

JOINT TRANSPORTATION RESEARCH PROGRAM

Principal Investigator: Venkatesh Merwade, Purdue University, vmerwade@purdue.edu, 765.494.2176

Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

Sponsor: Indiana Department of Transportation, 765.463.1521

SPR-3716

2015

Relating Design Storm Events to Ordinary High Water Marks in Indiana

Introduction

Ordinary high water marks (OHWM) determine the lateral limits of federal jurisdiction over non-tidal waters in the absence of adjacent wetlands in the United States. Even though accurate estimation of OHWM has significant legal and economic implications, they are dependent on physical features of streams without any hydrologic definition. OHWM significantly impact hydraulic design and environmental permitting. For sites without an established OHWM, hydraulic structures are designed conservatively with higher construction costs. This conservative design is often carried out to reduce future maintenance costs, increase safety and reduce property owner complaints. Typically, bridges across a stream are most affected by the non-existence of precisely identified OHWM values. Having an objective way of identifying OHWM is desirable for increasing construction precision and economic sustainability of these structures. This project aims to relate OHWM with storm return periods to reduce the subjective nature of OHWM estimates. Accordingly, this project has the following objectives: (1) to establish and quantify the relationship between OHWM discharge and return periods for ungauged streams in Indiana; and (2) to relate OHWM discharges to the 100-year design discharges for Northern, Central and Southern Indiana.

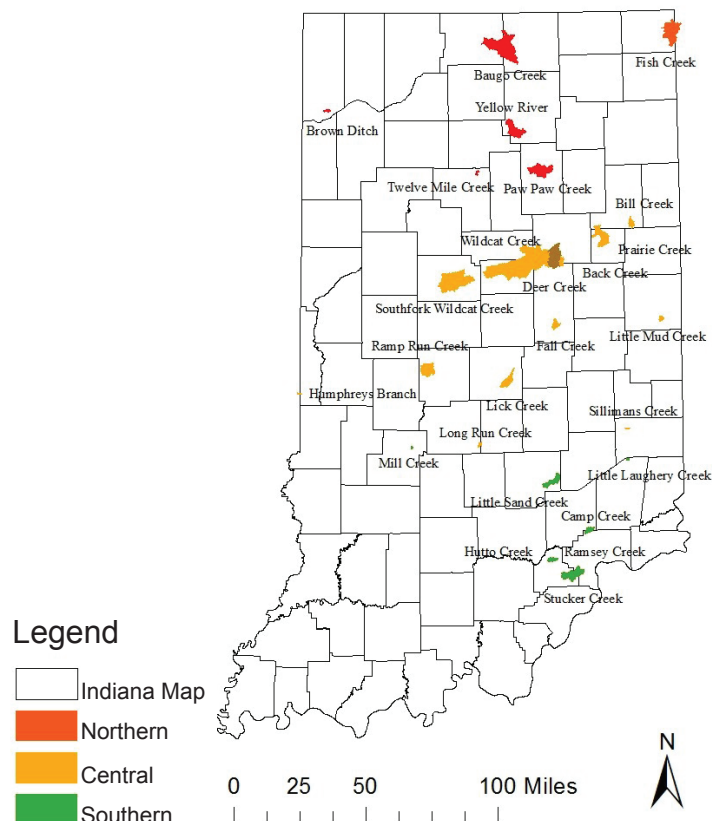
Findings

- OHWM correspond to return periods of less than 2-years' duration.
- The average return period corresponding to OHWM from this study has a range between 0.73 and 1.12

years. This result suggests that the OHWM does not necessarily correspond to the bank-full depth with a return period of 1.5–2 years.

- OHWM discharges computed as a percentage of 100-year flows range from 2.5% to 5.7% for Indiana. However, on computing the 2-year flows as a percentage of 100-year flows for Indiana, the range is found to be from 20.7% to 23.8%. This range proves the hypothesis that 2-year flows are

Study Streams in Indiana



not accurate predictors of OHWM, and the current INDOT policy needs to incorporate a different range in estimating OHWM.

- For Indiana, it is found that ratio of OHWM discharge and 100-year discharge has an average value of 4.99% for the northern part, 3.60% for the central part, and 5.49% for the southern part.

Implementation

The findings and recommendations from this study are expected to be incorporated in the next update of the Indiana Design Manual. The revised policies will be used by the hydraulics division at INDOT for design projects and Federal Aid local projects.

Recommended Citation for Report

Saksena, S., & Merwade, V. (2015). *Relating design storm events to ordinary high water marks in Indiana* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2015/19). West Lafayette, IN: Purdue University. <http://dx.doi.org/10.5703/1288284316004>

View the full text of this publication here: <http://dx.doi.org/10.5703/1288284316004>

Published reports of the Joint Transportation Research Program are available at <http://docs.lib.purdue.edu/jtrp/>.

OHWM and 2-year discharges as a percentage of 100-year discharges for Indiana*

Location	Mean	Standard Deviation	Lower 95% CI	Upper 95% CI
OHWM discharge presented as % of 100-year discharge				
Statewide	4.11	3.82	2.53	5.69
Northern	4.99	3.36	1.46	8.52
Central	3.60	3.22	1.55	5.64
Southern	5.49	6.08	1.00	11.11
2-year discharge presented as % of 100-year discharge				
Statewide	22.26	3.71	20.73	23.79
Northern	21.51	3.42	17.93	25.10
Central	23.63	3.12	21.64	25.61
Southern	20.55	4.44	16.44	24.65

*All values represent %100-year discharges. The confidence intervals are calculated using a t-distribution.

