



# Flood Predictor

Stantec.io



# Flood Predictor Overview

STANTEC FLOOD PREDICTOR

## Flood Predictor

Stantec.io

# 85-95%

**TN Plan Community Portal**

**Flood Predictor**

Menu  
Project Management  
Community Management  
Flood Predictor

**Flooding Type**  
Flash Flood Riverine

**Hydrologic Unit Code**  
071200040403

**Recurrence Interval**  
100yr

**Map Type**  
Probability Prediction

Compare with FEMA Effective 100yr

Metrics for 071200040403	
Recurrence Interval	100yr
Runoff (inches)	4.869
Curve Number	80
Precision	0.778
Recall	0.671

**FLOODING PROBABILITY**

- 10% - 20%
- 20% - 30%
- 30% - 40%
- 40% - 50%
- 50% - 60%
- 60% - 70%
- 70% - 80%
- 80% - 90%
- 90% - 100%

**0.72 F1 Score**

https://tnplan.azurewebsites.net/#/floodpredictor

7:45 AM 4/11/2022



1

Engineering  
Features

2

Machine  
Learning

3

Visualization

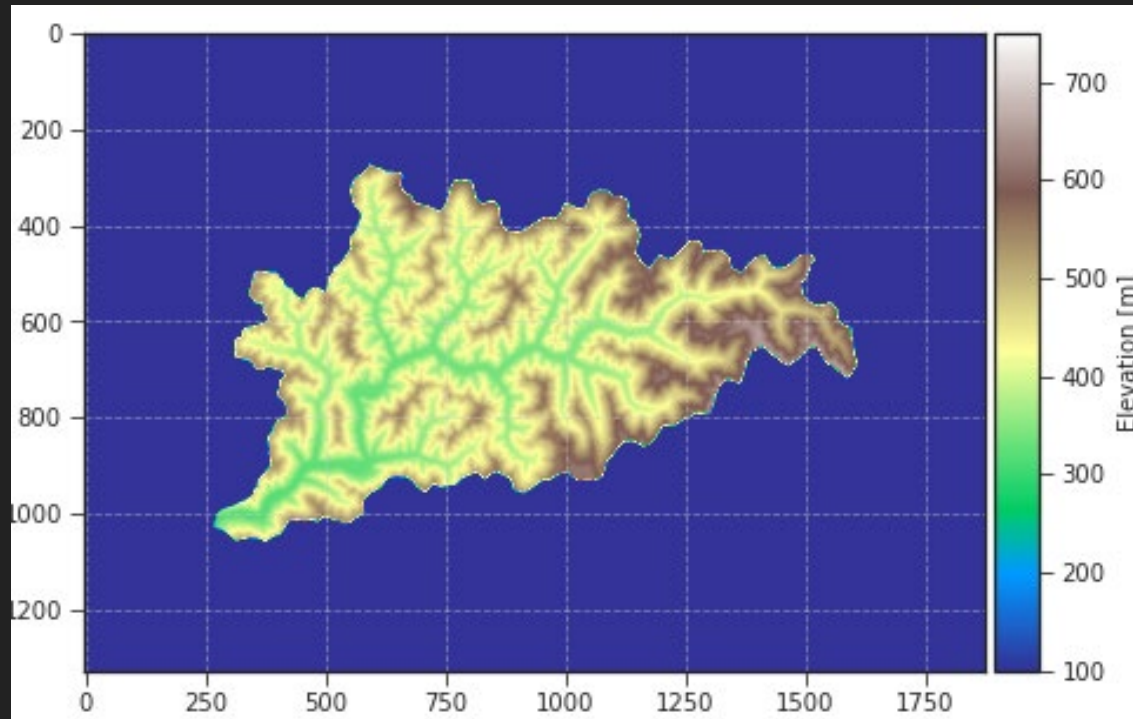
4

Performance

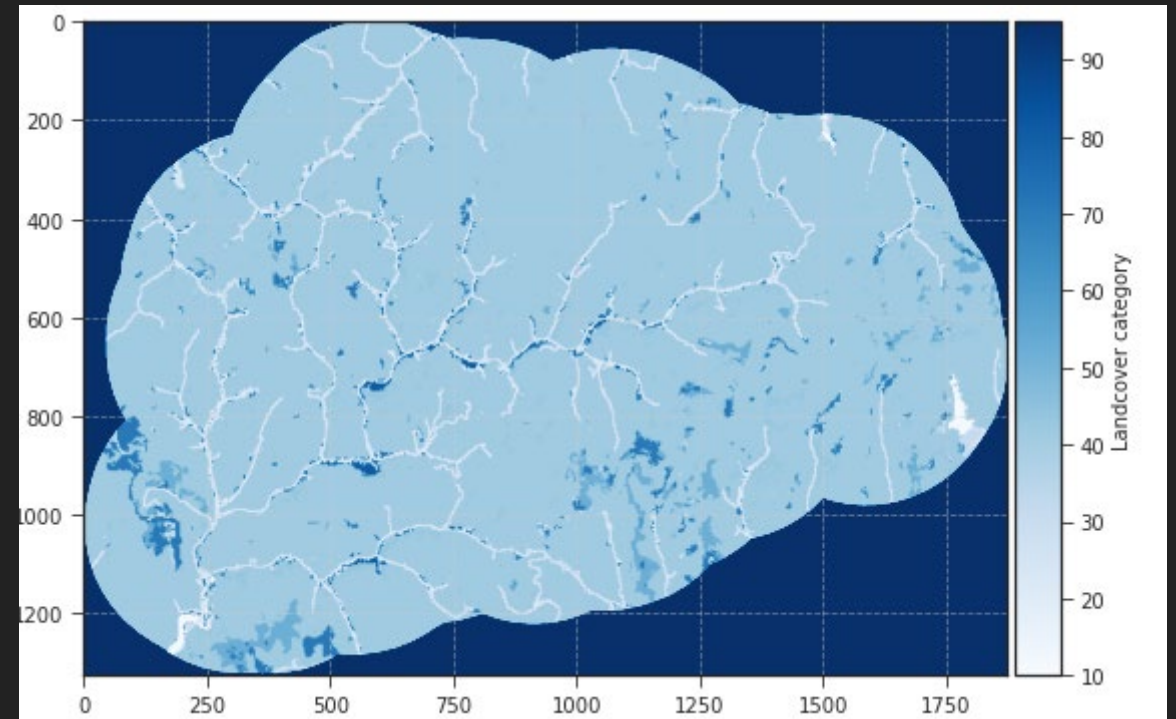


# Engineering Features: Data Harvesting

USGS: Digital Elevation model



MRLC: Land Use



The main inputs for Flood Predictor are terrain and land use data. High resolution terrain (1m) can be used if available and desired.

Typically, 10m or 3m are used otherwise. Land use data may also be refined to include historic or future changes.

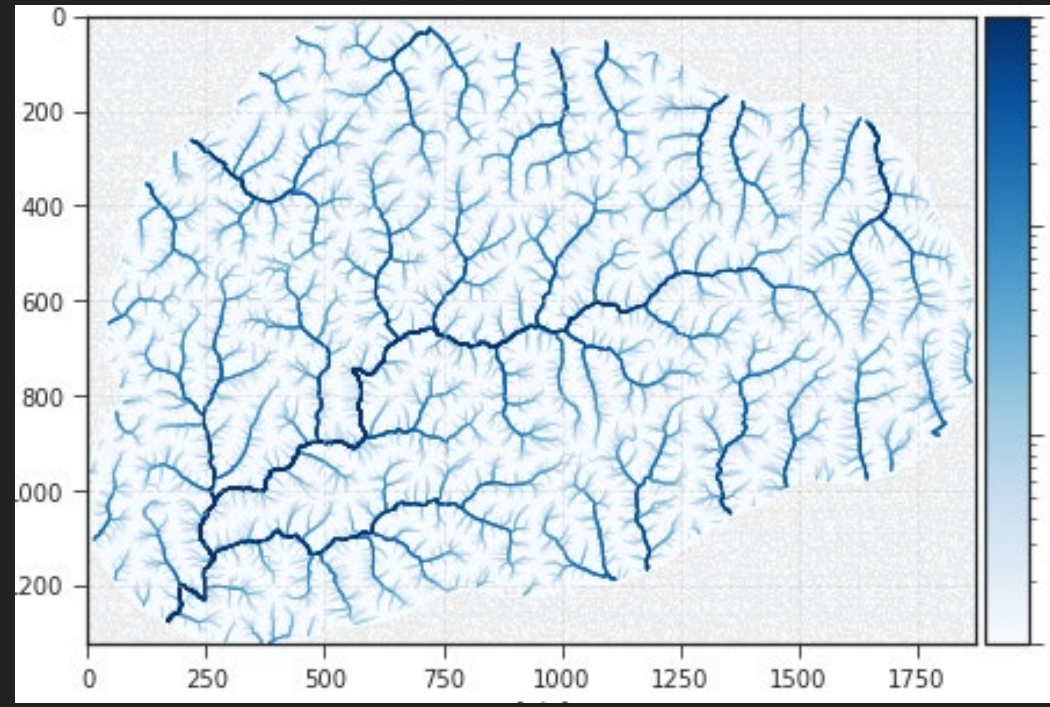


1

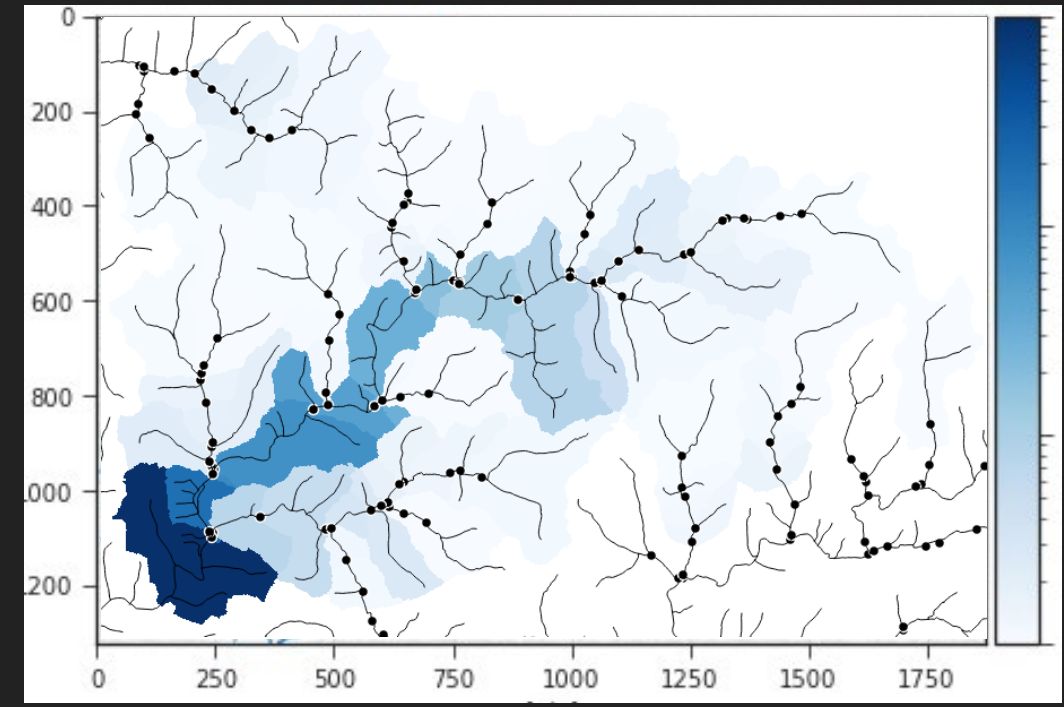
STANTEC FLOOD PREDICTOR

# Hydrology Features: User Defined

### Total Rainfall / Runoff (Flash)



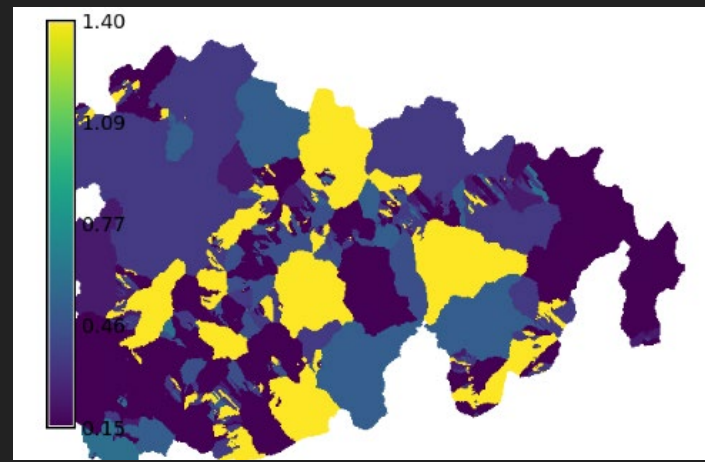
### Peak Flows (Riverine)



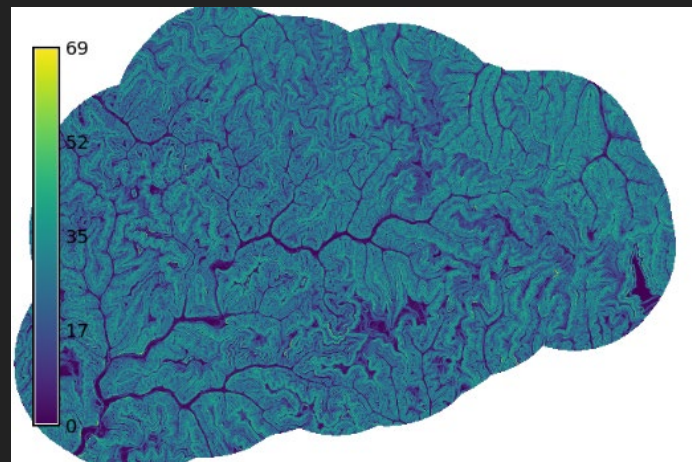


# Engineering Features: Data Derivatives

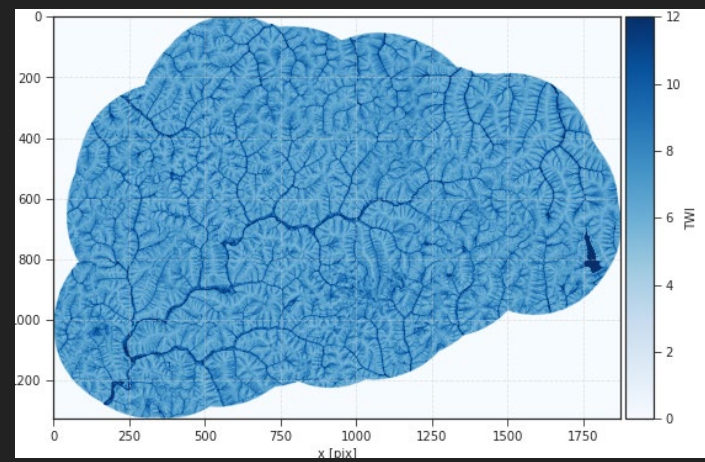
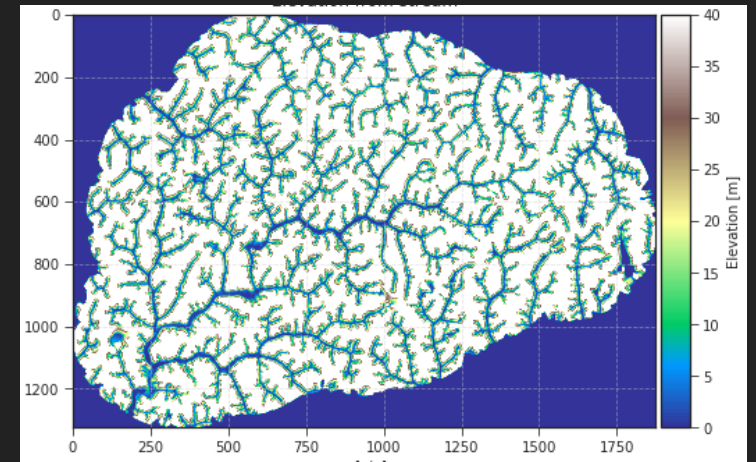
Velocity (from Manning's Equation)



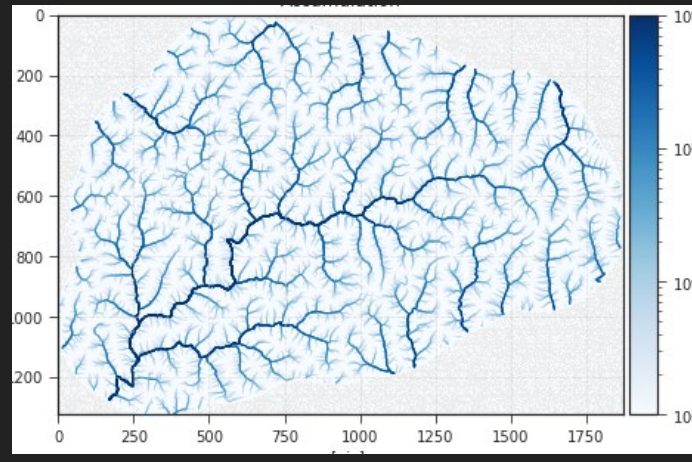
Slope



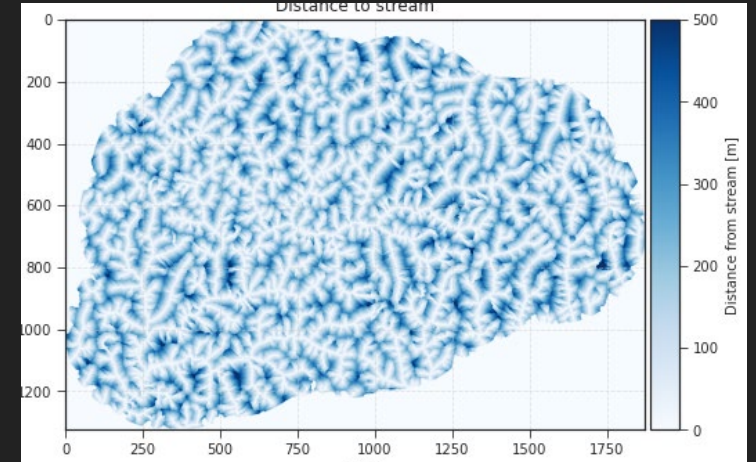
Elevation from stream



Topographic Wetness Index



Accumulation



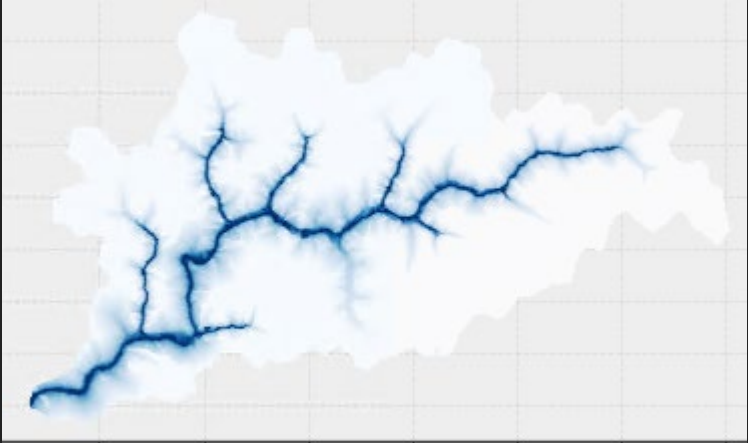
Distance to stream



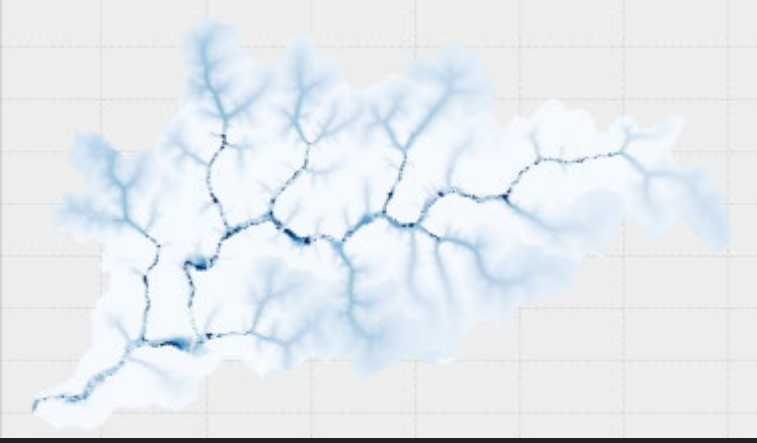
1

# Engineering Features: Dimensionless Engineering Features

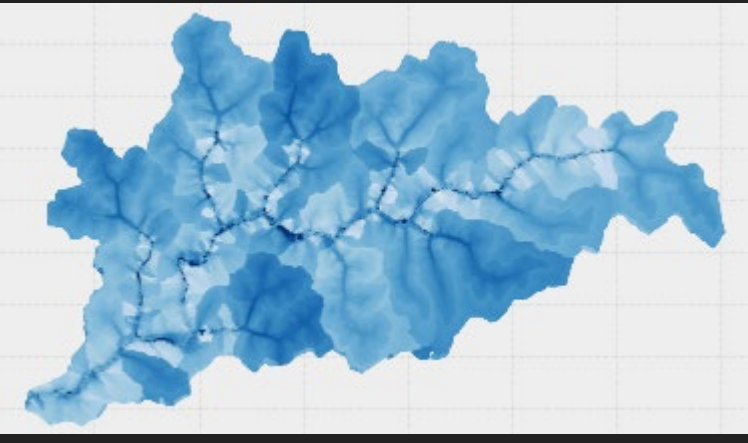
Hydraulic index 1



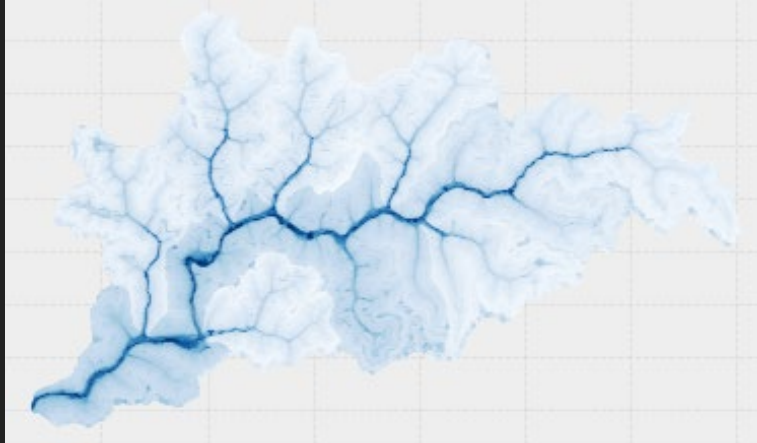
Hydraulic index 2



Hydraulic index 3

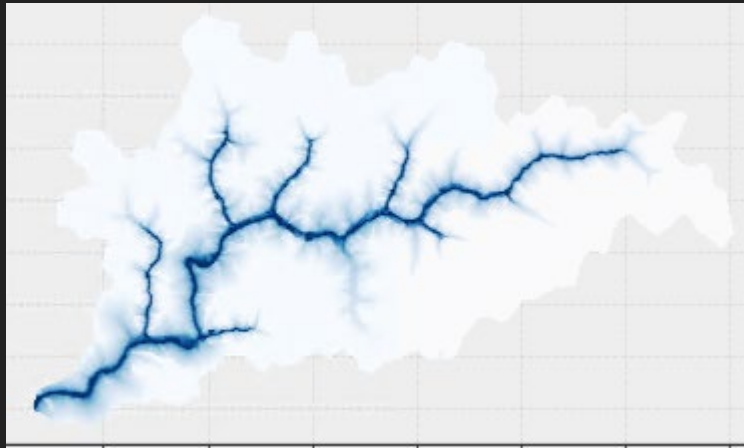


Hydrologic index



# Engineering Features: Dimensionless Engineering Features

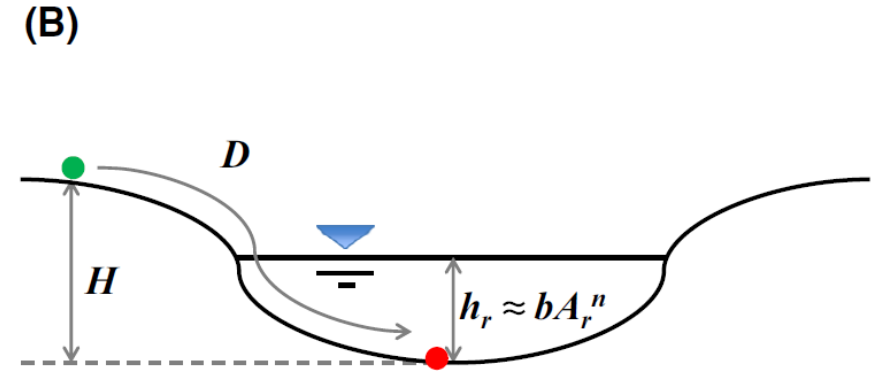
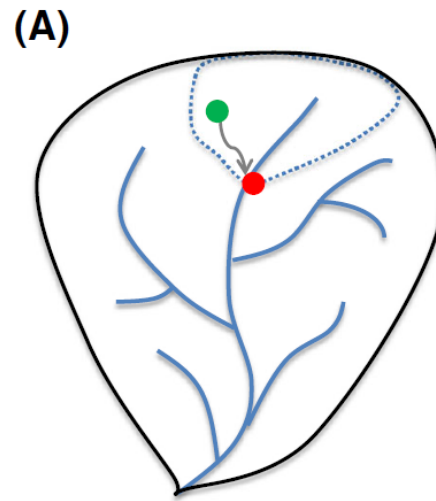
Flood Predictor  
Flood Index (hydraulic index 1)



$$= \text{Log} \left[ \frac{\text{Flow or Runoff}}{n} H_R^{2/3} S^{1/2} H D \right]$$

Velocity,  
Manning's  
Equation

Cross  
Sectional  
Area



- Location under exam
- Nearest element of the river network along the flow path
- Flow path

Fig. 5 Example of a hydraulic cross section with the description of the parameters  $H$  and  $h$





# Flood Predictor Potential Applications

1. Pluvial and Fluvial flood extents
2. Real-Time Storm Predictions
3. Unmapped or invalid study areas
4. Limited or no data
5. Limited budget
6. Limited schedule
7. Mitigation and Resilience Planning support
8. What if/ climate change
9. Emergency Management/Disaster Response



# Flood Predictor Benefits

1. Scalable, high resolution flood risk data for the nation
2. High resolution floodplains and Annual Exceedance Probability (AEP) data can be created in minutes
3. Can be applied to create hazard and risk information for unmapped areas
4. Leverages and aligns to existing FEMA data (flows, floodplains and 2D BLE)
5. Ready for planning purposes “Future Conditions” analysis (climate change scenarios, land use changes, storm forecasting, etc.)



# Flood Predictor Models & Roadmap

## Currently supported:

- Riverine, flash & combined flood risk

## Upcoming:

- Depth and velocity estimates
- Coastal (storm surge) flooding
- Weather forecast integration
- Watershed moisture status (real-time) for runoff potential
- Integration of global climate model trends