Restoring floodplain hay meadows:
a case study of Chimney Meadows nature
reserve in Oxfordshire.

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Upper Thames Floodplain: 1700km²
Chimney Meadows National Nature Reserve SSSI (NVC MG4)
National Vegetation Classification (NVC) Rodwell 1992

Mesotrophic Grassland 4 – Flood plain meadows; Meadow foxtail and Great Burnet grassland

Mesotrophic Grassland 5 – Dry neutral grassland; Crested Dogstail – Black knapweed grassland
Key Objectives

To conserve, expand and enhance key grassland habitats of the floodplain:

- Species rich floodplain hay meadows
- Floodplain grazing marsh
- Reedbeds
• Arable reversion
Phosphate Levels (Scale 1-5)

Previous management:
- a. Set-aside
- b. Spring barley
- c. Winter wheat
Ex-arable field preparation 2004

- Existing vegetation sprayed off using a Glyphosate based herbicide
- Dead vegetation topped 2 weeks later
- Disc harrowed to turn the dead vegetation into the soil
- Seed bed ready
35ha of green hay cut at the National Nature Reserve.
A double chop harvester cut the hay into 5cm sections and blew the hay onto a tractor drawn trailer.
• Green hay then transferred to recipient fields

• A grab transferred the hay into 2 tractor drawn Muck spreaders with rear mounted beaters.
Green hay spread across the field at a ratio of 1:2 donor to recipient site then rolled.
Early Topping (End April – Early May)
Yellow Rattle
(Rhinanthus minor)

Hay cut (July/August)

Aftermath grazing by sheep
Monitoring Management Effects

Two 30x30m plots – Control and Treatment

Contrast plots at the NNR
Surveying the Arable Reversion fields

- 9 Permanent quadrats
- NVC botanical survey
Measuring sward structure

- Drop disc measure of sward height
- % cover of grasses, forbs, bryophytes and bare ground

Surveying the Arable Reversion fields

- Invertebrate sampling: suction sampling
  (75 suckions per 30x30m plot)
Surveying the Arable Reversion fields

Invertebrate sampling: pitfall trapping
How we can look at community structure

Ordination statistics

Redundancy Analysis (RDA)
Example RDA diagram

Plot 1 →
Plot 2 →
Plot 3 →
Plant species associations

Control*05
Control*06
Control*07
Treatment*05
Treatment*06
Treatment*07

Show the position of national nature reserve MG4 / MG5 plots – target for restoration
Similarity of experimental treatments to the nature reserve MG4 / MG5 target

Treatment: $F_{1,14} = 33.7, \ p<0.001$

Year: $F_{2,26} = 15.2, \ p<0.001$

Treatment*Year: $F_{2,26} = 1.03 \ ns$

* Jaccard's similarity is a binary similarity coefficient
Vulnerability of floodplain meadow communities:

Conservation of MG4 grassland relies on a balance of:

1. Water regime

2. Nutrient regime

3. Vegetation management
1. Water Regime: depth zones MG4

Diagram from 'Ecohydrological guidelines for Lowland wetland plant communities' (2004)
Chimney Summer Flooding July 2007
& June/August 2008
Rodwells MG4 constant species

Year

Species richness
2. Nutrient regime: acceptable nutrient deposition rate

NERC funded project NE/F009232/1 'Impact of summer flooding on floodplain biodiversity via nutrient deposition. Prof David Gowing Open University
3. Vegetation management (NNR)

- Hay cut (July/August)
- Aftermath grazing by cattle
Rodwells MG4 constant species

Summed percentage cover

Year

2006  2008  2009

0  10  20  30  40  50  60  70  80
Ground Beetle and Rove Beetle data from pitfall trapping

Abundance or species richness

Year

2005  2006  2007  2008

July 2007 Flood

- N
- Sr

Ground Beetle and Rove Beetle data from pitfall trapping
Further Species reductions:

63% decline in worm density across the National Nature Reserve

100% decline in breeding curlew numbers across the NNR and lower wetland area
To restore and enhance the capacity and quality of the wetland area by:

- Creating integrated wetland features including ponds/scrapes
- Enhancing ditches/rivers
- Creation of flood flow channels
Integrated wetland features
Integrated Hydro-Ecological Research

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL
Key Objectives

To maintain, enhance or encourage colonisation of key floodplain species:
- Curlew, snipe, redshank and bittern
- Grass snakes and great crested newts
- Meadows foxtail, great burnet, Black poplar, Fen violet
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