

WET EXPOSURE MODEL FOR PREDICTING SPLASH AND SPRAY

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Overview

- **Splash-Spray Assessment Tool Development Program**
- **Wet exposure definition**
- **Approach and model products**
- **Findings & further works**

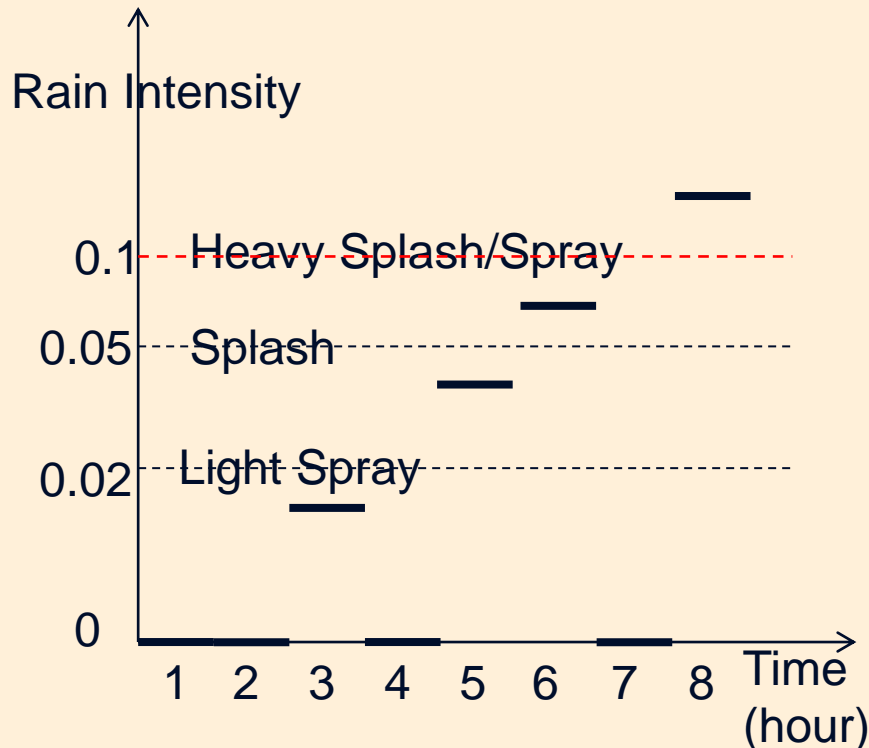
Splash-Spray Assessment Tool Development Program

- **To predict splash and spray potential for different pavement and rainfall**
 - Mechanism, Modeling and Validation
 - Show the level of impact on road user
- **Incorporate weather records**
 - Estimate the splash/spray potential for a specific road or design on any location

Research objective

Build a model to incorporate historical weather records in the splash and spray tool to predict the local splash and spray potential.

Definition of Wet Exposure



For this 8 hour process, the wet exposure of heavy splash/spray is 1, or 1/8 (13%).

The **total time** or **percentage of time** when pavement is above certain level of splash and spray potential.

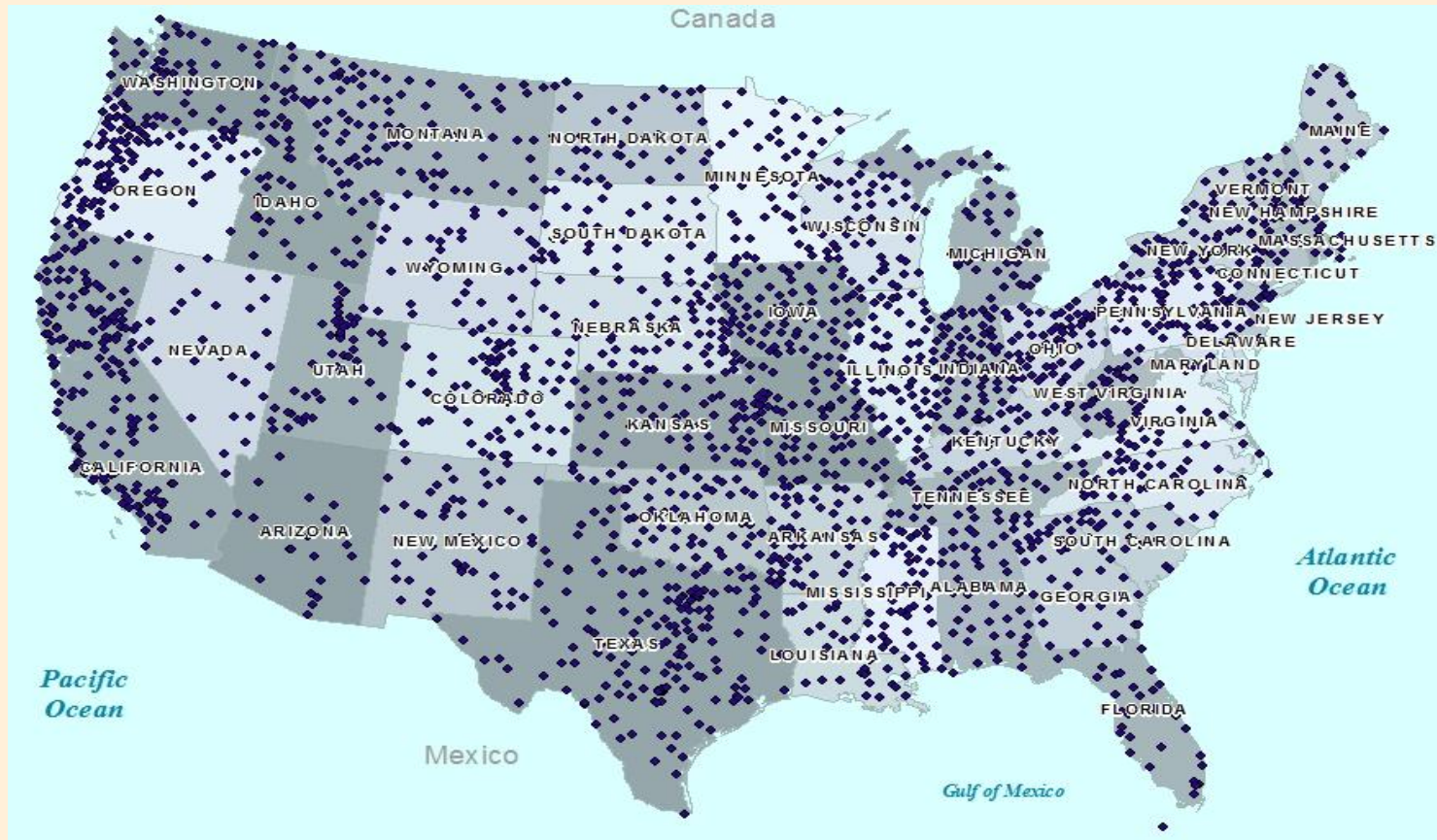
- The dash line position depends on pavement
- Total hours in 1 year are used in for the percentage of time

Approach

- **Data collection**
 - **Hourly precipitation data from National Climate Data Center**
- **Data analysis**
 - **Data quality control**
 - **Single station wet exposure calculation**
 - **GIS interpolation for entire US**
- **Create interface to the tool**

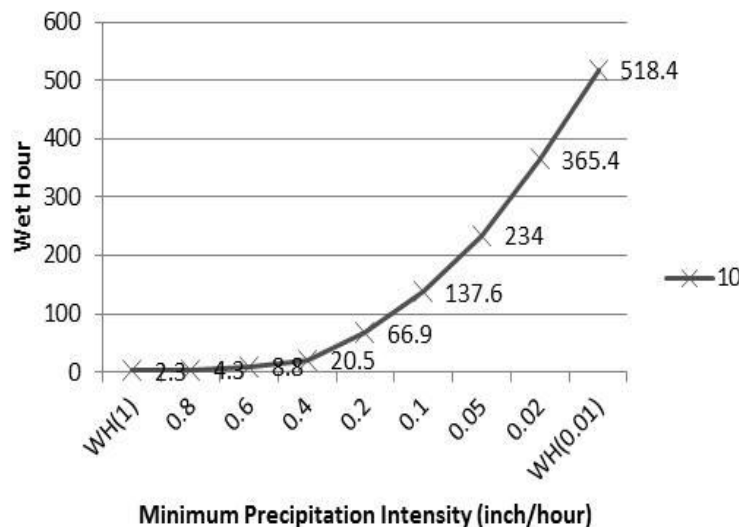
Products

1. Point Wet Exposure Coverage for U.S.



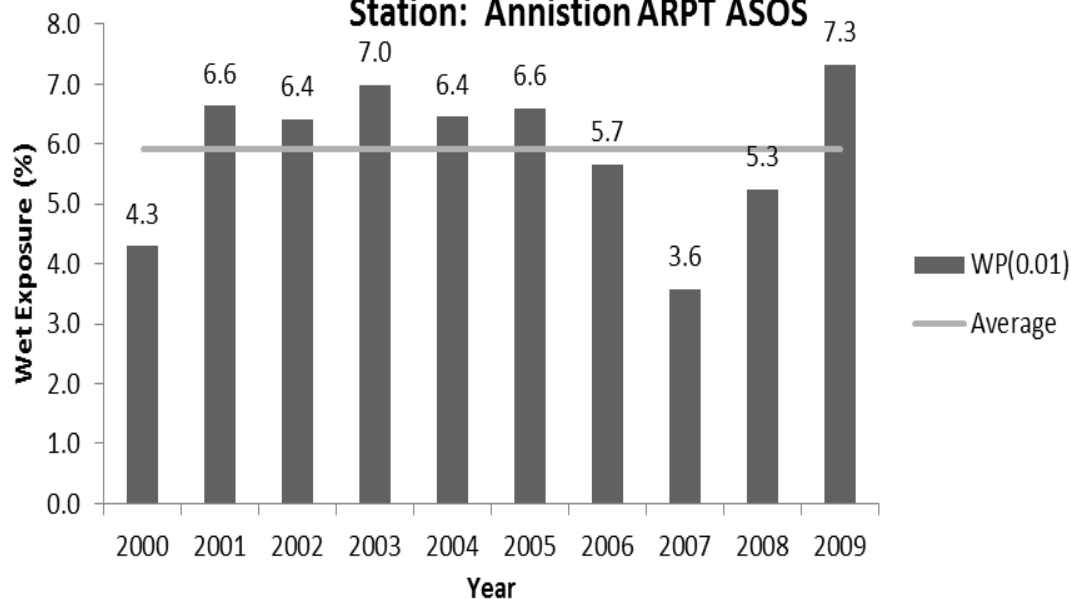
Point Wet Exposure

Anniston ARPT ASOS



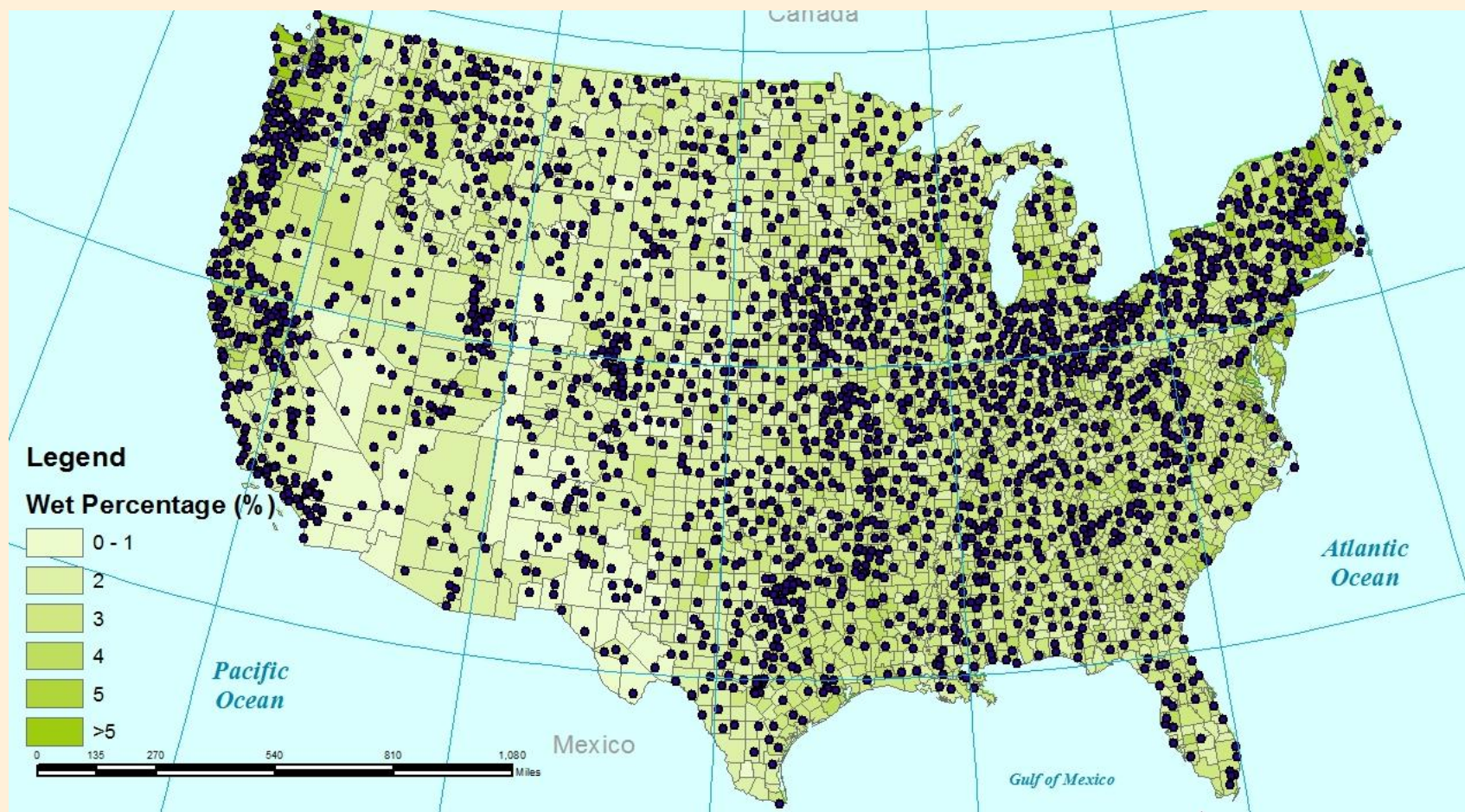
The histogram shows change of exposure with time for given splash and spray level.

Station: Anniston ARPT ASOS



The Curve shows the wet exposure for any splash and spray level.

2. County-level wet exposure map



Findings

- A hydrologic index maybe needed for water related pavement design



Three Gorges Dam <http://www.xinhua.org>

Design based on 1,000 years
return period flood

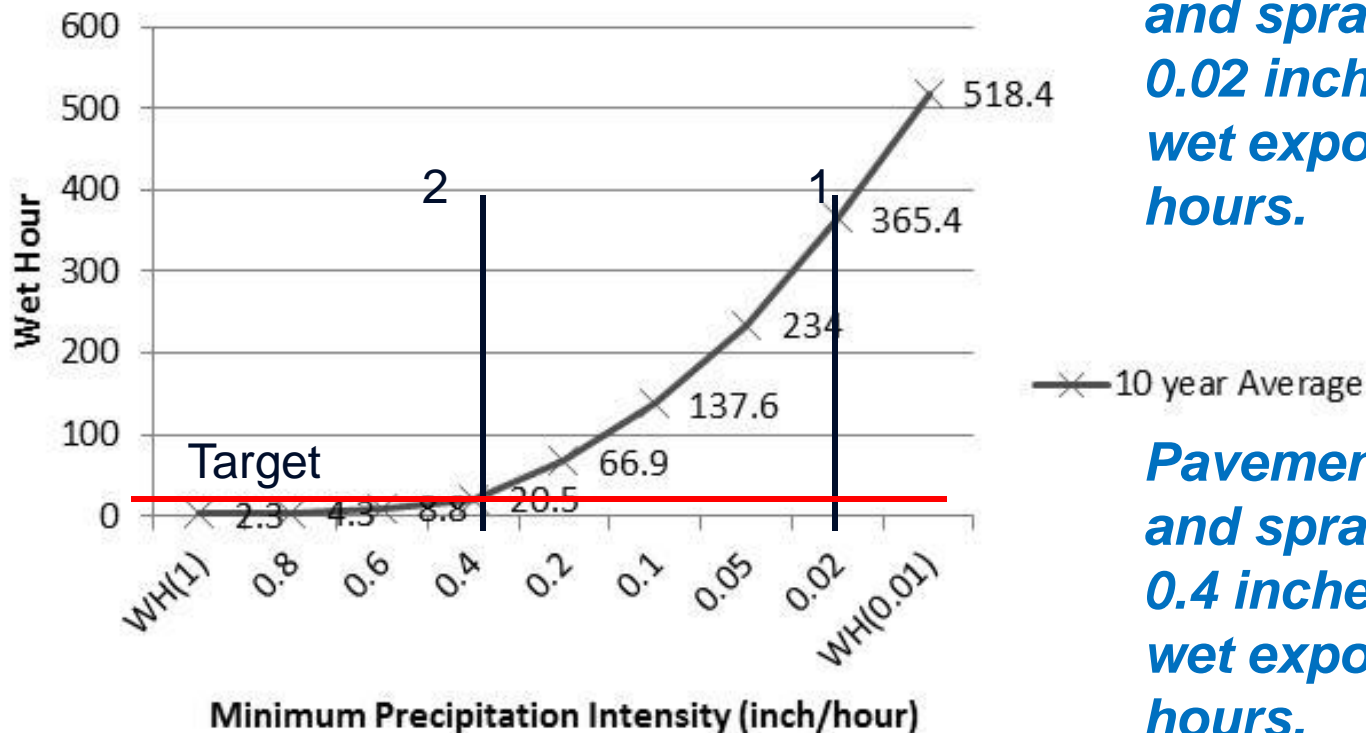
Reduce the frequency of major
downstream flood from once
10 years to 100 years



Design based on 10 years storm
is not necessary for pavement.

Wet exposure: a good index for splash and spray design

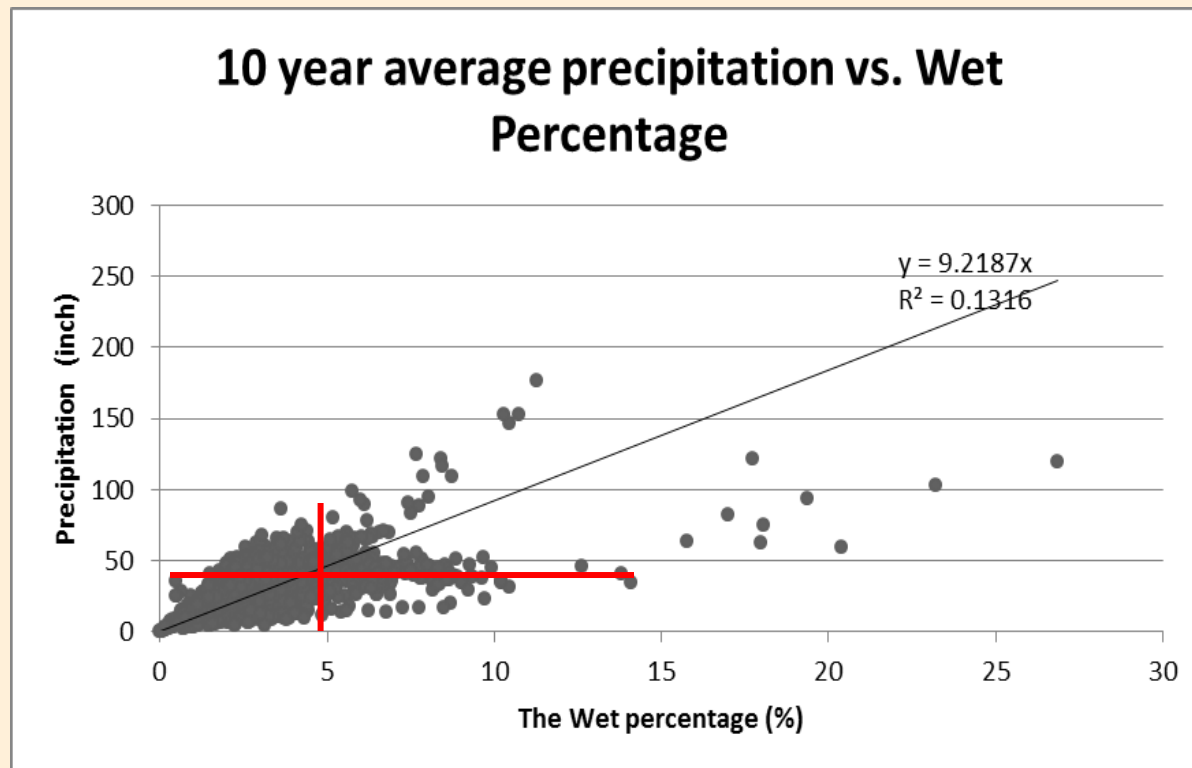
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*Pavement 1: has splash and spray at the rain of 0.02 inches/hour, has a wet exposure of **365** hours.*

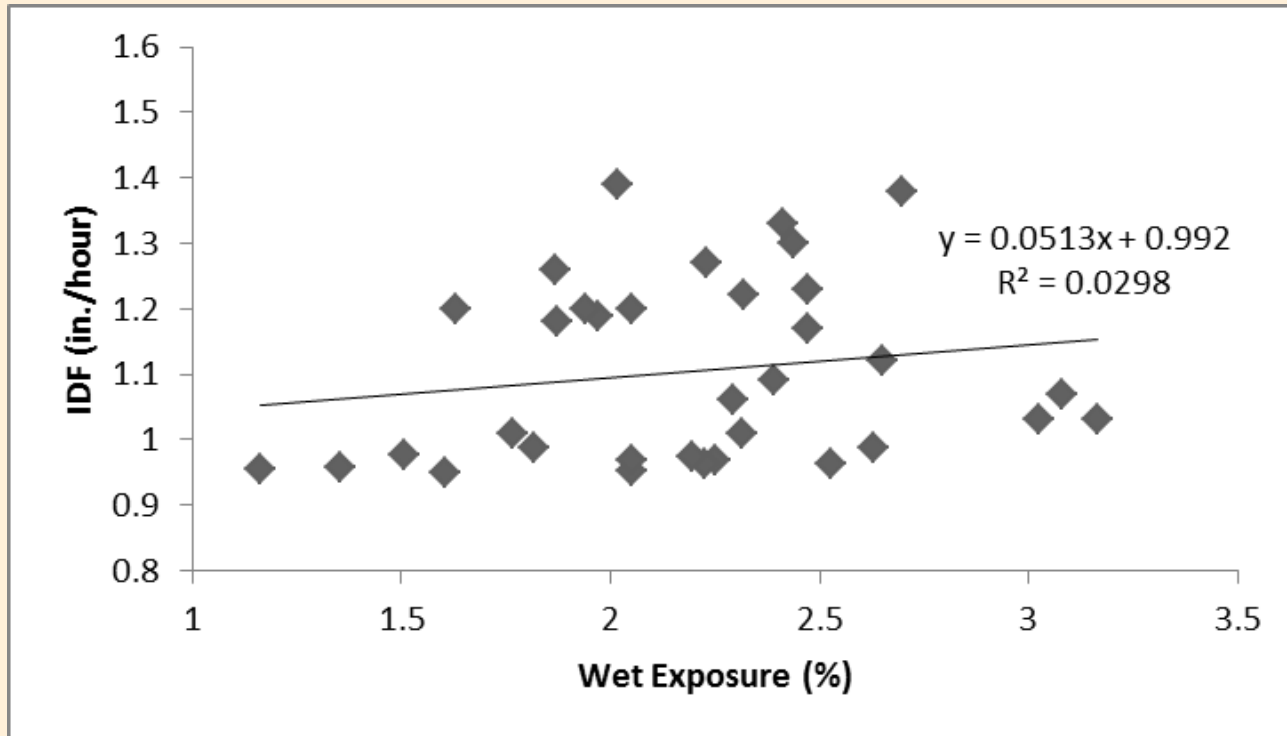
*Pavement 2: has splash and spray at the rain of 0.4 inches/hour, has a wet exposure of **20** hours.*

Wet exposure versus annual precipitation



- The wet exposure has poor correlation with total precipitation.

Wet exposure versus 1 year storm



- The wet exposure also shows very poor correlation with extremely weather.

Further Works

- **Wet exposure impact on road safety/ efficiency**
 - Correlation between wet exposure and road safety (wet accident rate)
 - Wet exposure impact on road efficiency.
- **User perspective**
 - Level of nuisance produces by the splash and spray
 - Wet exposure tolerance limit

Integrated splash and spray tool

- **For the final tool:**
 - **Input: location and pavement properties (permeability, geometry, speed limit etc.)**
 - **Output: Exposure to levels of nuisance.**
 - **Maps**

Thank you!

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