

Integrated water resources management to reconcile agriculture with environment in dry coastal areas

Conflicting water uses in coastal zones demand integrated approaches to achieve sustainable water resources management, protecting water quality while allowing those human activities which rely upon aquatic ecosystem services to thrive. The Vallevecchia wetland system (Fig. 1) is based on a reclaimed 900 ha-large drainage basin located along the coast of the NW Adriatic Sea near Caorle, Northern Italy, where droughts recently impacted agricultural activities causing water scarcity and saltwater intrusion. Vallevecchia is a multipurpose experimental system with the pioneering goal of allowing agricultural practices close to the sea. Rainwater and drained water are recirculated inside the system (where no significant internal freshwater sources exist) to limit saltwater intrusion, provide water for irrigation during dry periods and reduce the nonpoint pollution of agricultural origin, i.e. the nutrient loads discharged into the bordering sea. The staff of LASA has been monitoring the surface water quality of Vallevecchia since 2003; results show that the groundwater is saline and about 1 m deep, but sometimes it can even reach the ground surface where salt crusts can occasionally be noticed. There are two hydraulic pathways in the system. One runs across the Sbregavalle channel: water flows from secondary channels, which run across the fields and collect their surface runoff, into the Sbregavalle channel, then to a gated spillway, and finally to a pumping station which pumps water out of the system. Regulating gates are found at the beginning and at the end of the secondary channels, and when they are closed the water level inside these channels increases and consequently water is distributed in the fields. In this manner the groundwater table is raised up uniformly, thus benefiting agricultural activities and possibly reducing saltwater intrusion. In the second pathway, water from the Sbregavalle channel is pumped into a storage basin and then the water is recirculated back into the system for irrigation in dry periods. In the framework of the LIFE+ project WSTORE2, started on November 2012, LASA is carrying out extensive water quality monitoring inside Vallevecchia. Monitoring aims to provide a knowledge base to better manage the hydraulic structures in the system; management is also assisted by the recently implemented automation of all the gates, located at the end of every channel that flows across the agricultural fields, which are operated with the goal of storing rainwater (to stop saltwater infiltration) and permitting the outflow of good quality water coming from the drainage of agricultural soils. The clearly positive outcome of the activities of WSTORE2 is highlighted by the monitoring data collected over the first two project years, which show a much better water quality than the data we had collected before the project start (Fig. 2).

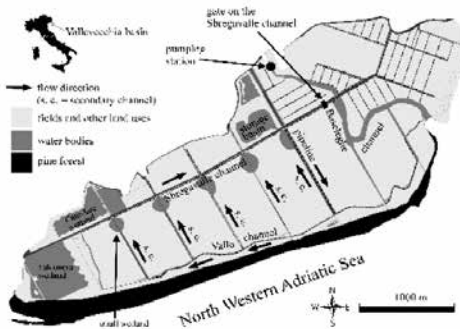


Figure 1. Hydraulic network and land use in the Vallevecchia wetland system

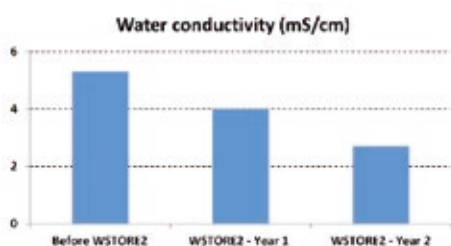
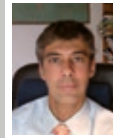


Figure 2. Mean water conductivity across the Sbregavalle channel

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WSTORE2 is a LIFE+ project, which started in November 2012 and will end on October 2015. The goal of the project is to implement and demonstrate the efficacy of an innovative management process designed to maximize and optimize the use of available rainfall water in rural coastal areas.

Main research topics:

- Surface water quality
- Point and diffuse pollution of water bodies
- Aquatic ecosystem monitoring and modeling
- Water treatment wetlands
- Ecotoxicology
- Air quality and odor dispersion models