Macrophytes as an Indicator for the Ecological State during Restoration Measures on Lake Durowskie

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Introduction

Lake Durowskie

- Located in Wągrowiec in the western part of Poland
- Major attraction of Wągrowiec city for recreational activities
- Has been degraded because of:
  - increased nutrient inputs (upstream sources, sewage, recreational activities, erosion)

Introduction

Why are Macrophytes important?

- Macrophytes serve as an important land – water ecotone
- Provide habitats for fish, birds and smaller animals
- Bind sediments and protect banks from erosion
- Natural filter and absorb nutrients and
- Produce oxygen

"… they are important indicators for the ecological status of the lake…"

Introduction

Aims of the Investigation

- Assessment of ecological state of the Durowskie lake and its tributaries based on macrophyte indices
- Assessment of the trend in trophic state of the lake - relating current results to results from previous years (2009-2013)

Materials and Methods

July (Week 1): Field data collection

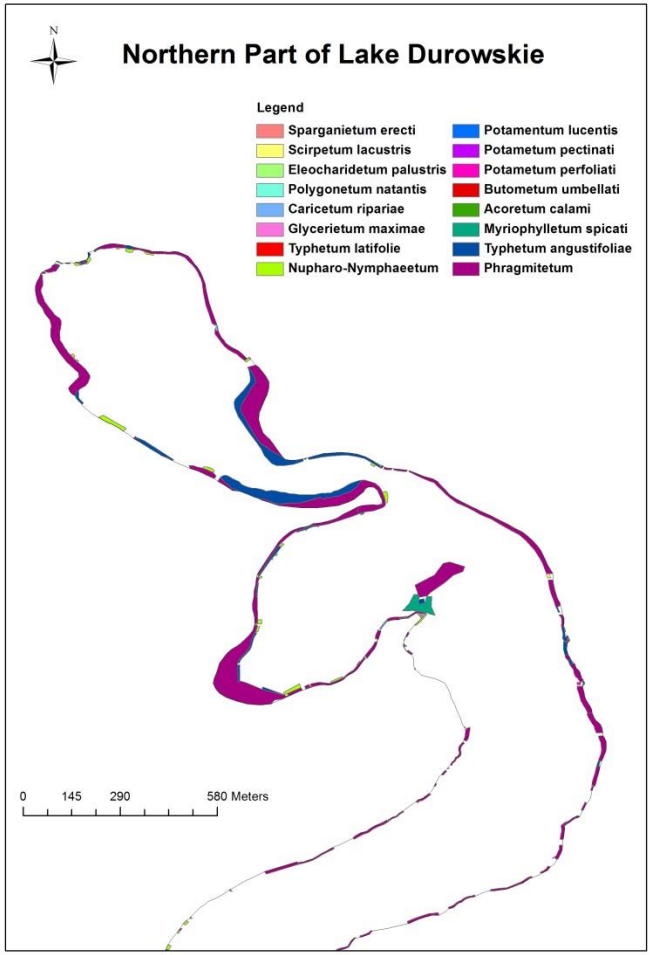
- Perimeter survey of lake and at outflow
- Braun-Blanquet method

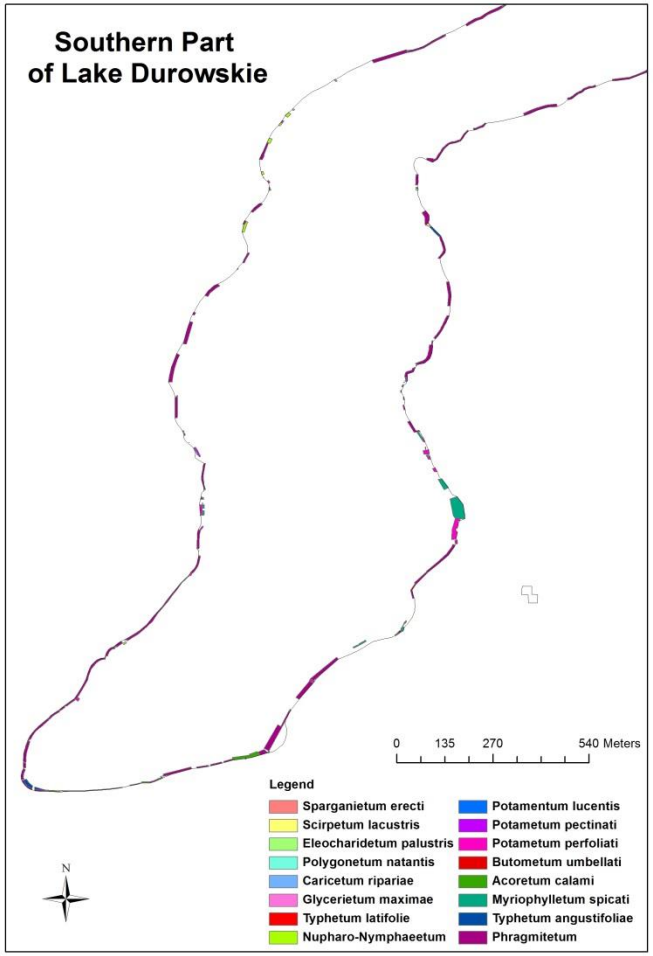
July (Week 2): Data Analysis and Report

- GIS and Mapping software – Spatial Analysis
- ESMI and MIR

Results

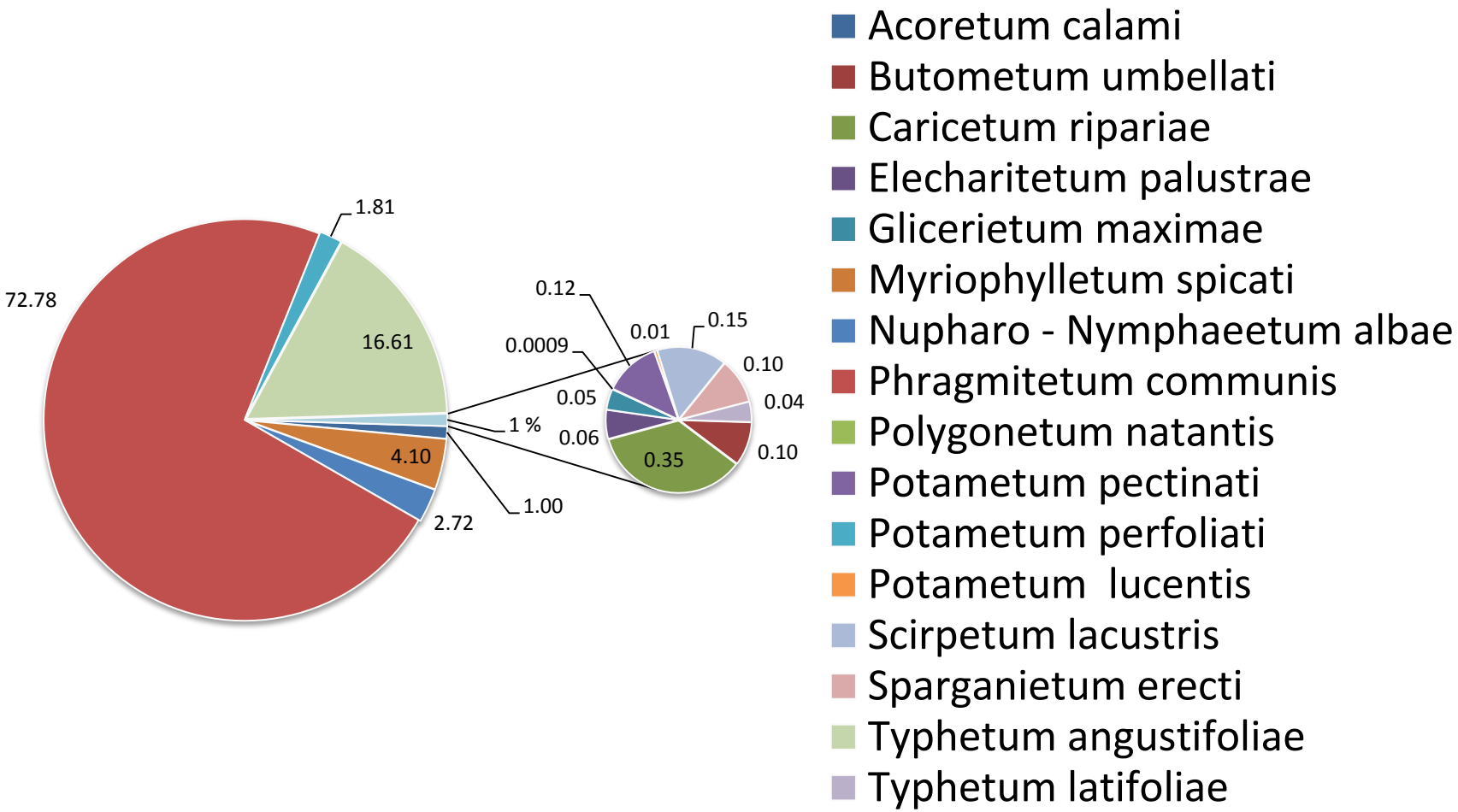
Macrophyte associations on Lake Durowskie





Results

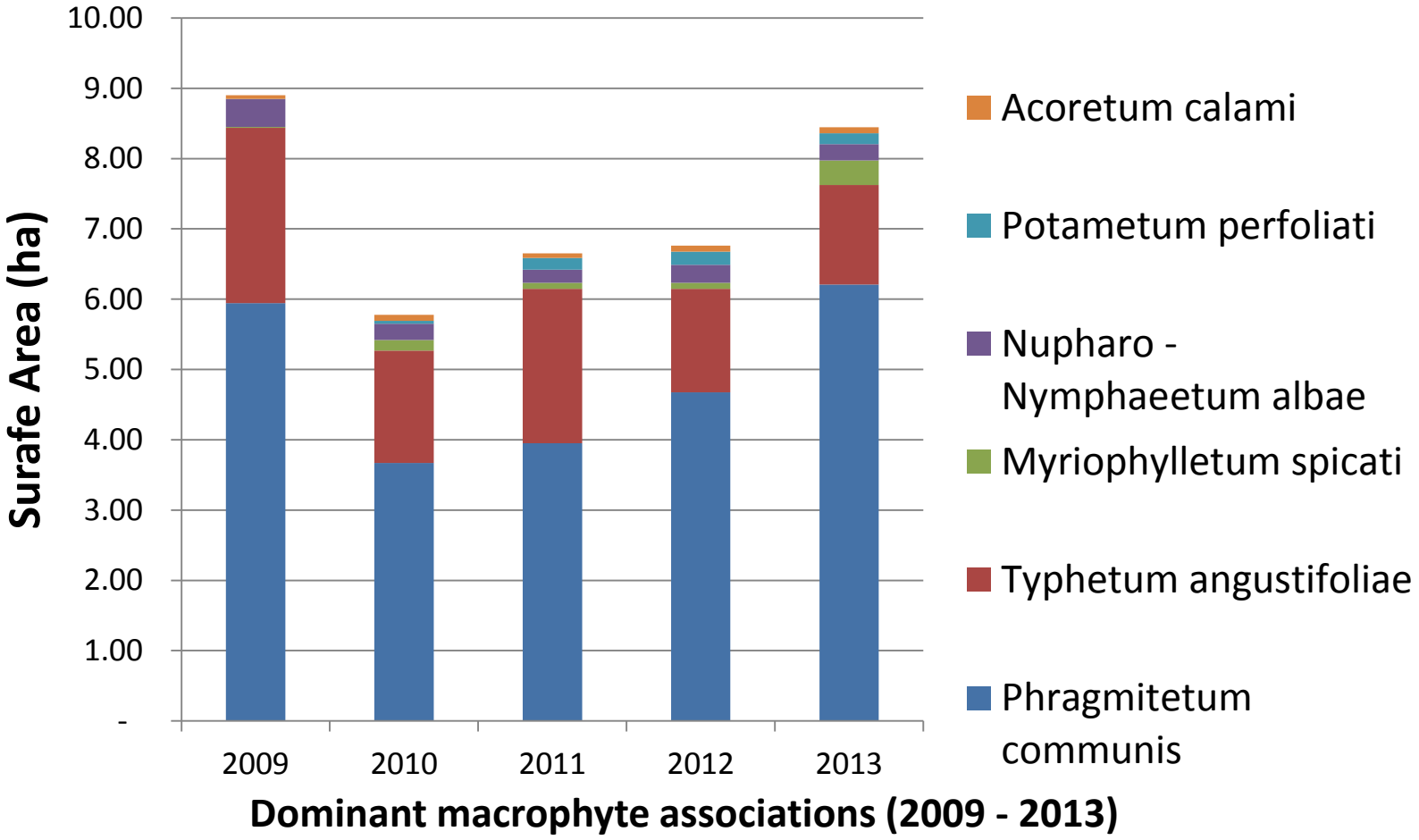
Spatial Coverage



Spatial coverage of macrophyte associations in 2013 expressed in %

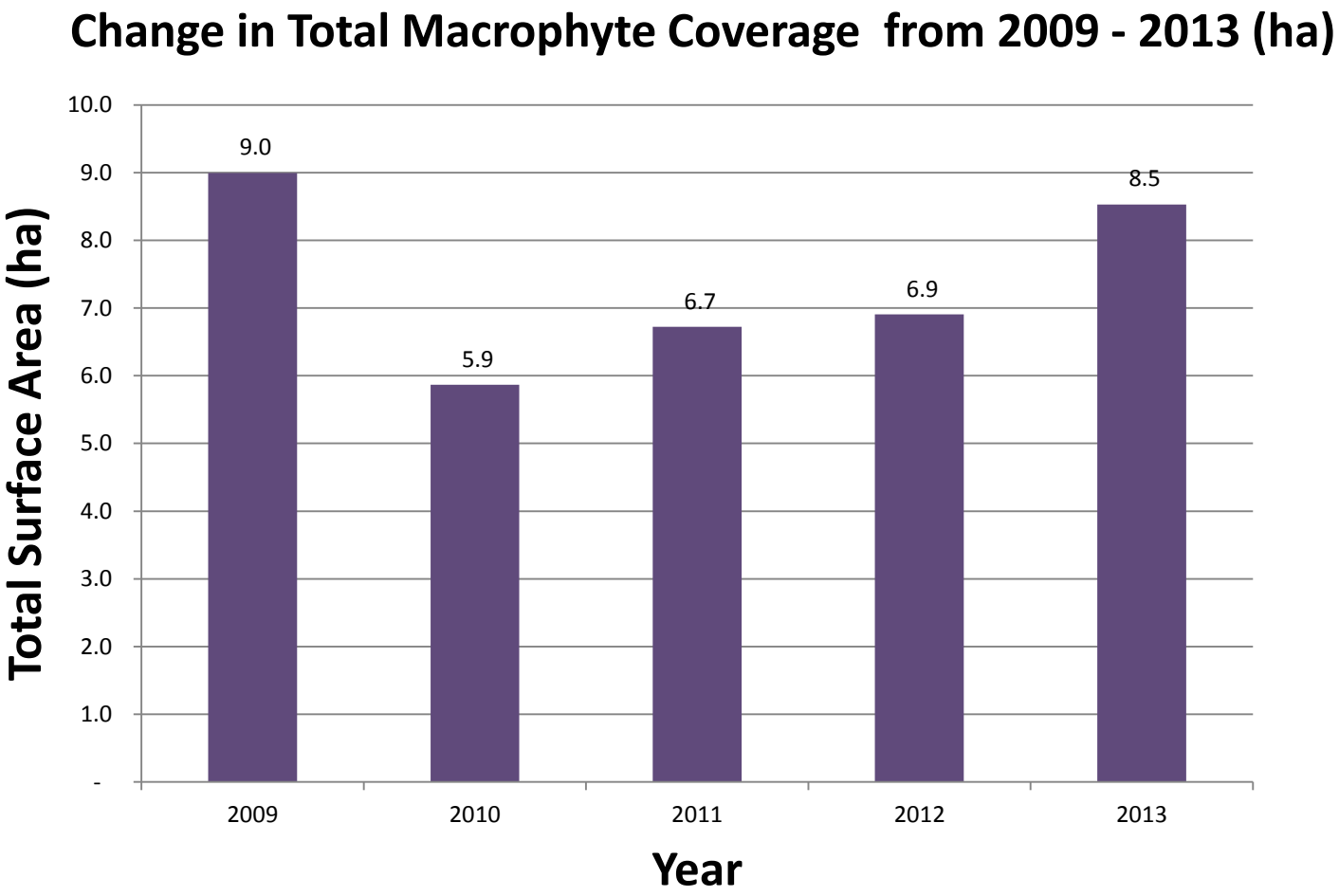
Results

Macrophyte Associations



Results

Macrophyte Associations



Results

Change in Macrophyte Associations at the Outflow

SPECIES COMPOSITION	2012	2013
Butomus umbellatus	6	6
Acorus calamus	4	1
Potamagetum pectinatus	6	6
Myriophyllum spicatum	4	1
Scophularia umbrosa	1	1
Potamogetum perfoliatus	1	
Lysimachia thyrsiflora	1	
Rorippa amphibia		1
Cladophora glomerata		6
Phalaris arundinacea		1

Results

ESMI and MIR

Classification of ESMI (for deep stratified lakes) and MIR values

Ecological state	ESMI	MIR
very good	0,680 - 1,000	≥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

Values of ESMI and MIR indices 2009 – 2013

	2009	2010	2011	2012	2013
ESMI	0,109	0,103	0,118	0,120	0,136
MIR	30,6	31,7	29,8	33,41	26,05

Discussion

- Phragmitetum communis (most dominant assoc.) increased its cover (32%) and is spreading to deeper waters.
- Ceratophyllum demersii – absent since 2011 indicator of bad water quality
- Potametum lucentis – disappearing previous years (covered by Numphar leaves), 2013-new patches appeared – present in water of moderate quality
- Myriophylletum spicati (submerged macrophyte) increased its coverage by 4 times related to better light availability

Recommendations for Management

- Introduction of new macrophyte species such as *Charales (stoneworts)*.
- Educating fishermen and users of the lake on care of macrophytes
- Designating priority/sensitive areas

THANK YOU