

List of potential MSc projects in association with the Broads Authority 2011/12

Investigate the cause of decline in Common toad, *Bufo bufo*, at Lound Lakes and develop methods of safeguarding the population for the future – (MSc Level)

During the annual toad migration, significant numbers of toads are killed on our roads. Lound Lakes has an active volunteer group who have taken part in the 'Toads on Roads' project, coordinated by Froglife, over the last six years. This scheme utilises volunteers to remove the toads from target roads to prevent them getting run over. It has been observed that the number of toads rescued and those killed on roads has dropped considerably during the past six years. This MSc project will identify the main causes of decline and look at possible ways of safeguarding the population for the future.



What does this project involve?

This project will require an extensive **literature review** to identify potential causes of *Bufo bufo* population declines. Impacts investigated will include changes in the local climate, disease, roads and traffic, non native species invasions including *Crassula helmsii* and large predator populations. Once this is completed, field observations will be undertaken from February to August to recognise the site specific impacts. The project will conclude with an action plan to safeguard Lound's future *Bufo bufo* population. This will include developing a reliable way of monitoring the population, further research needs and active management suggestions to aid their survival.

What can we offer you?

We offer a chance to get hands on experience at tackling a real ecological problem through scientific research into one of Britain's favourite amphibians. Through your research, you will make yourself known to organisations like the BA, Essex and Suffolk Water, Froglife and the Amphibian and Reptile Conservation Trust. Your research will be used to guide practical management solutions to stop the Common toad from declining at Lound Lakes. We have a large volunteer group who may be able to assist with data acquisition. There will be a small budget for any equipment and chemical analysis required.

What skills do you need to do this?

A genuine interest in amphibians is essential and it would be desirable if you had aspirations to specialise in this area. You will also need a sound knowledge of ecological and environmental issues facing amphibians and be keen to safeguard their populations for the future.

How to get in touch?

If you would like to take on this project, please contact Hannah Gray to arrange an informal meeting.

Tel: 07711 439180. Email: hannah.gray@broads-authority.gov.uk

Address: Lound Water Works, Old Yarmouth Road, Lowestoft, Suffolk, NR32 5LZ

Investigate the causes determining the condition of littoral and hover reed margins in the Broads – (MSc Level)

The Broads is Britain's largest nationally protected wetland. It consists of rivers, broads (shallow lakes), marshes and fens, which cover 303 km². It is a unique area, rich in rare habitats, which support a myriad of plants and animals, making it one of the finest and most important wetlands for nature conservation. As a result 28 Sites of Scientific Interest (SSSIs) have been designated, with one third of SSSIs also designated as National Nature Reserves (NNRs). Virtually the entire SSSI network is designated as internationally important for nature conservation under the European Habitats and Birds Directives, and the Ramsar Convention on Wetlands of International Importance.



Why assess the extent of reed margins?

Reedswamp is an important habitat in the Broads wetland. Its loss in certain areas of the Broads is well documented, particularly the Upper Thurne area. The causes of this decline are linked to several factors including mechanical damage, geese grazing, water level stabilisation and water quality.

What does this project involve?

A desk based study investigating changes in the extent of littoral and hover reed margins, using past and present aerial photography.

The extent of littoral and hover reed margins in the Broads should be mapped and quantified, using aerial photography. The factors that may influence the extent of reed margins should be investigated including, water quality, goose grazing barriers and recreational pressure from boats.

What can we offer you?

The project will provide excellent experience using satellite imagery and geographical information systems. Exploring the factors that may influence reed extent will provide a good knowledge of issues affecting habitats in an extensive wetland.

What skills do you need to do this?

You should have at least two year's GIS experience and an interest in ecology and environmental issues.

How to get in touch?

If you would like to **discuss** this project, please contact Erica Murray (Ecologist) to arrange an informal meeting.

Tel: **01603 610734**. Email: erica.murray@broads-authority.gov.uk

Address: Broads Authority, Dragonfly House, 2 Gilders Way, Norwich NR3 1UB

Investigate the quality of fen ditches in relation to environmental factors at How Hill NNR - (MSc Level)

The Broads is Britain's largest nationally protected wetland. It consists of rivers, broads (shallow lakes), marshes and fens, which cover 303 km². It is a unique area, rich in rare habitats, which support a myriad of plants and animals, making it one of the finest and most important wetlands for nature conservation.

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Water soldier by Steve Aylward

Habitats and Birds Directives, and the Ramsar Convention on Wetlands of International Importance.

How Hill National Nature Reserve is owned by the Broads Authority and is part of the Ant Broads and Marshes SSSI. The reserve has a large area of fen surrounded by fresh water dykes containing diverse aquatic plant species. In order to inform site management practices and assess possible impacts from climate change, a methodology for surveying fen ditches should be established. The relationship between plant species present and various environmental factors should be investigated.

Why assess fen ditches?

The fresh water fen ditches in the Broads are becoming more susceptible to saline influence, given the increased frequency and intensity of climatic driven saline events. This combined with the impacts of phosphate from local river systems can reduce the biodiversity of fen ditches.

What does this project involve?

Establish an ongoing methodology for surveying the aquatic plants present in fen ditches at How Hill NNR. Investigate relationships between plant species and environmental factors including salinity, phosphate, water flow and proximity to the river. Investigating management information, including ditch clearance rotations should also be considered.

What can we offer you?

A chance to get hands on experience in ecological survey, gaining skills in aquatic plant identification and environmental monitoring.

What skills do you need to do this?

You will need a genuine interest in wetland conservation, with the aptitude to carry out field work on rough terrain or water. The ability to identify wetland ditch plants is desirable but not essential.

How to get in touch?

If you would like to discuss this project, please contact Erica Murray (Ecologist) to arrange an informal meeting.

Tel: **01603 610734**. Email: erica.murray@broads-authority.gov.uk

Address: Broads Authority, Dragonfly House, 2 Gilders Way, Norwich NR3 1UB

Investigating the relationship of Odonata larvae with tidal and non tidal waterbodies at Wheatfen Nature Reserve - (MSc/BSc Level)

The Broads is Britain's largest nationally protected wetland. It consists of rivers, broads (shallow lakes), marshes and fens, which cover 303 km². It is a unique area, rich in rare habitats, which support a myriad of plants and animals, making it one of the finest and most important wetlands for nature conservation. As a result 28 Sites of Scientific Interest (SSSIs) have been designated, with one third of SSSIs also designated as National Nature Reserves (NNRs). Virtually the entire SSSI network is designated as internationally important for nature conservation under the European Habitats and Birds Directives, and the Ramsar Convention on Wetlands of International Importance.



Wheatfen 'Ted Ellis' Nature Reserve

[Wheatfen](#) nature reserve consists largely of open fen, reed beds, sallow carr and the small broads Wheatfen and Deep Waters.

Why assess the relationship between Odonata larvae and waterbodies?

A total of twenty one species of dragonfly have been recorded at Wheatfen nature reserve over the past 8 years, but there are few records of larval stages. Investigating the relationship of Odonata larvae to different habitat types will help inform conservation management techniques at Wheatfen and in the wider Broads area.

What does this project involve?

A detailed study of the dragonfly and damselfly larvae present in the waterways and ponds (tidal, non-tidal and static) at the Ted Ellis Nature Reserve at Wheatfen, Norfolk. To investigate the relationship between larvae species and habitat type including vegetative cover, water depth and marginal vegetation species. To provide recommendations for Odonata conservation management at the reserve and wider Broads area.

What can we offer you?

A chance to get hands on experience in ecological survey, as well as gaining dragonfly and aquatic vegetation identification skills. The Ted Ellis Trust has a purpose built study centre with microscopes, field equipment and key text that can be used for the study. The Trust also has boats available to assist the researcher in collecting specimens from the deeper tidal channels and broads.

What skills do you need to do this?

You will need a genuine interest in invertebrate conservation, as well as the aptitude to carry out field work on water and land.

How to get in touch?

If you would like to discuss this project, please contact Erica Murray (Ecologist) to arrange an informal meeting.

Tel: **01603 610734**. Email: erica.murray@broads-authority.gov.uk

Address: Broads Authority, Dragonfly House, 2 Gilders Way, Norwich NR3 1UB

Identifying measures to conserve and enhance habitat availability for the European eel in the Broads – (MSc Level)

What is the Broads National Park?

The Broads is Britain's largest nationally protected wetland. It consists of rivers, broads (shallow lakes), marshes and fens, which cover 303 km². It is a unique area, rich in rare habitats, which support a myriad of plants and animals, making it one of the finest and most important wetlands for nature conservation. As a result 28 Sites of Scientific Interest (SSSIs) have been designated, with one third of SSSIs also designated as National Nature Reserves (NNRs). Virtually the entire SSSI network is designated as internationally important for nature conservation under the European Habitats and Birds Directives, and the Ramsar Convention on Wetlands of International Importance.



Why assess the availability of eel habitat?

There is considerable concern regarding the status of the European eel (*Anguilla Anguilla*), with recruitment falling throughout its range of distribution. Eels are integral components of the freshwater coastal marsh ecosystems and inland waterways and are particularly important as prey for piscivores like bittern and otters. As a result organizations such as the EA, RSPB, NWT are now increasingly interested in eel recruitment and stock levels due the knock-on effect the decline in their numbers may have on their own key species. The European eel is a listed BAP species and conservation measures are required to be considered by the Broads Authority. While there are a several of factors contributing to this decline in the European eel there is no doubt that production is also restricted due to eels being denied access to suitable habitat by man-made structures and water level management schemes.

What does this project involve?

By taking into consideration ecological and conservation processes, stakeholders and other organization's priorities and best use of resources the project aims to provide advice on how best to maximise the availability of habitat and eel movement in, out and around the Broads. This project will focus on a specific area of the Broads with the results being applied to the rest of the area in due course. The project will require extensive liaison with other external organizations such as the RSPB, NWT, EA, IDB. It will also be necessary to undertake site assessments of potential habitat, waterways and water level management structures and reviewing existing data sets.



Data collected and collated will be used to create a GIS map identifying and mapping key entry/exit points for eels, movement pathways, habitat availability and relating these to relevant aspects of eel biology and life cycle. Potential mitigation measures will be identified to improve access to habitat and enhancing existing conservation measures to improve the overall status of the eels in the Broads. This will entail balancing and integrating conservation, ecology and essential water level management requirements of other stakeholders, especially with respect to flood defence and agriculture.

What can we offer you?

This project is a great opportunity for anyone looking to get work experience in conservation particularly of aquatic ecosystems. We will be able to provide assistance with contacting external organisations and land owners. Advice will be provided for the assessment of the habitat and water management structures found within the study area. Contribution to subsistence and travel will be available.

What skills do you need to do this?

An understanding of aquatic ecology will be very useful, and a desire to learn more. You will need to be prepared to work in all weather conditions. In order to identify and assess barriers to eel movement, you will require your own transport to get to the field sites. All Health and Safety documentation must be completed prior to commencing work. Good communication skills will be required when contacting landowners for permission to access sites and external organisations for information and data. Good computer skills will also be required to collate and interpret your results and a working knowledge of GIS to present the data.

How to get in touch?

If you would like to take on this project, please contact the Andrea Kelly (Senior Ecologist) to arrange an informal meeting: Tel: 01603 756051. Email: andrea.kelly@broads-authority.gov.uk
Address: Dragonfly House, 2 Gilders Way, Norwich NR3 1UB

Trinity Broads Aquatic Plant Survey – Data analysis and mapping - (MSc level)

Summary

Each year the Broads Authority undertakes a comprehensive survey of aquatic plants growing in the Trinity Broads. Aquatic plant communities within the broads are highly protected features, and are vulnerable to collapse as a result of elevated nutrients, algal blooms and disturbance from fish, birds and storm events. Monitoring of plant communities in the Trinity Broads has taken place for over a decade and has shown significant change in that time period. This project is a largely desk based study of the existing dataset, and will involve mapping and statistical analysis. It is suitable for a student with GIS and statistical experience. Elements that could be investigated include:

- Map distribution of different plant species over the years and discern trends.
- Compare distribution maps with substrate and depth data to determine any correlations.
- Map seasonal variations in plant communities and determine change over the years.



- Compare distribution maps with water quality data to determine whether plant species are displaying nutrient tolerance limits.

What are the Trinity Broads?

The Trinity Broads are located to the north-west of Great Yarmouth, and actually include five broads: Ormesby, Rollesby, Lily, Ormesby Little and Filby. These broads account for 14% of the open water in The Broads National Park. The protected area includes open water, fen and wet woodland, covering approximately 4.5km².

The Trinity Broads have several nationally and internationally important conservation designations, namely a Site of Special Scientific Interest (SSSI) and a Special Area of Conservation (SAC). They are isolated from the River Bure by a sluice, located in the Muckfleet drainage channel. This protects the Trinity Broads from saline intrusion, and nutrient inputs arising from sewage works.

Why do we survey the plants in the Trinity Broads?

In 1995 an 'EU LIFE'-funded project to improve the ecological status of Ormesby Broad was carried out, including biomanipulation of the fish population. This management aimed to create a more diverse fish community, which would allow zooplankton to consume algae, and hence promote clear water. This clear water should in turn support aquatic plants.

Since 1997, annual surveys of the aquatic plants in the Trinity Broads have been carried out to monitor their status. Most years Ormesby Broad supports a varied and vigorous plant community, with notable scarce species occurring. In contrast, the remaining four broads have sparse plant cover, with a tendency towards algal blooms in late summer. However, in the past few years, our monitoring has shown a general trend of improvement in the distribution and diversity of aquatic plants in some of the other broads.

What does this project involve?

The brief for this project is to conduct analysis of the long-term dataset to develop a more detailed understanding of how the plant communities in the Trinity Broads are changing. The project will involve analysing the data through Excel software and mapping the data through 3D analytical mapping software (e.g. Surfer, provided). It is anticipated that the project will be largely desk-based, though there will be an opportunity to assist with the summer plant survey to gain experience of the methodology and species identification.

The first part of the project is to map distribution of different plant species over the years. Are there any obvious trends for particular species or groups of species (e.g. pondweeds, stoneworts)? This mapping should then be compared with information about substrate, water depth and sediment depth to determine any correlations.

Another element of the project could be to assess whether the database demonstrates evidence that certain plant species have nutrient tolerance limits. Studies that have been carried out in other shallow lake ecosystems and in experimental mesocosms suggest some aquatic plants are more vulnerable to elevated nutrients than others. The extensive Trinity Broads aquatic plant dataset will provide a useful 'real-life' test for some of these models.

Another element of the project could be to map individual species peak densities for each year in order to determine whether perceived seasonal variations in aquatic plant communities are real, and whether certain plant species are more limited in their growth season than others. This analysis should then be compared with similar studies in other sites. Other parameters that could be investigated include plant height and macroalgae abundance.

What can we offer you?

This project is a great opportunity for anyone looking to get work experience in nature conservation. You will be working in one of the most intensively monitored shallow lake systems in the UK, and will gain invaluable insights into lake management theory and practice.



What skills do you need to do this?

An understanding of aquatic ecology will be very useful, and a desire to learn more. You should be considering this project as a Master's level project. It is essential that you have computer skills, including Excel, Word and GIS mapping. Experience in statistical analysis of large datasets is important, and ability to interpret trends within these datasets and communicate these in a written report will be essential.

How to get in touch?

If you would like to take on this project, contact the Project Officer - Trinity & Loundto arrange an informal meeting.

Tel: 01493 367814 / 07711 439180.

Email: hannah.gray@broads-authority.gov.uk.

Assessing the effect of salinity on fen plant growth – (MSc Level)

What is the Broads Authority?

The Broads is Britain's largest nationally protected wetland. It consists of rivers, broads (shallow lakes), marshes and fens, which cover 303 km². It is a unique area, rich in rare habitats, which supports a myriad of plants and animals, making it one of the finest and most important wetlands for nature conservation. As a result 28 Sites of Scientific Interest (SSSIs) have been designated, with one third of SSSIs also designated as National Nature Reserves (NNRs). Virtually the entire SSSI network is designated as internationally important for nature conservation under the European Habitats and Birds Directives, and the Ramsar Convention on Wetlands of International Importance.

The Broads have undergone large changes in recent years through nutrient inputs from sewage works and agriculture, which has reduced water quality and affected the fragile aquatic ecosystem. Considerable effort has gone into addressing this issue and many broads and rivers have now been, or are in the process of being, restored to give much lower nutrient loads, clearer water and a return to more balanced, thriving aquatic communities.

Why assess the effect of salinity on fen plants?



The Broads are connected to the sea at Great Yarmouth via the Breydon Water estuary, into which all the rivers within the Broads catchment flow. At high tide saline water can be moved up the river valleys and, through flooding and seepage, affect the adjacent freshwater fens and marshes.

**Hickling Broad and Horsey Mere
with the North Sea clearly
visible. Photo© Mike Page**

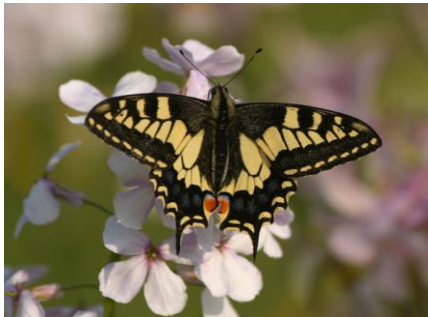
The River Thurne catchment, particularly Hickling Broad and Horsey Mere, is also influenced by saline leakage through the sea wall and wind-blown sand and salt water entering the system.

As sea-level increases (at Lowestoft, mean sea level increased by 2.01 (+/- 0.42) mm per year over the period (1960-1996) saline incursion and flooding are likely to increase. Salinity has been shown to influence the communities of many aquatic species and communities.

In Hickling Broad, increased salinity has been identified as the most likely factor reducing macrophyte growth, especially of rare Stonewort species. Many fen ditch and dyke communities, such as those dependent on Water Soldier *Stratiotes aloides*, are also less abundant or lost where saline flooding occurs. Of particular concern are the River Yare and Upper Thurne fens and marshes, the Yare having experienced several damaging flood events in recent years.

Sites within the River Yare catchment support a number of rare or notable invertebrate species that depend on specific fen and marsh plants for food. In order to manage these species in the future it is important to understand the effects of increased salinity within these areas.

What does this project involve?



Swallowtail Butterflies rely on Milk-parsley as a larval food source. Photo© Nick Sampford

In this project bioassays will be used to test the salinity tolerances of key fen plant species. Appropriate plant species will need to be determined, but an emphasis should be placed on Milk-parsley *Peucedanum palustre*, the main larval food plant of the Swallowtail Butterfly *Papilio machaon britannicus*. Plants will have to be grown or collected, and standard growth conditions established prior to commencing the study. Conductivity data sets collated by the Broads Authority, RSPB, and Environment Agency will be available to establish the tolerance of plants to typical concentrations of chloride (Cl⁻) and sodium (Na⁺) that they would naturally be exposed to currently.

What can we offer you?

This project is a great opportunity for anyone looking to get work experience in wetland conservation. You will be working in one of the most intensively monitored shallow lake systems in the UK, and will gain invaluable insights into lake management theory and practice on a wide scale.



Drainage ditches support many rare species. Photo© Natural England



Haworth's Minor moth uses Cotton-grass as a larval food. Photo© Ian Kimber.

The Broads Authority Senior Ecologist will be your main point of contact during the project. They will be available to give advice on setting up the study and analysing the results. Any useful literature can be provided. Where necessary it may be possible for a member of the Broads Authority team to help with field work. Contribution to subsistence and travel will be available.

What skills do you need to do this?

An understanding of wetland systems will be very useful, and a good knowledge of fen and marsh plants would be desirable. In order to collect specimens, you will require your own transport to get to the field sites. All Health and Safety documentation must be completed prior to commencing work. Good communication skills will be required when contacting landowners for permission to access sites. Good computer skills will also be required in analysing and interpreting the data, and communicating the results as a written report.

How to get in touch?

If you would like to take on this project, please contact Andrea Kelly (Senior Ecologist) to arrange an informal meeting:

Tel: 01603 756015 / 07711 451503. Email: andrea.kelly@broads-authority.gov.uk. Address: Dragonfly House, 2 Gilders Way, Norwich NR3 1UB (as of 8th December 2008).