Going to the Sun Road Avalanches: Briefing for Road Crews

Your Name

Introduction

Briefly describe the dataset (where it comes from, what an observation is, and a few key variables).
State the practical goal of your report in 1–2 sentences, for example: $y = mx + b$

> The goal of this report is to identify avalanche paths and time periods along Going to the Sun Road that deserve the highest priority from road-clearing crews.

When avalanches happen

```
avalanches$month <- month(avalanches$Date, label = TRUE)

ggplot(avalanches, aes(x = month, fill = AvalancheType)) +
  geom_bar(position = "stack")
```

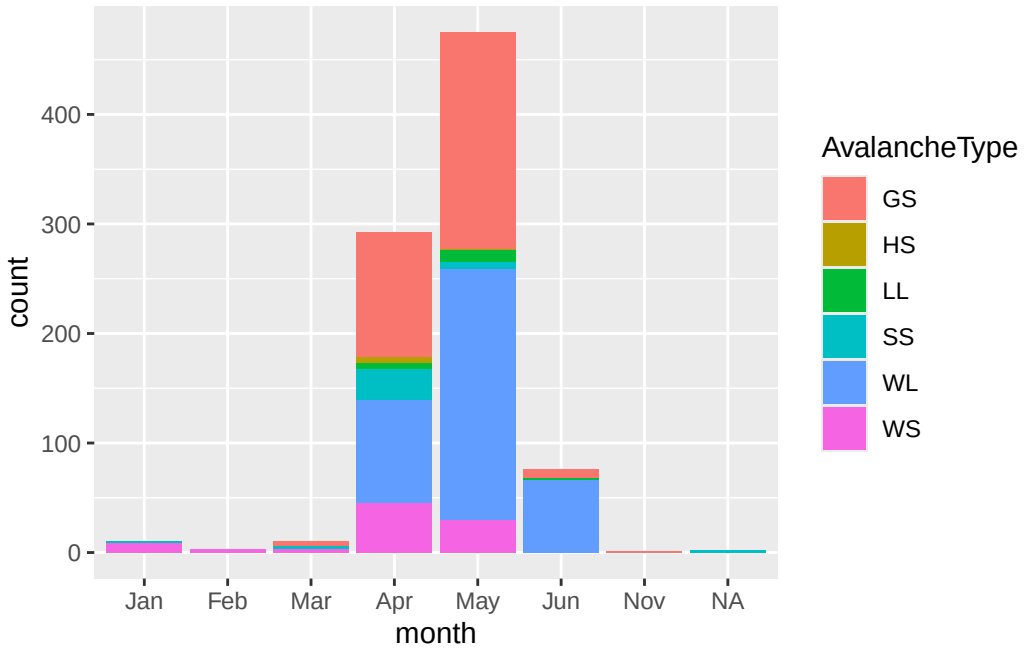

Figure 1: Number of recorded avalanches by month and type.

In 2–3 sentences:

- Identify which months have the most recorded avalanches.
- Comment on whether certain avalanche types are more common in particular months.
- Mention any limitations (for example, convenience sampling and missing data).

If you explore time of day, you may insert an additional plot and description:

```
have_time <- avalanches %>%
  filter(!is.na(TimeAccuracy))

ggplot(have_time, aes(Time, fill = AvalancheType)) +
  geom_histogram() +
  facet_wrap(~ TimeAccuracy)
```

Key avalanche paths

```
key_paths <- avalanches %>%
  group_by(PathName) %>%
  summarise(
```

```
    clearing_time = sum(TimeToClear, na.rm = TRUE),
    mean_depth    = mean(RoadBurialDepth, na.rm = TRUE),
    mean_length   = mean(RoadBurialLength, na.rm = TRUE),
    road_index    = mean((HitRoad == "Yes") * SizeDestructiveForce, na.rm = TRUE),
    frequency     = n()
  )

top10_paths <- key_paths %>%
  arrange(desc(road_index)) %>%
  slice_head(n = 10)

top10_paths
```

```
# A tibble: 10 x 6
   PathName            clearing_time mean_depth mean_length road_index frequency
   <chr>                       <dbl>      <dbl>       <dbl>      <dbl>     <int>
 1 Red Rock                     7.25       8.8          51         2.92         7
 2 Below East Tunnel            0.5        2.5          25         2            1
 3 Lower Grizzly                0.33       3            40         2            1
 4 No Stump Point               0          2            25         2            2
 5 Triple Arches                8.7        2.13         33.2       1.76        27
 6 Big Drift                    0.5        0.5          20         1.75         2
 7 Chute Above Triple~          0.35       1.5          30         1.75         2
 8 Half Tunnel                  0.7        2.5          11.5       1.75         4
 9 1st Chute Below Ar~          2.55       3.3          24.4       1.69         9
10 Little Granite               0          10           60         1.67         3
```

```
ggplot(top10_paths, aes(x = reorder(PathName, road_index), y = road_index)) +
  geom_col() +
  coord_flip() +
  xlab("Path name") +
  ylab("Road index (mean destructive force for road-hitting avalanches)")
```

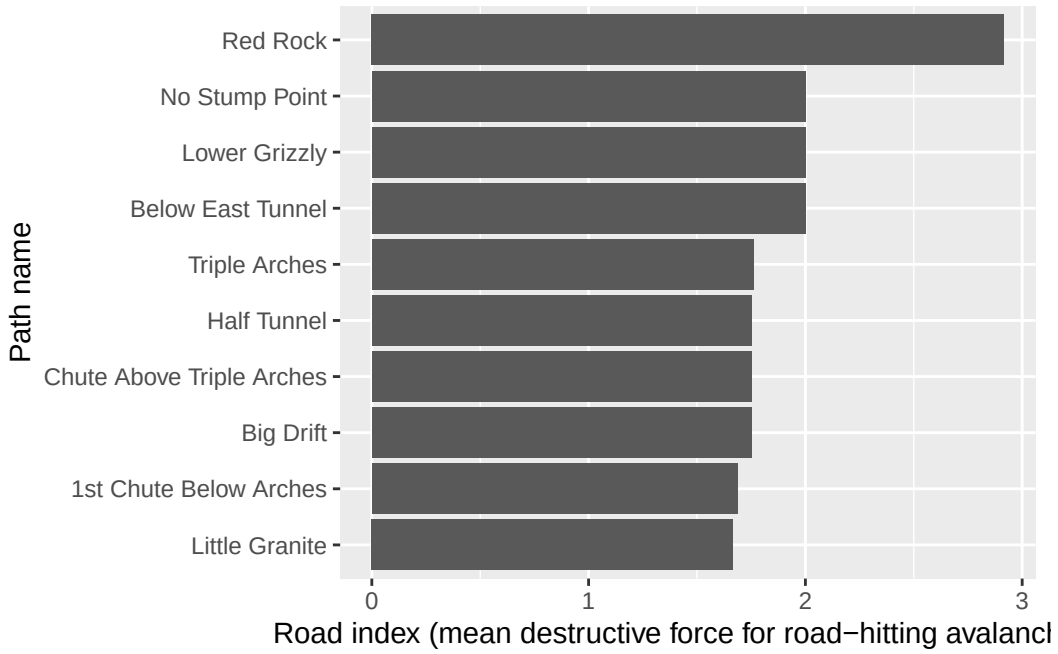

Figure 2: Top 10 paths by average destructive force for avalanches that hit the road.

In 3–4 sentences:

- Name 2–3 paths that appear highest-priority and explain why (for example, high clearing_time, high road_index, and/or high frequency).
- Comment briefly on road burial depth and length if relevant.

Avalanche size and type

```
ggplot(avalanches, aes(VerticalRunFeet, SizeDestructiveForce,
                       color = AvalancheType)) +
  geom_point(alpha = 0.5) +
  geom_smooth(method = "lm", se = TRUE)
```

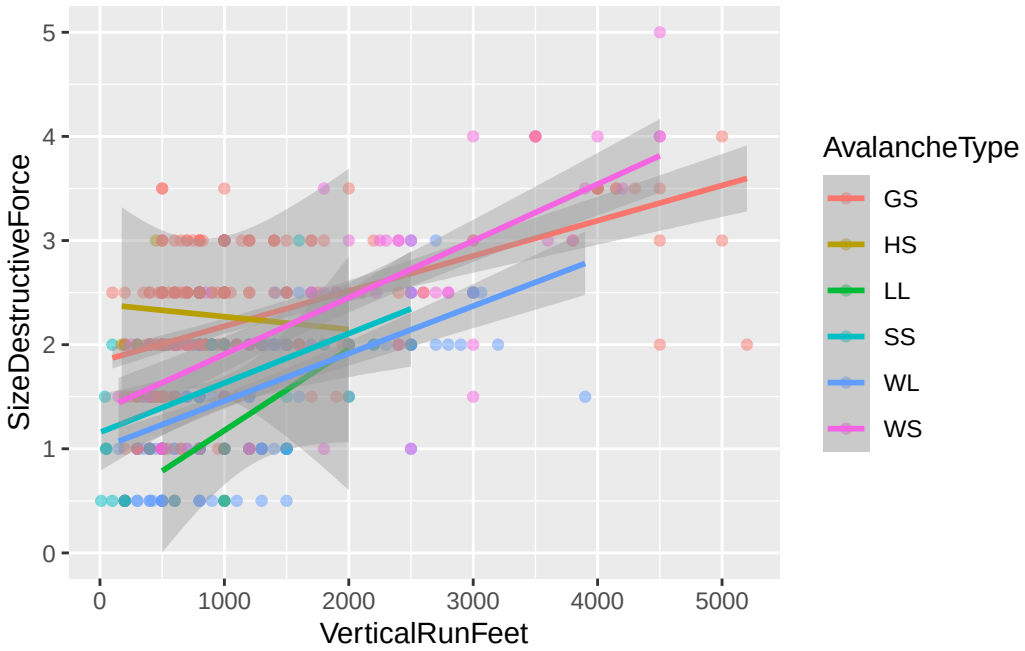

Figure 3: Vertical run versus destructive force, colored by avalanche type.

In 2–3 sentences:

- Describe the relationship between vertical run and destructive force.
- Explain in words what the slope of the regression line represents.
- Mention any differences you see between avalanche types.

(Optional) Faceted version:

```
ggplot(avalanches, aes(VerticalRunFeet, SizeDestructiveForce,
                       color = AvalancheType)) +
  geom_point(alpha = 0.5) +
  geom_smooth(method = "lm", se = TRUE) +
  facet_wrap(~ AvalancheType) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Briefing for the road-crew supervisor

Use bullet points to summarize your findings in non-technical language. Aim for 5–7 bullets total, for example:

- 2–3 bullets naming specific paths and why they are high-priority (referring to clearing_time, road_index, frequency from `key_paths`).

- 1–2 bullets about when avalanches are most commonly recorded (months and, if you used it, time of day).
- 1–2 bullets connecting avalanche type to destructive force or timing.

Example starter sentences (modify based on your results):

- "The paths that appear to require the most attention are _____ and _____ because they have high road_index and long total clearing times."

- "Most recorded avalanches occur in _____, so crews might prioritize staffing during these months."

- "Avalanches that hit the road tend to be of type _____ in season _____, with an average destructive force of about ___ on the SizeDestructiveForce scale."