

ProCleanLakes project - Integrated emerging approaches for joint protection and restoration of Natural Lakes in the spirit of European life heritage support

Vrana Lake: Challenges of Managing a Shallow Freshwater Ecosystem

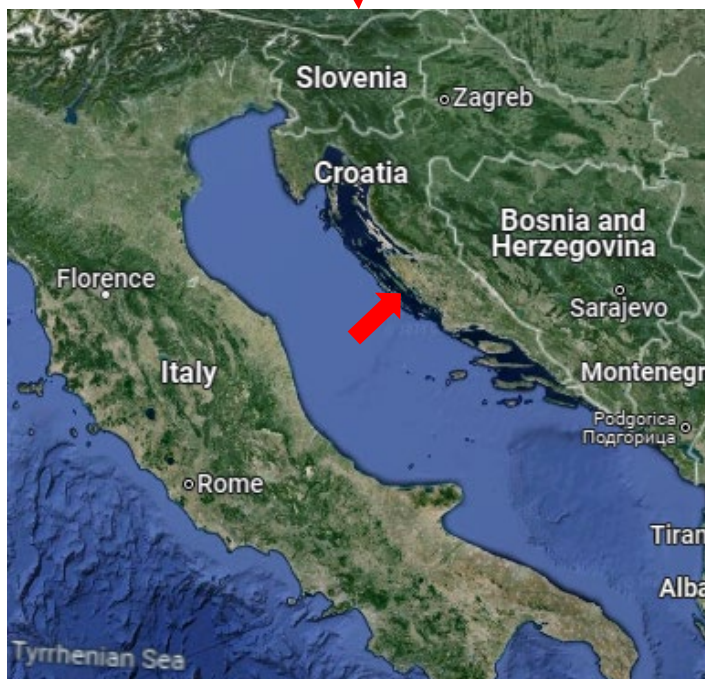
Maja Čuže Denona, Public institution Nature park Vransko jezero

#MissionLakes Webinar
Developing a European Community of Practice on Lake Restoration
3.9.2026.



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- Nature park Vransko jezero - 1999.
- Special ornithological reserve - 1983.
- Natura 2000 site Vransko jezero i Jasen - SPA HR1000025 Vransko jezero i Jasen (60 target species of birds) and SAC HR5000025 Vransko jezero i Jasen (7 habitat types, 7 target species)
- Natura 2000 site Ravni kotari – 2023.
- IBA - important bird area - 1983.
- Ramsar site - 2013.



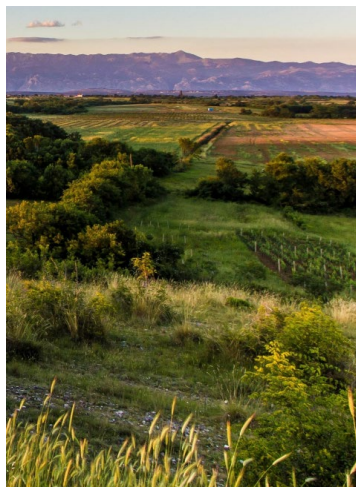
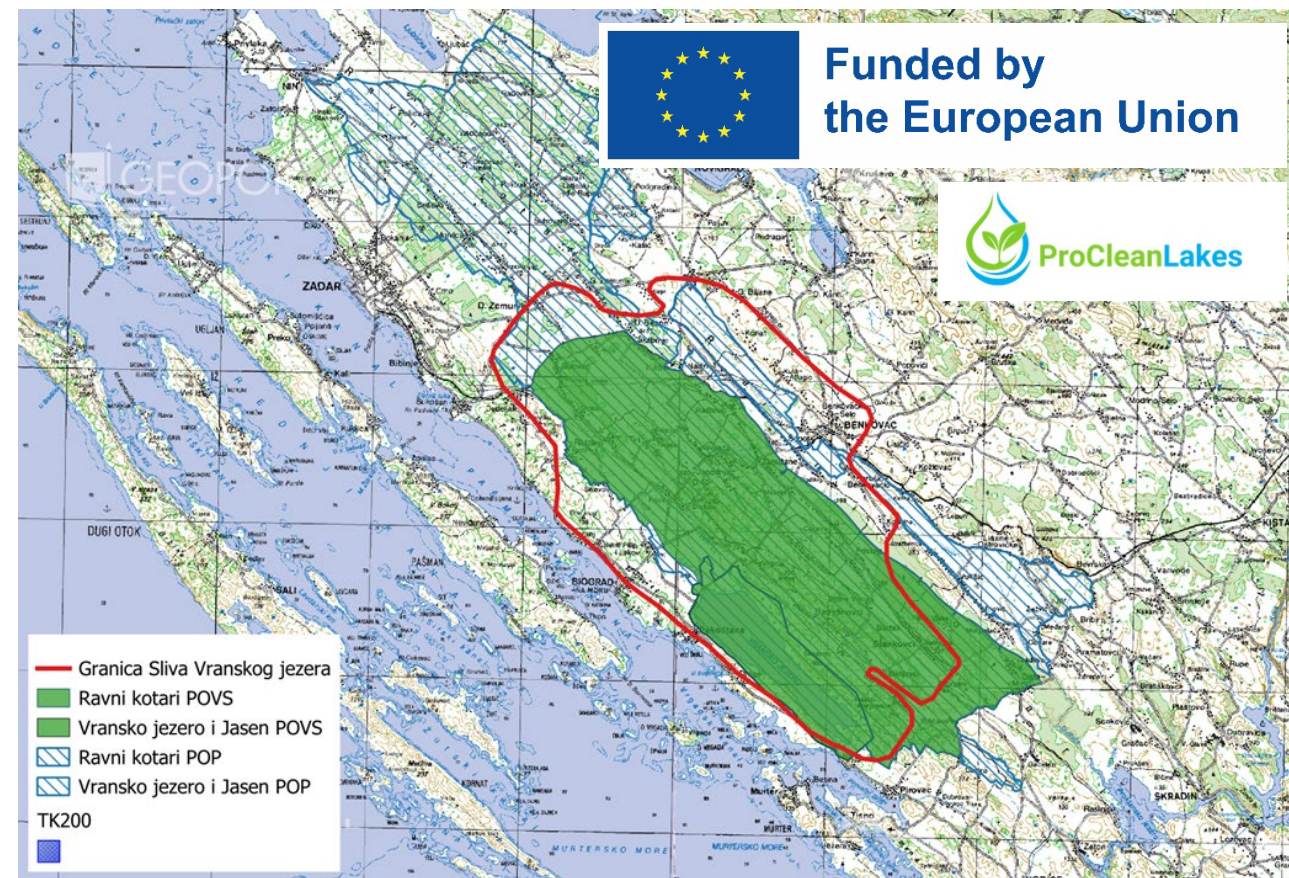
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SPA HR1000024 Ravni kotari (18 target species)
64000 ha

SAC HR2001361 Ravni kotari (2 habitat types, 12
target species of invertebrates, reptiles,
mammals) 56000 ha

a mosaic landscape of rich and diverse
agriculture land use (arable land, hedgerows,
meadows and pastures) alternating with forests
and water habitats, favouring the preservation
of target species of birds





- largest natural lake in Croatia with the surface area of 30 km²
- situated in a shallow karst bed and separated from the Adriatic Sea by a narrow karst ridge
- significant seasonal variations in water level and changes in salinity due to intrusion of sea water through permeable karst, create conditions for development of very specific habitats.
- the shallowest northwest part characterized by reedbeds, floodplain and seasonally flooded arable land





- Cryptodepression - bottom at 3.47 m b.s.l.
- Water levels vary in the range of 0.02 – 2.25 m a.s.l. (average 0.82 m a.s.l.)
- Lake volume varies 44.9 to 121.5 mil. m³ (average 74.9 mil m³)
- Average water exchange time 2.1 year
- Complex hydrological system in dynamic balance with the sea



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- canal was dug out in the SE part of the lake in order to reduce the marsh area of the Vrana field and in that way to control malaria and enlarge cultivable land in 1770
- 470 km² basin – dependant on the annual percipitation
- construction of the Prosika chanel in 1770 and a melioration network and pumping stations in the 1960s



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Main challenges and management problems



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WATER QUANTITY

- **climate change** affecting the hidrological conditions in the watershed – at the same time intensified need for water for agriculture and water supply (high in tourist season) and also raising sea level
- intrusion of the sea water and salinization up to 18‰ – in cryptosdepressions risks increasing with lower inflow of freshwater in the lake system, increased loss through evapotranspiration
- prolonged low water levels with extreme salinity values lead to reduction of the species in the lake and the degradation of populations which indicate a favourable ecosystem status
- Plans for further water uptake for irrigation in the catchment (two accumulations) – double the amount that is now being used
- the risk of a cumulative increase in salinization - the mixing of freshwater inflows from the basin with the brakish lake water, and their outflow through the Channel Prosika is the necessary mechanism for its desalination

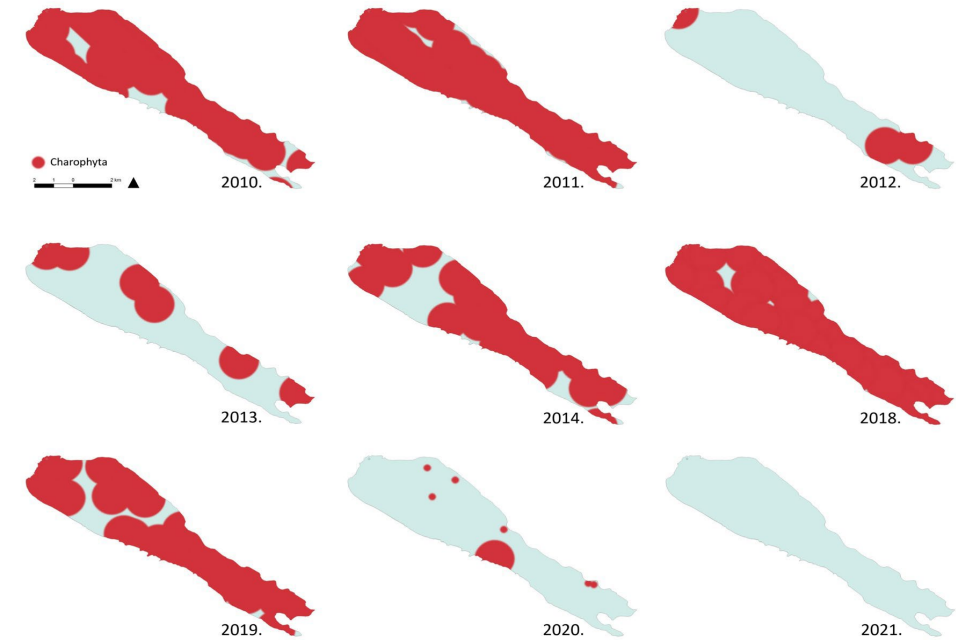


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WATER QUALITY

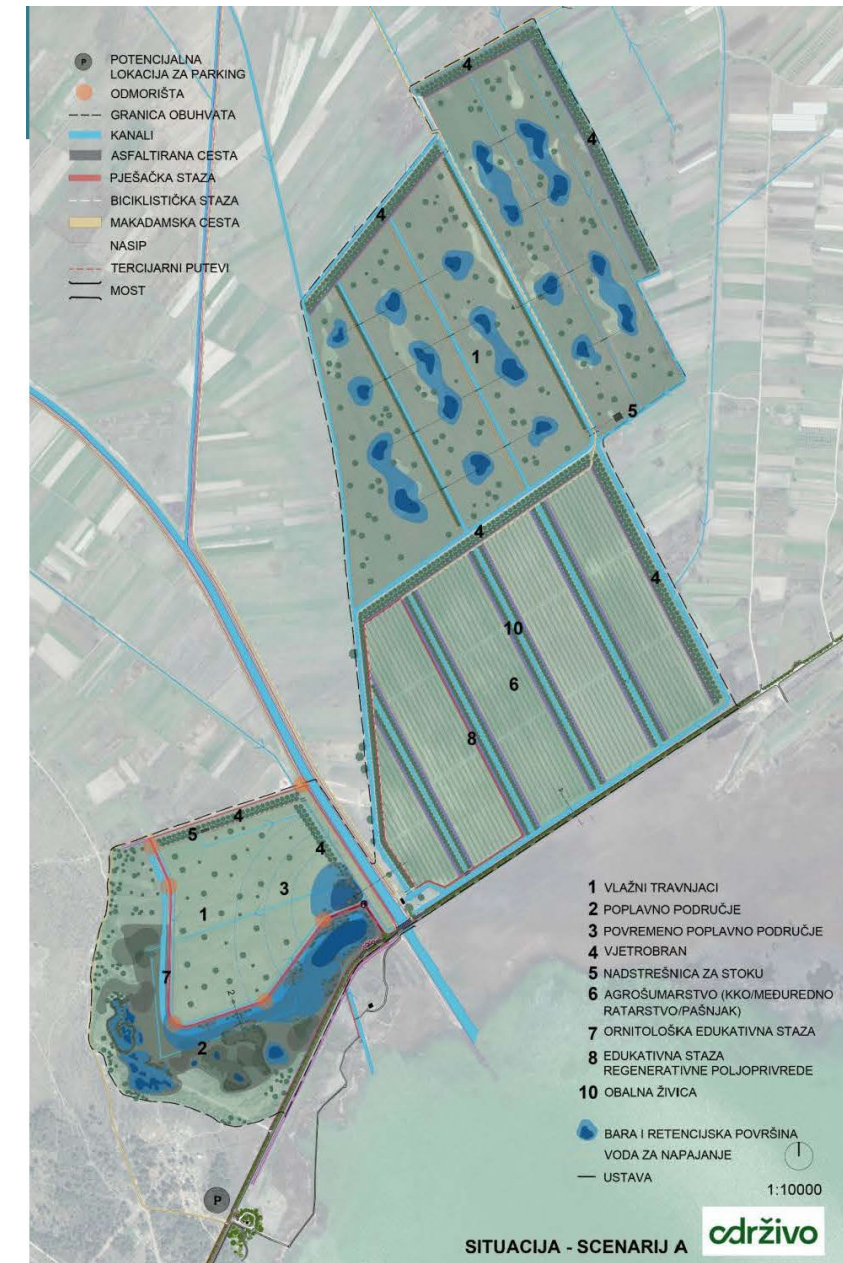
- **eutrophication processes** intensified during drought periods affecting biodiversity
- water turbidity
- anoxia
- Natura 2000 habitat 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp completely disappearing (3000 ha)
- intensive agriculture in the catchment area and intensive cleaning of the flood control channels – removing the natural filters of nutrients
- **Alocthonous and invasive fish species** without population control (Prussian carp and carp)



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- **Water in the lake and the watershed is managed by Croatian water** management company according to the WFD– water quality in the channels and the lake is inadequate – active measures are needed – more communication since the whole watershed is not under the jurisdiction of the protected area management institution
- Irrigation plan in cooperation with all stakeholders – not enough freshwater – awareness raising
- Building of the removable dam on the channel Prosika and managing it adaptively with Croatian waters
- Restoration of the wetland area adjacent to the reserve that is also a natura 2000 site and target habitats currently partly used as an agricultural land – natural filter of the nutrients from the catchment, wet meadows and grasslands, managed as an extensive pasture and regenerative agriculture



Expectations of the CoP

Knowledge on the specific ecosystems functioning

Experience from European lakes

Interdisciplinary approach

Overlapping of jurisdictions – involvement of stakeholders



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Thank you for your attention!

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