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# Invasive Water Lettuce in the Topla Stream



The aim of this research was to find the main reasons for the spread of the Water Lettuce (Pistia stratiotes) in the topla stream area (Čatež ob Savi).



Laboratory work.



### **Problem overview**

- Water Lettuce has overgrown almost the entire surface of the stream Topla.
- Dead plants cover the bottom of the stream.
- Invasive Water Lettuce is displacing native plants and animals.
- Warm water (37 38 °C) is discharged from the Terme Čatež.

### Methods

- Remote sensing : analysis of satellite imagery.
- Field work.
- Observation Laboratory: observation of reproduction in the aquarium.





Route determination (Google Map, GPS in Logger Pro).





Flow rate measurement.



Temperature gradient measurement.

- The experimental work (changing the temperature and luminosity) in the aquarium.
- Interview (President of Angling Club Brežice).

#### Data

Physical measurements:

- GPS-determination of microlocation,
- temperature gradient stream,
- continuity of the flow,
- cross wire,
- flow rate.

Satellite and aerial images:

- Rapid Eye (6.5 m),
- SPOT 5 (2.5 m),
- Digital orthophoto (0.5 m).



15,62852

15.62819

45,88448 45,88436

45,88349

Measurement points determination.



Diagram - field measurements of temperature gradients of the stream Topla.



10 July 2010 10 May 2009 24 June 2008 17 Aug 2009 23 June 2003 Proliferatison: (ortophoto) 84% 0% 62% (Google Earth) 

#### 36 INVAZIVNA VODNA SOLATA





Research task on website: http://www2.arnes.si/~sssknm4/solata/

## Conclusions

- The plant reproduces at the minimum temperature of 19°C (lab observation).
- The water temperature in the Topla river never drops below 17°C (field measure ments in the winter).
- Flow measurements have demonstrated the inflow of warm underwater.
- Satellite imagery have showed a change of water lettuce coverage.
- Invasive plant was introduced into the stream in 2001-2002 from the aquarium.

#### Solutions

• Forced cooling of the water.

From left to right: RE for 11 Mar 2011 (upper) and 2 Sep 2011 (below); SPOT5 for 23 Sep 2010, 24 May 2011, 20 Aug 2011, 15 Sep 2011, 6 Oct 2011.

- Entry of herbivorous fish species.
- Mechanical removal (Solar elevator).
- Manual elevator for tourists.
- Food for aquatic mammals (the Ljubljana ZOO).

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