



April 2020

# Informational Sheet Agricultural Risk Study

## Scope of Research

The NDSU Department of Agribusiness was asked to study how the temporary storage of floodwaters would affect crop production and agricultural revenues in the area upstream of the FM Area Diversion Project.

Specifically, NDSU has studied how the effects of flooding align with regional planting and increasing the understanding of how Project operation would impact planting dates.

## Observations at a Glance

### Hydrology

- Substantial acreage within staging area is not adversely affected.
- The majority of adversely affected acreage has potential planting delays of one to five days.
- Some storage tracks will have substantially adverse effects. It is hard to make generalizations that represent all situations.

### Economic & Historical

- Economic conclusions are influenced by high acreage of soybeans -- 50% of land is in soybeans. Soybeans have later planting dates and are less sensitive to yield reductions.
- Economic losses are sensitive to dry-down requirements.
- Combinations of a long, or late-occurring flood and relatively early planting start dates are required to produce more pronounced levels of planting delays.

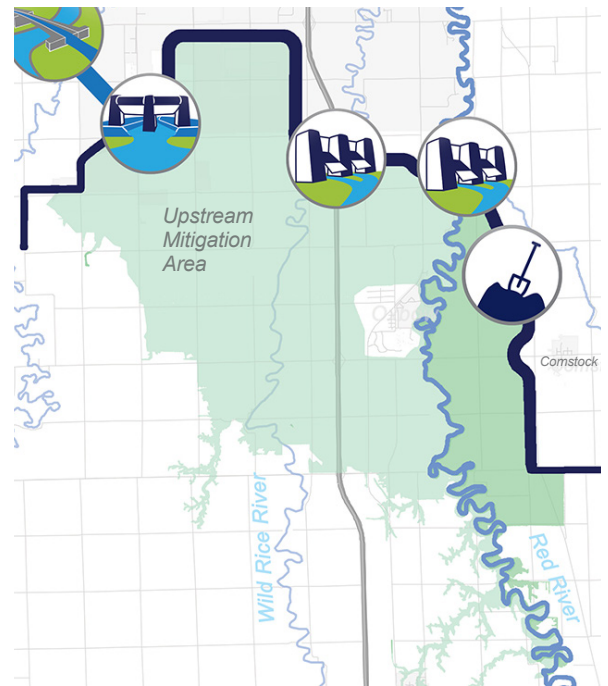
### During a 25-year or larger flood event with the Project in place,

- There is a high probability of modest revenue losses due to planting delays
- There is a low probability of greater revenue losses due to planting delays

Study conducted by the North Dakota State University Department of Agribusiness and Applied Economics

## Upstream Mitigation Area Studied

- 241 individual storage areas totaling more than 54,000 acres
- Exceeds the designation of the staging area provided by USACE (27,000 acres of inundated lands)
- Data from HEC-RAS 9.1 hydrology model provided by FM Diversion Authority
- Study used entire acreage of a storage area if any portion of the area was inundated



## Preparing the Data



## FLOOD SIMULATION

### ANALYSIS of 10 flood events


- 10-year event
- 20-year event
- 3 kinds of 25-year events
- 50-year event
- Similar to 2009
- 100-year event
- 500-year event
- Probable Maximum Flood (PMF)

With the Project

Without the Project

# Hydrology Effects Identified Five Conditions

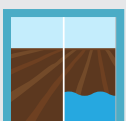
Hydrology effects vary by storage area and by flood size

**1**  Land that does not flood with or without the Diversion Project

**2**  Land already floods, but floods same duration with Diversion Project

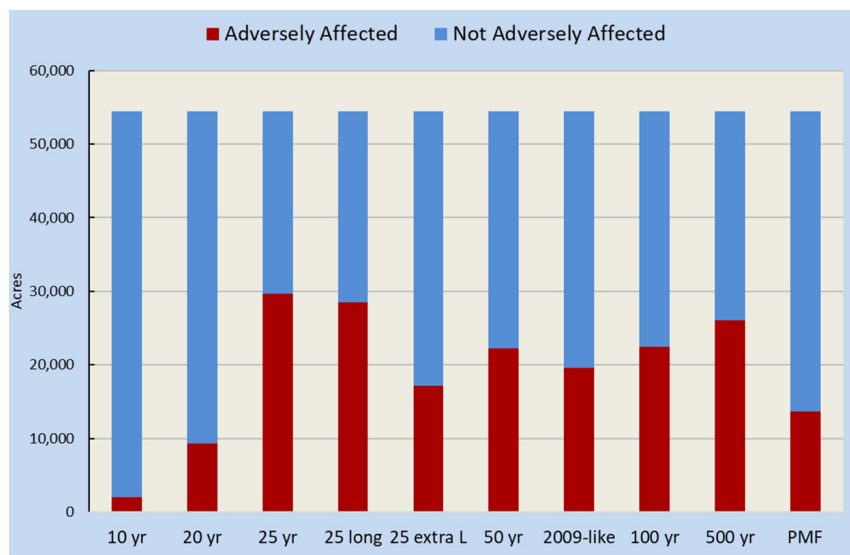
**3**  Land already floods, but floods longer with Diversion Project

**4**  Land already floods, but floods shorter with Diversion Project

**5**  Land that would not flood, but now floods (new flooding) with the Diversion Project

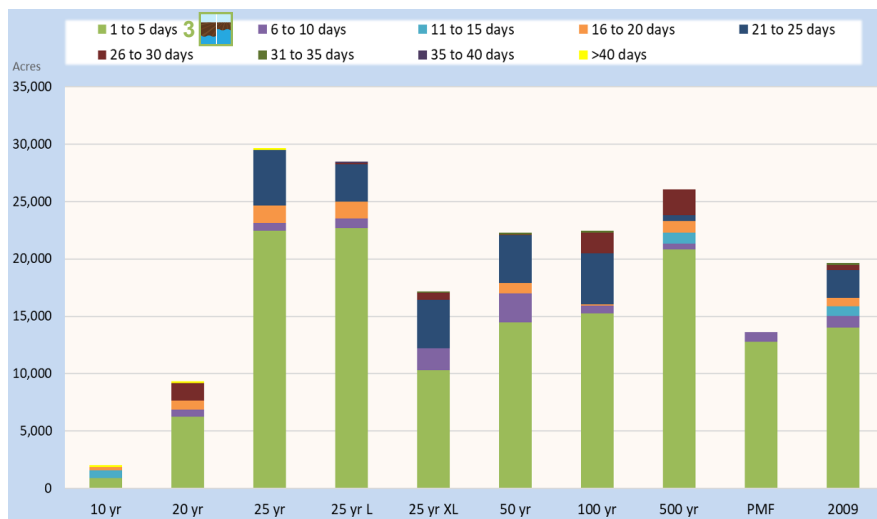
Data from the Study

## Acres Adversely Affected or Not in Various Flood Scenarios



With and Without the Project Comparison

## Comparing Additional Days of Floodwater Impacts With and Without the Project In Place



Fundamental Factor

## Driving Economic Effects

These two time periods are very similar in length. The likelihood (probability) of a planting delay will be sensitive to factors affecting those periods.

Calendar During a Flood Situation



Calendar for Agricultural Operations



## Key Take Aways

### Most Frequent Floods

When placed on a calendar timeline, total time (days) required for the effects of temporary water storage to be over are similar to the calendar dates when spring planting begins.

*Determined by Hydrology Data and NDSU modeling*

### Less Frequent & Longer Floods

Additional time for effects of flooding to be over will increase frequency and magnitude of revenue losses.

*Determined by Hydrology Data and NDSU modeling*