

Dave Johnson

Director of River Ecosystem Services

The Rivers Trust

TOPSOIL: A Groundwater case study

- Groundwater & Climate Change
- Developing a shared understanding
- Doing something about it

Dave Johnson

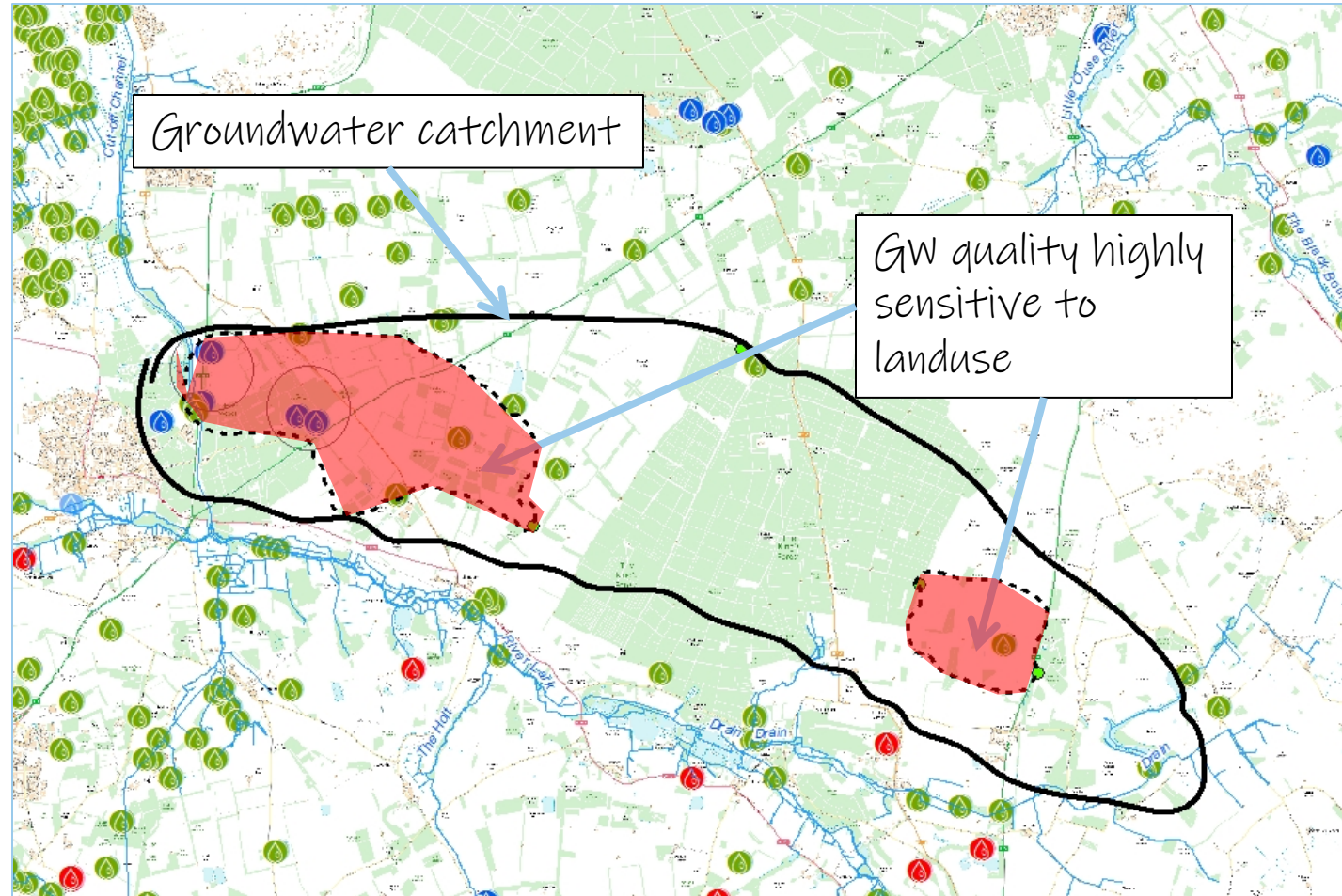
New supply option*	Emissions	Carbon cost relative to baseline	Carbon cost
	kgCO ₂ e/day/house	pence/m ³	pence/m ³
Current water 'supply-use-disposal' carbon cost	2.43	baseline	28
Direct ground water abstraction	2.46	+1	29
Aquifer storage and recharge	2.47	+1	29
River intake	2.48	+2	30
Indirect effluent reuse	2.57	+3	31
Reservoir	2.61	+3	31
Desalination (brackish water)	2.91	+6	34
Desalination (saline water)			

GW is the lowest carbon source of water

~£1M per MI per annum @ 2009 prices

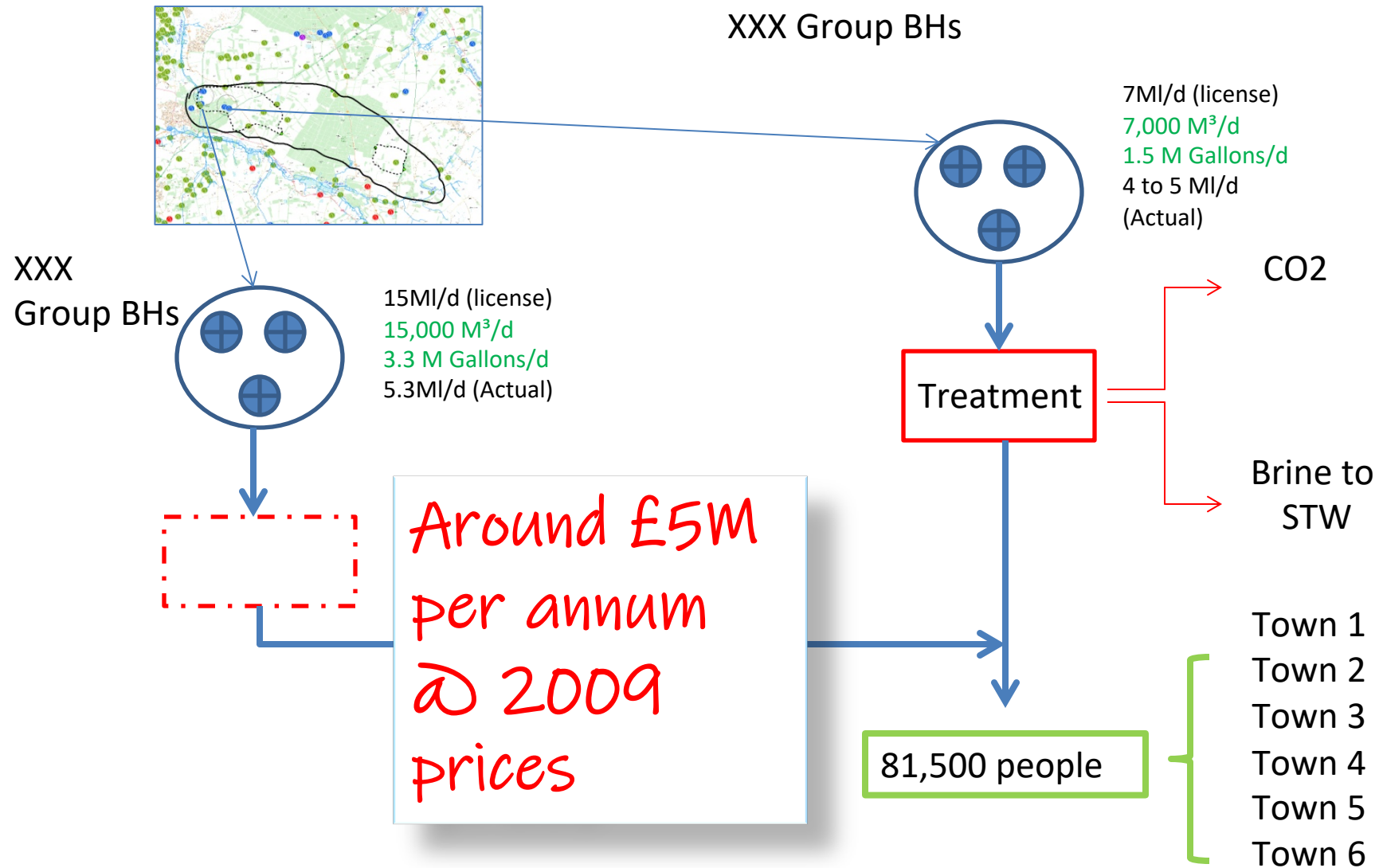
Option	Range of costs (pence per cubic metre)
Near-universal (90%) metering ⁵⁸	140-160
Groundwater development	100-500
Surface water development	100-500
New reservoir	300-1000
Desalination plant	400-800

How the GW abstraction works?

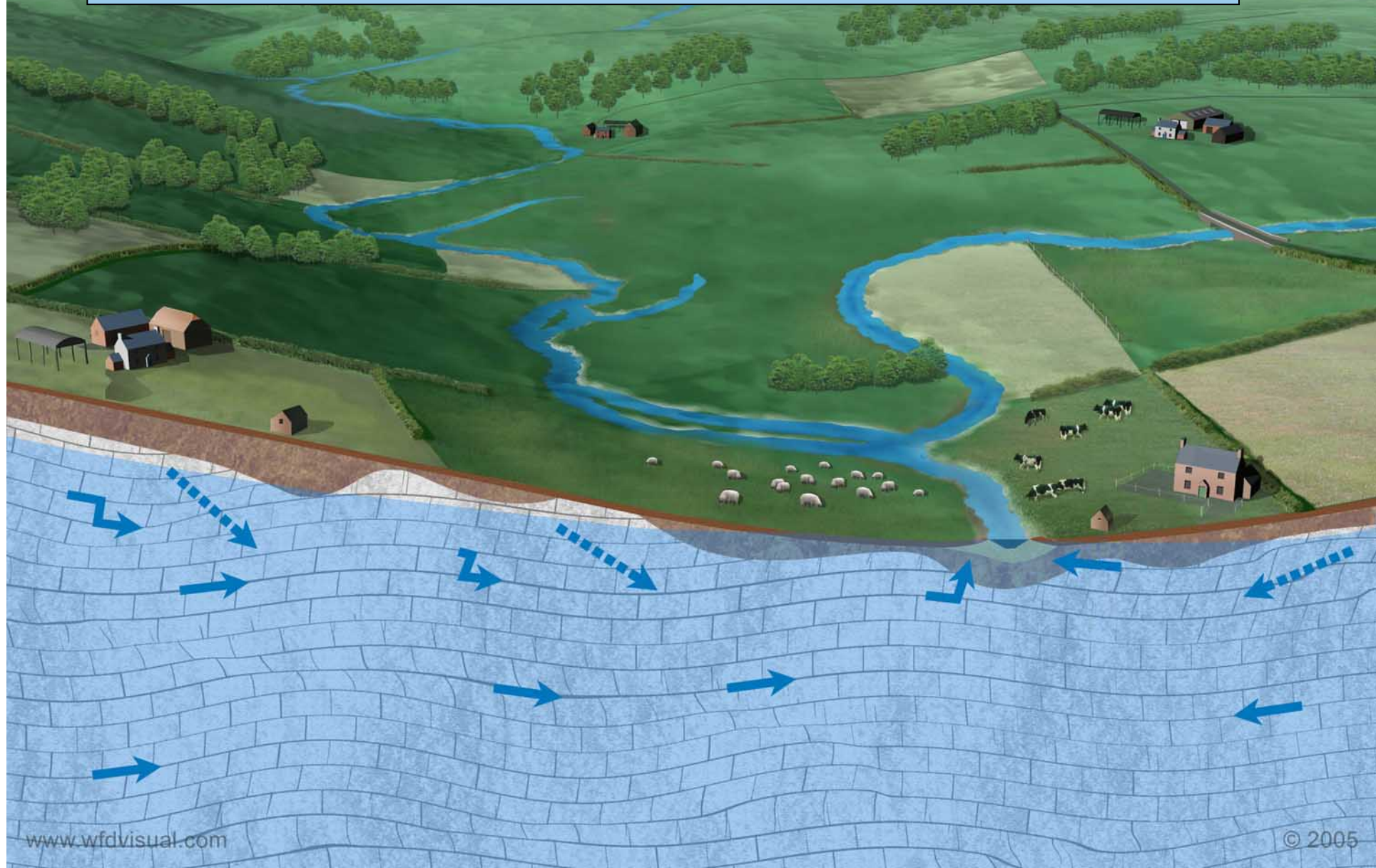


**Aim: To get a shared understanding of how the system works.
Start with CaBA data package and add in local data.....**

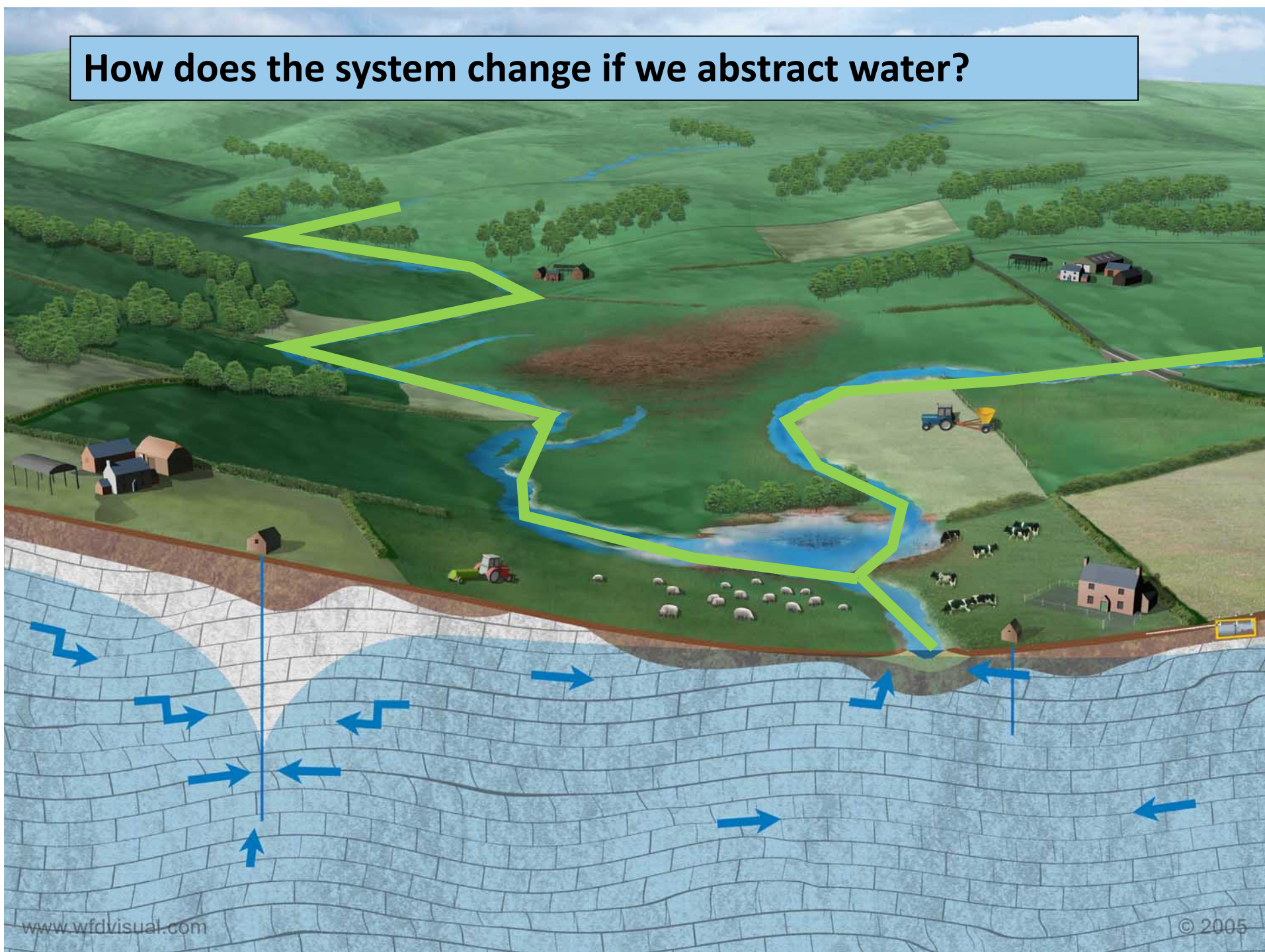
How the GW system works



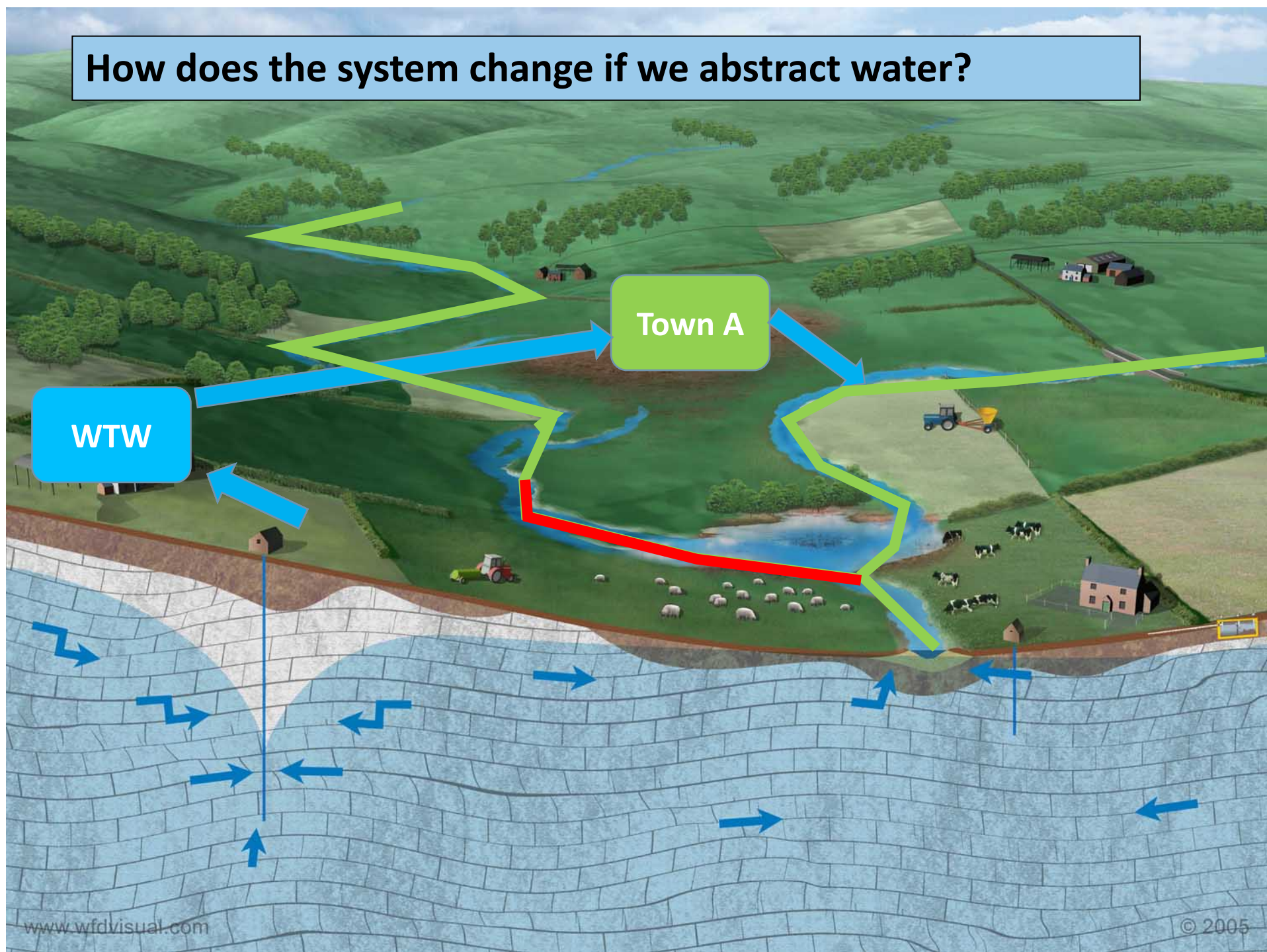
How the natural Groundwater system works: Recharge and groundwater flow



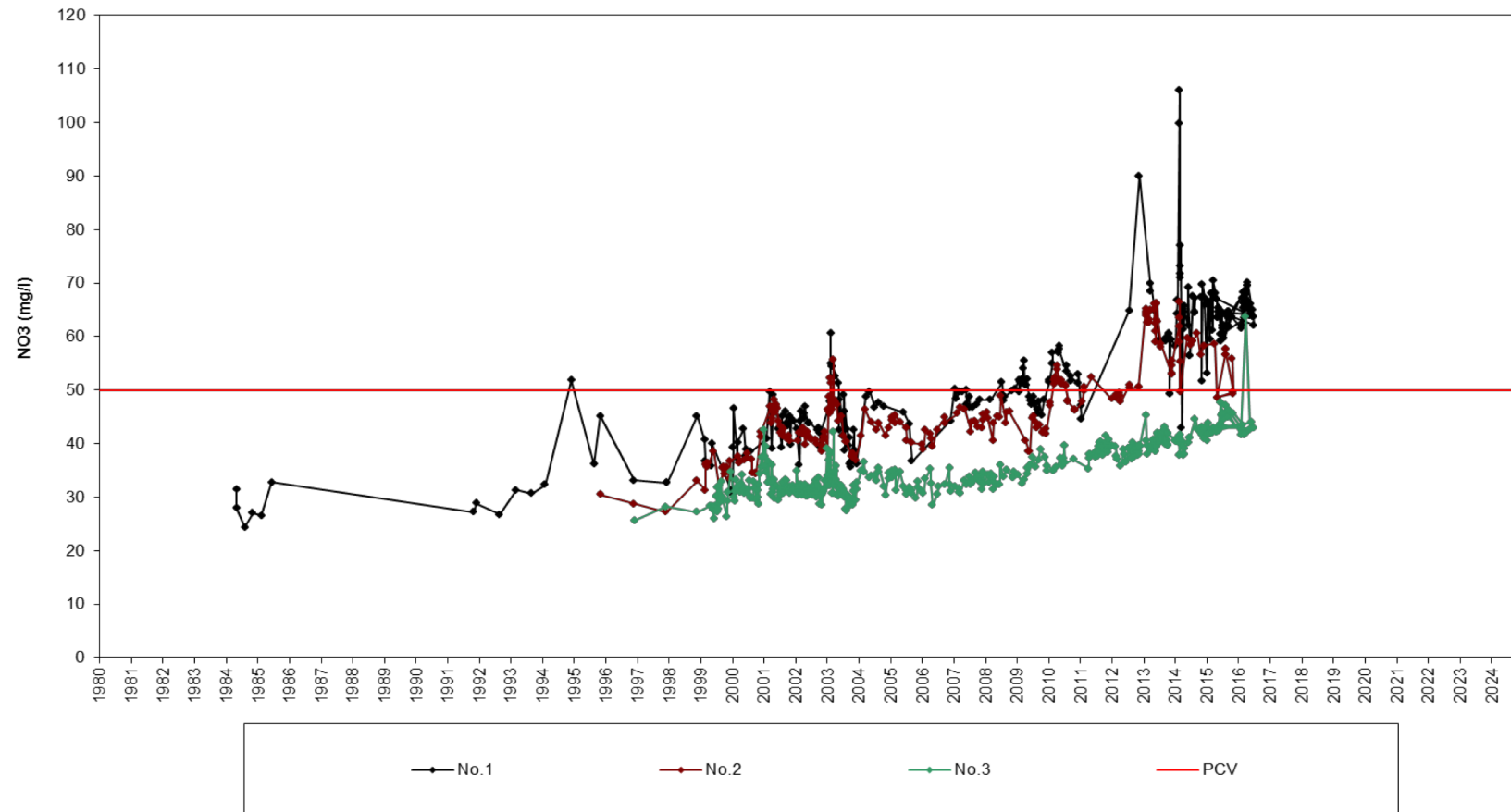
How does the system change if we abstract water?



How does the system change if we abstract water?



Nitrate concentration in groundwater



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How to use WFD Visual

WFDVisual Search

Welcome to the WFDVisual search tool. To start a search, please select from the options below.

This screen lists the search options for the different water body settings. At present, only groundwater is represented.

For the groundwater option there are currently three landscape/land use settings: rural lowland, rural upland and urban lowland.

To run a search:

- 1) Select your desired landscape/land use scenario.
- 2) Choose the search type - specific, rule-based search, or broad search.

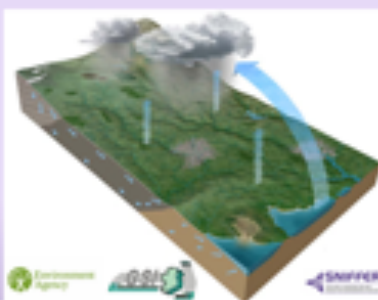
The search options are listed in groups according to whether they are pollution or abstraction pressures, pathway factors or receptors (i.e., the Source-Pathway-Receptor model). There are additional options to choose from also, to enhance the image.

- 3) Specify which options you want in your search by changing the order of the traffic lights.
- 4) When you are happy with your options, select 'Run This Search' from the bottom of the page.

Water Bodies

- Groundwater
 Wetlands
 Rivers
 Coastal
 Transitional Waters

Can't find what you are looking for? Don't forget to have a look at the [storyboard images](#), or [contact us](#) to let us know what other images would be useful for you.



Scenario

the topographic setting, location within the catchment, and land use.

Rural Lowland



Rural Upland



Urban Lowland



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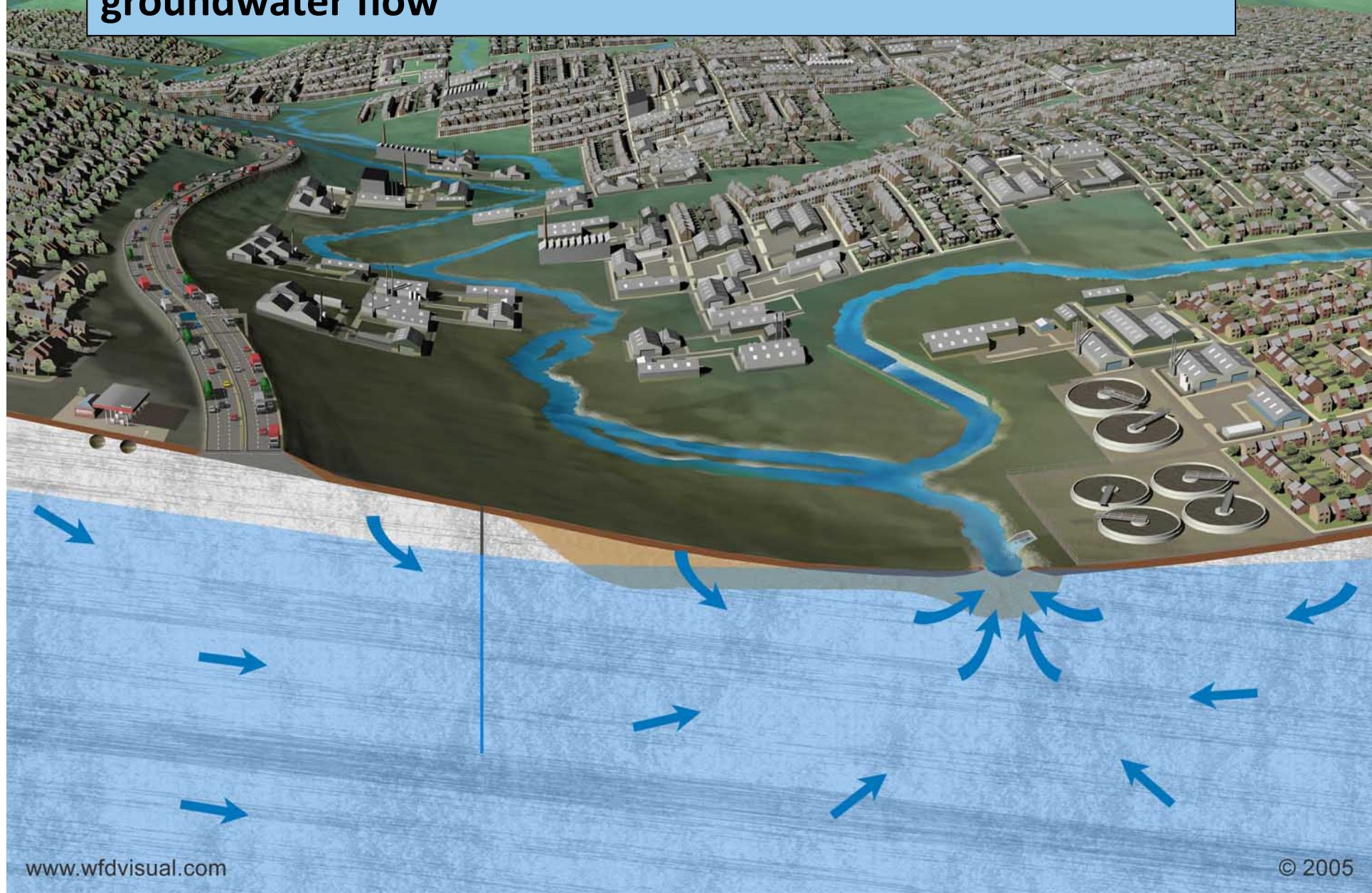
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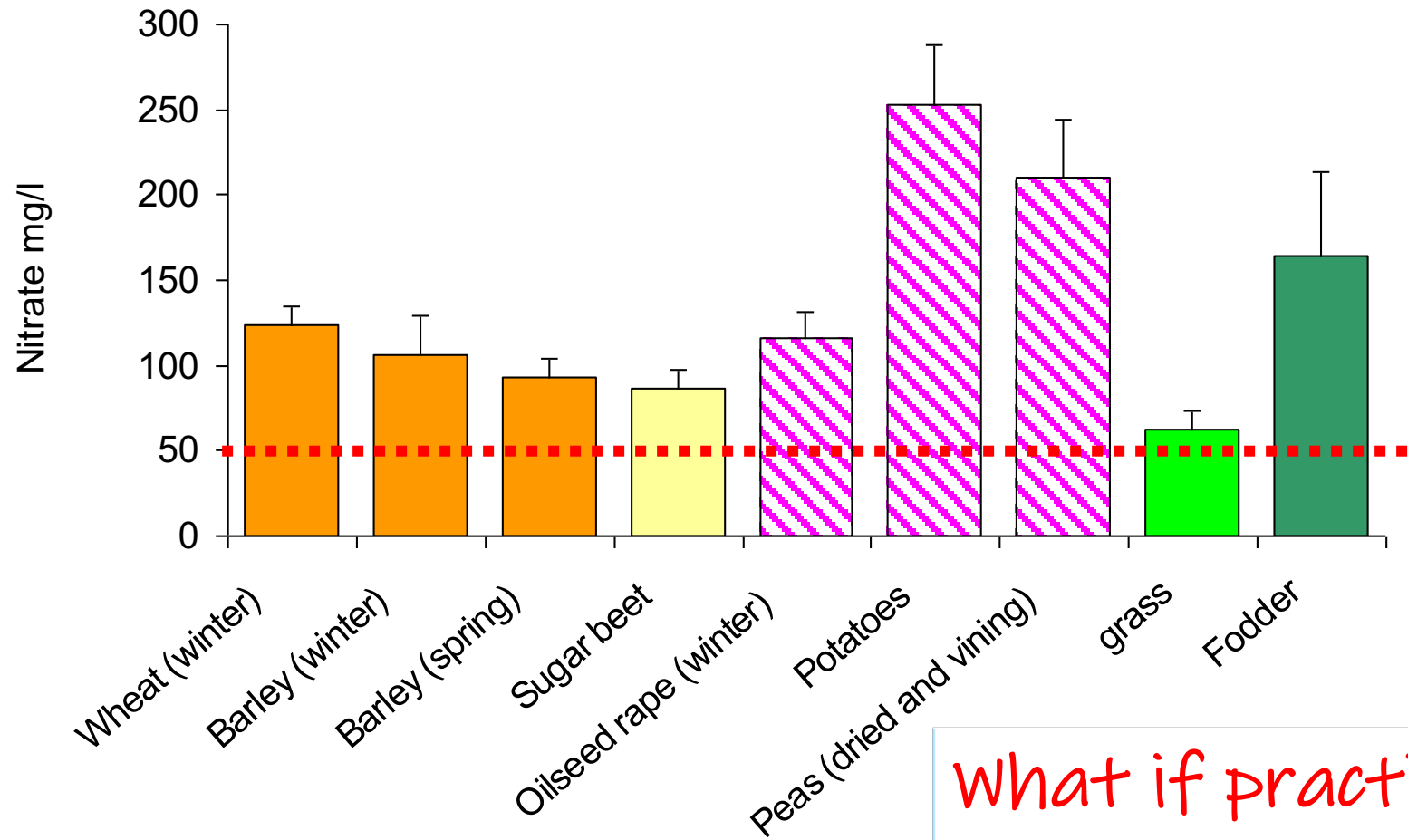
How the natural Groundwater system works: Recharge and groundwater flow



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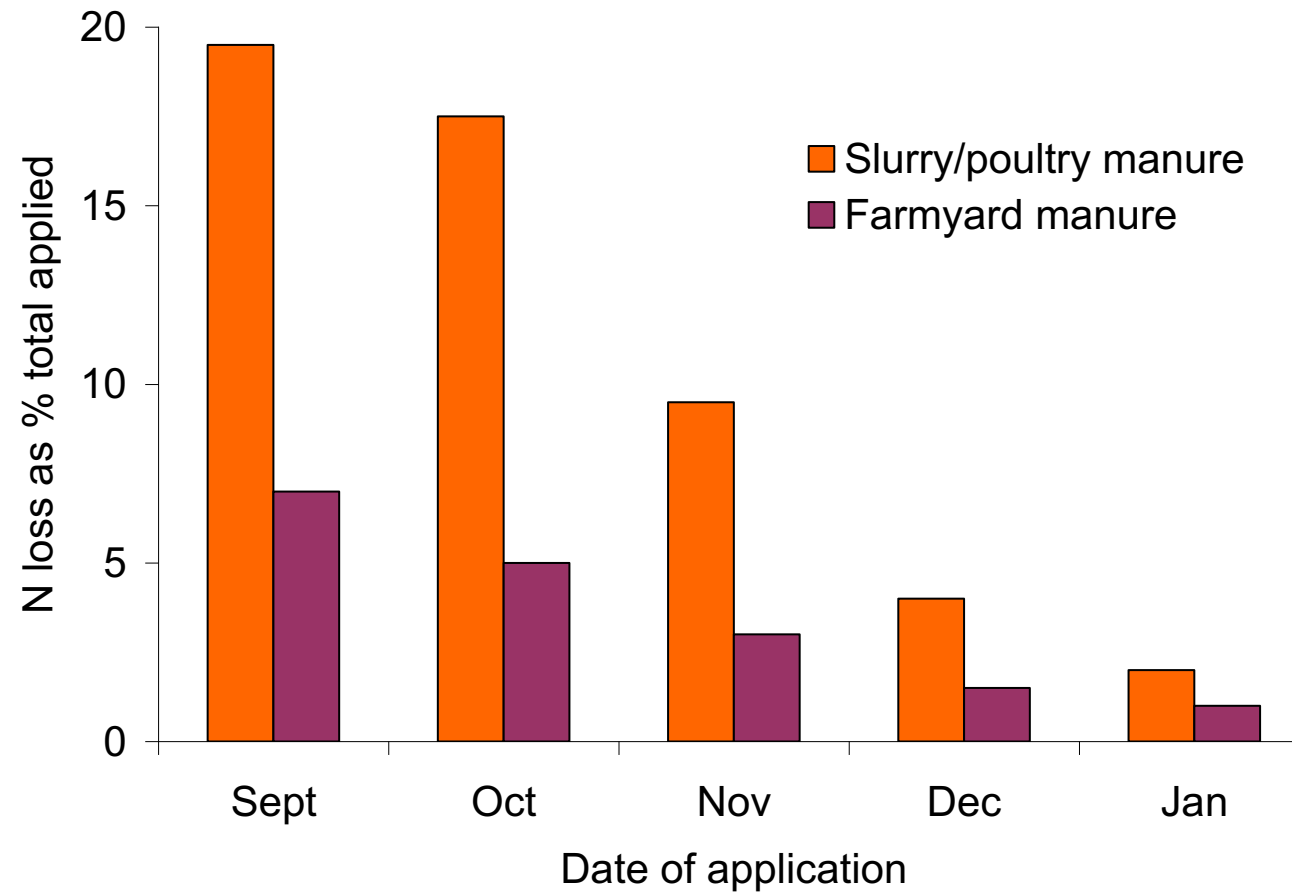


Crop type. Some crops leak more nitrate, not just down to application rates

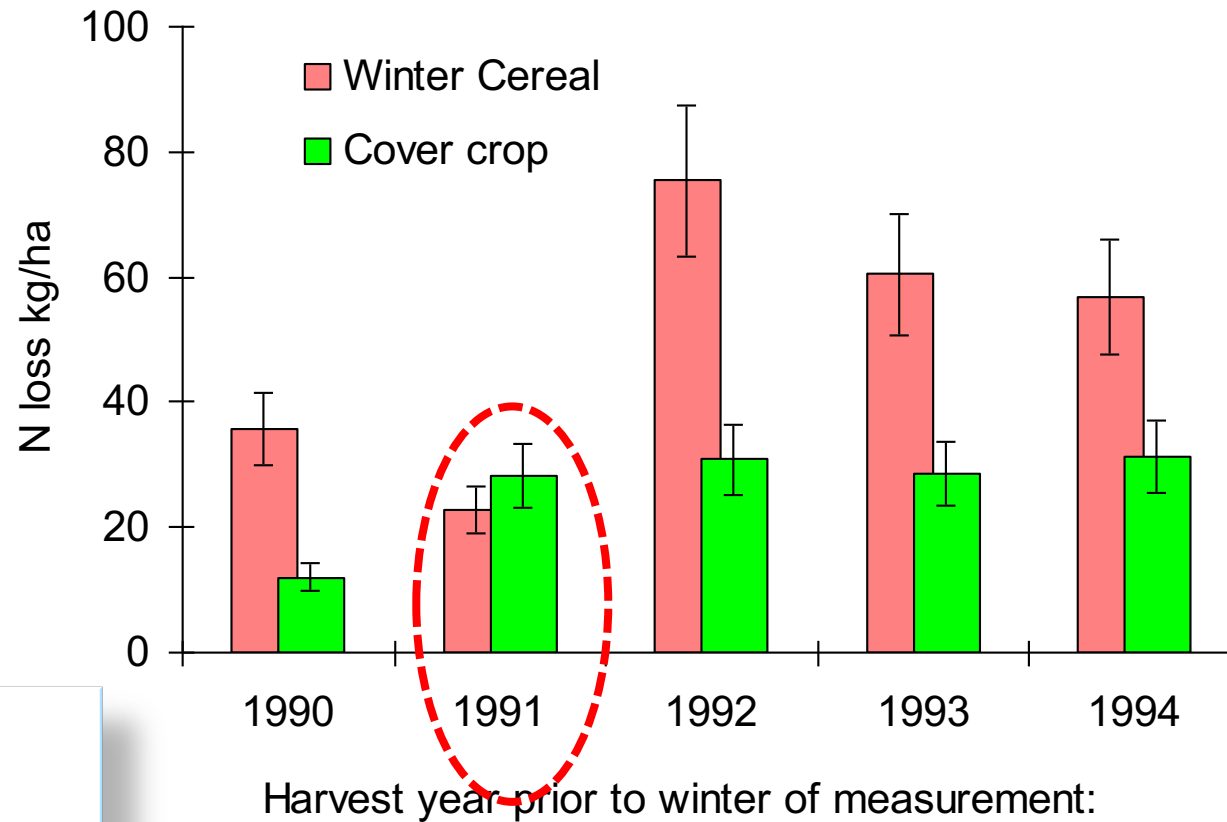


What if practice
has changed?

Some manures leach more than others

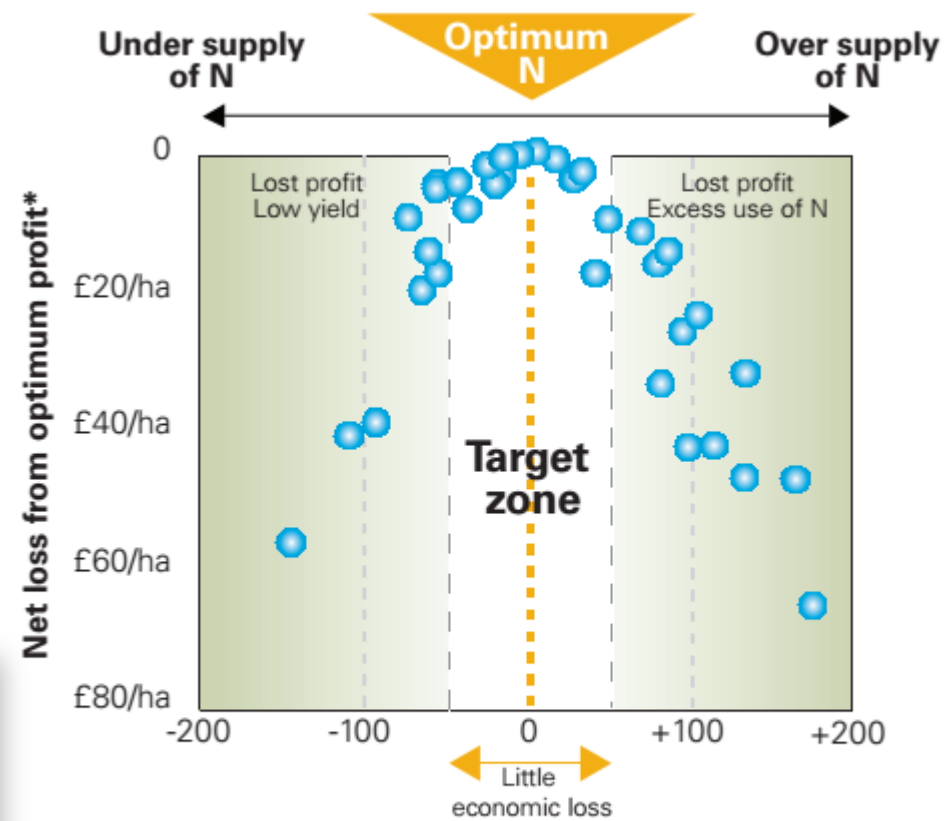


Early autumn planting, including cover crops significantly reduces leaching



Local trials?

Low-optimal N?: Profit vs. application



Pers
COMM
DTC

*based on wheat = £100/t; ammonium nitrate = £173/t

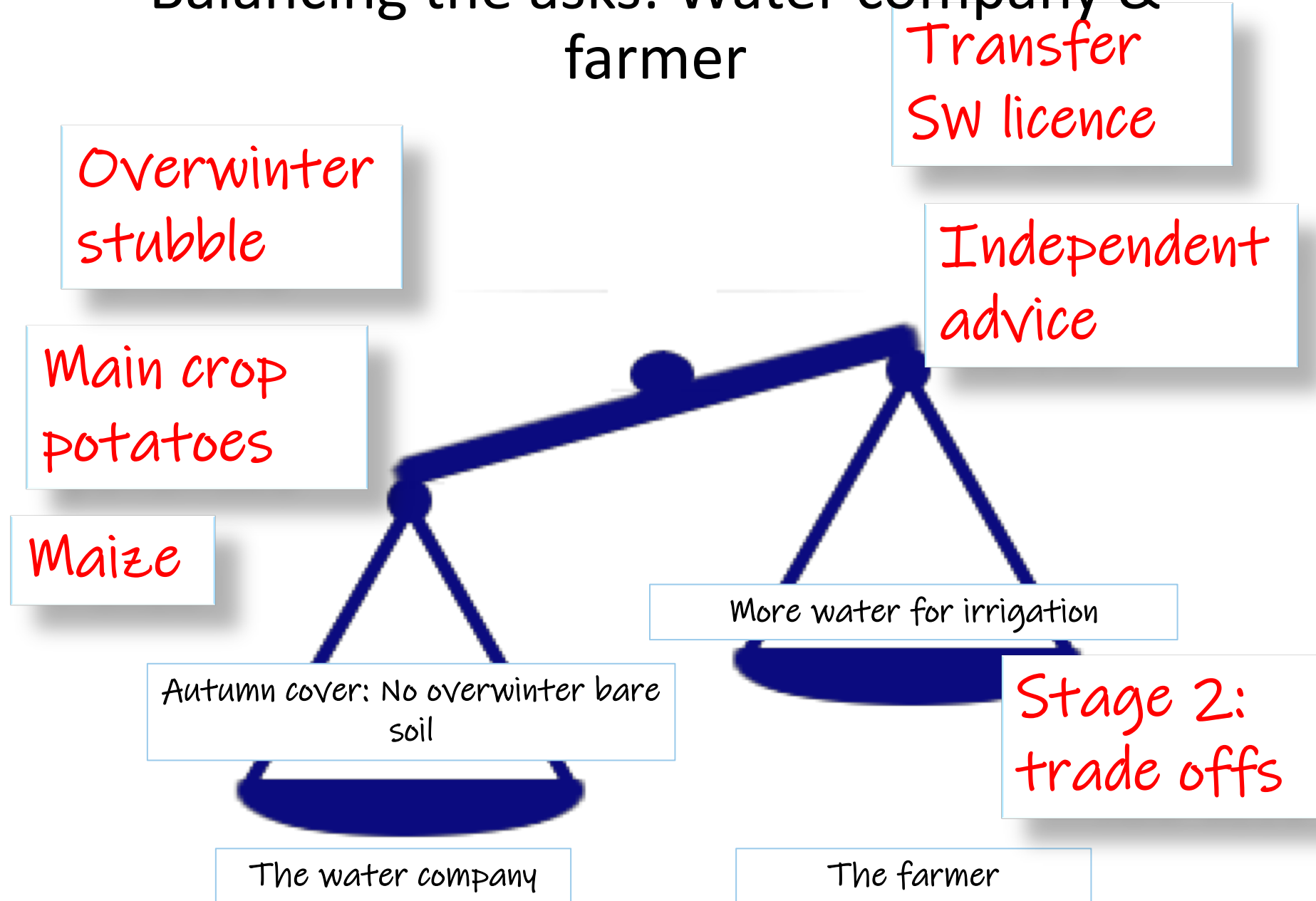
Hierarchy of asks: Water company

Stage
1: Easy
wins

1. Landuse. **Woodland** => permanent pasture => low leaching crops => **high leaching crops** => **plough-up**
2. Manure management. **Minimal manure in GW catchment** => No autumn application => Low N manure => **slurry or poultry litter & outdoor pigs.**
3. Autumn cover. **Early autumn establishment** => Cover crops => 'greening up' => **late harvest & bare soil.**
4. Nutrient application. **Low-optimal nutrient application** => Precision nutrient management => full evaluation of manures => **Insurance application for yield or quality.**

2) Local trials

Balancing the asks: Water company & farmer



Early autumn planting, including cover crops significantly reduces leaching

