An assessment of the effects of the 2013-14 flooding on the wildlife and habitats of the Somerset Levels and Moors

Produced by Natural England with support and contributions from Royal Society for the Protection of Birds, Somerset Wildlife Trust, Somerset Consortium of Internal Drainage Boards, Farming & Wildlife Advisory Group South West, Bangor University and Flooding on the Levels Action Group.

Summary Overview

The winter 2013-14 flooding of the Somerset Levels and Moors had major impacts on communities, property, transport infrastructure, tourism and agriculture. Such a significant event will inevitably also affect the natural environment. However, considering how long the area was under water, our understanding is that the effect on wildlife and habitats was perhaps not as great as might have been expected.

Our key findings are summarised below:

- Grasslands reacted in two different ways to the flooding and its aftermath. Older, more established grasslands, which are of greater importance to wildlife, appear to have recovered well whereas more recently established grasslands were either badly damaged or destroyed.
- Wildlife in ditches appears to have survived the flooding. There is a concern that the flooding may have resulted in some aquatic invasive species having spread beyond their previous range. This will need to be monitored.
- The numbers of waterfowl and wading birds remained about average for February, with the floods attracting significantly more of some species, notably ducks, but seeming to displace others, such as golden plover and teal.
- Numbers of breeding waders showed a slight dip in 2014, compared to 2012 and 2013, but were still higher than 2009.
- There seems to have been no significant impact on soil, and the earthworm population is recovering quickly.
- There is anecdotal evidence of reduced numbers of mammals, insects and birds which are not wetland specialists in areas which have not flooded for many years.

We remain concerned regarding the impact of uncontrolled and extreme flooding on farm businesses which need to be economically viable in order to achieve high value wildlife outcomes for the area.

Aerial looking across Southlake Moor, Burrow Mump and North Moor - January 2014.

Introduction

The Somerset Levels and Moors is one of Britain's unique wetland environments where the interface between human activity and the natural world has developed into a spectacular and wildlife rich landscape. The area is recognised as nationally important with 7200ha designated as Sites of Special Scientific Interest and of this 6300ha is internationally important and designated as a Special Protection Area. Much of the area outside of these designations is also very rich in wildlife and all is highly valued by locals and visitors alike.

The Levels and Moors lie in the floodplains of the Rivers Parrett, Tone, Brue and Axe and the farming systems, landscape and wildlife in this special landscape have developed around the ebb and flow of flooding.

In the last two years the Levels and Moors have been subject to exceptional flood events. Between April 2012 and March 2014 the Somerset Levels and Moors were flooded three times. The summer 2012 flooding affected property and infrastructure and was very damaging for agriculture. However, it was the December 2013 to March 2014 flood which was particularly devastating, with around 175 homes flooded. Moorland and Fordgate villages were both evacuated, while Muchelney and Thorney were variously flooded and isolated for months, accessible only by boat.

With the water taking up to 12 weeks to recede, there was significant impact on transport (road and rail closures), business and tourism. The economic effect of this is still being felt. Farming was also severely affected, with thousands of hectares of land underwater for many months. Around six farms and a number of small holdings, including animals, were evacuated from the Moorland and Fordgate area. Local government and agencies have made understanding the human impact and economic cost of the flooding a high priority, and continue to document the effects.

The aim of this document is to summarise our understanding of what has happened to wildlife and habitats in the Somerset Levels and Moors as a result of the winter 2013-14 flood, as best we can. It is not a detailed assessment of the impact of the 2013-14 flood event on wildlife and has come about thanks to a combination of observations by local people, surveys by ecological advisors, and some commissioned surveys.

Question posted to the Flooding on the Levels Action Group:

IMPACTS OF FLOODING ON WILDLIFE: I'm working with Natural England to produce a report on the floods and the impacts on wildlife. It would be great to hear from FLAG group members of changes you have seen in your local wildlife, both during and after the floods. Have plant communities changed in fields, have you seen more of somethings and less, or none, of others?

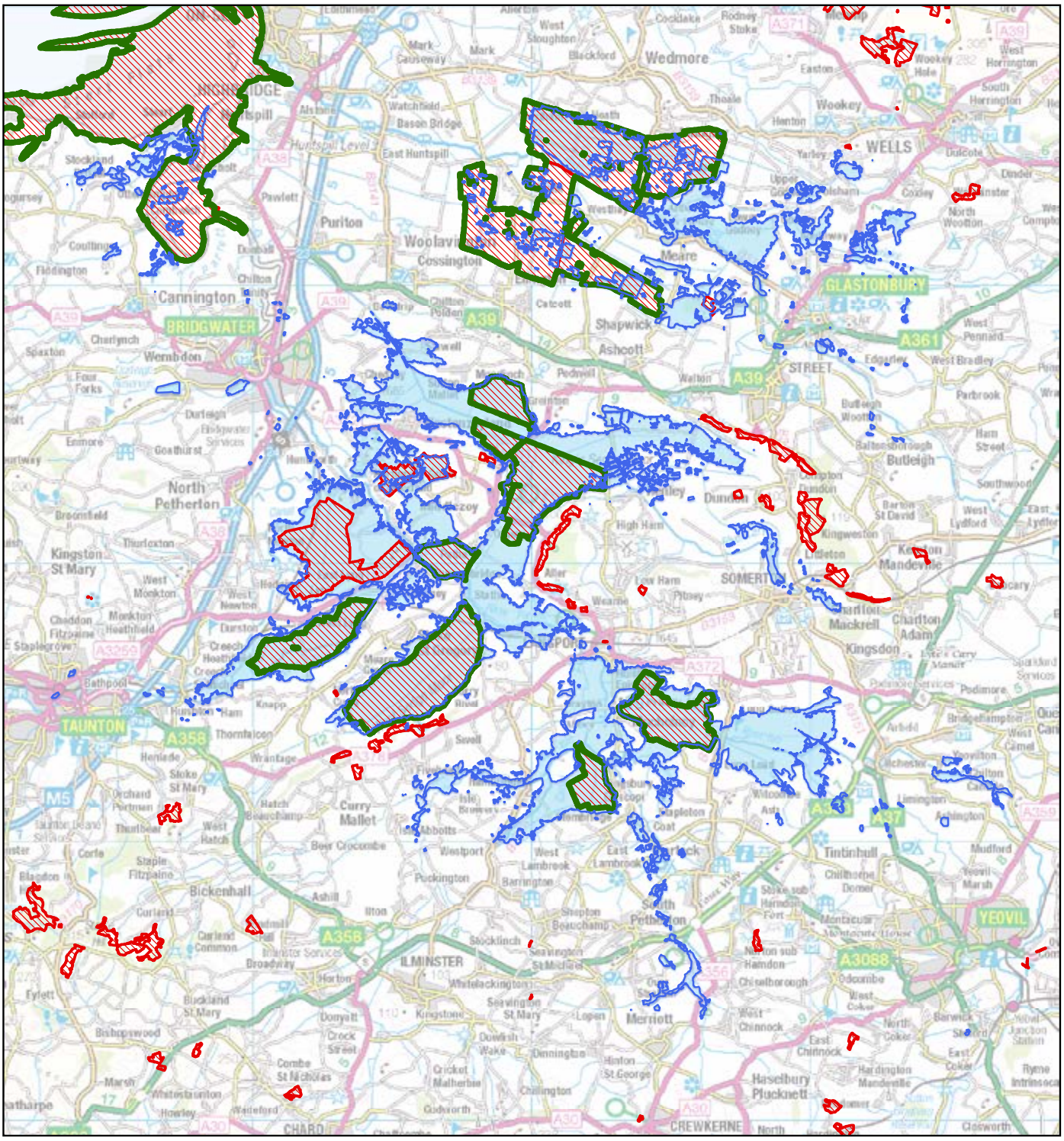
A selection of the responses received can be found throughout this report.

Designated wildlife sites and the extent of flooding on the Somerset Levels and Moors during winter 2013-14

Somerset Flood Event, combined extents © Environment Agency

Special Protection Areas and Ramsars © Natural England

Sites of Special Scientific Interest (SSSI) © Natural England



The flood extent was estimated from colour infrared DMC satellite data at 22 metre resolution. These data were used to map the water extent within the flooded analysis area. Some of these areas would normally be permanent water

The satellite data in this map were provided to EA under the International Charter Space and Major Disasters.

Map produced by David Hunt,GI & AST (1). Date: 03/10/2014. Map Reference:NE141003-1505-322

Summer flooding and Wildlife

Fortunately, deep and prolonged summer flooding is a rare event as it can be damaging in the short term to the habitats and species characteristic of the Levels and Moors.

The scale of impact of a summer flood appears to depend on:

- The air and land surface temperature while the land is flooded.
- The depth of the flood. Plants can continue to grow under shallow water for a period of time so long as the light can reach their leaves.
- The nature of the wet grassland or short-term grass ley affected.
- The length of vegetation in the affected area. Fields with short vegetation (ie. which have been cut or grazed) provides less material to rot compared with longer grass.

Flooding reduces the oxygen available to plants and this effect is worse in summer when oxygen levels are lower in warm water, plants are growing more actively and dead vegetation rots more quickly, reducing oxygen levels further. Water with very little oxygen (anoxic) is a threat to animals also, particularly fish.

Anoxic water being pumped following Summer Flooding, June 2012.

Once the floodwater has turned anoxic, the Environment Agency need to re-introduce oxygen before it can be pumped back into the rivers. This re-oxygenation process can take time and so the impact of the anoxic water on the crops and wildlife of the flooded land can increase.

Summer floods can have a severe impact on arable crops and on short-term grass leys, and can kill these if the flood lasts more than a few days in hot weather.

Older, well established wet grasslands are more resilient but all the above ground vegetation can be damaged or destroyed if covered by floodwater for any significant length of time in hot weather. These established grasslands will recover from the rootstock and seed bank once the floodwater recedes. However unless the crop has already been taken, it will probably have been lost for the season.

Winter flooding and Wildlife

The floodplains of the Levels and Moors are managed to accommodate winter flooding whilst reducing flood risk elsewhere. These flood events are widely recognised as part of the special character of the Levels and Moors in terms of the grassland.

Waterfowl on Greylake.

Over the centuries, the wetland wildlife of the Somerset Levels and Moors has adapted to winter flooding. The older well-established pastures are resilient to winter flooding as is the wildlife of the ditches and rhynes. The area attracts large numbers of wintering wildfowl and waders, most of which come from other wetlands in northern Europe as conditions are more suitable for them in winter on the Levels than in their summer breeding grounds.

The conditions favoured by these wintering birds in winter (late November to end of February) are:

- Large areas of extensively managed wet grassland covered by splashy and shallow water.
- A few areas of deeper water which provide them with safe roosts.
- Dynamic floods with extensive areas of splashy and shallow water provided by floods which come and go in response to rainfall in the catchments.
- A plentiful supply of food eg. seeds floating on the water, and uncovered wet grassland nearby.
- A sense of being safe eg. freedom from disturbance where they feed or roost.

The use of the Levels and Moors by these winter bird populations means they are recognised as being of international importance for their nature conservation interest. They provide one of the great nature spectacles on the Levels in the winter. The calls of the wigeon and teal at night, as they fly from their roosts to their feeding areas are a delight, as is the sight of the large flocks of lapwing and golden plover as they swoop over King's Sedgemoor. These sights and sounds contribute to people's sense of the special place that is the Levels, the coming and going of the seasons and the well-being in the natural world around them.

"No barn owls seen – we have left 2 m (owl food) strips on all our silage fields."

"Swallow population right down..."

"We've lost our resident buzzards..."

1 Grasslands and fields

The Levels and Moors contain an extensive mosaic of wetland habitats including old, well-established wet grasslands (many of which are full of wildflowers), fen and swamp habitats with some short-term grass leys and arable land.

Following the winter floods of 2013-14, Natural England monitored all of the Sites of Special Scientific Interest and the land in Higher Level Stewardship agreements, to find out the effects of the flooding on grasslands.

Although there was variation in the way grassland responded across the Somerset Levels and Moors, a few key effects were noticed at a number of locations:

> *"Certain grass varieties recovered after being under 4ft of floodwater for 10 wks to produce very good volume of hay. Other grass types have not recovered at all. Worms repopulated ground within a very short space of time."*

- Older, well-established grasslands, which are more important for wildlife, recovered faster than short-term grass leys
- Short-term grass and arable crops were either destroyed or badly damaged
- There was an increase in marsh ragwort and creeping buttercup at some locations, which can have an effect on the farming needed to maintain the areas.

Looking more closely at the individual areas, we found that the flooding had a limited effect on wildlife and habitats in the Brue catchment. There was less rainfall in this smaller catchment and floodwater was also quickly moved into the Bristol Channel.

Flooding had a more significant effect on the Parrett catchment area. Across the Parrett catchment, including areas around Langport and Aller Moor, any short-term grass and arable crops which were underwater for a considerable time were destroyed. In common with other areas, the older, well-established grasslands recovered more quickly than short-term leys, in some cases with the help of a little over-sowing in the few bare areas.

Damaged sward.

There has been an increase in marsh ragwort in both the Brue and Parrett catchment, which is proving a challenge to manage effectively. As a biennial plant, it is likely this increase was as a result of the summer 2012 floods, rather than the more recent and widespread flooding of winter 2013-14. Other plants which have increased this year include creeping buttercups and docks, found particularly in more improved fields.

Southlake Moor remained under water from mid-December through to March. It took a long time for grass to start growing once the water was gone, but it has now recovered well with few signs of any damage.

Curry Moor has been affected most, with more improved and semi-improved grass killed than elsewhere. Following the summer 2012 floods, much of the area was quickly sown with more agriculturally productive grasses. Unfortunately, fields re-established in this way were completely destroyed by the winter floods, while those which regenerated more naturally following the earlier floods fared much better.

2 Wildlife living in ditches

The wildlife of the rhynes and ditches in many parts of the Levels are considered to be of international importance and they support several water beetles, snails and dragonflies that have a very limited distribution in the UK. Wildlife of this wetland habitat is well adapted to survive flooding, and many of these species were inactive during the winter floods. Prolonged flooding during the winter of 2013-14 appears to have had little effect on the plants or animals living in the ditches.

Blue-tailed damselfly.

The damage caused by the summer flooding of 2012 was a greater concern because of the potential impact on growing vegetation and greater ecological activity when the flood water became anoxic. However, sampling in summer 2013 confirmed that most of the major invertebrate groups, including beetles, molluscs and dragonflies, were found across Wet Moor and Curry Moor Sites of Special Scientific Interest.

These species were found again during the spring and summer of 2014, along with others, such as pond snails and damselflies.

Ditch plants too appear to have been relatively unaffected by the winter flood in 2013-14, according to the results of surveys carried out in summer 2014. The survey showed that all the typical wetland plants were still present, with species including frogbit, flowering rush, lesser water parsnip and tubular water dropwort all abundant. In addition, the extremely rare greater water parsnip was found in three new locations at Southlake Moor.

There is some concern that invasive floating pennywort may have been carried to new locations by the floodwaters. No evidence has yet been found of this, though we will continue to monitor for signs of spread. In fact we are particularly pleased to report that it seems to have disappeared altogether from the River Tone on Curry Moor.

3 Over-wintering waterfowl and wading birds

Over the centuries, the winter flooding of the Levels and Moors has attracted large numbers of wintering wildfowl and waders – well over 100,000 in recent years, making this one of the top ten UK sites for these birds. Many of these visitors come from other wetlands in North West Europe as conditions are more suitable for them in winter on the Levels than in their summer breeding grounds. The use of the Levels and Moors by these winter populations means that they are of international importance for their nature conservation interest.

A water bird survey was carried out in February 2014, when around two-thirds of the Parrett and Tone floodplains were still deeply flooded. The number of ducks, swans and waders was about average for the first half of the month, but with some variations across the area and between species.

Wigeon.

West Sedgemoor, the main roosting site on the Levels, was deeply flooded and had only 20% of its usual February number of water birds. Other deeply flooded areas, such as North Moor and West Moor, had higher than average numbers.

At least two-thirds of the birds displaced from West Sedgemoor seem to have stayed in the Parrett and Tone floodplains. Most moved to shallower flooded sites such as King's Sedgemoor, Moorlinch and Sutton Moor, where the number of birds was more than double the February average.

As might have been expected, different species reacted differently to the floods:

- There were significantly more pintails and shovelers in the Parrett and the Brue, as birds, attracted by new feeding opportunities,arrived from other wetland sites
- The number of golden plover and lapwing was double the average number in December, but fell rapidly following the first floods. In February, golden plover numbers were about two-thirds of the February average. Lapwing numbers remained close to normal levels, but birds were widely distributed away from the deepest floods.
- Mute swan and wigeon numbers stayed close to average levels in February
- Teal numbers were between 60 to 75% of February average, although they had also been much lower before the floods in December, possibly due to the mild conditions.

The number of ducks in the area was still exceptionally high at the end of March, with 20,000 ducks still present, mainly on West Sedgemoor and Wet Moor.

"Fields around Fordgate had masses of buttercups this year."

"My birds are back in full swing eating 3 feeders full a day, I think a badger has been in the garden. Loads of crickets and grasshoppers in the field and grass growing well."

Cranes

Around 55 cranes wintered on the Levels during the winter of 2013-14, feeding regularly on Stan Moor from late November. Stan Moor also became their main roosting site through to early March, due to floodwater in West Sedgemoor and other low-lying moors.

Small group cranes in floods - March 2014.

The cranes started using North Moor for roosting and feeding as the floodwaters receded in early March. As water levels dropped further by mid-March, they were seen over a wider area, including West Moor, King's Moor, Curry Moor and near Isle Brewers.

Suitable nesting areas for cranes were underwater into April. The first nest was found at the end of April. By comparison, cranes in eastern England were nesting from the end of March.

Grey heron.

Breeding herons appear to have increased following the floods. The number of nests at Swell Wood heronry has fluctuated between 56 and 98 since 2009, but there were 150 nests counted in 2014. This could be due to more food from animals killed or displaced by the floods. Nesting for herons started later, with nest building delayed until early February.

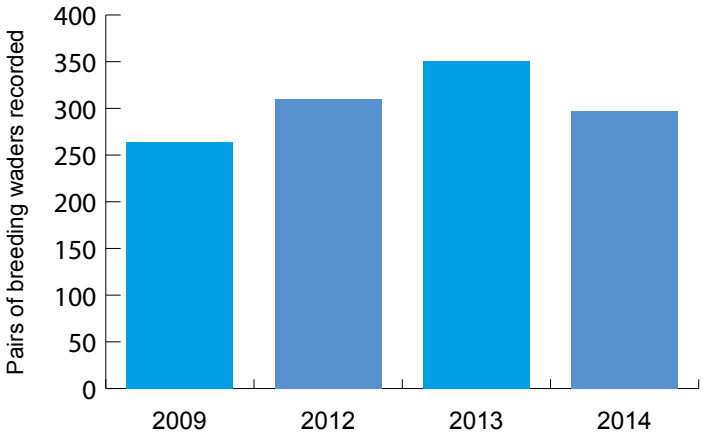
There was also an increase in little egret nests at Swell Wood, from 17 in 2013 to 26 in 2014. This may be linked to greater food availability over the winter and in early spring as floodwaters receded.

Redshank at Tealham (with Tor in background).

4 Breeding wading birds

The Levels and Moors support the largest assemblage of breeding wading birds (lapwing, redshank, snipe and curlew) in south west England.

In 2014 the total number of breeding pairs across all sites was 297, compared with a recent high of 351 in 2013, 310 in 2012 and 264 in 2009. The general picture is one of a continued modest increase in numbers, largely in areas where water levels are managed carefully for wetland wildlife.



Overall numbers of lapwing have remained fairly constant over the last three years, although with some local increases and decreases at different sites. Both snipe and redshank populations have stayed very similar since 2009, apart from a significant increase in 2013. Numbers of both species were back down to 2009 levels in 2014. Curlews, most of which live at West Sedgemoor, seem unaffected by the floods, with levels remaining constant since 2009.

It's not clear whether the winter floods of 2013-14 had any positive or negative effect on the population of breeding birds in the area. Other factors which would have had an impact include the height and nature of the grass in spring, the amount of splashy water around at nesting time and numbers of predators.

It is likely that the winter 2013-14 floods provided more fields suitable for breeding lapwing and redshank than do years without big floods. The receding water in March and into April meant the shorter grass and splashy conditions they need were around for longer than usual.

5 Soil

In the aftermath of the flooding, there was concern about the impact on earthworm populations and soil condition. The reality is that green worms, one of 27 native species of worm, are prevalent on the Levels and Moors and have adapted to living in flood conditions. Earthworms reproduce using egg cocoons that hold up to 50 eggs and can survive flood conditions for up to five months.

Inspecting a soil pit.

Soil surveys on Curry Moor confirmed that, while earthworm numbers were low when the water receded, however they recovered quickly as the eggs hatched and the reproduction cycle started again. These surveys also confirmed there is no evidence of the flooding having had a significant impact on the physical properties of the soil.

6 Wildlife not specific to wetland areas

There are many non-wetland specialist species living on the Somerset Levels and Moors, particularly in areas not subject to regular flooding. The extent of the winter 2013-14 event was so great that many areas where the animal populations are perhaps not well-adapted to flooding were affected.

"Not many butterflies but sadly the plants we used to have that attract them didn't make through the flood."

"Doesn't seem to have affected the grass snakes – have seen a couple in the garden sunbathing this year – normally see 2 or 3 a year."

"Noticeable reduction in the number of Swallows."

"Our rabbit population has increased massively on the ridge."

"Badgers moving back in – new setts being dug."

This has been noticed in particular by members of the community in and around the settlements at Moorland and Fordgate where during the floods local people reported lots of drowned animals and following the floods people felt an absence of wildlife.

Swallow.

Though many animals are likely to have moved to higher ground, those which were unable to escape would have drowned. Others would have put themselves at risk from predators while searching for a new home, as well as using up valuable energy.

More badgers were seen at the roadsides, most likely as a result of them having to move from waterlogged areas. In one incident some badgers stranded on a narrow strip of land were rescued by Secret World Wildlife Rescue.

With domestic gardens having been destroyed in some areas, there will have been some loss of nectar sources for bees, butterflies, moths and other insects. During field visits ecologists observed there appeared to be good populations of insects, including ladybirds and grasshoppers, in most meadows in the area during summer 2014.

"Haven't seen any barn owls since the floods."

"Grass snakes all gone;"

"Our bats seem to have survived but there only seem to be a couple."

"... the mosquitos were down but seem to be back with a vengeance"

However, similar fields had much lower numbers and the reasons for this difference weren't obvious.

A local decline in some insects may affect some farmland and garden birds and people have suggested that swallows in particular had reduced in number in summer 2014 in some areas. Thankfully feedback from the wider Levels and Moors suggests 2014 was generally a good breeding season for swallows.

With small mammal populations likely to have been displaced or destroyed in some areas it is not surprising that a number of people in Moorland and Fordgate have reported seeing fewer barn owls. It remains to be seen whether any temporary reduction in small mammal populations has affected the breeding activity of barn owls in that area.

Conclusion

In this document, we paint a picture of how the nature of the Levels and Moors appears to have responded to the major flood event in the winter of 2013-14. We believe some of the changes we have observed might have been triggered by the floods of summer 2012 or winter 2012-13, and these earlier events may have increased the severity of the impacts on grassland habitats.

Our initial reports and observations suggest that many aspects of the wetland nature of the Somerset Levels and Moors have recovered well. There have been fluctuations in wildlife numbers, breeding patterns and locations for some species, with little change for others. People have noticed an impact on the wildlife, particularly non-wetland species in areas which have not flooded for many years.

Recovery has been strongest in those areas with older, well-established grasslands that are extensively (rather than intensively) farmed, and has been helped by the mild spring and warm dry summer. Wetland environments are very dynamic and can respond quickly to periods of flood or drought, and to more subtle changes in the local environment. Parts of the Levels and Moors have flooded many times before and will continue to flood in the future. Flooding is widely acknowledged as being part of the special character of the Levels. It is a major factor in the area being of international importance for its populations of wintering wildfowl and waders.

Monitoring the wildlife and habitats in the Levels and Moors for signs of long-term change will continue. We cannot take these latest observations as a definitive guide as to how the Levels will respond to flooding in the future. Each event is probably unique with the response being affected by the 'memory' of earlier floods, by the season and by the land management that has taken place before and after the water has receded.

Looking to the future, a healthy natural environment will be most resilient to extreme flood events and best placed to adapt to climate change. We must also consider the future of the farming community that manages the wetland and needs to be economically viable to achieve high value wildlife outcomes for the area. There will be challenges but with the right kind of thinking, support and action there can be opportunities for investments to reduce flood risk while benefitting farming, wildlife and the economy. On this basis there is good reason to be optimistic that the unique wetland environment of the Somerset Levels and Moors will continue to thrive and develop following the winter floods of 2013-14.

Northmoor.

Further Information

The evidence within this report comes from a variety of sources including observations by the local community, Natural England's Integrated Site Assessment (ISA) programme, the joint RSPB, FWAG SW, SWT and NE Breeding Wader survey and a water bird survey undertaken in February 2014 during the peak of the flooding (in Press).

It also draws on the work looking at the Legacy effects of extreme flood events on soil quality and ecosystem functioning as undertaken by Bangor University and co-funded by Defra and the UK Natural Environment Research Council under the URGENCY programme (in Press).

The National Character Area profile contains general information regarding the natural environment and cultural landscape of the Somerset Levels and Moors (including the North Somerset Levels) - **http://publications.naturalengland.org.uk/publication/12320274**

The Great Crane Project: **http://www.thegreatcraneproject.org.uk/**

Environmental Monitoring in England 2012:
http://publications.naturalengland.org.uk/publication/6278902 (Includes reference to ISA)

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