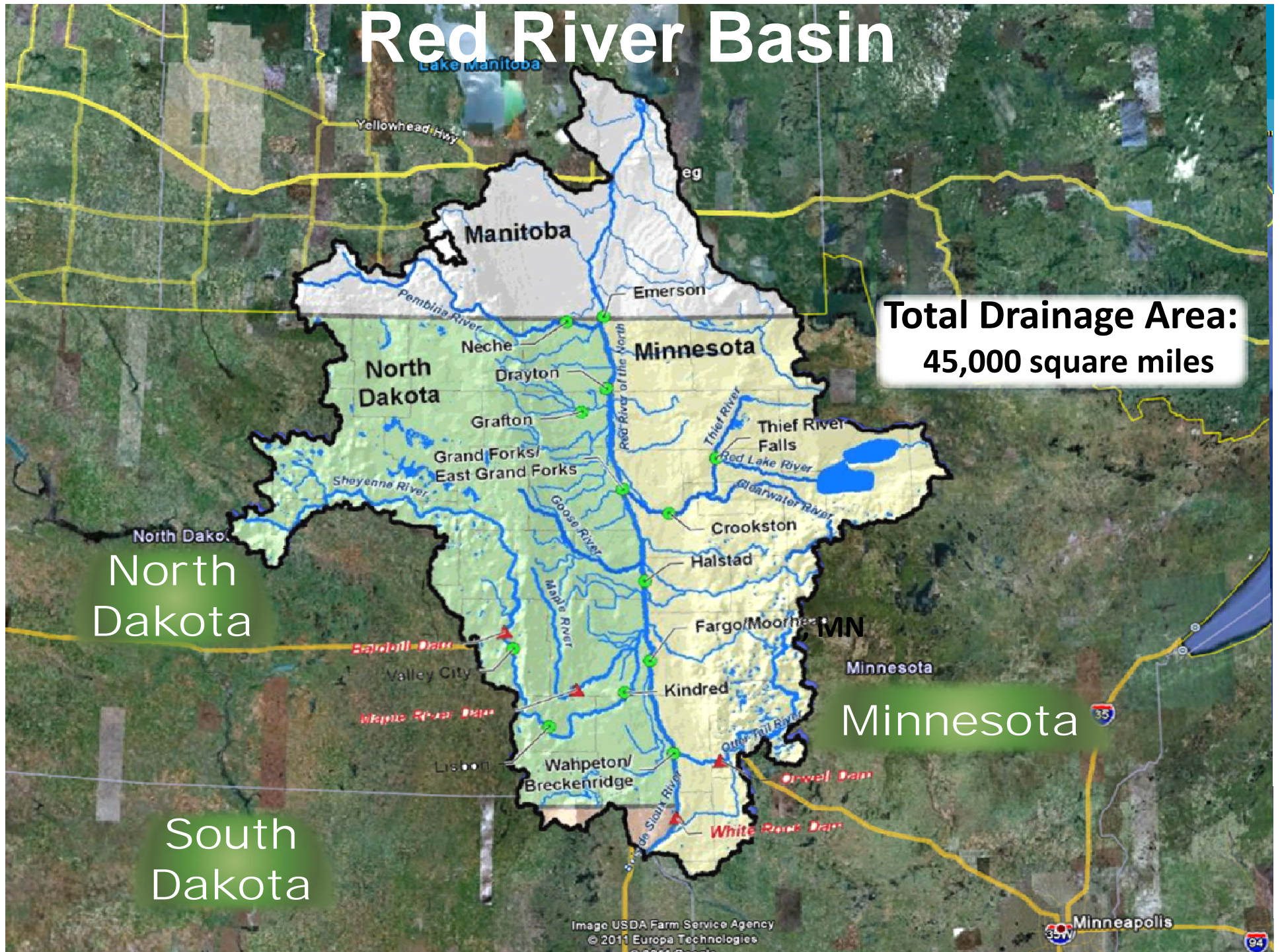


Red River Basin and FM Diversion Hydrology

Presentation to Water-Related
Topics Overview Committee
April 19, 2012

Red River Basin

Total Drainage Area:
45,000 square miles

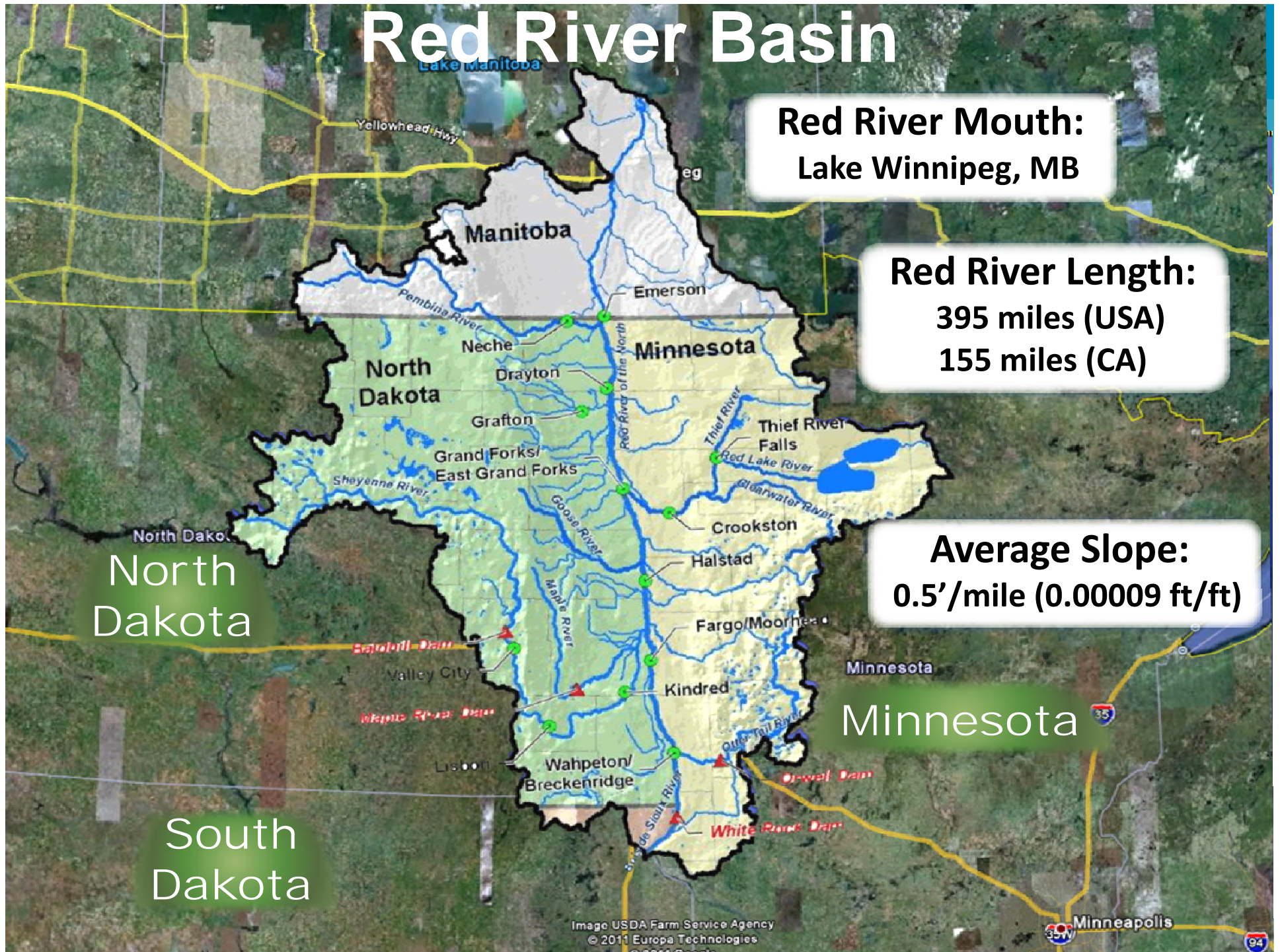


Red River Basin

Red River Mouth:
Lake Winnipeg, MB

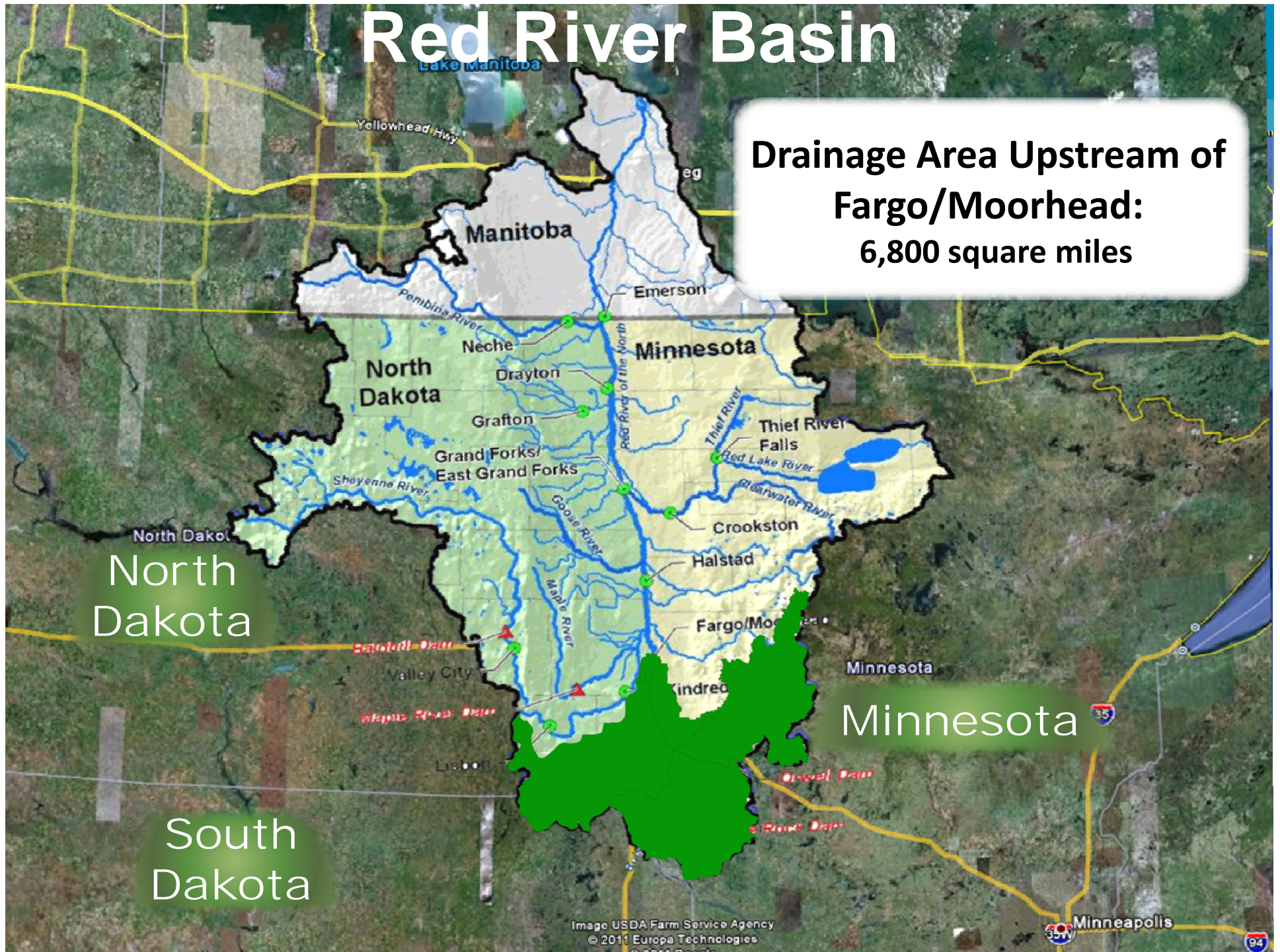
Red River Length:
395 miles (USA)
155 miles (CA)

Average Slope:
0.5'/mile (0.00009 ft/ft)



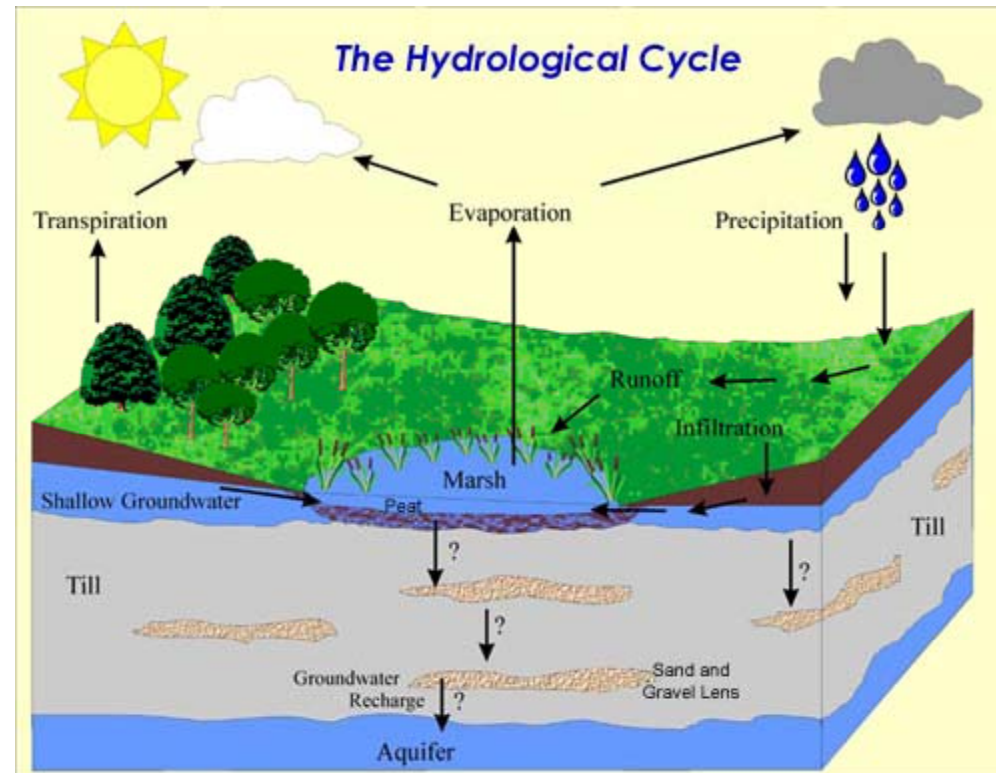
Red River Basin

**Drainage Area Upstream of
Fargo/Moorhead:
6,800 square miles**



Definitions

- **Hydrology** – *a science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere (Merriam-Webster).*



Definitions

- CFS (Cubic Feet Per Second) – *a rate of the flow in streams and rivers. One “cfs” is equal to 7.48 gallons of water flowing each second.*

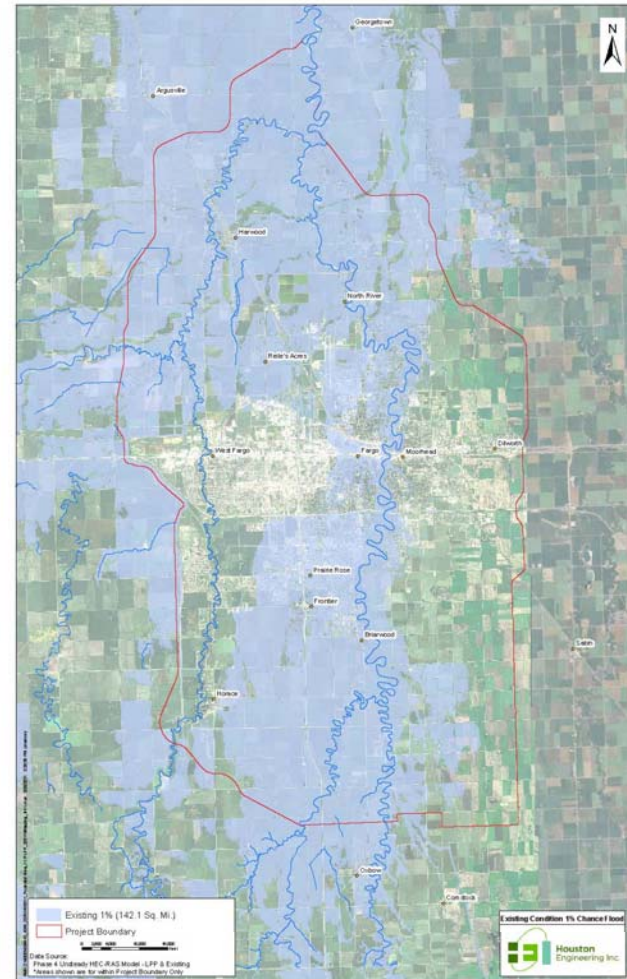


Definitions

- Recurrence Interval
 - *How often (statistically) does the event occur?
Once every 10 years, once every 50 years?*
 - *Small floods happen more frequently, large floods happen less frequently*
 - *Storm Based: x-year storm causes x-year flood*
 - *It's a statistical estimate; it may not happen that often or it may happen more often*

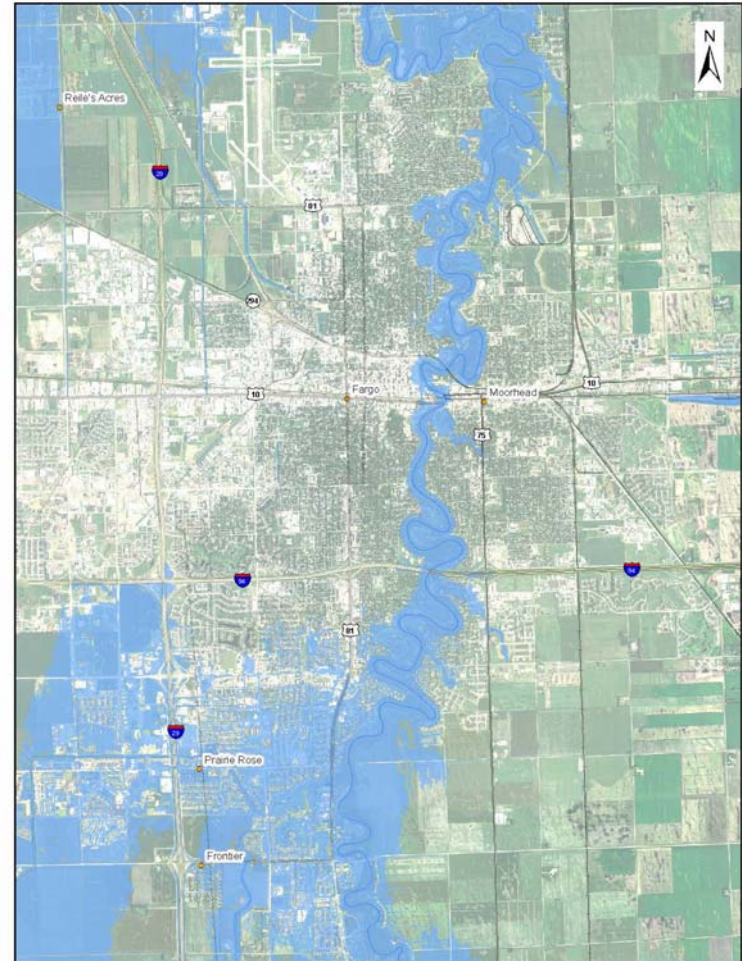
Definitions

- **The Base (100-year) Flood:**
 - *The Base Flood is FEMA's standard for flood insurance mapping*
 - *The Base Flood has a recurrence interval of 100-years.*
 - *It is the flood having a one percent chance of being equalled or exceeded in any given year.*



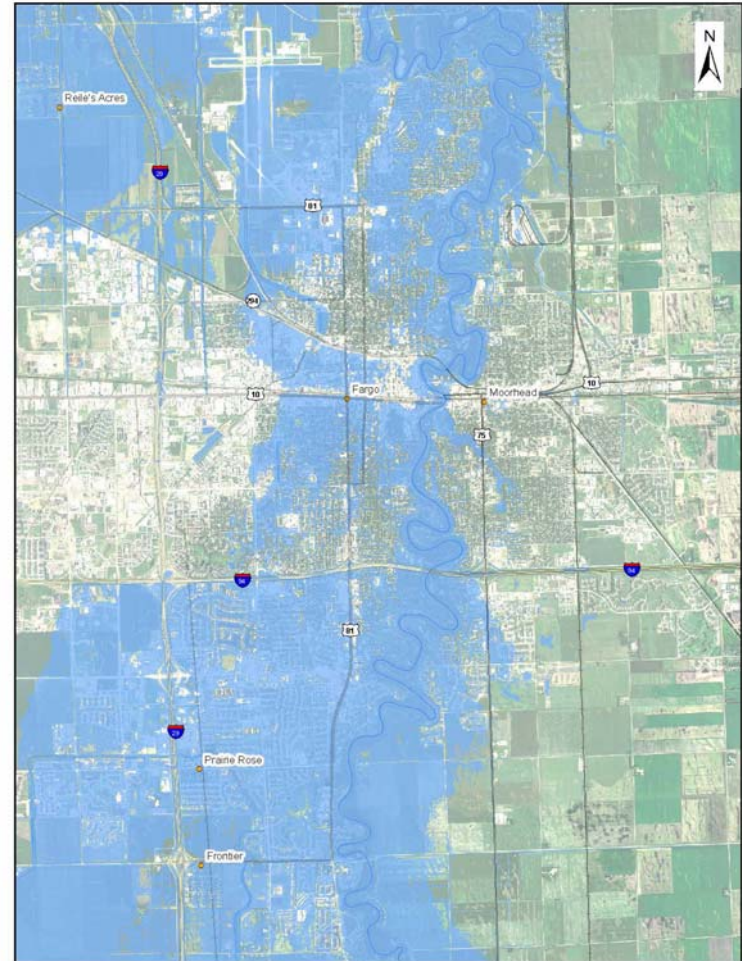
Definitions

- **FEMA (100-year) Floodplain:**
 - *Regulatory floodplain developed by FEMA and adopted by local communities.*
 - *Properties in the floodplain with a federally backed mortgage are required to carry flood insurance.*



Definitions

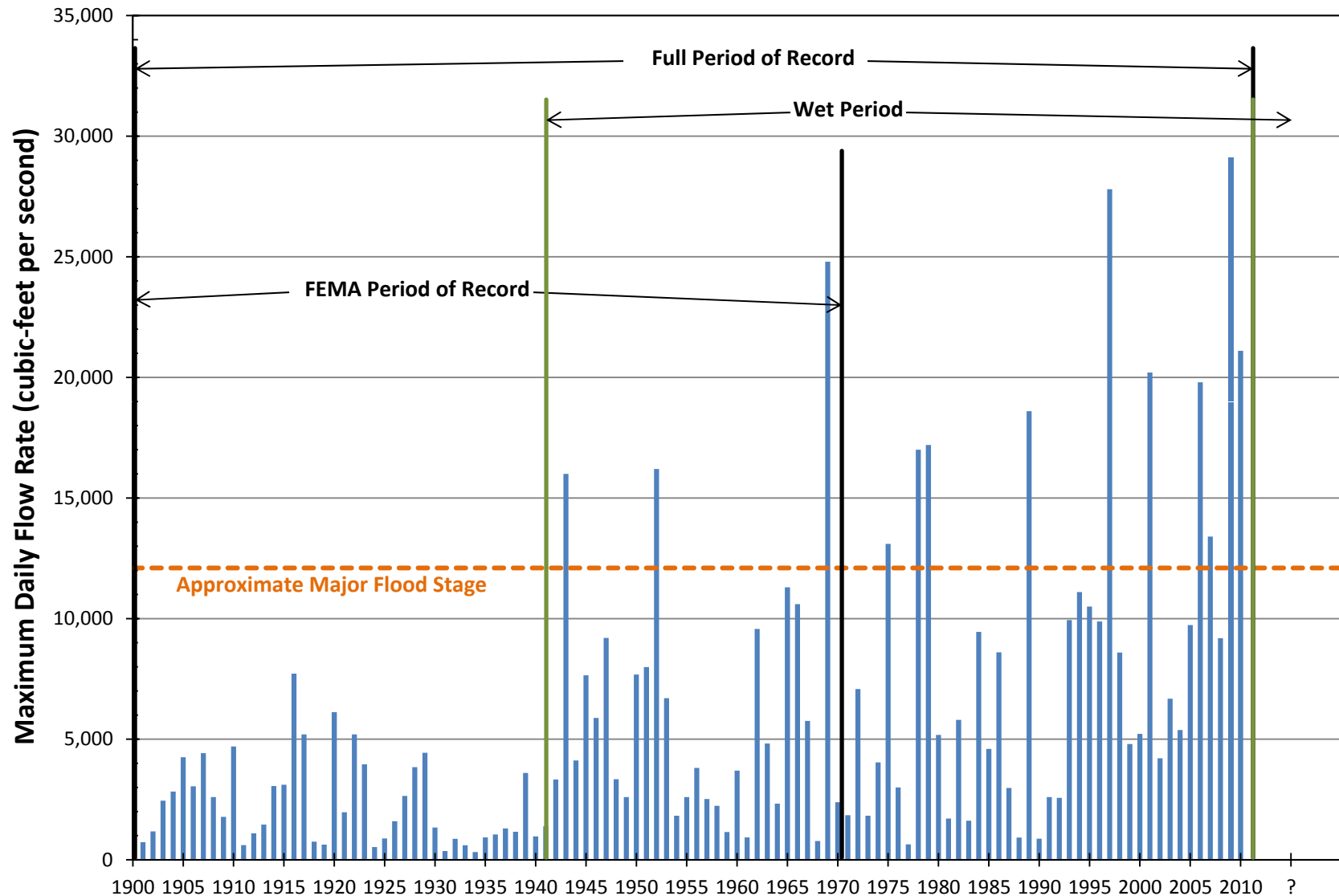
- **USACE (100-year) Floodplain:**
 - *Flood inundation area developed by the USACE during feasibility.*
 - *Used to assess flood risk and assign project benefits.*
 - *May lead to future map updates by FEMA.*



Hydrology Summary

- FEMA Effective FIS
 - *Red River of the North Regional Flood Analysis, Breckenridge to International Boundary (1971)*
 - *Administrative agreement between NDSWC, MN DNR, NRCS, USACE, and USGS*
 - *Carried forward as part of ongoing map updates.*
- USACE Full Period of Record
 - *Analyzed full period of record (1882, 1897, and 1902 to 2009)*
- USACE Wet Cycle
 - *Analyzed Wet portion of the period of record (1942 to 2009).*
 - *Does not include data from 2010 and 2011 flood events.*
 - *End date for wet cycle is unknown.*

Red River of the North at Fargo, North Dakota



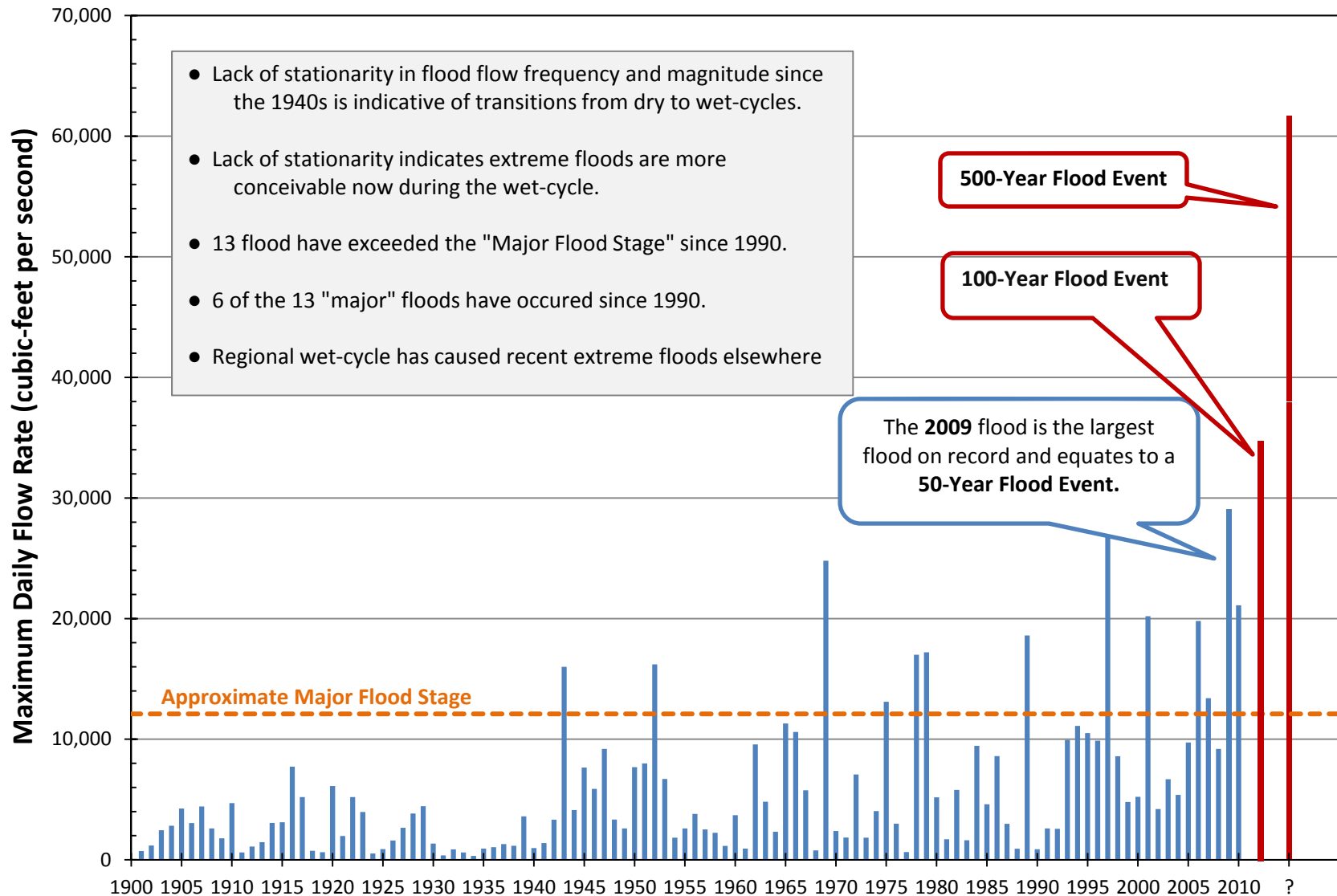
Source: USGS river flow data from USGS Station

Hydrology Summary

Red River of the North at Fargo

Event	FEMA Effective (cfs)	Full Period of Record (cfs)	Wet Cycle (cfs)
10-year	10,300	13,865	17,000
50-year	22,300	26,000	29,300
100-year	29,300	33,000	34,700
500-year	50,000	66,000	61,700

Red River of the North at Fargo, North Dakota

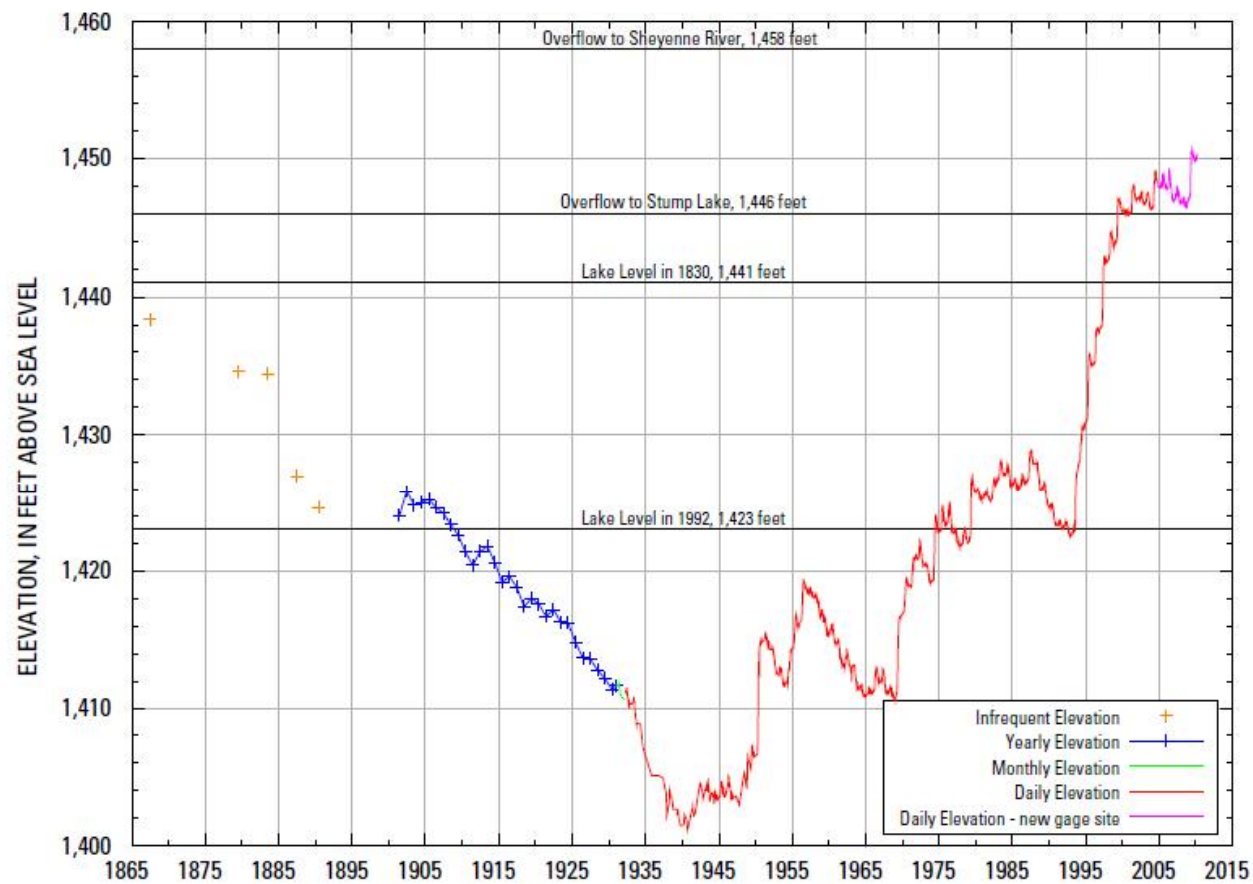


Source: USGS river flow data from USGS Station

EOE Results

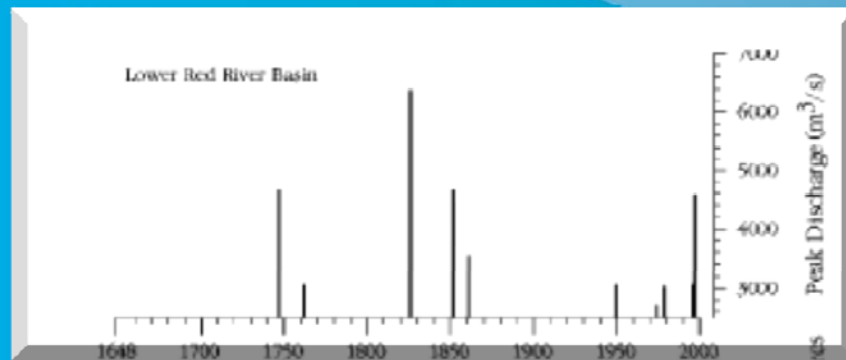
- Hydrology developed by USACE included EOE (Expert Opinion Elicitation) Panel to look at climate variability.
- “experts rather quickly moved away from a discussion of climate change, per se, and focused instead on the apparent lack of stationarity in the flood flow frequency and magnitude data over the period of record (the last 110 years or so). “

Devils Lake



Tree Ring Study

Flood records for the Red River, Manitoba, Canada Scott St. George and Erik Nielson, 2003



At Winnipeg

-No Large Floods, 1648-1746, 1763-1825, 1862-1948

-Large Floods, mid 1700's, mid 1800's, latter half 1900's

(65% wet/35% dry)

EOE Panel Recommended Defining Wet Cycle as 1942-2009