

# Combining Flood Risks from Snowmelt, Rain & Ice – The Platte River in Nebraska

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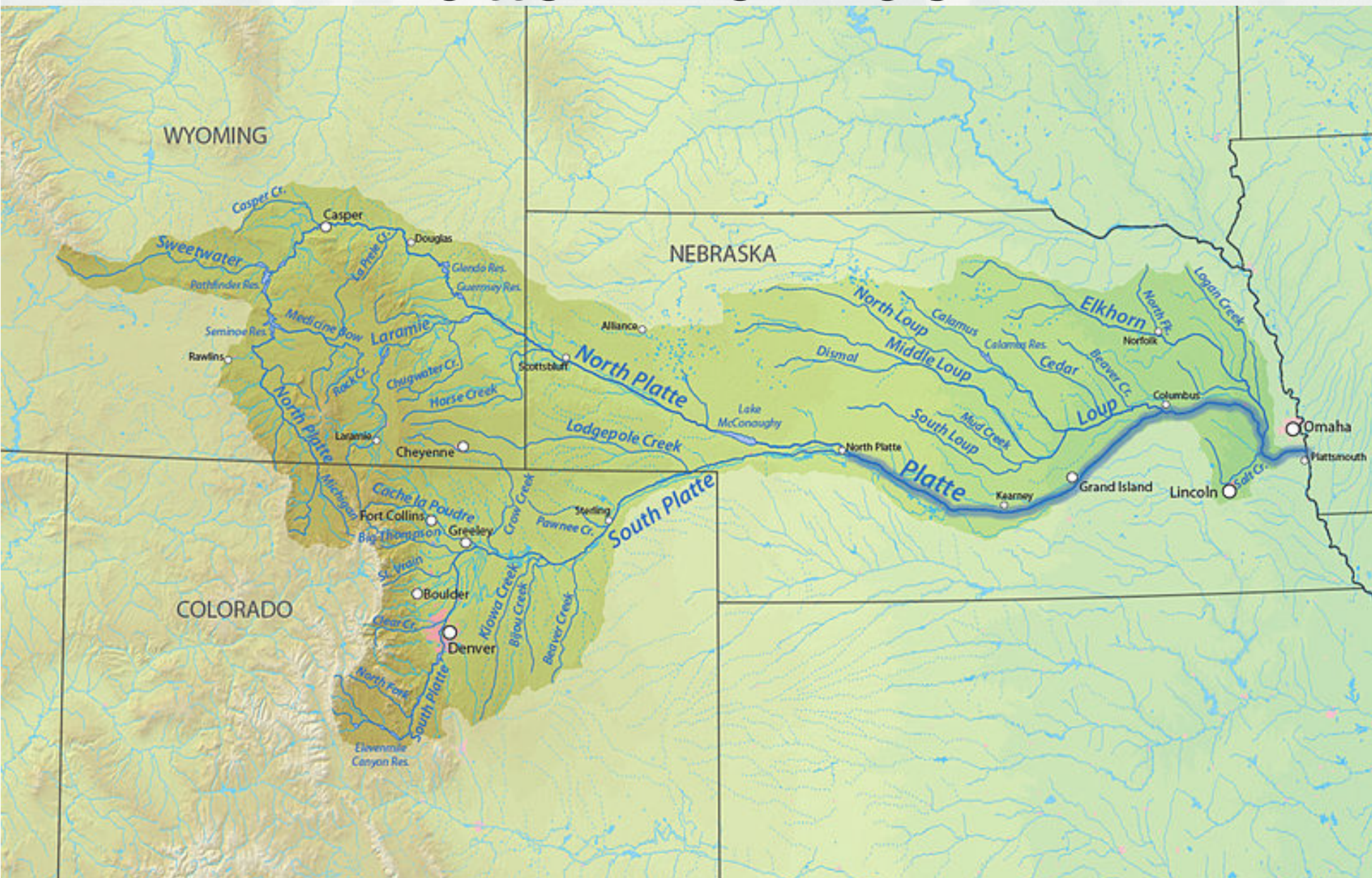
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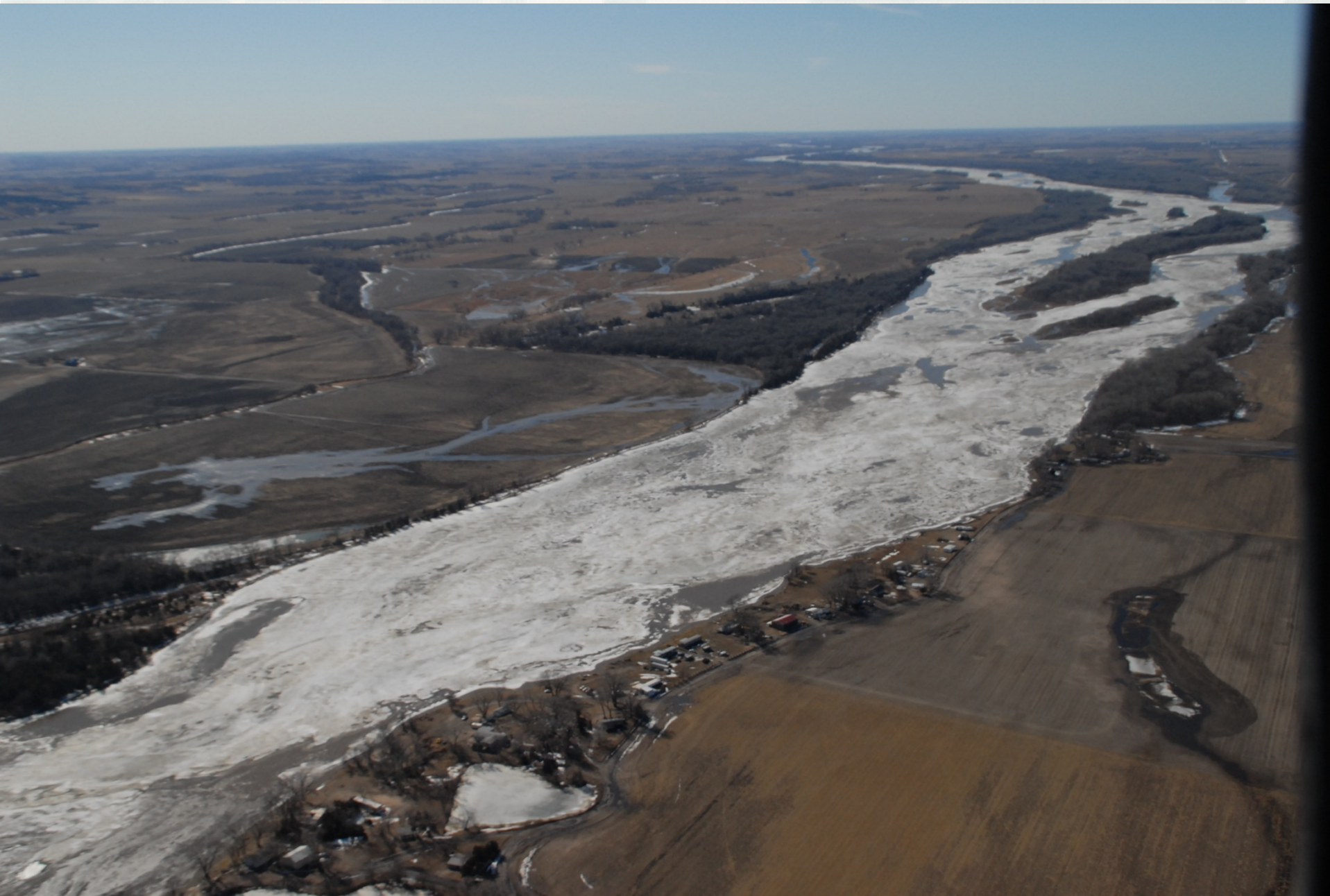




# Platte River Basin







# Causes of Lower Platte Floods

- Spring Snowmelt and or Rainfall
- Ice-Affected Spring Snowmelt/Rainfall
- Summer Rainfall





# FEMA Publication 37

Federal Emergency Management Agency, "Flood Insurance Study Guidelines and Specifications for Study Contractors – Appendix 3 Analysis of Ice Jam Flooding", March 1993

$$P_s = P_{si} + P_{sq} - P_{si} \times P_{sq} \quad (1)$$

Where,

$P_s$  = probability of a given stage being equaled or exceeded from either an ice-affected event or a free flow event

$P_{si}$  = Probability of that stage being equaled or exceeded from an ice affected event

$P_{sq}$  = Probability of that stage being equaled or exceeded from a open water event





If maximum annual stages in the snowmelt season are not always ice affected, the term  $P_{si}$  needs to be expanded as:

$$P_{si} = P_{wi} * N_i + P_{wo} * N_o \quad (2)$$

where,

$P_{wi}$  = probability of a given stage in the snowmelt season that is ice-affected.

$N_i$  = fraction of years during the snowmelt season that stages are ice-affected

$P_{wo}$  = probability of a given stage in the snowmelt season from open water

$N_o$  = fraction of years during the snowmelt season that stages are from open water

Combining Equations (1) & (2):

$$P_s = P_{wi} * N_i + P_{wo} * N_o + P_{sq} - [P_{wi} * N_i + P_{wo} * N_o] \times P_{sq} \quad (3)$$





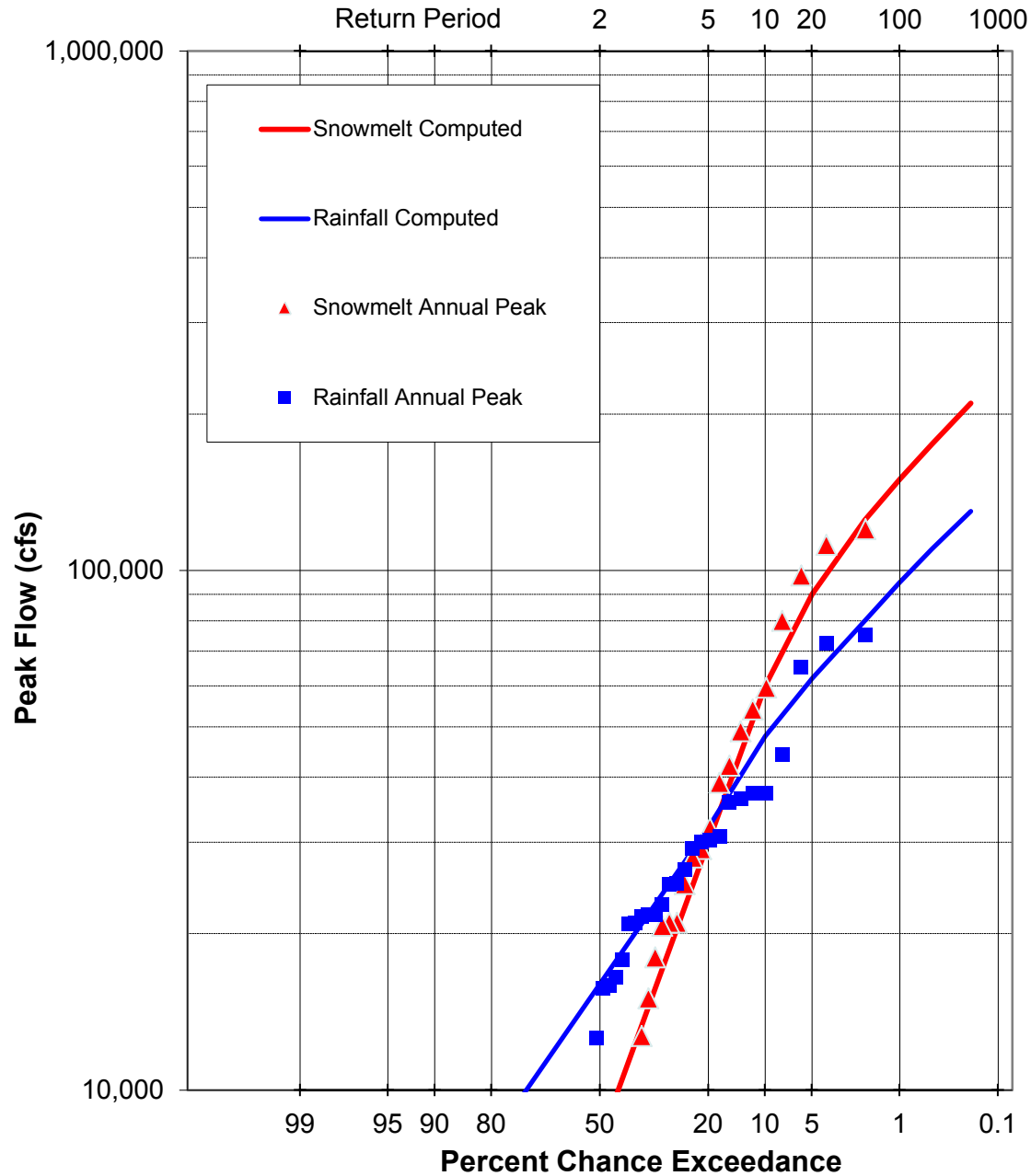
# Hydrologic Data Needs

- Flow Frequency
  - ▶ Ice-Affected Season
  - ▶ Open Water Season
- Stage Discharge
  - ▶ Ice-Affected
  - ▶ Open Water
- Percent of Years Stages Ice Affected



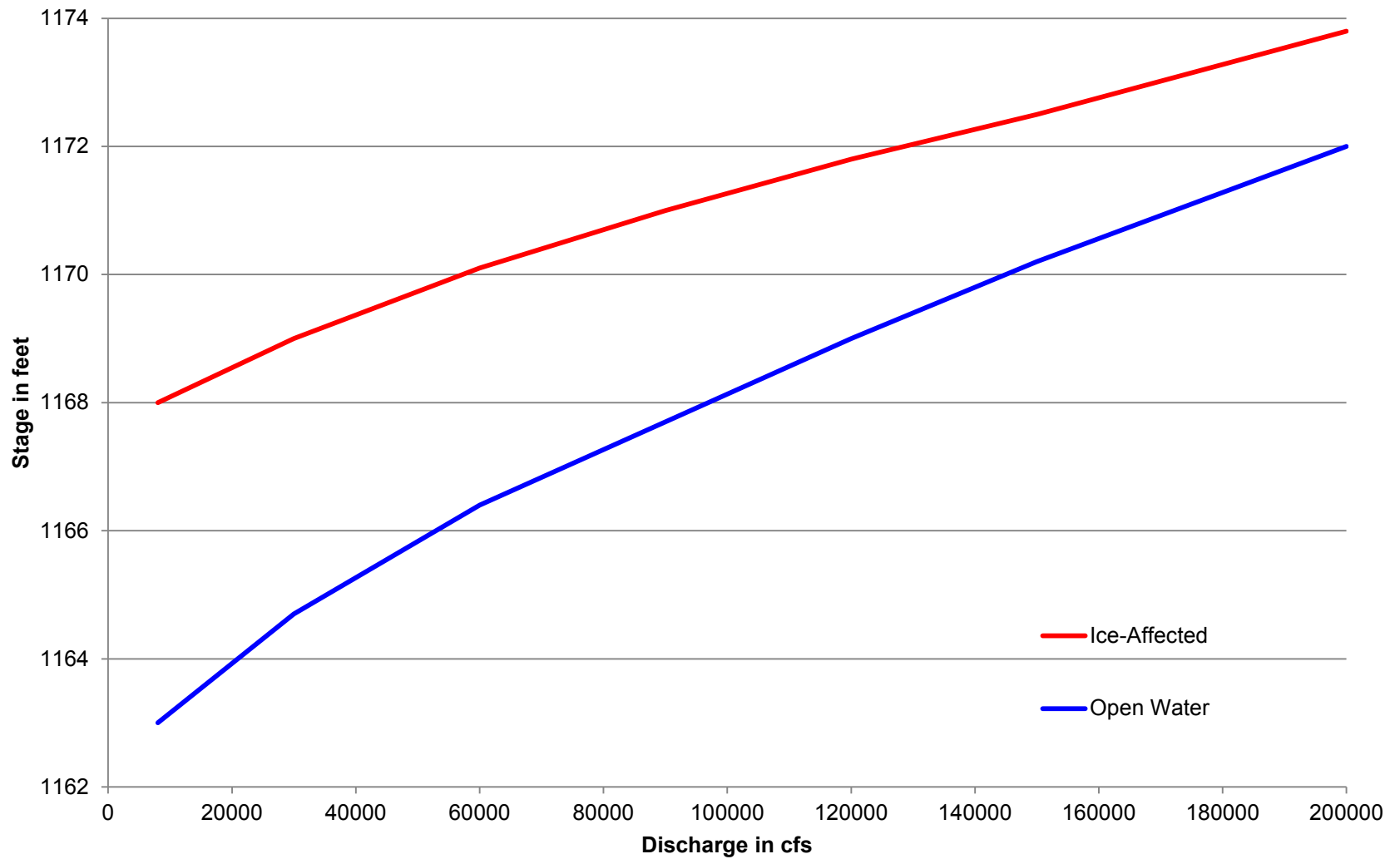


# Platte River Flow Frequency



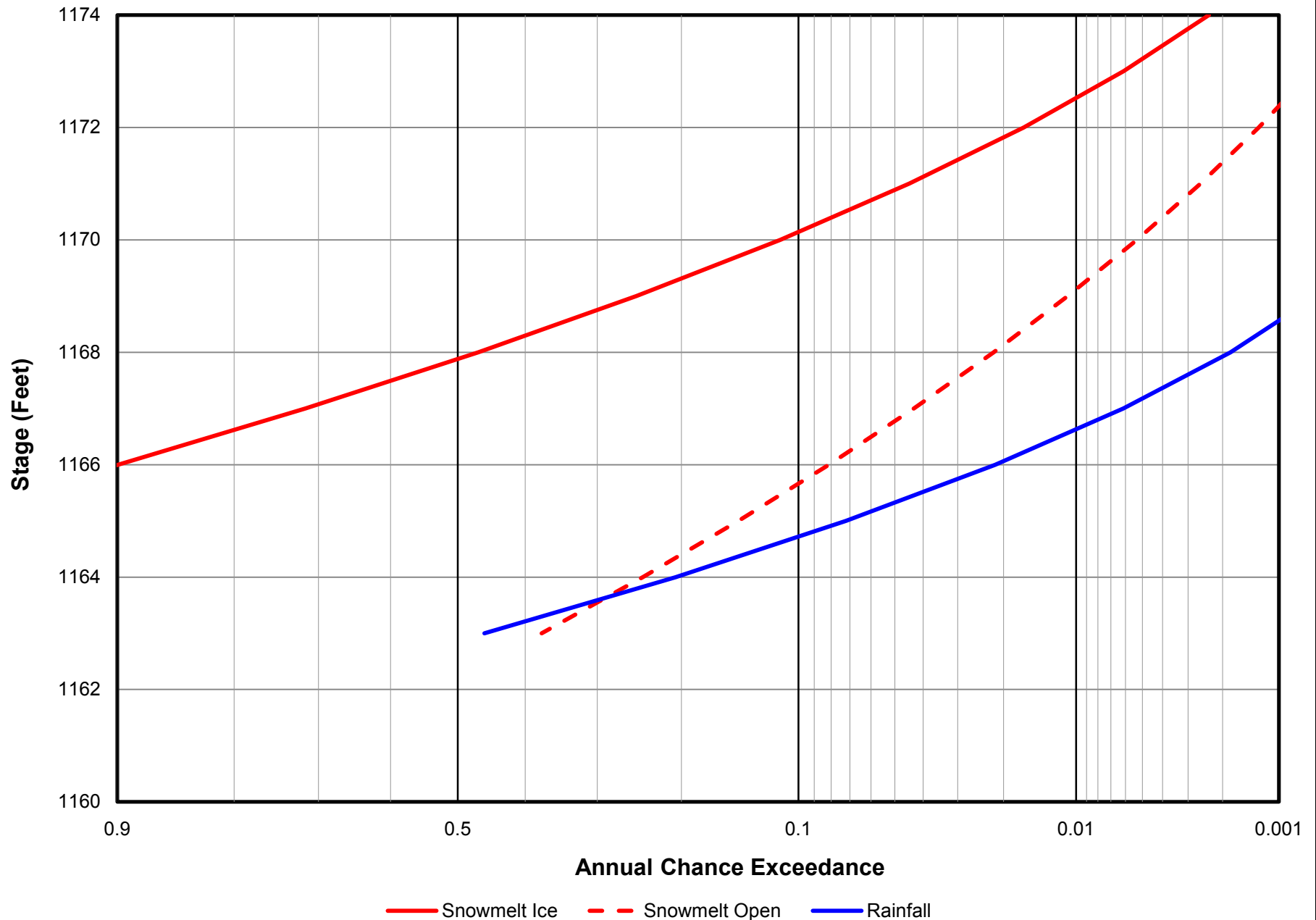
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## Platte River Stage Discharge Relationship



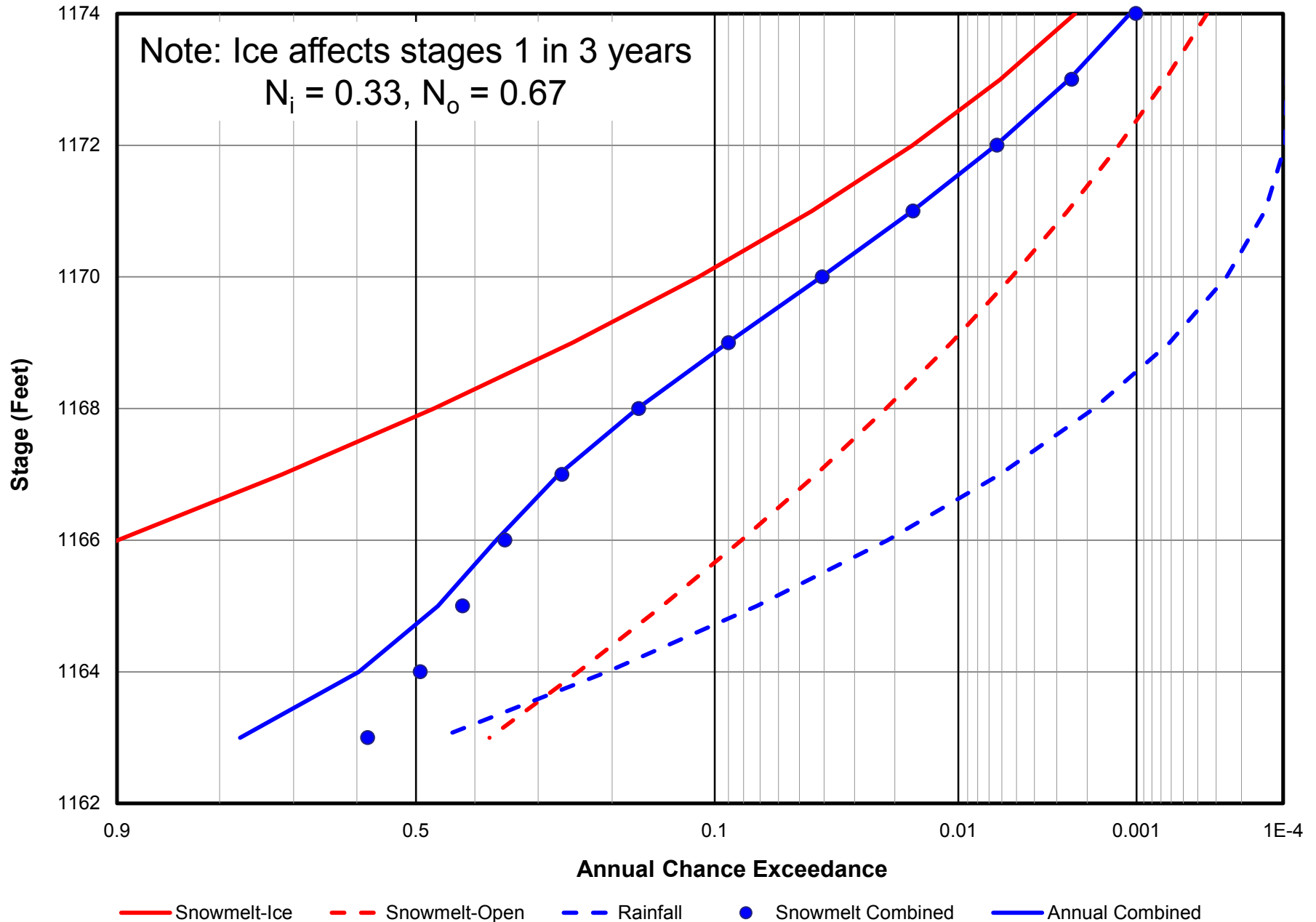


# Platte River Stage-Frequency



# Platte River Stage-Frequency

Note: Ice affects stages 1 in 3 years  
 $N_i = 0.33$ ,  $N_o = 0.67$





*Map*  
**MODERNIZATION**  
Federal Emergency Management Agency



**FEMA's Flood Hazard Mapping Program**

**Guidelines and  
Specifications**  
*for*  
**Flood Hazard  
Mapping Partners**

*Appendix F: Guidance for Ice-Jam  
Analyses and Mapping*



**FEDERAL EMERGENCY MANAGEMENT AGENCY**

[www.fema.gov/fhm/dl\\_cgs.shtm](http://www.fema.gov/fhm/dl_cgs.shtm)

**April 2003**



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# Questions/Discussion

