2004

Integrated GIS

and

Microbial Water Quality Modeling

through use of

Network Processing

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The purpose of this presentation is

- **To provide you with some inside of the Arc*Hydro* *Network* feature dataset and**
- **To demonstrate the capabilities of a geometric network to identify *Contamination* in streams**

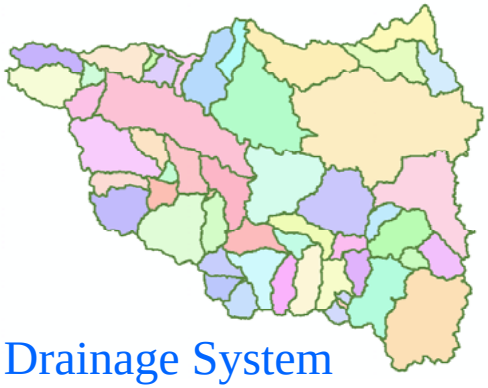
What is Arc Hydro?

A geographic data model for storing geo- spatial and temporal water resources data in ArcGIS

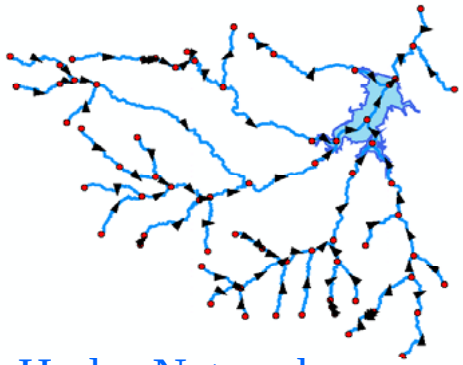
- A set of hydro objects built on top of ArcObjects
- A set of standardized attributes

- A vocabulary for describing data (glossary)
- A toolset for implementing the data model

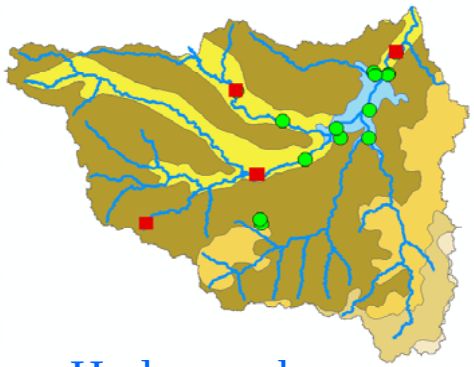
Arc Hydro Components



Drainage System

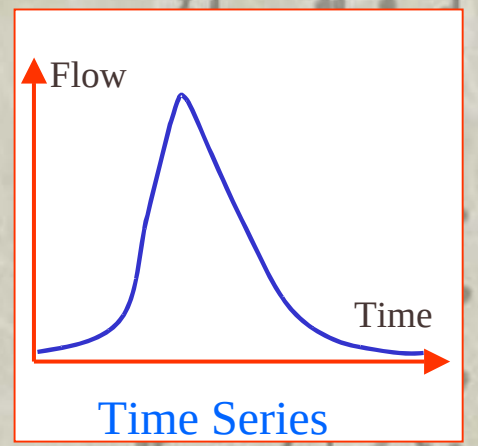


Hydro Network



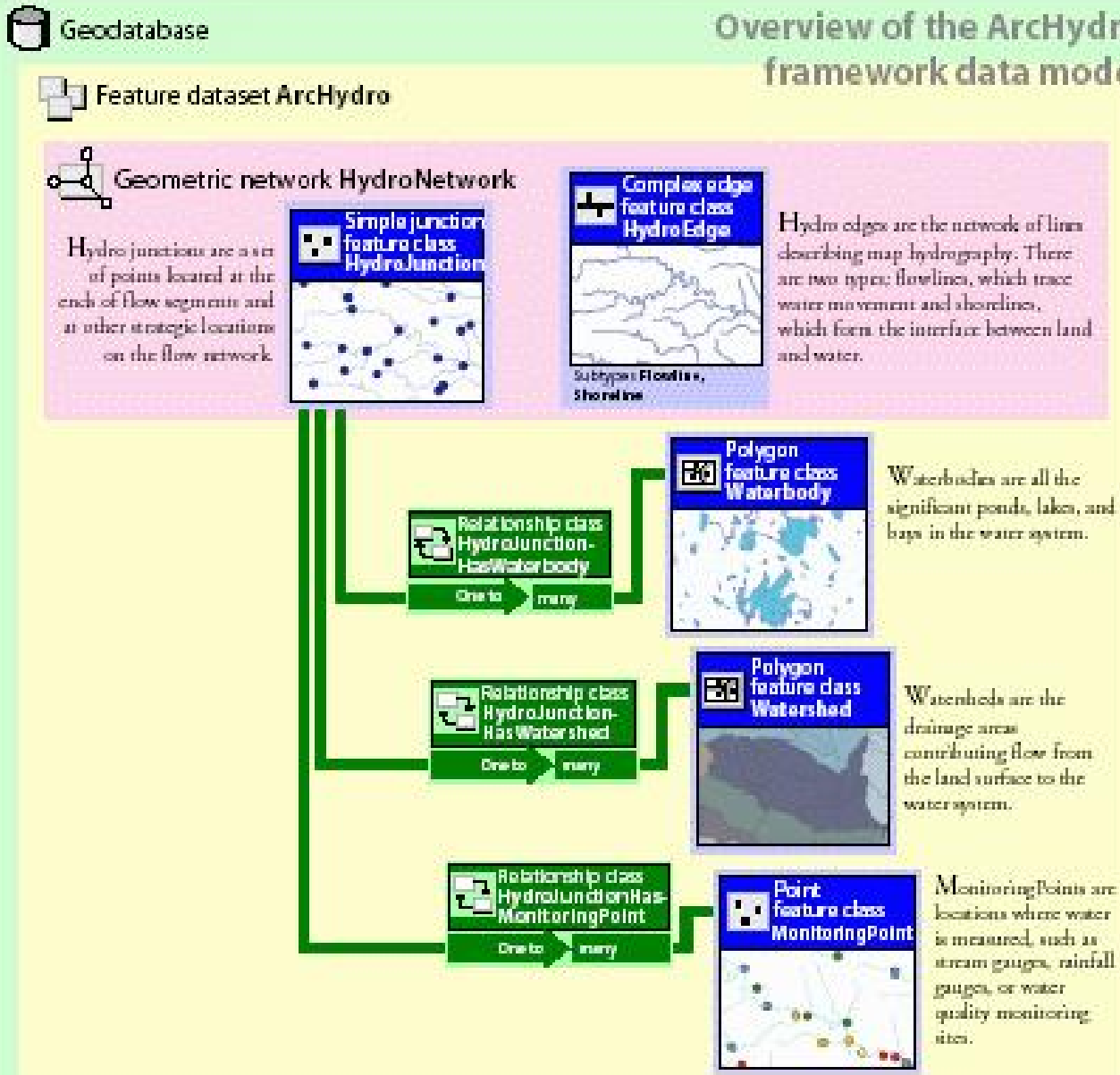
Hydrography

Channel System



Time Series

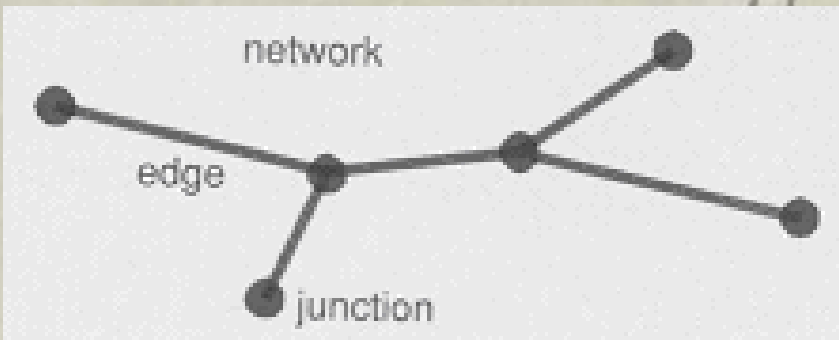
Overview of the ArcHydro framework data model



HydroNetwork

The *Network* feature dataset describes the connectivity of water flow through the landscape as a water resources network

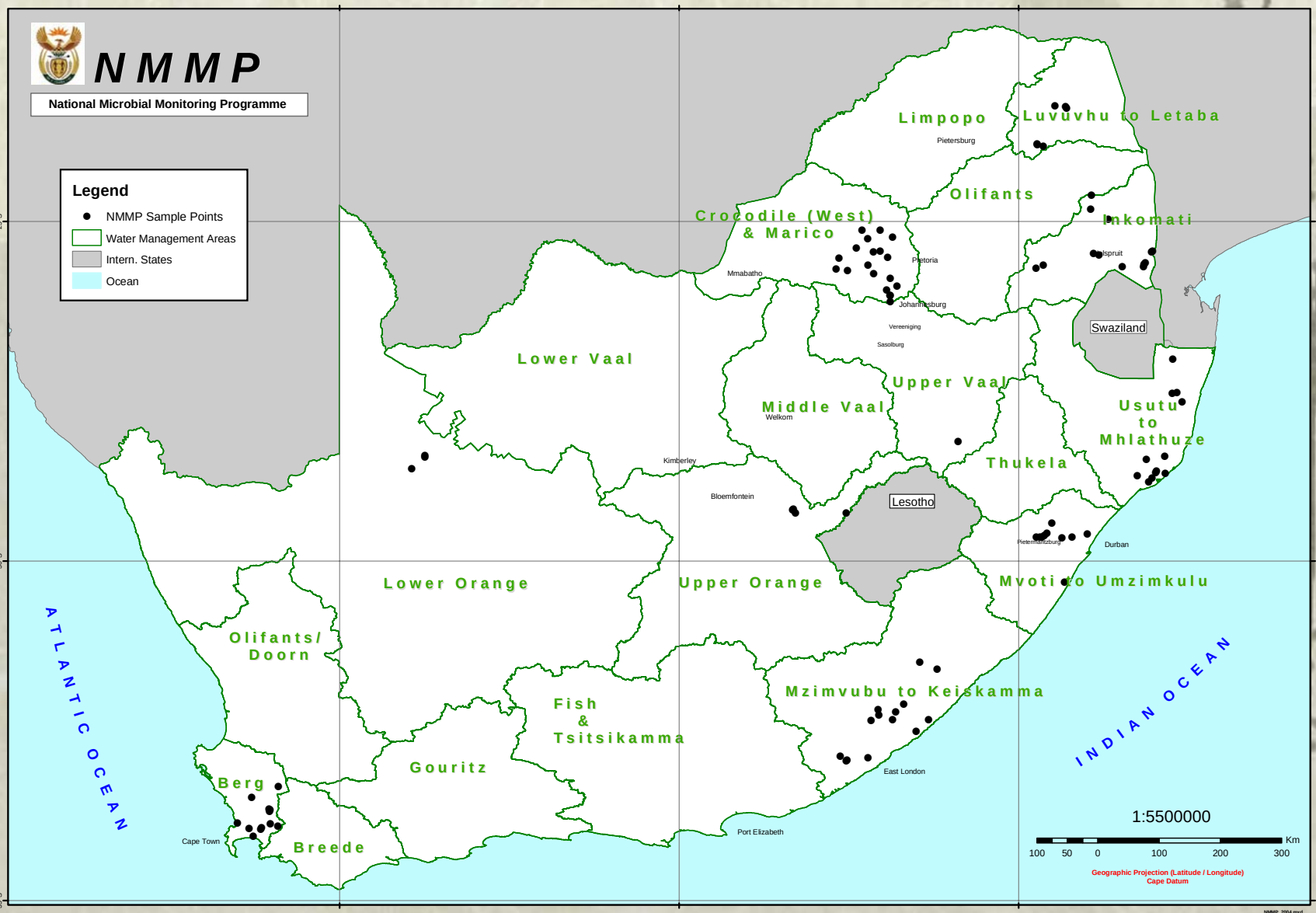
HydroNetwork* is the principal feature class of this dataset: It is an ArcGIS geometric network, whose components are *HydroEdges* and *HydroJunctions



Water flows along *HydroEdges*, and *HydroEdges* are connected by *HydroJunctions*

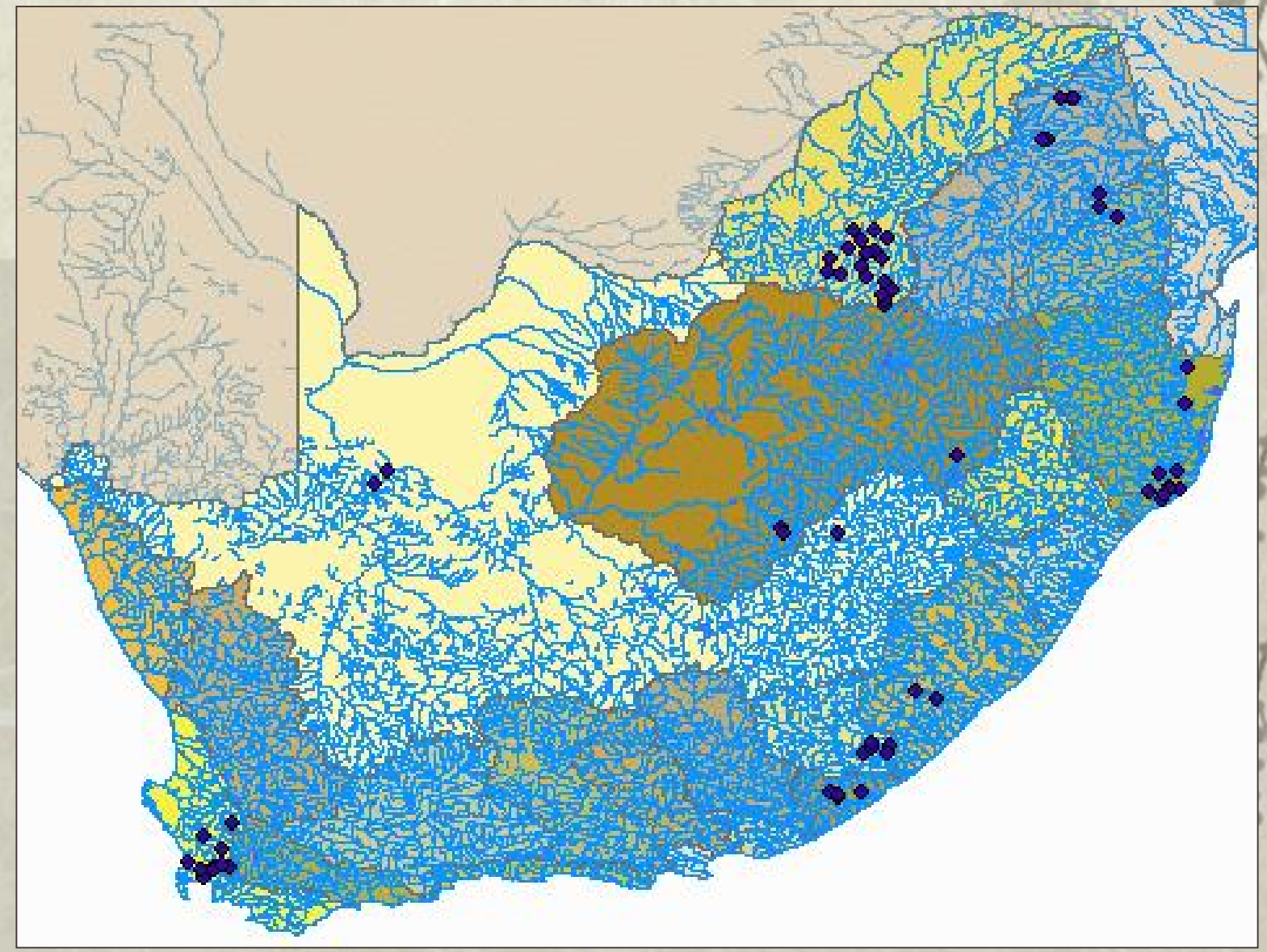
The HydroNetwork describes flow through rivers and streams, and the centerlines of waterbodies

NATIONAL MICROBIAL MONITORING PROGRAMME

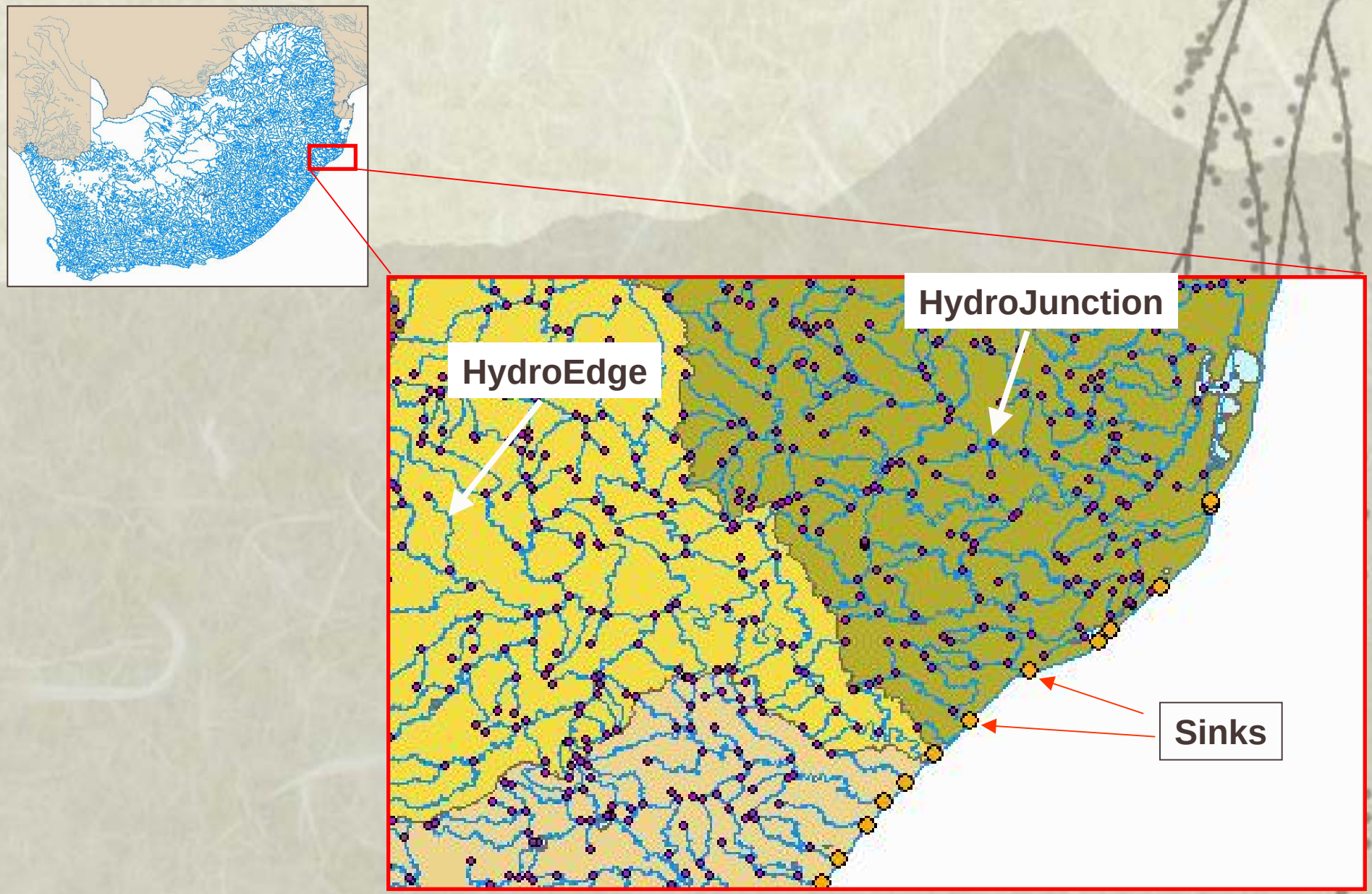


ArcHydro Network RSA at 1 : 500 000

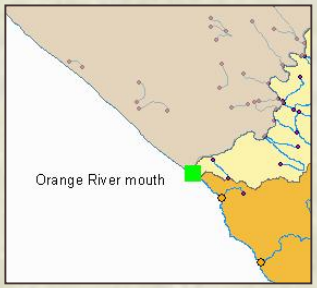
Including the spatial distribution of Microbial Monitoring Points



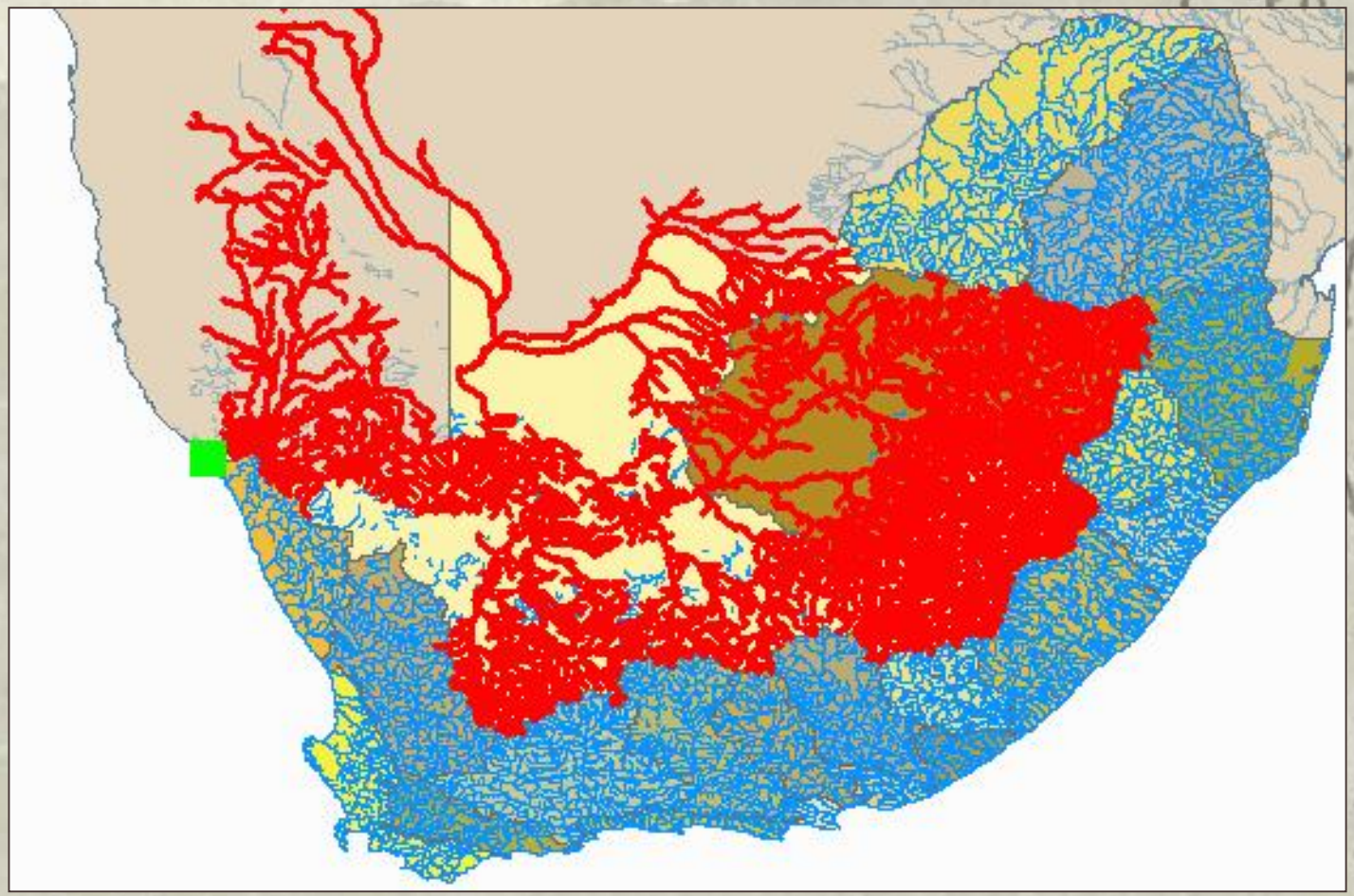
A closer look at the geometric Network



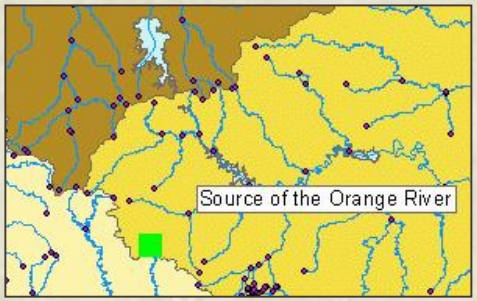
ArcHydro Network RSA



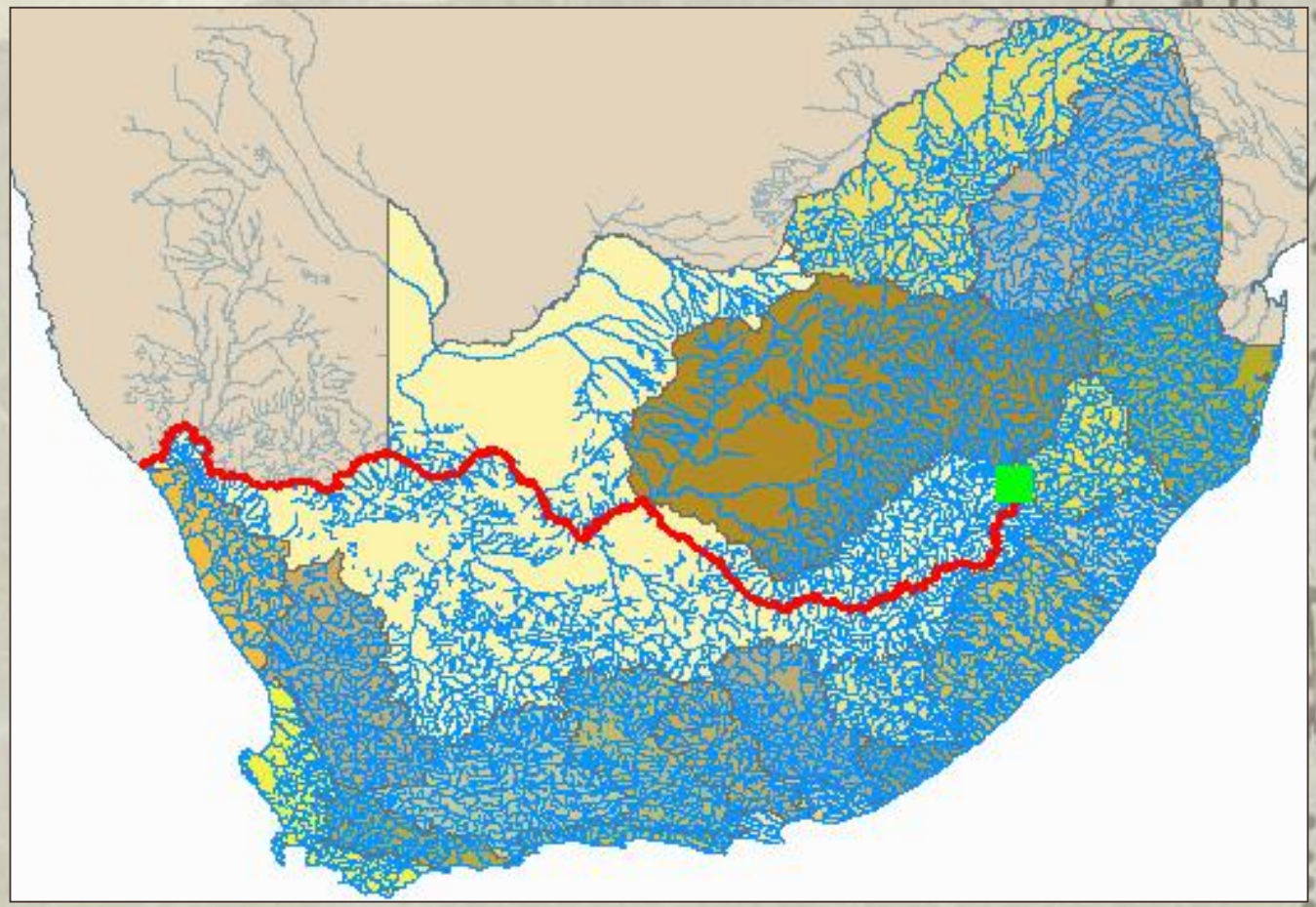
Trace Upstream the Orange River Mouth



ArcHydro Network RSA

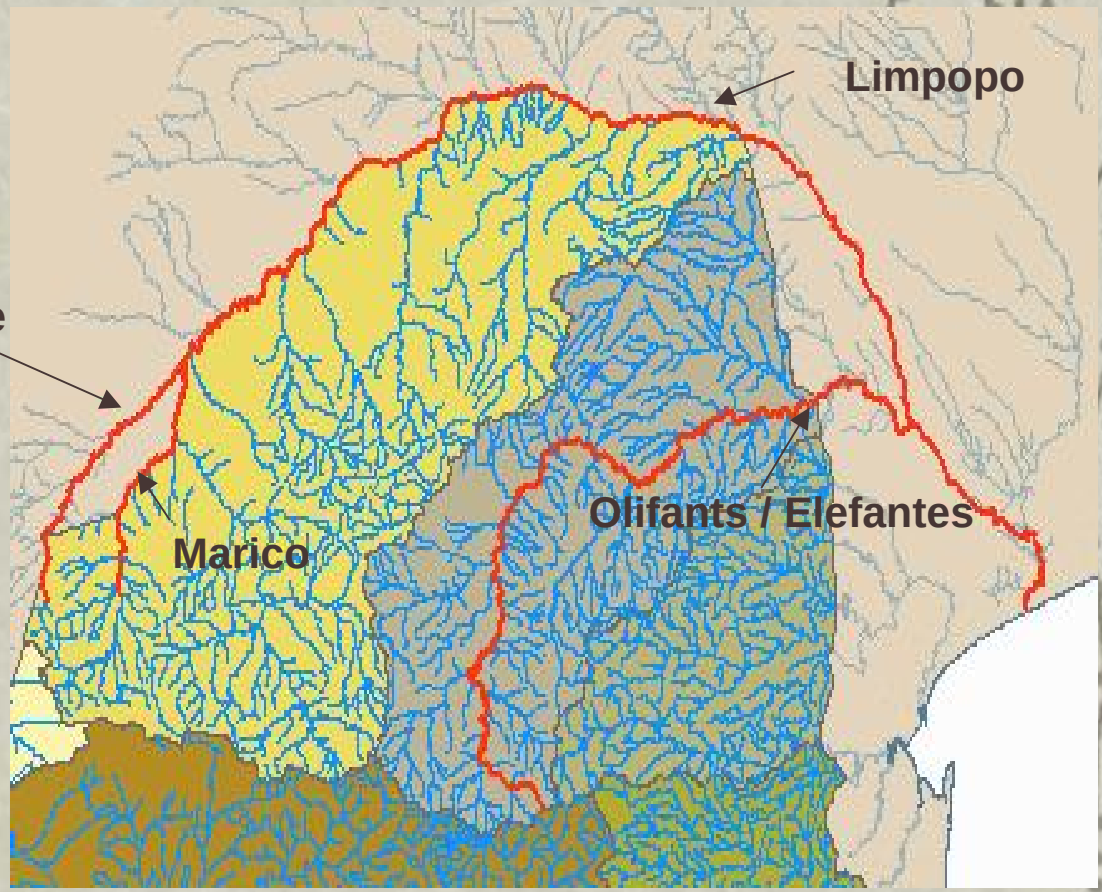


Trace Downstream the Orange River



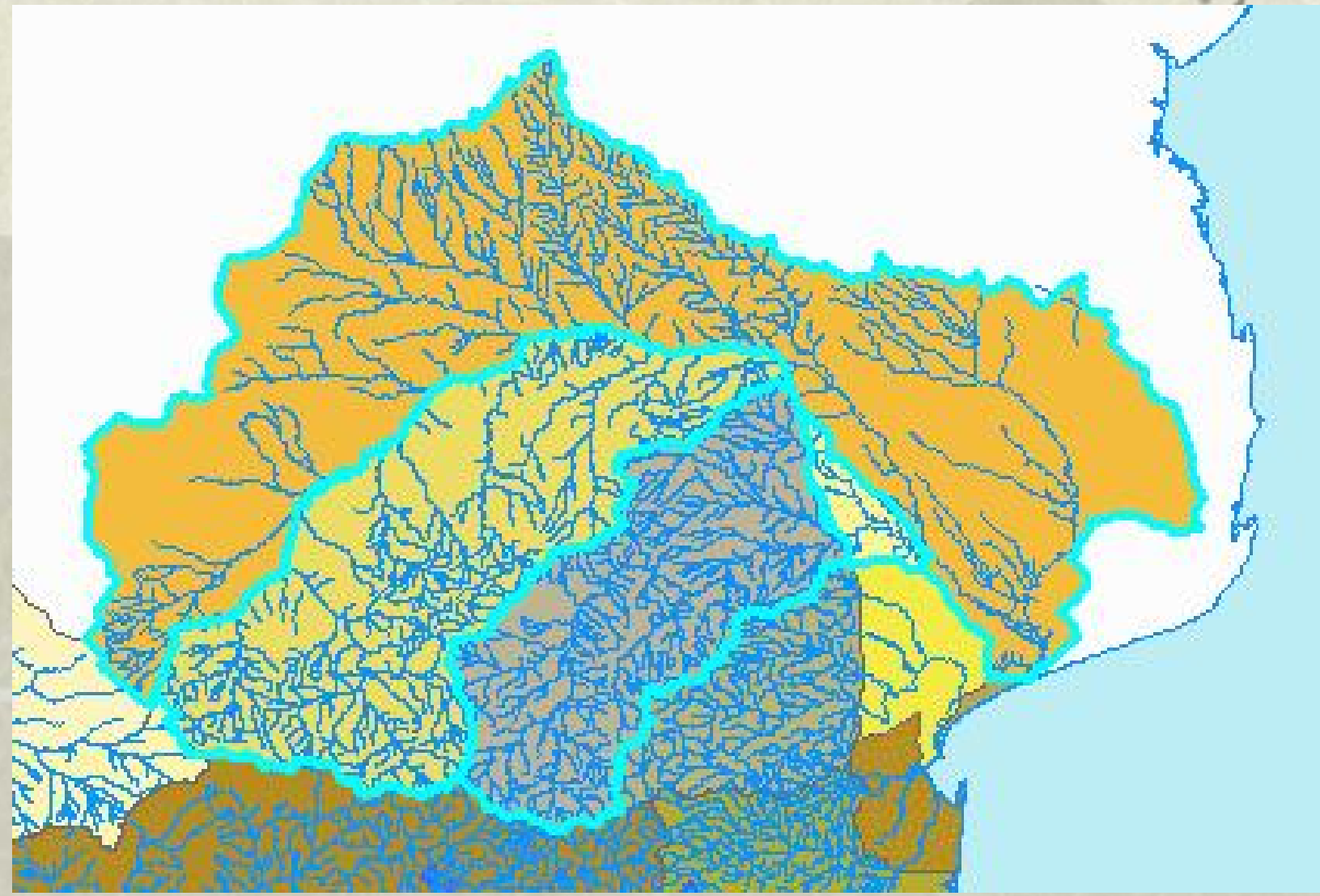
Working with Geometric Network

Identify Contamination in the LIMPOPO Basins

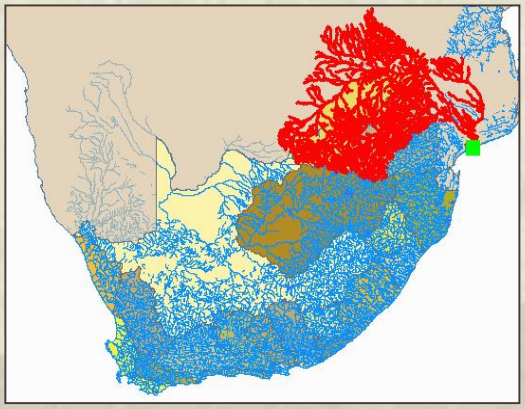


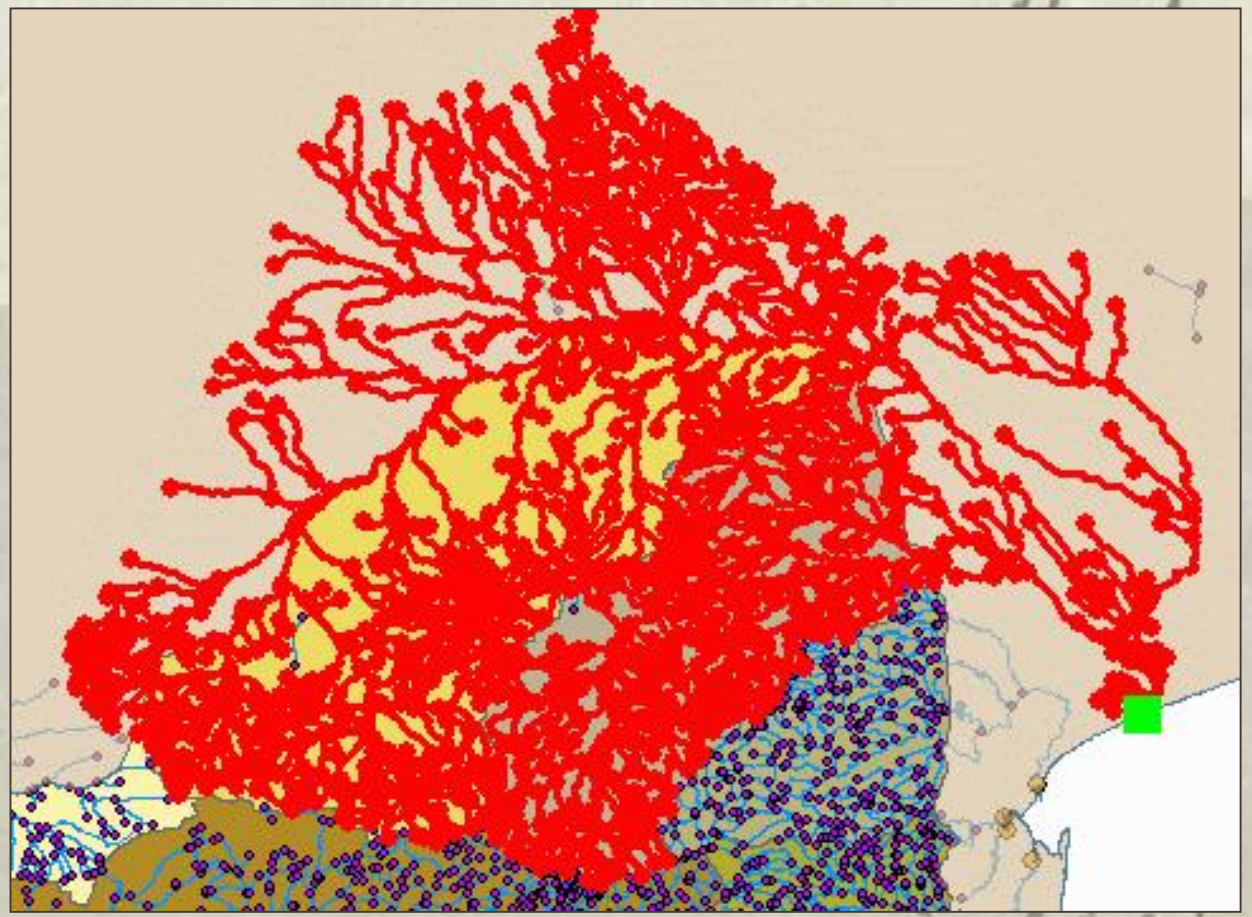
We use
ArcGIS *Network Tools*

Catchment Area's of the Limpopo Basins



Lets do a **Trace Upstream** from the sink at the bottom of Limpopo River





To perform a trace function, you must

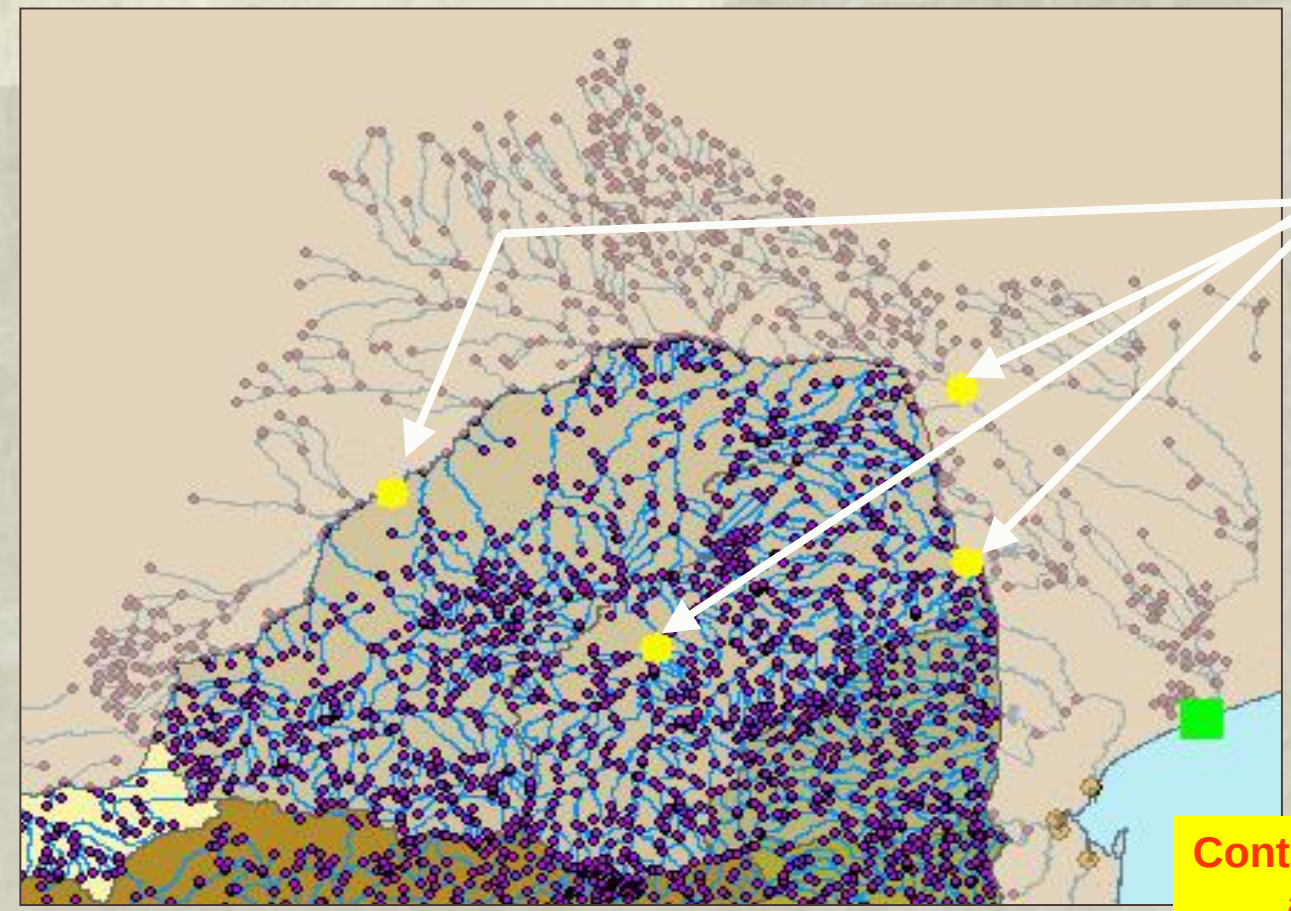
- Add a junction flag tool
- Set the Trace Task as *Trace Upstream*
- Click the solve icon

The trace found all the streams that flow into the ocean at this sink. You can see that all connected rivers were selected as the solution to the trace upstream from the position of the flag

Pollution investigation

We'll narrow the search by ruling out those parts of the network that cannot be sources of the contamination.

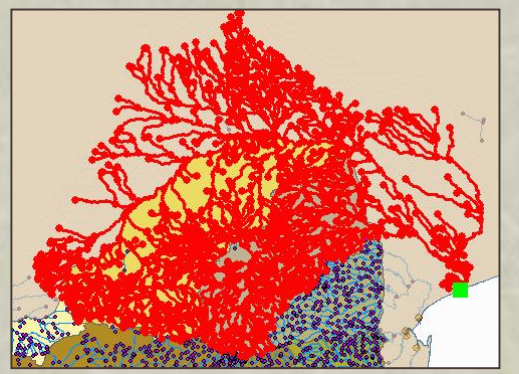
Data has been collected from four locations along the stream and none of the samples shows contamination.

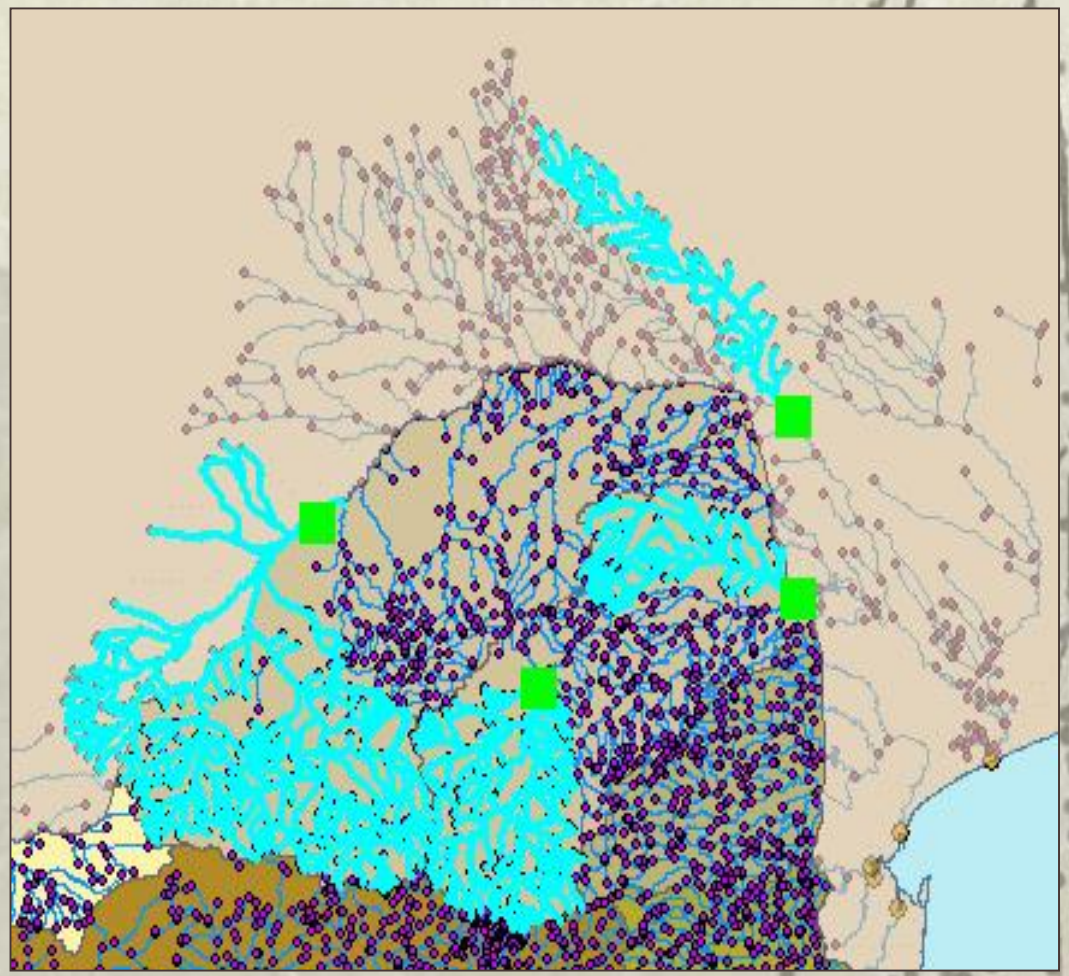


Contamination has been found at the Limpopo mouth

Pollution investigation

Click the **Add Edge Flag** tool and place an edge flag on the edge specified by the green squares



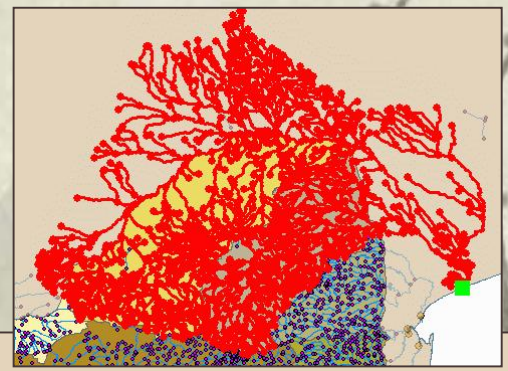


The Trace Upstream from the sample points shows the areas of the network that cannot be sources of pollution

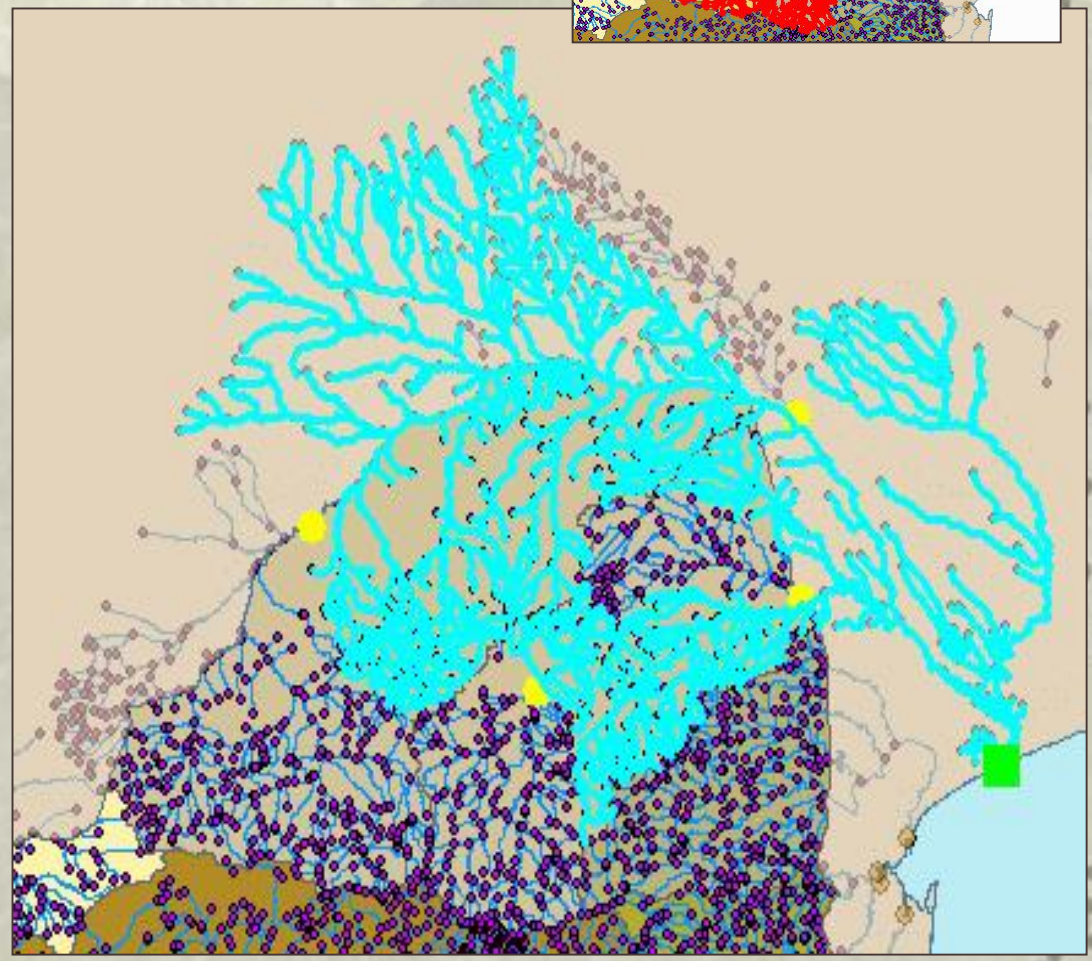
All other parts of the watershed are potential sources of the contamination, so you could focus future field samples on the remaining stream segments

Pollution investigation

To select possible sources of pollution we will trace just the **unselected** features.
These features could be sources of contamination because no samples have been taken in these areas.



- Clear Flags
- Place a Junction Flag on the sink at the bottom of Limpopo River
- From the Analysis menu, choose Options
- In the General tab, under Trace on, click Unselected features
- Click Solve button



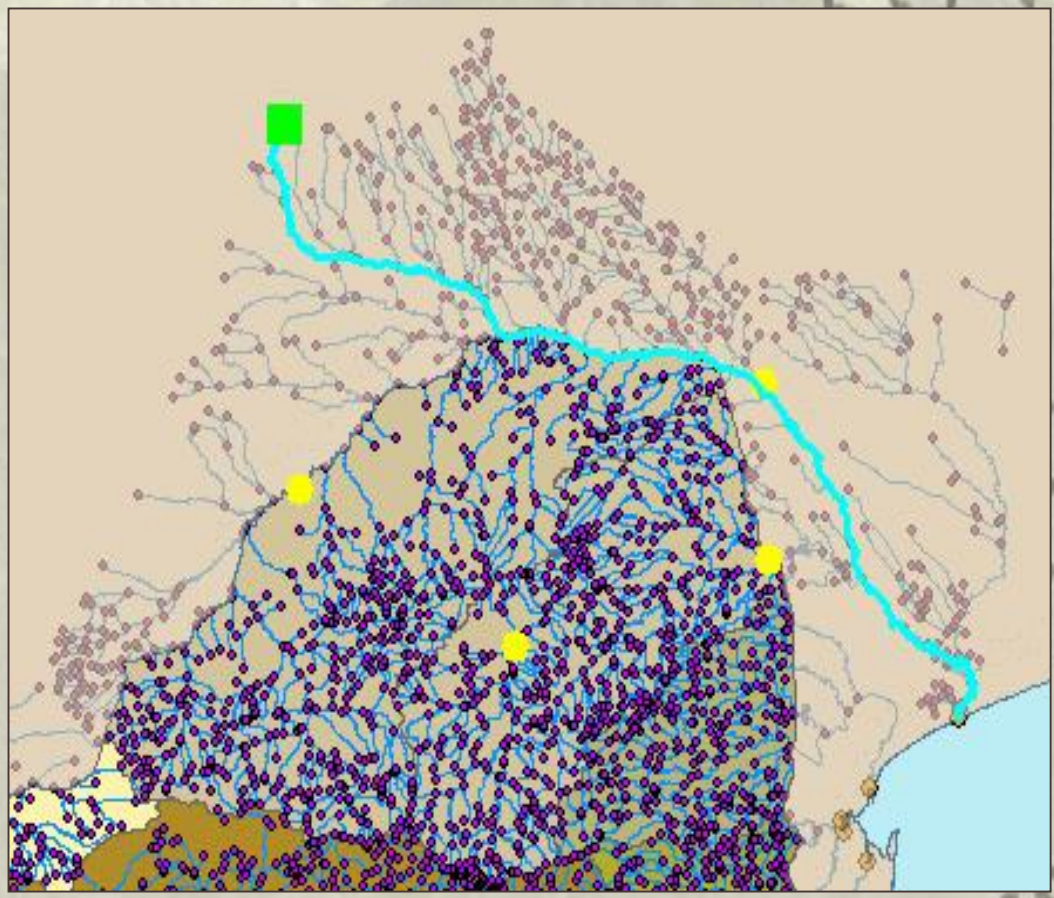
The trace result shows the streams where more samples should be taken

Pollution investigation

Find all streams that are contaminated.

Guided by your network analysis, researchers have taken more water samples and have now determined exactly where the pollution is coming from.

- Clear Selection and Flags
- Add a Junction Flag at the source of the pollution
- From the Trace Task drop down menu, choose Trace Downstream
- Click Solve button



The Selected features indicate the locations where cleanup operations should be focused