Supplementary Materials

The FLOod Probability Interpolation Tool (FLOPIT): A Simple Tool to Improve Spatial Flood Probability Quantification and Communication

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**Figure S1.** Map of a roughly 3 km reach of the Susquehanna River and tributaries at Muncy, PA. Panel 1 shows the location Lycoming County and Muncy, PA. Panel 2 shows the FEMA floodplains, derived from FEMA flood surface elevation data for the 1% and 0.2% annual chance (1 in 100-year and 1 in 500-year) floods. Panel 3 shows the FLOPIT interpolated flood probabilities, from 10% to 0.2% annual chance (1 in 10-year to 1 in 500-year). Flood probabilities are almost always higher than the flood zone communicated probabilities. The Borough of Muncy is located in the center of the map, with large northern sections inside the flood zones.

**Figure S2.** Map of a roughly 1.5 km reach of the Sims Bayou in Houston (TX). Panel a) shows the location of Harris County and the Sims Bayou. Panel b) shows the FEMA floodplains, derived from FEMA flood surface elevation data for the 1% and 0.2% annual chance (1 in 100-year and 1 in 500-year) floods. Panel c) shows the FLOPIT interpolated flood probabilities, from 10% to 0.2% annual chance (1 in 10-year to 1 in 500-year). Flood probabilities are always greater than or equal to the flood zone communicated probabilities.
Figure S3. Box and whisker plot of the interpolated return period versus the FEMA flood zone return period for each map pixel of the Muncy map. Return periods in the 100 (1%) year flood zone range from 10 (10%) to 100 (1%), and the average return period is roughly 20 years (4%). Return periods in the 500 year zone range from 100 (1%) to 500 (0.2%), and the average is roughly 250 (0.4%) years. Whiskers extend to maximum and minimum of data.

Figure S4. Box and whisker plot of the interpolated return period versus the FEMA flood zone return period for each Sims Bayou in Houston (TX), map pixel. Flood probabilities in the 1 in 100 (1% annual chance) flood zone range from 1 in 10 (10% annual chance) to 1 in 100 (1% annual chance), with an average flood probability of roughly 1 in 30 (3.3% annual chance). Flood probabilities in the 1 in 500 (0.2% annual chance) zone range from 1 in 100 (1%) to 1 in 500 (0.2%), and the average is roughly 1 in 300 (0.33% annual chance). The solid green line illustrates a hypothetical perfect relationship. Whiskers extend to maximum and minimum of data.
Figure S5. Box and whisker plot of the interpolated return period versus the FEMA flood zone return period for each map pixel of the Selinsgrove map. Return periods in the 100 (1%) year flood zone range from 10 (10%) to 100 (1%), and the average return period is roughly 20 years (4%). Return periods in the 500 year zone range from 100 (1%) to 500 (0.2%), and the average is roughly 250 (0.4%) years. Whiskers extend to maximum and minimum of data.