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Assessment of water features around the Berdawni Watershed

Technical Report – Zahlé Region

ECOMED – Écologues et Médiateurs

Contributors

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ECOMED is

- A french consultancy firm established in 2003 (recently rejoined EODD group)
- Specialized in biodiversity, ecosystem restoration and Mediation
- Helps actors in land development / infrastructure / territorial planning embed biodiversity / ecological constraints into projects.
- Operates in regulatory, scientific, and ecological domains: e.g. species-impact studies, habitat inventories, compliance with regulations (e.g. Natura 2000 / CNPN), ecological restoration, monitoring.
- Works to export techniques and know how and cross breed knowledge and applications

Scope of the work of Eco-MED

As a part of the overall project, ECO-MED is in charge of

Year 1

- Conducting an Assessment of Wet Zones in the Berdawni Watershed
- Suggesting criteria to be discussed (Municipality and Forum de l'eau) to identify a candidate site to serve as a pilot site for rehabilitation of wet zone

Year 2

- Develop a rehabilitation plan inspired from Nature Based solutions and "cultiver l'eau douce" approaches
- Implementing the rehabilitaiton plan on the pilot site (partial implementation depending on the BOQ)
- Developping monitoring indicator to hand over the monitoring to the forum de l'eau

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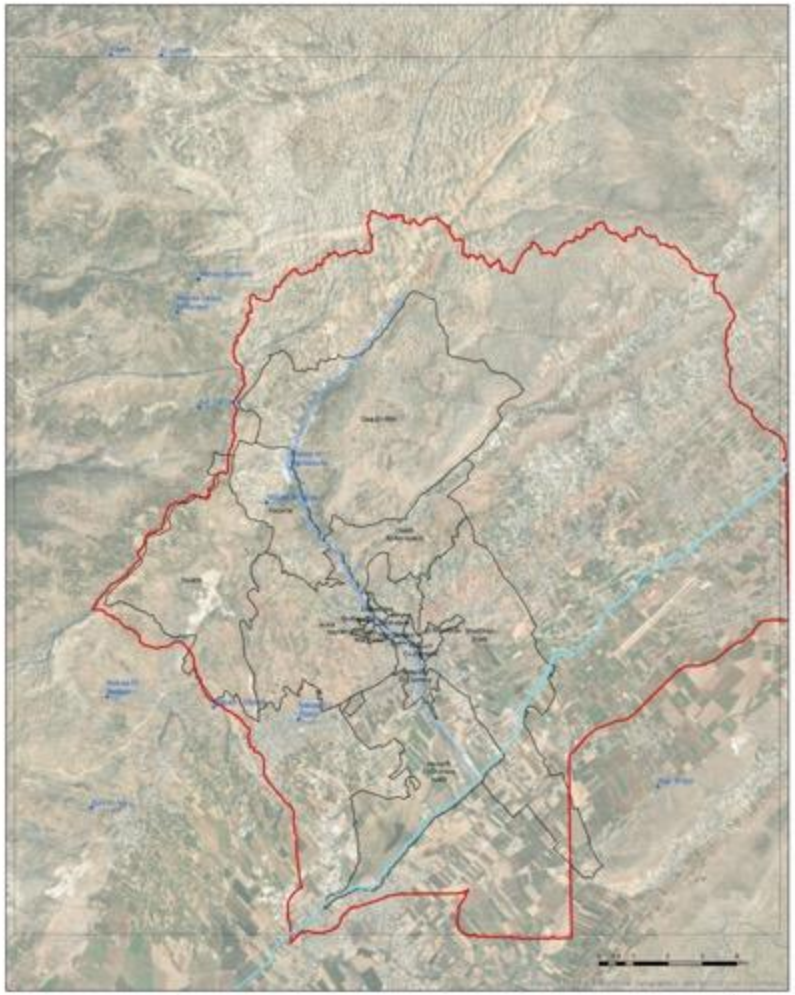
Area of concern



Water features assessment
Initial findings

The spatial analysis, combining satellite imagery (2025), GIS mapping, and field verification, identified a wide range of wet zones across the Berdaouni basin. These include both natural and anthropogenic environments, reflecting the complex interaction between hydrological systems and human land use.

- Natural environments consist of springs (such as the Berdaouni Spring), seasonal streams, seepage zones, and natural ponds located in the upper basin. These water bodies exhibit strong seasonal variability, often drying out in summer but maintaining ecological value in wetter months.

- Man-made environments include irrigation ponds, retention basins, and an extensive network of canals and drainage systems that support agricultural production in the Bekaa plain.

- Degraded or hybrid environments are areas that were originally natural wetlands or streams but have been modified by quarrying, land use change, or pollution. These zones retain ecological importance and present opportunities for restoration.

- The sewage treatment plant (STP) south of Zahlé plays a critical role in wastewater management, but its location next to the Litani means that any malfunction or improper maintenance could directly impact downstream water quality.

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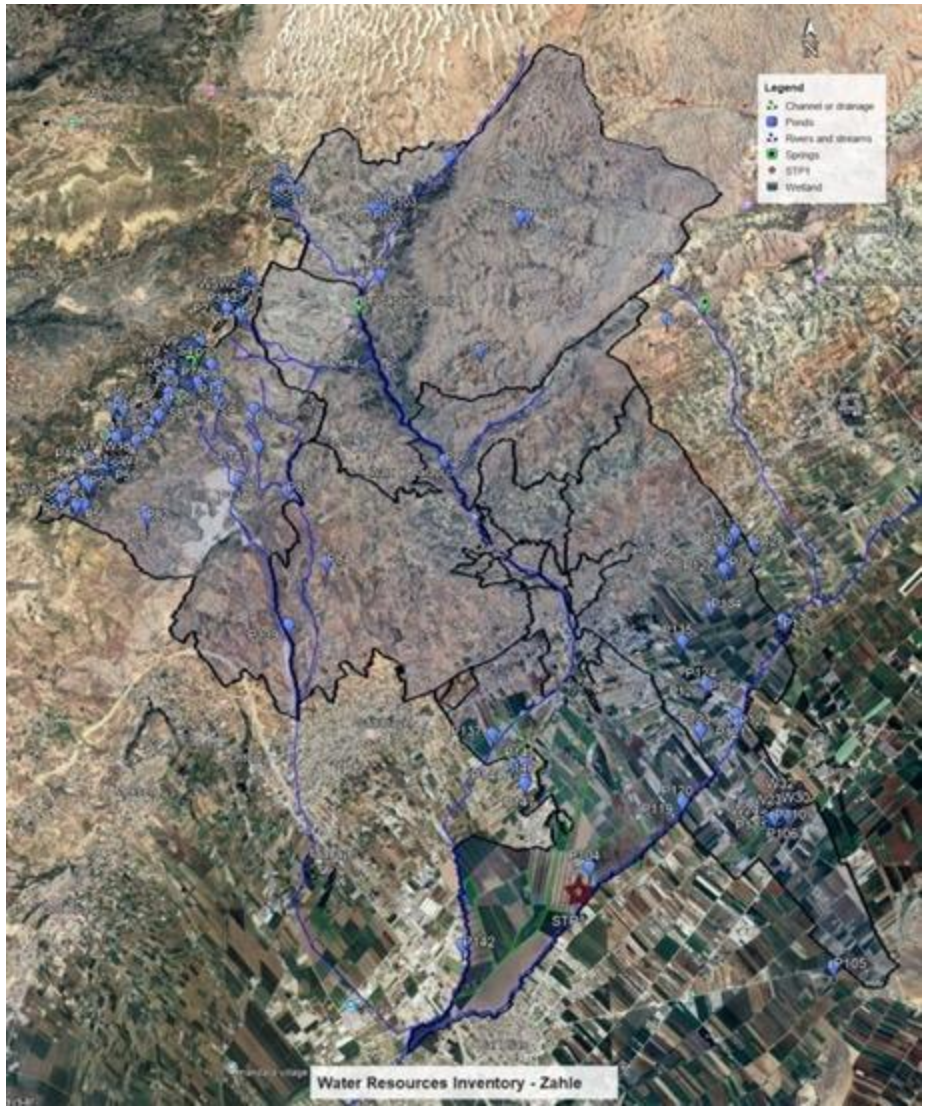
Water features



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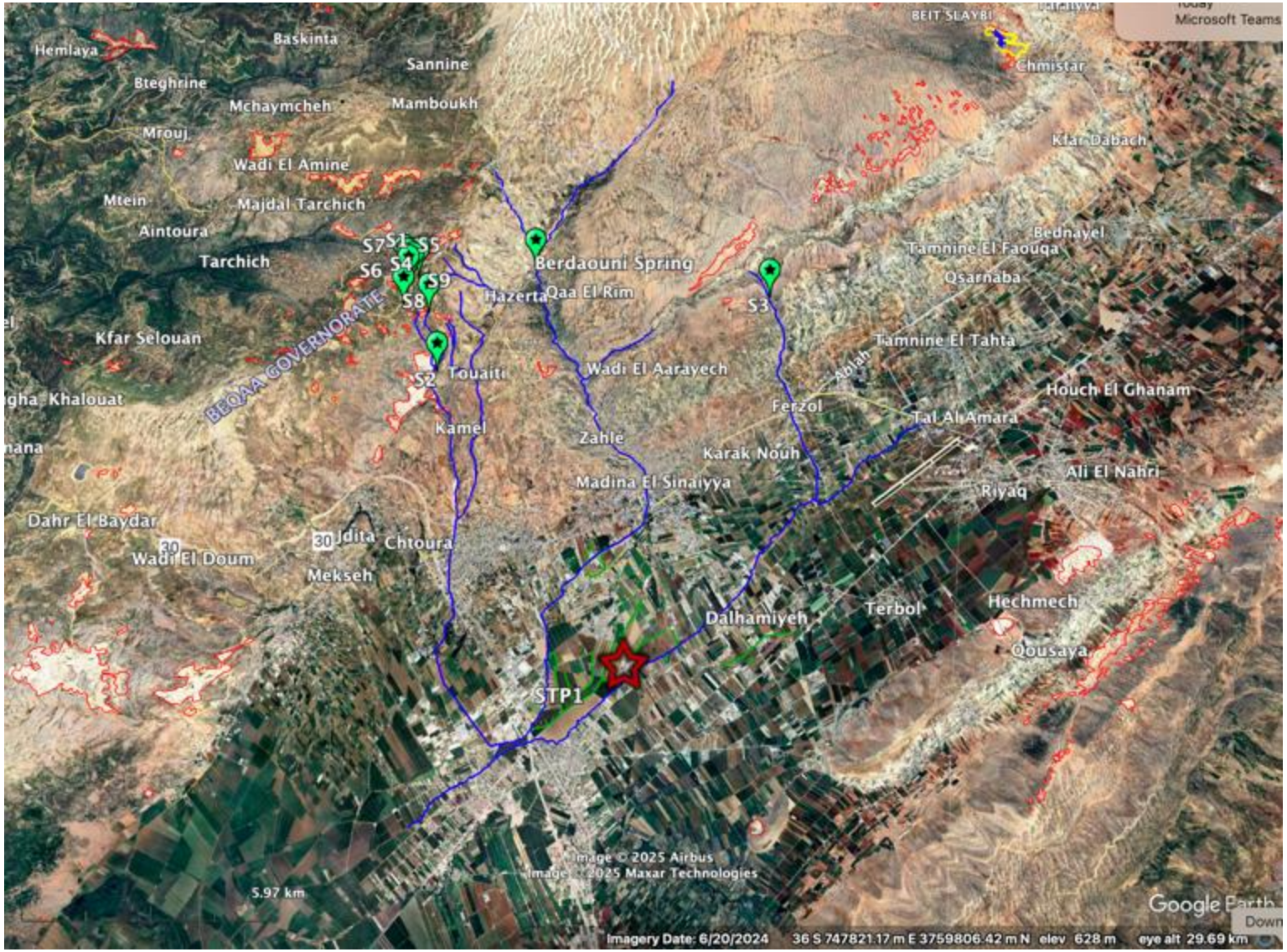
Water features - Springs



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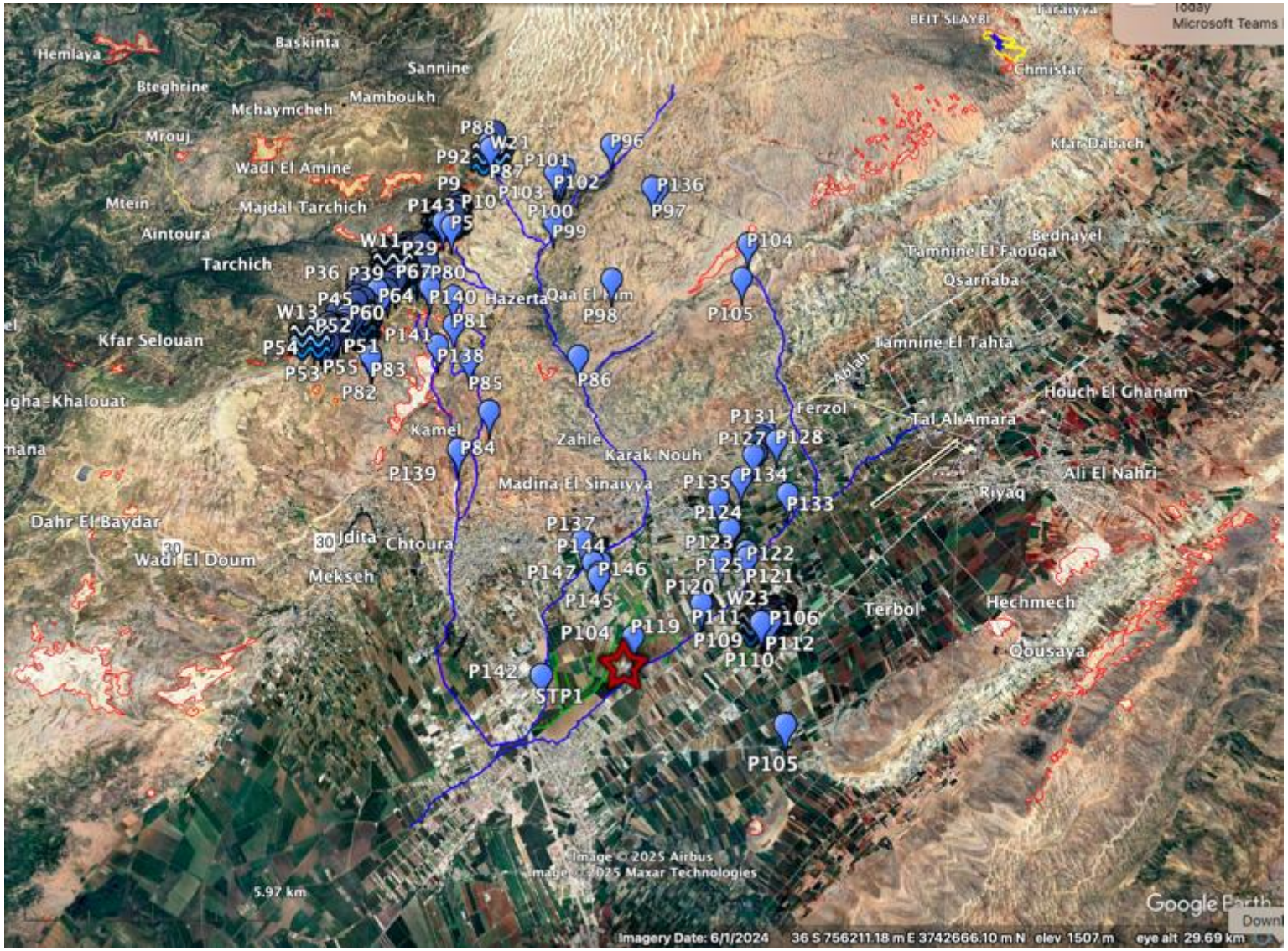
Water features - ponds



Findings and Proposition

The following actions represent examples of interventions that Ecomed can conduct in the study area. These interventions consider impacts on water quality, water availability, health, agricultural practices and wellbeing

It is important to note that these applications can be implemented in different geographic areas than those shown in this presentation.

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Quarry Site

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Tweiti quarries site

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Create retention ponds

Stripping away topsoil at quarry sites accelerates runoff, increasing erosion and flood risks. Creating water retention ponds in these quarries can capture and reuse water, mainly for dust suppression, reducing the demand for external water sources and positively impacting neighboring health. These ponds can also function as sedimentation ponds, removing pollutants before water re-enters streams. The restored water can then be used for on-site or neighboring orchard plantation purposes. Before operation, a hydrological model can assess the size and locations of the ponds.

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Runoff and downsteam remediation

Controlling Water threats

Uncontrolled water runoff poses significant threats to planted lands, particularly during snowmelt season.
Slowing water flow and preventing water speed is essential for any agricultural project planning.

Proposed Solution:

- **Install runoff breakers** to control water speed and prevent soil erosion
- **Gently redirect water courses** to manage flow during peak snowmelt periods
- **Create a series of small ponds** to serve dual purposes:
  - Increase water availability for irrigation
  - Support wildlife habitat

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Wetland habitat boosting

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Ecological Rehabilitation

Natural water resurgence following earthwork creates favorable conditions for micro-habitat development. Sandy soil characteristics at certain locations make them ideal candidates for ecological rehabilitation. With proper intervention, these habitats can support endemic and ecologically significant flora species.

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Mountain Ponds
A Multi-Purpose Solution

The proposed study area includes Sand and Karst formations. Creating ponds on sandy formations rather than karst terrain significantly reduces both construction costs and timeline. Sandy soils provide natural water retention and require minimal sealing work, while karst formations present challenges including limestone permeability, sinkholes, and underground drainage that dramatically increase project complexity and expenses.

Strategic pond placement effectively controls water-related threats to agricultural land. By capturing and managing runoff, these systems prevent soil erosion, reduce flooding risks, and transform potential hazards into valuable water resources. Mountain ponds create critical habitats for wildlife, support biodiversity, and enable ecosystem recovery in rehabilitated areas such as former sand pits. They provide essential water sources during dry seasons when natural water bodies diminish.

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Mountain Ponds
A Multi-Purpose Solution

Beyond agricultural irrigation benefits, these ponds serve as strategic firefighting water sources, enabling rapid helicopter response to wildfires. This dual-purpose infrastructure delivers substantial cost savings through reduced fire damage, lower emergency response costs, and enhanced agricultural productivity. The investment in properly sited ponds generates long-term returns through ecosystem services and risk reduction, making them valuable assets with huge environmental and economic impact.

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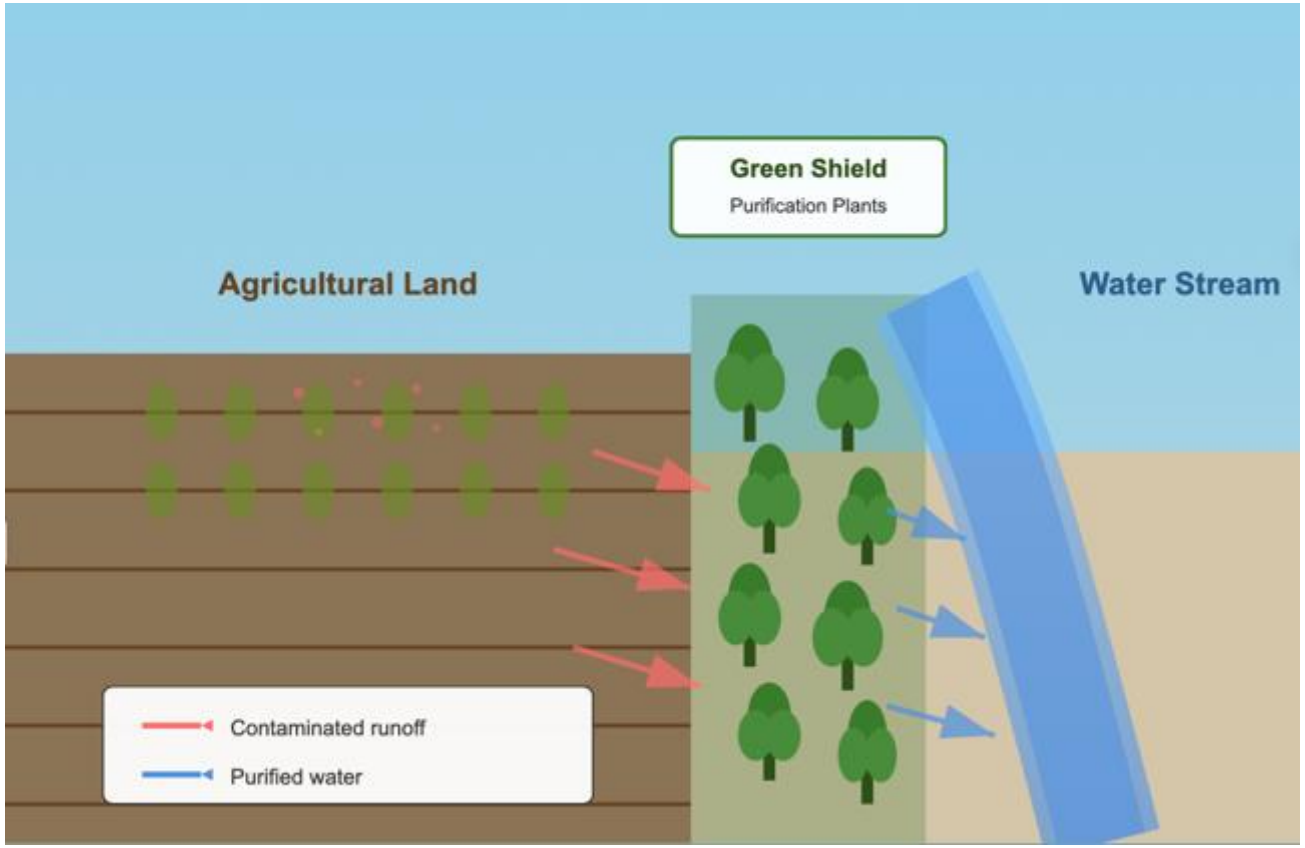
Creating a Green Shield for Water Quality

The concept involves establishing a "green shield" around existing ponds and between agricultural land and water streams using specialized plants with water purification properties. This natural buffer system employs phytoremediation, a biological process where plants absorb, accumulate, and break down pollutants through their root systems and metabolic processes. The selected plant species naturally filter pesticides, heavy metals, and excess nutrients from agricultural runoff before it reaches the main water course. This phytoremediation approach transforms contaminated water into cleaner effluent, protecting underground water and downstream water and wetland ecosystems



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Thank you