

# ***Overview of Landslides in Southern Maine and the September 16, 2020 Westbrook Landslide***



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## A Few Modern Landslide Examples



1983



1996



2005

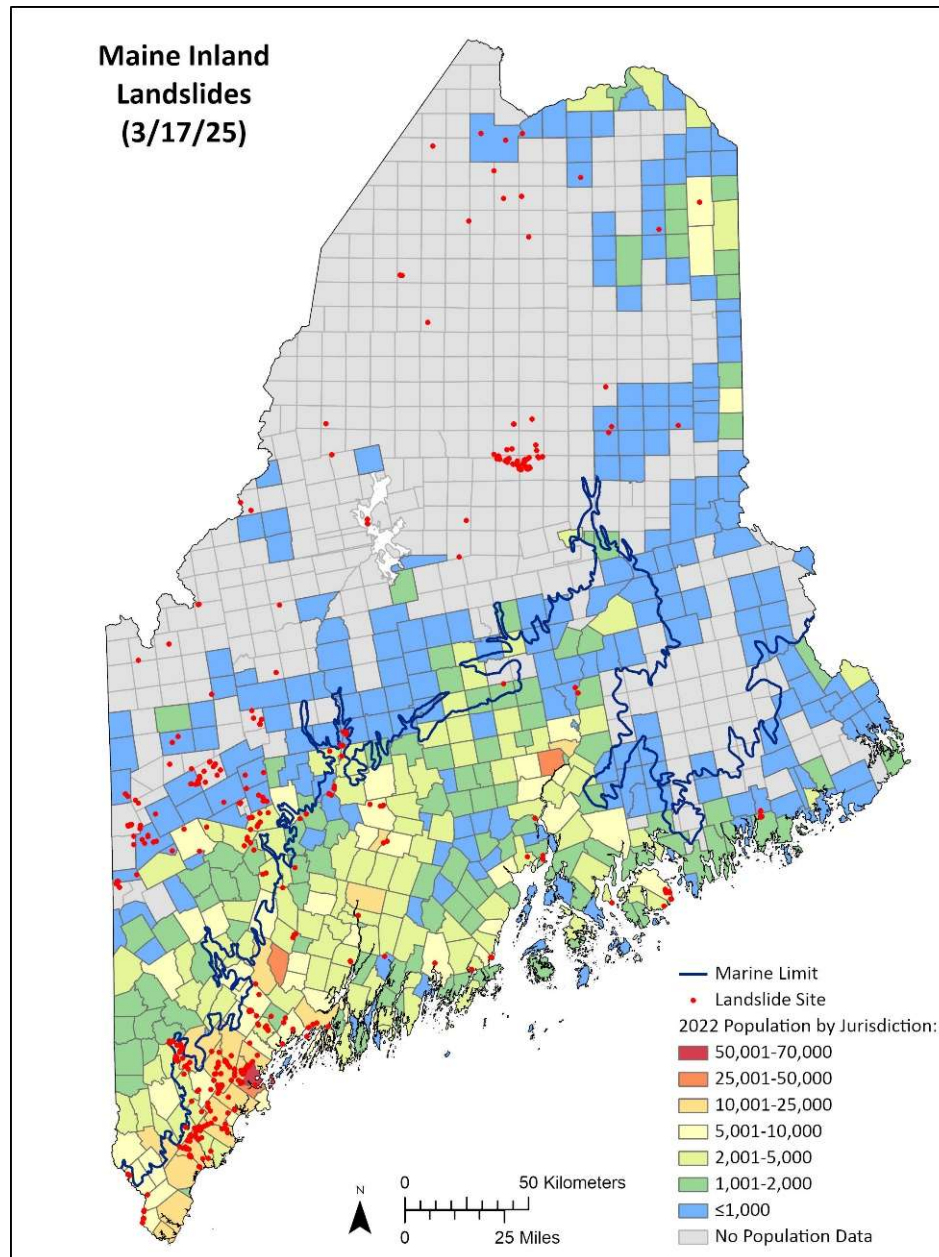


2006

## Lidar and Landslides



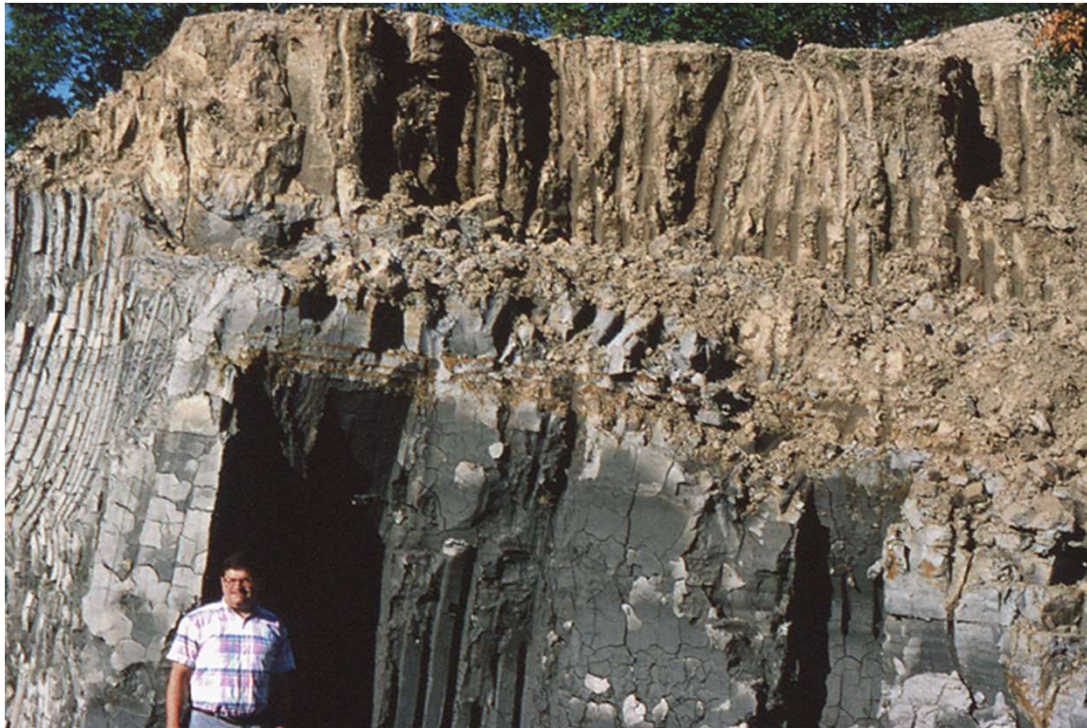
## Current Inland Landslide Inventory



- **447** inland landslides:
  - **238** below marine limit (most related to Presumpscot Formation).
  - Highest density in most populated area of the state.

## Presumpscot Formation

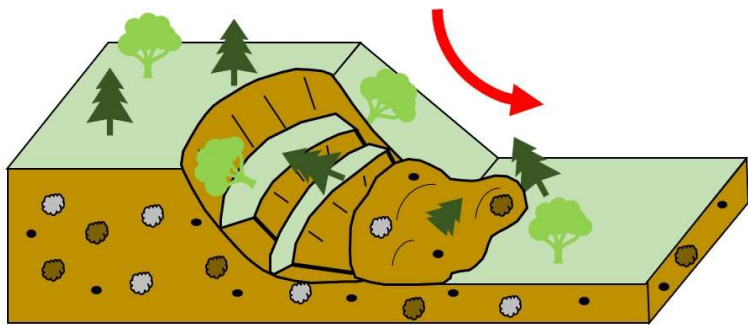
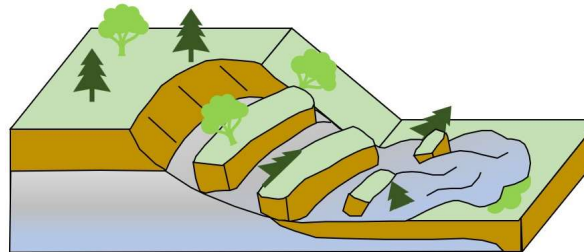
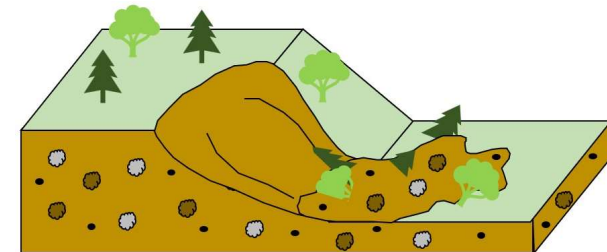
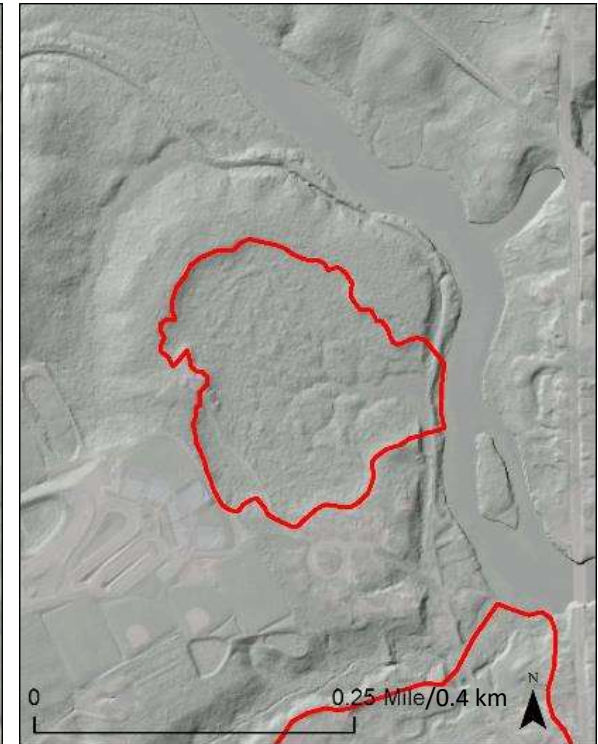
- Sensitive glaciomarine mud deposit found at lower elevations in portions of southern Maine.
- Significant contributing landslide factor in southern Maine.
- Can liquefy and flow when disturbed or left unsupported.



**Presumpscot Formation exposure, south-central Maine.**



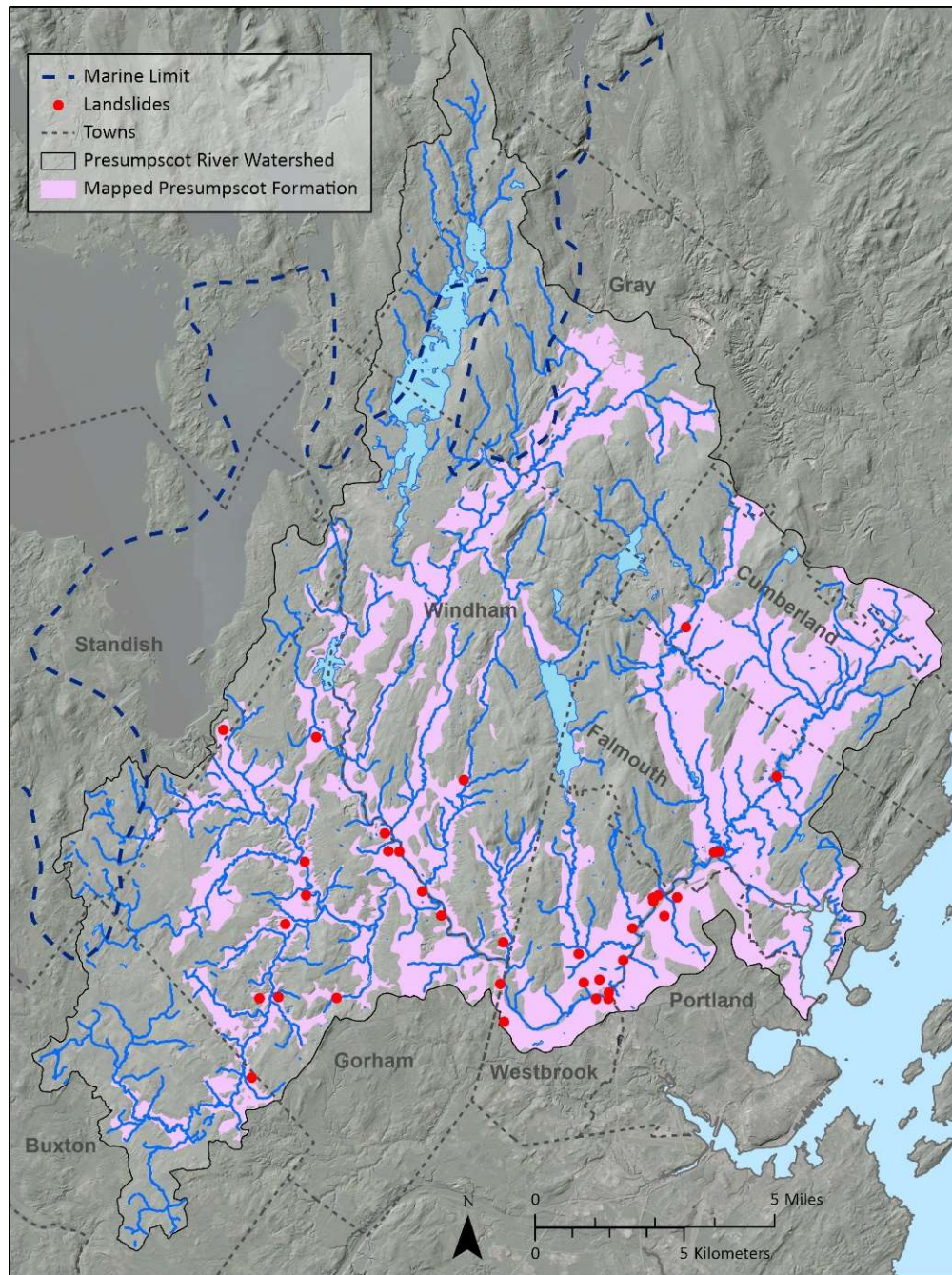
**Soft Presumpscot Formation removed from landslide site along Penobscot River.**

Typical Presumpscot Formation Landslide Morphologies**Rotational****Spread****Flow**

### Typical Contributing Factors

- **Water** (reduced shear strength)
- **Steep, unsupported slopes** (freshly eroded riverbanks, excavated areas)
- **Weight** (water, structures, large trees)
- **Vibration -> Presumpscot Formation liquefaction** (earthquakes or humanmade)
- **Combination of above**



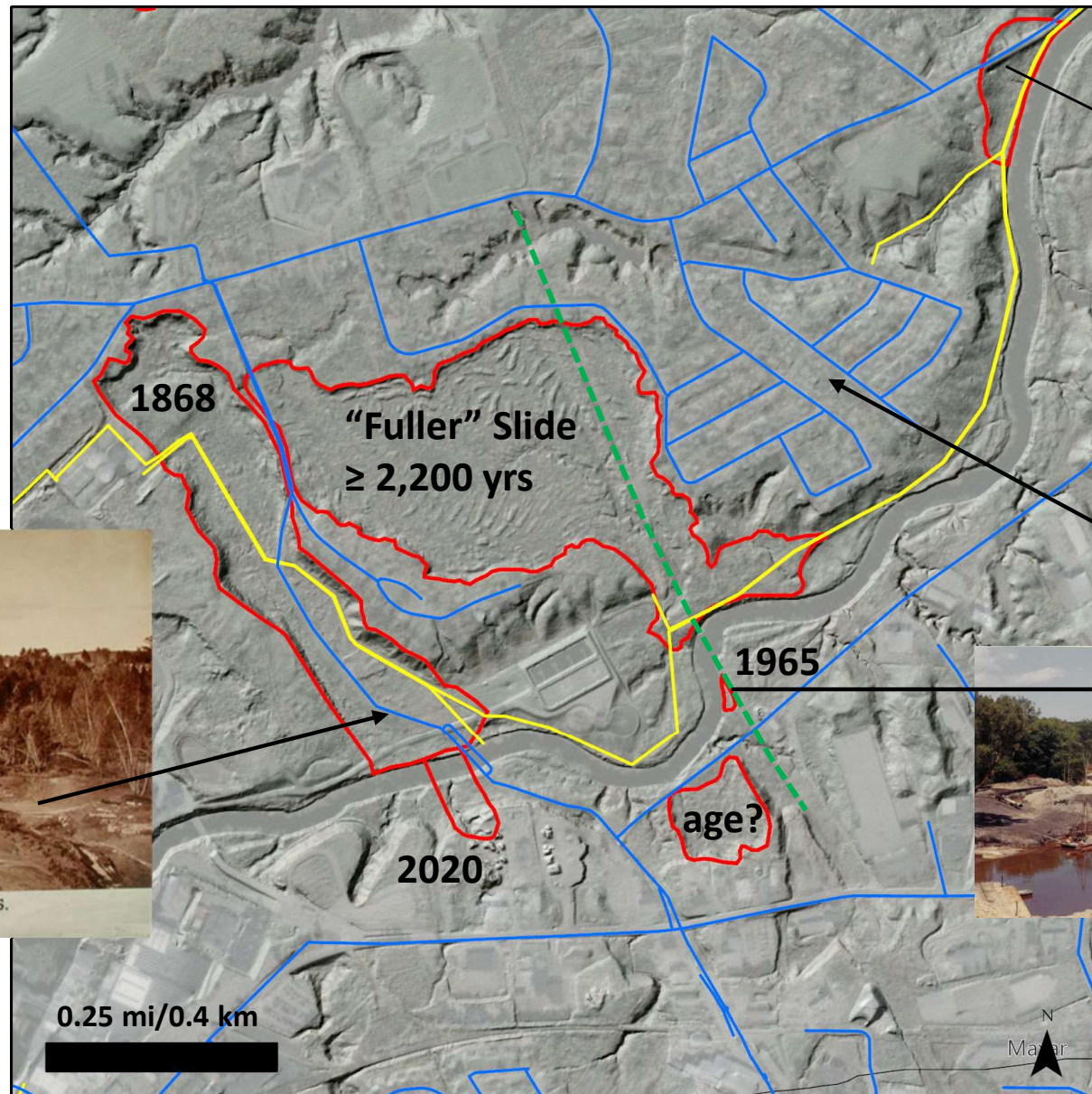


## Local Context: Presumpscot River Watershed

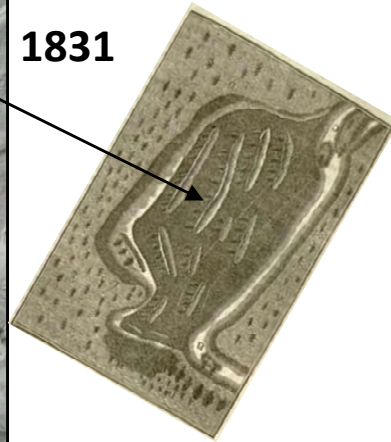
- 35 landslides
  - 3 modern
  - 2 historic
  - 4 prehistoric
  - 26 unknown age
- Disturbed area (acres):
  - Mean: 31
  - Max: 321
  - Min: <1
- All related to Presumpscot Formation.
- Mostly along rivers/streams.

Local Context: Westbrook 2020 Event**Line legend:**

- **Red:** Landslide Extents
- **Blue:** Water
- **Yellow:** Sewer
- **Green:** Gas (approx.)



1831



Devin and  
Sandford (1990)  
study



1965

age?

2020



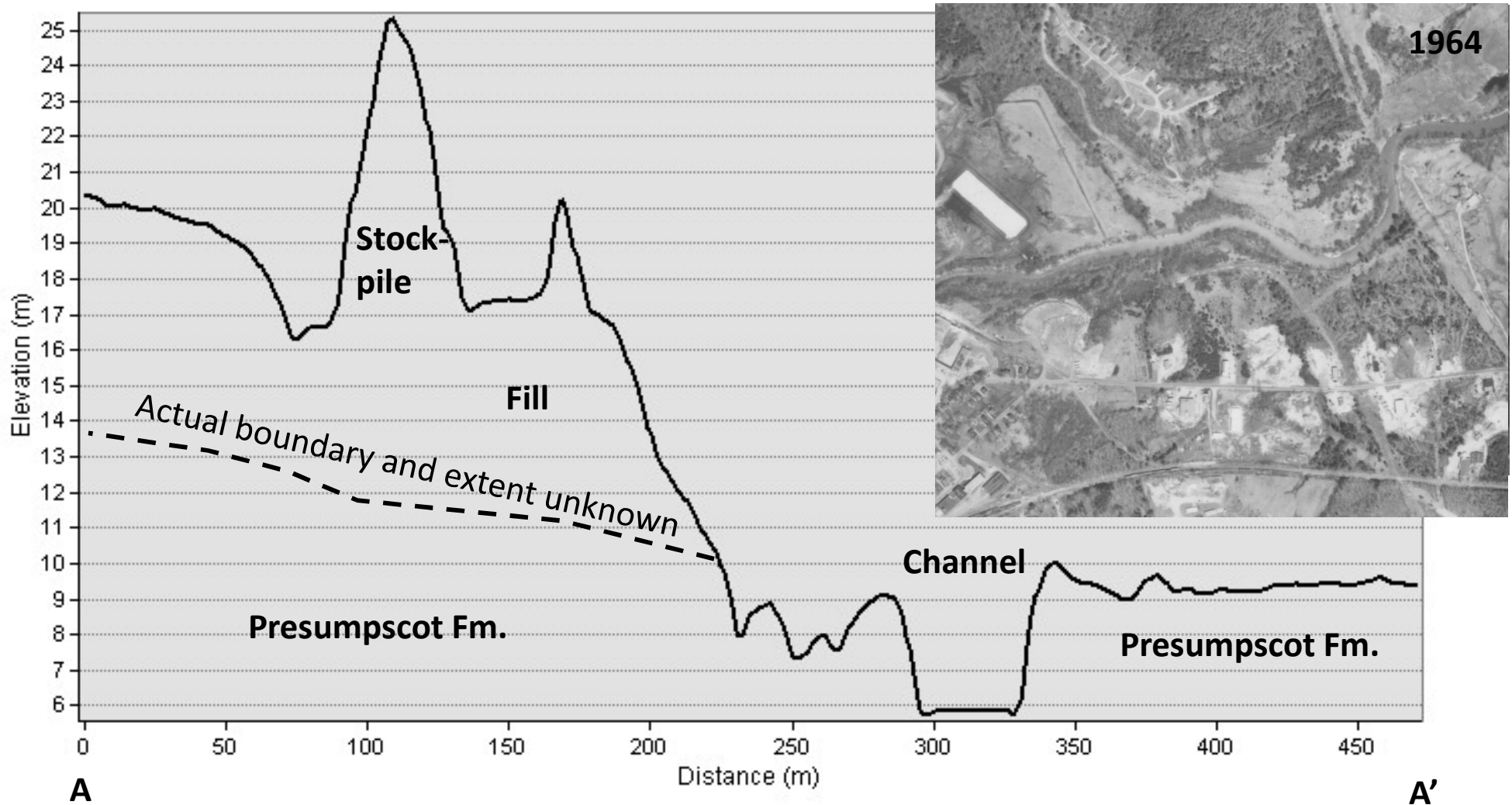
Photo: Portland Pipe Corp.

## 2020 Event Local Geology: Fill over Presumpscot Formation

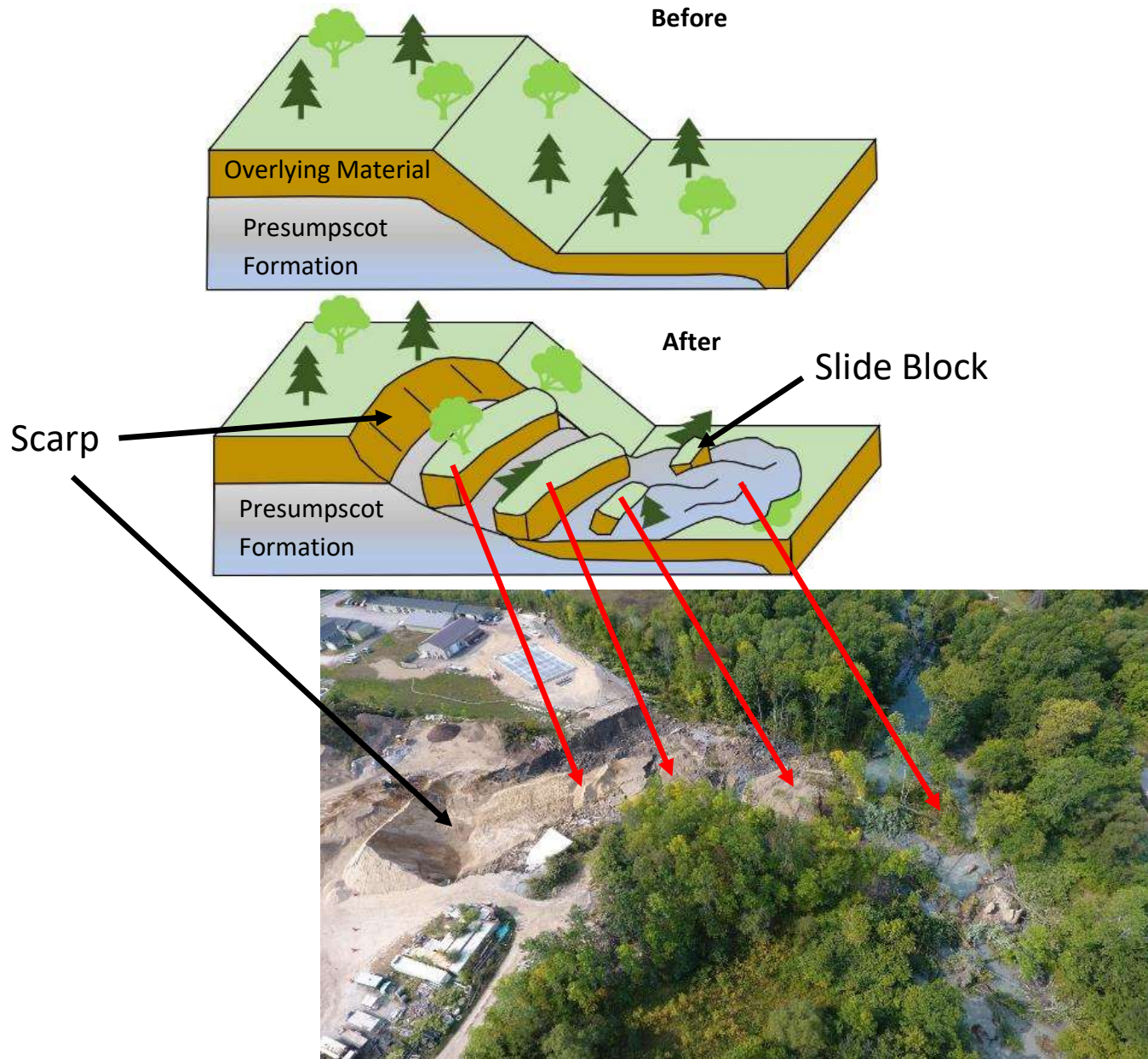


Photo: SAPPI or City of Westbrook

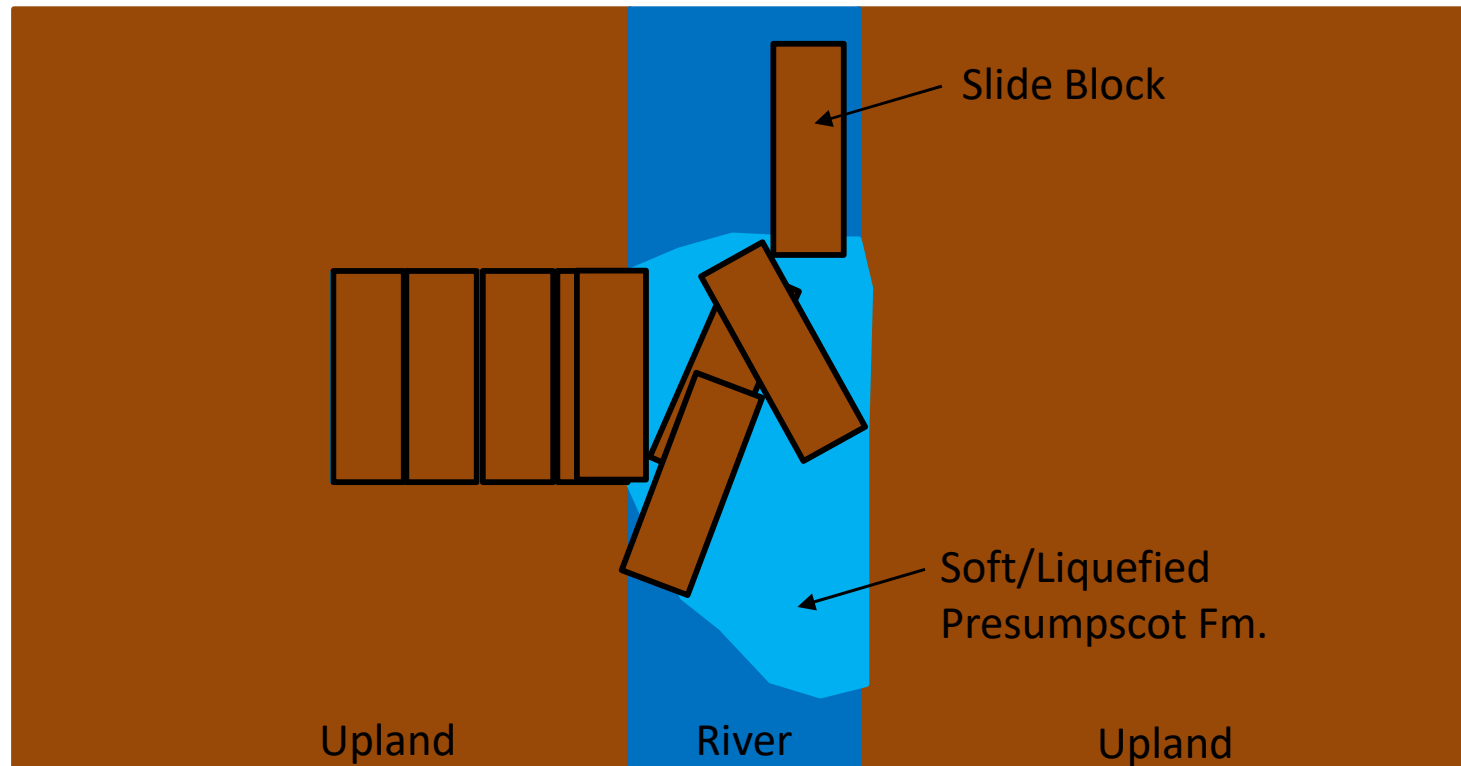
Pre-Landslide Lidar Cross Section



## 2020 Event Landslide Morphology: Retrogressive Spread



## Retrogressive Landslide: Map View



## Rafted Slide Blocks -> Islands



Photo: SAPPI or City of Westbrook

## Rafted Slide Blocks -> Islands



## Known Factor: PRESUMPCOT FORMATION



## Possible Factor: Overburden Weight



Photo: SAPPI or City of Westbrook

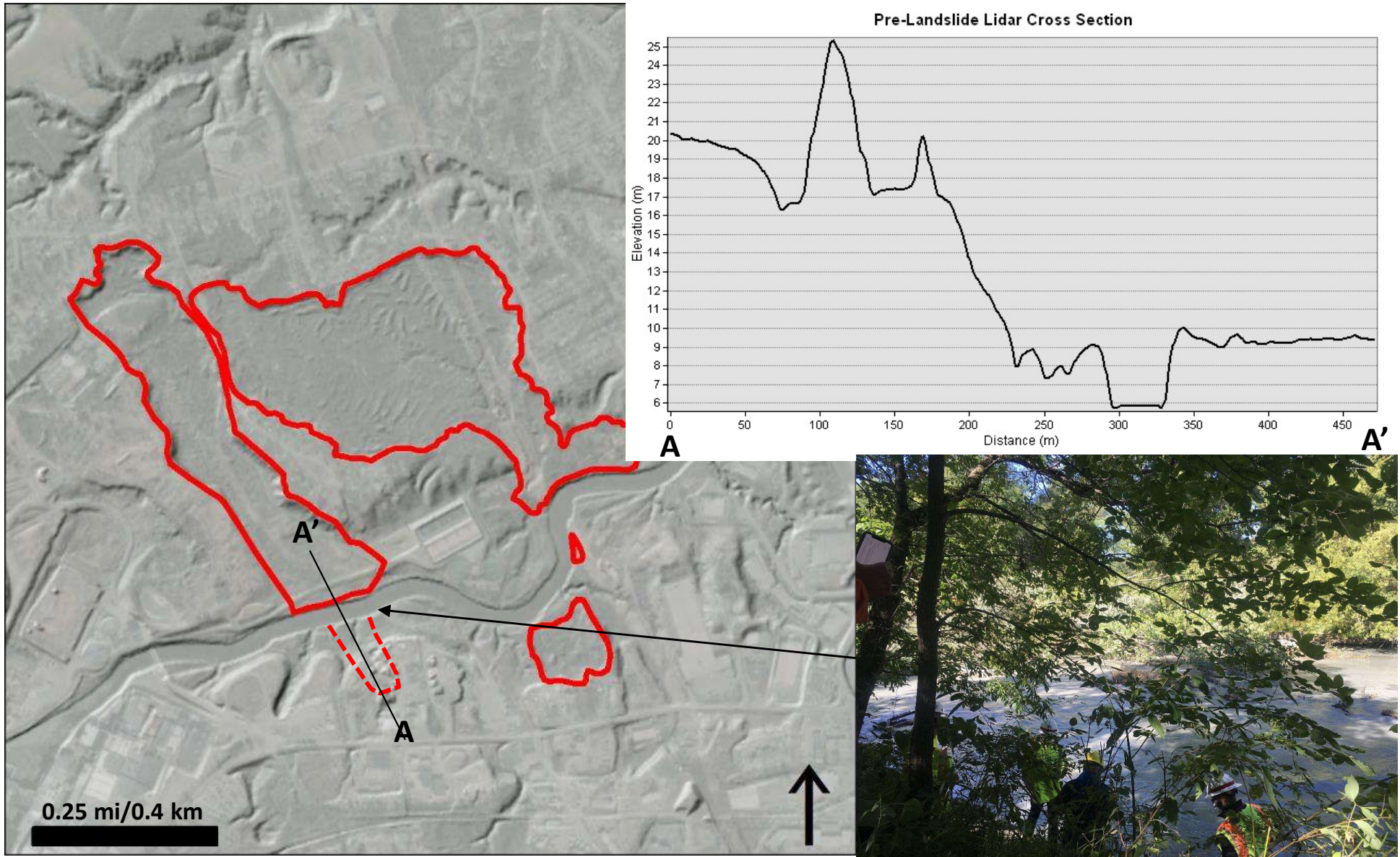
## Possible Factor: Overburden Weight



## Possible Factor: Vibration

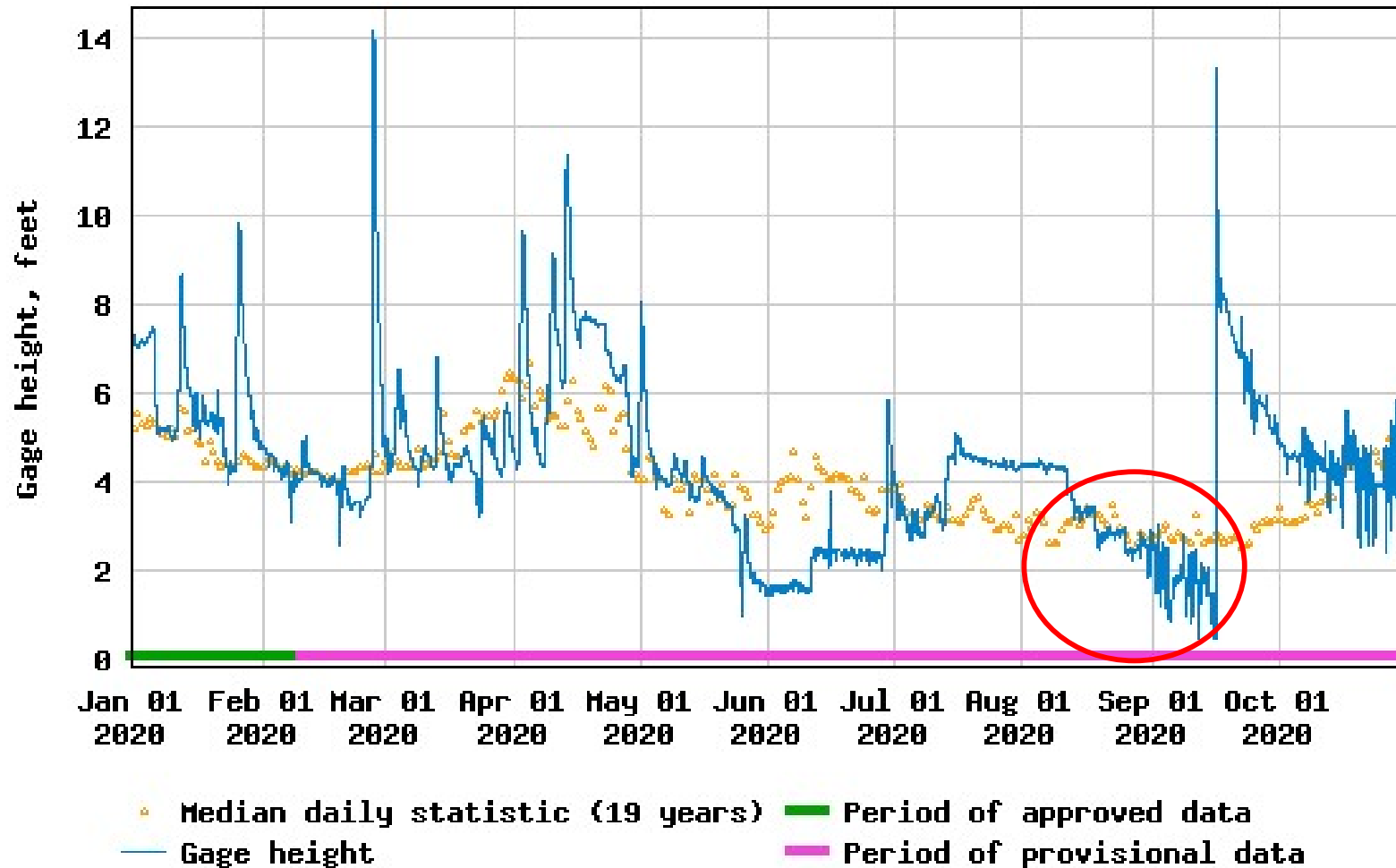


## Possible Factor: Exposed Banks



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USGS 01064110 Presumpscot River at Westbrook, Maine



## More Information:

- Maine Geological Survey Landslide Page:
  - <https://www.maine.gov/dacf/mgs/hazards/landslides/index.shtml>
- Maine Geological Survey Webmap (easily browse lidar and popular datasets):
  - <https://experience.arcgis.com/experience/cfbc9177649b466795c1f0d3f18f1f40>

