



OWP | OFFICE OF  
WATER  
PREDICTION

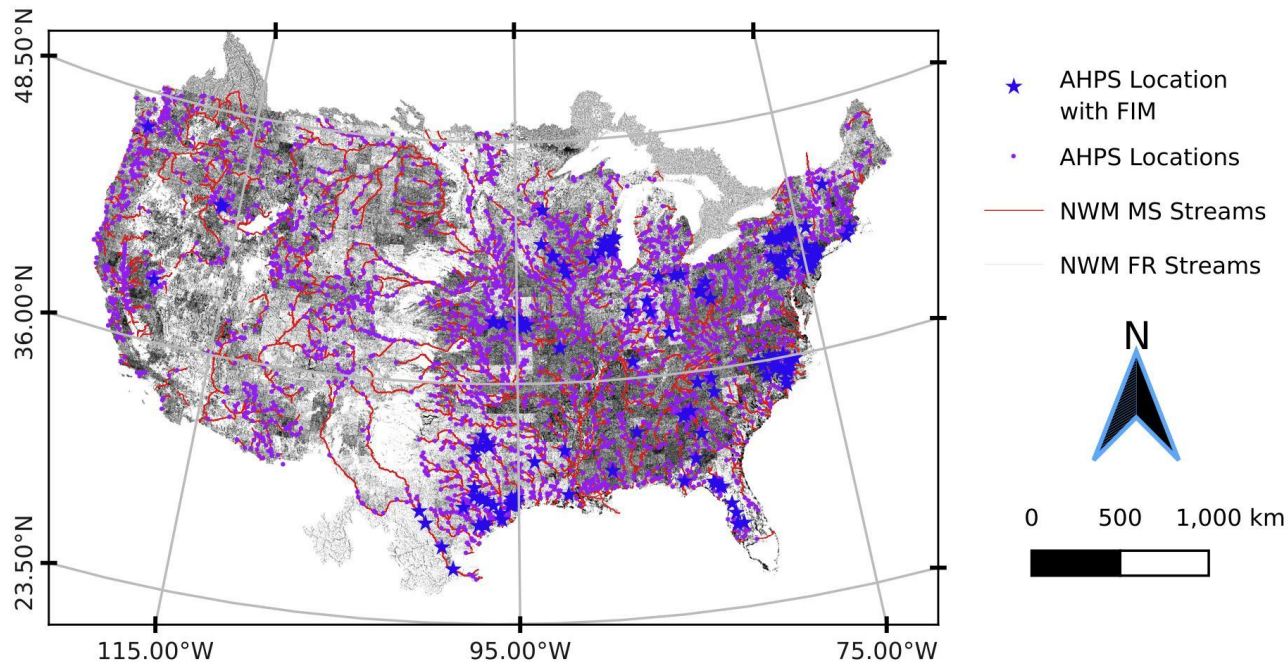
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# **Assimilation of High Resolution Elevation Data For Continental Scale Flood Inundation Mapping Derived from Height Above Nearest Drainage**

*Fernando Aristizabal, Fernando Salas, Jasmeet Judge, Taher Chegini*



# National Water Model



- FR = Full Resolution. Entire NWM stream network
- MS = Mainstems. 4% of FR network. All streams at or downstream of AHPS points

# Height Above Nearest Drainage (HAND) Method

Digital Elevation Model (DEM)

80.1	80.2	80.3	82.1	82.1
80.1	80	80	80.5	82.1
81.2	80.8	79	78.6	79.5
82.1	79.3	78.3	78	76.2
82.1	80.5	79.2	76.1	76

- Height Above Global Datum -

Relative Elevation Model (REM)

0.1	0.2	0.3	2.1	2.1
0.1	0	0	0.5	2.1
1.2	0.8	0	0.6	1.5
2.1	1.3	0.3	0	0.2
4.1	1.5	1.2	0.1	0

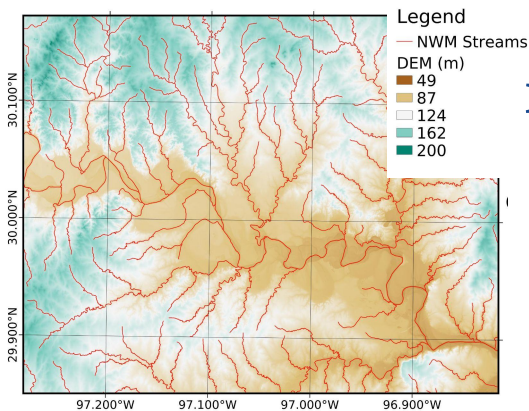
- Height Above Local Channel  
(i.e. nearest drainage) -

Geospatial

Processing

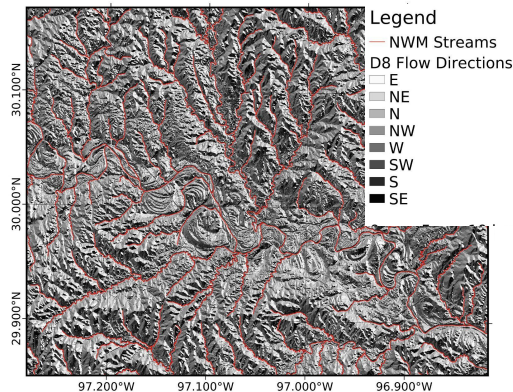


# Height Above Nearest Drainage + Synthetic Rating Curves

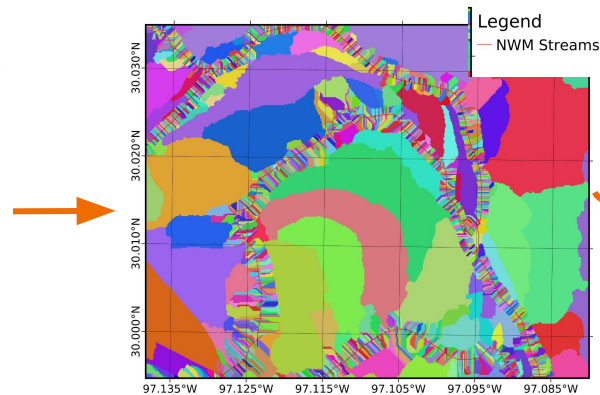


DEM

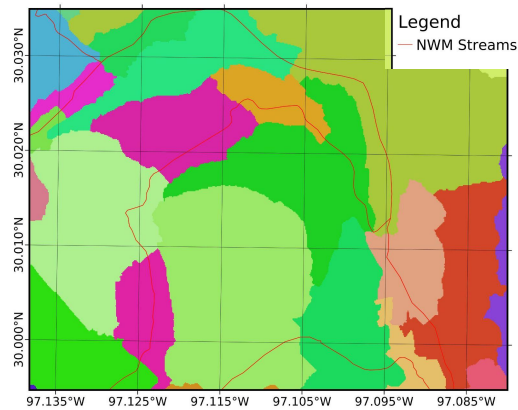
Hydro-Con  
ditioning



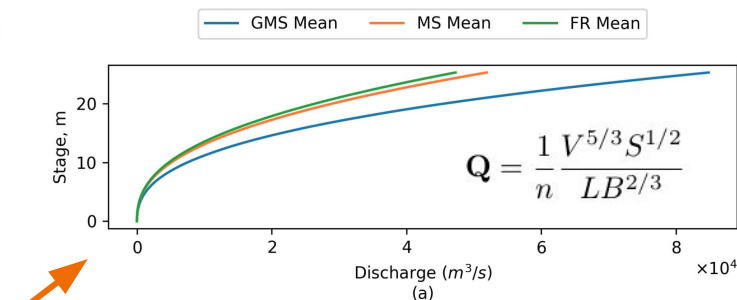
D8 Flow Directions



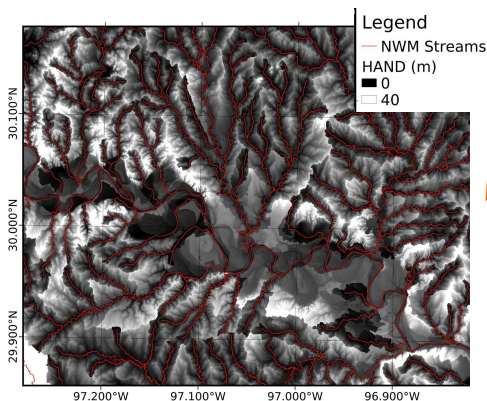
Stream Pixel Catchments



Reach Catchments



SRCs



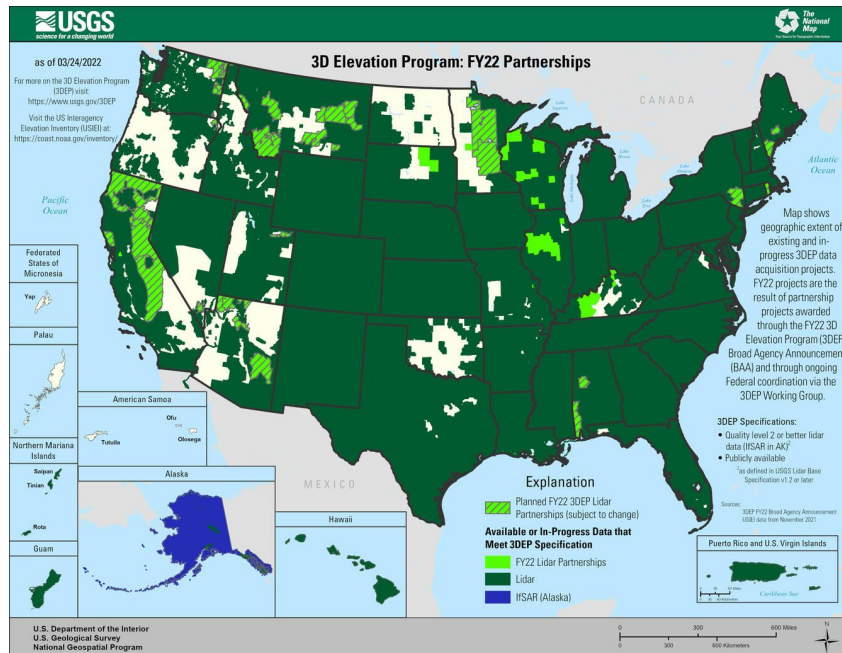
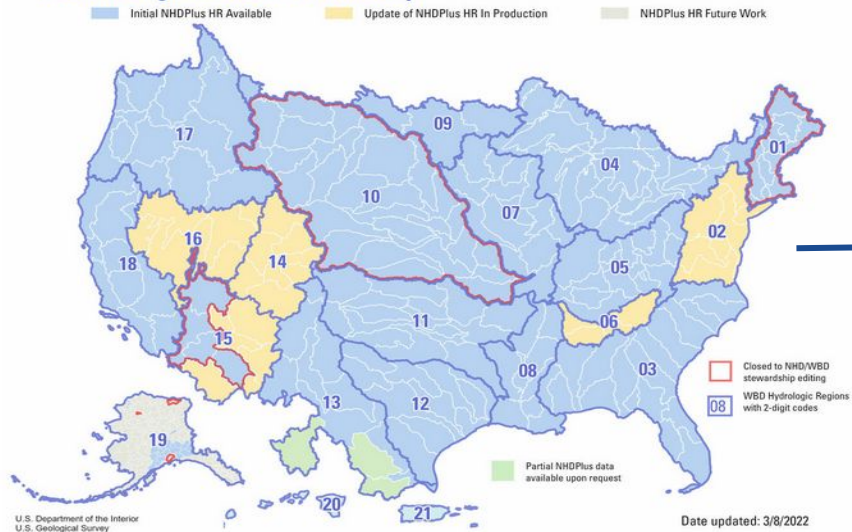
HAND

# DEM Data Sources

## NHDPlusHR vs 3DEP



### NHDPlus High Resolution Availability



# DEM Mosaicing and Retrieval

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## noaa-owp/inundation-mapping

- Acquire\_and\_preprocess\_inputs.py
- User defined list of HUC4's and block size
- Acquires 3DEP data in parallel using Dask
- Mosaics blocks to VRT

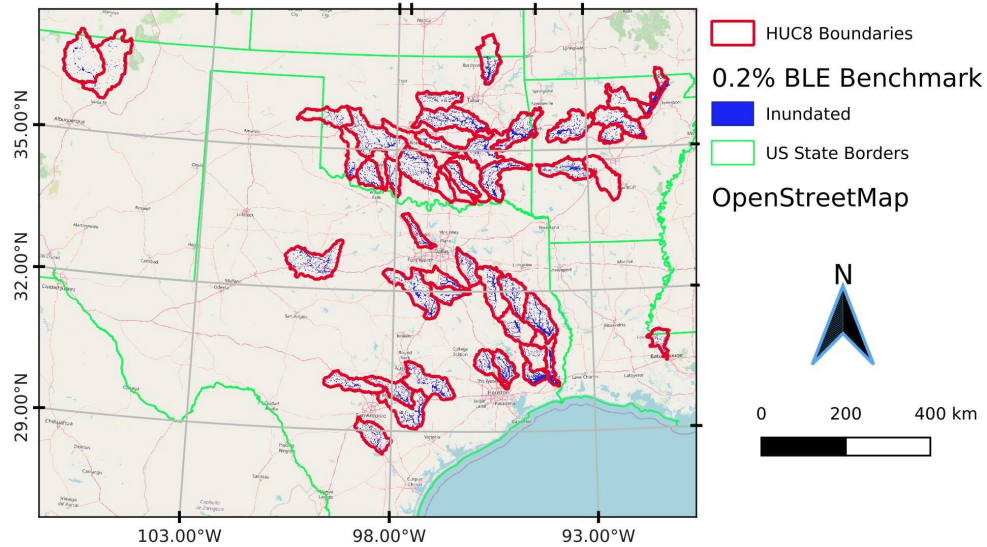
## Py3DEP

Python API returning xarray

## 3DEPElevation (ImageServer)

- Querying
- Mosaicing
- Resampling
- Sources:  
1,3,5,10,30m

# Study Domain

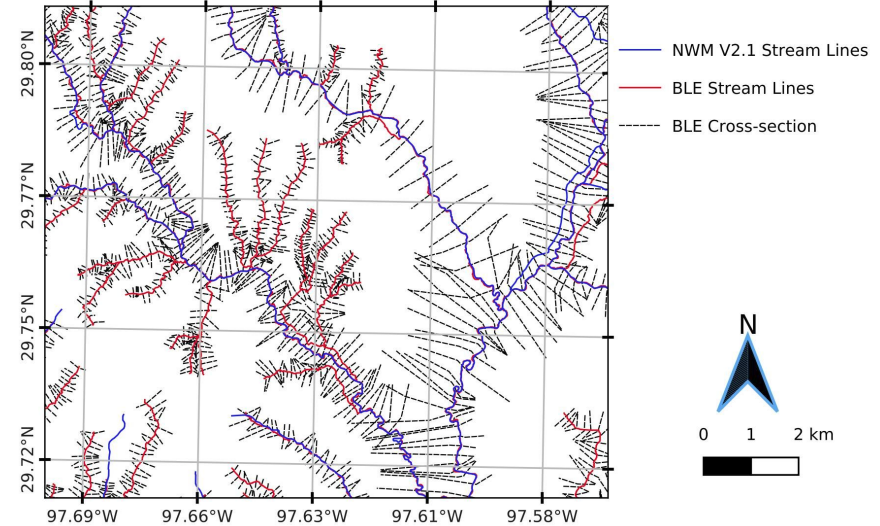


## Source

Base Level  
Engineering  
(BLE)

## Entity

FEMA Region 6



## Model

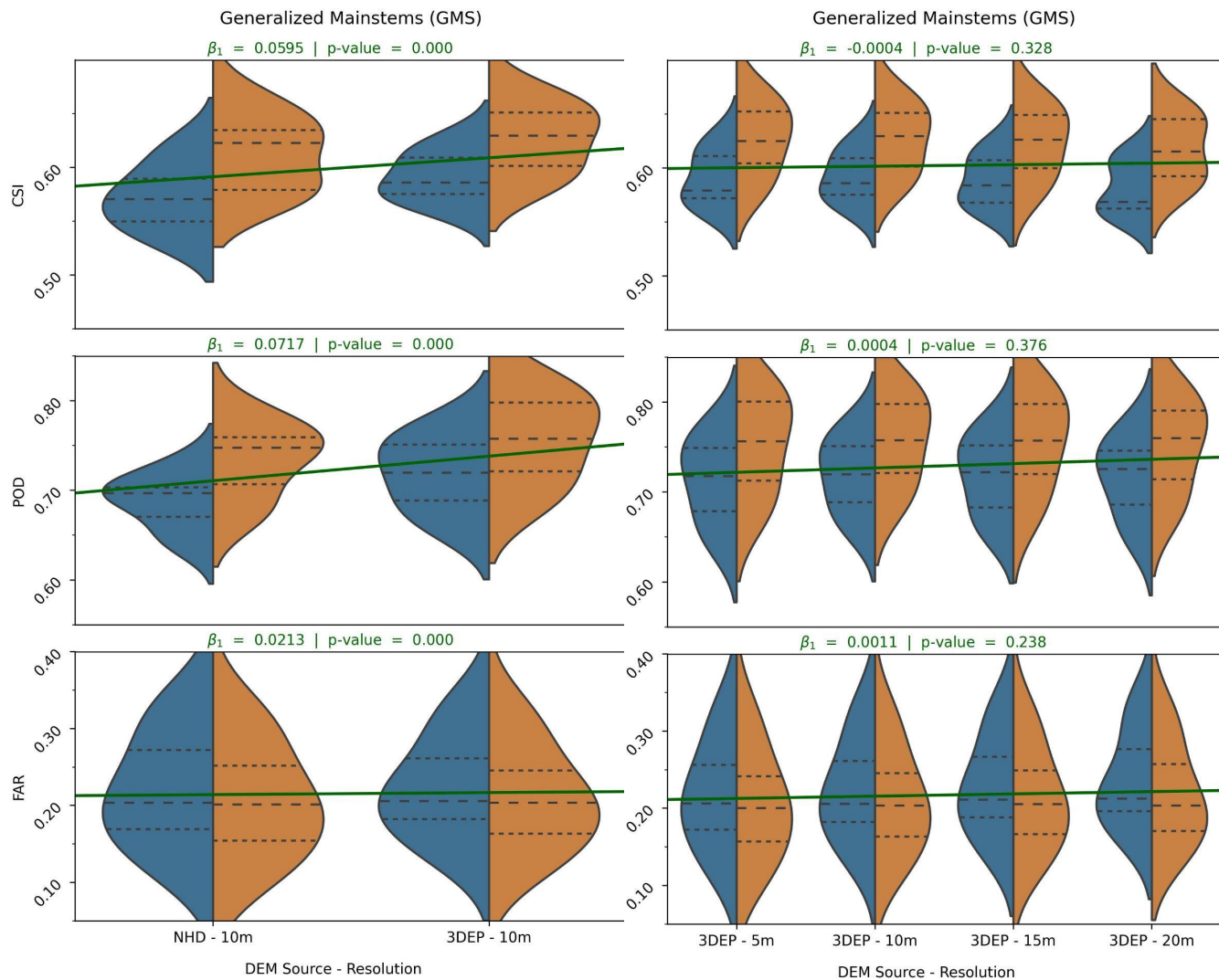
HEC-RAS 1D

## Magnitudes

100yr (1%)  
500yr (0.2%)



# Results







## Conclusions

- Utilization of 3DEP DEM at 10m resolution likely improves FIM skill when compared to NHDPlusHR DEM
  - This is most likely due to the more rapid integration within 3DEP of enhanced vertical accuracy data from Lidar derived sources.
- Varying DEM resolution shows no clear relationship with FIM skill thus no current evidence to change resolution.

## Future Work

- Evaluate regions by source availability
- Expand evaluations to more regions with more 1m Lidar availability
- Explore finer scale evaluations
  - Effects of higher spatial resolutions maybe more evident at more local scales



# More Resources



## Resources



# ESSOAr

Earth and Space Science Open Archive

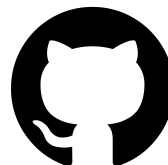
Reducing Horton-Strahler Stream Order Can Enhance  
Flood Inundation Mapping Skill with Applications for the  
U.S. National Water Model



# GitHub

NOAA-OWP/inundation-mapping

## Fernando Aristizabal



## Partners

**UF** UNIVERSITY of  
FLORIDA

**Lynker**  
An Employee-Owned Company

UNIVERSITY of  
**HOUSTON**