**Slide 1**

(intro names)

Slide 2 (Planning motivation)

In June 2013 the city of Calgary experienced an extreme flooding event that resulted in the displacement of 100,000 people and 1.7 billion dollars were needed for repairs. The event was one of the costliest disaster in Canada's history. In this project we aim to build a predictive model that will help Calgary and cities with similar topography be better prepared for future large-scale flooding events such as the 2013 disaster.

Slide 3 (predictive modeling)

Predictive modeling can help with early action and planning, as decision-makers and the public will readily have information on what areas of the city might need to be evacuated. Additionally, the model can also help identify areas of the city that might need buyouts and/or revisions to the building code to require floodproofing.

An advantage of our algorithm compared to FEMA federal-level floodplain mapping is that the model should be able to help identify areas of flooding beyond just river flooding. Because the model is based on a historical event that resulted in flooding, not near rivers, the model should be able to capture flooding in other low-lying areas and valleys outside of riverine areas.

**Slide 4 (workflow)**

The workflow for this model included

**Data Acquisition:** Gathering all relevant data relevant to historical flood events.

**Data Preparation:** Cleaning and formatting the data into a structured dataset.

**Data Analysis:** Examining the data to understand patterns and trends.

**Feature Engineering:** Creating new data features to improve model accuracy.

Percent of flooded cells are predicted

**Modeling:** Running the logistic regression model to predict flood-prone areas.

**Deployment:** Translating model predictions into actionable insights for stakeholders.

**Slide 5 (dependent variable)**

Our analysis will use a 100m x 100m grid and a logistic regression model to determine areas that are likely to be flooded during a flood event similar to the event that occurred in Calgary in 2013. We split the grid squares into training and test data, and train our model using the training data and then test model accuracy using the grid squares in the test dataset.

**Slide 6 (predictors)**

The predictor variables we used are most closely related to the likelihood of a flooding event, they include:

\* Elevation above minimum elevation in the city

\* Dominant Land Cover

\* Slope

\* Distance to Water

\* Water Flow Accumulation (i.e: the number of grid squares flowing into a grid square)

**Slide 7 ( Model threshold)**

The logistic regression model produces a probability that a grid square will be flooded. The chart below shows the predicted flood probability density for grid squares in the test dataset that flooded and did not flood. Grid squares that did not flood (0) have a very low predicted probability of flooding, the predicted probability for flooding is below 0.05 for almost all grid squares. For grid squares in the test dataset that flooded the predicted probability ranges significantly, but peaks around 0.12.

Based that information we have determined that the optimal threshold is 0.12. Grid squares that the model predicts as having a flood probability higher than 0.12 are classified as flooded by our model. Grid squares that have a flood probability lower than 0.12 are classified as likely not to flood.

**Slide 8 (model Performance**

At the 0.12 threshold, we have an overall model accuracy of 88%. The model correctly predicts 83% of flooded grid squares (sensitivity) and 88% of non-flooded (specificity) grid squares correctly, making it a great tool for flood mitigation planning.

**Slide 9 (Denver)**

Thanks to the model's adaptability, we can use it to identify areas at risk of flooding in other cities with similar landscapes. When we apply it to Denver, Colorado, for example, we find that areas nearest to bodies of water face the highest risk of flooding.

**Slide 10 (Conclusion)**

Predictive modeling is a powerful tool that can help mitigate damages and economic losses caused by major flooding events in cities worldwide.