

# Meltwater Detention Systems: Site Suitability Analysis in the Harrop-Procter Community Forest

## Introduction

This project aims to support the beginning stages of research into meltwater detention ponds, within the Harrop-Procter Community Forest boundary area. The objective is to provide a useful overview of suitable sites for water storage systems within the local watershed.

## Water Detention Systems:

- ✓ Reduce runoff
- ✓ Control erosion
- ✓ Intercept pollution
- ✓ Provide storage
- ✓ Enhance biodiversity
- ✓ Prevent floods

**Natural Design:** ability to utilize pre-existing topographical features

**Globally Applicable:** not geographically or climate specific; pond systems can be applied across a variety of landscapes

**Adjustable:** the sizing of the pond and system can be adapted for the receiving catchment/drainage area

## Methods

ArcGIS was used to conduct a spatial analysis prioritizing inputs of slope, terrain stability, elevation, and proximity to streams. Additional considerations were given to current cutblock and forestry road locations for construction and maintenance ease (map 2).

Preparation for weighted overlay analysis through reclassification:

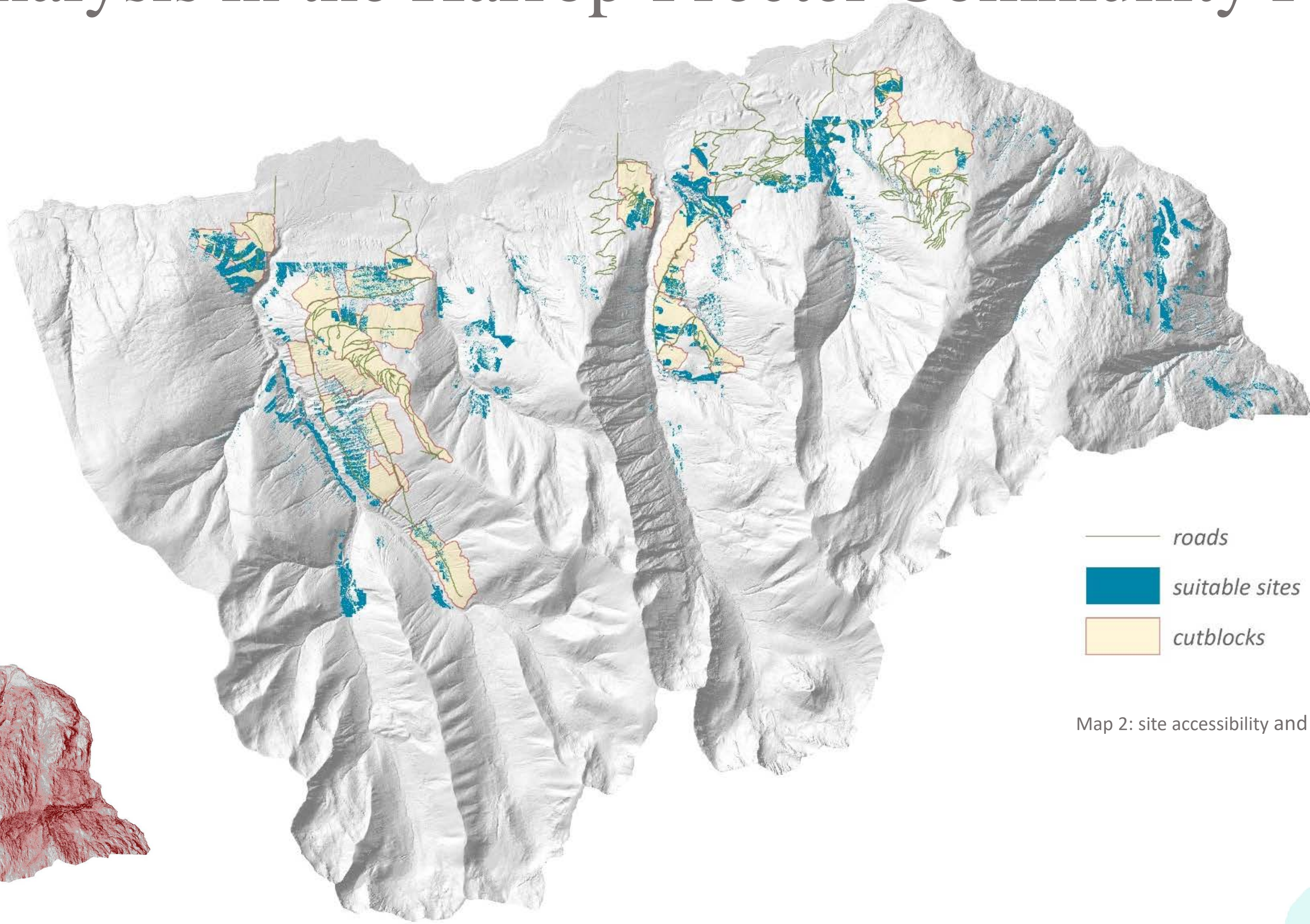
- The digital elevation model (DEM) was ranked to prioritize mid-elevation altitudes: 600-1000m
- Terrain was weighted for the most stable locations
- Slope was prioritized at values: <25% (map 3)
- Stream data was rasterized and buffered to isolate areas within 50m of a waterway

The final output considered regions greater than 500 m<sup>2</sup> as ideal. The minimum pond sizing was selected from average case study research suggestions (Larm 2000). The elevation range was specified to move the detention basins farther into the watershed, concentrating its sediment storage and flood mitigation upstream, outside of populated areas.

Map 4: ArcPro 3D visualizations of pond locations

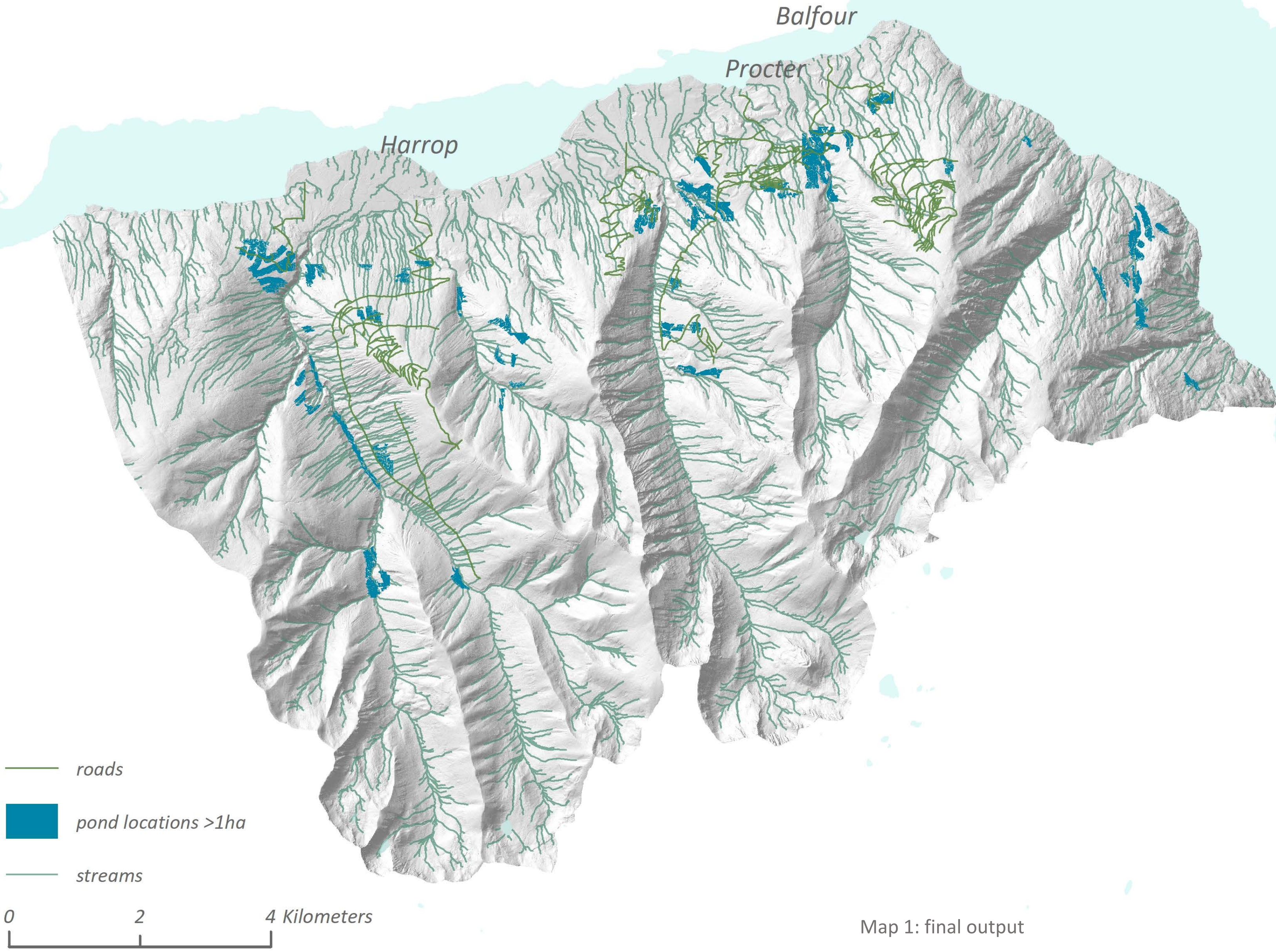


Map 3: incline levels



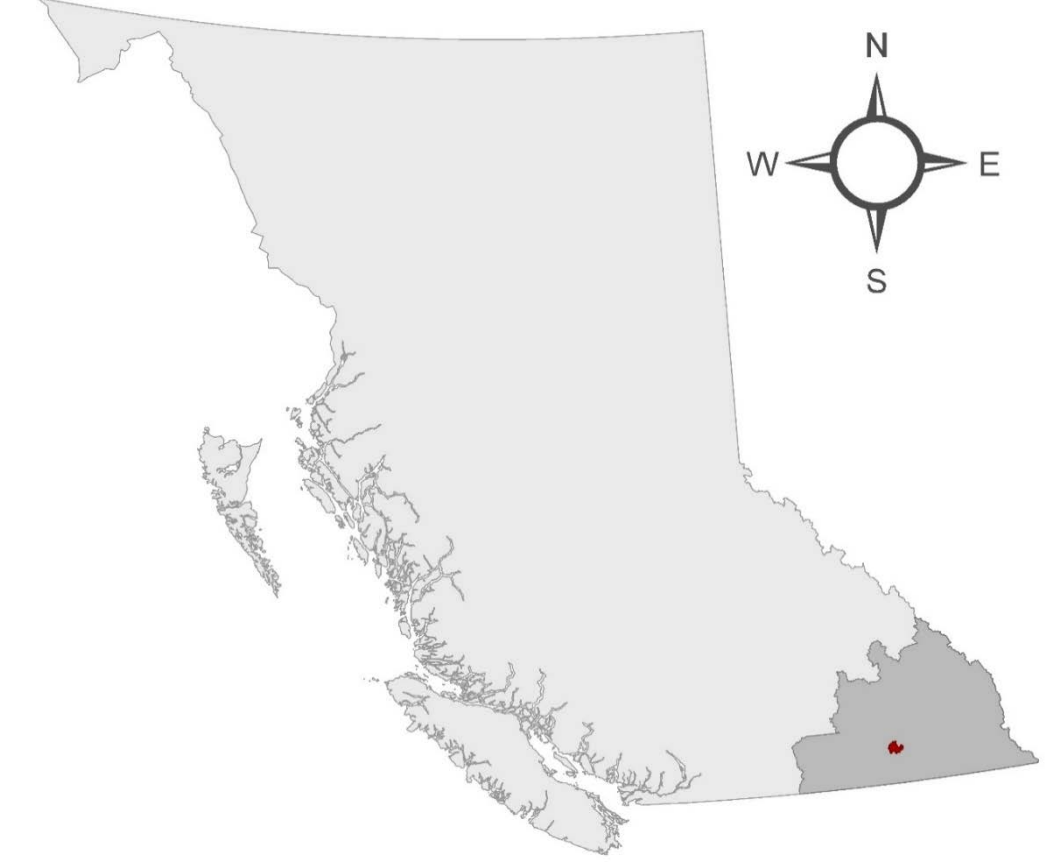
roads  
suitable sites  
cutblocks

Map 2: site accessibility and cutblocks



roads  
pond locations >1ha  
streams  
0 2 4 Kilometers

Map 1: final output



## Results

After converting the overlay results from raster to polygon, 93 plots met the identified criteria and are suggested for further suitability investigation (map 2). 58 of those plots had a connected area greater than 1 ha (map 1).

The cutblock and road overlays showed significant overlap with suitable detention basin locations (map 2). Further research should investigate logging as a source for planning detention systems. As well as to consider how these water storage strategies could provide environmental support to cutblocks.

ArcPro was used to create a 3D visualization of suitable sites across the Harrop-Procter Community Forest land base (map 4).

## Limitations and Assumptions

The project assumed each thematic layer to be weighted equally in the overlay process, this may not be realistic, or true to priorities.

Potentially critical themes were not included in the overlay analysis:

- Flow accumulation modelling and catchment size information.
- Soil type; suggested texture would be sandy clay loam (Kumar et al. 2017).
- Detailed land-use and land-cover layers.

Limited research is available regarding detention implementation across mid-elevation, upstream, forested, mountain topography. There is a need to consider how this specific terrain impacts infrastructure and alters engineering expectations for site development.

Data sources: Harrop-Procter Community Forest Co-operative (HPCF)  
Client: Erik Leslie, Forest manager HPCF

Created by: K. MacDougall  
Selkirk College  
IEP 271  
April, 2019

