CREST HIRES Summer 2016 Research Project
River ice

SIMON KRAATZ

RESEARCH GROUP/THEME III: LAND SURFACE HYDROLOGY

TOC

A. Introduction to Ice Jams

B. Project
   - Mapping of Landsat imagery on Google Earth
   - Change detection for traffic cameras (ice vs. no ice)
   - Use result of traffic camera algorithm and other data (gauge, temperature, satellite product …) and explore how they relate to ice cover via model (i.e. GLM, ANN…)

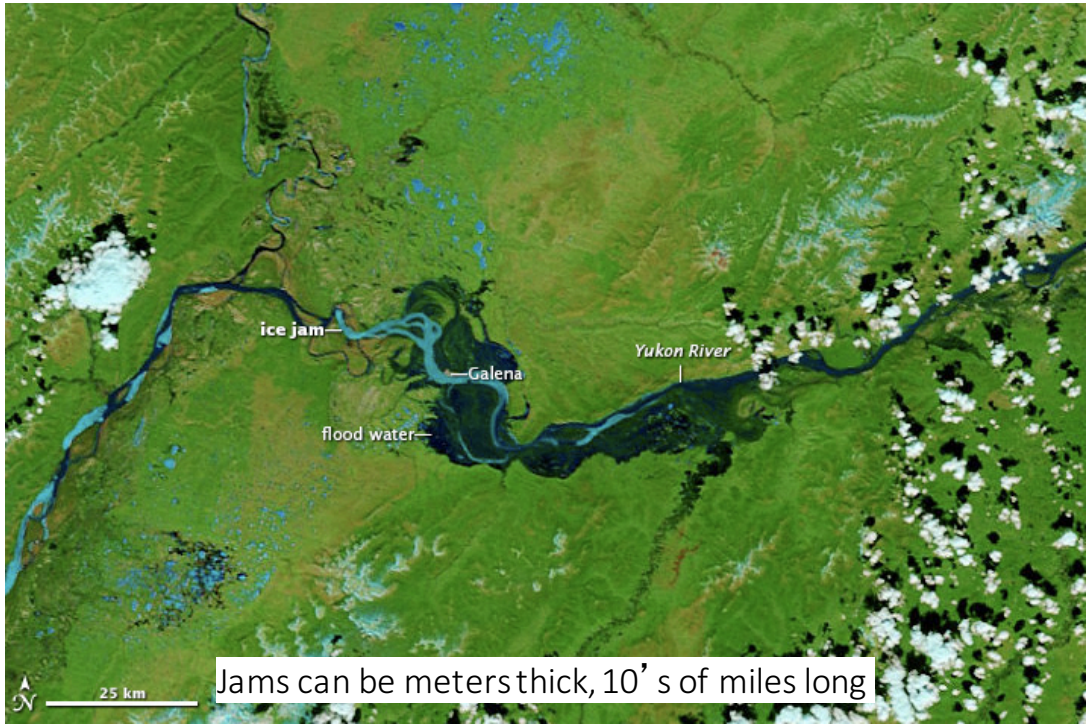
A. River ice jams

A collection of loose, randomly oriented, needle-shaped ice crystals in water (i.e. slush)

"…a stationary accumulation of ice or frazil that restricts flow"

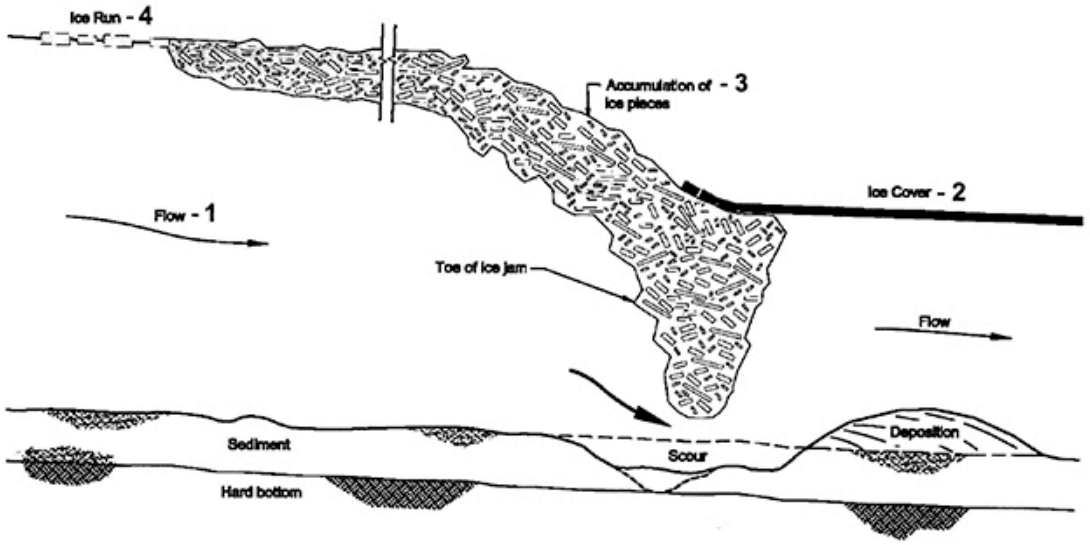
International Association for Hydraulic Research (IAHR)

A. River ice jams



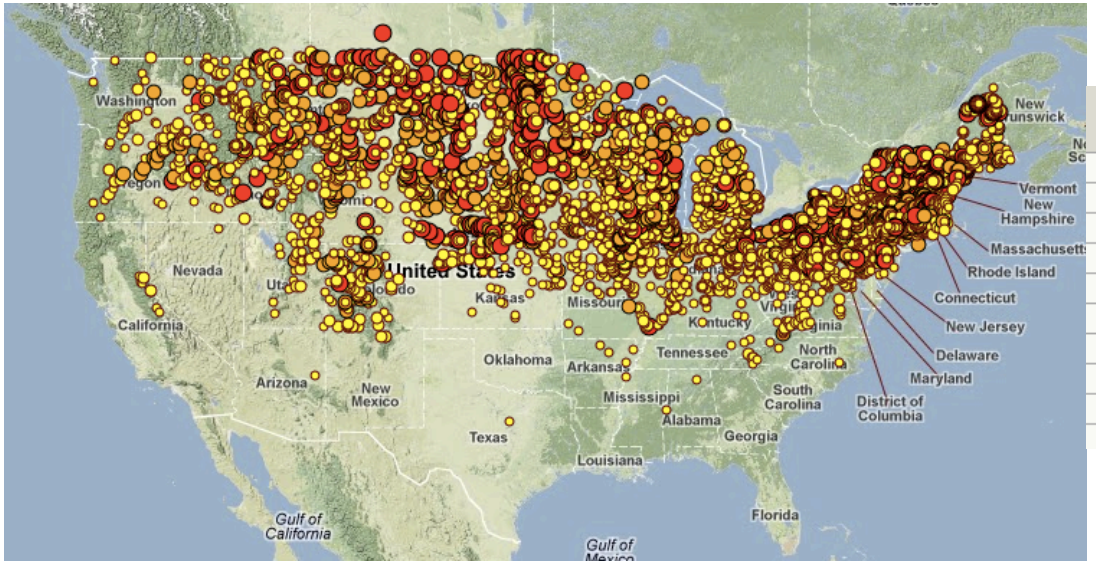
MODIS image of Yukon River before and after the jam caused flooding. May 2013, NASA EOS.

A. River ice jams



'Hanging Dam'
Source: www.thegrassriver.com

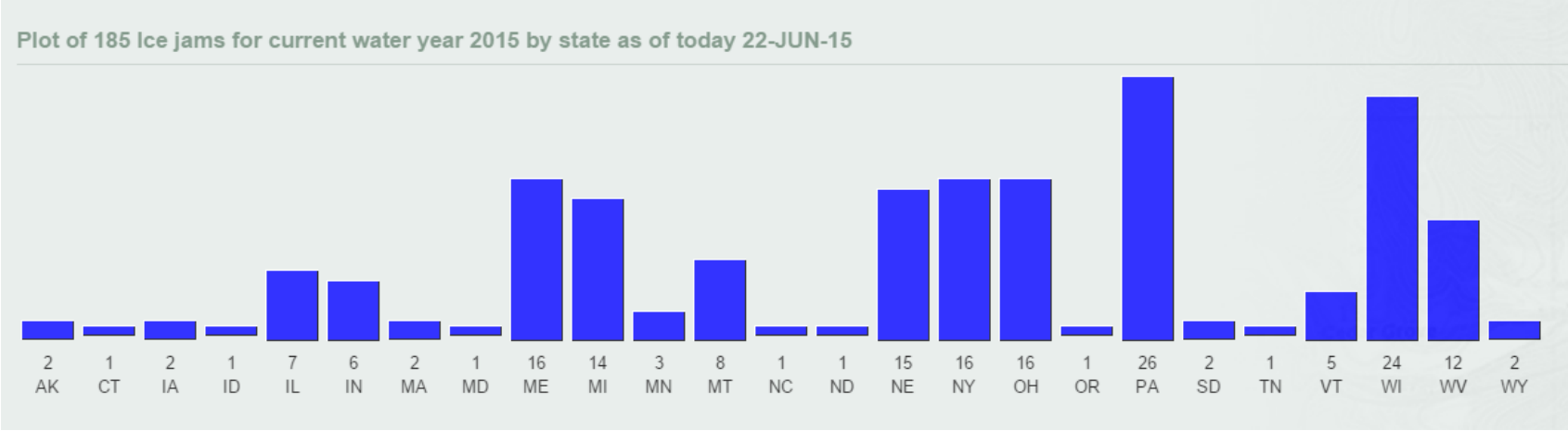
A. River ice jams



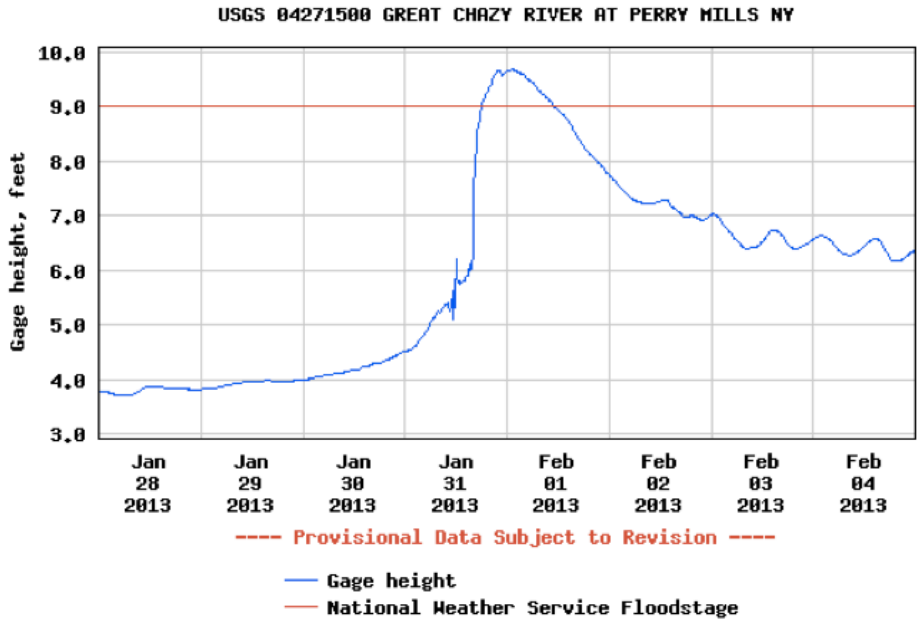
State	Number of Events	Most Recent Jam	Earliest Jam	Number of Rivers	Number of Locations	Rank by State
MT	1620	04/05/2011	01/01/1894	164	465	1
NY	1570	03/20/2011	02/09/1857	206	499	2
WI	1406	03/17/2011	04/07/1906	148	323	3
MN	1283	04/06/2011	01/09/1858	138	293	4
AK	1244	05/28/2011	06/01/1889	162	451	5
ND	1163	04/07/2011	03/31/1881	97	255	6
PA	1130	02/19/2011	03/15/1784	172	454	7
NE	1089	03/12/2011	02/26/1905	68	278	8
SD	1072	03/18/2011	04/05/1881	116	306	9
VT	903	03/13/2011	01/01/1785	96	267	10

Source: CRREL IJDB

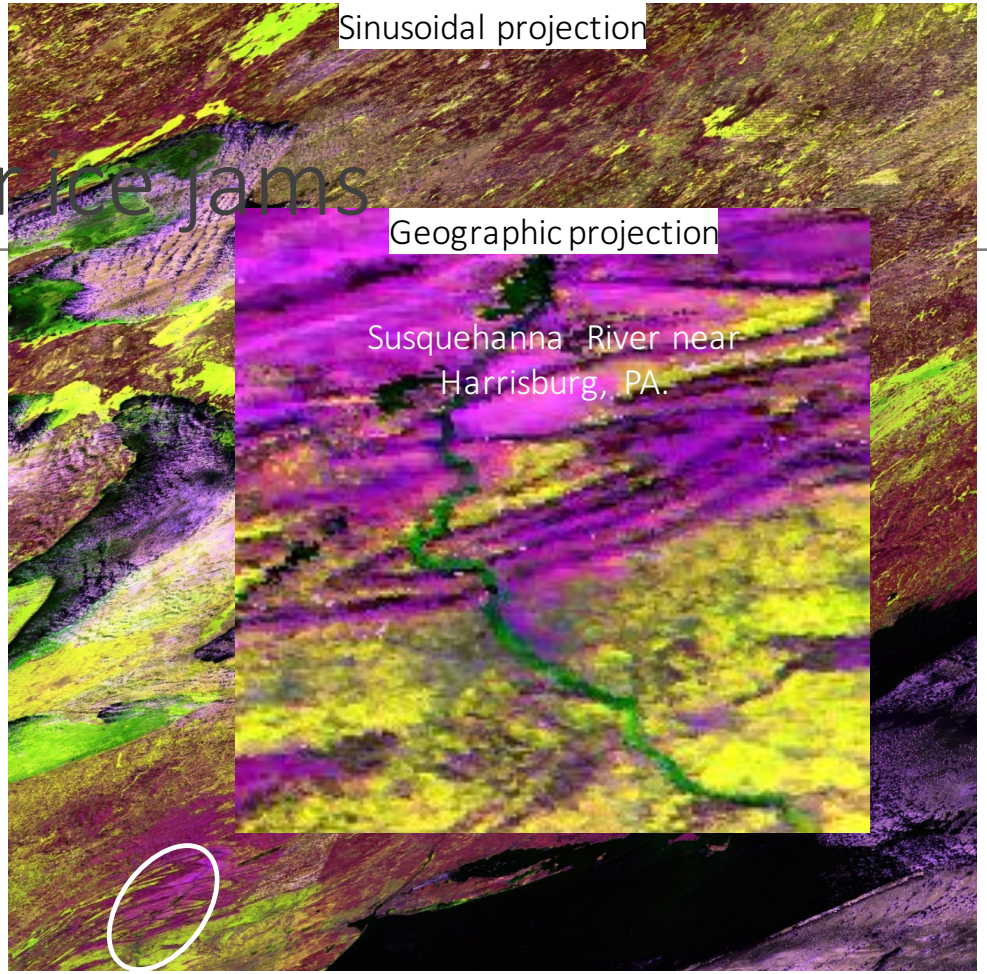
A. River ice jams



A. River ice jams



A. River ice jams



500 m resolution, MODIS Aqua.

B. Projects

PROJECTS (2)

(1) Model ice cover/jam on Lower Sus. River
- From surface observation only (Temp., Flow)
- Combination of surface with satellite data
  - Time series related to ice cover and ice cover change
- Assess value of satellite data

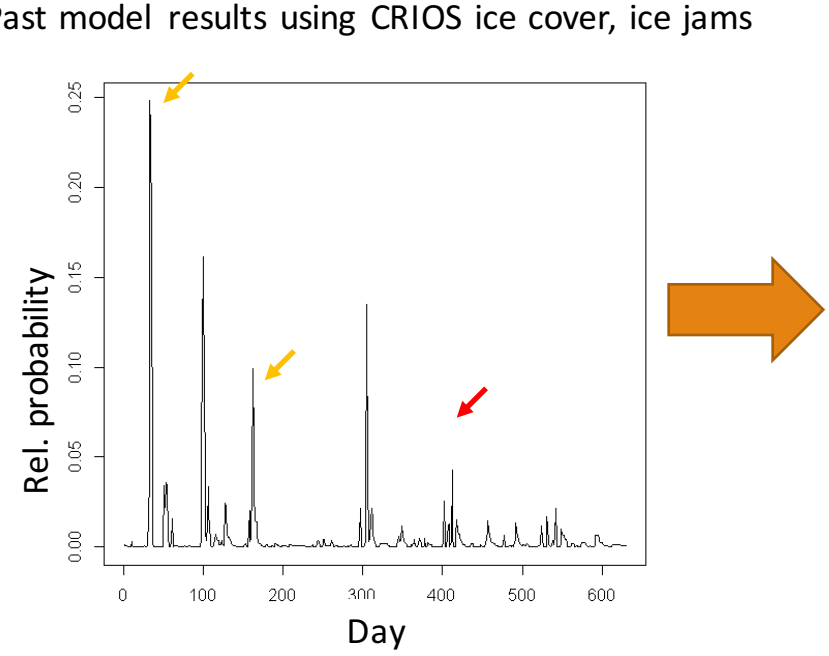
(2) Observe ice cover on Lower Sus. River
- Change detection for traffic cameras
- Make a 'mask'
- Analyze spectral statistics
- Determine if ice is present

SKILLS

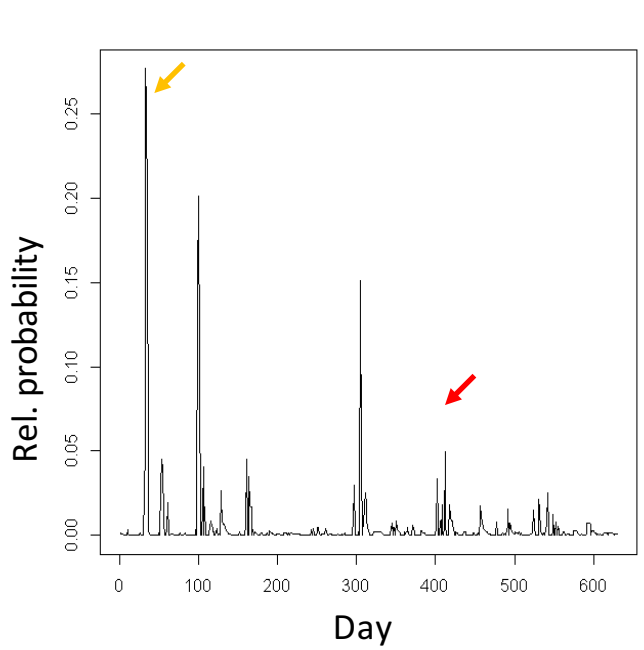
Amongst other things, you will
- work with satellite data/images
- create maps in GIS
- develop a model/algorithm
- use software such as Matlab, R, Excel, ENVI/IDL, Python and GIS for analysis and visualization

B. Model ice cover/jams

Past model results using CRIOS ice cover, ice jams



Jam probability (ground data only)

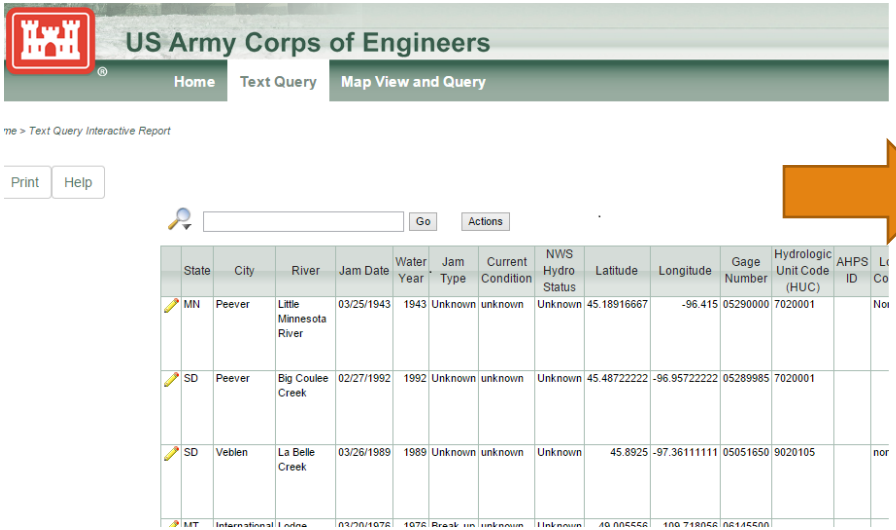


Jam probability (ground + sat data)

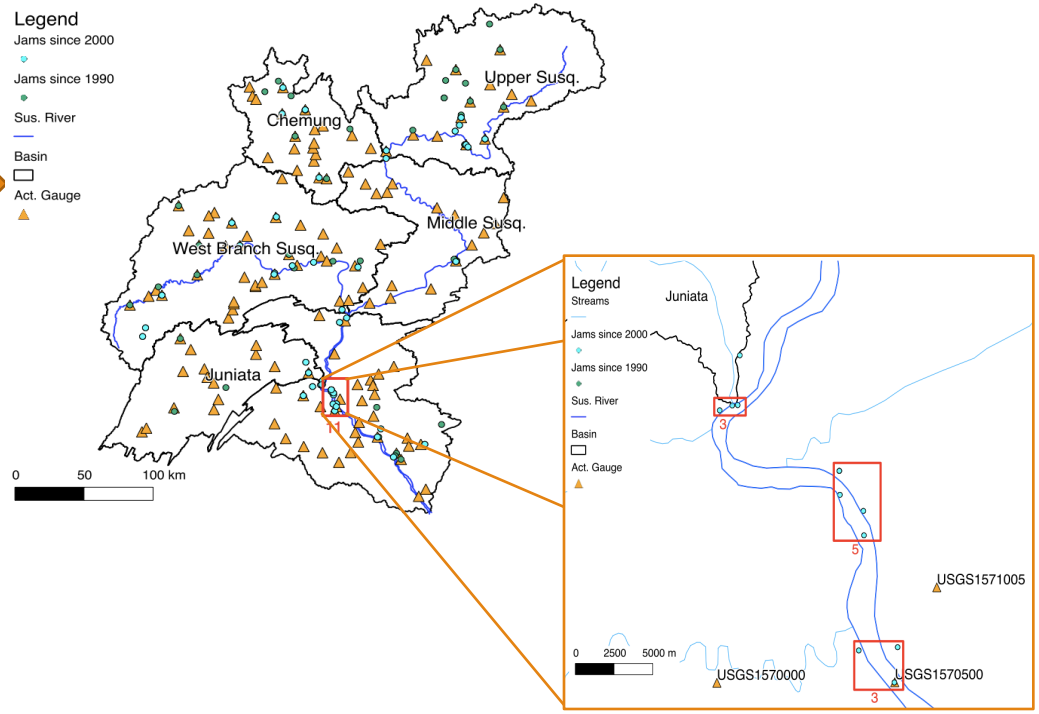
false alarm

no detection

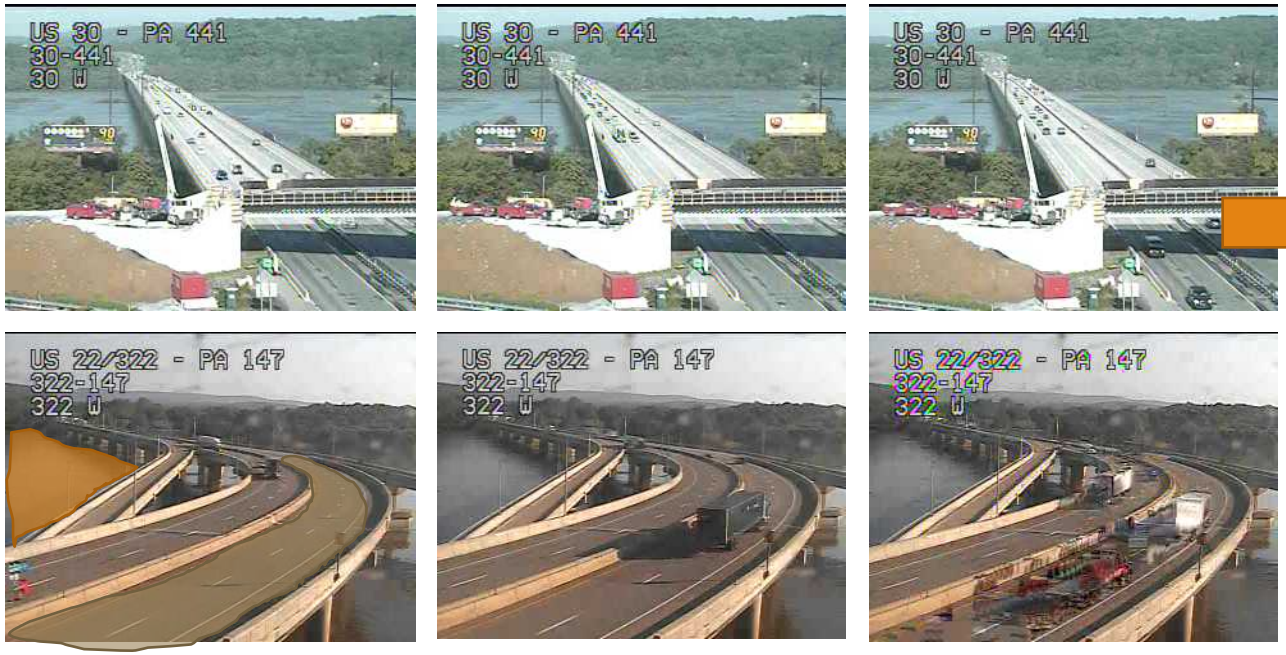
B. Visualize ice jam data in GIS

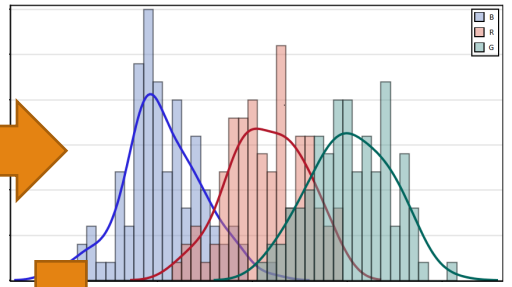


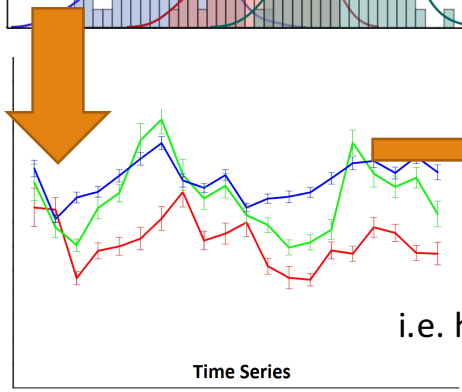
State	City	River	Jam Date	Water Year	Jam Type	Current Condition	NWS Hydro Status	Latitude	Longitude	Gage Number	Hydrologic Unit Code (HUC)	AHPS ID	Lo Co
MN	Peever	Little Minnesota River	03/25/1943	1943	Unknown	unknown	Unknown	45.18916667	-96.415	05290000	7020001		Nor
SD	Peever	Big Coulee Creek	02/27/1992	1992	Unknown	unknown	Unknown	45.48722222	-96.95722222	05289985	7020001		
SD	Veblen	La Belle Creek	03/26/1989	1989	Unknown	unknown	Unknown	45.8925	-97.36111111	05051650	9020105		nor
MT	International Lodge		03/20/1976	1976	Break-up	unknown	Unknown	49.005556	109.718056	06145500			



B. Change detection for traffic cameras







Code

Output

i.e. how many cars?