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Assessment on changes in wetland and floating vegetation cover

Theoretical background

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CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

GREEN ALTERNATIVE

1865

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Overview

- Goals
- Theory
- Methodology
- Preliminary results

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General Purpose

To assess the changes in wetland and floating vegetation cover over a time period in the selected Pilot areas

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Main goals to be achieved

- Changes in wetland and floating vegetation cover (growth intensity) associated with nutrient concentration in surface waters will be assessed
- PONTOS platform will be used to estimate the dynamic of changes in wetland and floating vegetation cover, identification areas and time of floating vegetation blooms
- In-situ measurements of nutrient concentration are to establish relationships with the estimated vegetation cover for a long term period in order to foster credibility of PONTOS results

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Hidden goals to be achieved

- Improve the knowledge of partner teams in the field of remote sensing and improve the skills of using its tools
- To exchange knowledge and experience acquired within the framework of the project between the specialists of the working group

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Step 1: Pilot Sites identification (completed)

Sevan lake(Armenia)

Kolkheti Lowland (Georgia)

Dniester Delta (Ukraine)

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Step 2: Testing floating vegetation in Ukraine (completed)

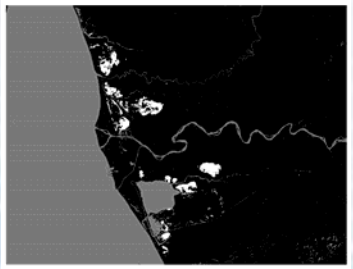
Armenia

14-10-2019

21-02-2020

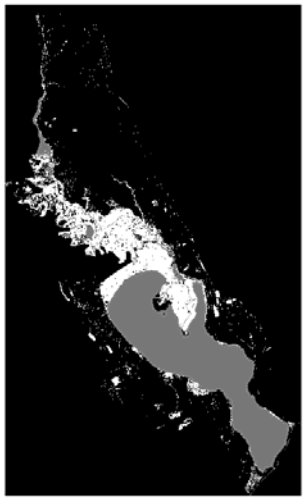
Georgia

23-06-2020



Ukraine

06-08-2020



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Step 3: Field Campaign (completed in Ukraine)

Collected data from Ukraine:

Dniester estuary

- 22/04/2021 (transparent mosaic)
- 23/07/2021 (Multispectral, RGB images, trapa and nuphar 5-150m)
- 28/07/2021 (RGB images)

Bile lake

- 21/04/2021 (small part of the lake)
- 11/06/2021 (full lake RGB)
- 26/07/2021 (Multispectral & RGB images)

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Next Steps

Step 4
- Download Sentinel-2 Data for the field campaign dates
- Floating vegetation implementation

Step 5
- Validate floating vegetation results utilizing the field campaign data

Step 6
- Download Sentinel-2 data 2017-2021
- Implementation of Floating vegetation for the downloaded Sentinel-2 data

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Water vegetation types

There three major types of vegetation in the land water bodies, which might be also divided by sub-types:

- Emerged vegetation (or wetland vegetation) – plants growing in shallow waters with leaves or steams above the water (mainly presented by reeds)
- Submerged vegetation – plants growing entirely below and up to the water surface
- Floating vegetation – when a whole plant or a part of it lies on the water surface; this can include:
  - Rooted floating vegetation (e.g. water lily, water chestnut)
  - Non-rooted floating vegetation (e.g. Salvinia natans)
  - Submerged vegetation at specific condition when (i) water level decrease and stems/ leaves lie on the water surface, (ii) when it overgrows and their long stems/ leaves lying within the water surface (interface between water and air).

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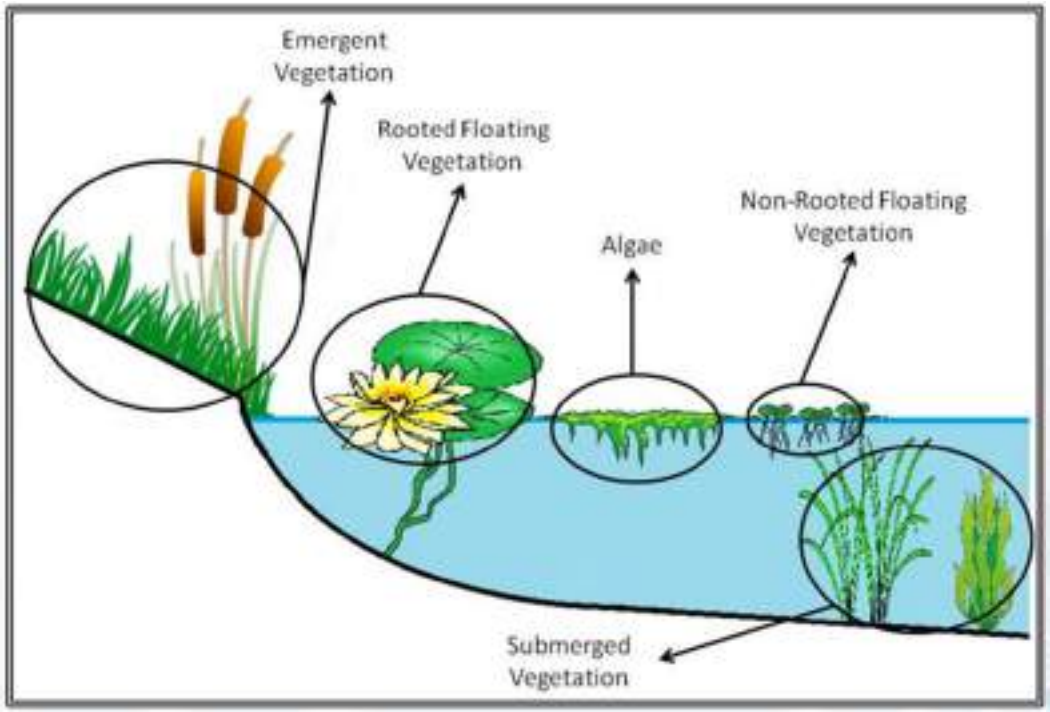
Classification of different types of aquatic vegetation (variant 1)



Source - https://fw.ky.gov/Fish/Pages/Farm-Pond-Management-Vegetation-Control.aspx

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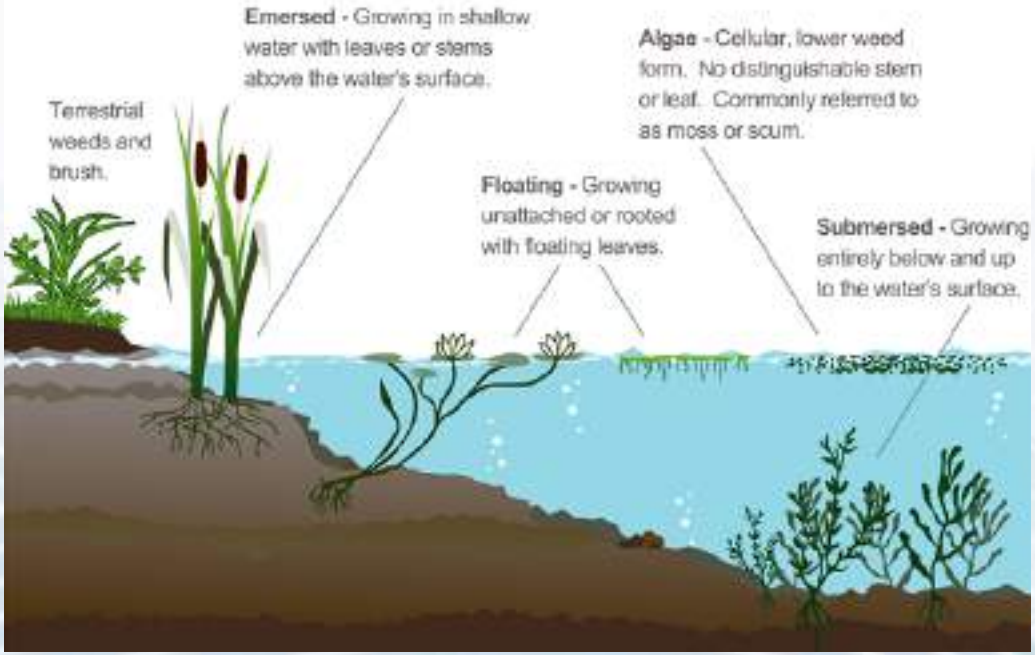
Classification of different types of aquatic vegetation (variant 2)



Source - http://invasivespecies.ie/invasive-plants-japanese-knotweed/aquatic-weeds/fw.ky.gov/Fish/Pages/Farm-Pond-Management-Vegetation-Control.aspx

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Water vegetation types

Mix of submerged and floating vegetation (left) and submerged vegetation (right) at low/middle water condition.

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Our purpose to detect the areas of the following:

- **Wetland (emerged) vegetation**
- **Floating vegetation (rooted and non-rooted)**
- **[optionally] Submerged vegetation at specific condition (As shown in the pictures above)**

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Wetlands definition:

Adopted by Ramsar Convention

"...wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters"

Source: https://rmi-data.sprep.org/system/files/RMI%20Ramsar%20Sites_appendix7.pdf

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Methodology

Satellite data processing

- Vegetation Indices
- Semi-automatic image classification and different aquatic vegetation types determination (with QGIS and SNAP)
- Hydroperiod estimation for wetland areas using spaceborne time series imageries (CERTH model)

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Methodology

In-situ measurements

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Applicability of a WFV tool at PONTOS platform

Stakeholders

- Nature National Park authorities
- River Basin Management authorities
- Fishery authorities
- Fishery association/ private fishermen
- Local/ regional policy-makers
- NGOs, eco-activists
- Ecotouristic companies/ ecotourists
- Locals

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PONTOS-UA

Tudurove and Bile Lakes

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PONTOS-UA

Northern part of Dniester Estuary