

HLWYM HEmails

From: John Bradbury
Sent: Monday, March 03, 2008 4:46 PM
To: LSNReviews
Subject: Fwd: Recycling Constraints
Attachments: TEXT.htm

>>> John Bradbury 10/25/2007 11:46 AM >>>

The equation $C/Co = 1/(1-F)$ where F is the fraction recaptured is an appropriate formulation for the simple system when the rate of influx equals the rate of outflux. My concern is that the equation doesn't bound the effect. As F approaches 1, C/Co blows up. Also, there is no consideration of time with this approach. How long does it take to reach the steady state condition?

I am trying to provide logical constraints for the amount of recycling. As was discussed in our meeting last week, I think we all agree that fields can be irrigated for only so long. Eventually the field is spent due to increased soil salinity. I found on the internet <http://extension.usu.edu/files/agpubs/ag425-3.pdf> that alfalfa is moderately sensitive to soil salinity. Based on this paper, and the conversion factor (500ppm = 1DS/m), the ECe (electrical conductivity from soil extraction) that doesn't stunt alfalfa growth is 2DS/m. The constraints are not so straightforward as they depend on a leaching factor. The example they provide in the article demonstrates that alfalfa can be irrigated with water having a TDS of 1500ppm and still be unstunted, as long as the leaching factor is 0.45 or greater. We can use the overwatering numbers in Amargosa Valley to determine the maximum salinity of the groundwater before crop yields drop.

I also note that EPA has a secondary maximum drinking water limit for TDS of 500ppm. The recycling process is essentially one of evaporation. I'm doing some PHREEQC simulations of evaporation to determine the effect on TDS. These calculations include consideration of precipitation. If the groundwater is saturated with respect to calcite or gypsum, evaporation won't result in increases in Ca, SO₄, and CO₃ concentrations. I'll do a PHREEQC calculation to see how much evaporation is needed to reach the TDS limit for the alfalfa constraint or 500ppm TDS for the secondary drinking water standard.

These limits support the conceptual model in which pumping wells move to different locations as the fields become spent. How often and where may be another question that we need to address.

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Subject: Fwd: Recycling Constraints
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From: John Bradbury

Created By: John.Bradbury@nrc.gov

Recipients:
"LSNReviews" <LSN.Reviews@nrc.gov>
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MESSAGE	2192	3/3/2008 4:46:43 PM
TEXT.htm	2843	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
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