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SUMMER SCHOOL

UAM

Ecological state of the lake during restoration measures

- Macrophytes -

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I. Introduction

http://www.wagrowiec.eu/en/rekreacja/


Messyasz, B

Lake Durowskie

- located in the western part of Poland
- attraction of Wagrowiec city

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I. Introduction

- vacation resort
- touristic impacts and sewage discharges
  → water quality suffers

Issues
- eutrophic
- ecologica

Measures
- two aerat
- biomanip ease of pikes

Durowskie beach, photo taken by students

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I. Introduction

Purpose of this study

- investigate the ecological state of the Lake Durowskie
- this macrophyte study aims to address:
    1. What is the present trophic state in the lake and its tributaries?
    2. What is the trophic state trend from 2009 to now?
- comparison of results with Summer School data from 2009 - 2012

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II. Methods

Table 1: *Vegetation coverage classes according to Braun-Blanquet (1928)*

code	coverage %
+	< 1
1	1-10
2	10 - 25
3	25 - 50
4	50 - 75
5	> 75

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II. Methods

Evaluation

- **ESMI index**
  - classification of the ecological state of deep stratified lakes

- **MIR index**
  - declare ecological state outflow river

Table 2: *Classification of the ecological state by ESMI and MIR index.*

Ecological State	ESMI index	MIR index
very good	0,680 - 1,000	$\leq$ 44,5
good	0,340 - 0,679	44,5 - 35,0
moderate	0,170 - 0,339	35,0 - 25,4
poor	0,090 - 0,169	25,4 - 15,8
bad	$<$ 0,090	$<$ 15,8

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III. Results & Discussion

Definition macrophytes

- aquatic plants, growing in or near water
- emerged, submerged or floating
- sediment and litter accumulation → growth potential
- large biomass production

Function as indicator

- long-term indicators
- beneficial because providing habitat and food for fish and substrate for aquatic invertebrates
- land - water ecotone
- associations occur dependent on nutrient status

III. Results & Discussion

- number of associations varied between 15 and 17 from 2009 to 2011
- 16 associations occured at Durowskie Lake (2012)
- Caricetum acutiformis disappeared

Acoretum calami
Butometum umbellati
Caricetum ripariae
Elecharitetum palustrae
Glycerietum maximae
Myriophylletum spicati
Numpharo-Nymphaeetum albae
Phalaridetum asundinaceae
Phragmitetum communis
Potametum pectinati
Potametum perfoliati
Scirpetum lacustris
Sparganiatum erecti
Thelypteridi-Phragmitetum
Typhetum angustifoliae
Typhetum latifoliae

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III. Results & Discussion

Dominant associations:

Nupharo-Nymphaceetum albea

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III. Results & Discussion

Potametum perfoliati

- serve as breeding area for water birds

Phragmitetum communis

- occurs in eu- / mesotrophic water

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III. Results & Discussion

Typhetum angustifoliae

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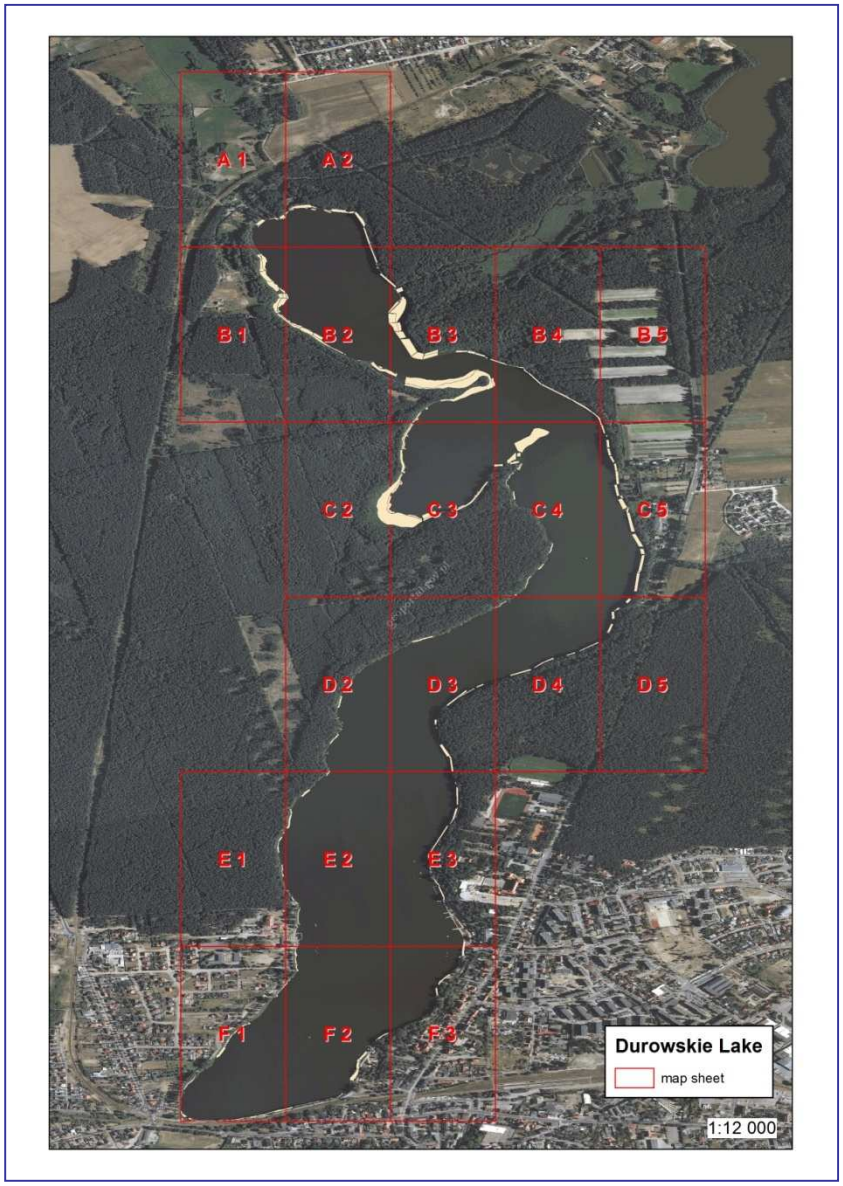
III. Results & Discussion



created map allows a general view of Durowskie Lake

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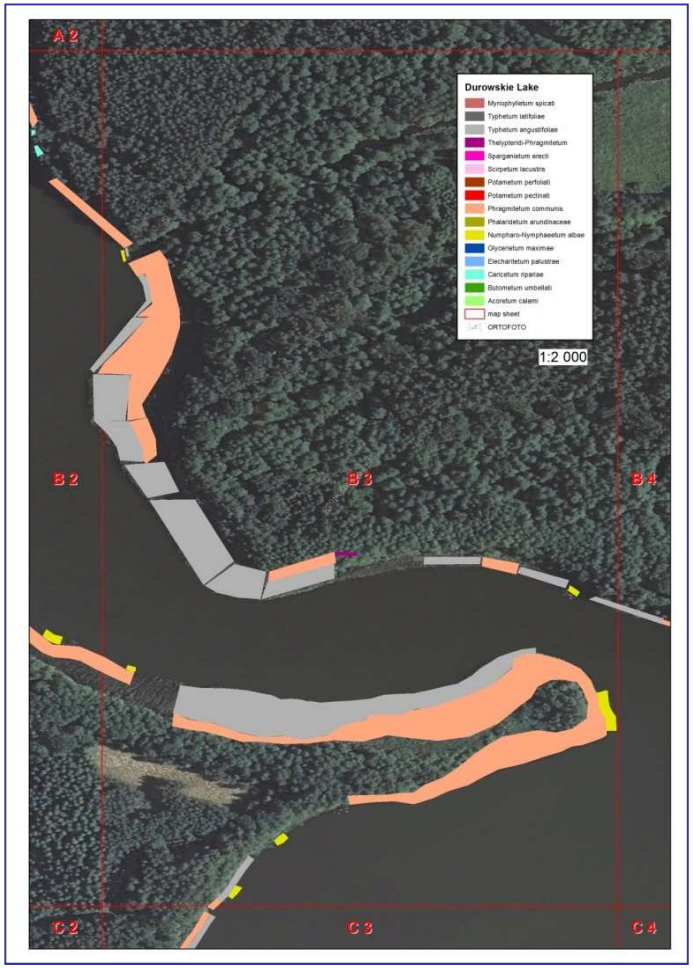
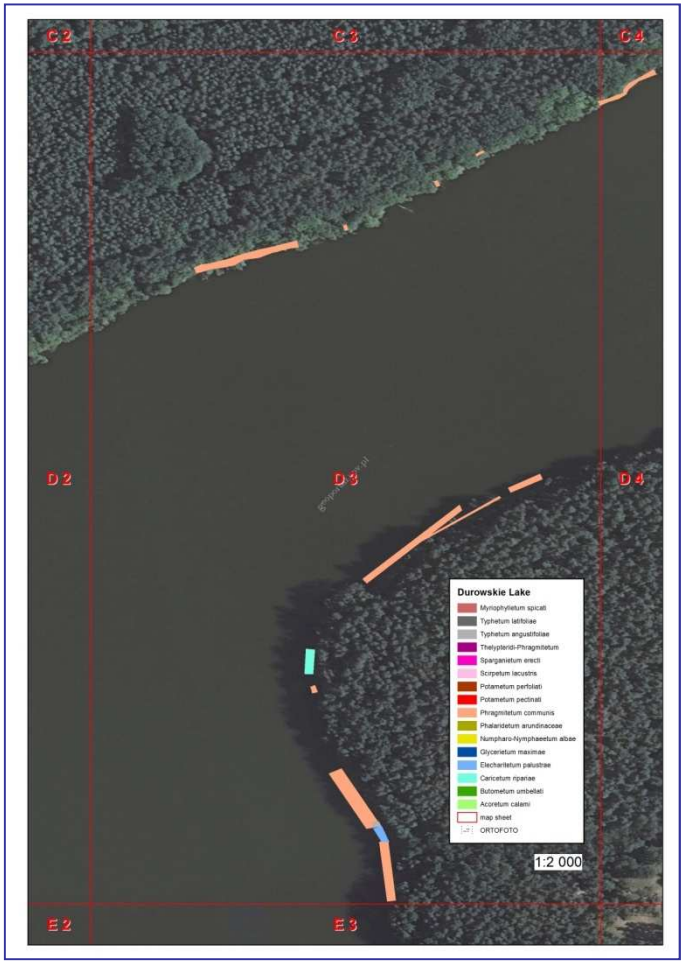
III. Results & Discussion



North of the lake



Middle of the lake

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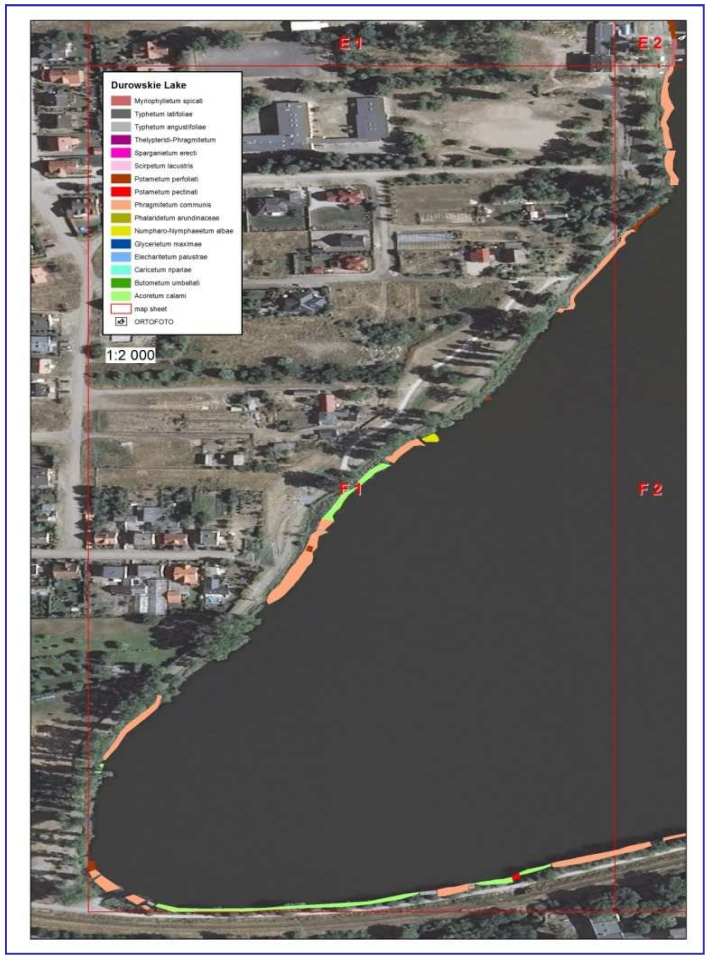
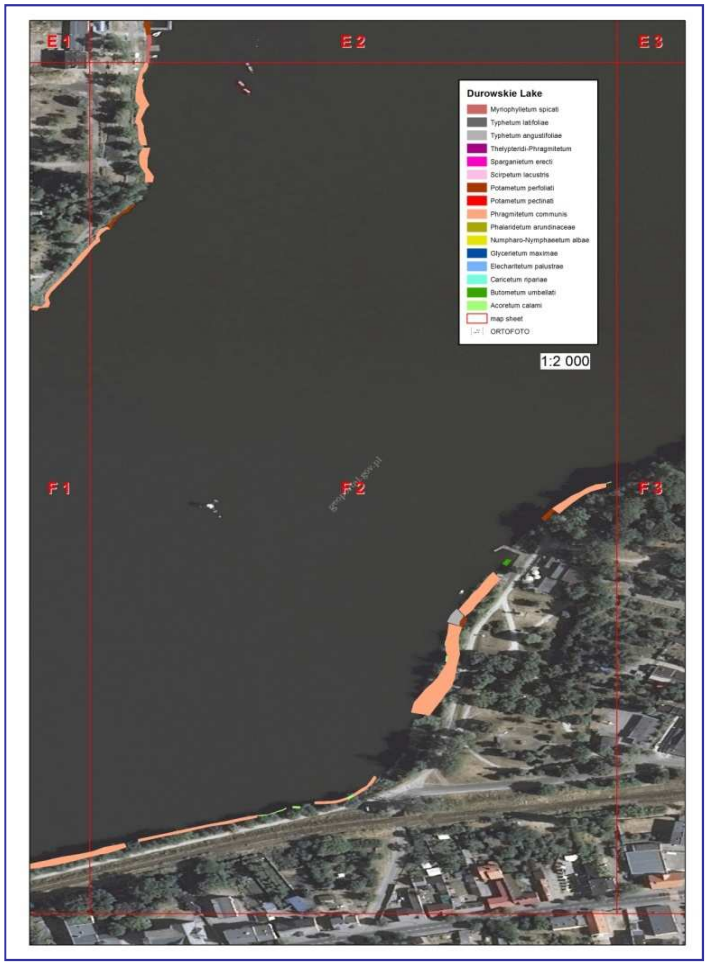
III. Results & Discussion





South of the lake

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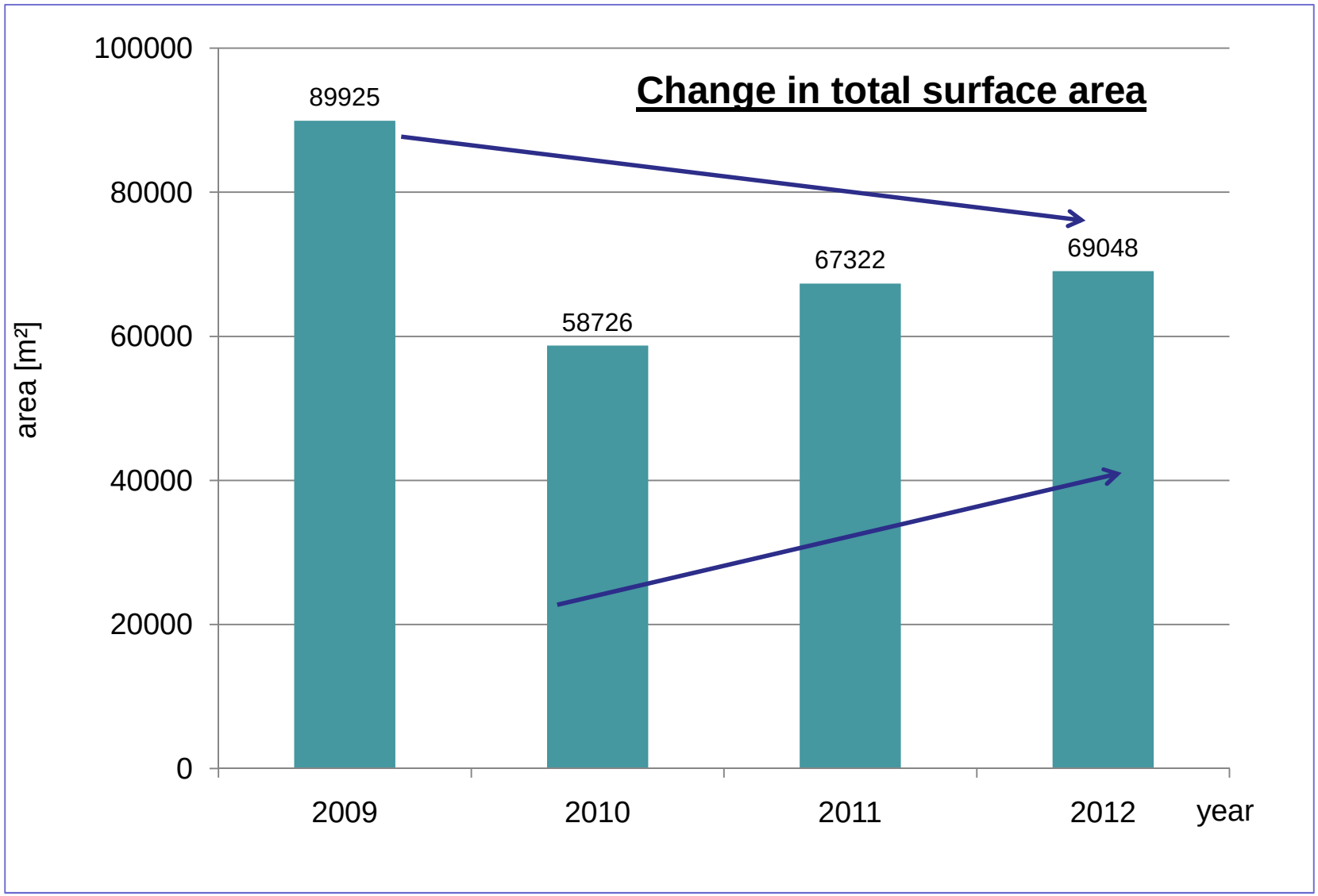
III. Results & Discussion



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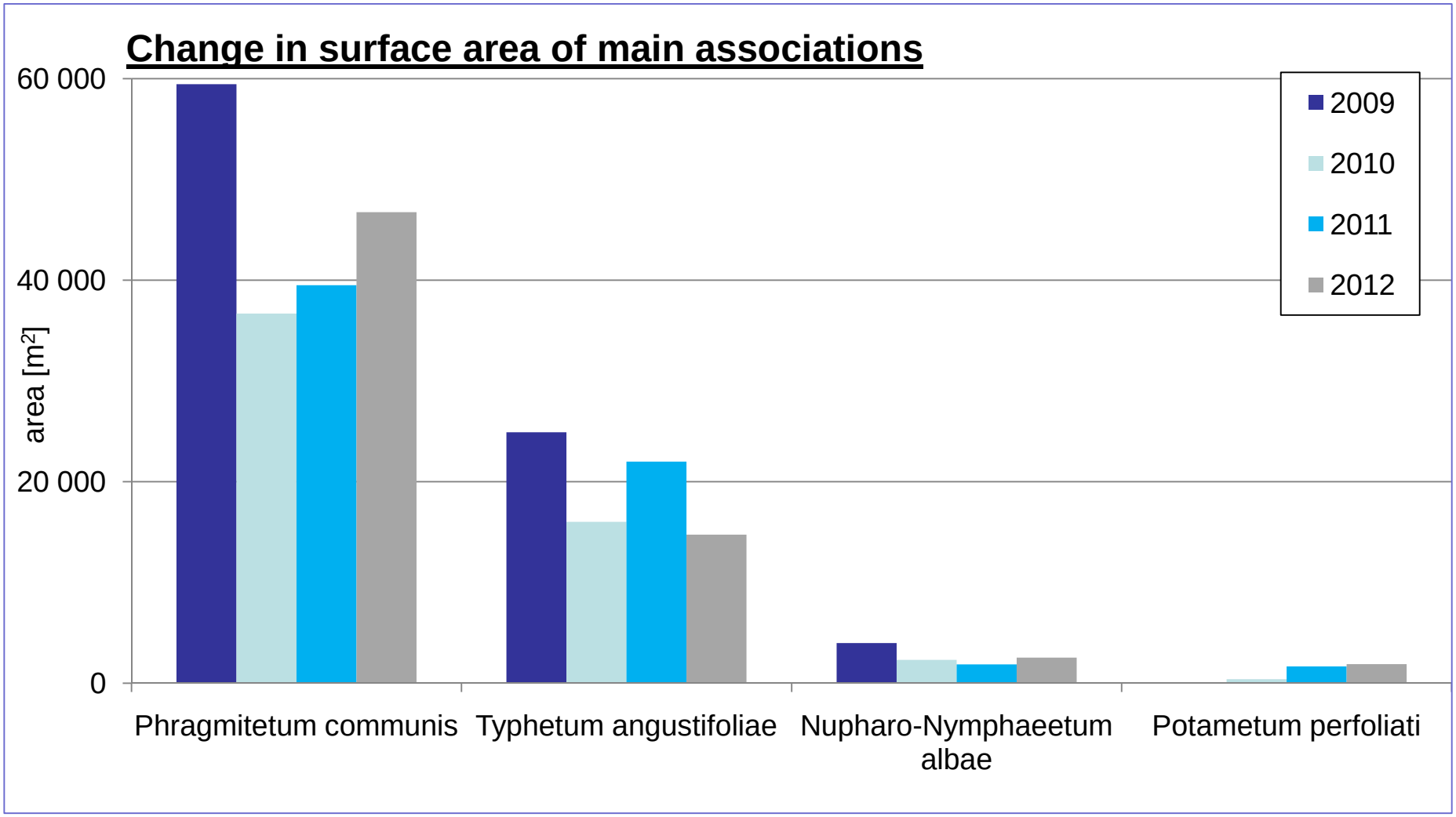
III. Results & Discussion



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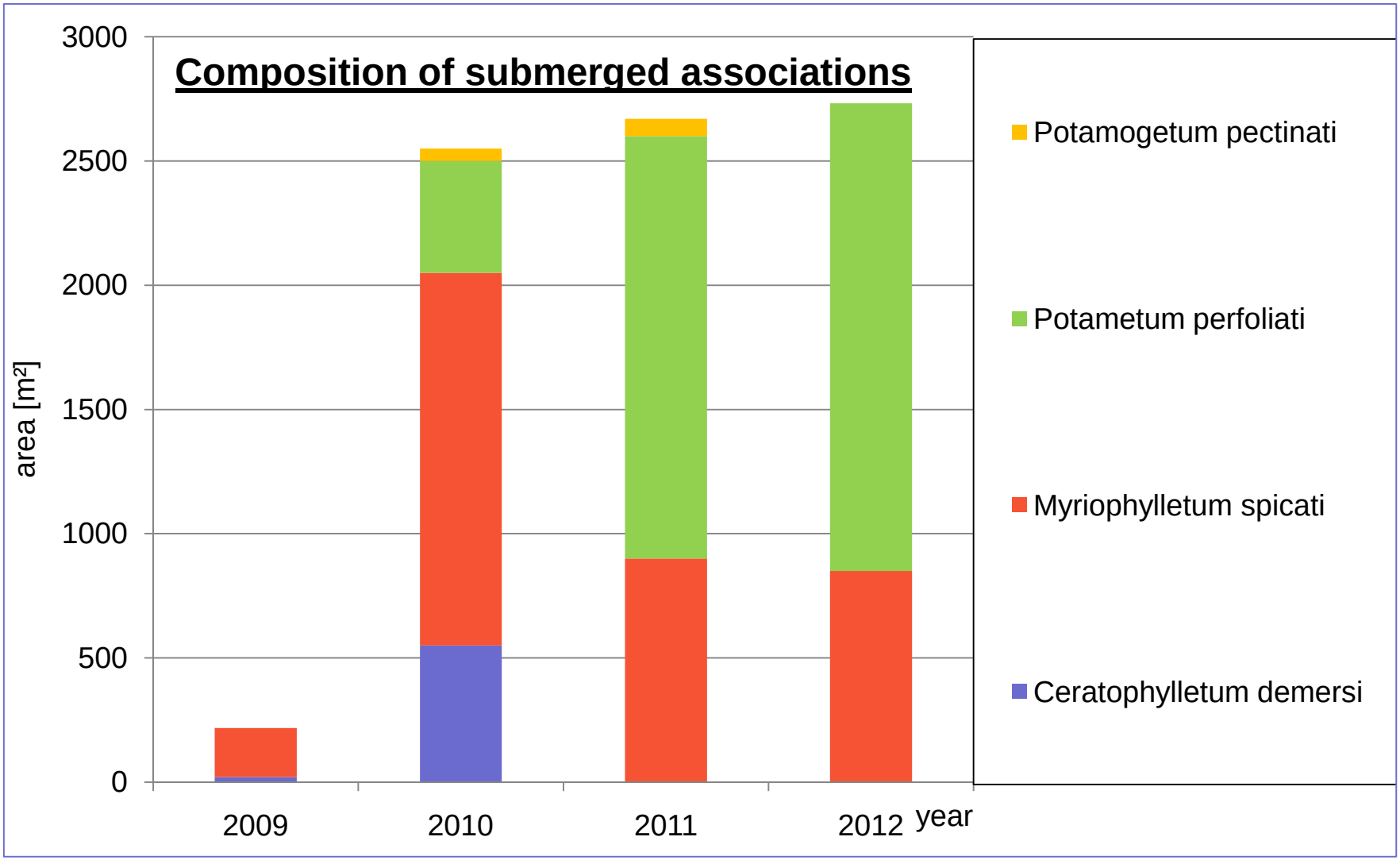

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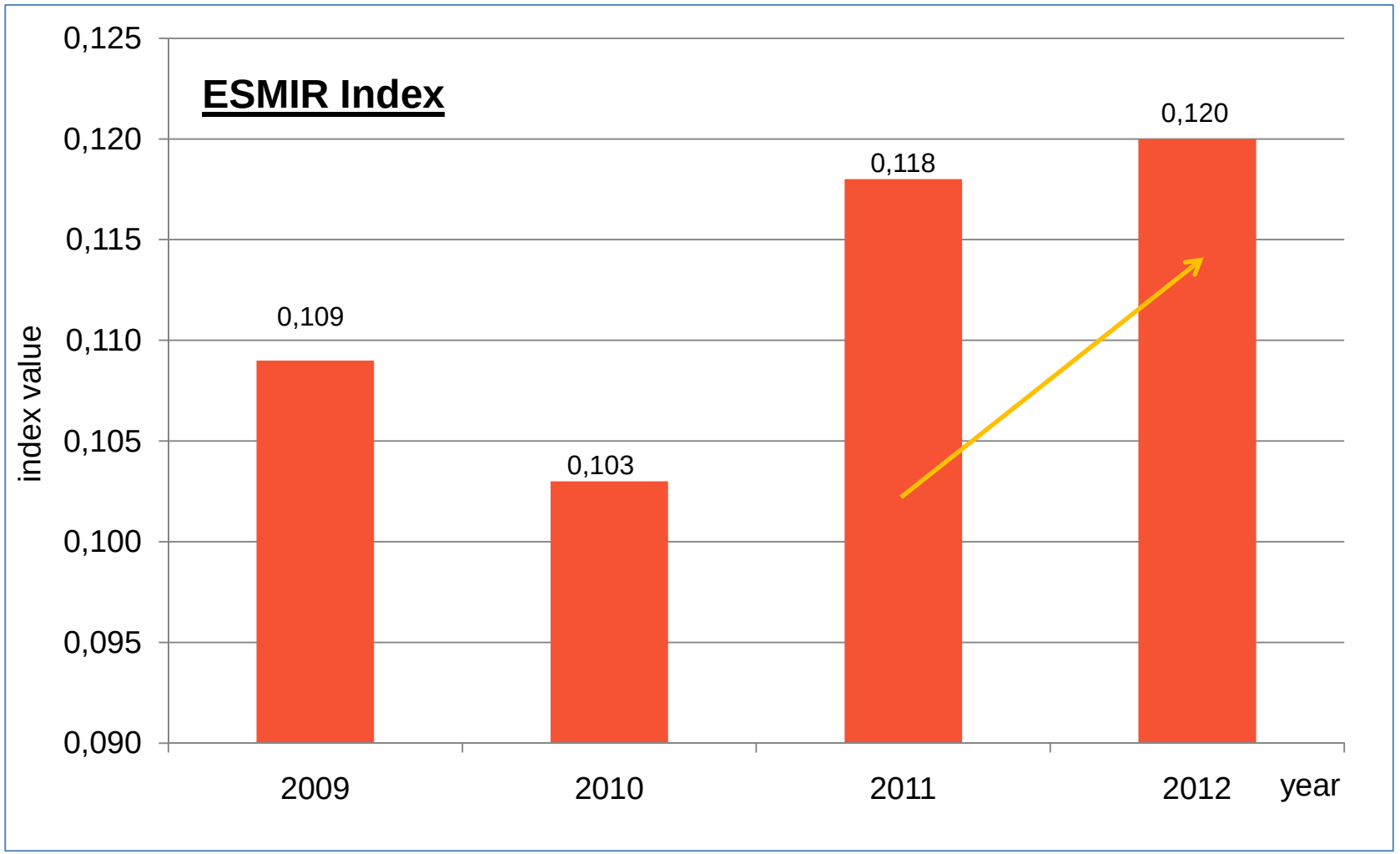

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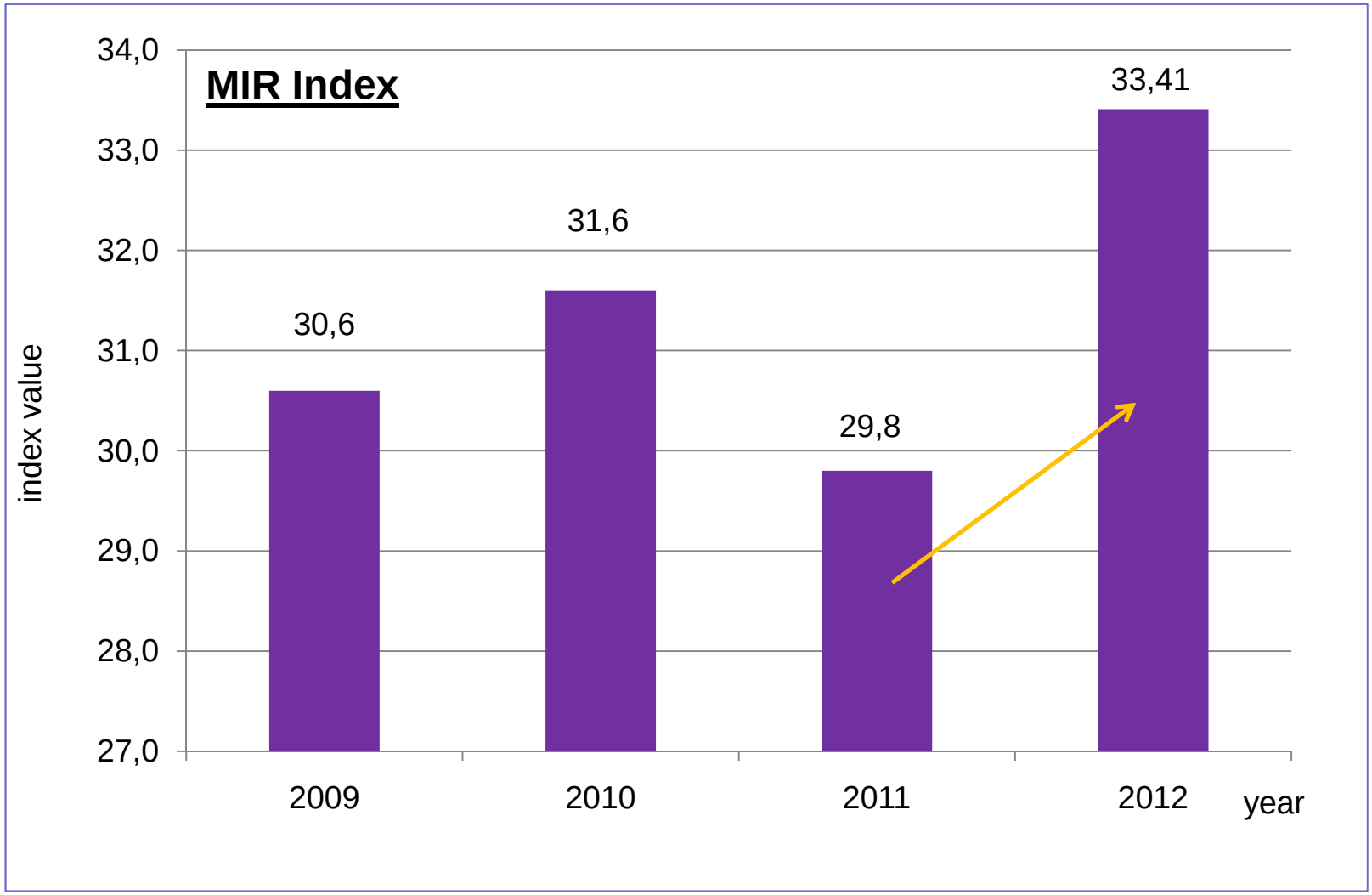

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III. Results & Discussion

- *ESMI Index (0.12)* → slightly higher than previous years, still "poor"
- MIR index (33.41) → higher value than previous years, still "moderate"

Table 2: *Classification of the ecological state by ESMI and MIR index.*

Ecological State	ESMI index	MIR index
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V. Conclusion

- slight improvements of indices, but still out of good ecological status
- association composition show sustained eutrophic state
- human impact influences obviously macrophyte patterns (North ←→ South)
- increase of total surface area covered by macrophytes shows moderate longterm reaction

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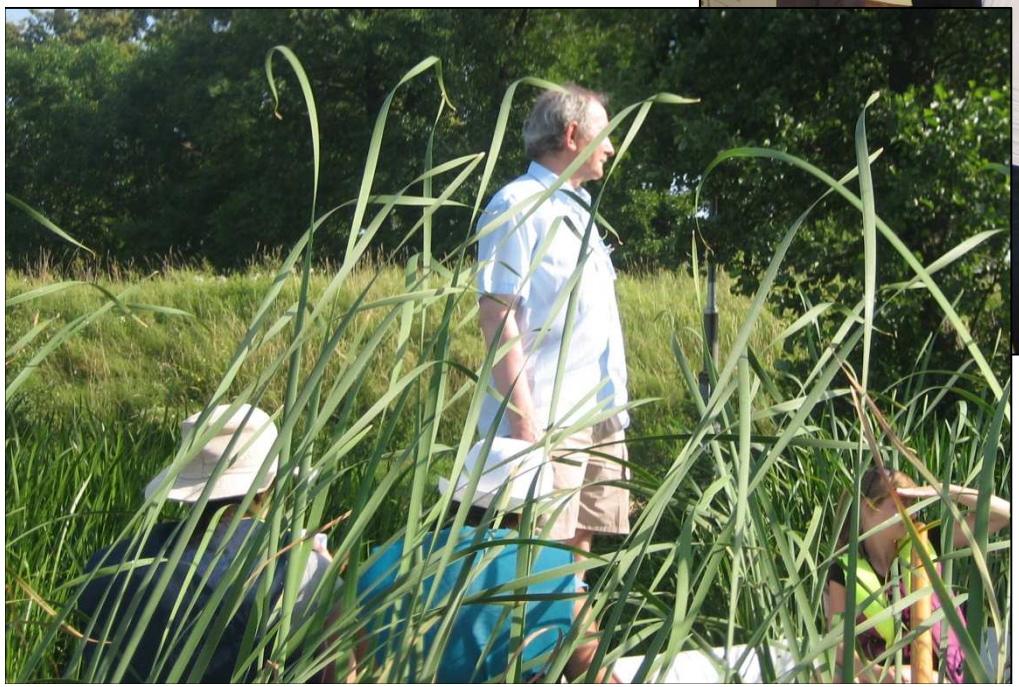
Thanks for your attention!!!



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VI. References

- Braun-Blanquet, J., 1928. Pflanzensoziologische Grundzüge der Vegetationskunde. Springer Verlag, Berlin, Germany.
- Kłosowski, S., Kłosowski, G., 2007. Rośliny wodne i bagienne. Multico Ofic. Wydaw , 336.
- Melzer, A., 1999. Aquatic macrophytes as tools for lake management. Hydrobiologia , 181– 190.
- Messyasz, B., Pikosz, M., Szendzina, L., 2012. MATERIALS FOR PARTICIPANTS OF SUMMER SCHOOL. International Summer School RESTLAKE of Lake Durowskie .
- Miejski, U., 2012a. Location. Last checked: 10.07.2012. http://www.wagrowiec.eu/en/ polozenie/opis/.
- Miejski, U., 2012b. Tourism. Last checked: 10.07.2012. http://www.wagrowiec.eu/en/ rekreacja/.
- Podbielkowski, Z., Tomaszewicz, H., 1996. Za- rys hydrobotaniki. Wydawnictwo Naukowe PWN, Warszawa, Poland.
- Schaumburg, J., Schranz, C., Hofmann, G., Stel- zer, D., Schneider, S., Schmedtje, U., 2004. Macrophytes and phytobenthos as indicators of ecological status in german lakes - a con- tribution to the implementation of the water framework directive. Limnologica , 302 – 314.
  Water and Rivers Commission, 2011. Water quality and macroinvertebrates. Water facts 2.
- Wilczyński, S., 9:00 am, 3rd of July 2012. Wel- come meeting with the maior of Wangrowiec for Summer School 2012. oral.