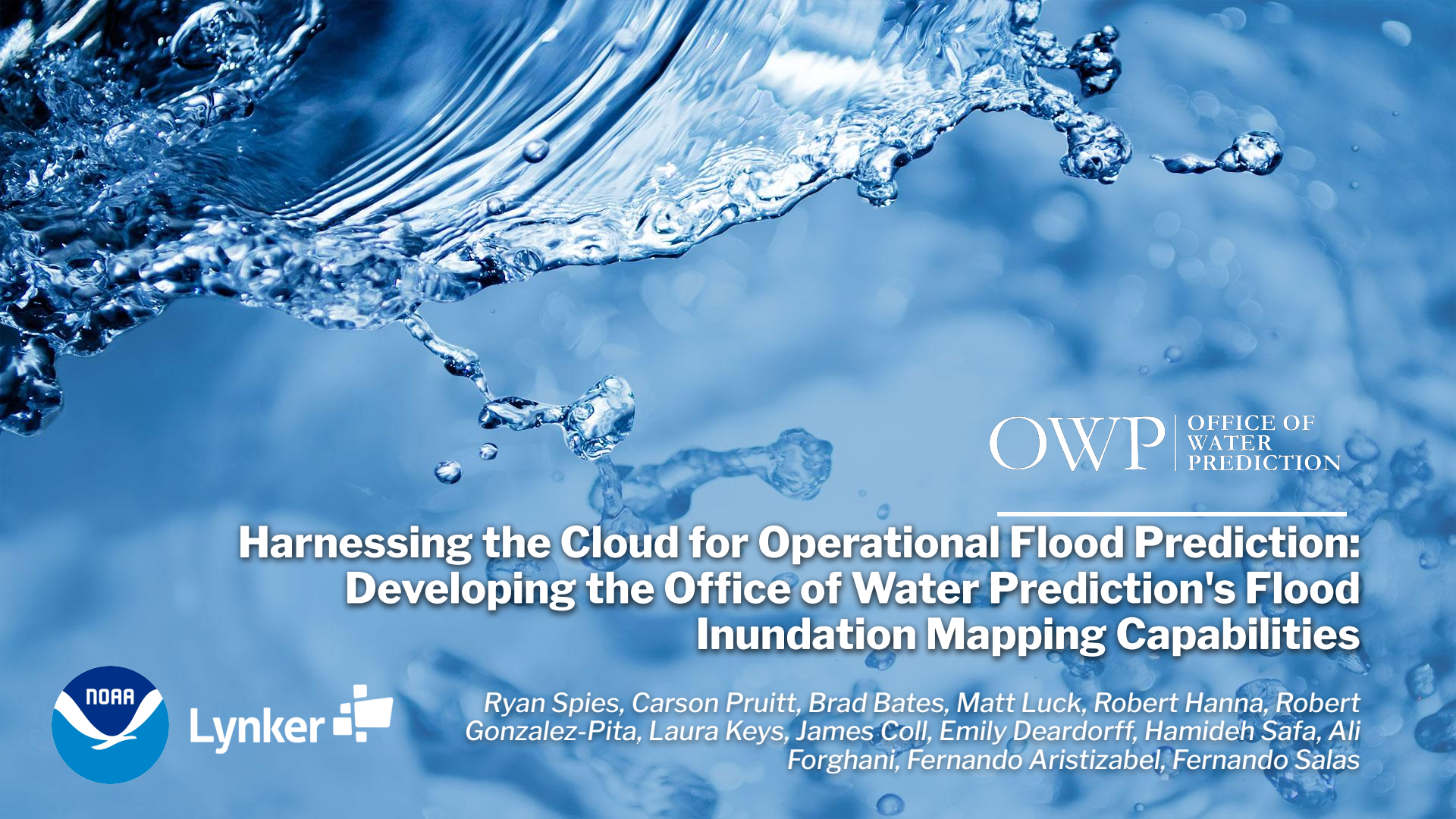
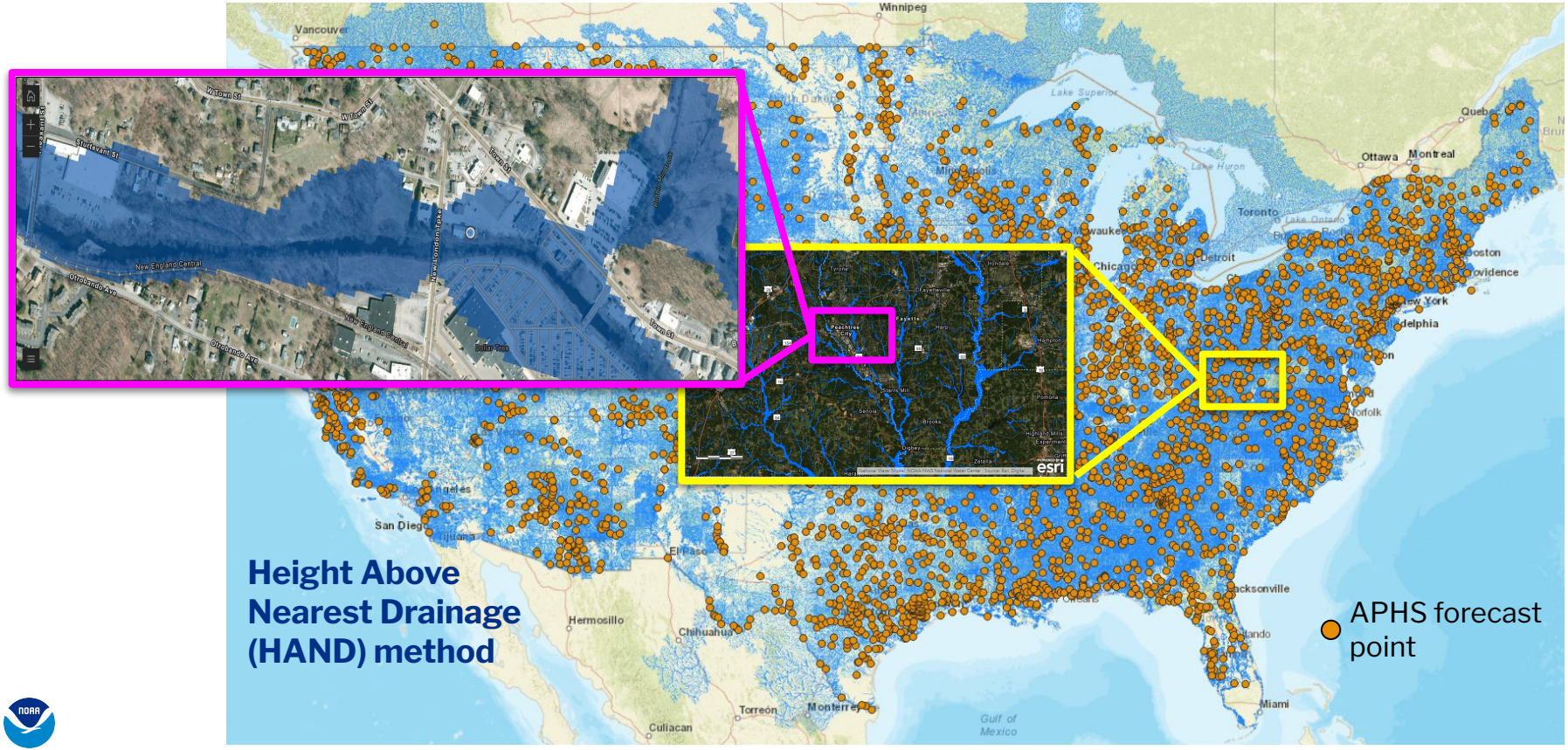


OWP | OFFICE OF WATER PREDICTION

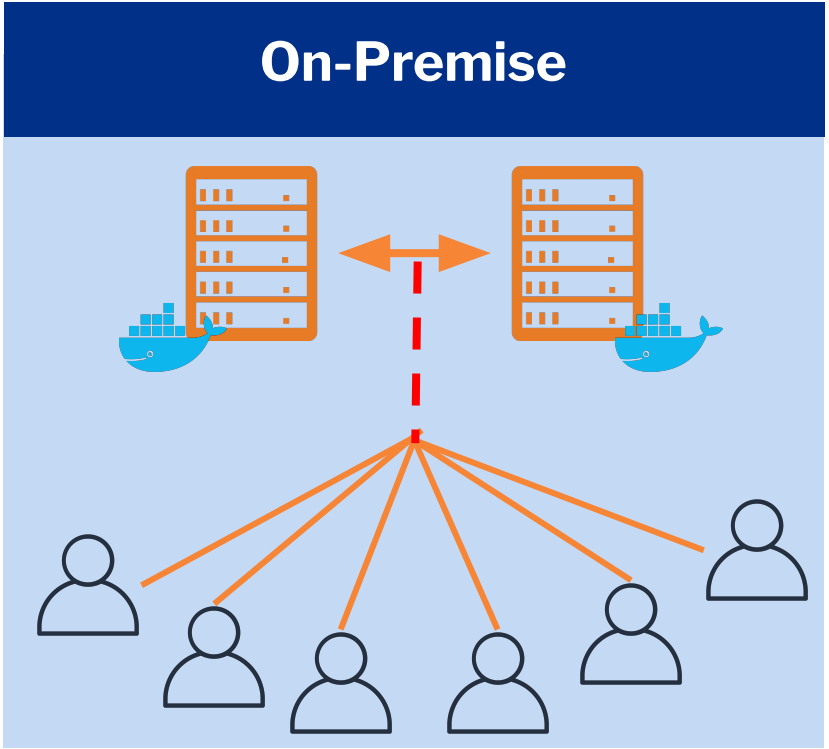
Harnessing the Cloud for Operational Flood Prediction: Developing the Office of Water Prediction's Flood Inundation Mapping Capabilities

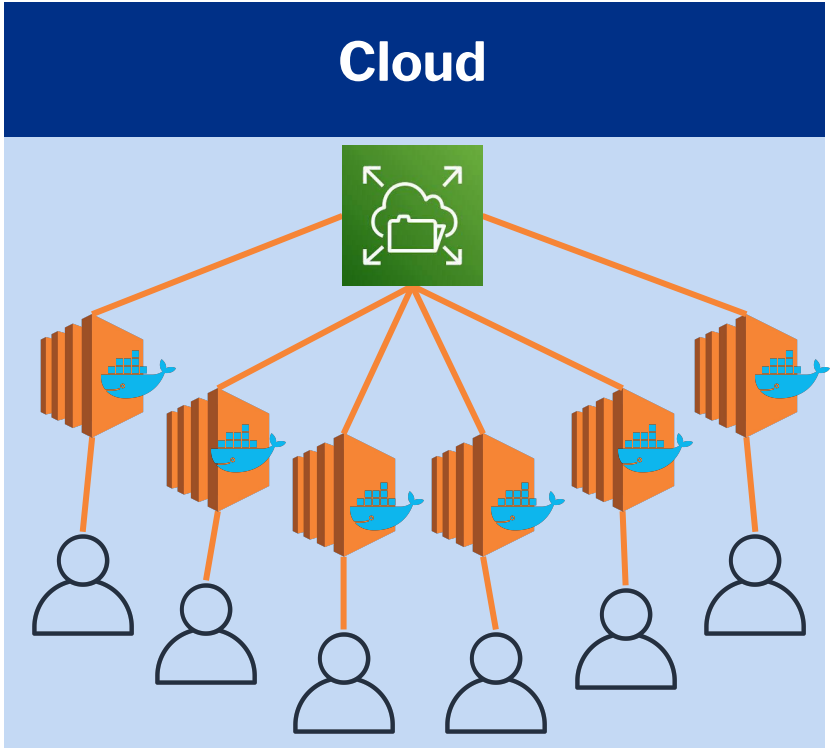
Ryan Spies, Carson Pruitt, Brad Bates, Matt Luck, Robert Hanna, Robert Gonzalez-Pita, Laura Keys, James Coll, Emily Deardorff, Hamideh Safa, Ali Forghani, Fernando Aristizabel, Fernando Salas

OWP has developed a continental scale flood inundation mapping system leveraging the National Water Model.



Development activities are migrating to cloud systems to expedite enhancements and operationalization.

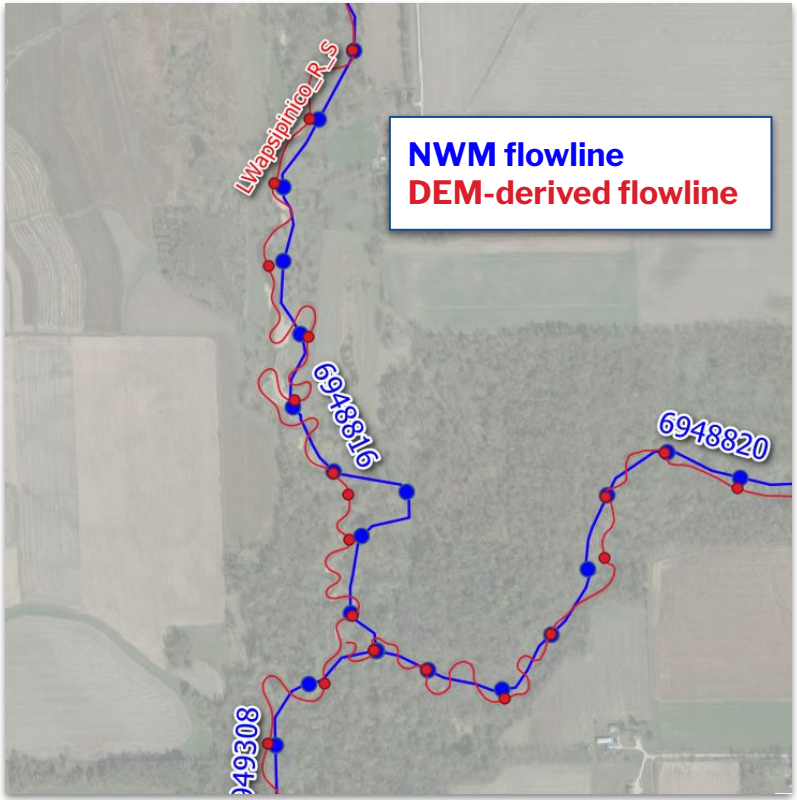


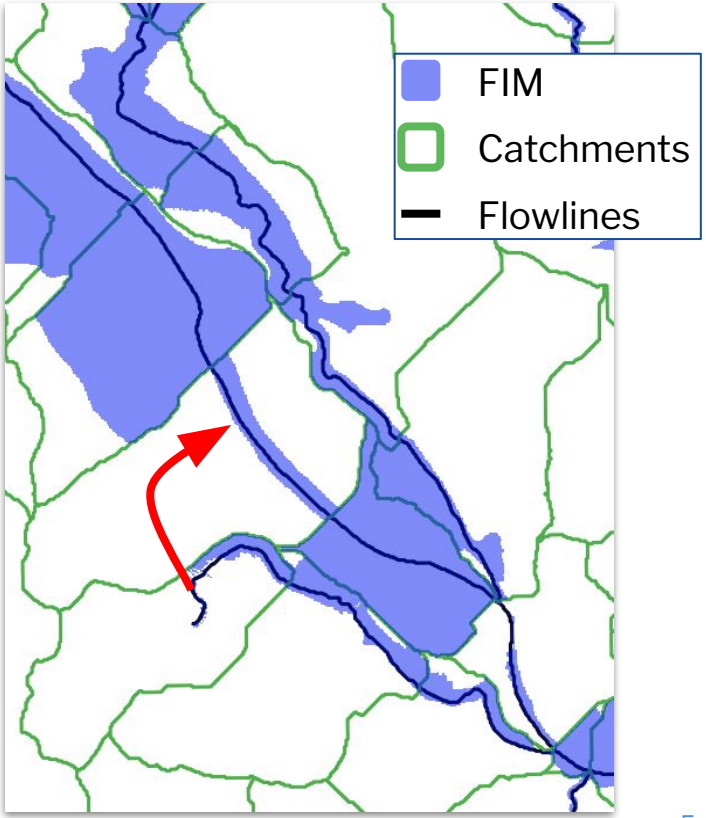


Primary method for producing inundation services relies on the Height Above Nearest Drainage (HAND) model.

NOAA-OWP/inundation-mapping

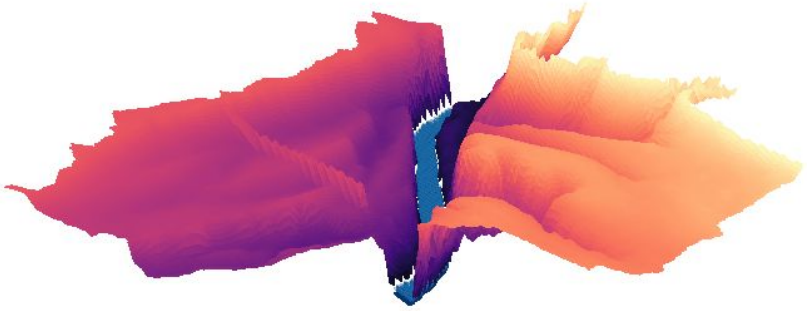
Testing options for improving the conflation method for relating NWM flowlines to the terrain derived flowlines.



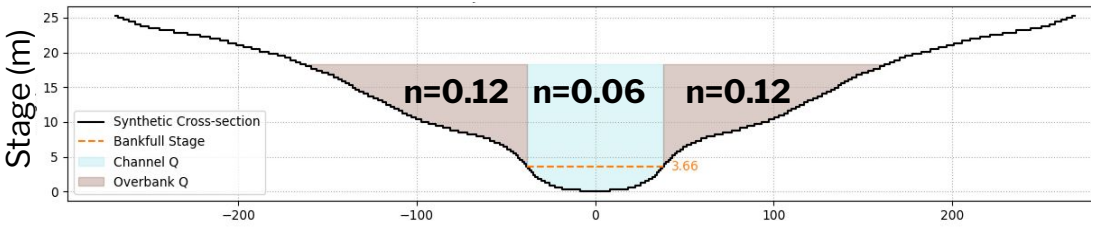


Reach averaged synthetic rating curves provide a method for converting streamflow to water surface elevation.

HAND Catchment

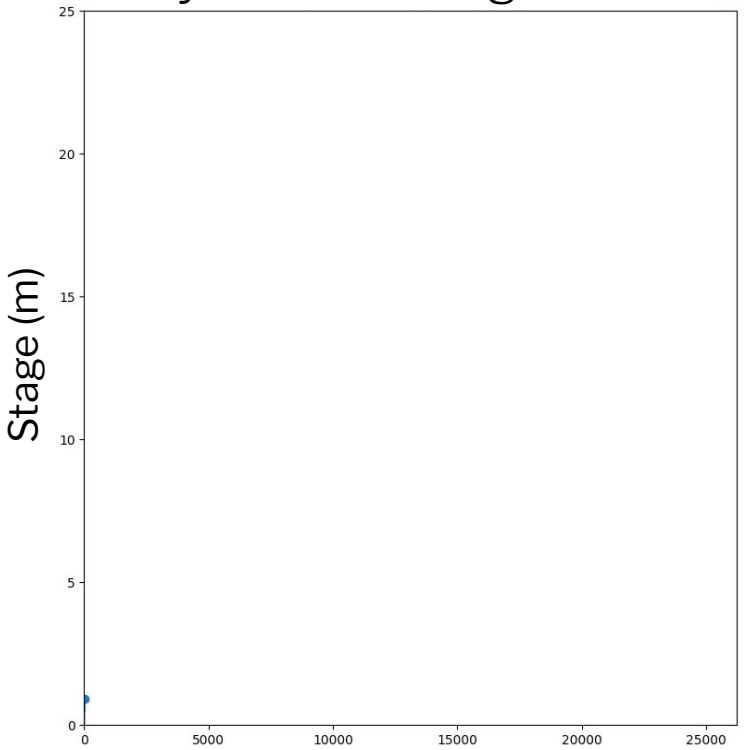


Synthetic Cross Section (Reach Average)



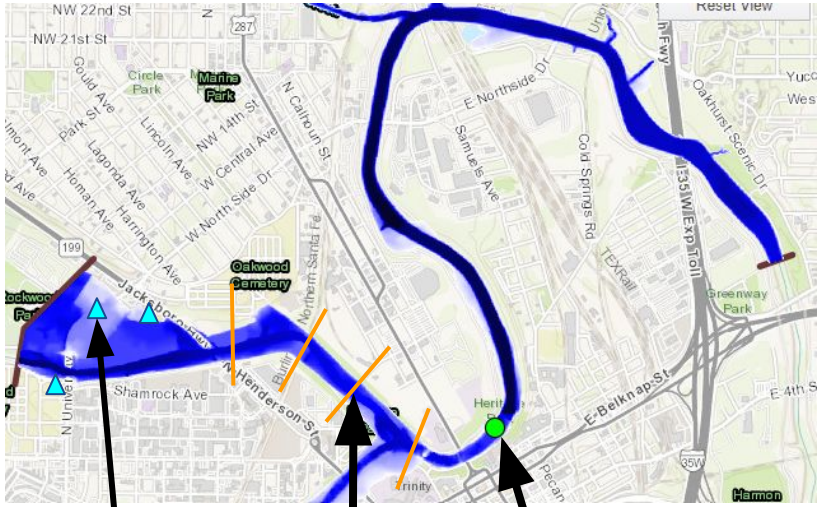
Distance from Thalweg (m)

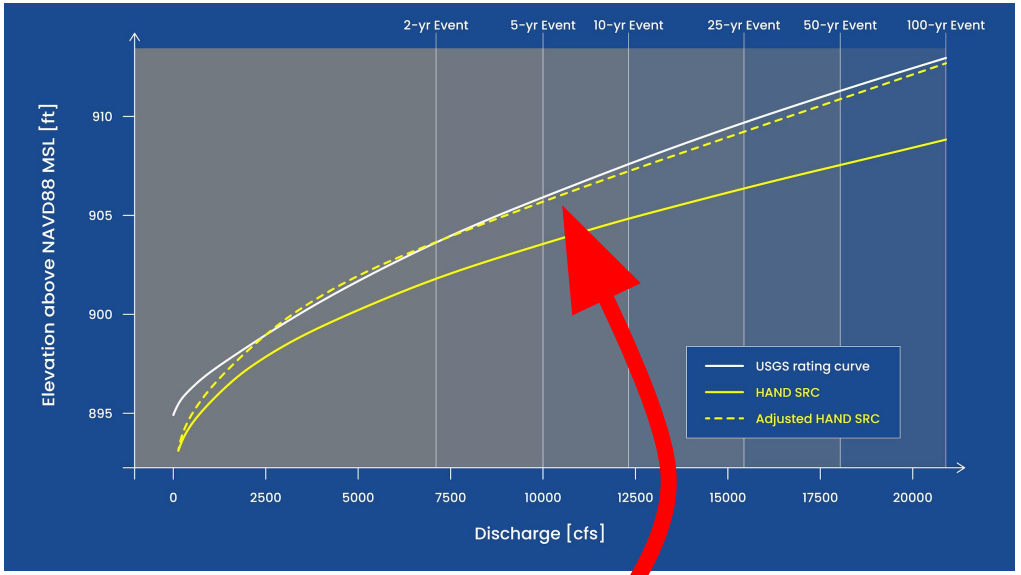
Synthetic Rating Curve



Discharge (cms)

Calibration methods are expanding to include multiple sources of “benchmark” data.





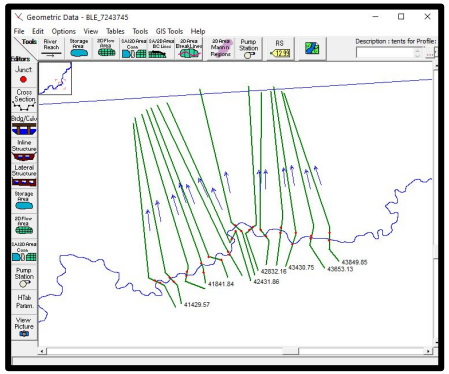
High Water Mark/Report

HEC-RAS model cross section rating

USGS rating curve

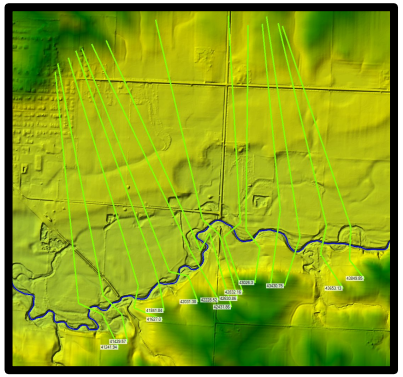
Calibration Coef
(Manning’s Equation)

Modeling methods are expanding to operationalize the vast library of existing HEC-RAS models.



Geospatial HEC-RAS 1D Model

+



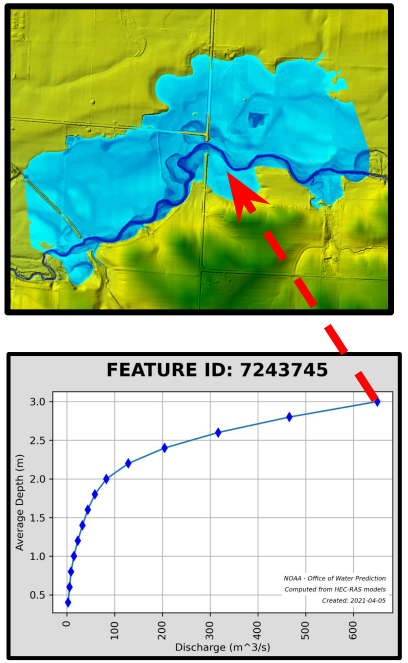
Detailed Bare Earth DEM

+

```
# ***********ngyge**********
df_huc12 = gpd.read_file(str_huc12_area_shp)
int_huc12_index = 0

# Loop through each HUC-12
for i in df_huc12.index:
    str_huc12 = str(df_huc12['HUC_12'][i])
    int_huc12_index += 1
    print(str_huc12)

    # Constant - Folder to write the HEC-RAS folders and files
    str_root_folder_to_create = STR_ROOT_OUTPUT_DIRECTORY
    + '\\HUC_' + str_huc12

    # Select all the 'feature_id' in a given huc12
    df_streams_huc12 = df_streams_merge_2.query('huc12 == @str_huc12')

    # Reset the query index
    df_streams_huc12 = df_streams_huc12.reset_index()

    # Create a folder for the HUC-12 area
    os.makedirs(str_root_folder_to_create, exist_ok=True)

    for i in range(len(df_streams_huc12)):
        str_feature_id = str(df_streams_huc12.loc[[i], 'feature_id'].values[0])
        flt_us_xs = float(df_streams_huc12.loc[[i], 'us_xs'].values[0])
        flt_ds_xs = float(df_streams_huc12.loc[[i], 'ds_xs'].values[0])
        flt_max_q = float(df_streams_huc12.loc[[i], 'peak_flow'].values[0])
        flt_max_q = flt_max_q * FLT_MAX_MULTIPLY
        str_geom_path = df_streams_huc12.loc[[i], 'ras_path'].values[0]
        int_max_q = int(flt_max_q)

        # create a folder for each feature_id
        str_path_to_create = str_root_folder_to_create + '\\' + str_feature_id
        os.makedirs(str_path_to_create, exist_ok=True)

        # create a HEC-RAS folder
        str_hecras_path_to_create = str_path_to_create + '\\HEC-RAS'
        os.makedirs(str_hecras_path_to_create, exist_ok=True)

        print(str_feature_id + ': ' + str_geom_path + ': ' + str(int_max_q))

        # create the HEC-RAS truncated models
        try:
            # sometimes the HEC-RAS model
            # does not run (example: duplicate points)

            river = fn_create_hecras_files(str_feature_id,
                                           str_geom_path,
                                           flt_ds_xs,
                                           flt_us_xs,
```

RAS2FIM Custom Python Scripts

=

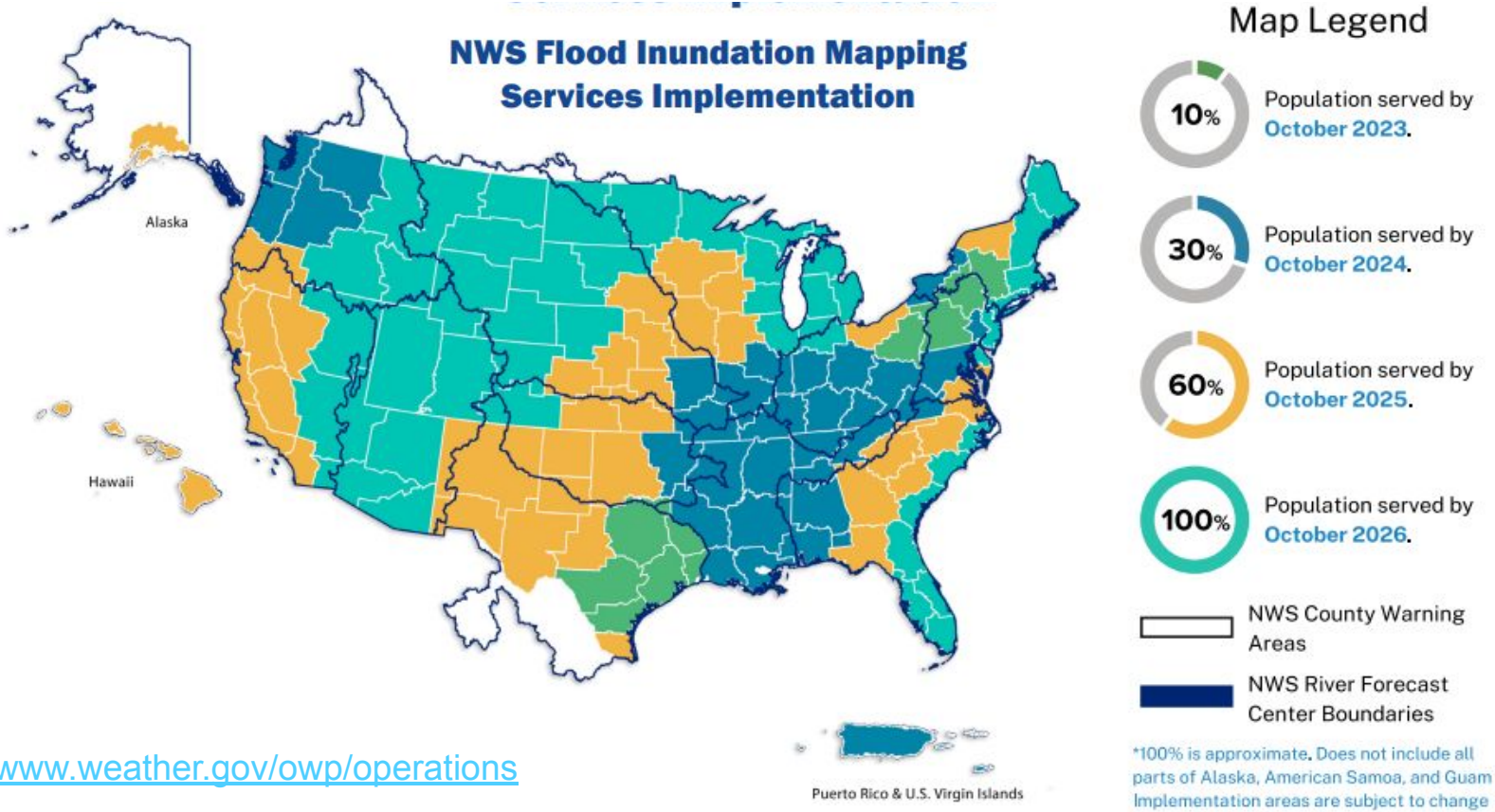


Flood Inundation Map library and Synthetic Rating Curves

NOAA-OWP/ras2fim

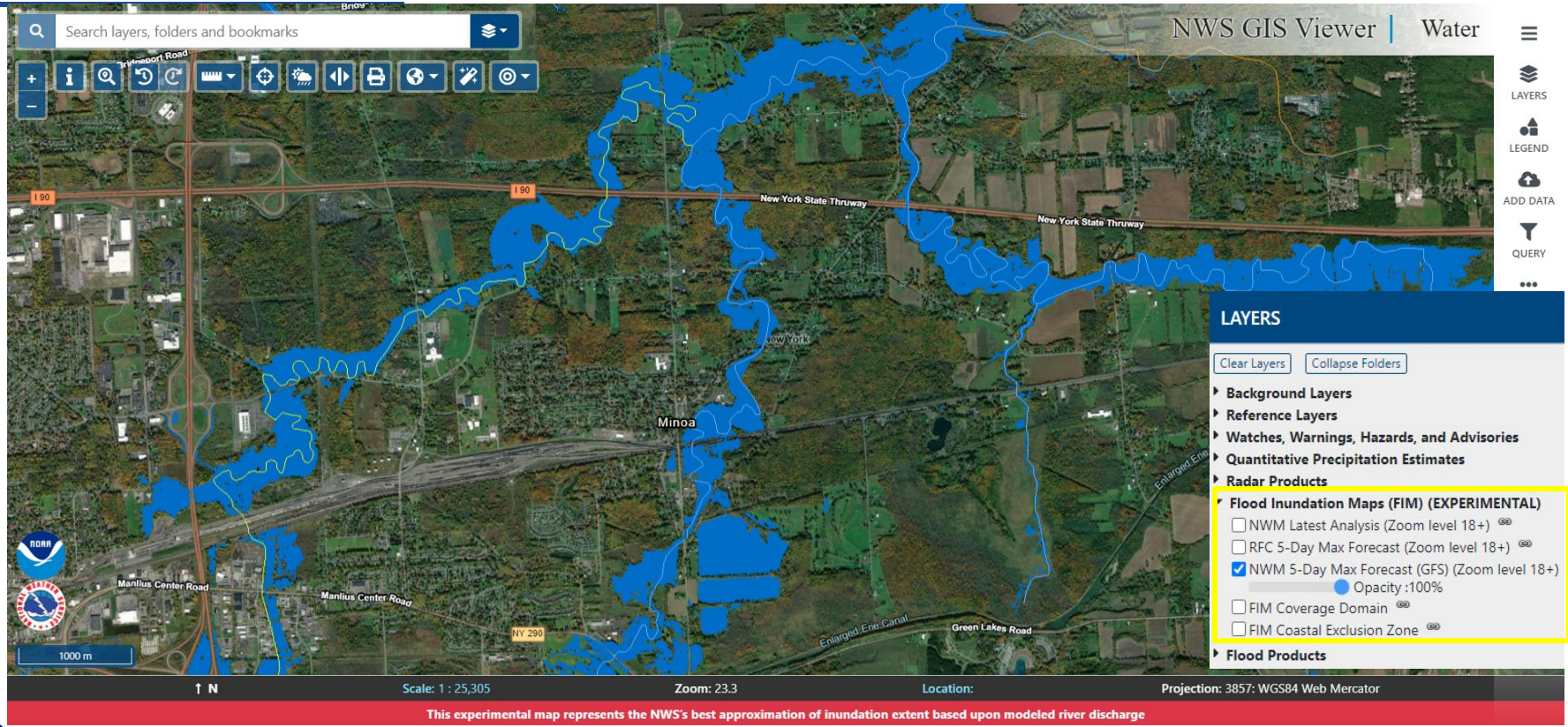
Carter et. al., (2021)

FIM services are being rolled out to the entire country by 2026.



https://www.weather.gov/owp/operations

Operational FIM services for 10% of the US population are publicly available via the NWS GIS Viewer.



https://viewer.weather.noaa.gov/water

Thank You!

Ryan Spies

ryan.spies@noaa.gov

https://water.noaa.gov

NOAA

OWP | OFFICE OF WATER PREDICTION