Cranfield UNIVERSITY ADAS

CATCHIS

An environmental catchment management information system

Summary

CatchIS team:

Cranfield: Steve Hallett, Jack Hannam, Ann Holden
ADAS: Chris Fawcett, Chris Procter

Generic substances entering and affecting water abstraction source

Regular diffuse application

Pesticides

Nitrates

Phosphates

Regulatory environment

Cost of treatment

Price control

Who pays the bill ?

Water Framework Directive

Nitrates Directive

Water Act

Regulation & legislation

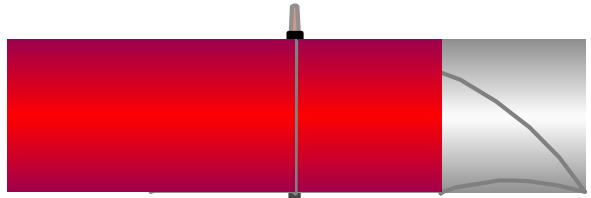
CATCHIS

- “With dense populations and competing land uses, the interaction of land and water is extremely important and is increasingly recognised in law. The ability to manage these complex relationships at the river catchment level is key. **CatchIS** provides a set of powerful tools to address this.”

  Severn Trent Water Ltd.

A tool underpinning Water Framework Directive
Follows ten years of development

CatchIS and the Water Framework Directive



RESOURCE MANAGEMENT

Water Framework Directive

INPUT CONTROL

- Urban wastewater
- Nitrates
- Pesticides
- IPPC
- Sludge to land

USE RELATED

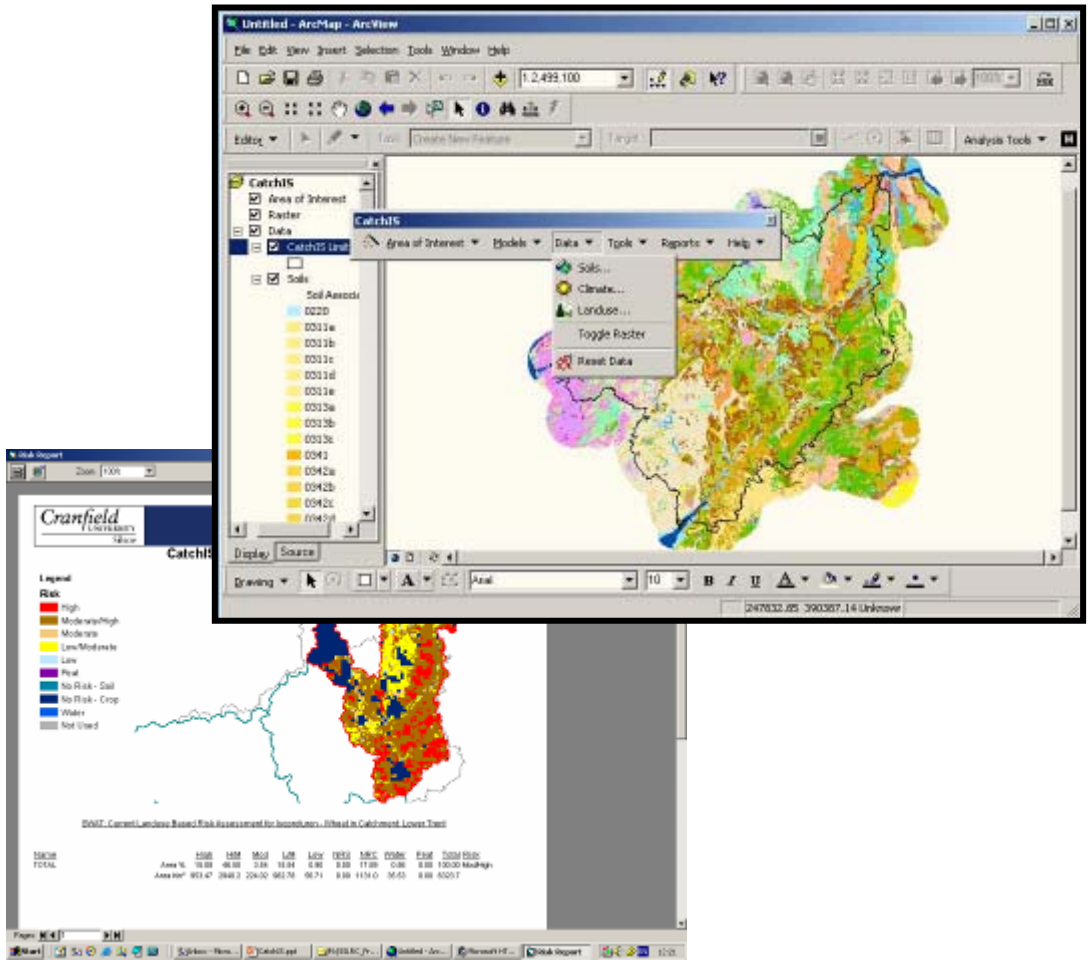
- Drinking water
- Bathing water
- Habitats

- Dangerous substances
- Groundwater

CatchIS Overview

Main Features:

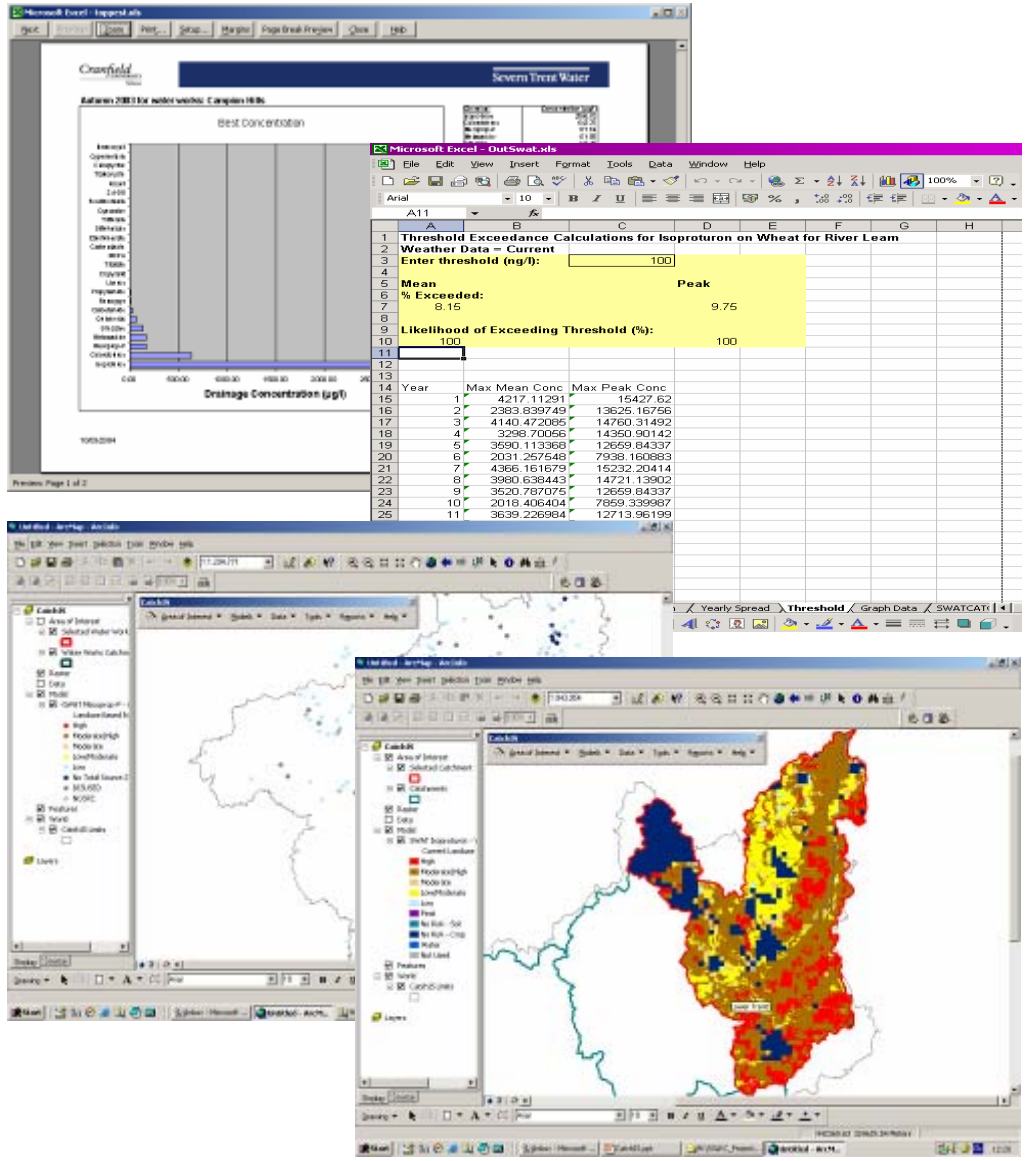
- Runs leading water quality risk assessment models
- Models operate on a range of areas of interest
- Scenario-based decision support
- Leading-edge GIS framework
- Easy to use
- Reporting and data export
- Tried and tested tool



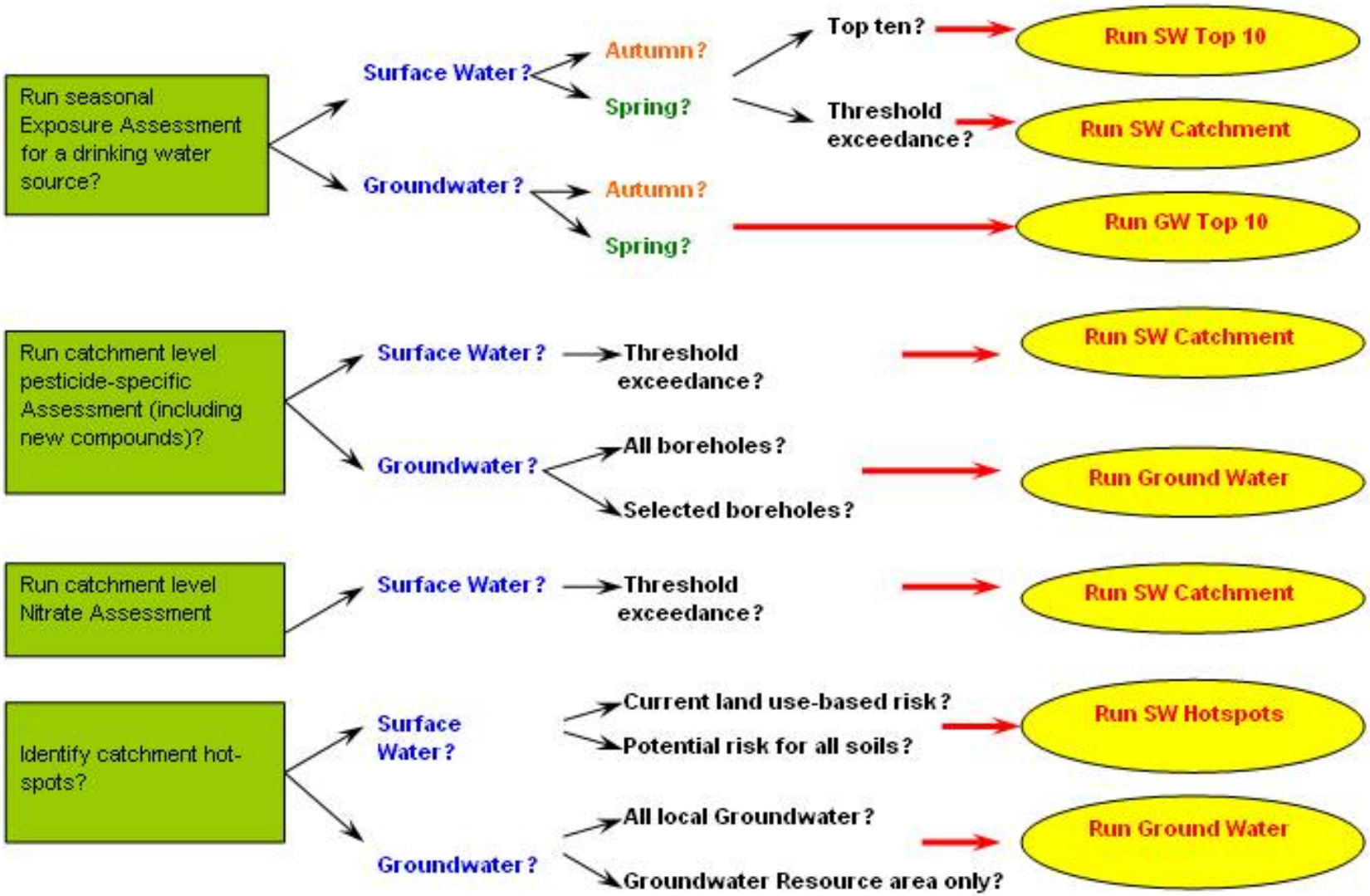
Pesticide Risk Assessment

3 ways to run pesticide risk assessment:

1. Seasonal exposure assessment
   a) Top ten pesticides
   b) Catchment threshold exceedance
2. Pesticide-specific assessment
   a) Catchment threshold exceedance
   b) Groundwater boreholes
3. Identification of catchment hot-spots
   a) Surface water hotspots
   b) Ground water hotspots

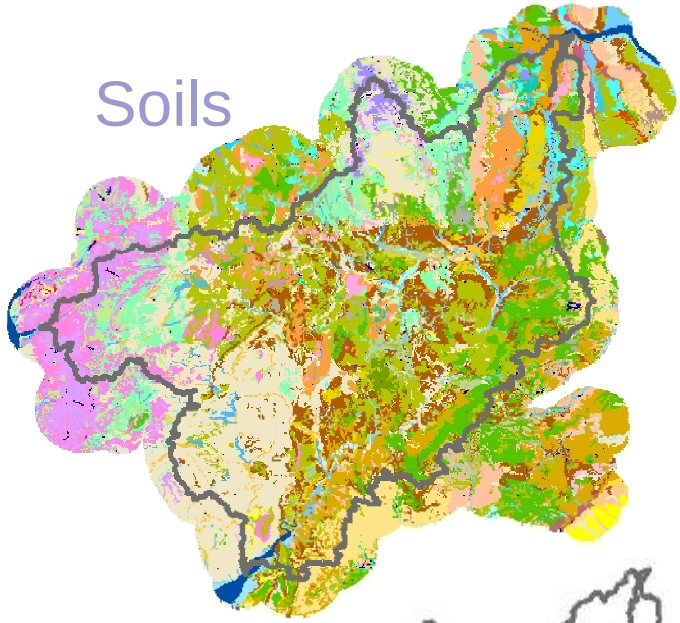


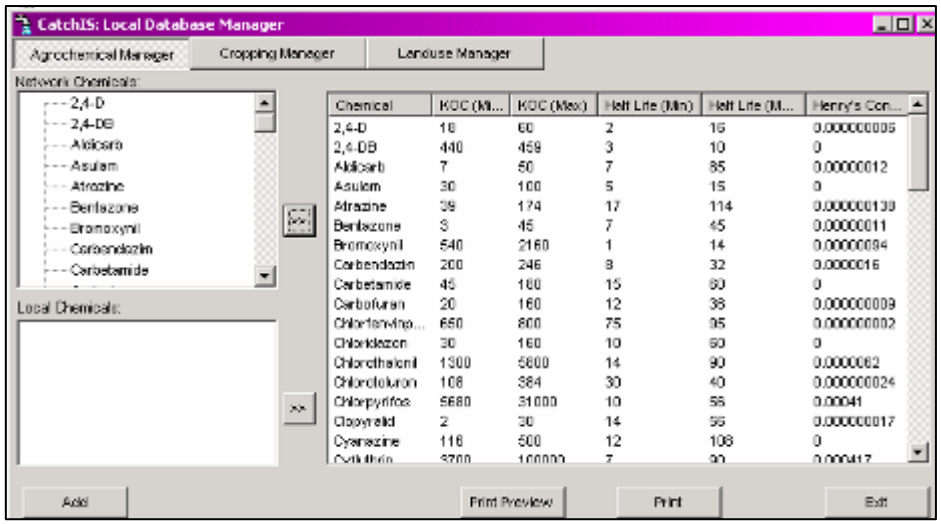
Modelling decision tree for CatchIS

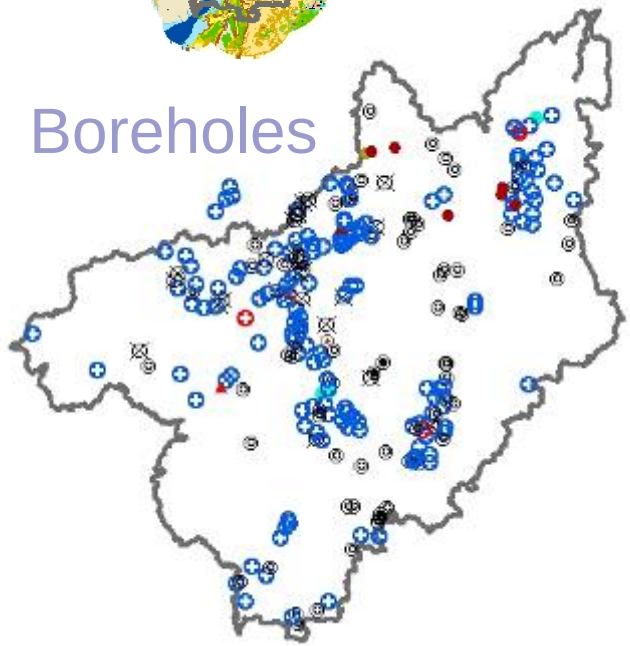


Data Sources

- Soils (**Cranfield University**)
- Predictive Pesticide Usage (**ADAS**)
- Surface water catchments (EA)
- Soil, climate, land use (EDL)
- Groundwater boreholes and SPZ (EA)
- NVZ, NSA
- Pesticide compound property database
- Integration of client data within GIS



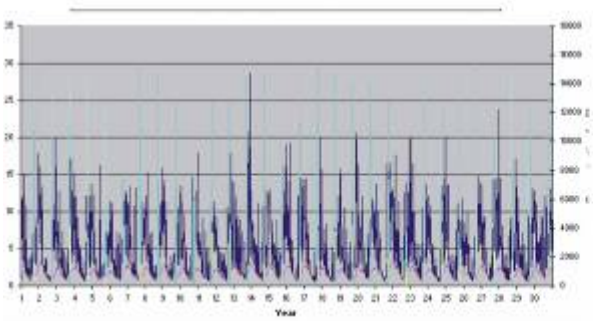




Climate Data

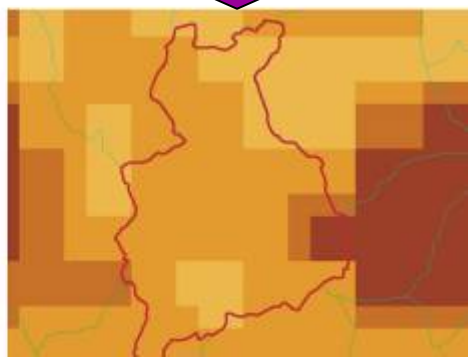
WEATHER DATA
30 year synthetic timeseries x10 stations

Used to derived a HER timeseries as input for the SW and GW models



CLIMATE DATA
Derived parameters (XWR, FCD) spatial coverage

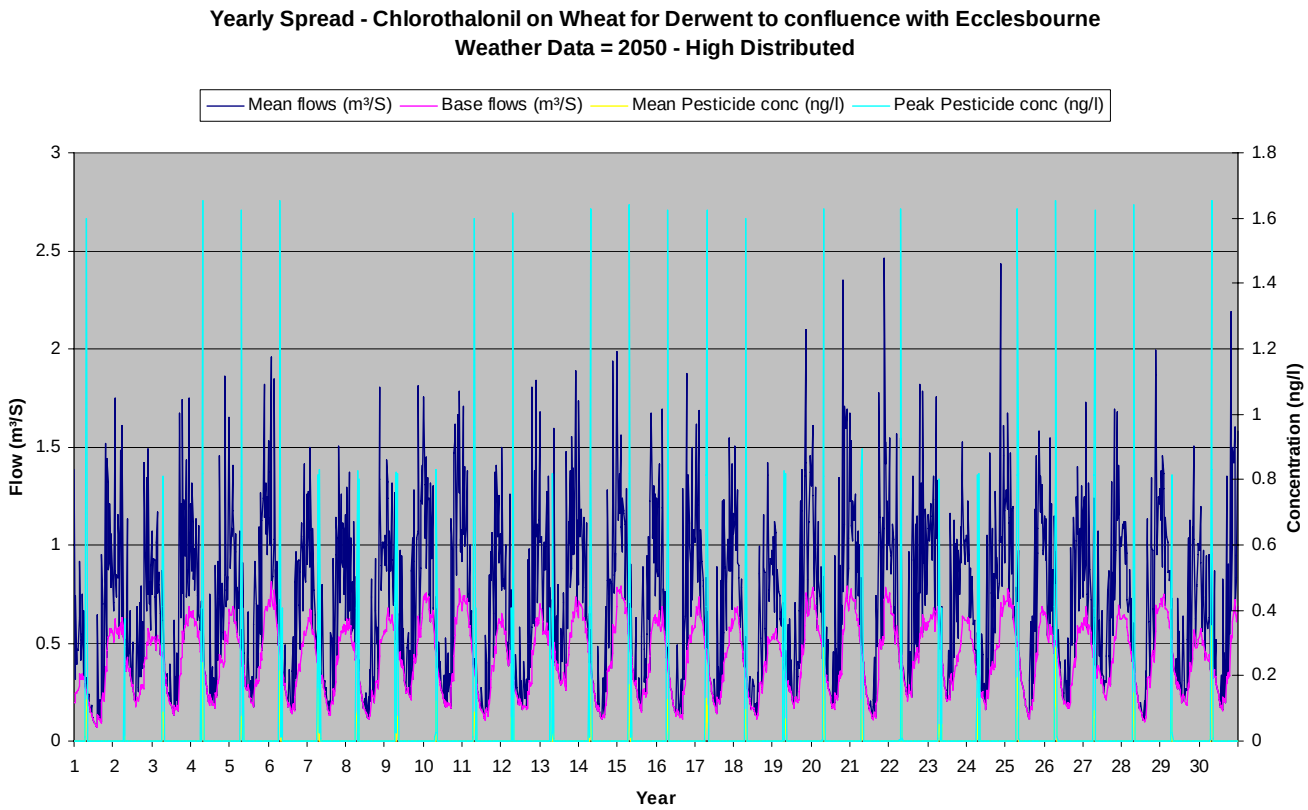
Used to select appropriate weather station data for the grid square to account to spatial variability in climate across the catchment



Climate Change Data

30 year Future Climate Data for UK-CIP:

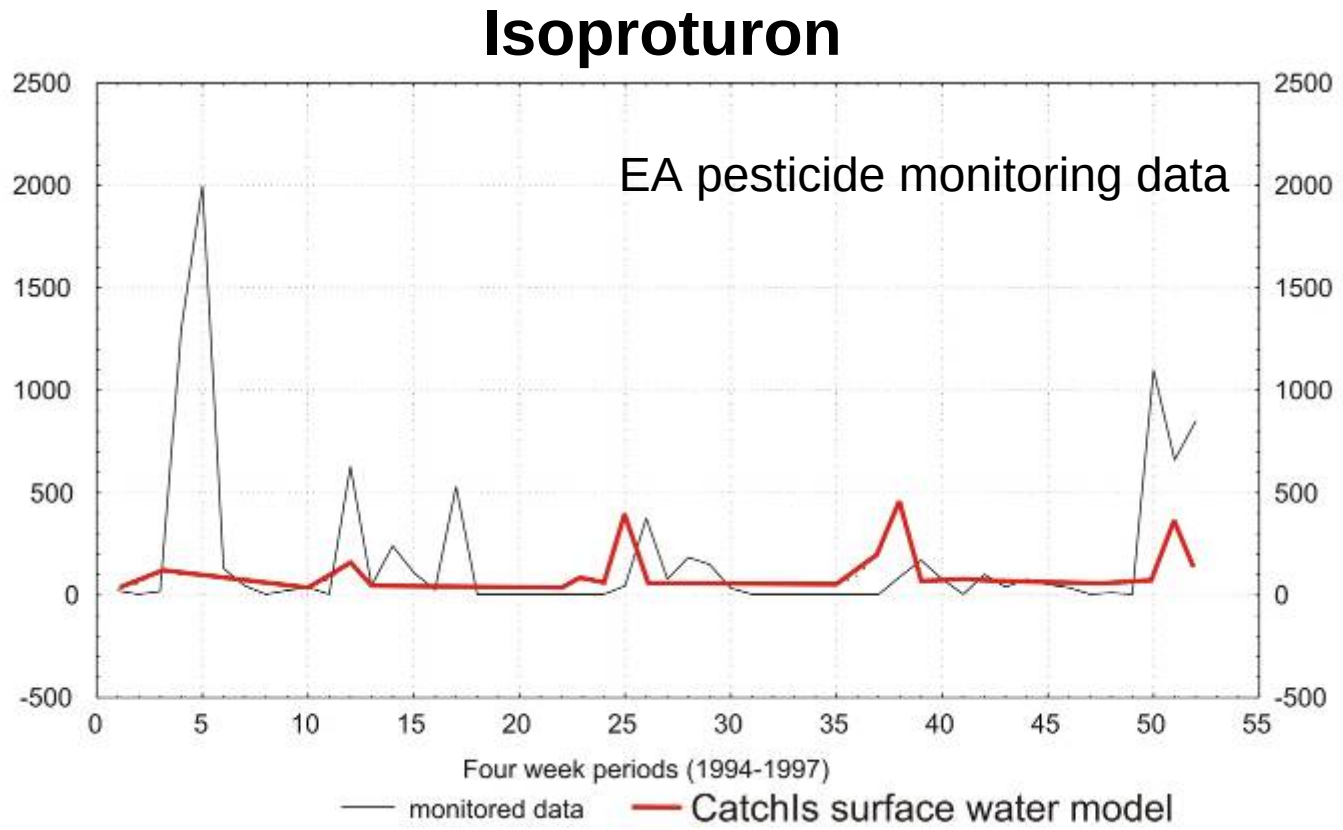
- 2020 Low
- 2020 Medium High
- 2050 Medium High
- 2050 High



Model Development

State-of-the-art pesticide fate models comprehensively validated at national and regional levels –

Surface Water. (2,000 individual analyses; 160 catchment-pesticide combinations: 29 catchments; 16 pesticides)

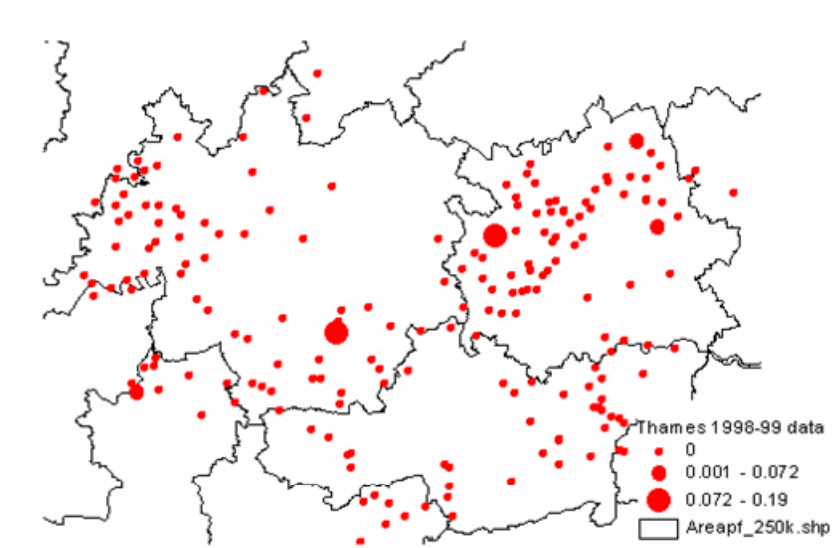


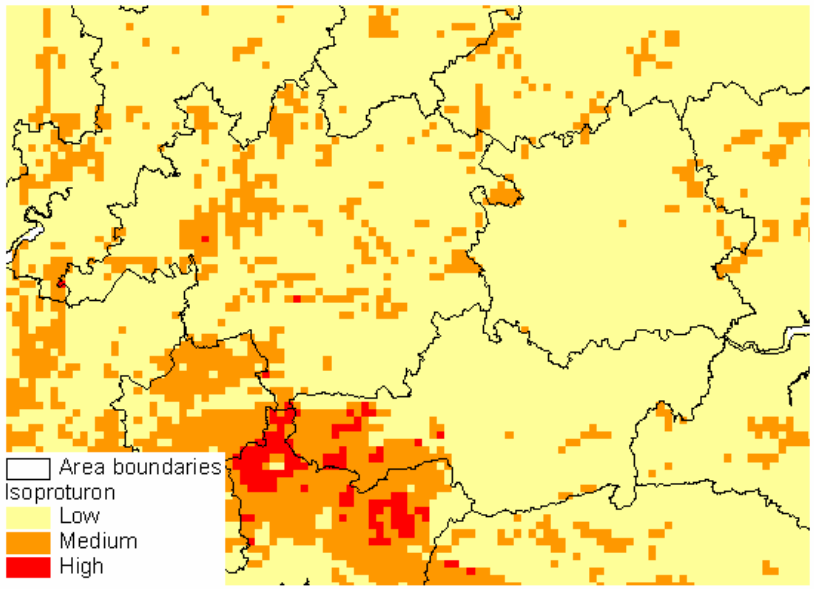
Brown *et al*, 2000

Model Development

- State-of-the-art pesticide fate models comprehensively validated at national and regional levels - **Groundwater**

Isoproturon





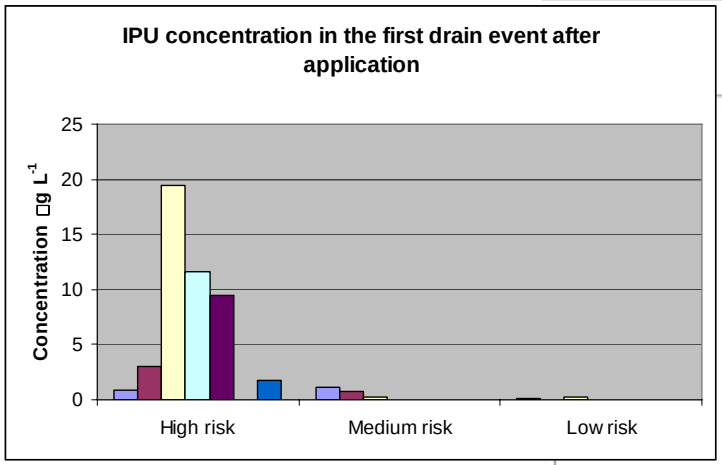
Measured (EA)

Modelled (CatchIS)

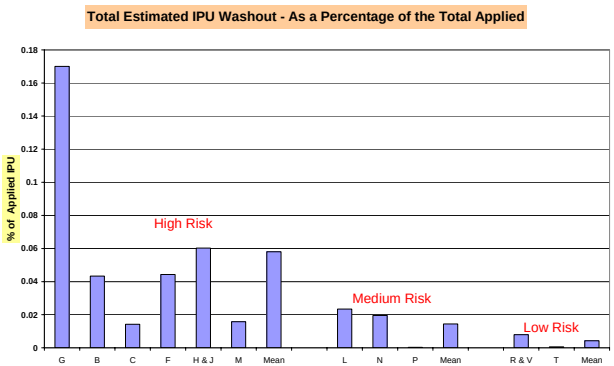
Holman *et al*, 2000

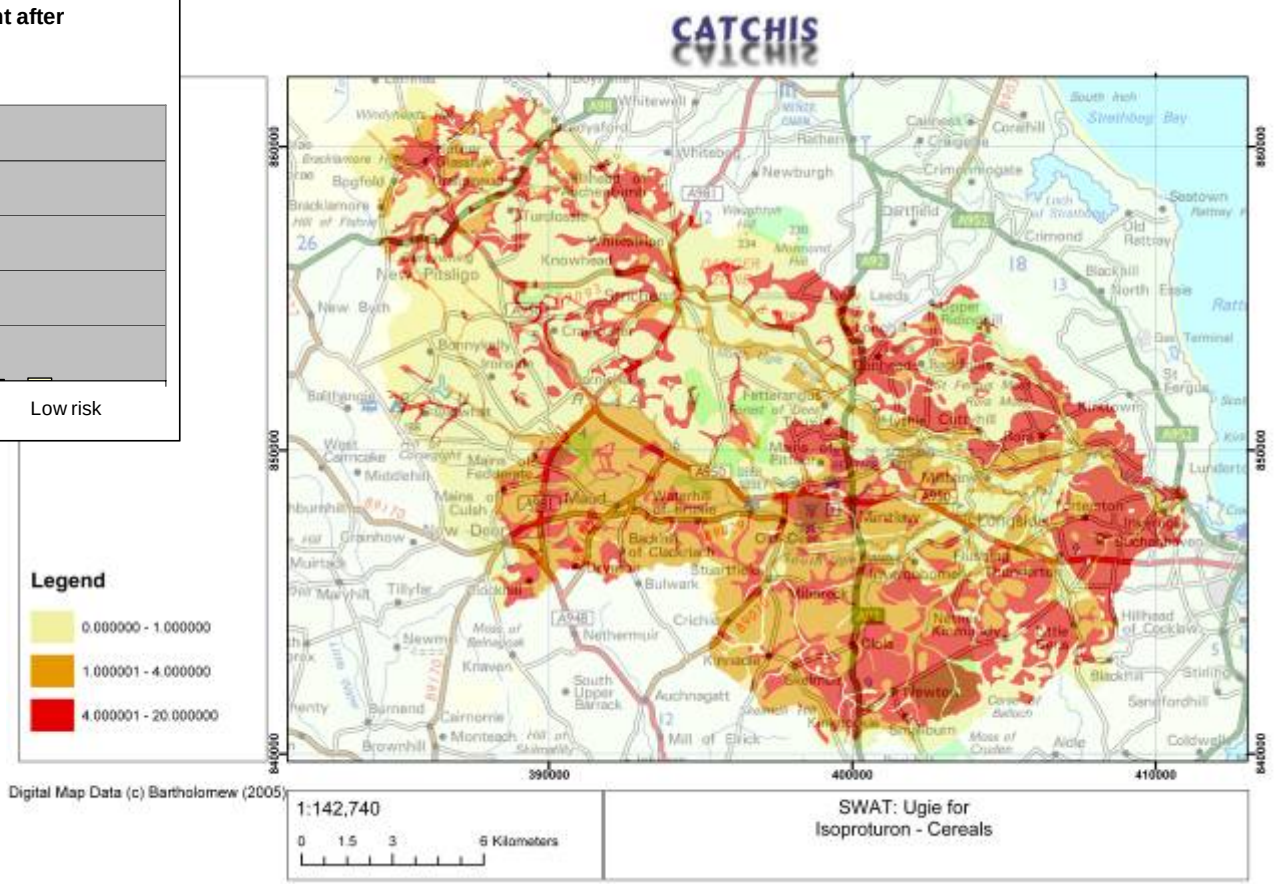
Pesticide-specific risk assessment:

The Ugie catchment **(Voluntary Initiative, 2005/6)**



Model Validation





Ugie leaching theory proven by computers

TESTS conducted on water entering watercourses from field drains in the River Ugie catchment area have confirmed the output of a computer model produced at Cranfield University which predicts the degree of leaching of the residual cereal herbicide Isoproturon from soil.

The tests were conducted by John Littlejohn in his capacity as project promotion officer for the **Voluntary Initiative (VI)** River Ugie Catchment Project.

Mr Littlejohn said: "It was important that we were able to validate the theory behind the model as it gives us greater confidence when promoting our recommendations for the use of Isoproturon this coming season, as these are based around the model's predictions of the leaching potential of the various soils in the catchment."

In its calculations the computer model takes into account the type and properties of the soil, local climate and several physical and chemical aspects of the herbicide before classifying the leaching potential of the soil.

The classes are high, where leaching levels are expected to be very significant; medium, where leaching will be less severe; and low, where leaching is not anticipated to occur to any significant degree.

In the current study Isoproturon tests, on water from drains covering the three soil classifications, confirmed that Isoproturon leaching following the predicted pattern.

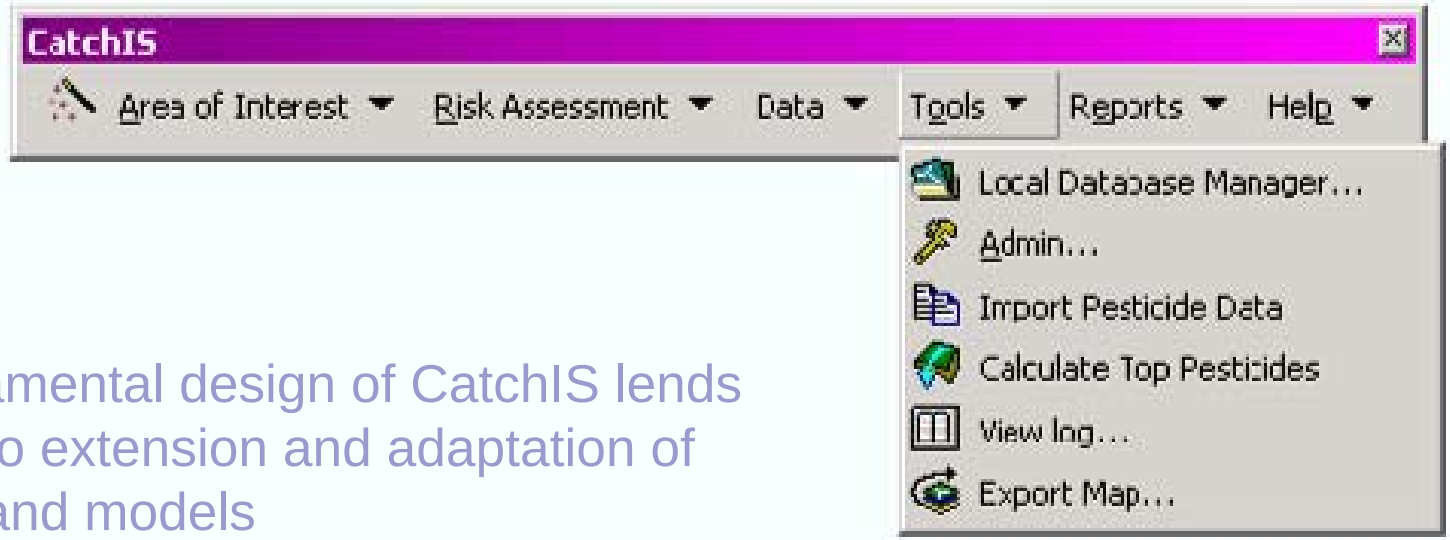
Scottish Water takes water from the River Ugie, which it treats at its Forehill Water Treatment Works, prior to distribution to Peterhead and the surrounding rural area. Drinking water is subject to a regulatory limit of 0.1microgrammes per litre for pesticides.

To enable Isoproturon levels to stay under the limit the River Ugie Catchment Committee has produced advice to farmers and sprayers on the use of the herbicide in the catchment.

The Buchan Observer

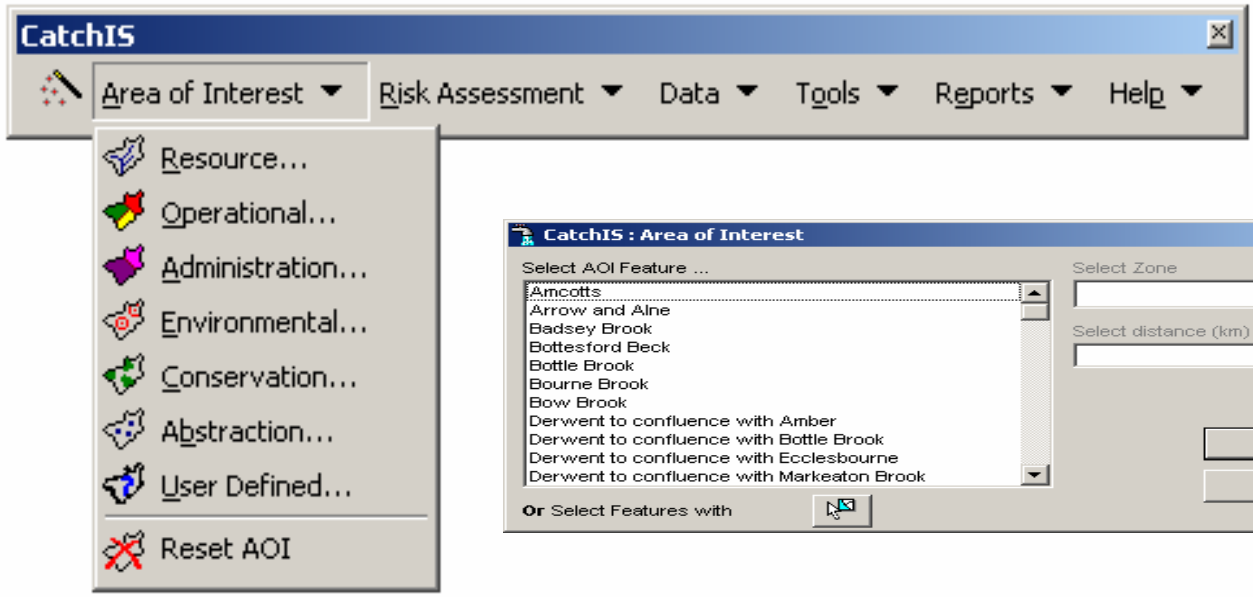
http://www.buchanie.co.uk/archived/2006/week_38/news/ugie.asp

Flexibility



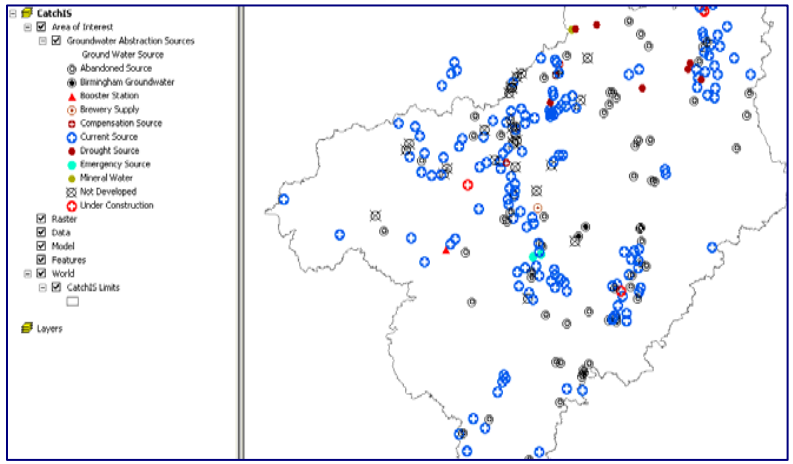
- The fundamental design of CatchIS lends flexibility to extension and adaptation of datasets and models
- Open-philosophy to model development – it is NOT a ‘black box’
- Client-led developments
- Expert scientific and technical support

Selecting Area of Interest



Areas of Interest based on user held data, but could include:

- EA Catchments
- Water framework Directive and CSF catchments
- Nitrate Sensitive Areas
- Nitrate Vulnerable Areas
- Ground Water Abstraction points
- User defined area



ADAS Pesticide Usage Data

- Developed using two unique data sources:
  - ADAS 1Km² agricultural census data
  - Local crop rotations and pesticide usage data from ADAS experts
- Combined using GIS

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Insight and Solutions

ADAS Pesticide Usage Data

- 1Km² Agricultural Census Data
  - Distribution of all crops reported in census
  - Developed from Defra's highest resolution data
  - Supplemented by other datasets (including CEH Landcover, OS Vector mapping)

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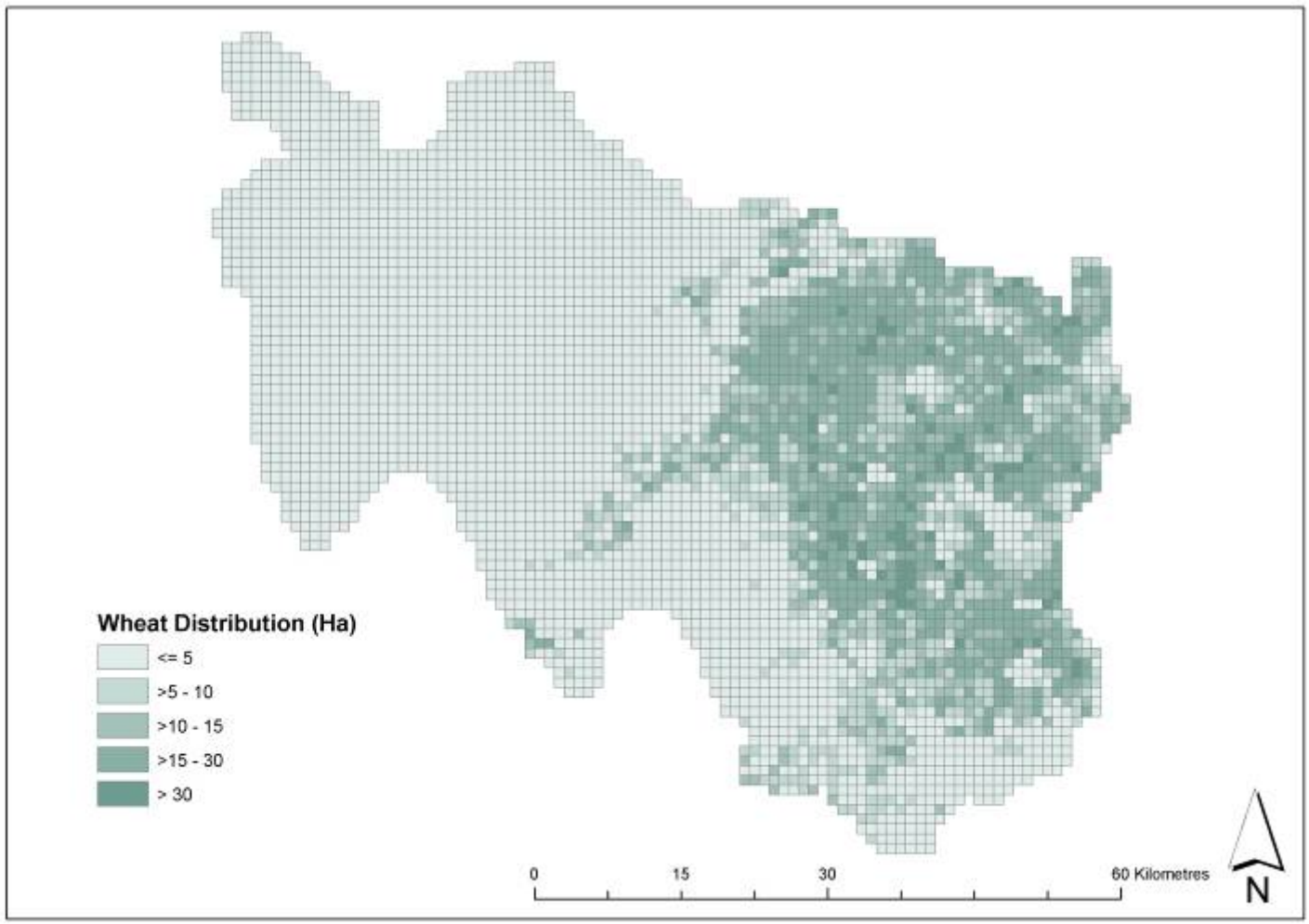
1Km² Agricultural Census Data



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ADAS Expert Input

- Local Field walkers and agronomists provide:
  - Pesticide usage statistics by catchment
  - Local crop rotations by catchment (to augment the ADAS 1Km² agricultural census)
  - 6 monthly updates to account for inter-annual variation

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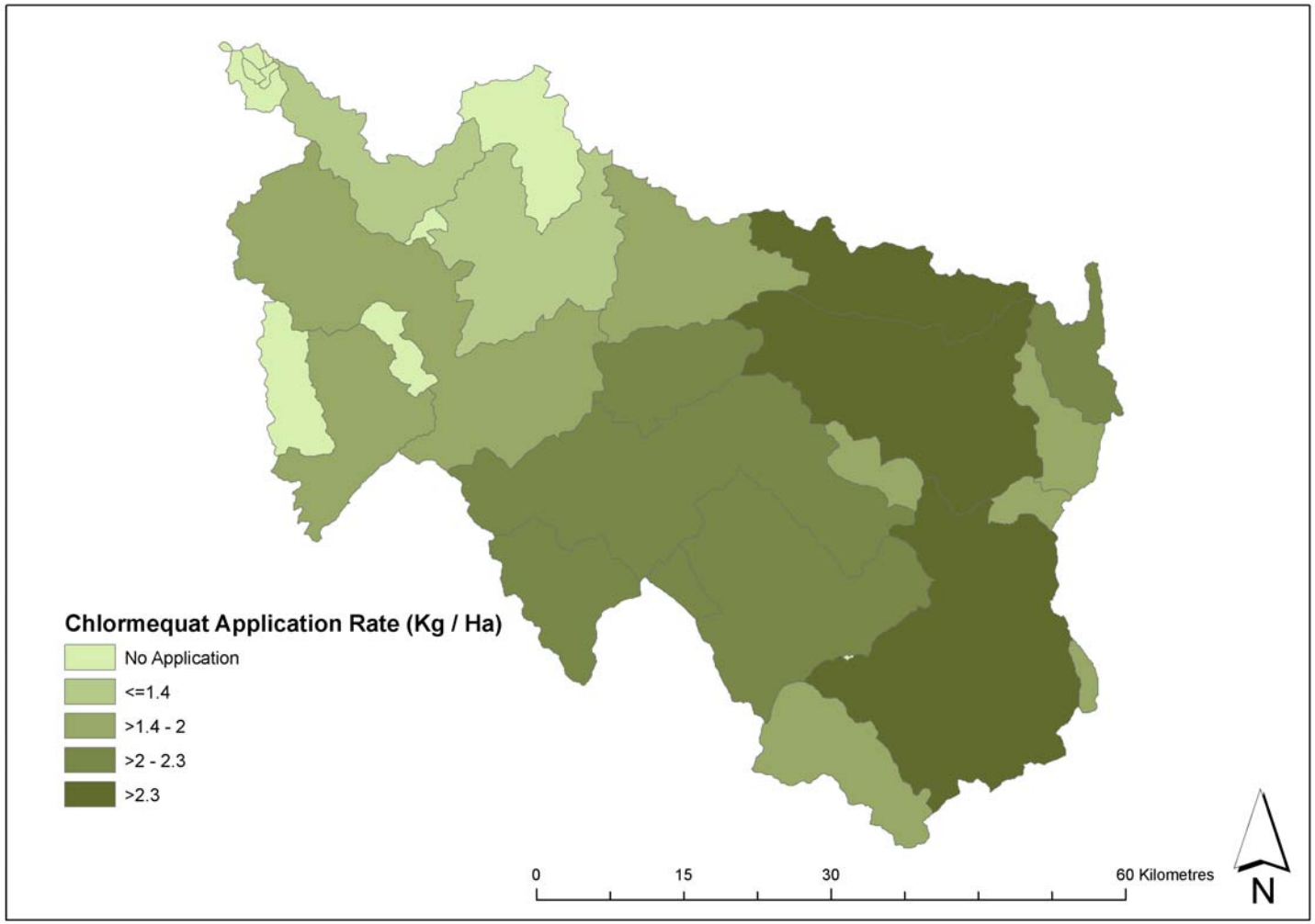
Application data



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Combination of Data Sources

- Agricultural Census data modified using local rotations
- Distribution of the catchment scale pesticide usage statistics over the modified 1Km² census data
- Combination carried out in GIS providing mapped output

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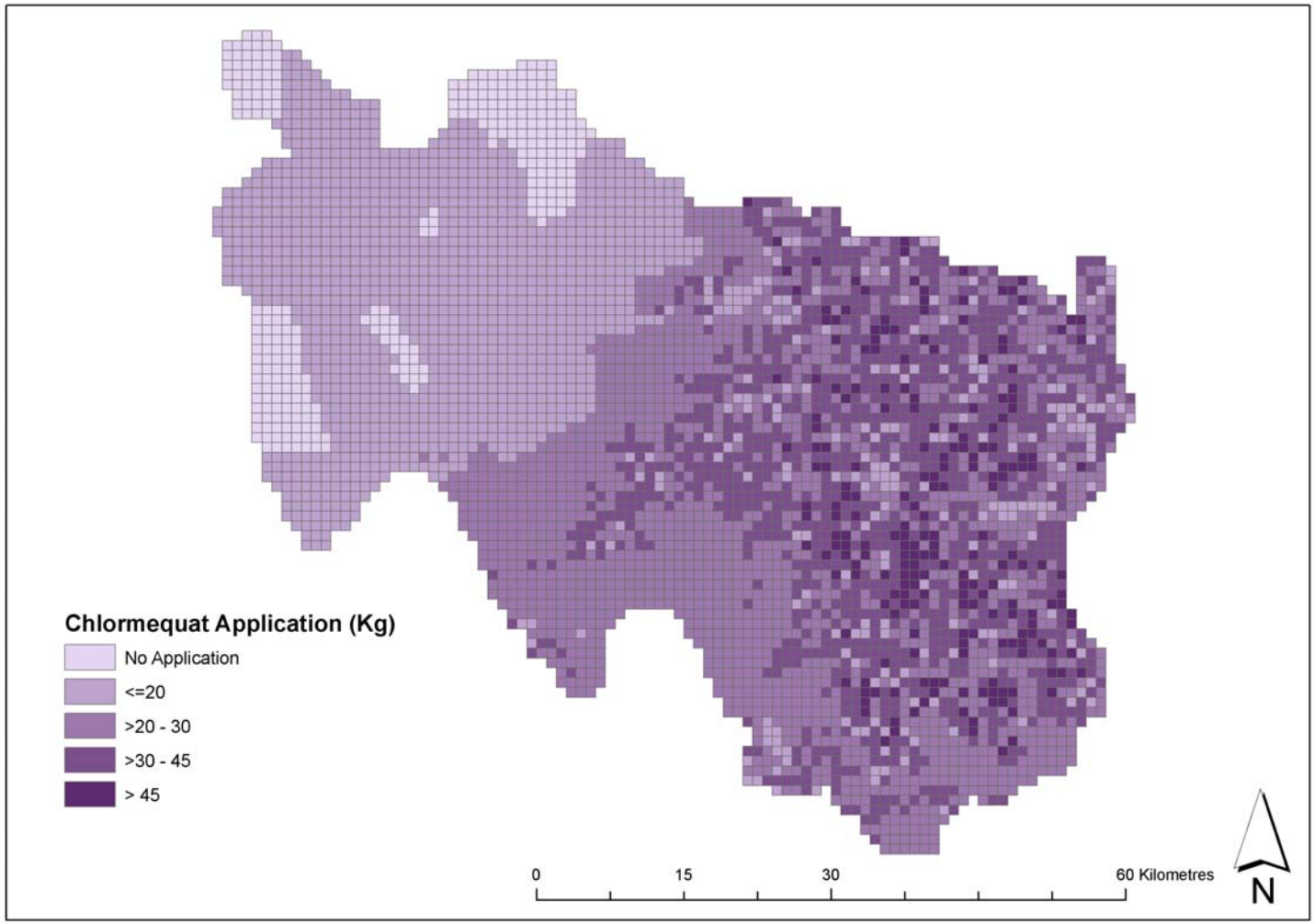
Crop-compound application data



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Other CatchIS Options

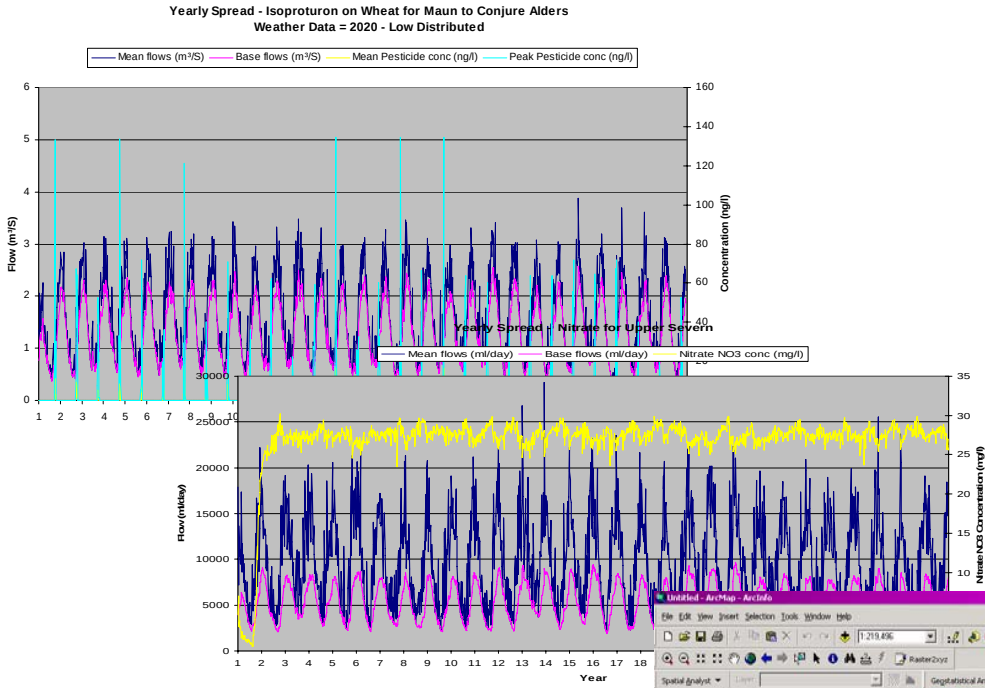
Nitrates

Phosphates

Climate Change

Sediment Erosion

Leakage and Asset Management



2020 LOW