



The Open
University

Floodplain Meadows: diversity, function and heritage

David Gowing





Biography

Why are meadows important

How wet is wet?

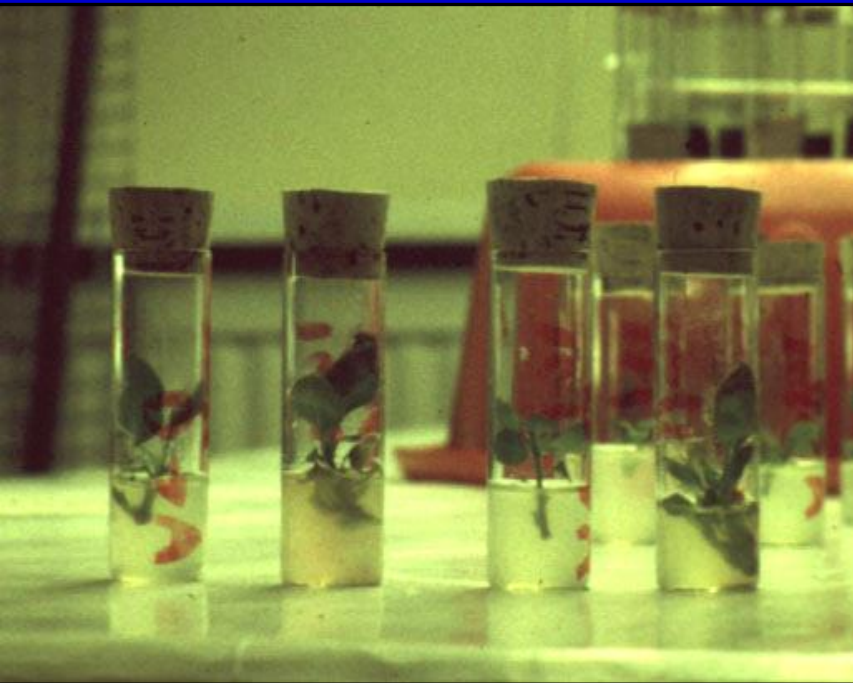
Future challenges

Working in partnership



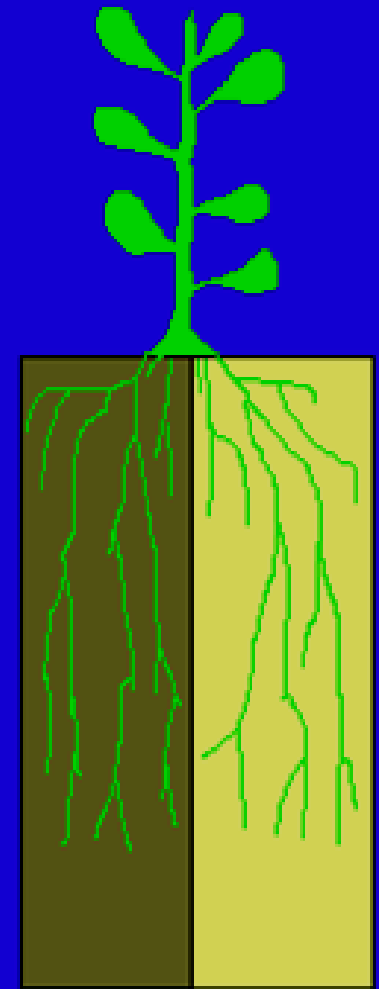
The Open
University

PhD work on apple trees



Multiplication in tissue culture

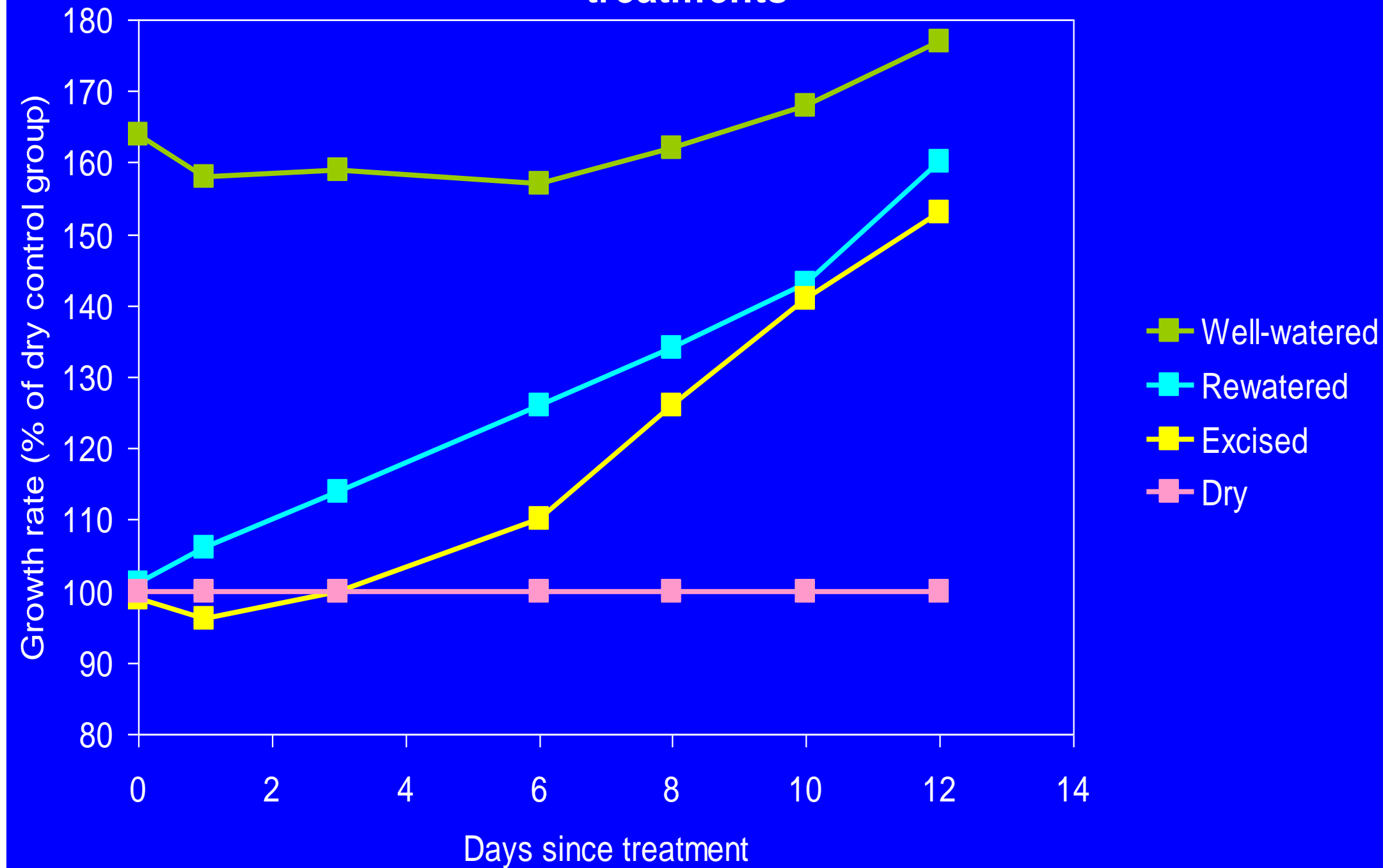
Transplant in a split-root chamber



**Wet
soil**

**Dry
soil**

Response of leaf area increment to different root treatments







Flood receding from Cricklade North Meadow

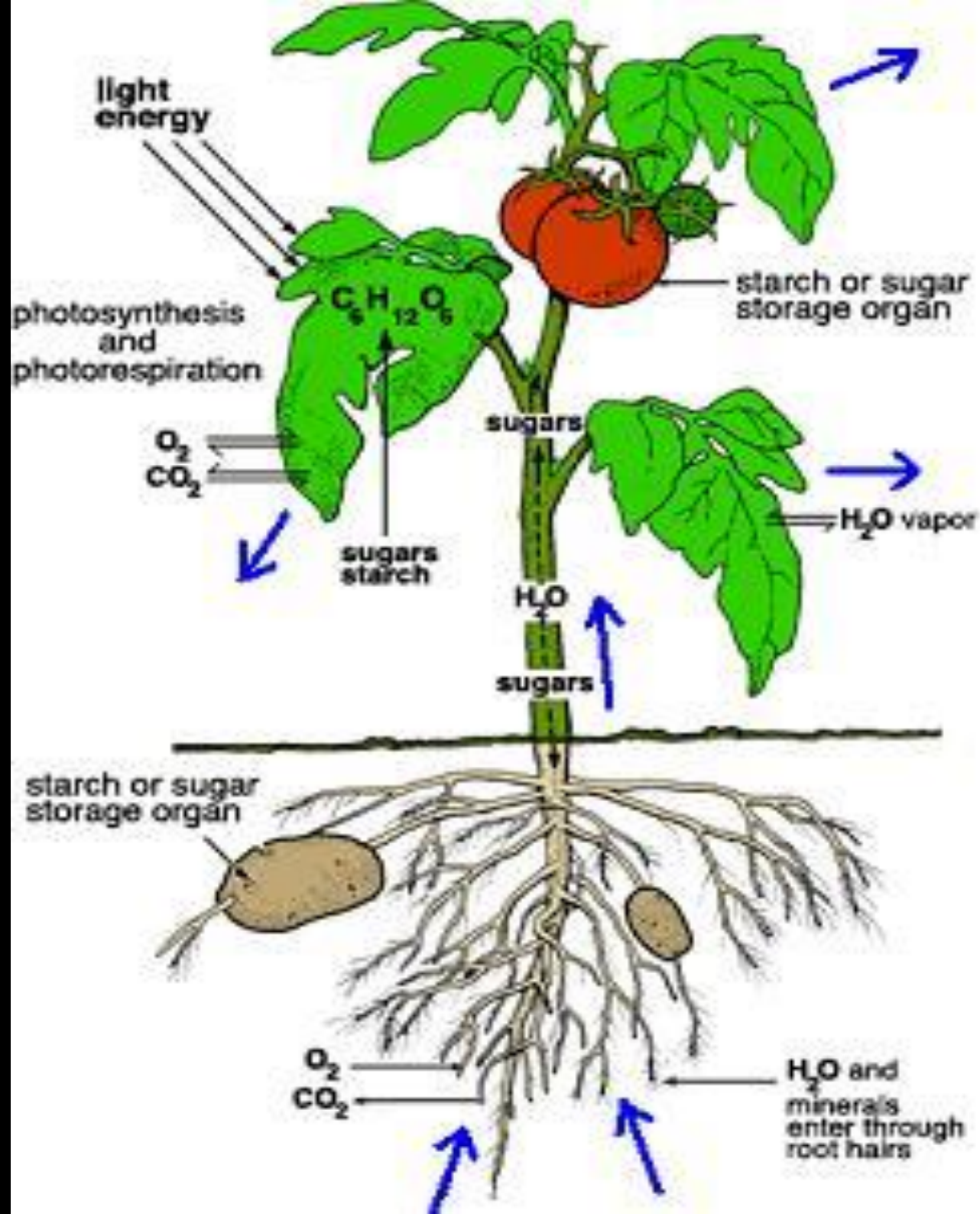




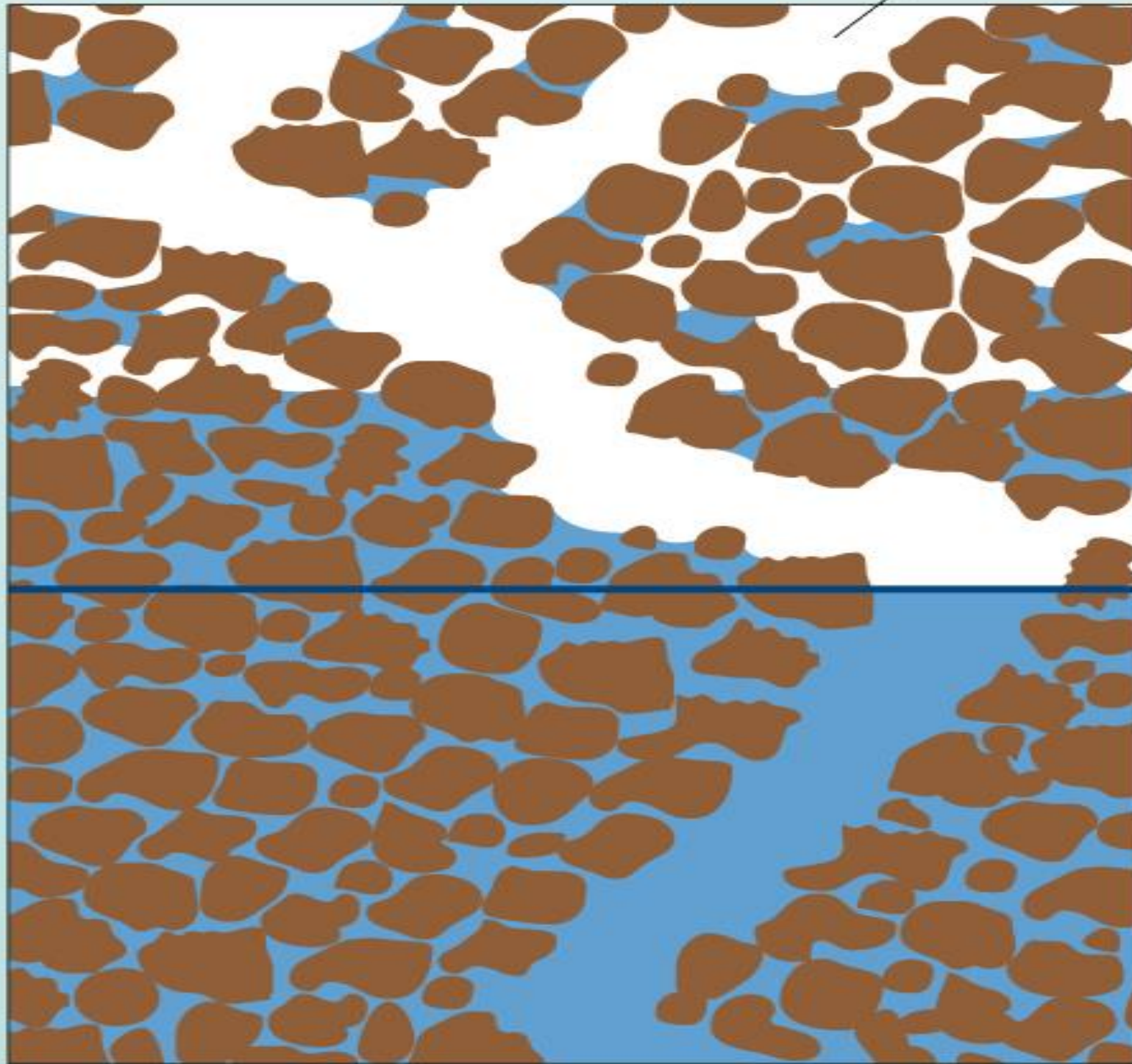


Plant communities on Cricklade North Meadow





macropore



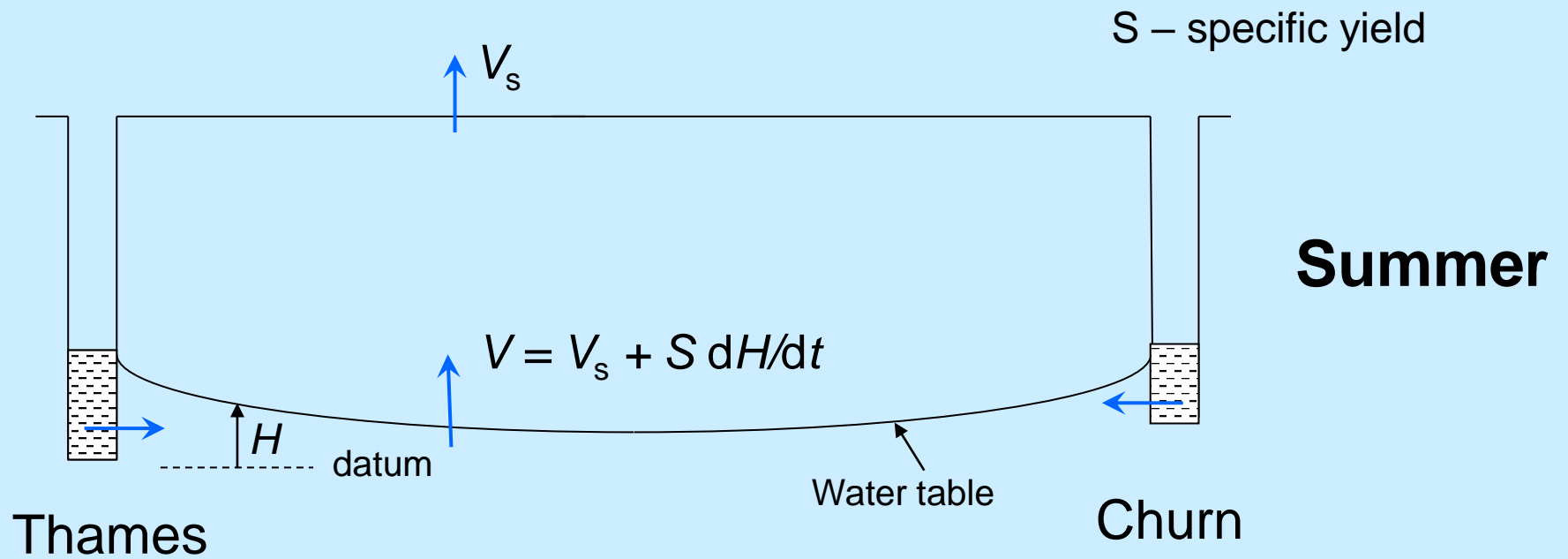
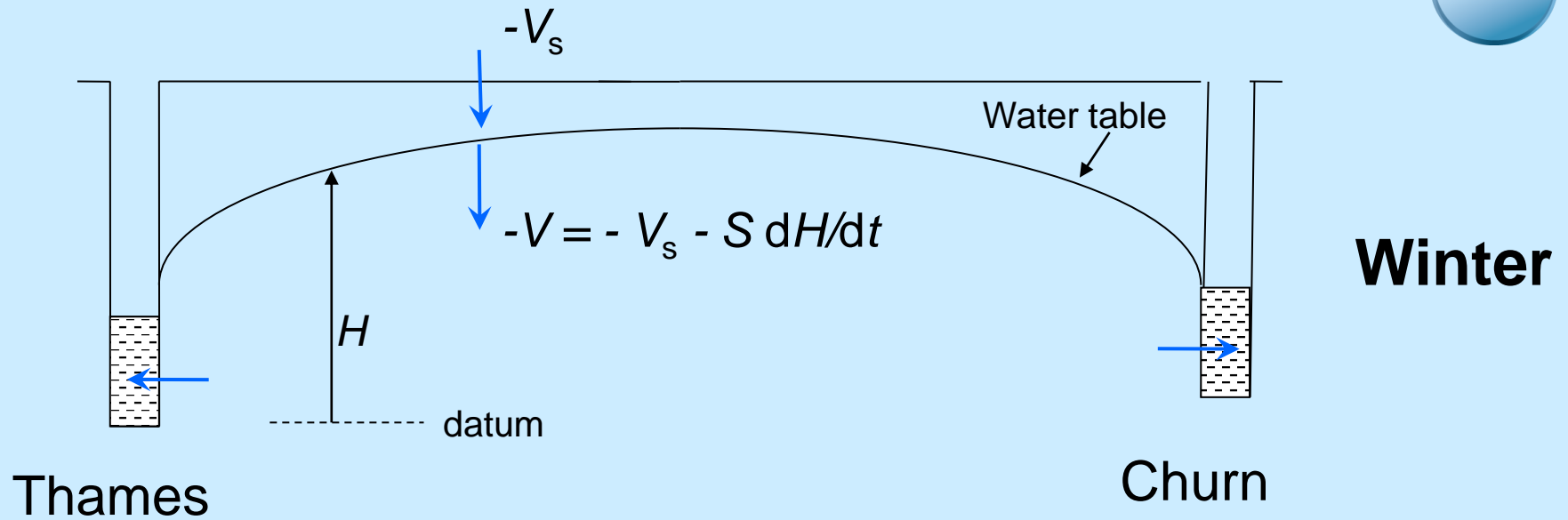
unsaturated zone

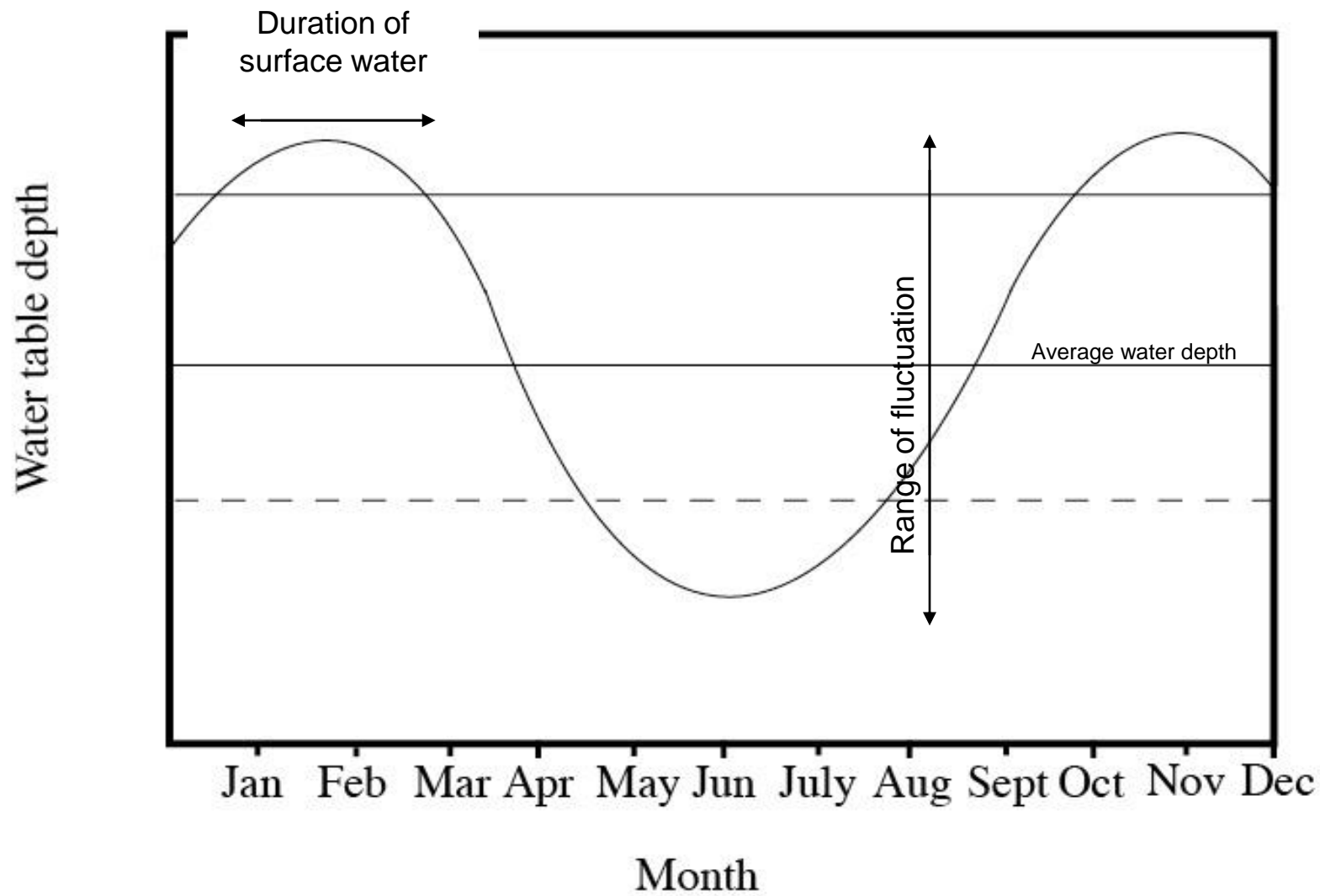
capillary fringe

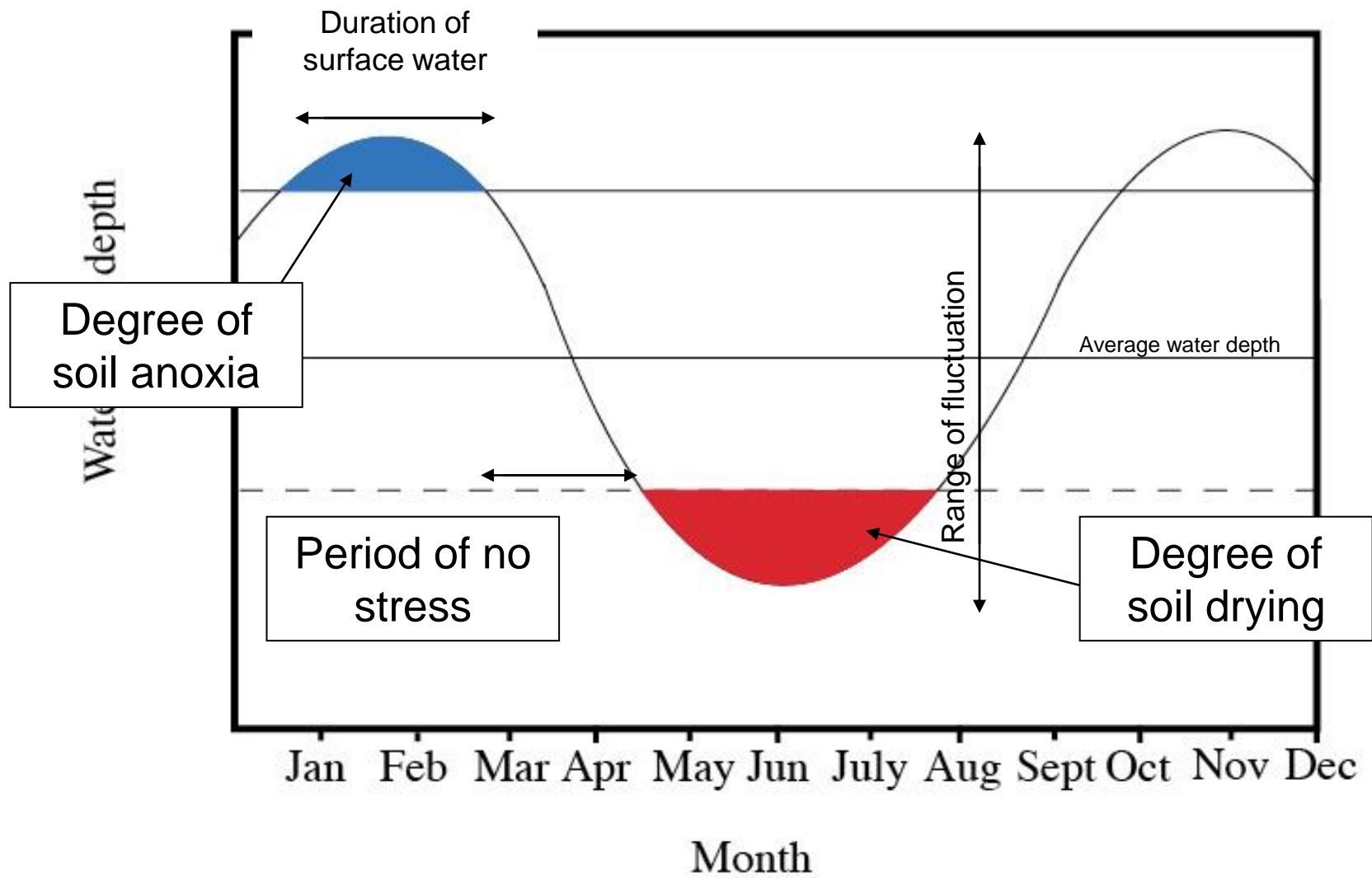
water table

saturated zone

Water tables between rivers



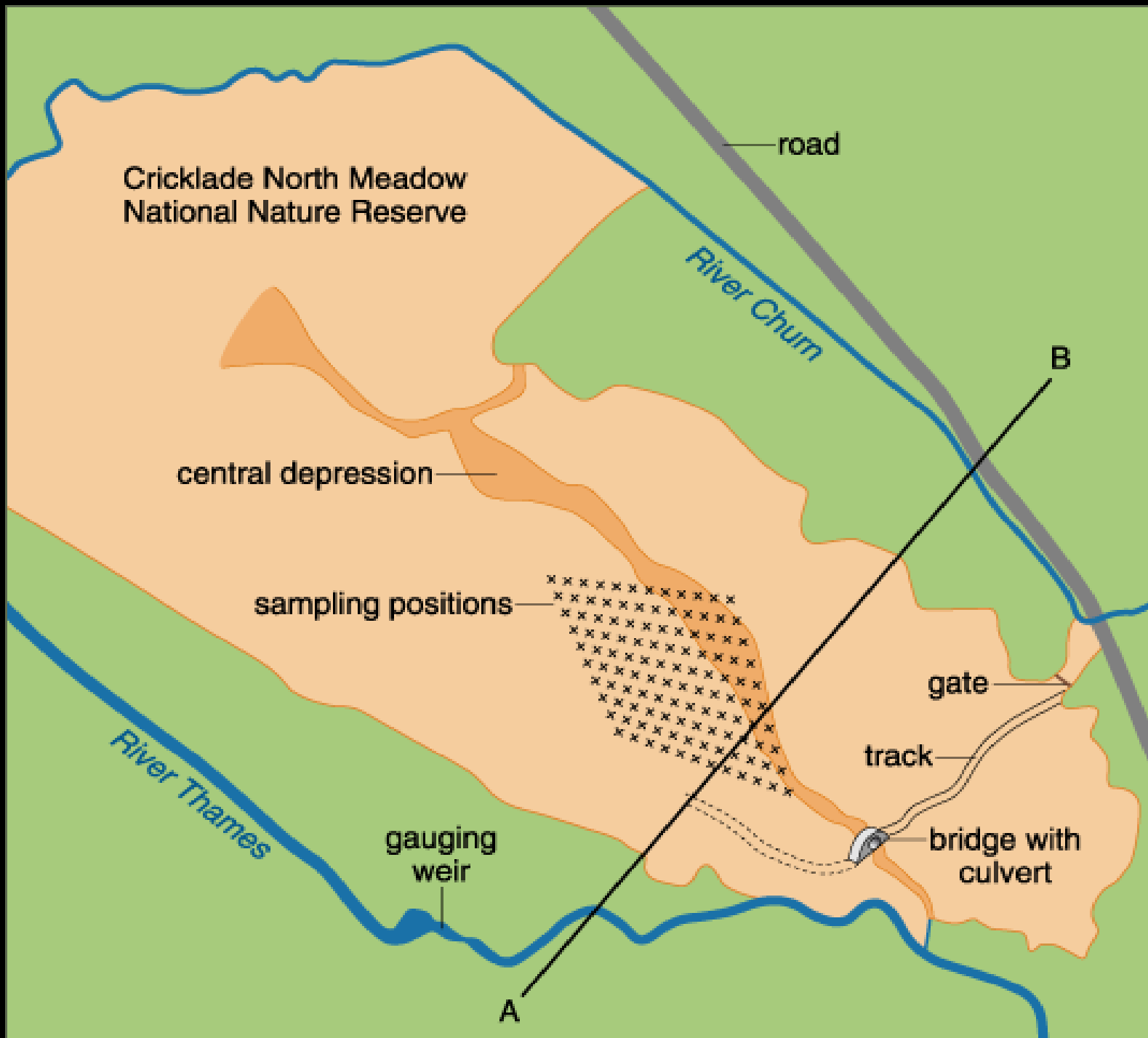


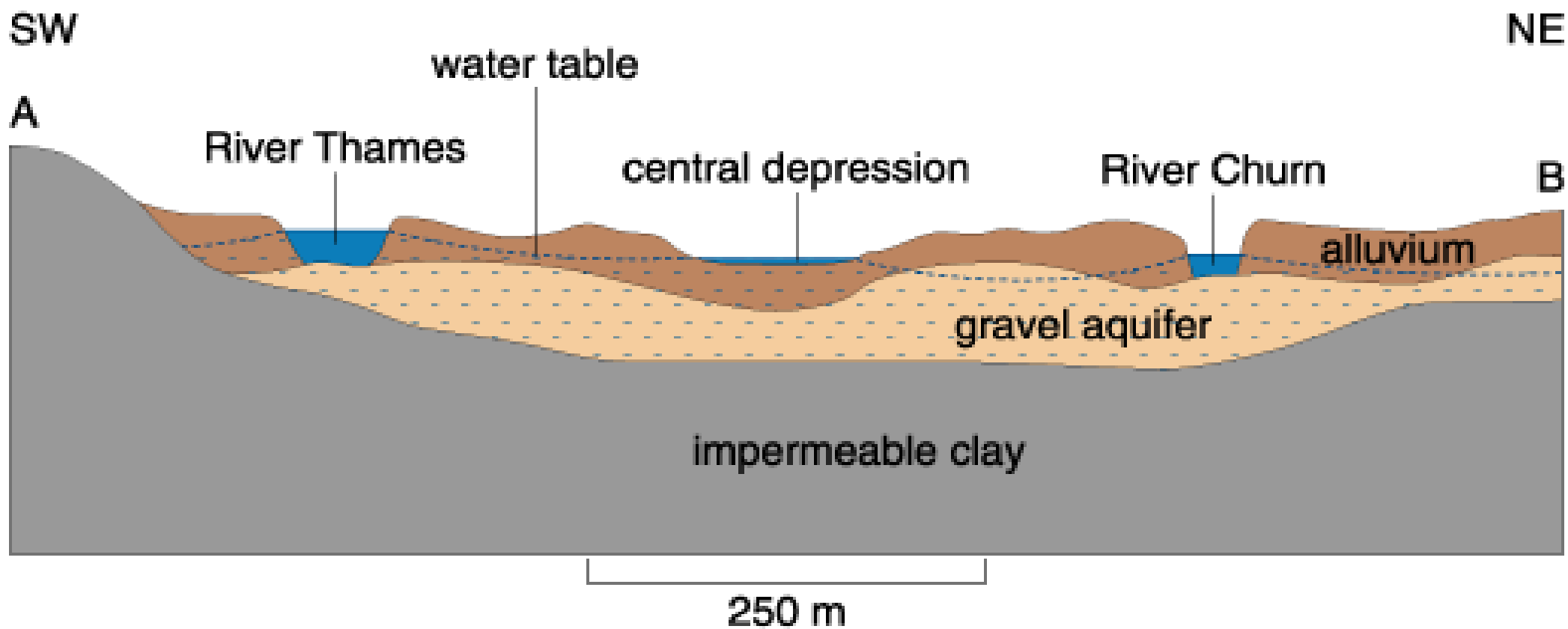


Great diversity of plants in West Mead, Yarnton



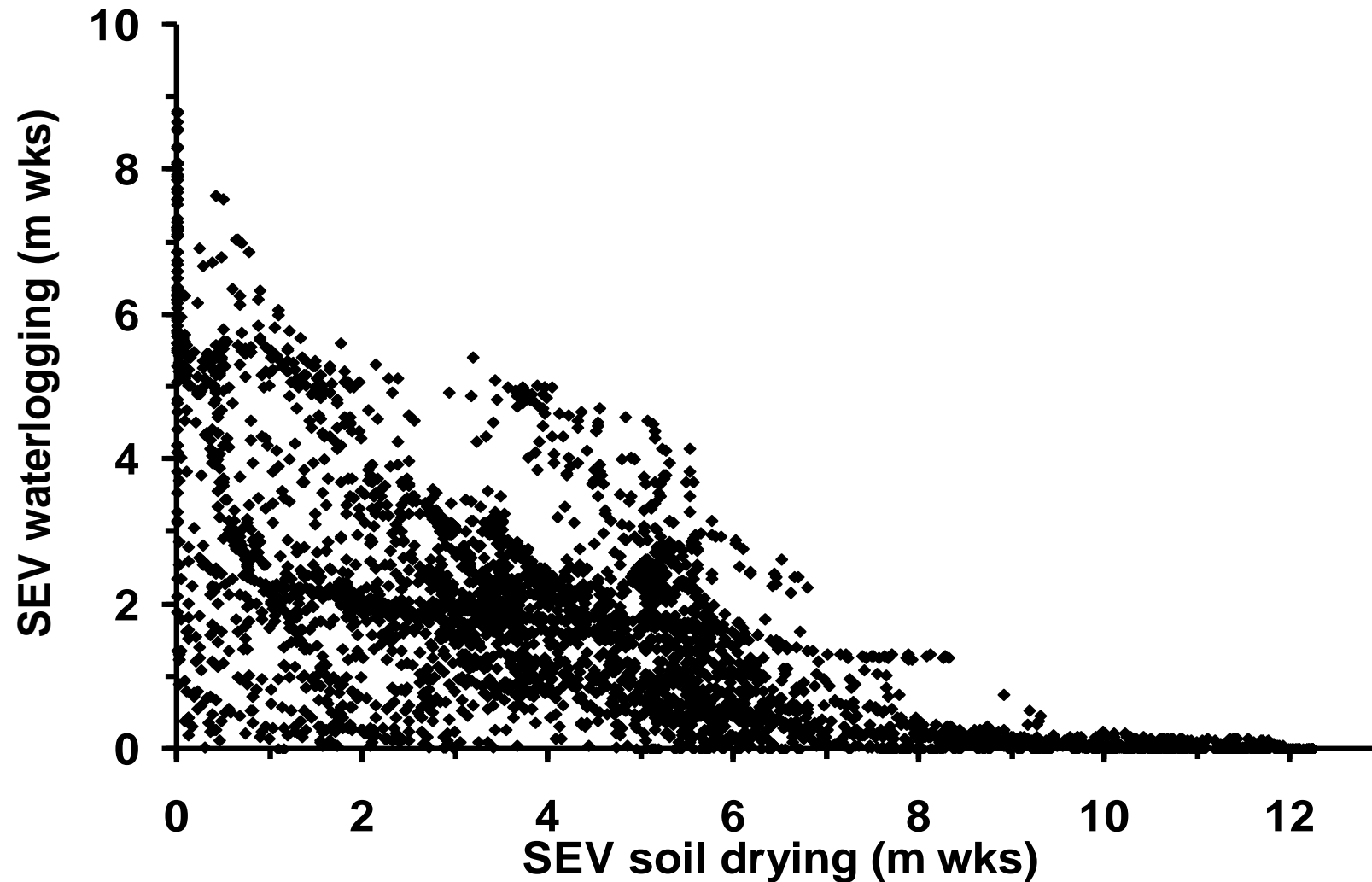
Video clip on Cricklade





Meadow hydrology model

Distribution of modelled water regimes

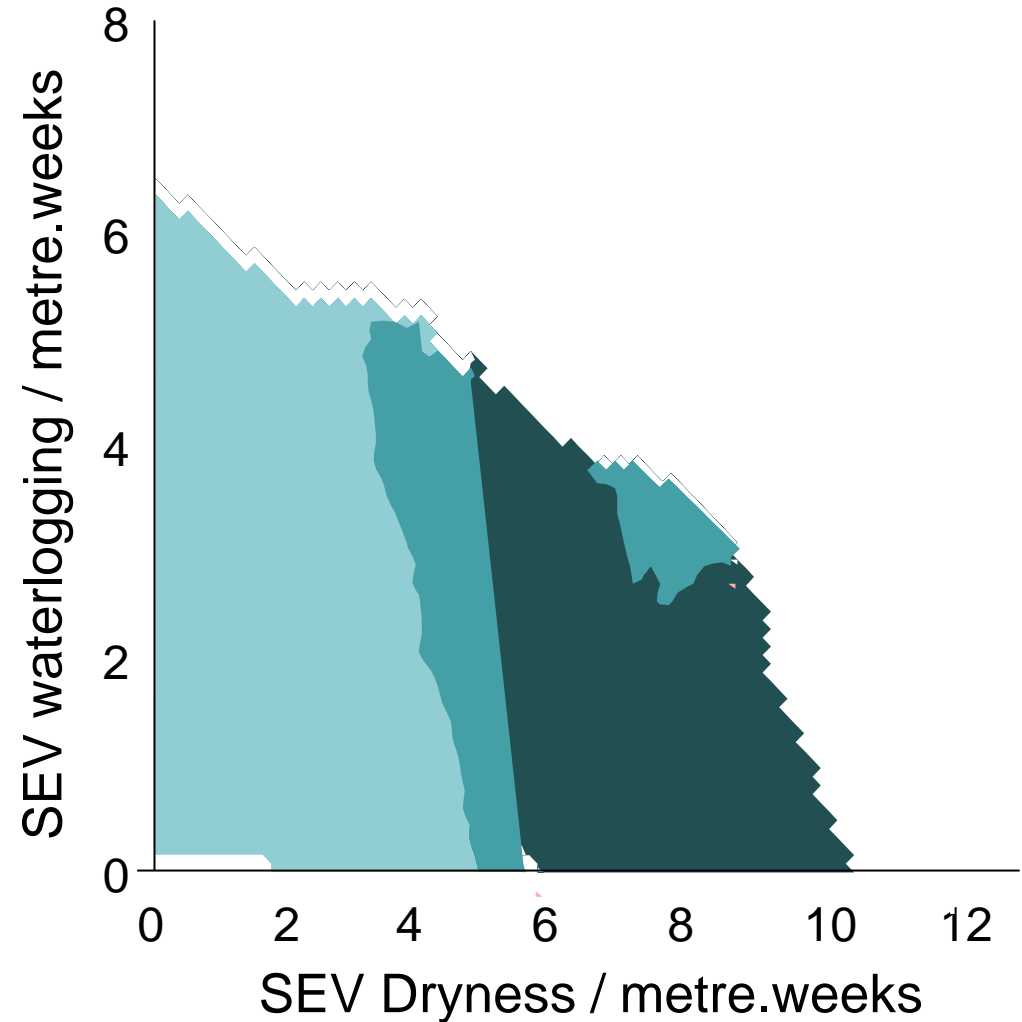


Species SEV tolerances

- Meadow vetchling (*Lathyrus pratensis*) frequency relative to SEVs



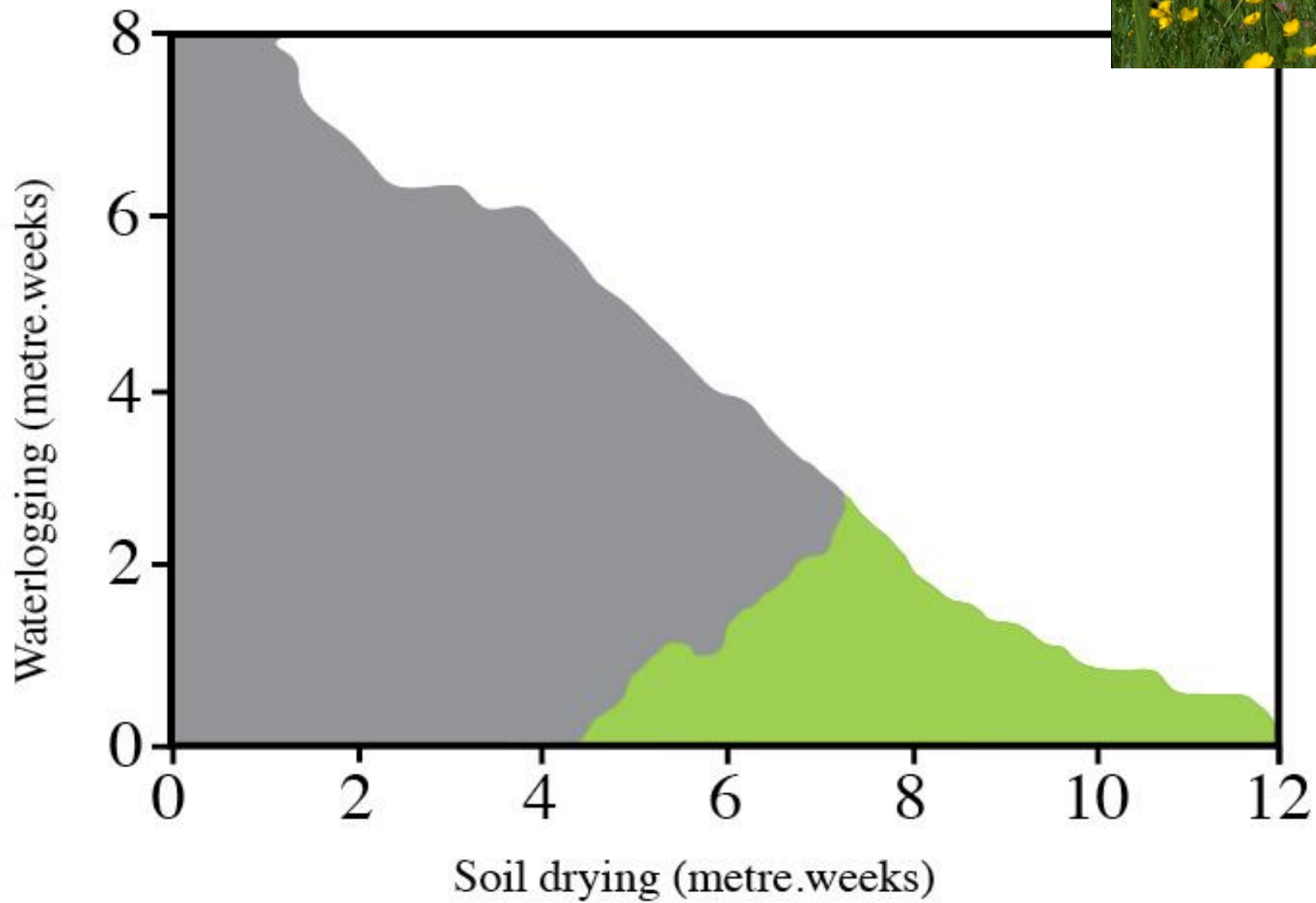
- Data compiled from >3000 sample positions from 7 sites across England with contrasting soils



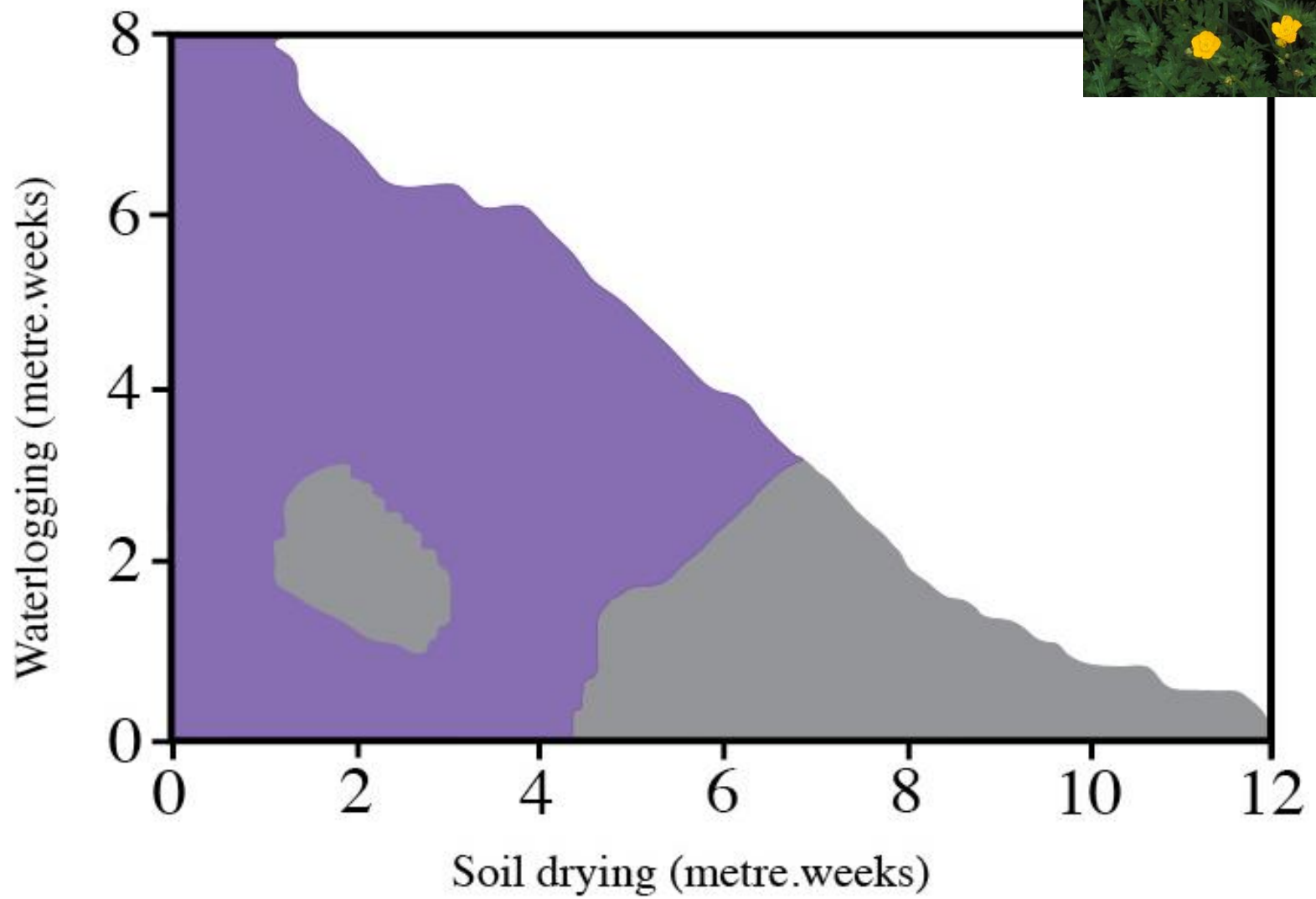

Less frequent than by chance


Expected frequency by chance

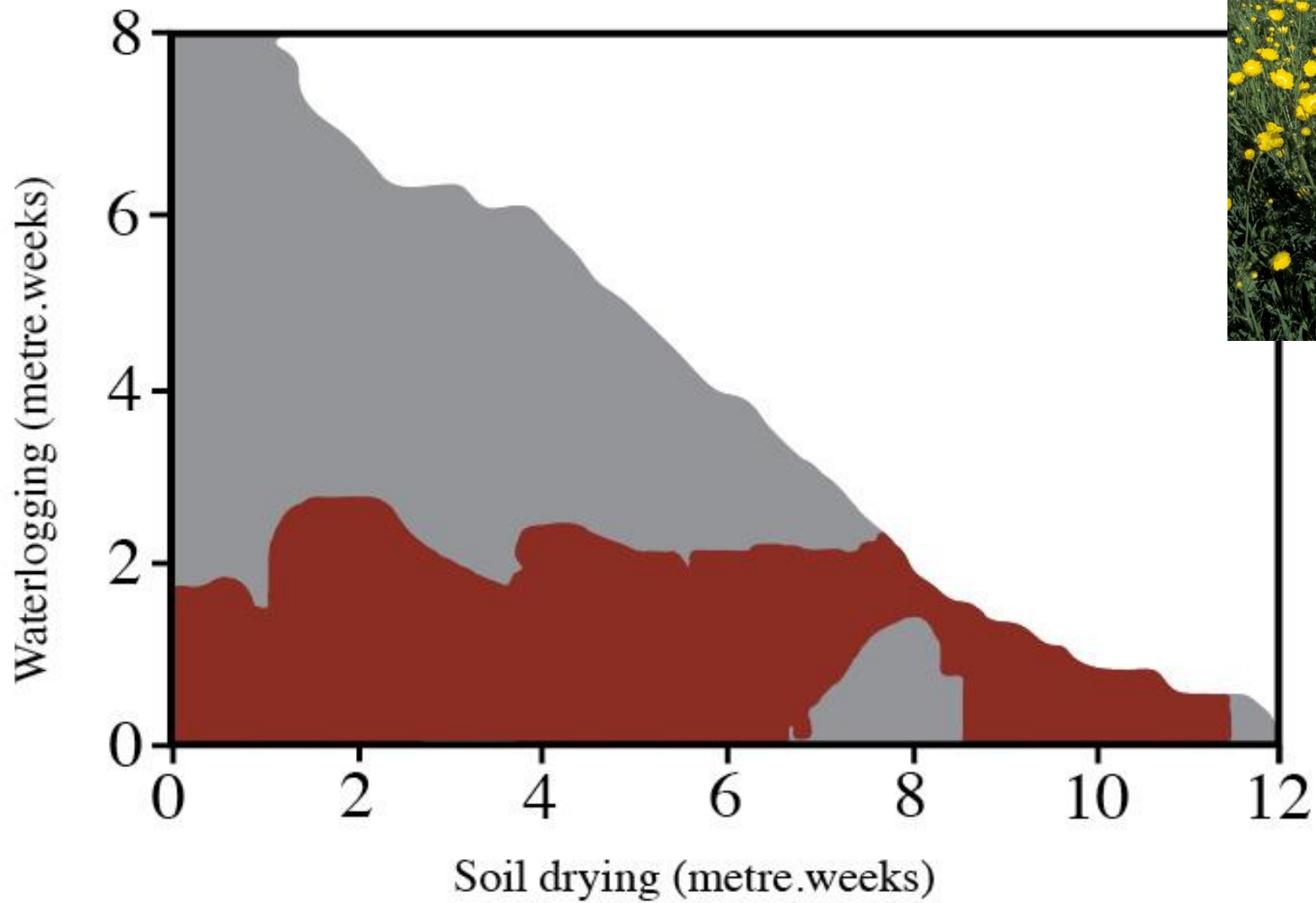

More frequent than by chance



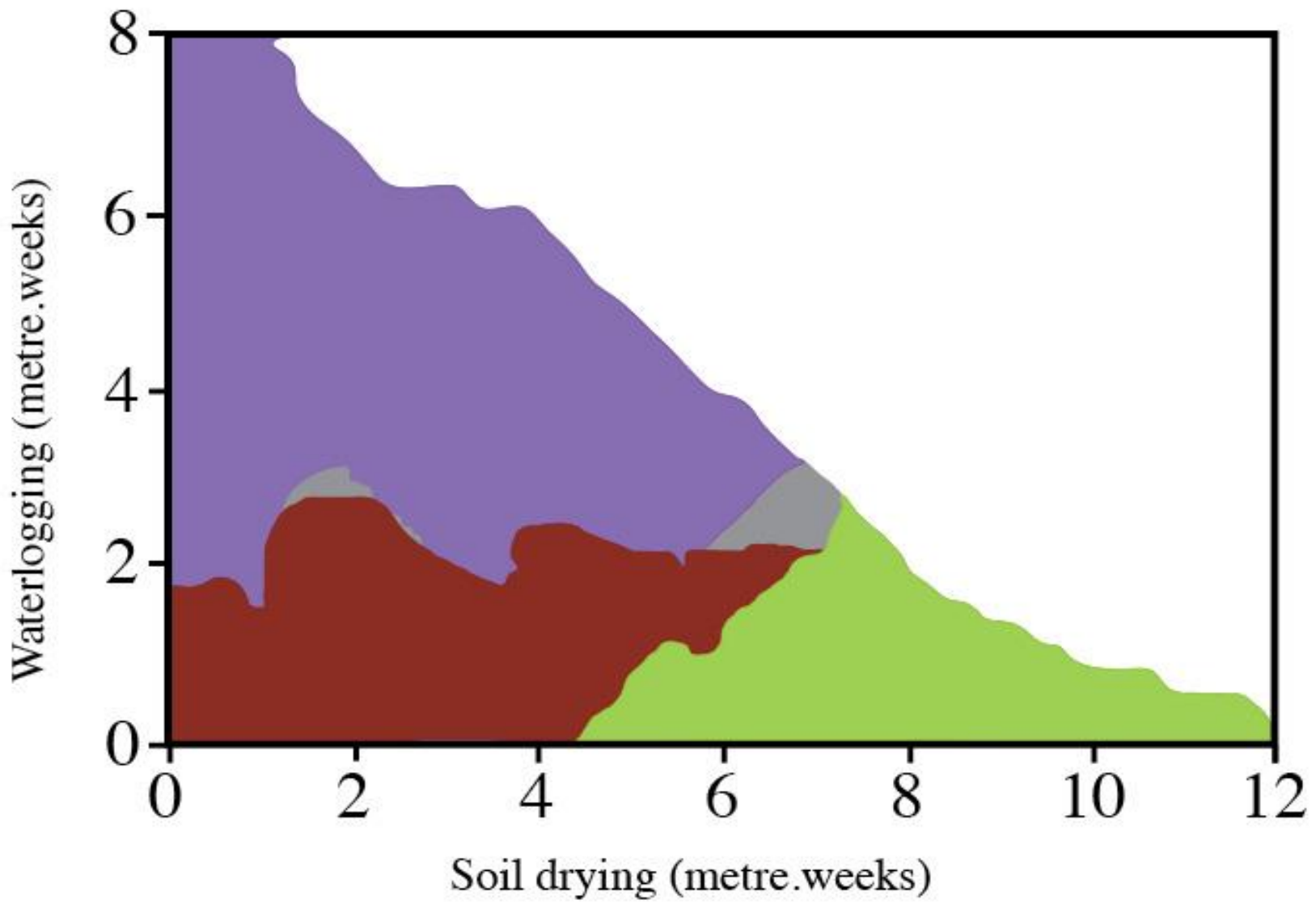
Bulbous buttercup (*Ranunculus bulbosus*)



Creeping buttercup (*Ranunculus repens*)



Meadow buttercup (*Ranunculus acris*)

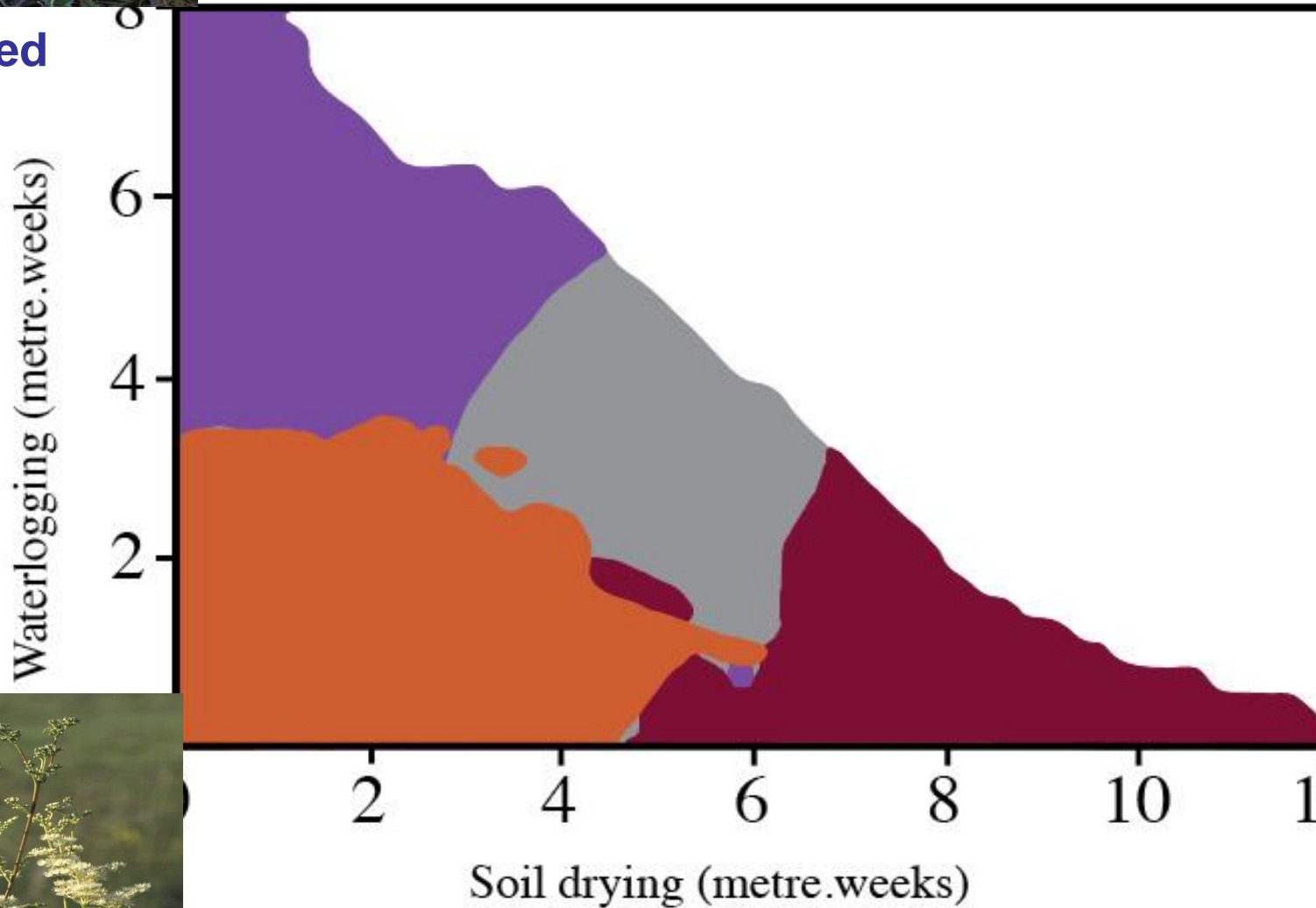




Hydrological niches of three species from the Rose family (*Rosaceae*)



Silverweed



Great burnet



Meadowsweet



Hydrologically defined niches reveal a basis for species richness in plant communities

Jonathan Silvertown*, Mike E. Dodd*, David J. G. Gowing† & J. Owen Mountford‡

*Ecology and Conservation Research Group, Biology Department, Open University, Walton Hall, Milton Keynes MK7 6AA, UK

†Silsoe College, Cranfield University, Silsoe, Bedfordshire MK45 4DT, UK

‡NERC Institute of Terrestrial Ecology, Monks Wood, Abbot's Ripton, Huntingdon PE17 2LS, UK

Species-rich plant communities are prized repositories of biodiversity and a dwindling resource, but how the large numbers of species that characterize such communities are able to coexist is poorly understood. Resource-based competition theory predicts that stable coexistence between species depends on each being a superior competitor in its own niche¹. The theoretical problem is that plants all require the same resources and acquire them in a very limited variety of ways, so observed niche overlaps are high^{2,3} and exclusion of all but the best competitor is the predicted result. This problem, central to community ecology, has elicited a variety of theoretical solutions^{4–7}, several of which invoke some degree of niche separation in time or space^{8,9}. The signature of niche separation in the field is to be found in community structure, which should indicate (i) smaller than expected niche overlaps on relevant niche axes and (ii) a trade-off between species' resource use on orthogonal axes. Here we provide evidence for the existence of both these conditions in a species-rich plant community.

We sampled two English meadow plant communities (floodplain meadows, NVC MG8 and MG4 (ref. 10)), at Tadham Moor, Somerset, UK, and at Cricklade, Wiltshire, UK. The percentage abundance of all species present was estimated in 844 1-m² quadrats within a 22-ha area at Tadham and in 641 quadrats within a 44-ha



Research

A fundamental, eco-hydrological basis for niche segregation in plant communities

Yoseph N. Araya¹, Jonathan Silvertown¹, David J. Gowing¹, Kevin J. McConway², H. Peter Linder³ and Guy Midgley⁴

¹Department of Life Sciences, Open University, Walton Hall, Milton Keynes MK7 6AA, UK; ²Department of Mathematics and Statistics, Open University, Walton Hall, Milton Keynes MK7 6AA, UK; ³Institute of Systematic Botany, University of Zurich, Switzerland; ⁴Kirstenbosch Research Centre, South African National Biodiversity Institute, Republic of South Africa

Summary

• Ecologists still puzzle over how plant species manage to coexist with one another while competing for the same essential resources. The classic answer for animal communities is that species occupy different niches, but how plants do this is more difficult to determine. We previously found niche segregation along fine-scale hydrological gradients in European wet meadows and proposed that the mechanism might be a general one, especially in communities that experience seasonal saturation.

Author for correspondence:

Yoseph N. Araya

Tel: +44(0)1908655582

Email: y.n.araya@open.ac.uk

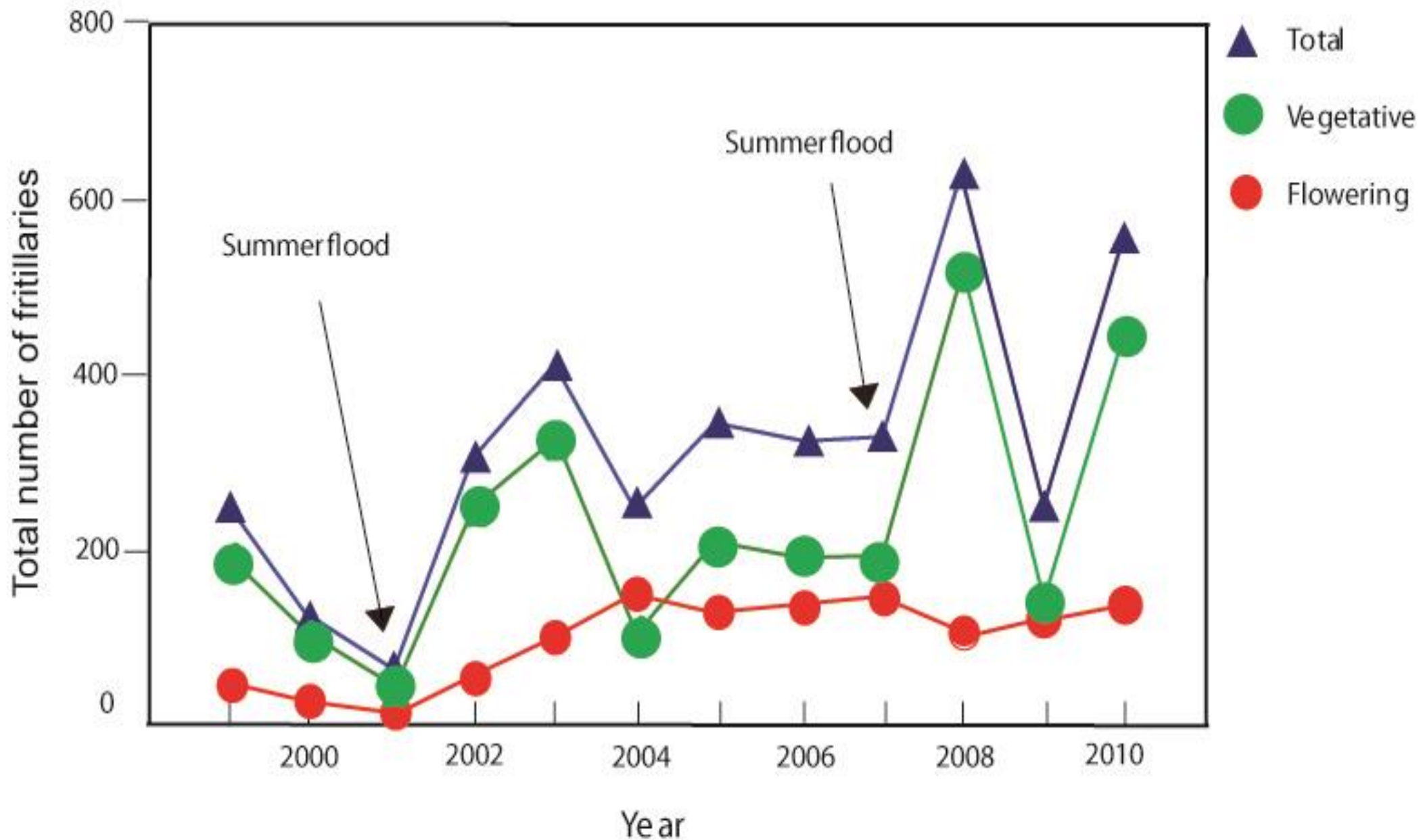
Received: 19 May 2010

Accepted: 10 August 2010

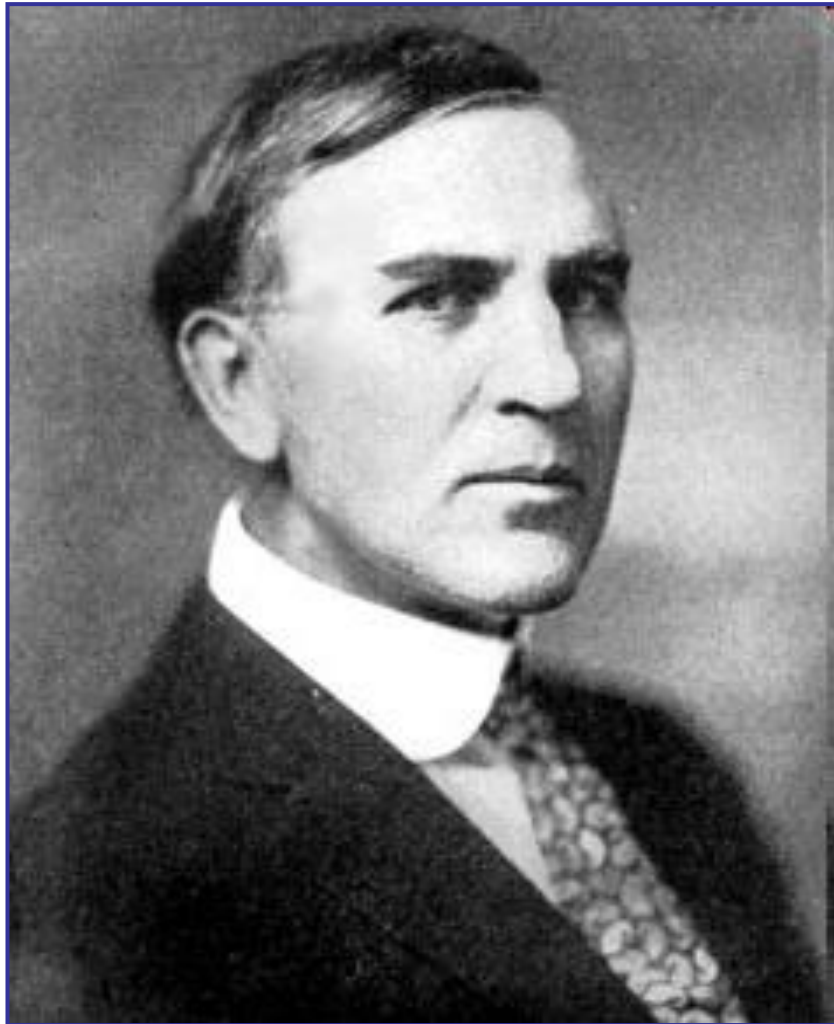




Abundance of fritillaries at North Meadow, Cricklade 1999-2010



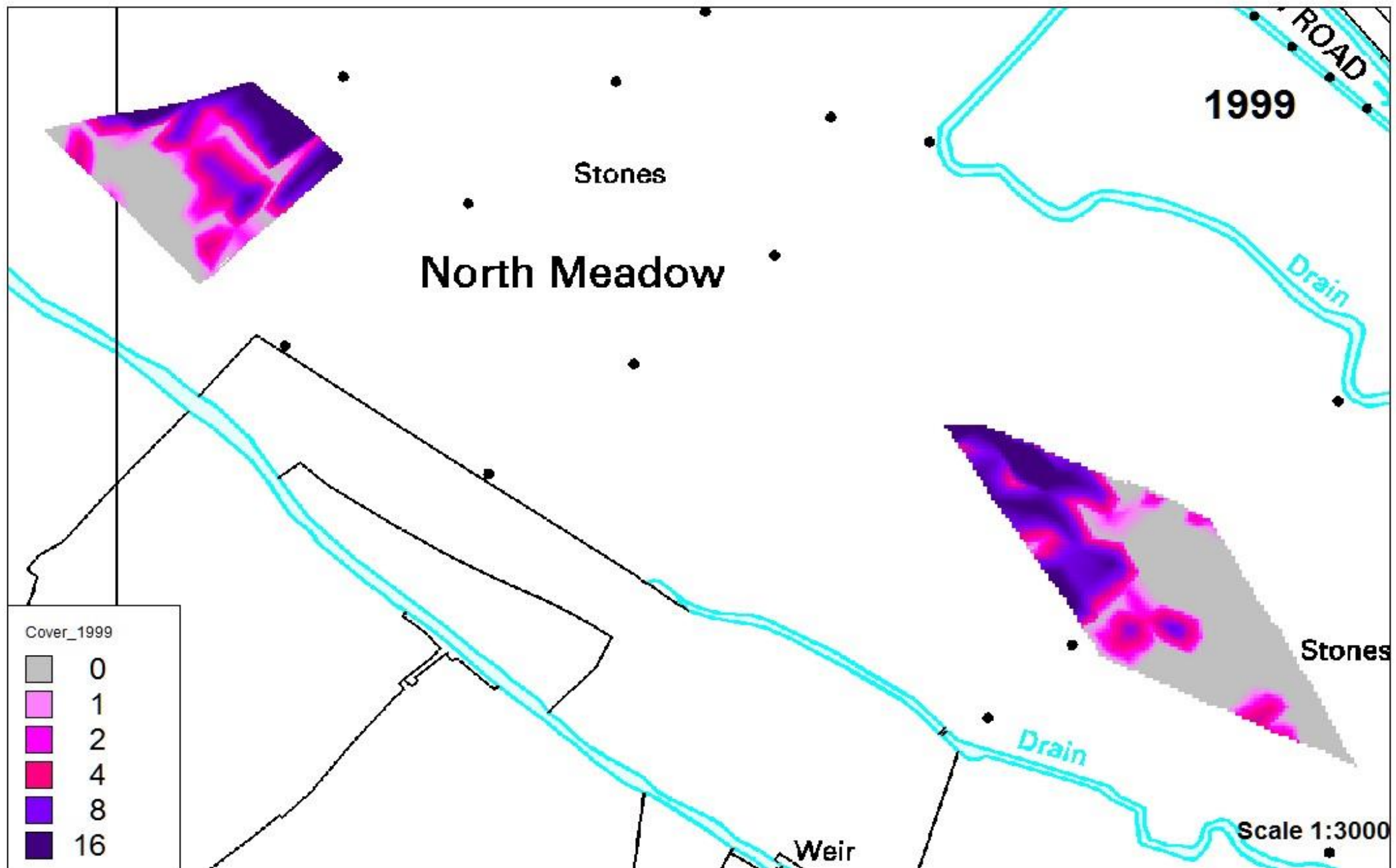
Clements versus Gleason

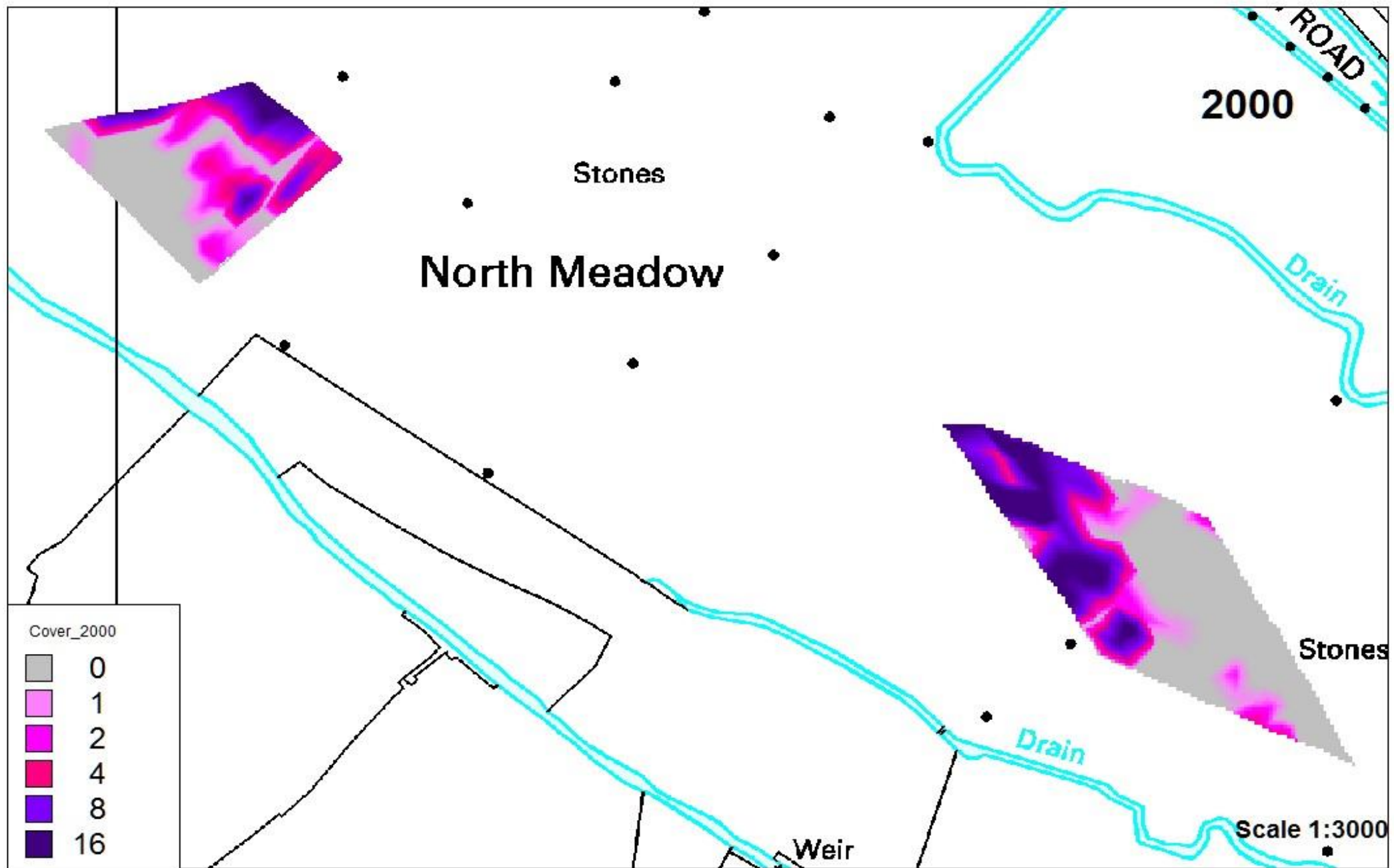


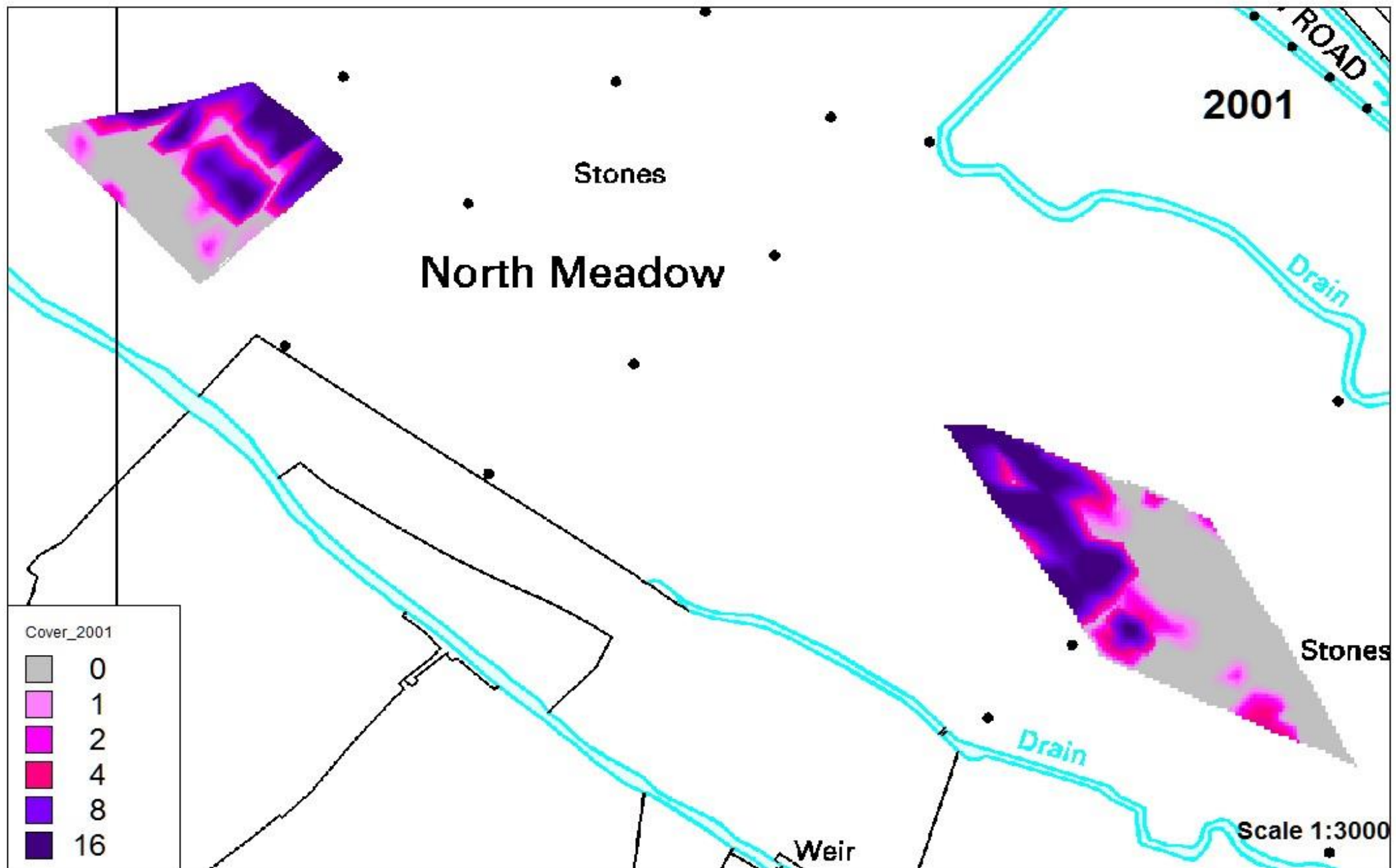
Tetris

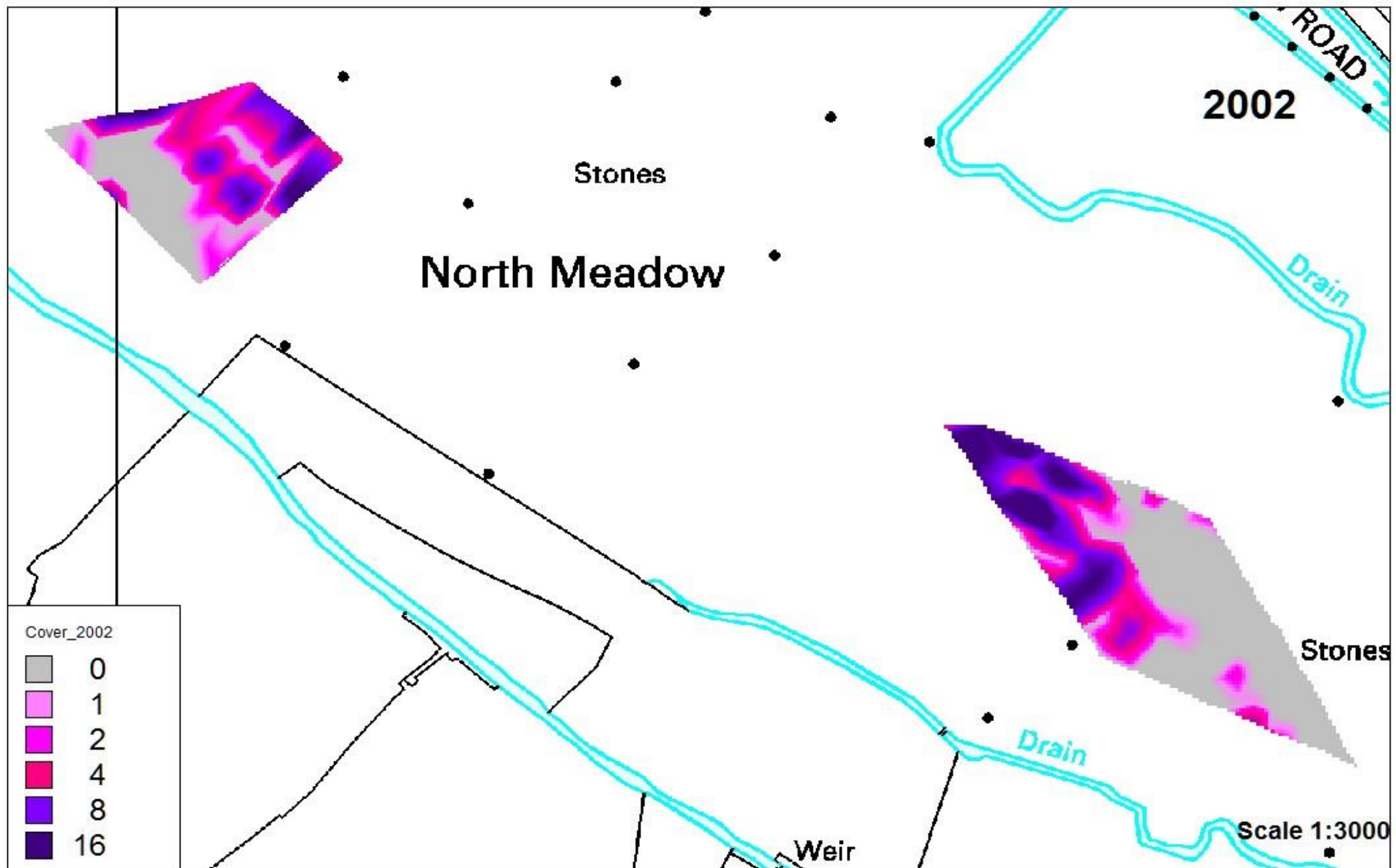


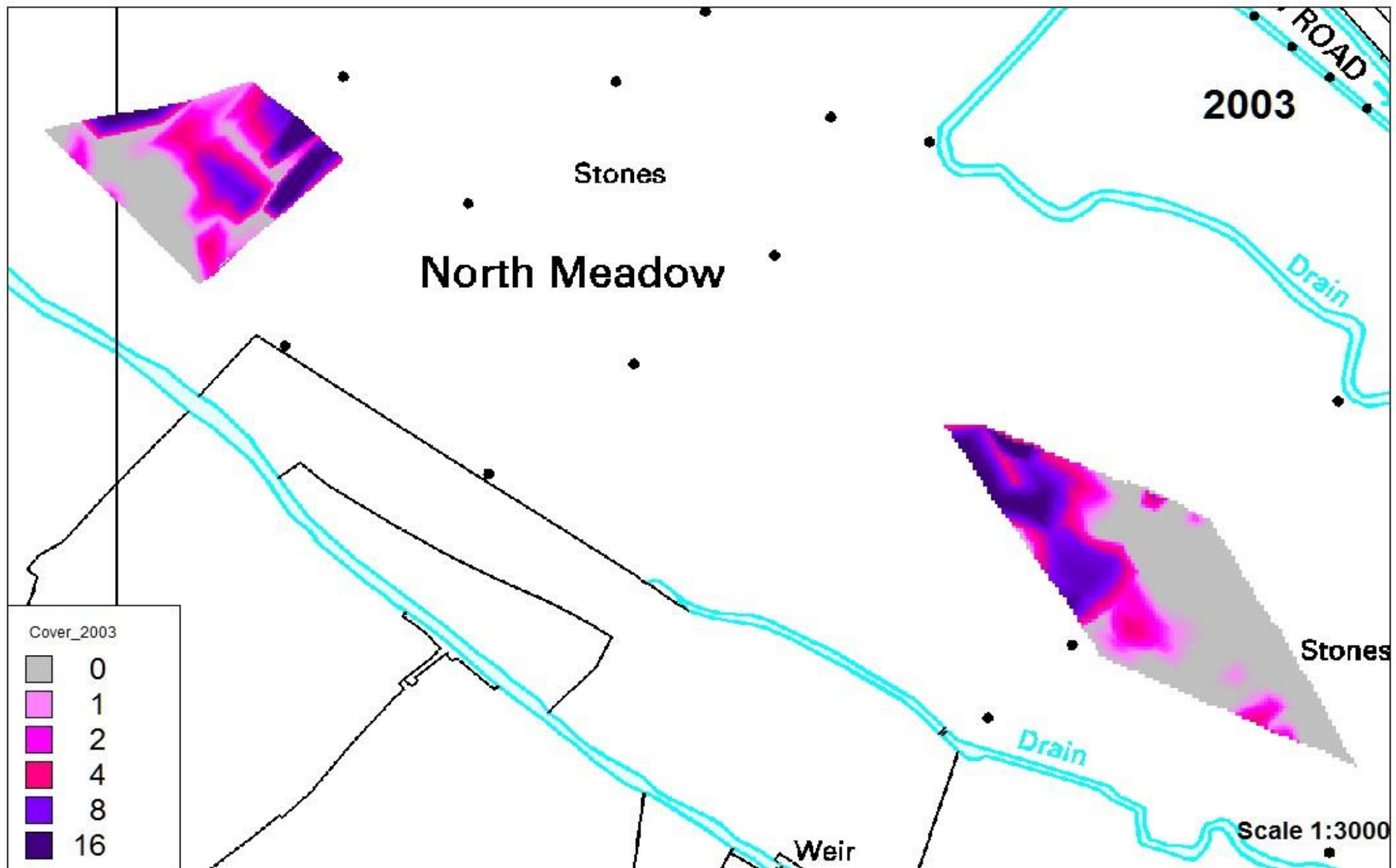


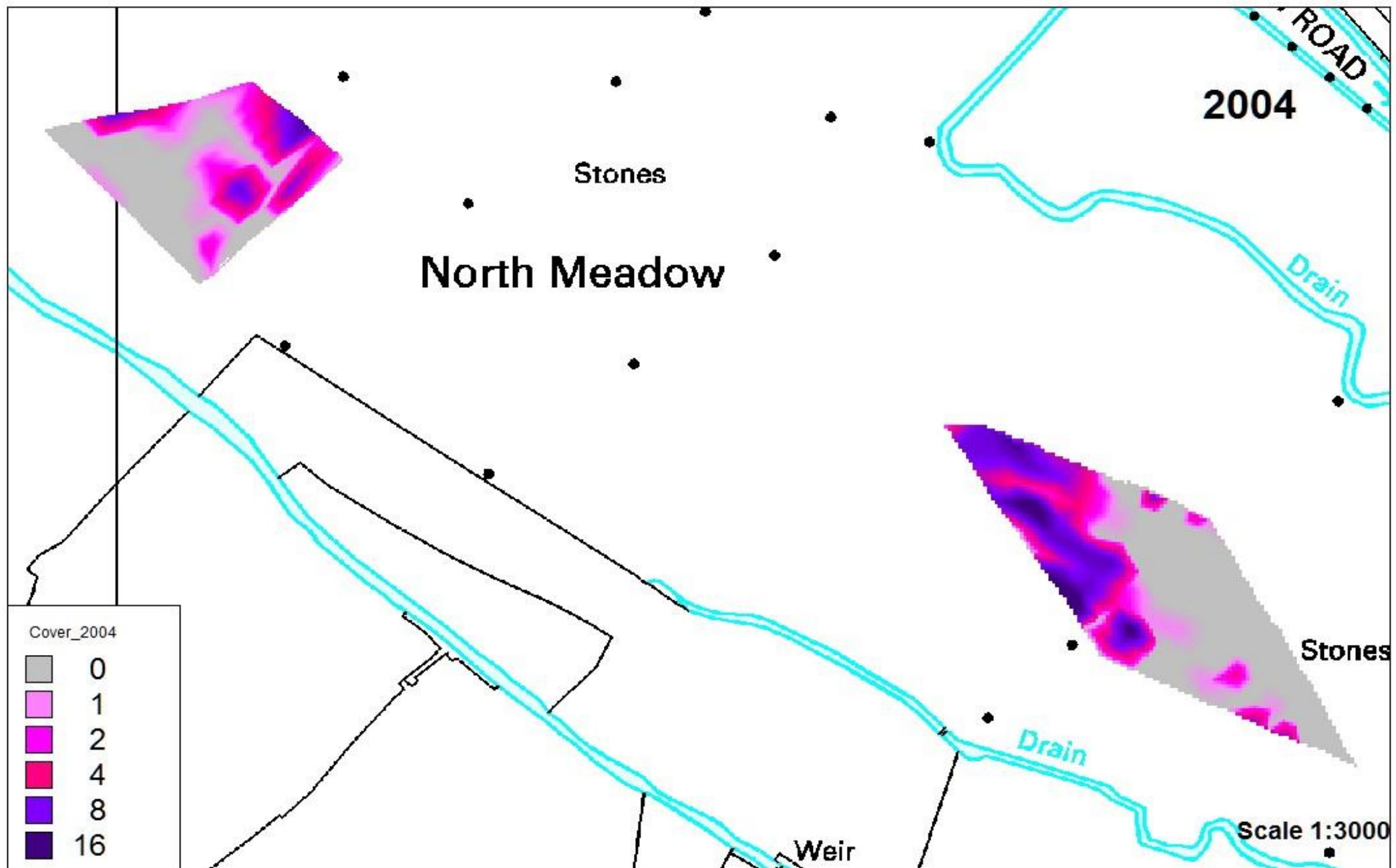


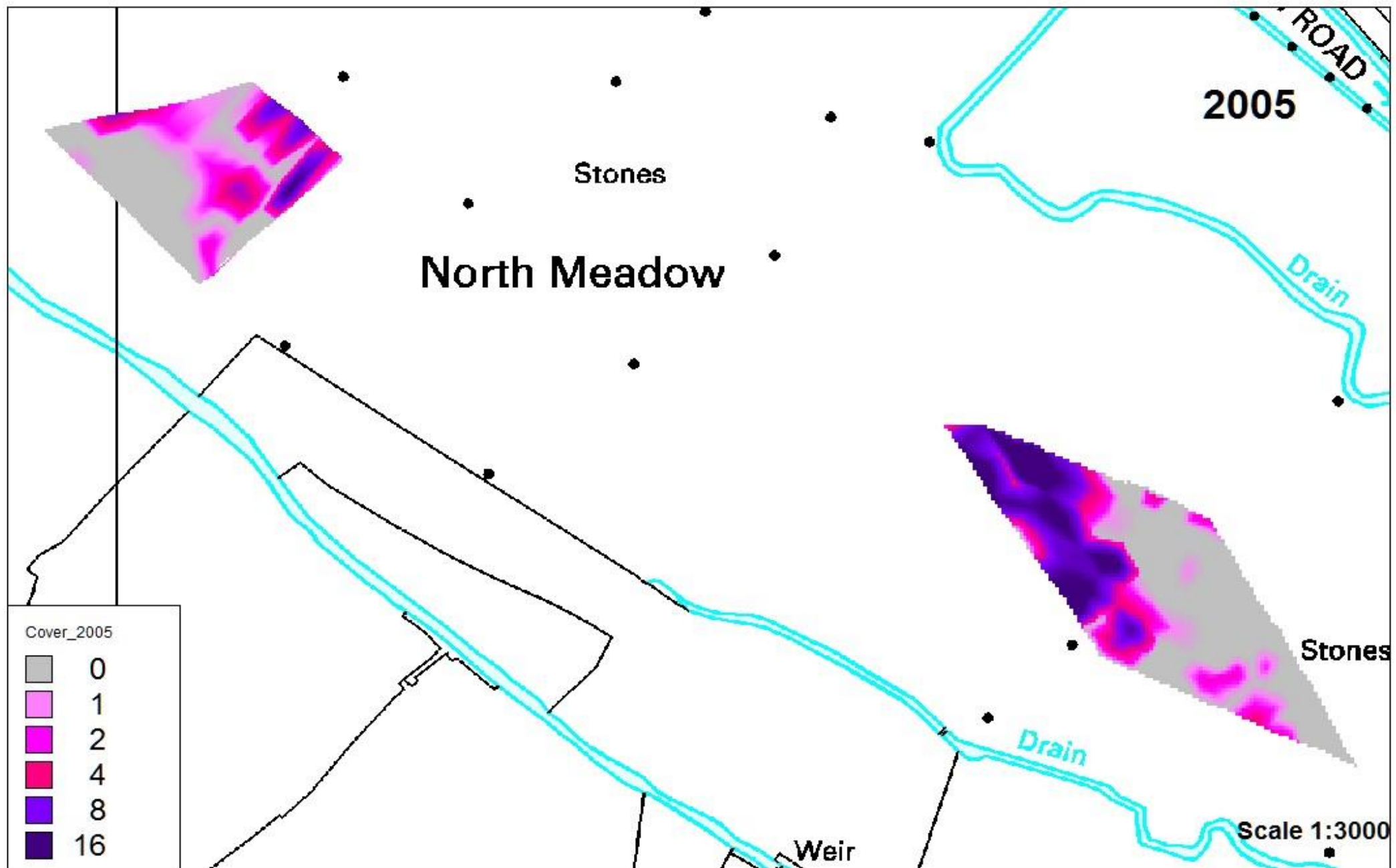


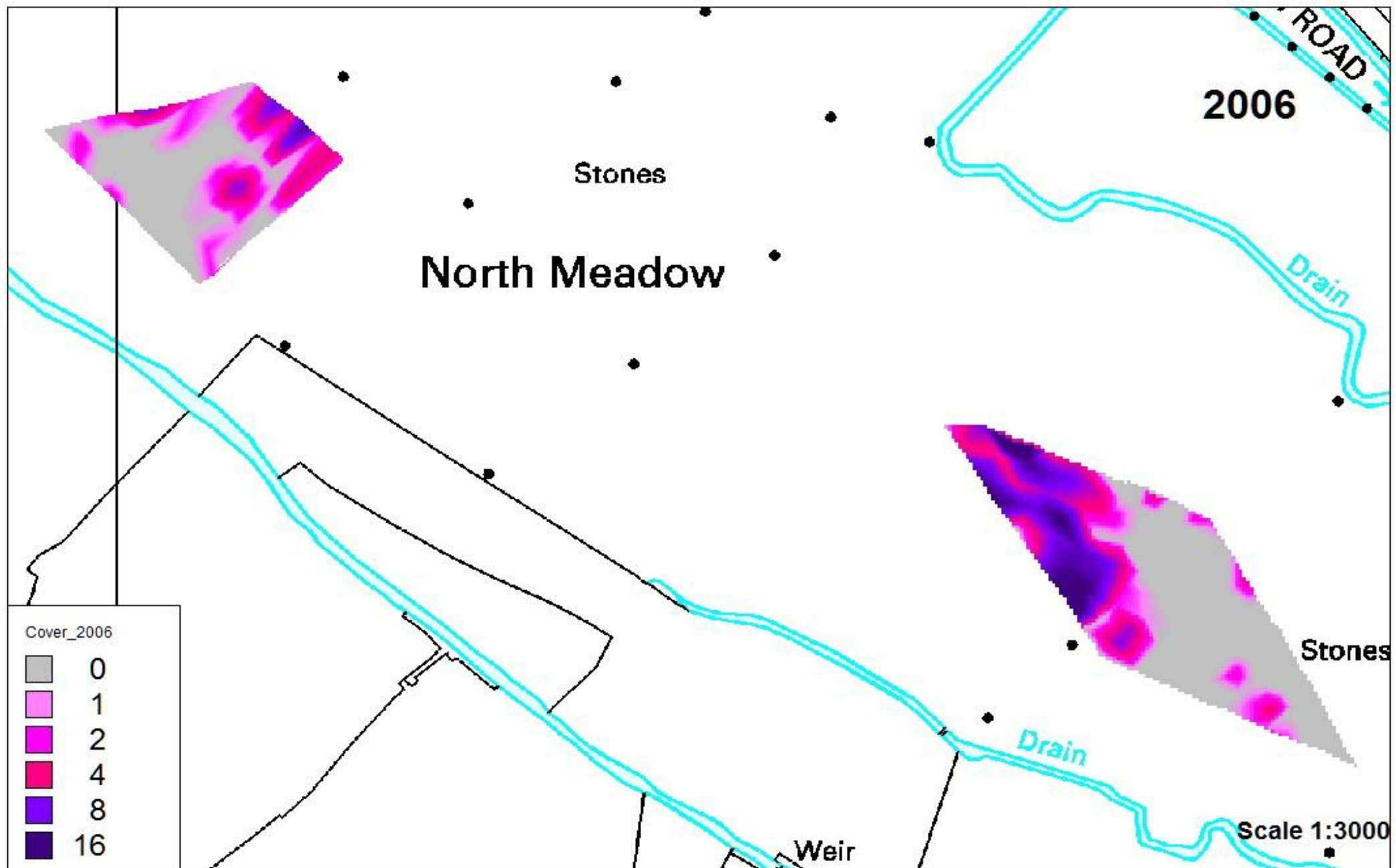


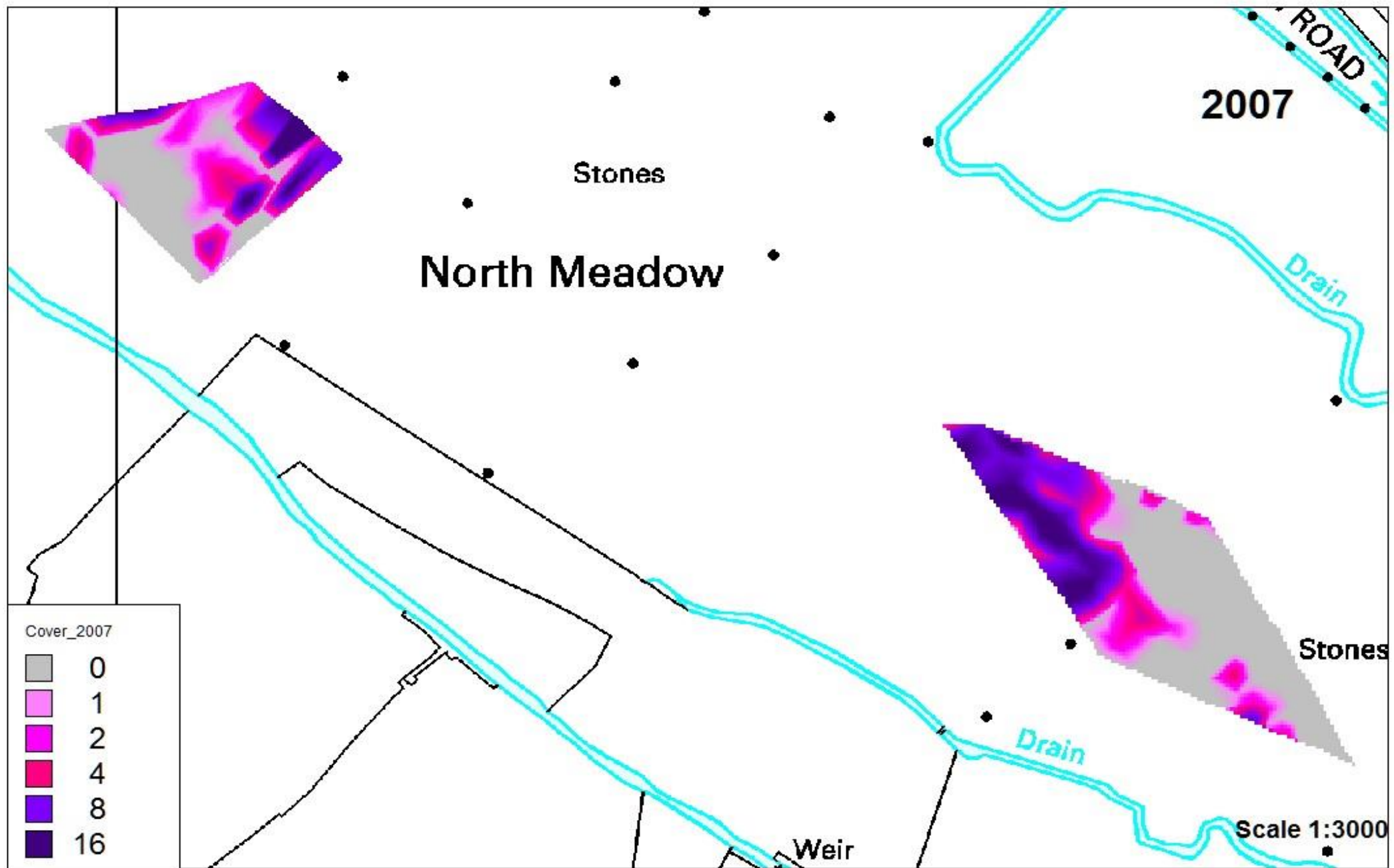


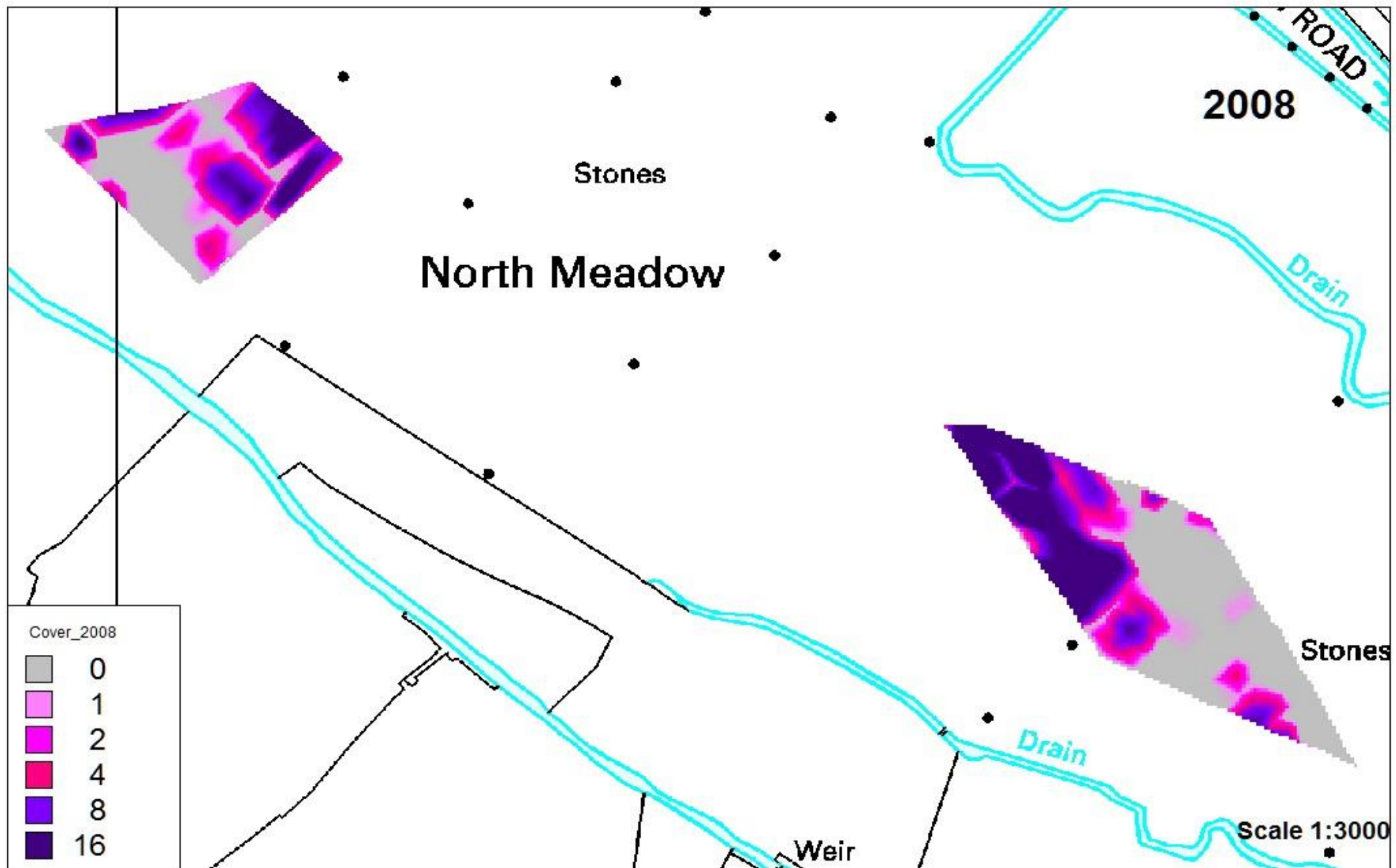


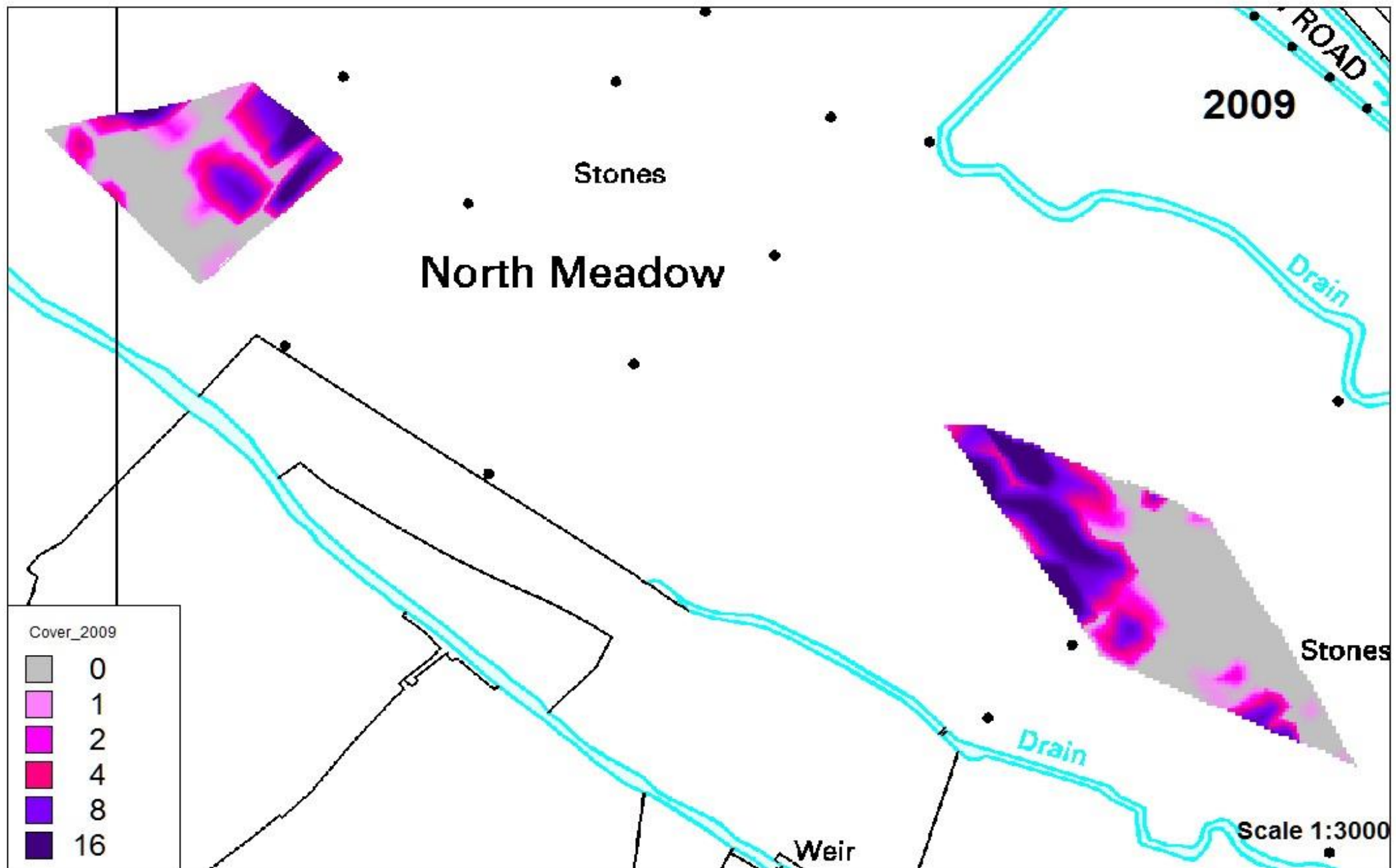


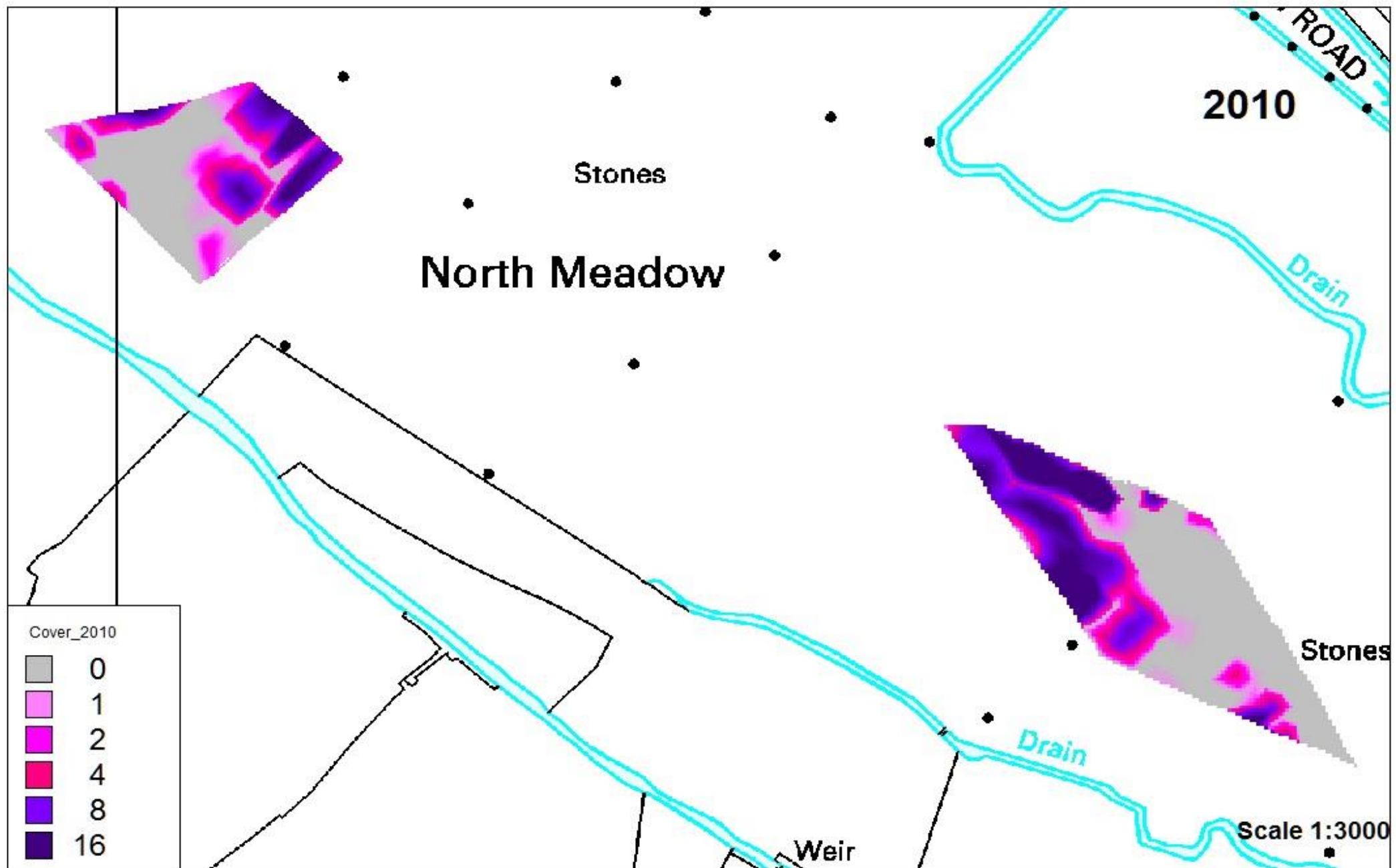


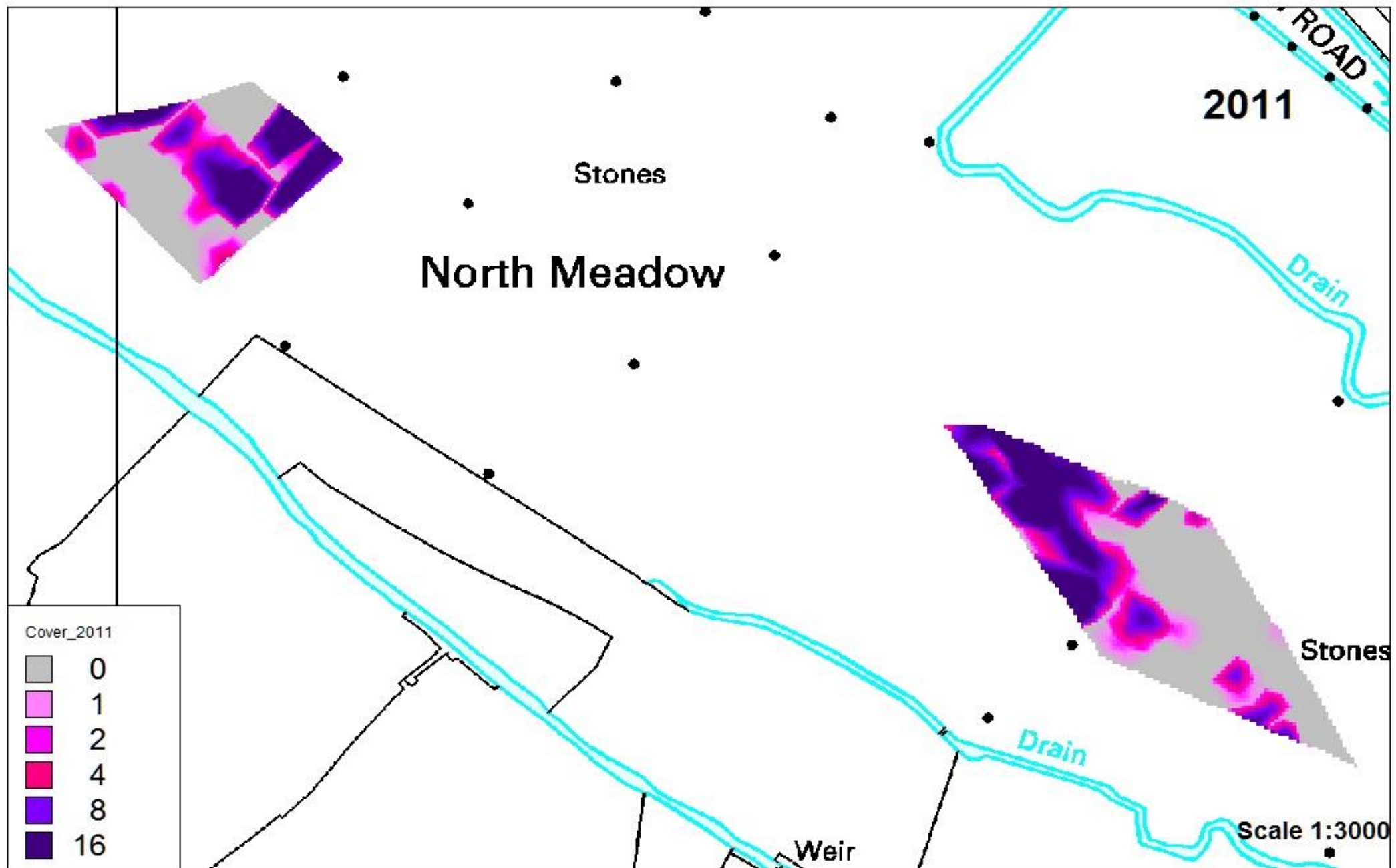














Centre for Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL



Environment Agency



The Grasslands Trust

for wildlife and people

FSC

BRINGING ENVIRONMENTAL UNDERSTANDING TO ALL



Floodplain Meadows Partnership



The Open University





 Floodplain
Meadows
Partnership



Workshops
and
conference

Former owners and managers of Motte Meadows NNR





**“June”
Paul de
Limbourg
(1440)**



Jan Wildens (1615)

“The sweetest place in all the year”

John Clare “to Julia” 1845









Acknowledgements:

Emma Rothero

Mike Dodd

Rob Wolstenholme

Kevin Church

Gordon Spoor

Edward Youngs

Peter Leeds-Harrison

Jo Gilbert

Clare Lawson

Kate Barber

Damion Young

Bill Davies

Heather Gowing

Hilary Wallace

Michael Francis

Steve Ball

Catherine Peacock

Yoseph Araya