unable to hold traffic safely locally
 - Increased road closure times= increased economic impact





Challenges

- Increasing traffic volumes
 - Historically used short local closures





Challenges

- Increasing traffic volumes
 - Moved to “corridor approach”
 - Work closely with neighbours and partners
 - Single longer closure Revelstoke to Golden
 - Safer, but bigger economic impact

Highway closure in B.C. between Revelstoke and Golden for avalanche control



By Doyle Potenteau • Global News

Posted January 27, 2023 12:42 pm • 1 min read





Recent Investments

Goals:

- Reduce risk to traffic
- Improve efficiency
- Minimize operational costs





Recent Investments

Cougar Corner 6, 7, 8 Snownets

- Problematic paths
- Largest snow net project in western hemisphere
- Added catchment at base of 7 and 8
- Very effective

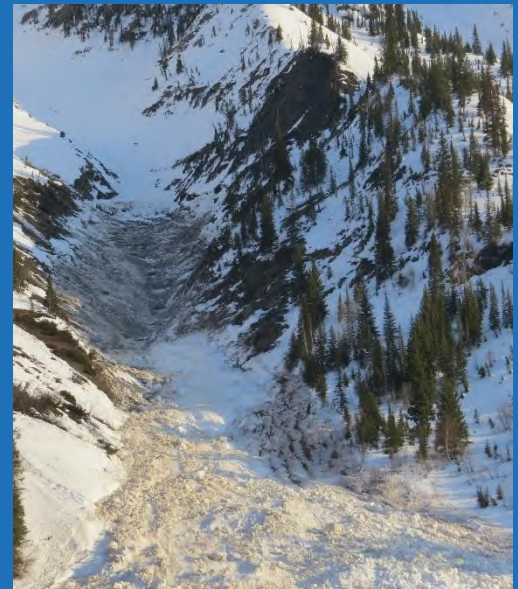
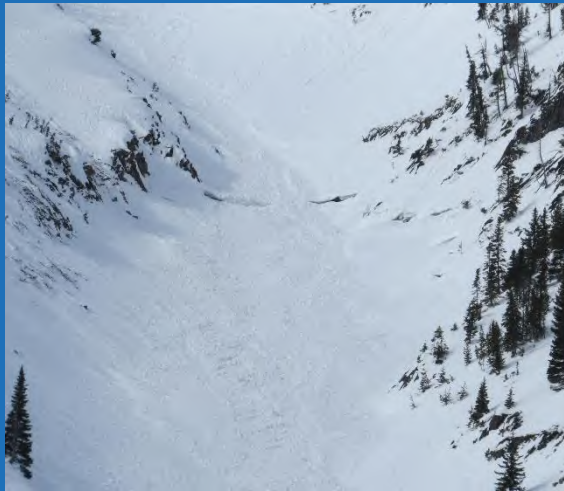




Recent Investments

Mounds Stopping Dam

- Annual glide crack avalanches





Recent Investments

Mounds Stopping Dam

- Engineered to hold 1:30 year event
- Held significant avalanche in April 2022 during record snow year





Recent Investments

RACS

- Locations selected with goal to reduce highway closure times
- Installed 5 Wyssen towers- east end
- Installed 5 Avalanche Guard towers – west end
- Mixed results achieving goals
 - No longer using Avalanche Guard





Challenges

- Increased backcountry visitation- challenges to the Winter Permit System





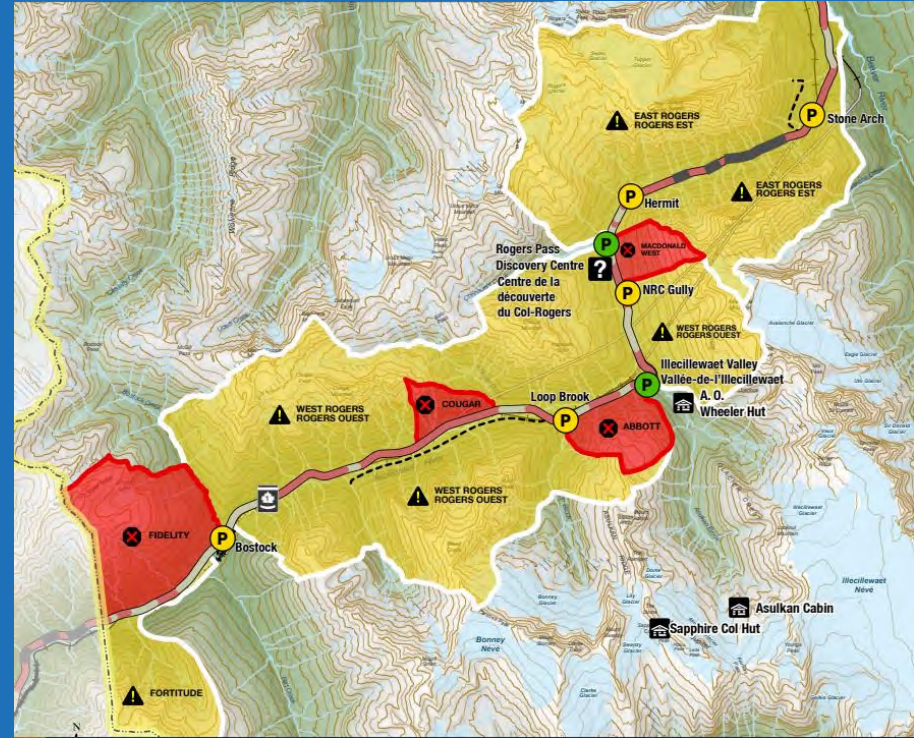
Winter Permit System

Separates backcountry enthusiasts and explosives on slopes that face the highway or slopes that may be effected nearby.

Permit areas are closed from midnight until reopened.

Winter Prohibited areas are closed for the season.

Compliance is essential





Questions ?

