Can agricultural land be used to "bank" groundwater?

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What is agricultural groundwater banking?

Agricultural groundwater banking (ag-GB) is the practice of applying "surplus" water to agricultural land during the winter months. This surplus water would be diverted from surface water sources immediately following storms and flood-control releases.

By diverting winter runoff during periods of peak streamflow we seek to increase groundwater storage. Current research is directed at assessing the feasibility (physical, agronomic, economic) of incorporating these practices into alfalfa and irrigated pasture systems.

Figure 1. Flooded alfalfa field in the Scott Valley.

Why alfalfa and irrigated pasture?

Alfalfa and irrigated pasture are attractive for ag-GB because they: 1) comprise a large acreage in CA (high probability of finding suitable soil types and infrastructure); 2) require relatively low N fertilizer and agrochemical inputs; and 3) are often flood irrigated using surface water (high capacity conveyance systems).

Requirements

- well-drained soils with high infiltration rates
- surface irrigation methods (flood, furrow, border check)
- installation of berms around fields to control application depth and runoff
- prefer adoption on old alfalfa stands (last year of rotation) to lower risk of crop damage
- water application rates should to be adjusted for dormancy and temperature conditions

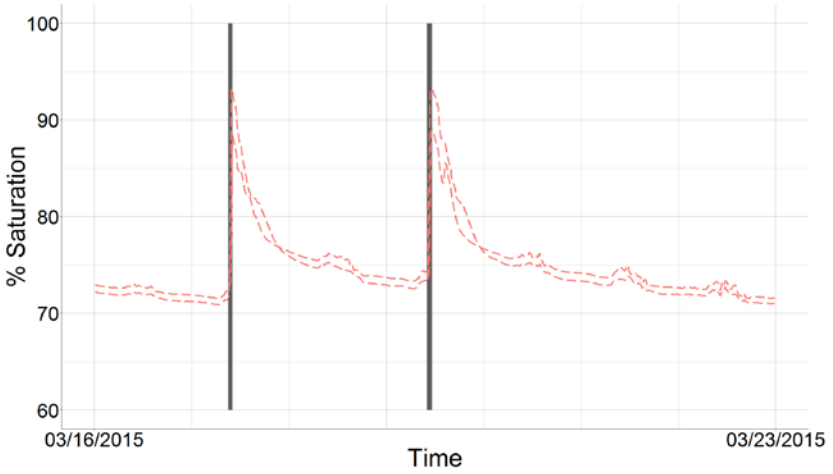

Figure 2. Change in soil saturation in root-zone following 1-foot recharge events (duration of irrigation shown as black rectangles)

Preliminary results

In winter of 2014/2015, two experiments were set out to assess the response of alfalfa to flooding on loamy soils. We were able to recharge a maximum of 1 foot per day (6 feet total over 2 weeks) during Jan. to mid-March without appreciable damage to the crop. In plots where water was applied continuously for 6 weeks increased incidence of water-borne pathogens was observed. A quick recovery of the crop was detected 4 weeks after the experiment.

Future directions

We are seeking collaborators for the 2015/2016 winter recharge season. We hope to identify several field sites representing a range of soil types and climate zones in both alfalfa and irrigated pasture systems. We would like to hear your input and assess the suitability of your area for groundwater recharge. Please contact Andrew Brown (agbrown@ucdavis.edu; cell: 860-471-1848) or Dr. Helen Dahlke (hdahlke@ucdavis.edu) for more information.