



# A GIS Flood Tool for Mapping Extent of Inundation

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# Motivation

- Floods consistently account for a major portion of the world's annual loss of life and property to natural disasters
- Many developing country communities lack flood mapping to build scenarios for mitigation and response planning
- USGS developed the GIS Flood Tool (GFT) with support from the USAID OFDA
- UNEP and Global Risk Identification Program
- Testing and training support by Riverside Technology inc. (RTi) of Fort Collins, Colorado

# GFT Concepts

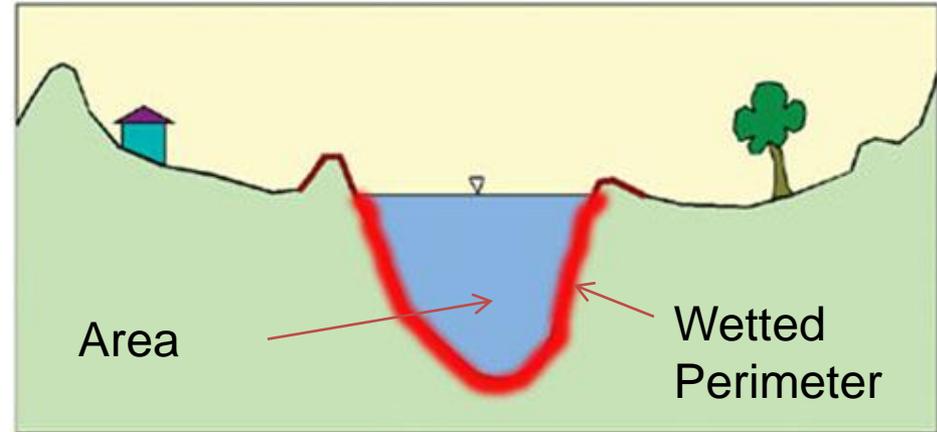
- A tool to produce flood inundation patterns given either:
  - A specified discharge ( $\text{m}^3/\text{s}$ )
  - A specified stage (m)
- Translation of discharge to stage is done using the ***Manning equation*** for flow in an open channel
- Mapping of stage onto land surface is done using a ***Relative DEM***

# GFT Software

- ArcGIS-based tools, written in Python and VBA
- Uses DEMs to:
  - Derive stream network
  - Develop cross-sectional information
  - Provide base for inundation mapping
- Can work with any DEM
- For our workshops, we used hydrologically conditioned SRTM data (HydroSHEDS-FM)

# Manning Equation

$$V = \frac{1}{n} R^{2/3} \sqrt{S}$$



Where:

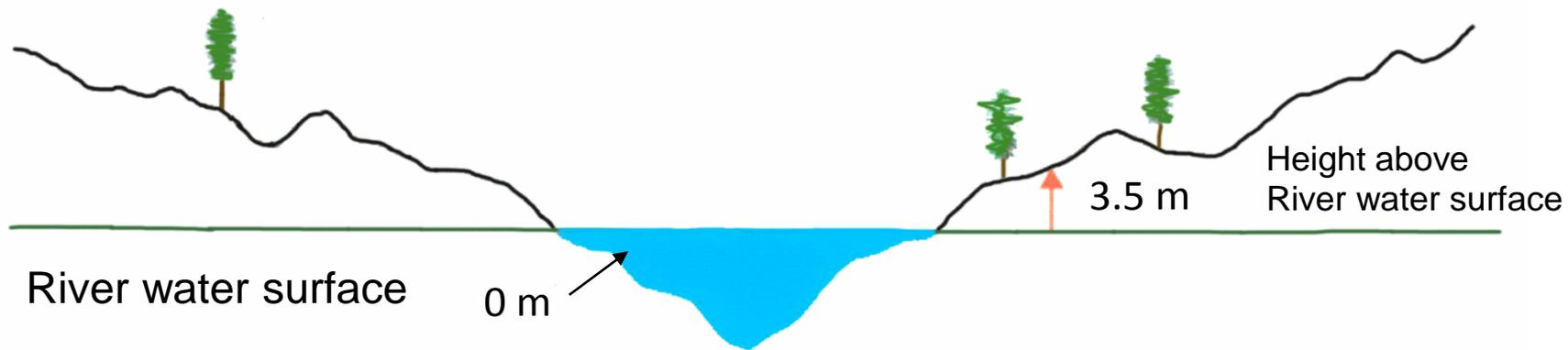
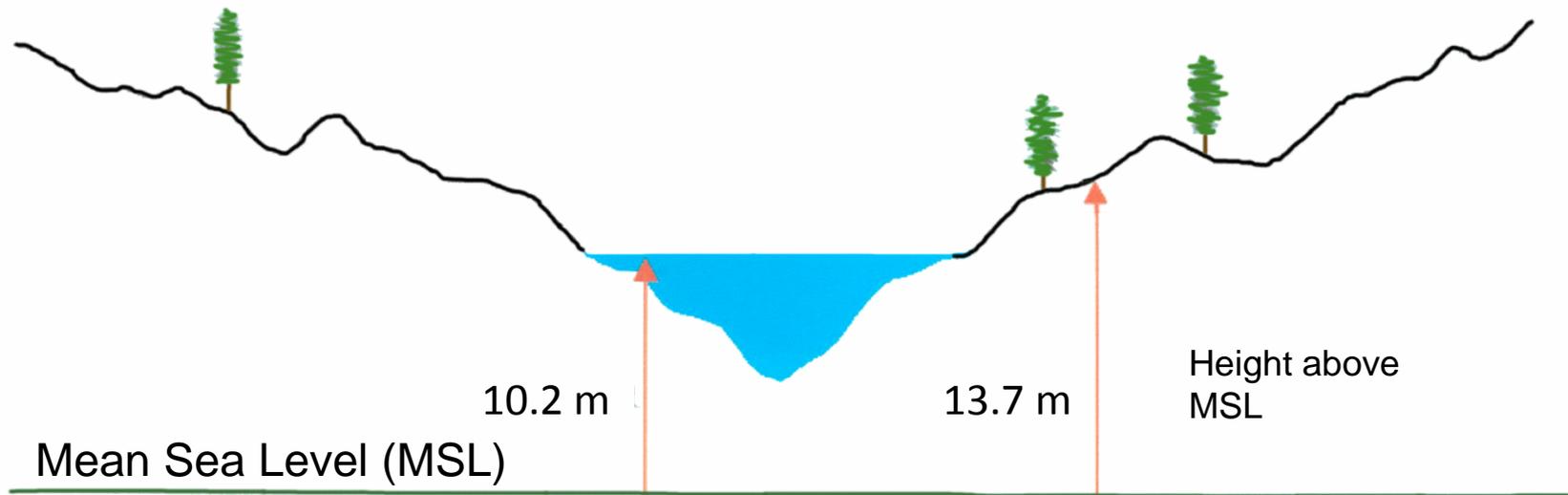
**V** = mean velocity in meters/second

**R** = hydraulic radius in meters

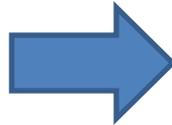
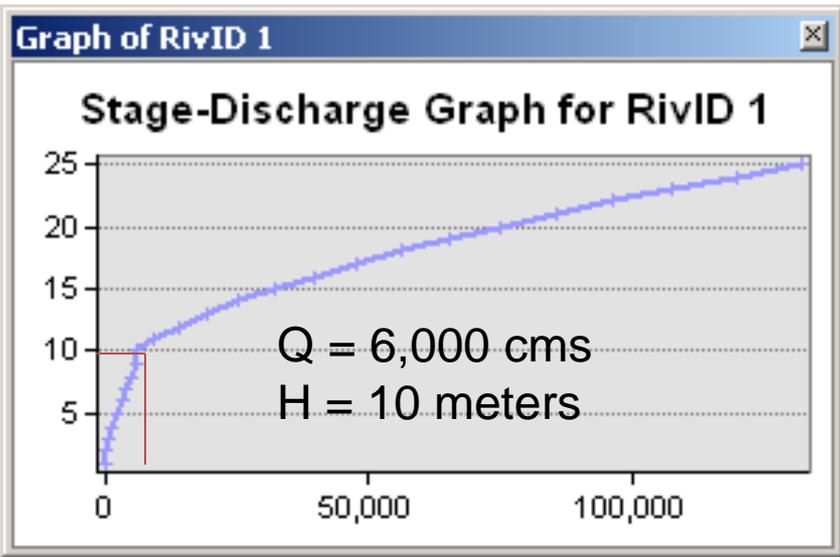
**S** = slope of the energy line

**n** = coefficient of roughness (“Manning’s n”)

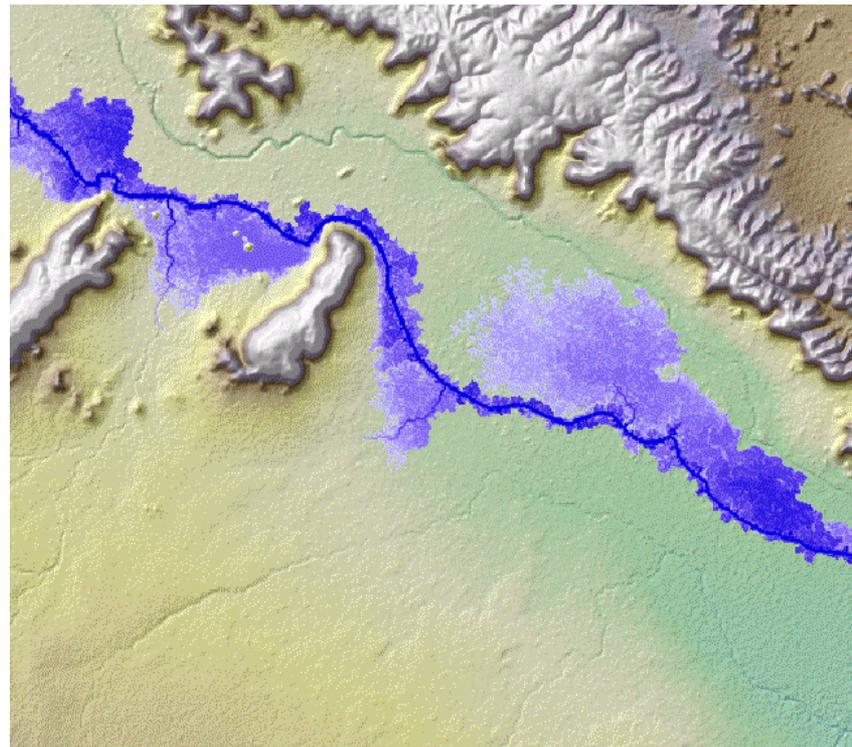
**Q** = discharge (m<sup>3</sup>/sec)



### Concept of Relative DEM



Query Relative DEM for all values less than 10 meter



# Training Workshops

- Kenya (Sept 2010) at RCMRD in Nairobi
- Riverside Technology Inc. in Ethiopia (Jan 2012)
- Review concepts of GIS, DEMs, and flood hydrology
- Achieve proficiency in the use of the GFT to:
  - Map the extent of inundation for a given discharge
  - Create a library of inundation maps corresponding to regular increments of stage
- Apply the GFT to participant flood inundation problems

# Thank you



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