Interface Between Rivers and Lakes: Philosophies and Challenges

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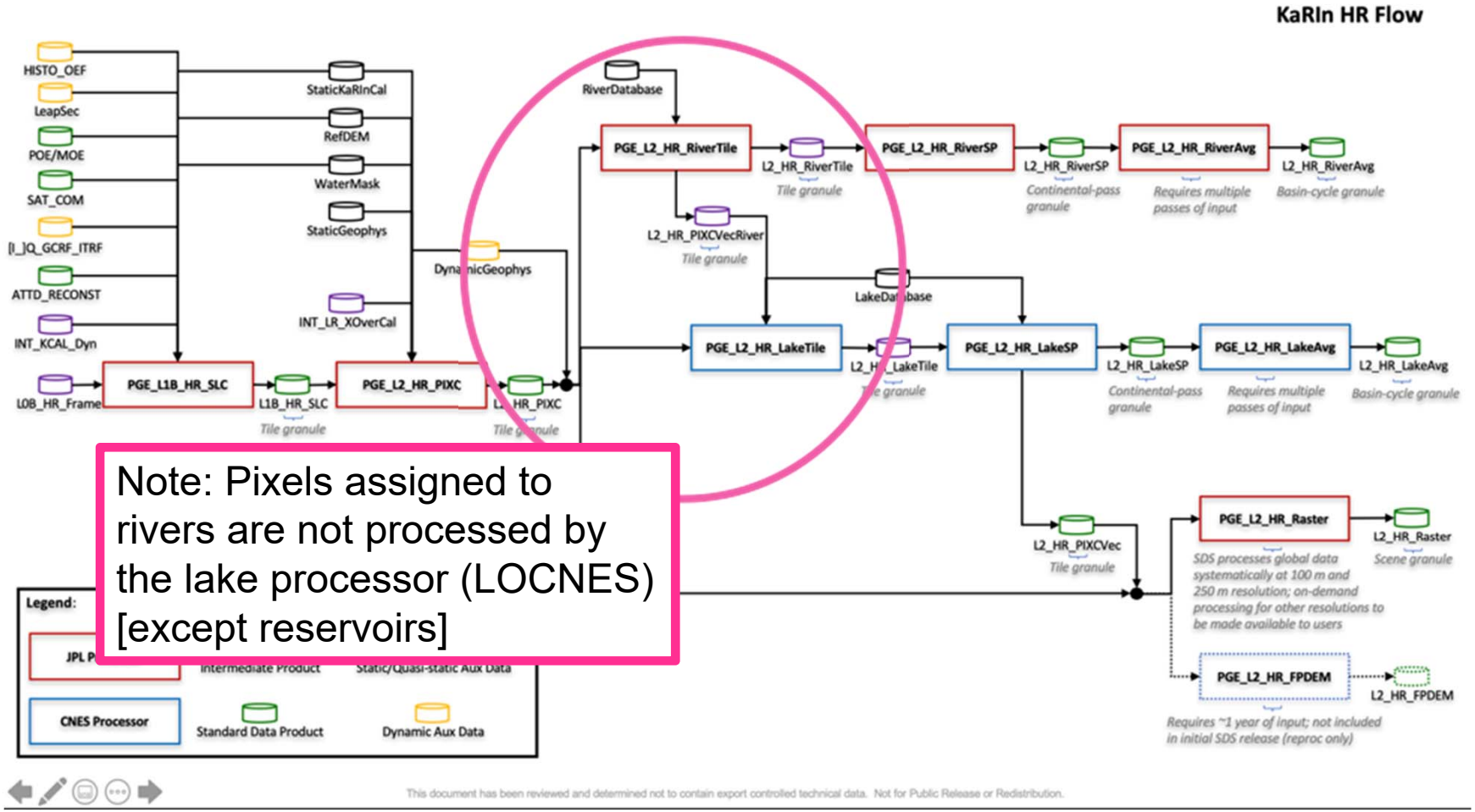
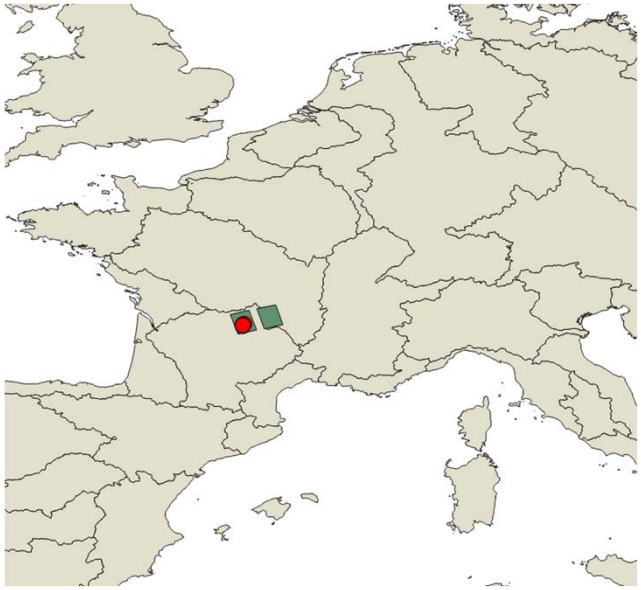
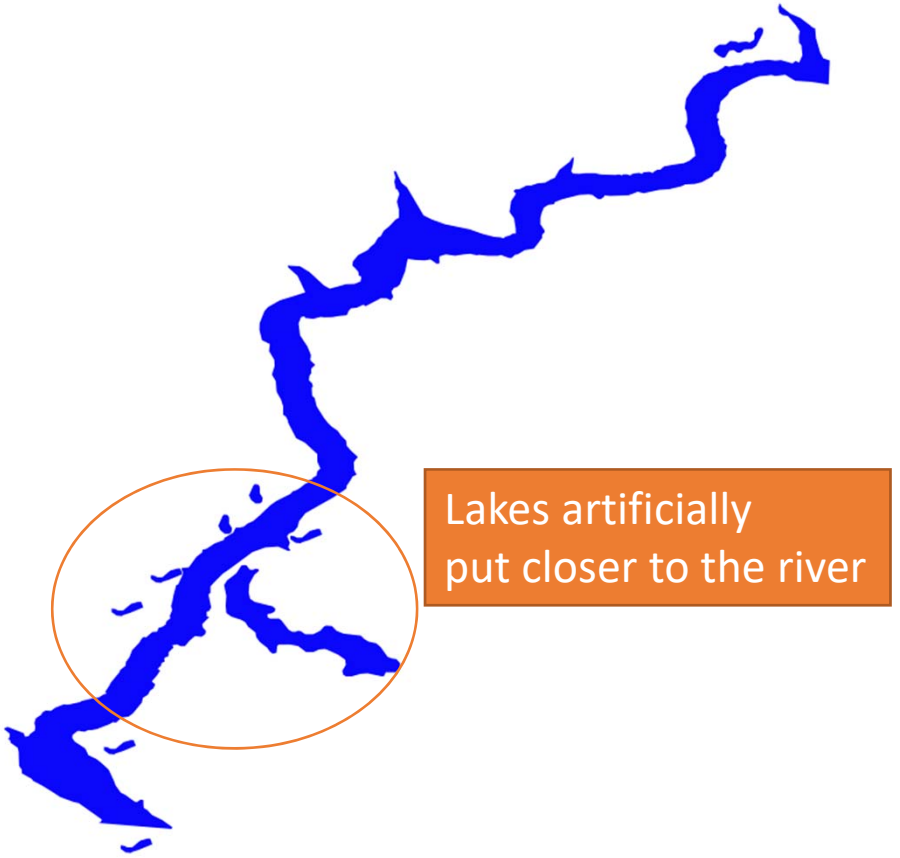
High-resolution processor flow chart



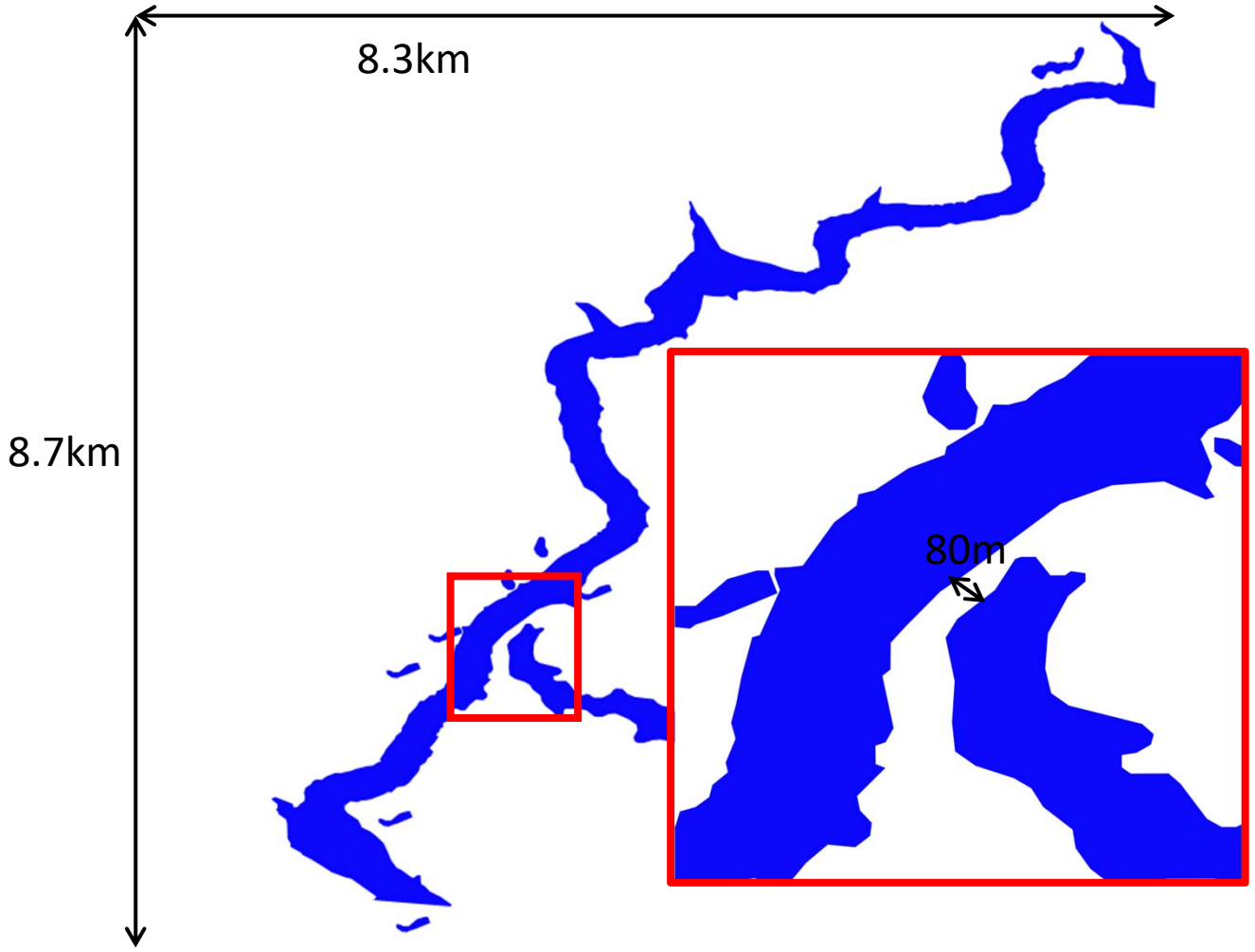
Small example with synthetic case from reality





Small example with synthetic case from reality

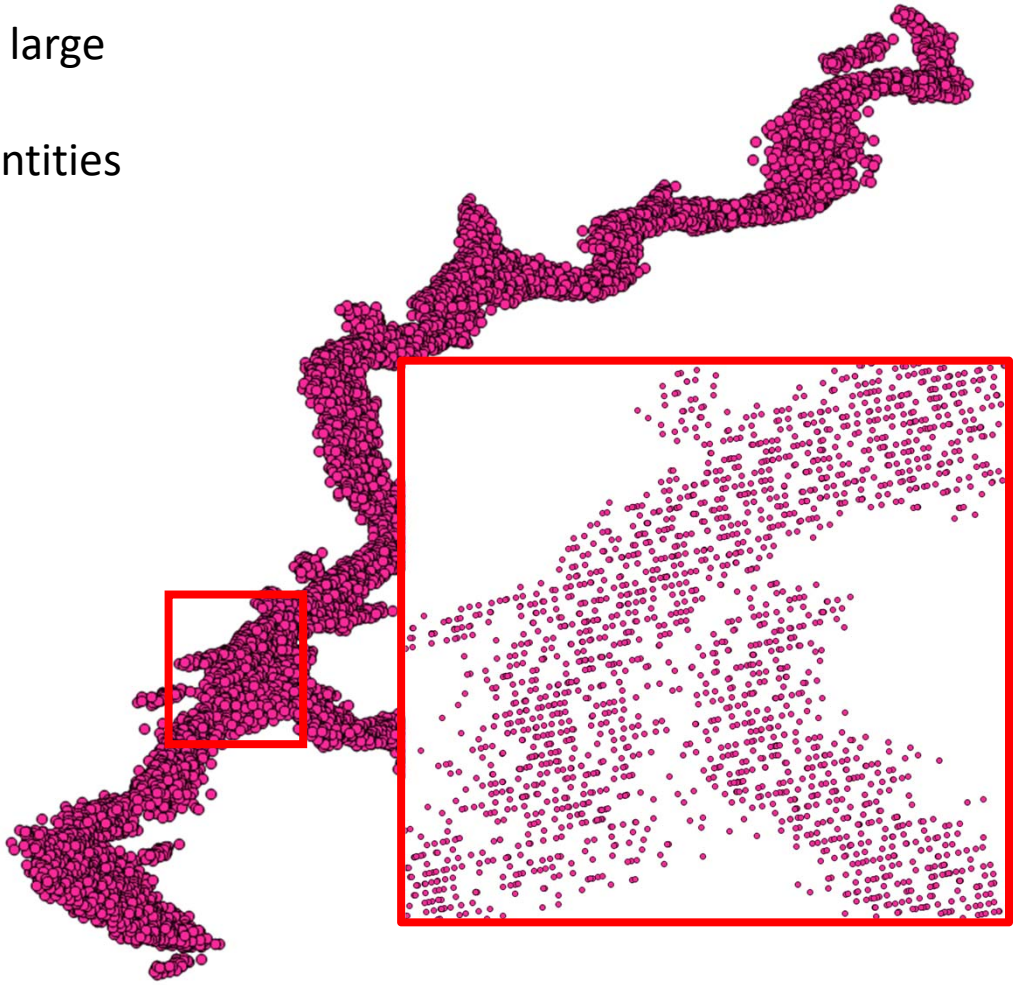
Water mask



Small example with synthetic case from reality

PixC obtained in output of the large scale simulator

→ Pixels are mixed between entities



Small example with synthetic case from reality

Nodes file obtained in output of RiverObs

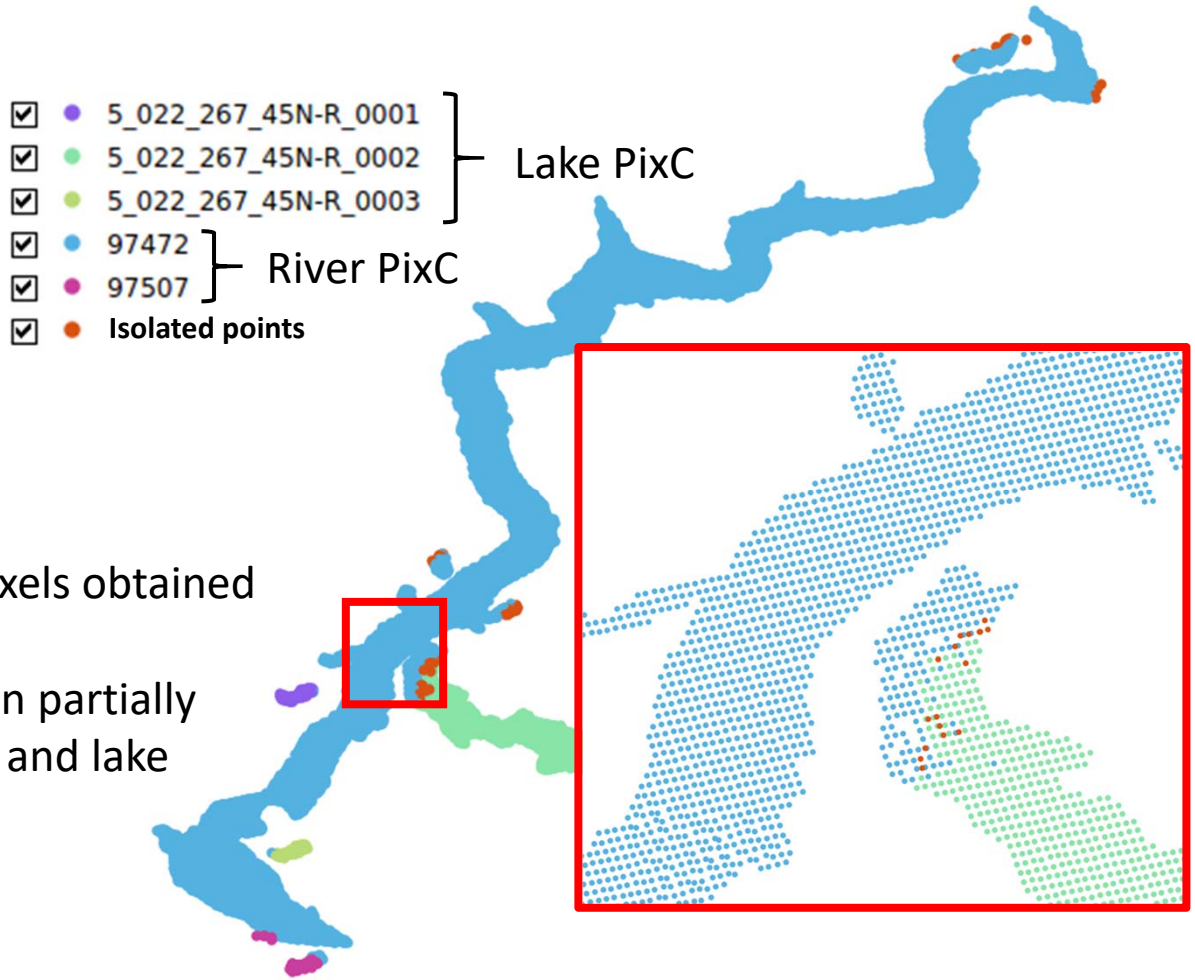
→ The centerline delineates the river

Small example with synthetic case from reality

Water mask

Improved geolocated pixels obtained in output of RiverObs
→ Some lake pixels have been processed by RiverObs

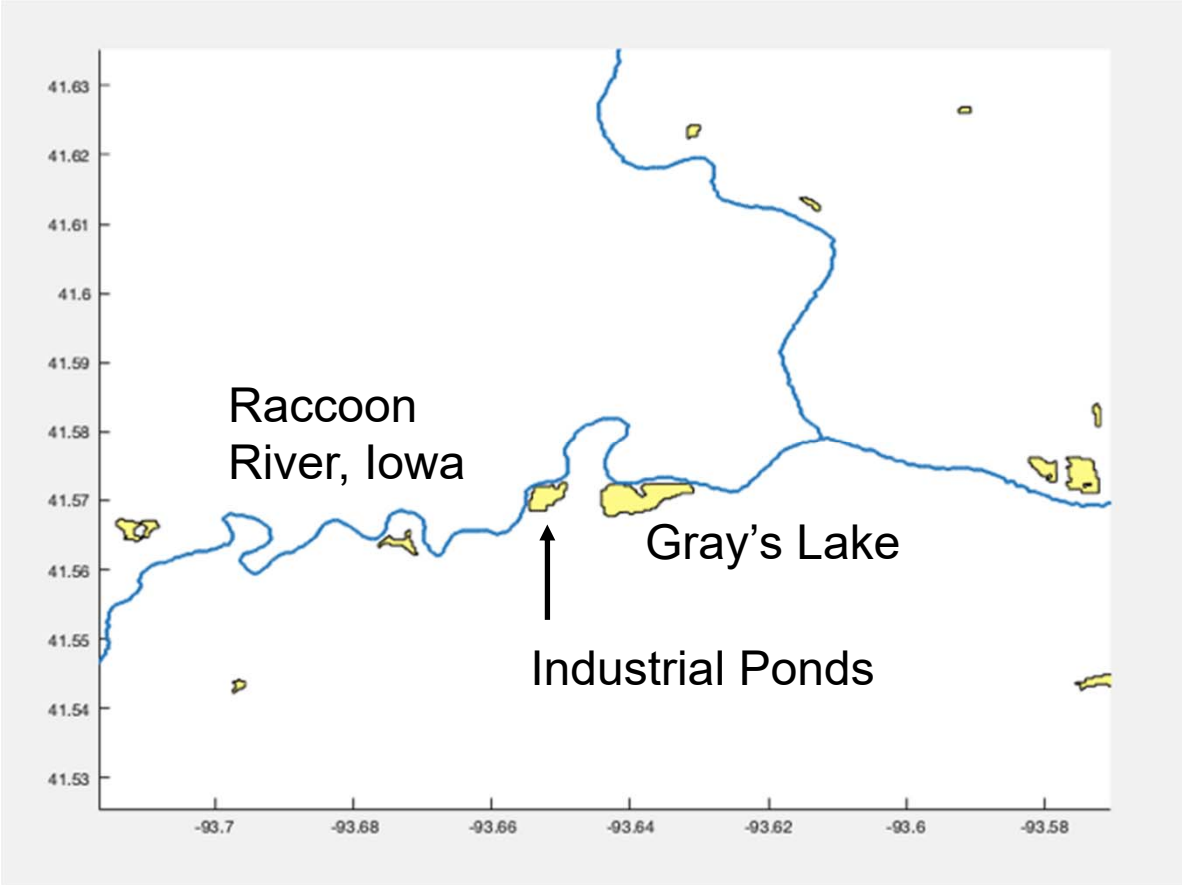
Small example with synthetic case from reality



Improved geolocated pixels obtained in output of LOCNES

→ Some lakes have been partially Processed by both river and lake processors

The “lakes-close-to-rivers” problem

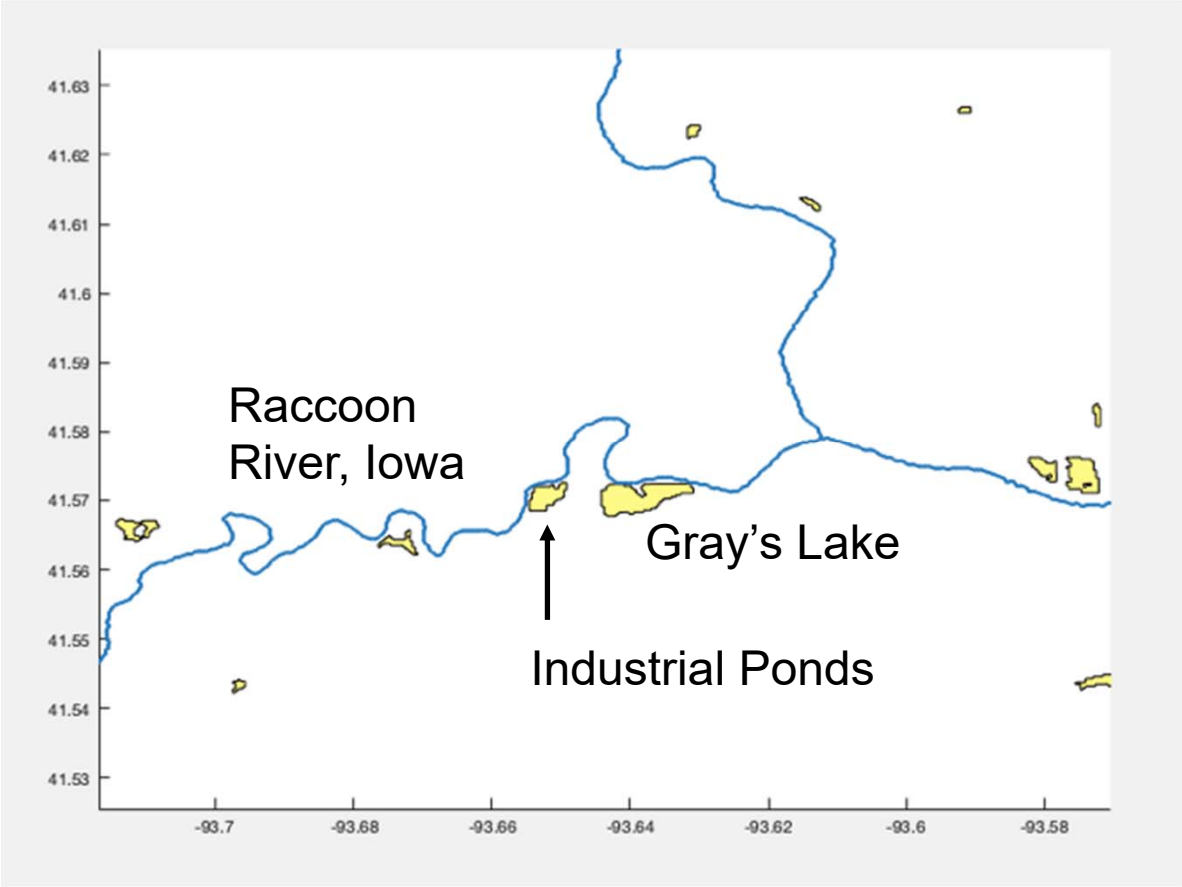


River and lake a priori databases shown: courtesy E. Altenau (UNC) and Y. Sheng (UCLA)

Baseline: set “max width” to 2x GRWL to allow for prior centerline error. “max distance” is thus equal GRWL width.

At nearest point, Raccoon is 65 m wide, berm is 40 m

The “lakes-close-to-rivers” problem



River and lake a priori databases shown: courtesy E. Altenau (UNC) and Y. Sheng (UCLA)

Worst case, river algorithm pulls in entire lake into the node, since it would be dominant segment at reach level. Node has crazy high area + width, and lake is not observed.

Less bad, if lake is not dominant segment, river node will steal pixels within “max width” from the lake.

Occurs fairly infrequently: seems worse for rivers < 100 m.

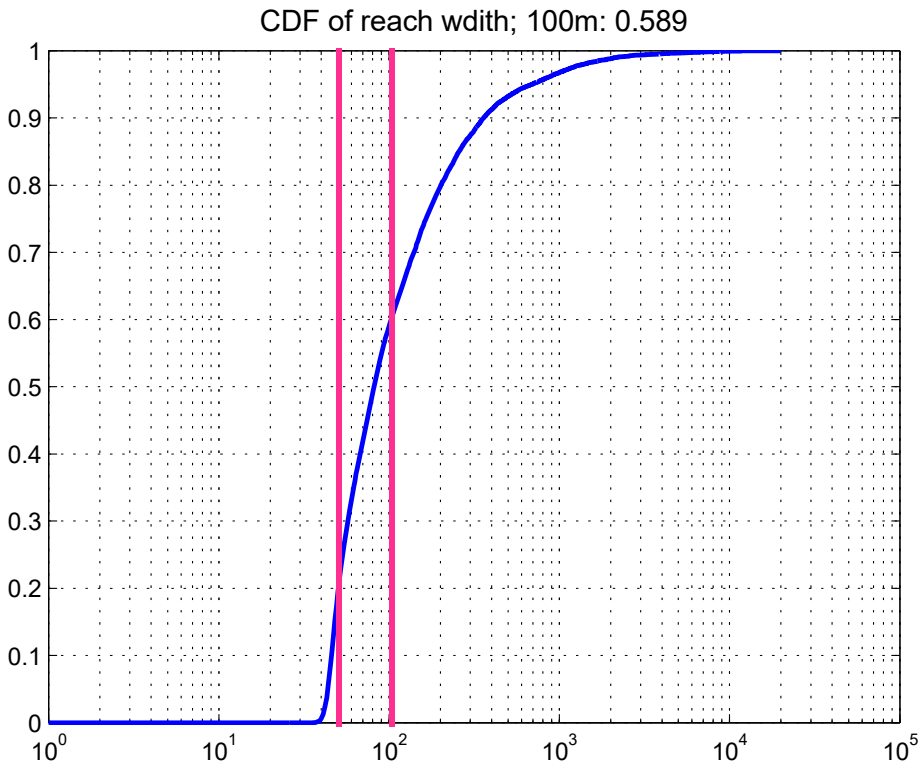
The “lakes-close-to-rivers” problem

The pink area (slightly exaggerated) shows pixels that would get pulled from the lake and assigned to the river.

Note these are not based on calculations and so shapes are approximate

How prevalent is the lakes-close-to-rivers problem?

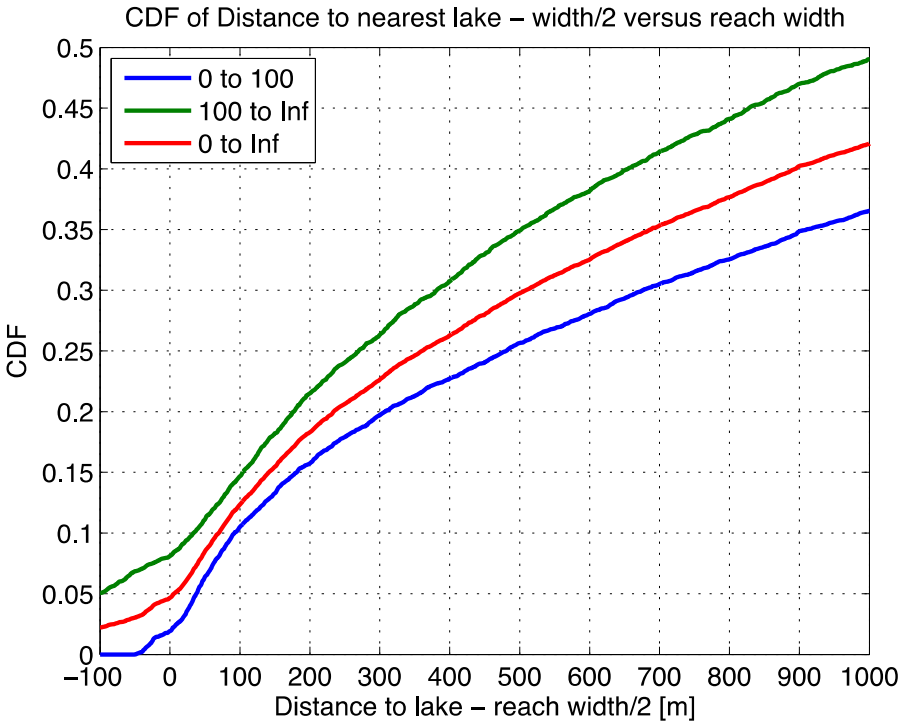
- Alex Fore (JPL) analyzed this for European lake and river databases (~16,000 river nominal 10 km reaches; ~460,000 lakes)
- Note that ~59% of river reaches < 100 m; 64.6% of lakes < (250 m)^2



Courtesy Alex Fore

How prevalent is the lakes-close-to-rivers problem?

- ~5% of reaches have a lake closer than ½ reach width. Problem worse (~7%) for rivers greater than 100m
- ~1% of lakes have a reach closer than ½ reach width. Problem worse (~6%) for lakes >1 km2
- This will get slightly worse, as it is likely that we will want to map pixels within 1 width (instead of ½ width) to centerline
- Digging in to better understand where these happen



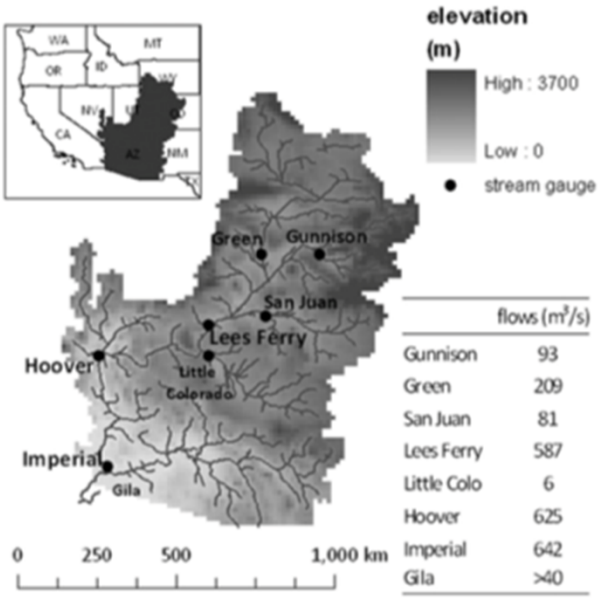
Courtesy Alex Fore

Consequences of pixel miss-assignment

- For rivers:
  - Impact on height and area values (and other attributes derived from them)
  - Impact on improved geolocation since its key principle uses the height
- For lakes:
  - Impact on lake boundaries (and other attributes derived from this)

Is there a solution to the lakes-close-to-rivers problem?

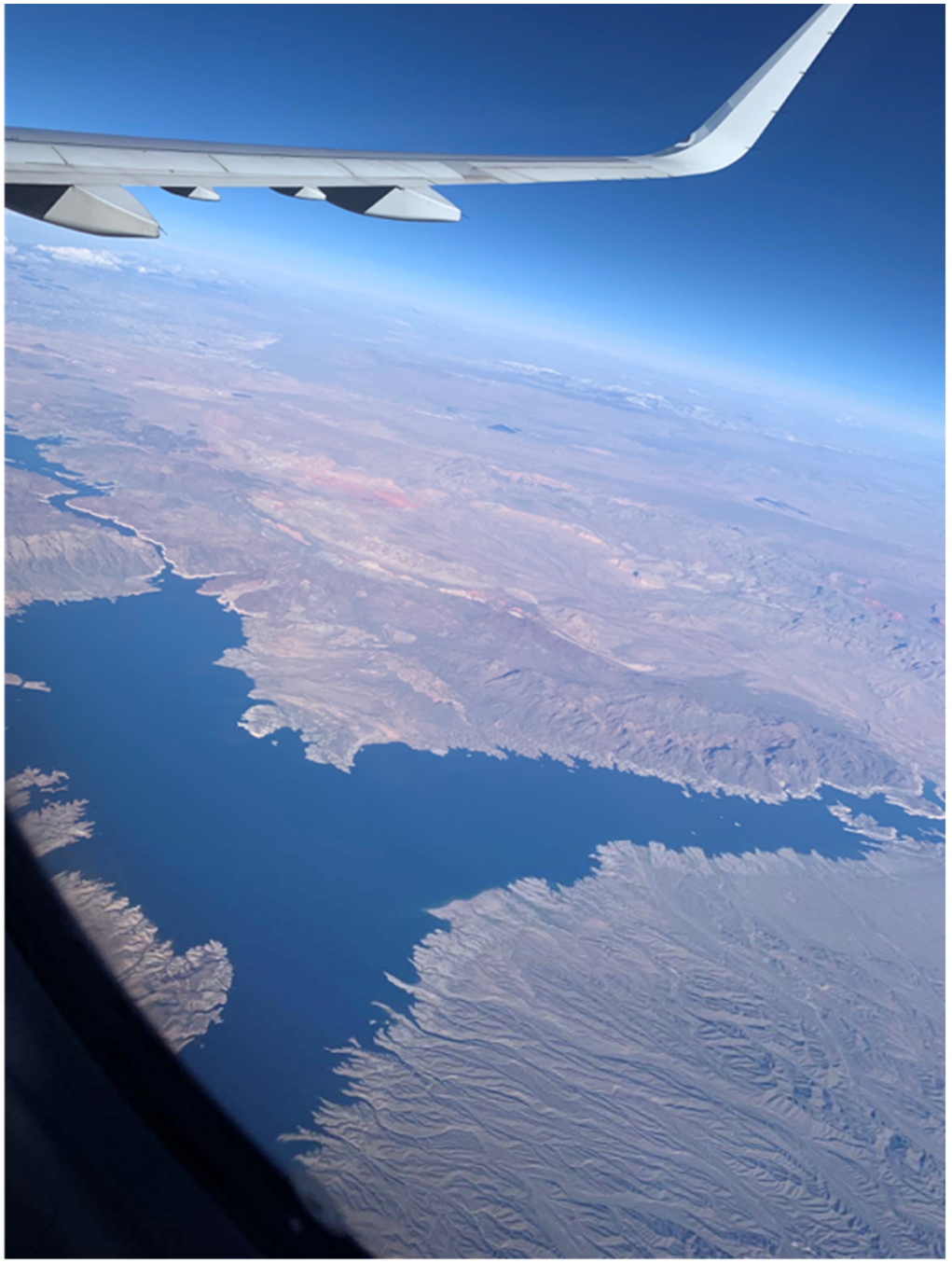
- JPL (Alex along with Brent Williams and others) are currently assessing whether or not a better pixel assignment algorithm might be feasible in RiverObs
  - It would take both the lake and river prior databases into account when assigning pixels
  - It is expected that this added complexity would yield higher accuracy, but at higher computational expense, and greater risk of failure in some cases
- To be developed in LOCNES:
  - Ability to process entities partially processed by RiverObs
  - Try to identify entities entirely processed by RiverObs but that should not (some ideas but more difficult to implement…)



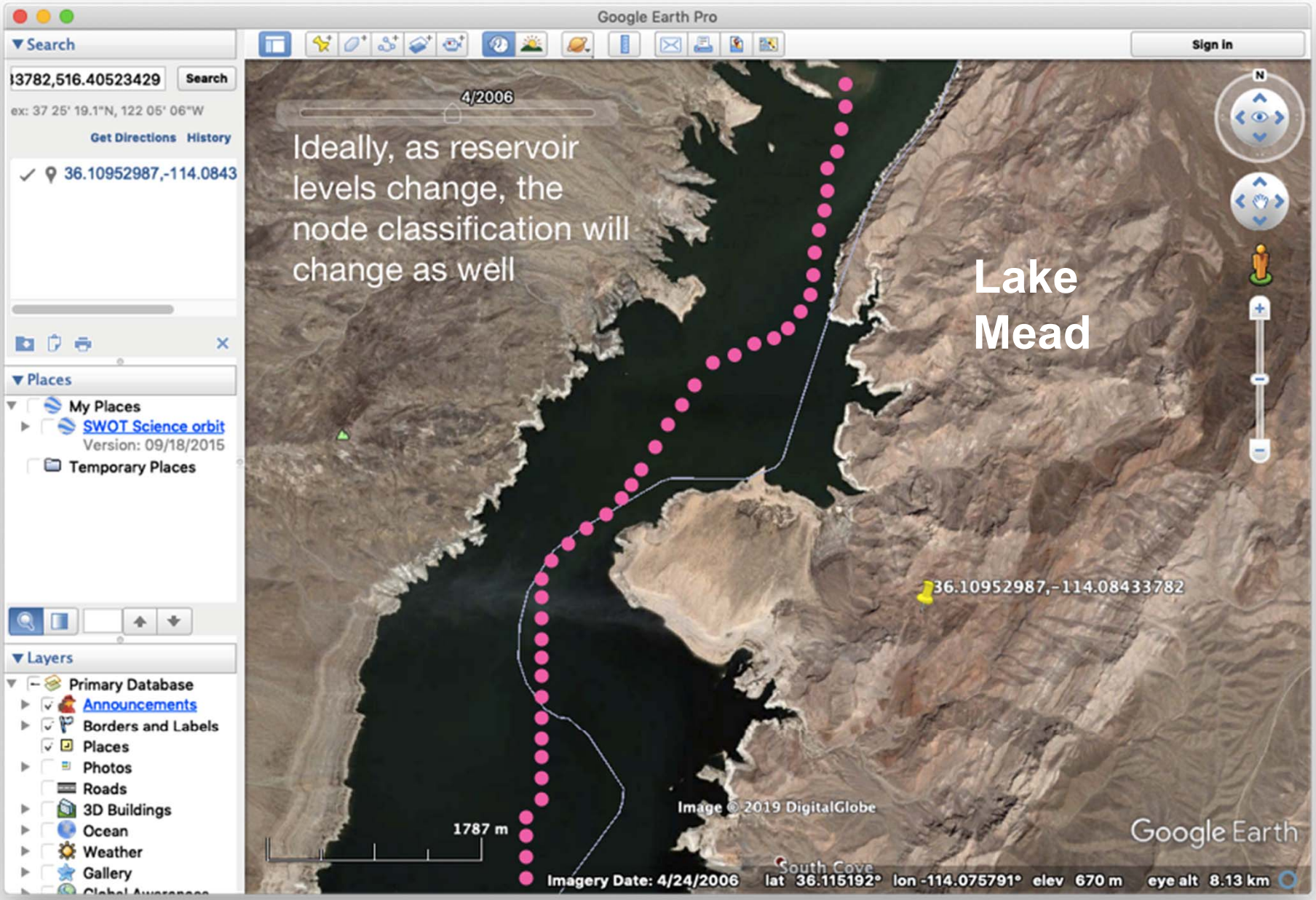
	flows (m^3/s)
Gunnison	93
Green	209
San Juan	81
Lees Ferry	587
Little Colo	6
Hoover	625
Imperial	642
Gila	>40

FIG. 1. Colorado River topography and subbasin flows. Flows in the table, except for Gila, are naturalized flow averages from USBR (2010) from 1975 to 2005 and correspond to the dots in the figure. USBR did not report flows for the Gila, so we report a predevelopment estimate from Blinn and Poff (2005).

One additional case where rivers and lake overlap will likely pose challenges to algorithms: lakes that fall along river networks, such as reservoirs like Lake Mead



Circles spaced ~200 m apart



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