Lake Kyoga Integrated Management Project

How Remote Sensing, GIS and modeling were used to understand an African lake

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PhD, Environmental Analysis

Lake Kyoga Integrated Management Project

Duration

2 (+1) years

Budget

110,000 (+50,000) USD

Project leader

Uppsala University of Sweden

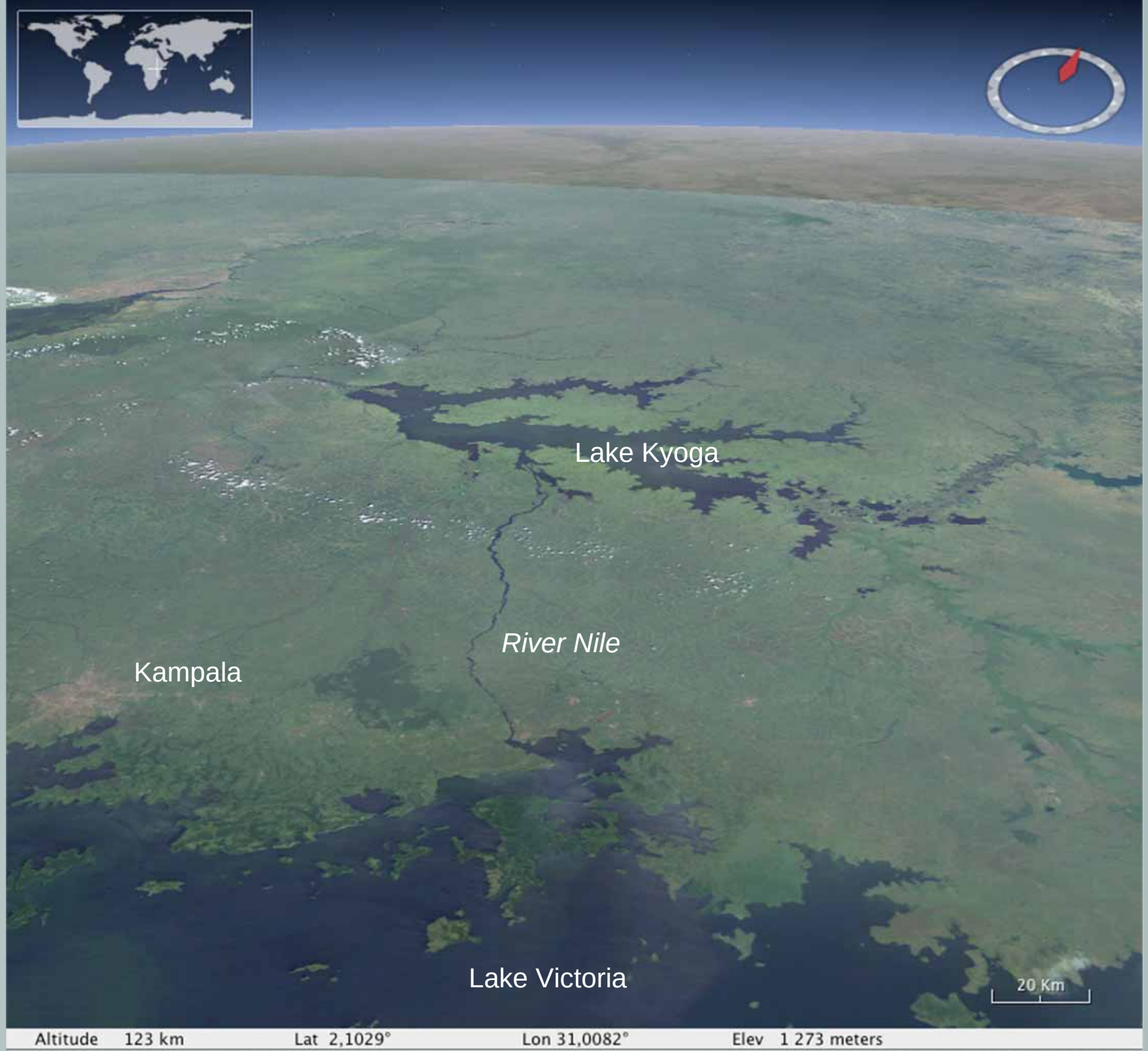
Ugandan Counterparts

Directorate of Water Development (DWD)

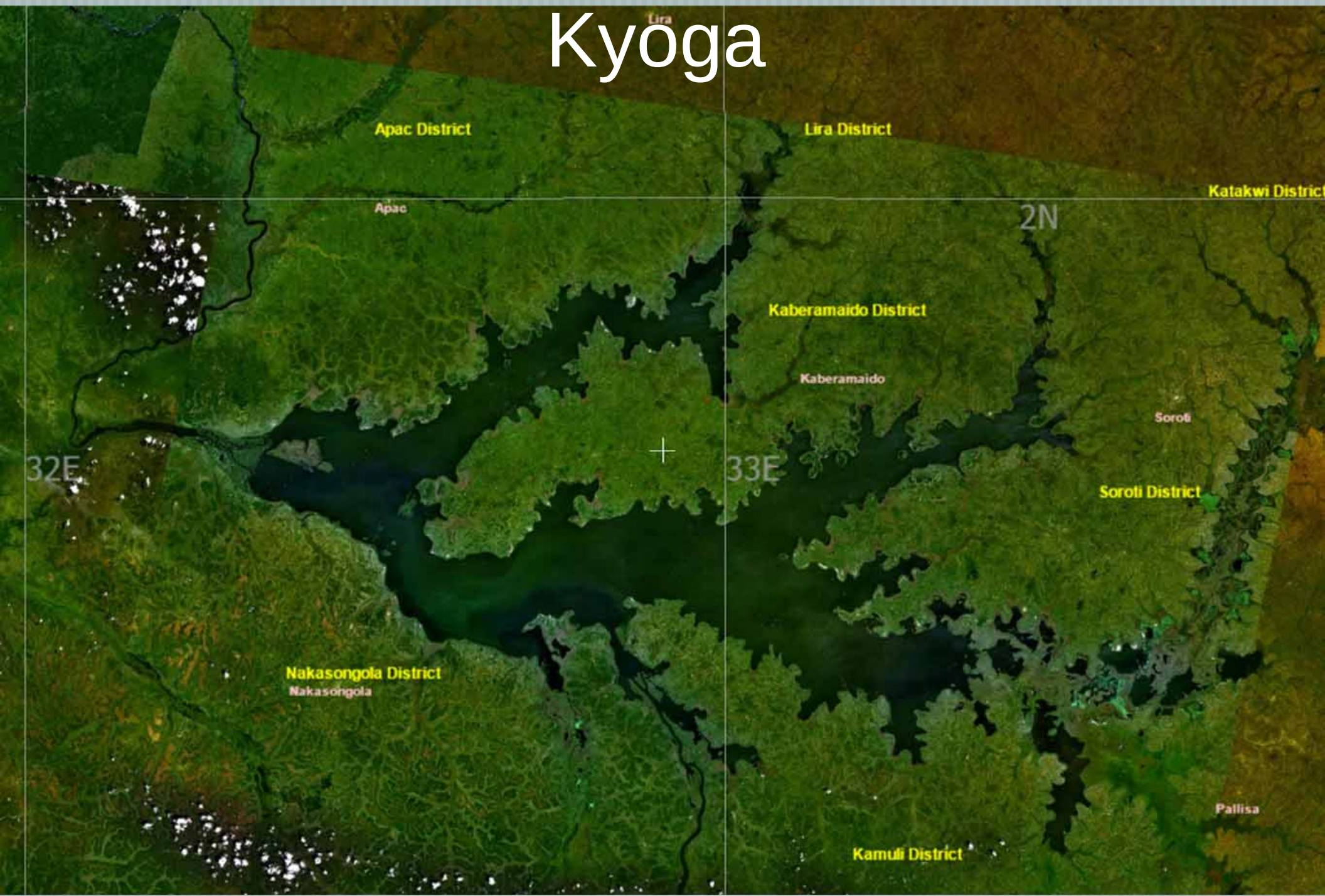
Fisheries Research Resources Institute (FIRRI)

Main goal

To develop and establish a lake foodweb model for Lake Kyoga in order to test different management scenarios and predict fish production


Lake Kyoga
River Nile
Kampala
Lake Victoria
20 Km
Altitude 123 km
Lat 2,1029°
Lon 31,0082°
Elev 1 273 meters

LANDSAT image (yr 2000) of Lake Kyoga



Why Remote Sensing?

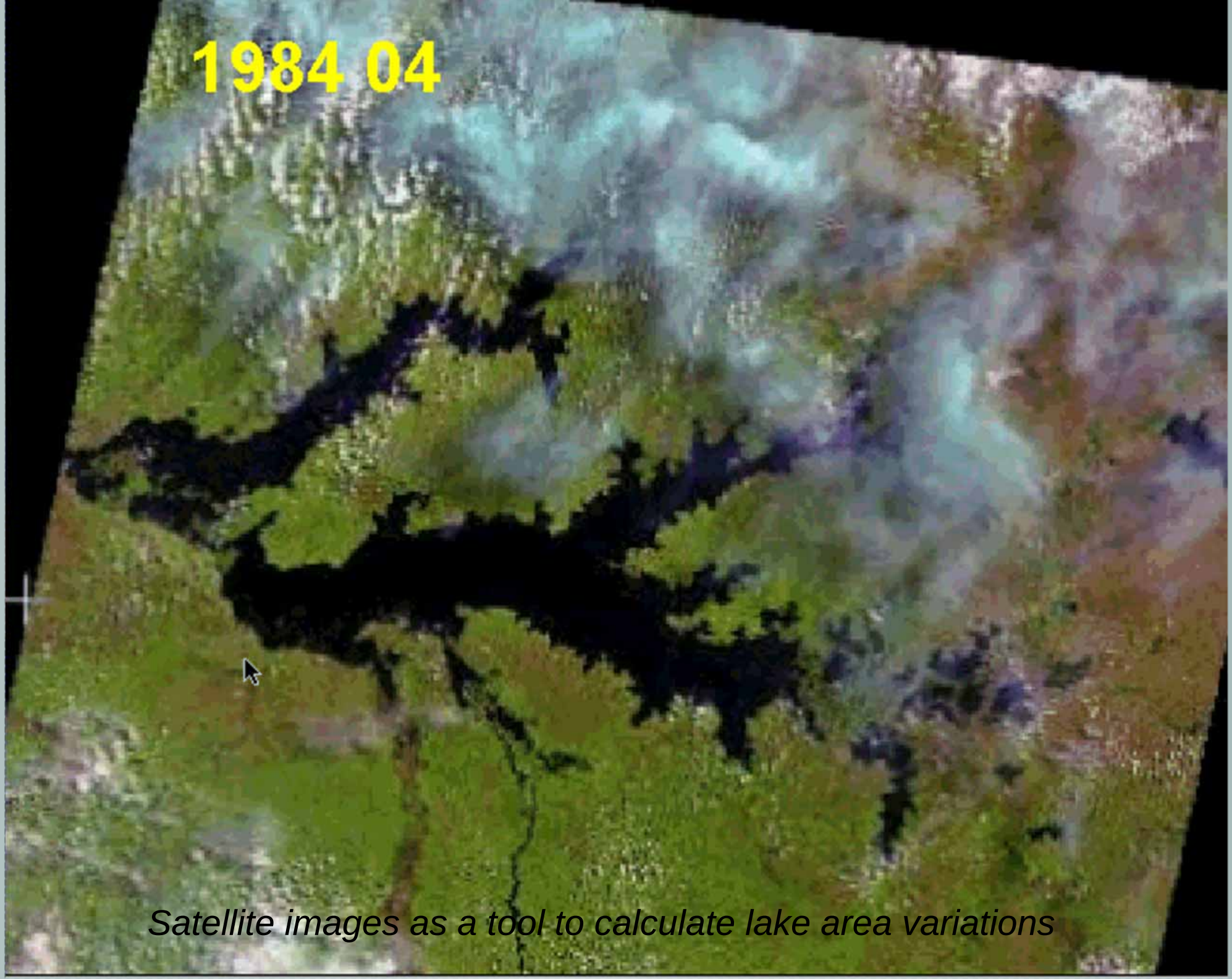
- *Cost efficient way to capture historical landuse and environmental data from*
  - *large areas*
  - *remote areas*
  - *dangerous areas*

Why GIS?

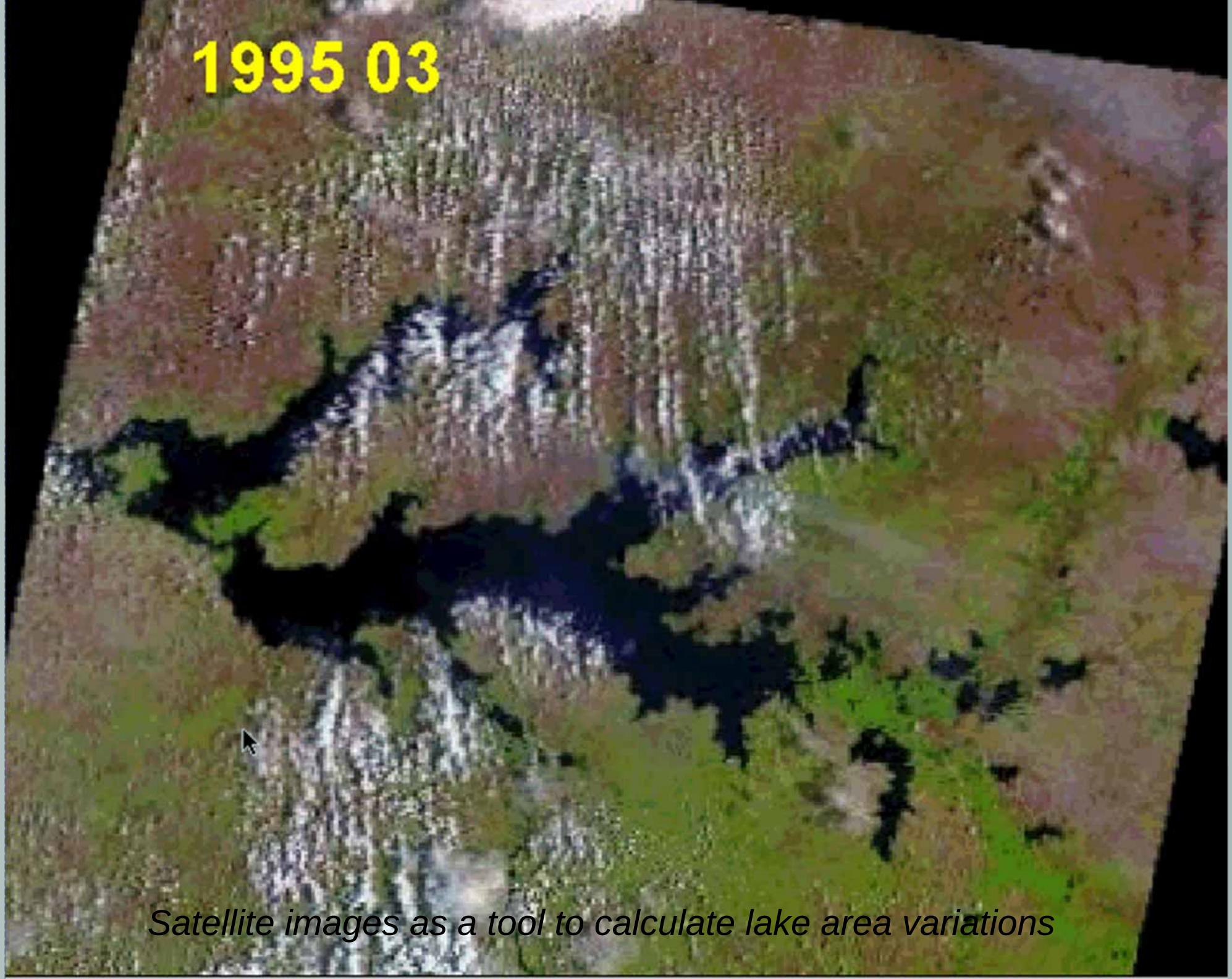
- *To structure and analyse spatial data*
- *To calculate catchment statistics*
- *To visualize and communicate drainage basin properties*

Why Dynamic Modelling?

- *To structure knowledge about the ecosystem*
- *To understand food webs and rule out important flows*
- *To study system response to environmental change or remedial actions*



Satellite images as a tool to calculate lake area variations



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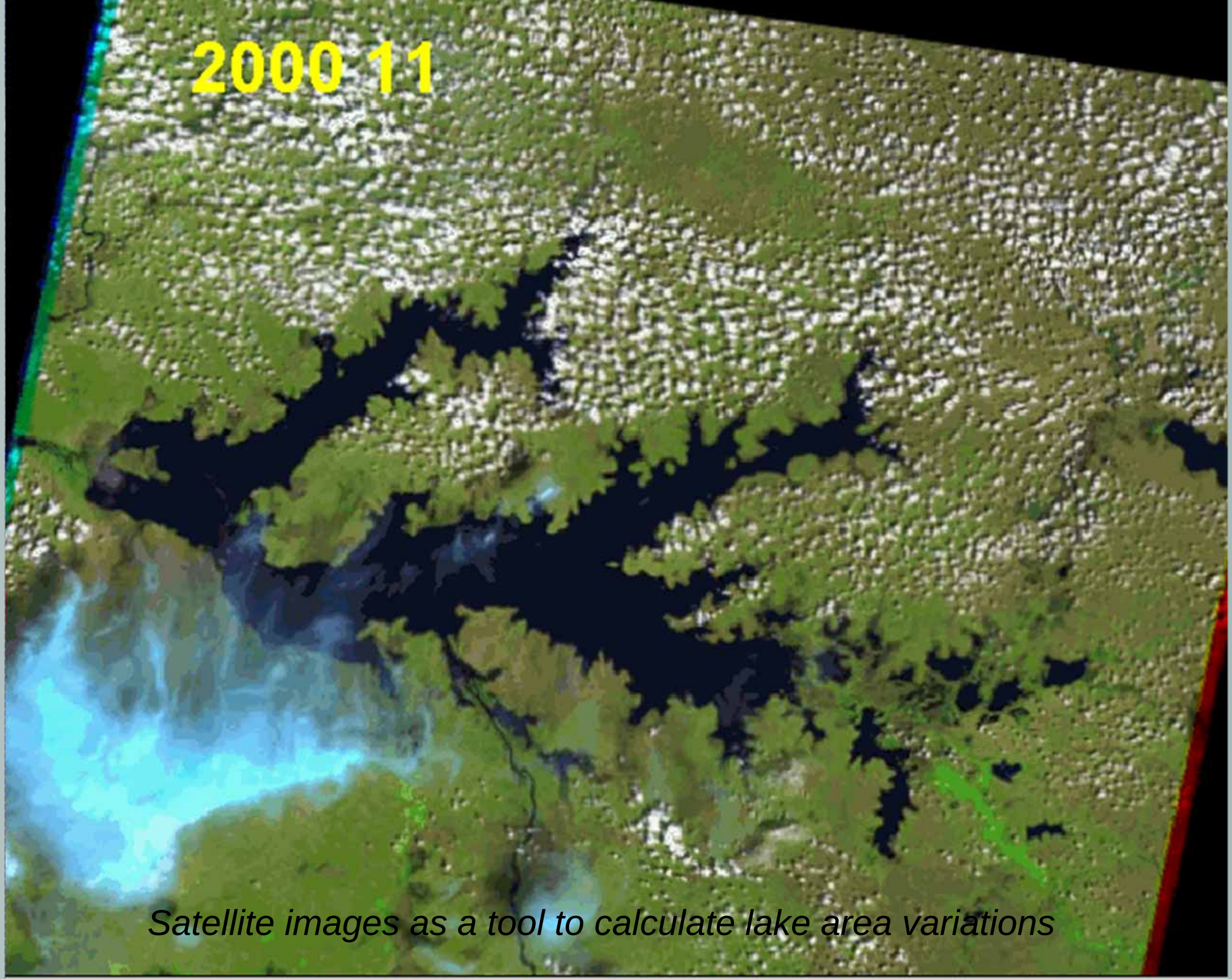

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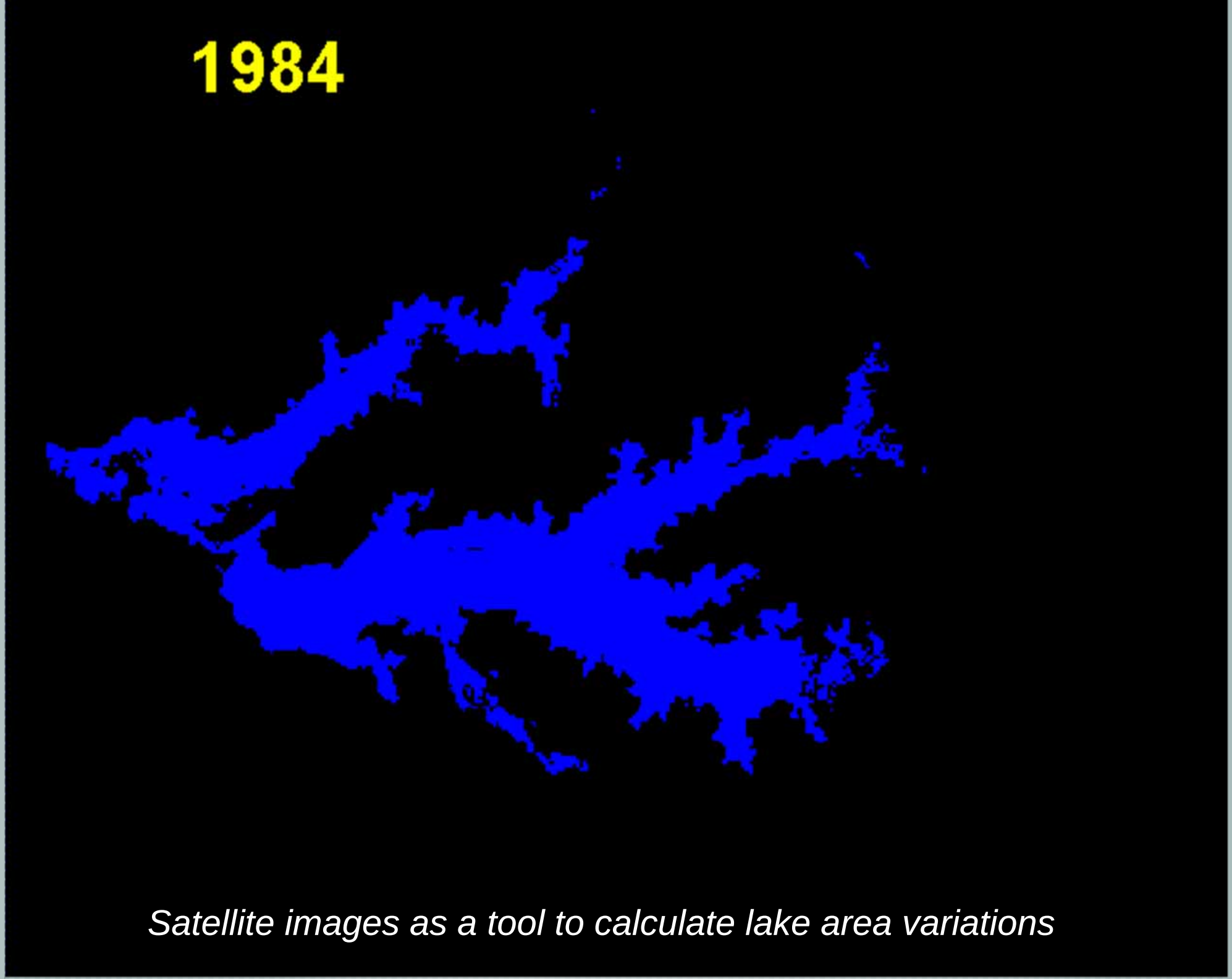

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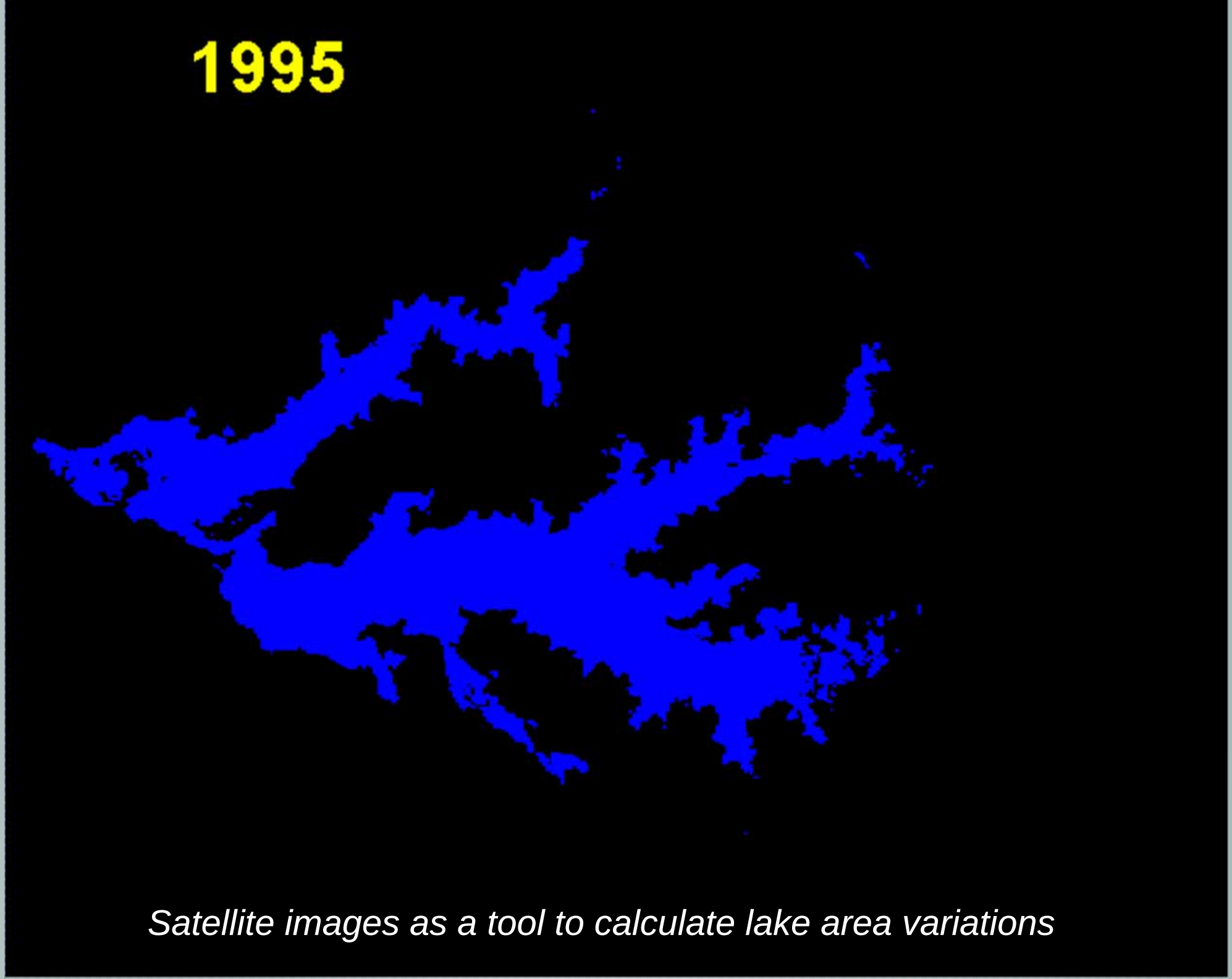

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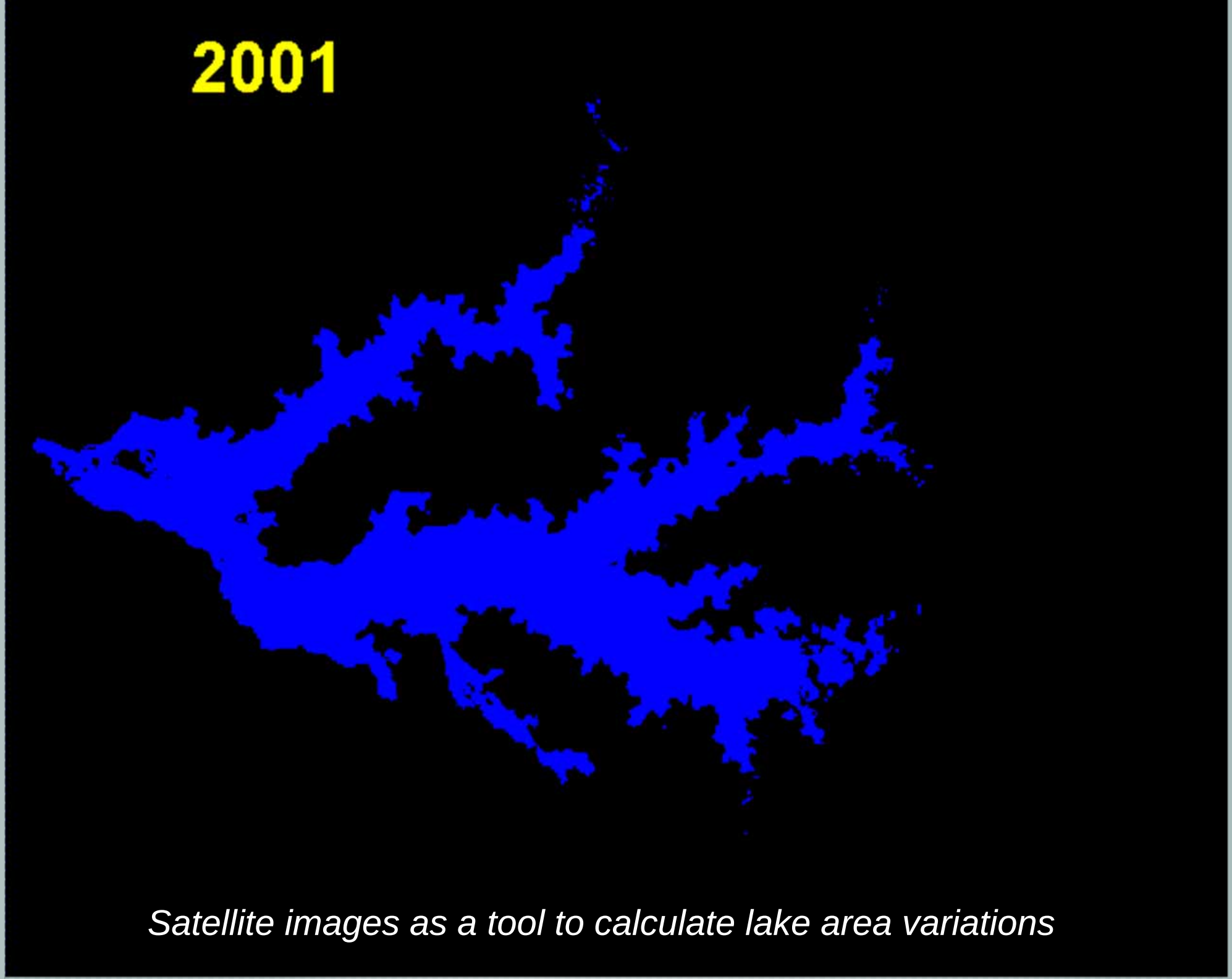
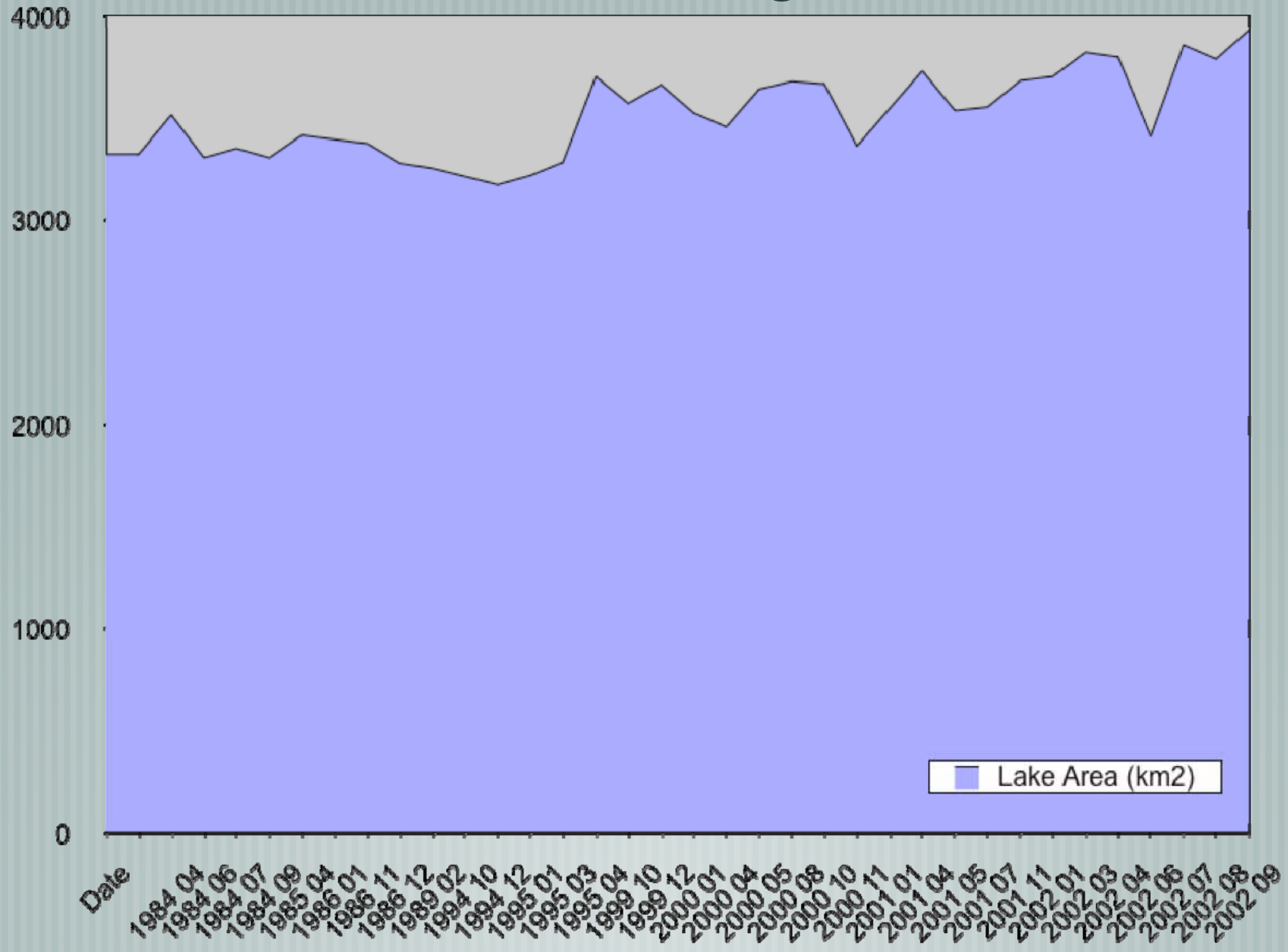
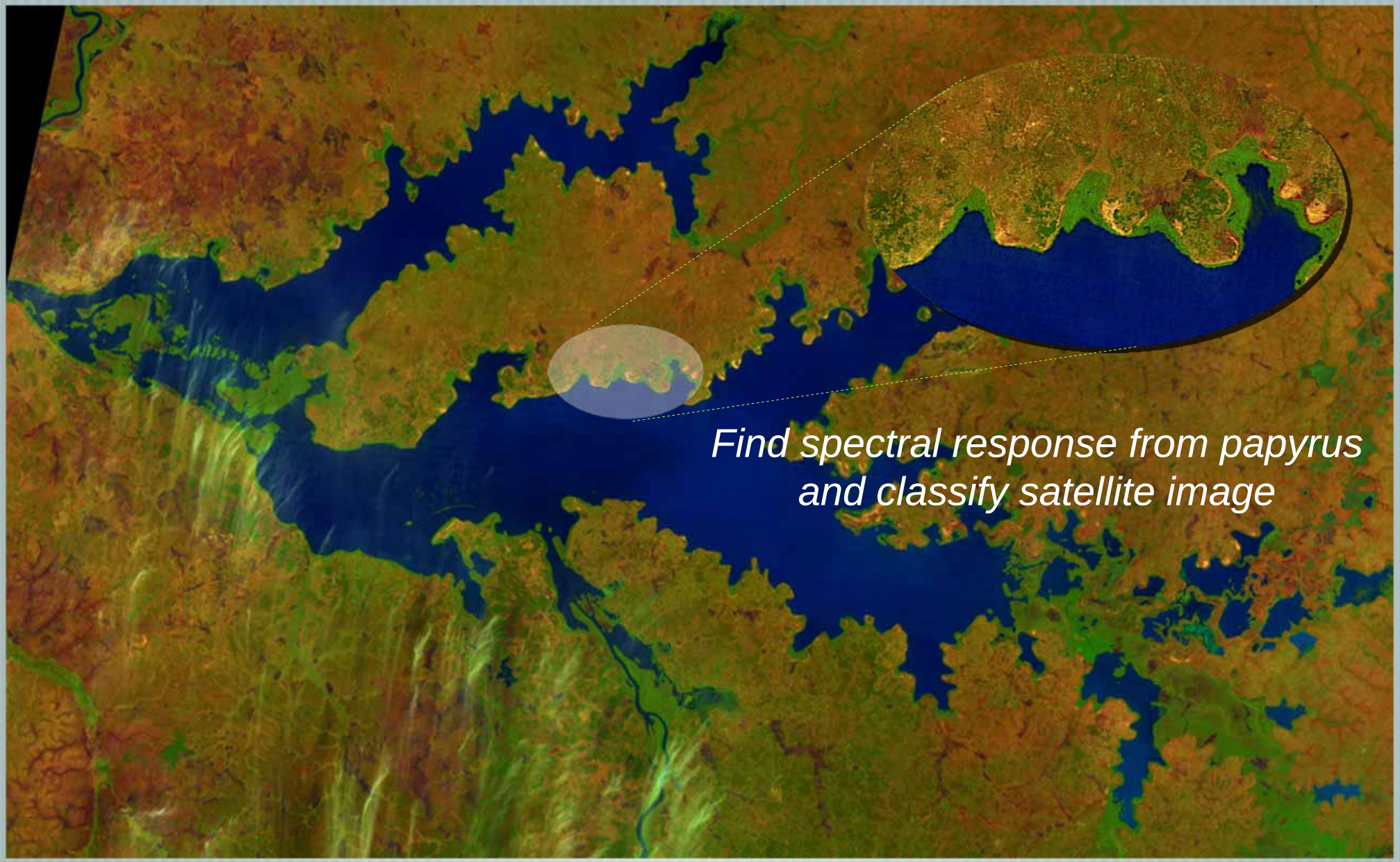


Satellite images as a tool to calculate lake area variations

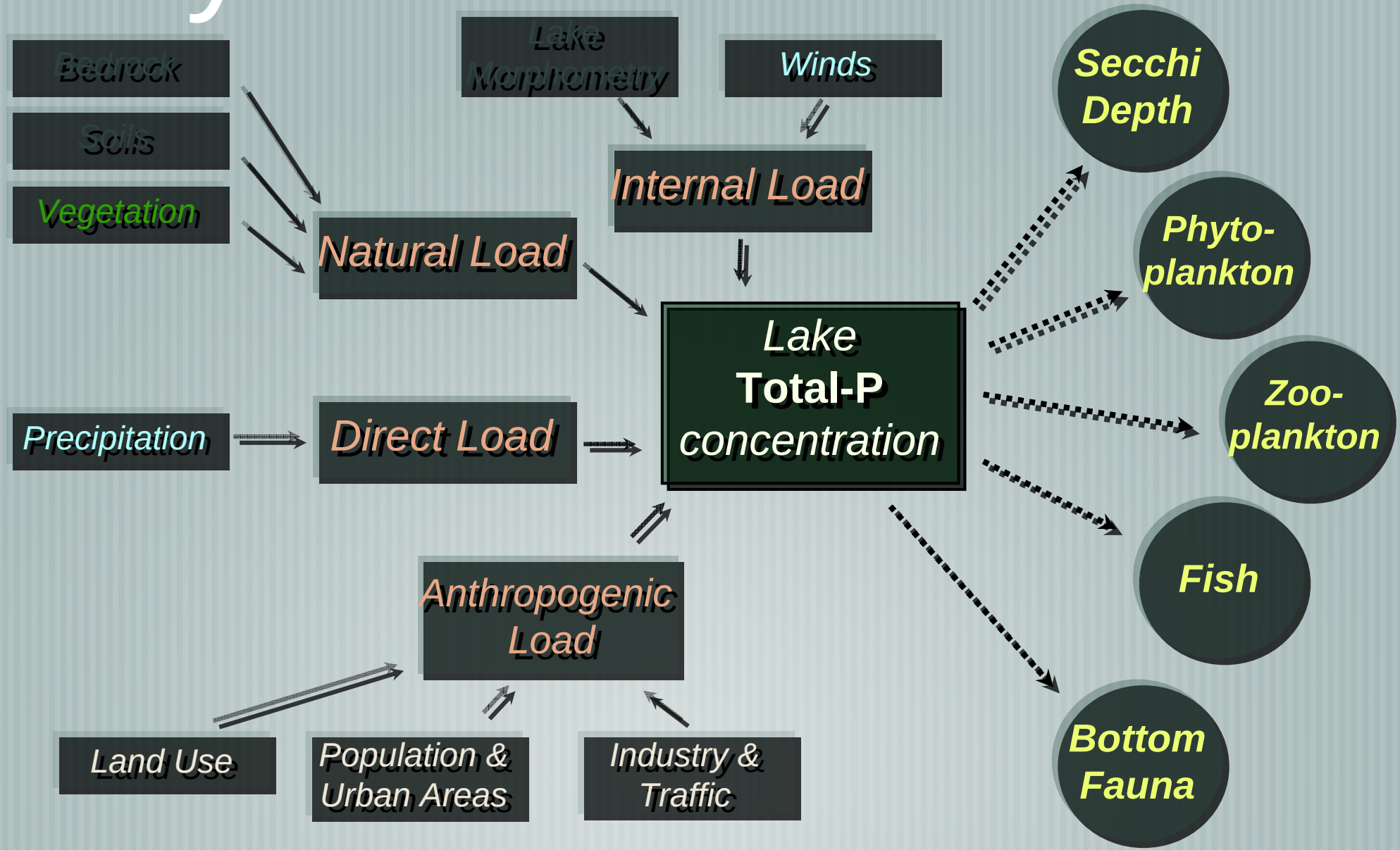
Lake area from classification of all available satellite images



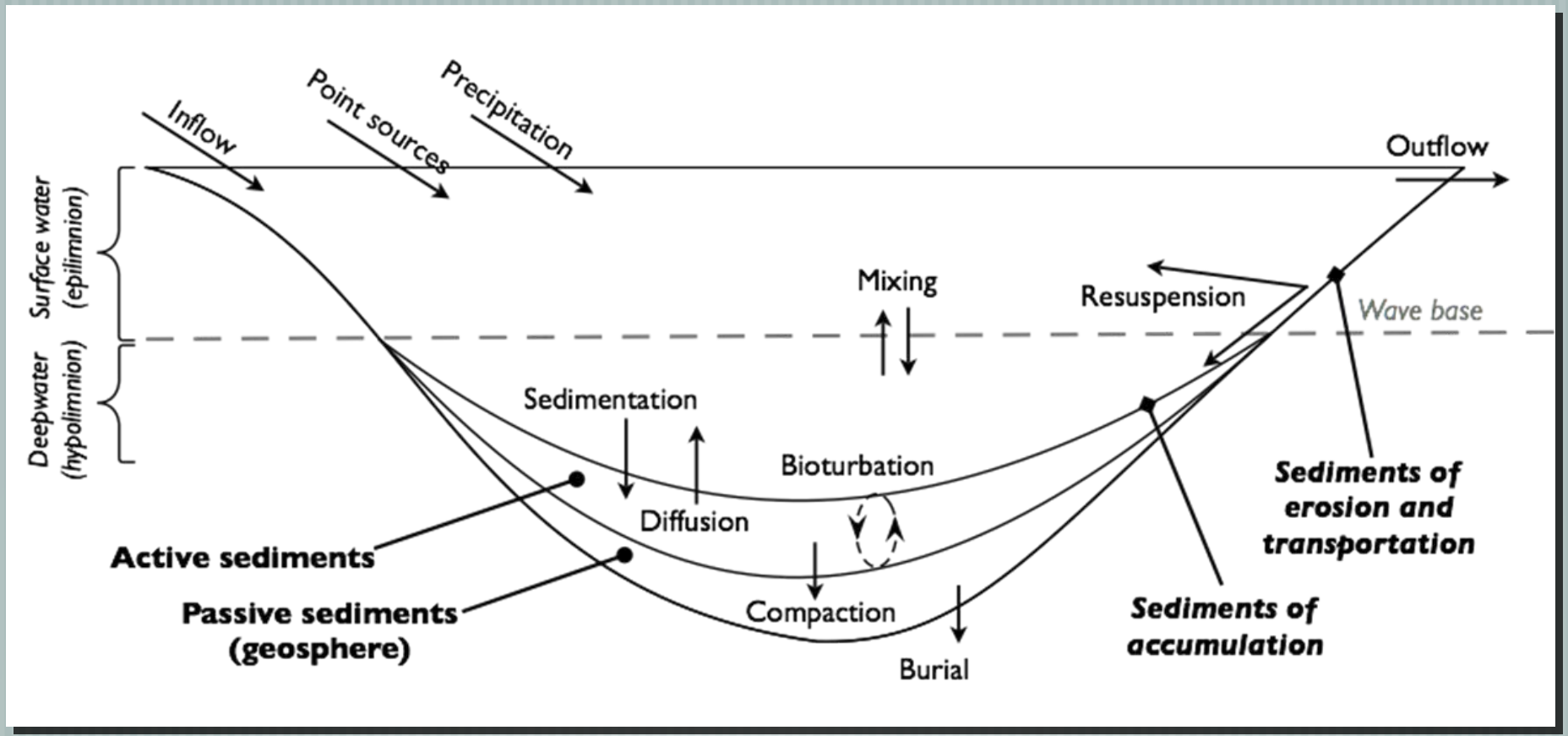
Finding and quantifying macrophyte cover from LANDSAT images



Lake Kyoga System Analysis



LakeWeb Biotic/Abiotic Interactions

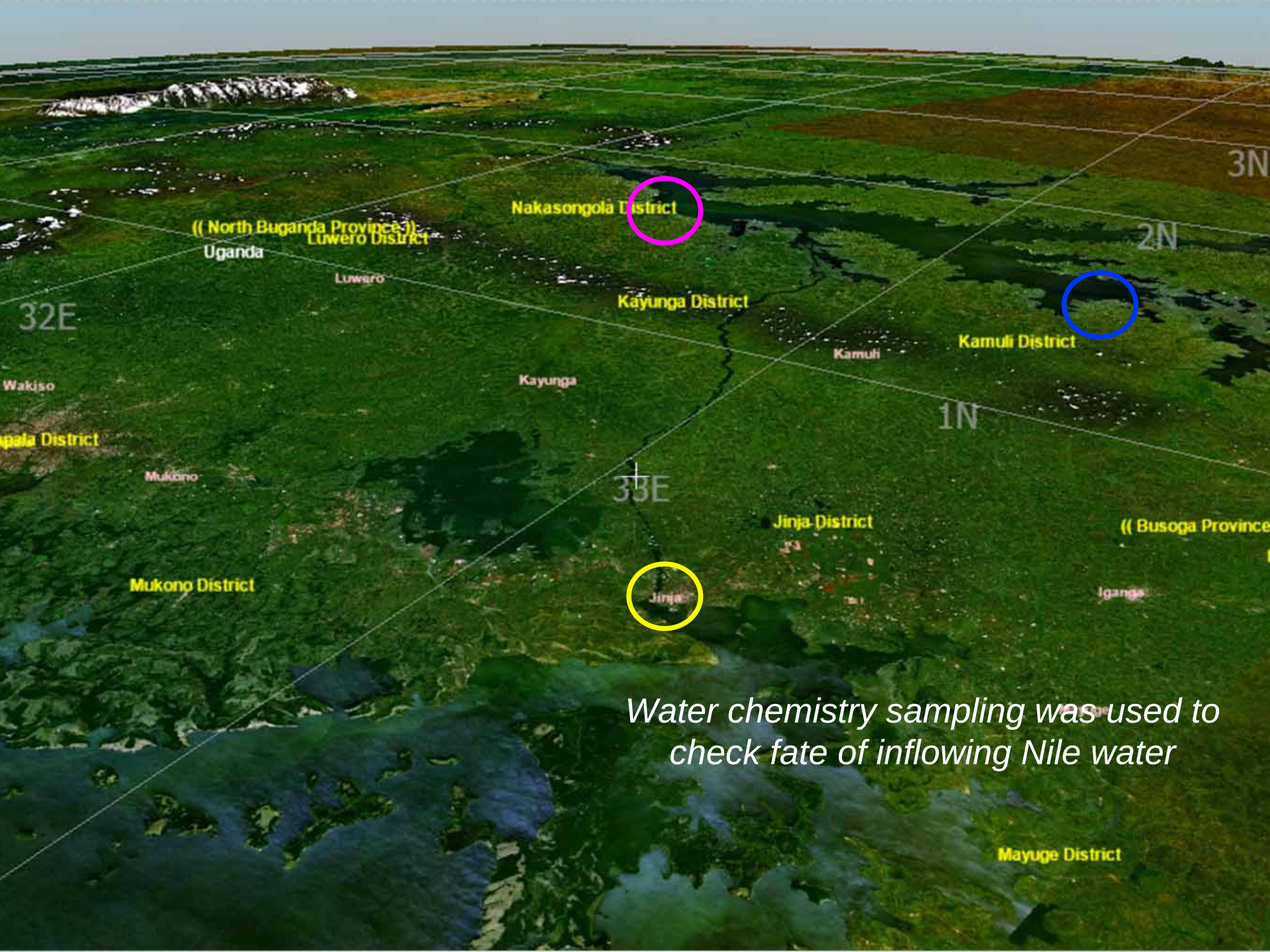


Foodweb Functional Groups

- Primary producers
  - Phytoplankton
  - Benthic Algae
  - Macrophytes
- Zooplankton
  - Herbivorous Zooplankton
  - Predatory Zooplankton
- Zoobenthos
  - Zoobenthos
- Fish
  - Prey Fish
  - Predatory Fish

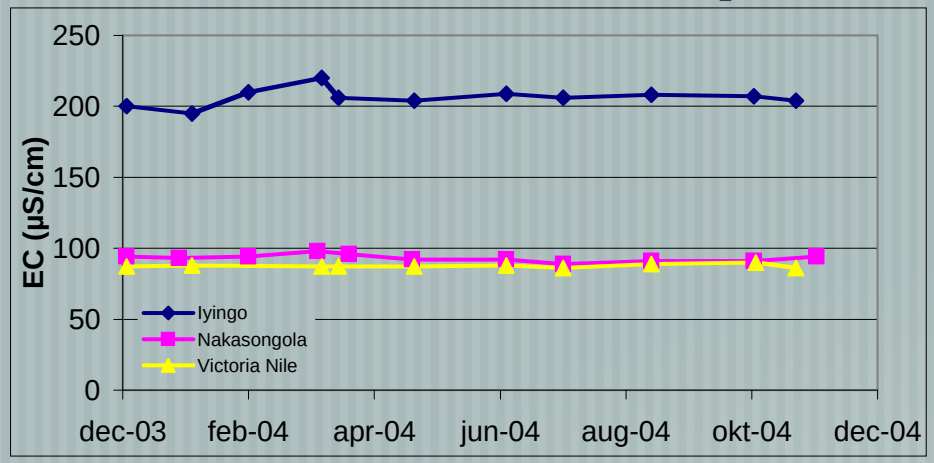
- Decomposers
  - Bacterioplankton

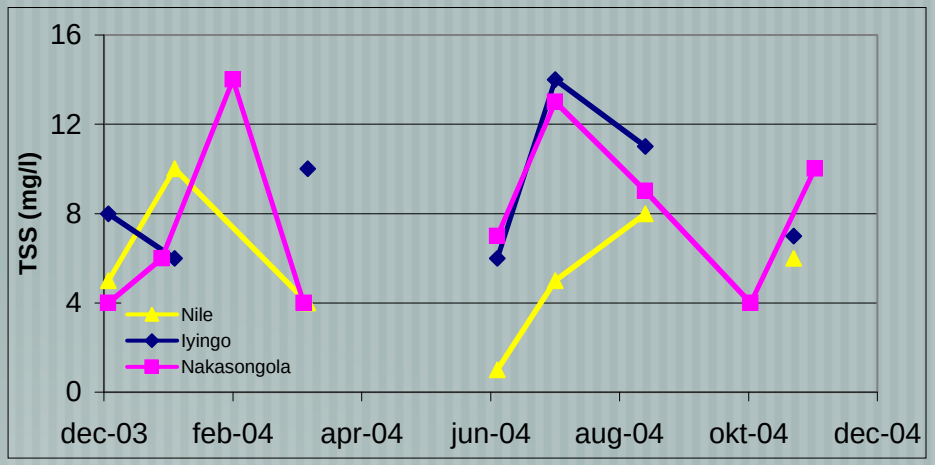

3N
2N
1N
32E
33E
Nakasongola District
((North Buganda Province))
Luwero District
Uganda
Luwero
Kayunga District
Kamuli District
Kamuli
Kayunga
Wakiso
Mukono
Mukono District
Jinja District
Jinja
((Busoga Province
Iganga
Mayuge
Mayuge District



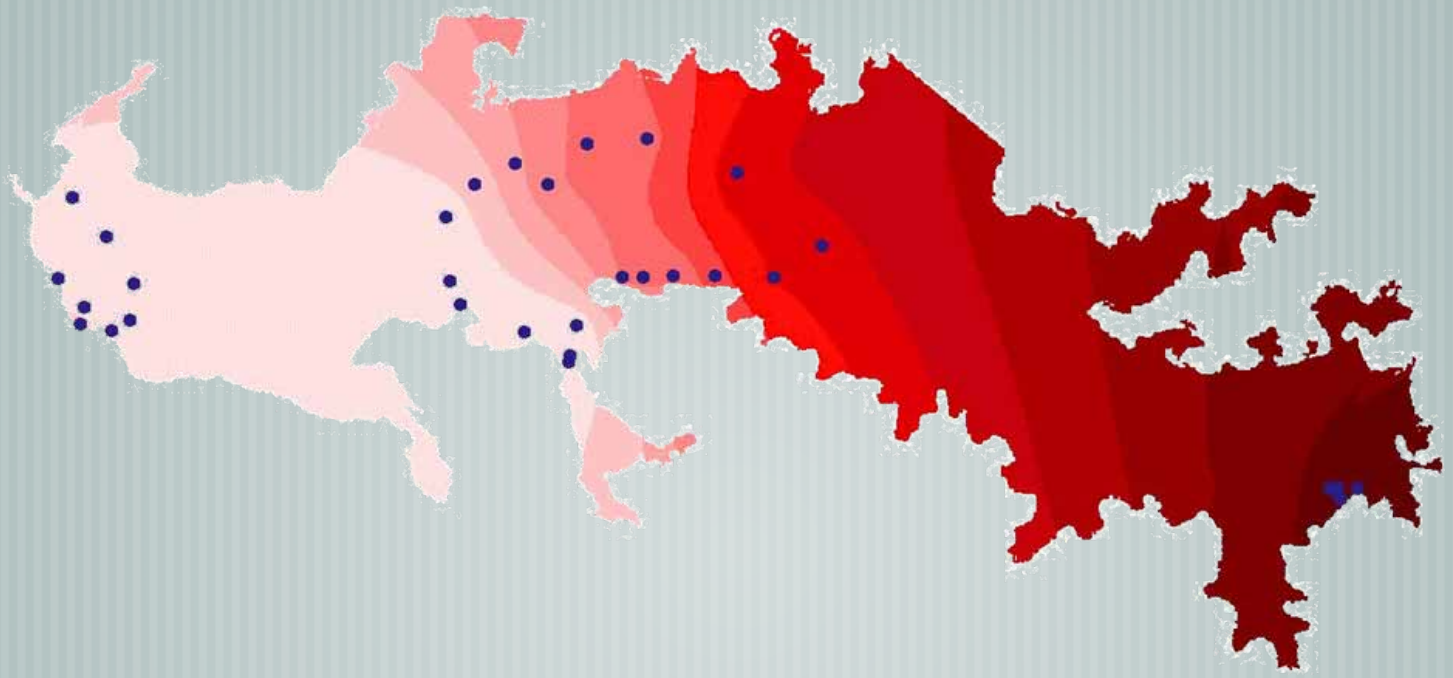
Water chemistry sampling was used to check fate of inflowing Nile water

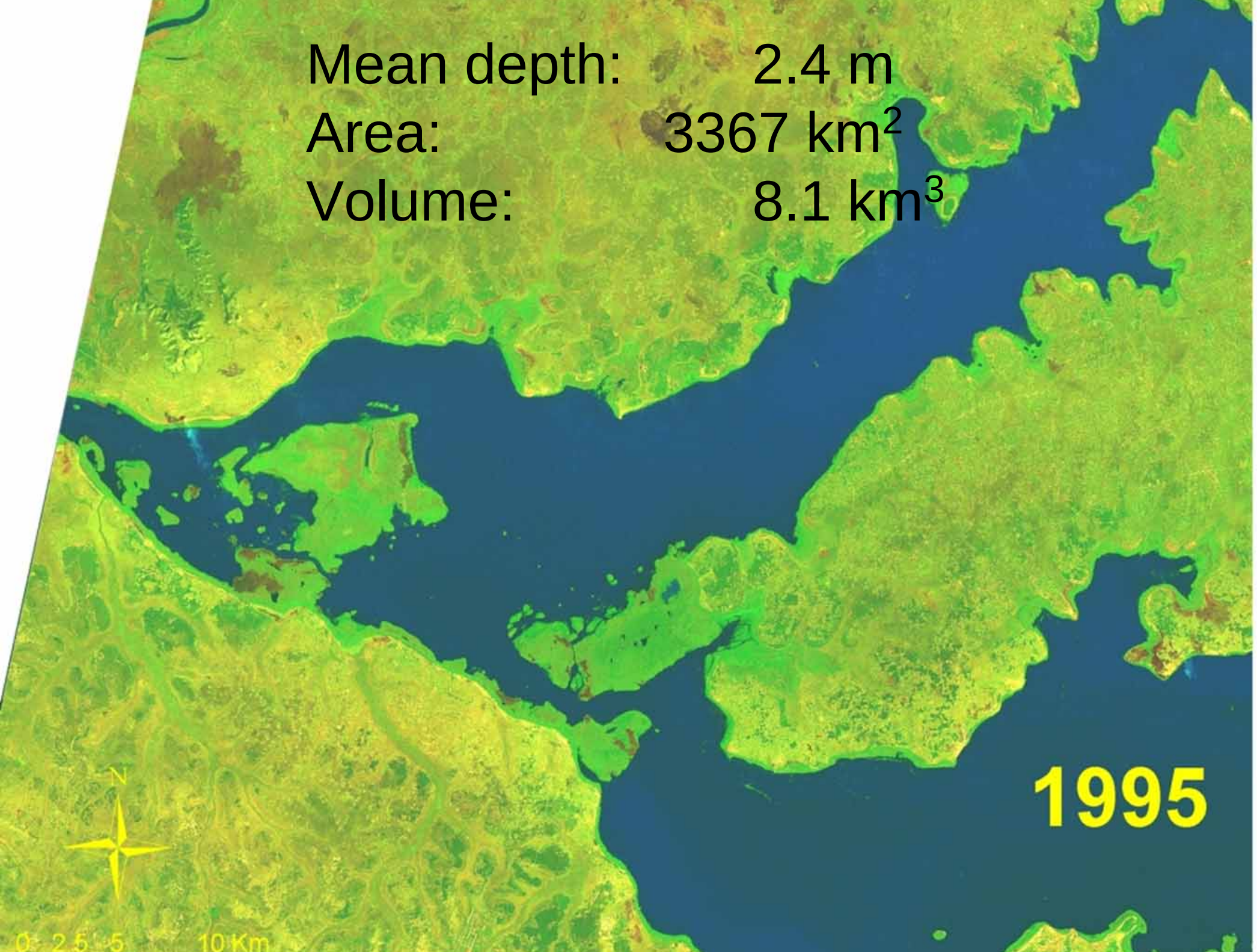
Water quality time series

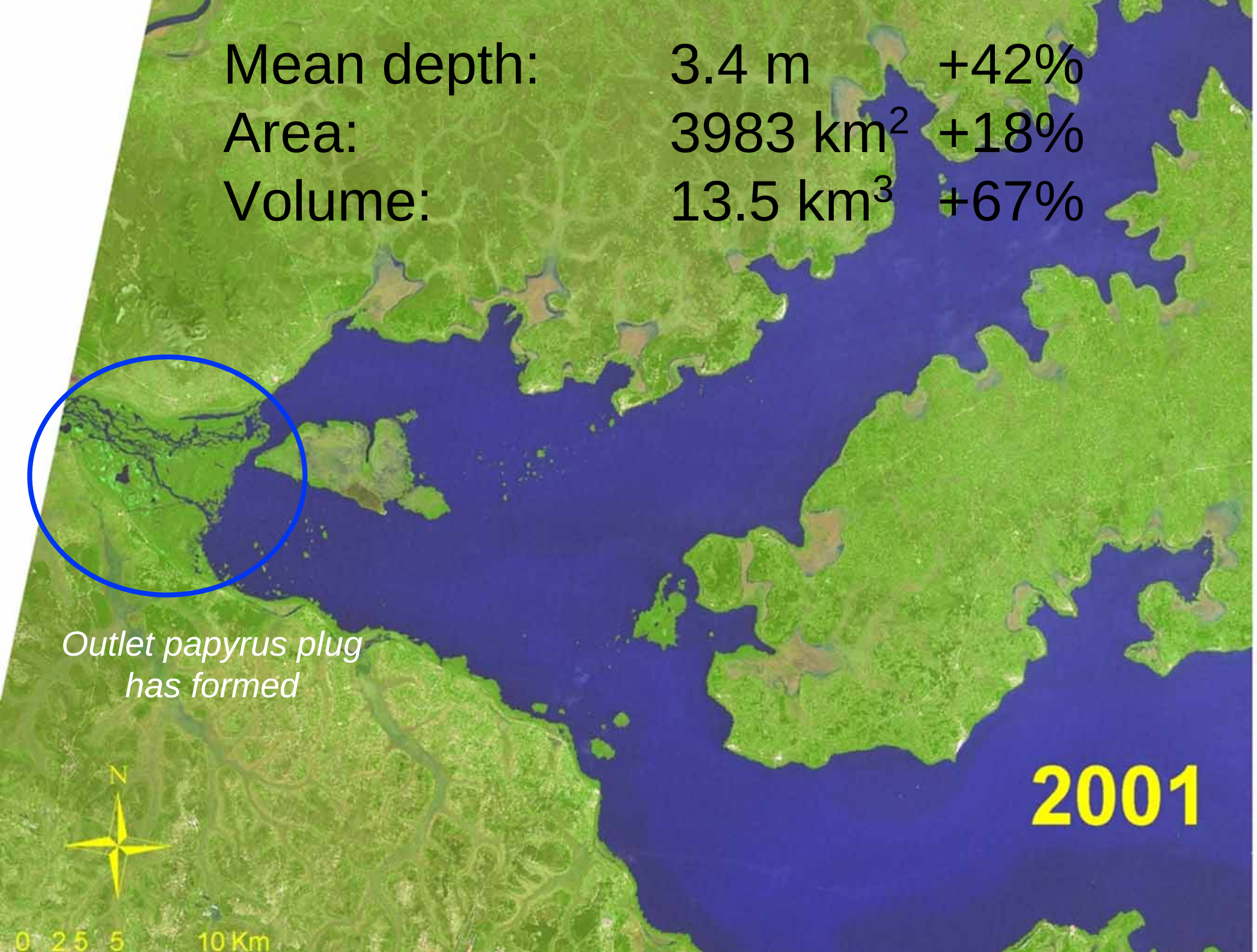


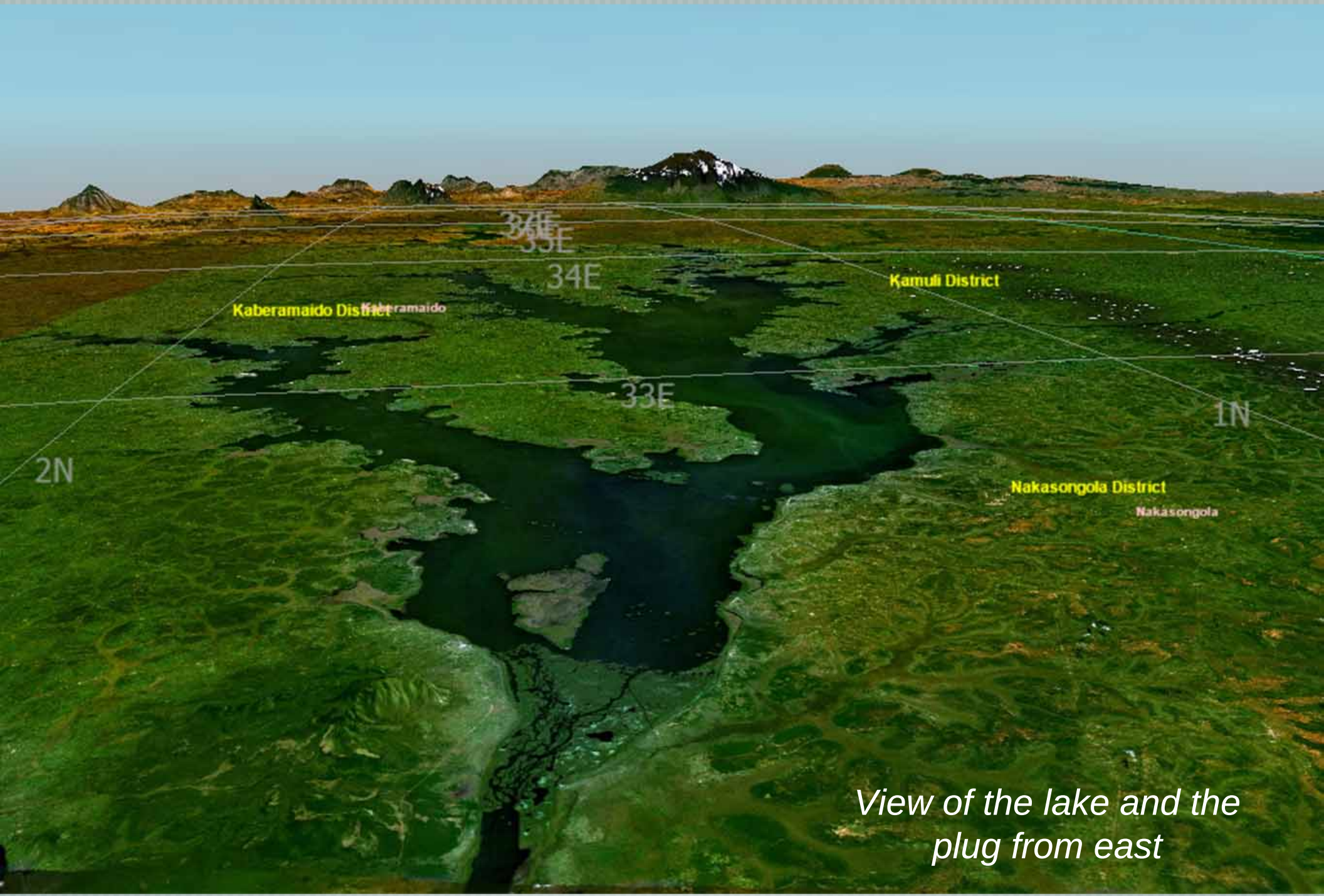


Lake conductivity




Mean depth: 2.4 m
Area: 3367 km²
Volume: 8.1 km³
1995
N
0 2.5 5 10 Km

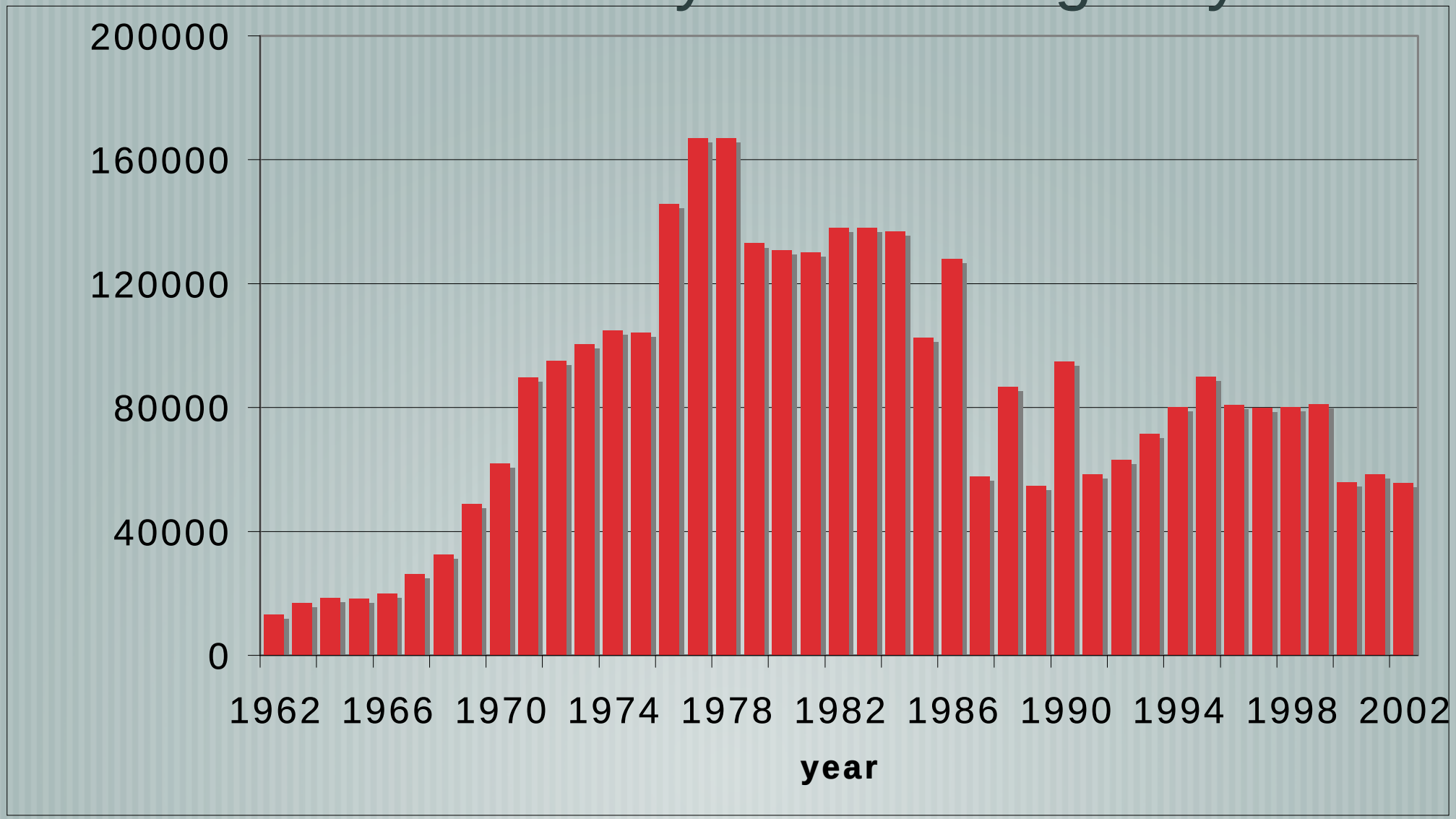

Mean depth: 3.4 m +42%
Area: 3983 km² +18%
Volume: 13.5 km³ +67%
Outlet papyrus plug has formed
N
0 2.5 5 10 Km
2001



View of the lake and the plug from east

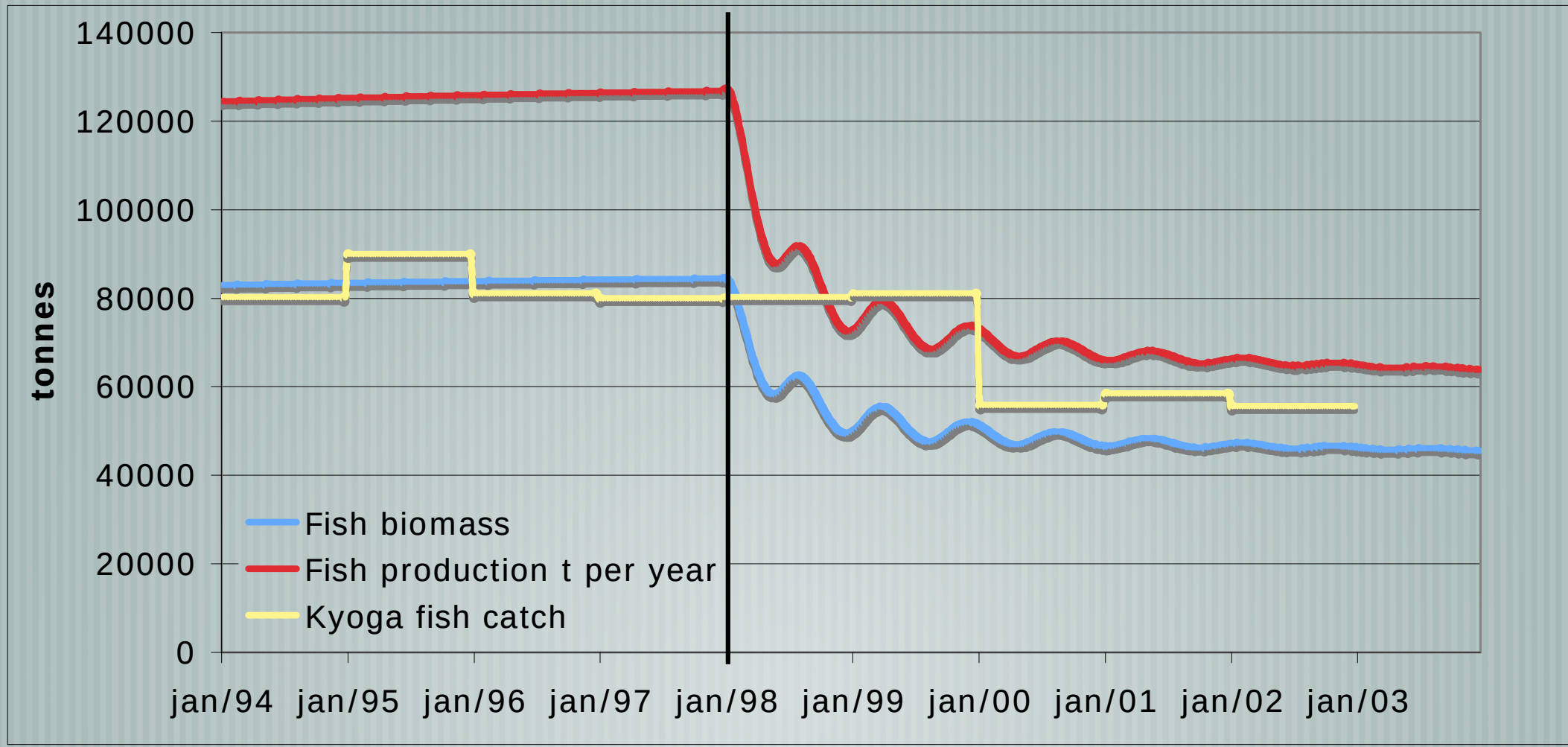
Kyoga fish catch statistics

167000 tonnes/year = 495 kg/ha/yr



Lake Kyoga model results

plug formation in 1998



Lake Kyoga model results

plug removal scenario