NORFOLK BIODIVERSITY ACTION PLAN

NORFOLK HAWKER

Aeshna isosceles (Müller 1767)

Norfolk Hawker is a large, gingery-brown dragonfly with conspicuous green eyes. It has largely clear wings, two yellow bands on each side of the thorax and a yellow triangle on segment 2 of the abdomen. Adults fly from May to August, but are most numerous in June and early July. Eggs are laid into living plant material below the water surface and hatch after three to four weeks. Larvae develop over two years.

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Plan Author:	British Dragonfly Society (BDS)
Plan Coordinator:	Waterbodies BAP Topic Group
Plan Leader:	BDS
Date: 25 March 2010	Stage: Final Version
Plan Duration	Five Years

1. CURRENT STATUS

National Status

Norfolk Hawker is a dragonfly that breeds in fen and grazing marsh dyke systems in east Norfolk and east Suffolk. It inhabits unpolluted ditches and dykes, and occasionally small turf ponds. It requires clean water, a rich aquatic flora and sufficient terrestrial space to hunt. In England, it is particularly associated with, although not totally dependent on, a rich aquatic flora that includes abundant Water Soldier *Stratiotes aloides*.

Globally, Norfolk Hawker is a Mediterranean species that is widely distributed in lowland areas of Southern and Central Europe. It is classified as Vulnerable in the North African Red List and is absent from Scandinavia, with the exception of Gotland.

In England, Norfolk Hawker has always been a scarce and local insect, although there are small pockets of relative abundance. Historically, the species was also found in the Cambridgeshire fens, but the last reliably dated record from the Fens was taken in 1893.

Since 1990, Norfolk Hawker has been regularly recorded from a maximum of eighteen 10km squares in Norfolk and east Suffolk. The largest populations are found in the Broads and in the marshes that border the eastern end of the River Waveney. There is a population in Suffolk centred on Minsmere and Sizewell. Further 10km square records in both counties and beyond are the result of wandering migrants or accidently and thus artificially transported larvae.

Norfolk Hawker has full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and is listed in section 41 of the NERC Act 2006. It was included on the national BAP list (2007) and is listed as Endangered in the Odonata Red Data List (2008).

Norfolk Status

Seven of the eight river valley systems or waterbody areas currently occupied by Norfolk Hawker are in east Norfolk, with the majority in the Norfolk Broads. The eighth location is in east Suffolk, on coastal marshes in the Minsmere/Sizewell area. Therefore, the majority of breeding sites for this species are within Norfolk.

Norfolk river valleys or waterbody systems supporting Norfolk Hawker populations are listed below:

- River Ant, including marshes adjacent to Alderfen, Barton and Sutton Broads;
- River Bure, including marshes adjacent to Ranworth Broad and Upton Marshes;
- River Thurne, including marshes at Horsey Mere, Hickling and Martham Broads;
- Trinity Broads and surrounding marshes;
- Halvergate and Acle (Damgate) marshes;
- River Yare, including Wheatfen and Strumpshaw Fen;
- River Waveney downstream of Bungay.

2. CURRENT FACTORS CAUSING LOSS OR DECLINE IN NORFOLK

- **Penetration of saltwater into grazing marshes**: Norfolk Hawker is not tolerant of brackish or saline water and overtopping of river systems can lead to localised extinctions. There are likely to be serious implications for the conservation of this species as a result of climate change and increasing sea levels. Without sufficient coastal protection and inland defences, the predicted sea level rise is liable to inundate the Broads with salt water, forming an estuarine ecosystem. If this is allowed to happen, Norfolk Hawker populations will be decimated, because sea water kills both the dragonfly larvae and Water Soldier plants.

- **Conversion of grazing marsh to arable farming**: During the last century, substantial areas of grazing marsh were lost through conversion to arable land. This significantly reduced the amount of suitable breeding habitat for Norfolk Hawker. Similar changes in farming practice in the future could further threaten the remaining grazing marshes and their dyke systems.

- **Inappropriate ditch management**: Unsympathetic management or neglect of the ditch and dyke systems are severe threats to Norfolk Hawker. The consequences of the loss of traditional benign dyke management techniques are uncertain, as little scientific study has been undertaken, but it is believed the effects are detrimental. Dredging of dykes with machinery increases suspended sediment and removes dragonfly larvae as well as plant material. Additionally, pumped drainage systems cause fluctuations in water levels; these and in particular lowered water tables, disrupt suitable habitats.

- **Eutrophication**: During the last century, excessive nutrient enrichment of the rivers and broads has occurred as a result of the intensification of agriculture and a rising human population. Changes in agricultural practice and increasing pollution from both domestic and agricultural sources have led to a rapid increase in the levels of nitrates and phosphates entering the aquatic system. This in turn has led to a loss of aquatic vegetation and an increased incidence of algal blooms, despite improvements in sewage treatment.

- **Toxic inputs**: The following causes of toxicity have contributed to a general decline in aquatic environments: runoff from agriculture (particularly pesticides), industry, the transport network and domestic sources.

3. CURRENT ACTION IN NORFOLK

- Some suitable management work for Norfolk Hawker has already been carried out by Norfolk Wildlife Trust and Natural England on sites in Norfolk. Scrub clearance to re-establish fen habitat, dyke creation and regular traditional dyke management have all been shown to benefit this species.

- Studies on the biology of this species are being carried out, or have been supervised, by members of the British Dragonfly Society.

- Most of the main breeding sites for this species are designated National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC).

4. ACTION PLAN OBJECTIVES AND TARGETS

National

- Maintain the current (2009) UK range by preventing loss of freshwater sites in Norfolk and Suffolk.

- Ensure all populations are in Favourable Condition (as defined by the statutory agencies) and increase populations within the current UK range by improving site management and creating new habitat.

- Increase the current UK range by up to three locations by 2020 using re-establishment at former sites and/or by ‘conservation introductions’.

Norfolk

- Maintain the current (2009) range in Norfolk by preventing loss of freshwater sites.

- Increase populations within the current Norfolk range by improving site management and creating new habitat.

- Increase the range in Norfolk by one site by 2020, if proven to be feasible.

Norfolk Targets for the Norfolk Hawker *Aeshna isosceles*

Target Type	Target Text	Units Norfolk	Norfolk Objective	Target Date	Monitoring
Range (Maintain)	Maintain current range in Norfolk by preventing loss of freshwater sites.	Norfolk Hawker occupies seven river valley systems and waterbody areas in Norfolk. Breeding recorded in nine 10km squares 1984-2008.	Ensure no loss of range of this species within Norfolk. Breeding populations to be maintained in nine 10km squares.	Ongoing	Annual survey at a selection of key sites; all existing areas surveyed at least once every three years.
Population size (Increase)	Increase populations within the current Norfolk range by improving site management and creating new habitat.	More than 12 per cent of adult records from ten main sites to show abundance greater than 20 individuals. More than 17 per cent of exuviae records from ten main sites to show abundance greater than 20.	Improve sympathetic management of all occupied sites and encourage the uptake of beneficial land management schemes on adjacent land. Future recording should show increased abundance in both adult and breeding populations.	2015	Annual monitoring at a selection of key sites; all existing areas surveyed at least once every three years.
Range (Increase)	Increase the range in Norfolk by one river valley system or waterbody area, if feasible.	Norfolk Hawker to occupy up to eight river valley systems and waterbody areas in Norfolk by 2020.	Ensure successful species' establishment at one suitable new site, if proven feasible.	2020	Annual monitoring following species re-establishment or conservation introduction.

5. Norfolk Hawker *Aeshna isosceles* - Norfolk Action Plan

	National Action (BARS Code[1])	Norfolk Action	Lead Action by	Partners	Date
5.1 5.1.1 **Priority: HIGH**	**Action Plan Process** This plan should be considered in conjunction with the UK Coastal and Floodplain Grazing Marsh HAP and UK Fens HAP (1.5).	This plan should be considered in conjunction with the Norfolk HAPs for Coastal and Floodplain Grazing Marsh and for Fens.	Wetlands BAP Topic Group		Ongoing
5.1.2 **Priority: HIGH**	Encourage integration with other relevant management plans, such as the Lake Restoration Strategy and Broads Flood Alleviation Plan (1.6).	BDS to be consulted by BESL about BFAP proposals in each compartment. BDS to liaise with other partners as appropriate.	BDS	BA, BESL, BESL, EA, E&SWC, NE, NT, NWT, RSPB	Ongoing
5.2 5.2.1 **Priority: HIGH**	**Communication – Advisory** Ensure relevant decision-makers/ landowners/ managers/ all others involved in the management of sites which support this species are aware of its presence and rarity, and of the appropriate habitat management measures for its conservation (2.11).	BDS will seek funding to produce an information and advice leaflet about Norfolk Hawker. BDS will communicate directly with relevant site owners and managers, providing on-site training where necessary.	BDS	BA, BESL, EA, E&SWC, NE, NT, NWT, RSPB	Ongoing
5.3 5.3.1 Priority: MEDIUM	**Communication – Publicity** Use this species to raise awareness of the threats facing freshwater fens, marshes and grazing marsh habitats and of their value to species conservation (3.14).	BDS to include articles about Norfolk Hawker and its habitat preferences in the Society's regular publications and its annual publicity plan.	BDS		Ongoing

[1] The Biodiversity Action Reporting System (BARS) is a national, web-based system for BAP progress reporting.

	National Action (BARS Code)	Norfolk Action	Lead Action by	Partners	Date
5.3.2 Priority: MEDIUM	Raise awareness of the threats to freshwater habitats from sea-level rise and saline incursion (3.16).	BDS to continue its advisory work to both national organisations and local interest groups through its Dragonfly Conservation Group.	BDS		Ongoing
5.4 5.4.1 Priority: LOW	**Funding / Resources** Encourage uptake of beneficial land management and agri-environmental schemes, including Higher Level Stewardship (HLS), on land within or adjacent to occupied sites (4.1).	Identify priority areas of habitat for entry into HLS in order to safeguard or enhance Norfolk Hawker populations.	NE, FWAG	BDS	Ongoing
5.4.2 **Priority: HIGH**	Funds needed to conduct research, survey and monitoring work (4.11).	BDS will seek funds or support in-kind from plan partners and outside sources.	BDS	NE, BA, EA, E&SWC, NT, NWT, RSPB	2015
5.4.3 Priority: MEDIUM	Ensure funding is available to support land management schemes (4.11).	Plan partners to support suitable land management schemes within their own areas.	EA, NE, BA, BESL	Landowners	Ongoing
5.5 5.5.1 **Priority: HIGH**	**Habitat and Site Management** Encourage the sympathetic management of all occupied and nearby sites, especially appropriate grazing marsh management (6.4).	BDS will produce an informative leaflet about Norfolk Hawker that includes advice about management of grazing marsh dyke systems.	BDS	NE, FWAG, NT, NWT, RSPB, WMA	2010
5.5.2 **Priority: HIGH**	Ensure that, where possible, the hydrology and water quality of occupied sites remains favourable (6.18).	Where possible, flood defence work should protect freshwater sites. Monitoring and water management should ensure that clean, non-saline conditions are maintained.	BESL, EA, E&SWC, WMA	NE, NT, NWT, RSPB	Ongoing

	National Action (BARS Code)	Norfolk Action	Lead Action by	Partners	Date
5.6 5.6.1 Priority: LOW	**Habitat Creation / Restoration** Re-create grazing marsh from arable or enhance existing grazing marsh adjacent to established Norfolk Hawker sites (7.2).	Enhance or create 80 hectares of grazing marsh in the northern Broads by special partnership projects.	NE, BESL	NWT, EA, NT, RSPB	2015
5.7 5.7.1 **Priority: HIGH**	**Information and Databases** Ensure information gathered during survey and monitoring of this species is shared between all organisations involved in this plan, incorporated in national databases and uploaded to the National Biodiversity Network (8.3).	All data to be collated by the Norfolk Dragonfly Recorder on an annual basis and then disseminated to other relevant organisations e.g. NBIS. Data to be passed to the DRN and uploaded to the NBN annually.	BDS	All plan partners	Ongoing
5.8 5.8.1 **Priority: HIGH**	**Policy and Legislation** Ensure coastal defence and flood management projects minimise impact on species (9.4).	All coastal and inland defence projects should protect and maintain freshwater conditions where possible and construction works should not adversely affect site hydrology.	Defra, NE, EA, BESL, BDS	RSPB, NWT	Ongoing
5.9 5.9.1 Priority: MEDIUM	**Research** Encourage further research into the species' ecological requirements throughout its range in Eastern England (10.1).	Develop a CASE studentship bid. Develop MSc and undergraduate projects related to habitat preferences and salinity tolerances.	BDS	University partners: possibly Liverpool and/or UEA	2015
5.9.2 Priority: MEDIUM	Research the implications of climate change and sea level rise for this species (10.2).	Research impact of potential changes in Norfolk using salinity data and predictions of sea-level rise.	BDS	University partners: possibly Liverpool and/or UEA	2015

	National Action (BARS Code)	Norfolk Action	Lead Action by	Partners	Date
5.9.3 **Priority: HIGH**	Identify precise habitat requirements and appropriate re-establishment techniques (10.10).	CASE studentship project and DCG expertise will be used to identify requirements and develop methodology.	BDS	University partners: possibly Liverpool and/or UEA	2015
5.10 5.10.1 Priority: MEDIUM	**Site Protection and Designation** Notify all additional Key-Sites identified with significant breeding populations of Norfolk Hawker as SSSIs (11.7).	Define site boundaries, carry out Key-Site assessments and notify Norfolk sites as CWSs in the first instance.	BDS	NWT, NE, NCC	2015
5.11 5.11.1 Priority: LOW (Other relevant actions to be completed first).	**Species Management** Following thorough surveys and identification of suitable habitats, increase current range of Norfolk Hawker by one pilot site (12.8).	A Conservation Introduction will be implemented beyond the reach of coastal flooding and saline incursion if all preliminary studies are favourable.	BDS to co-ordinate surveys	NE, BDS and site managers to implement	2020
5.12 5.12.1 **Priority: HIGH**	**Survey and Monitoring** Conduct regular survey and monitoring of extant sites, seeking to identify any further threats to the species (13.4).	Survey all Norfolk Hawker sites at least once every 3 years. Selected sites to be monitored annually as part of the Dragonfly Monitoring Scheme. BESL sites to be monitored for three years after new soke dyke construction.	BDS	BESL	Ongoing
5.12.2 **Priority: HIGH**	Encourage volunteer participation in the Dragonfly Recording Network (13.6).	BDS to attend events, give talks, run workshops and coordinate a local group. Annual feedback to recorders through the Darter newsletter. Full coverage of all Norfolk grid squares to be achieved by 2012.	BDS		2012

Abbreviations

BA	Broads Authority
BDS	British Dragonfly Society
BESL	Broadlands Environmental Services Limited
BFAP	Broads Flood Alleviation Project
DCG	Dragonfly Conservation Group (BDS)
DRN	Dragonfly Recording Network (BDS)
EA	Environment Agency
E&SWC	Essex and Suffolk Water Company
FWAG	Farming and Wildlife Advisory Group
NBIS	Norfolk Biodiversity Information Service
NBN	National Biodiversity Network
NCC	Norfolk County Council
NE	Natural England
NT	National Trust
NWT	Norfolk Wildlife Trust
RSPB	Royal Society for the Protection of Birds
SBRC	Suffolk Biological Records Centre
UEA	University of East Anglia
WMA	Water Management Alliance

6. DISTRIBUTION

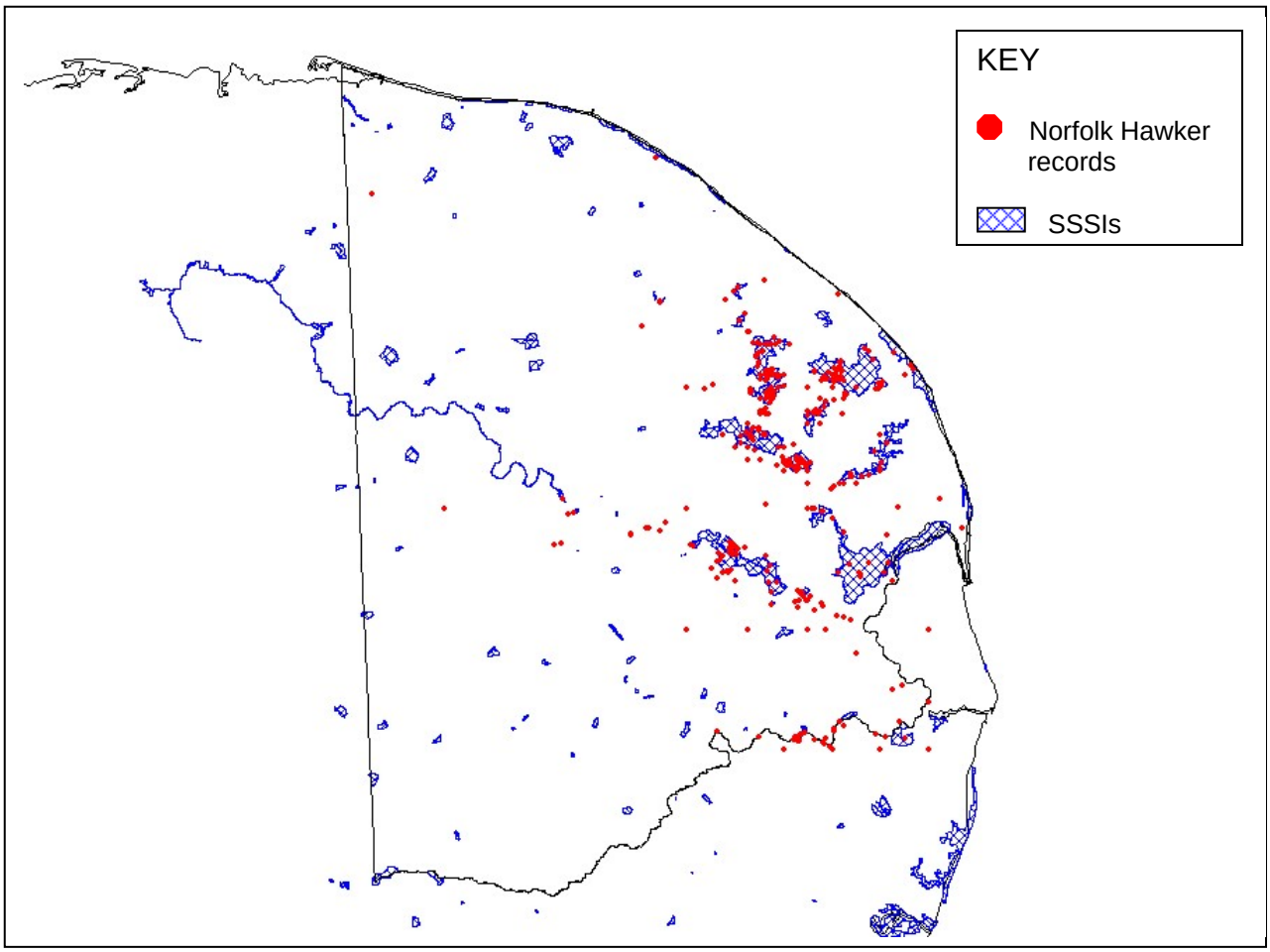

Figure 1. Map showing Norfolk Hawker records in the BDS database to 2008 and current SSSI boundaries in east Norfolk.

7. MANAGEMENT GUIDANCE

(This guidance is a general summary; for more detailed information or advice, please consult the references or contacts below.)

This is general guidance for maintaining current sites at optimal conditions for this species. If a new site is being created, the following information should be utilised to ensure that the new site has the best possible environment for Norfolk Hawker.

The optimum conditions for breeding appear to be unspoilt grazing marsh dyke systems with clean, non-saline water, rushy margins, an abundance of Water Soldier (*Stratiotes aloides*) and the presence of other aquatic plants.

Inhabited water bodies usually contain Water Soldier among the floating vegetation, which provides a large surface of plant material throughout the year. Other plants that are often present include Frogbit, pondweed and Greater Bladderwort. The importance of Water Soldier is not clearly understood, although it does indicate good water quality and supports a wide range of invertebrates, which are potential prey items for the Norfolk Hawker. In Suffolk and a few Norfolk sites, Norfolk Hawker has now been confirmed breeding at locations that are devoid of Water Soldier.

Both the Norfolk Hawker and Water Soldier appear to prefer dykes with a reduced flow rate, such as those found in dykes that branch off the main system or those that have a dead end. Trees and bushes are needed close to breeding sites, as they provide the adults with hunting routes and resting places overnight or during bad weather. Favoured water bodies also have rushes or Flag Iris along their margins providing shelter and daytime resting sites. Norfolk Hawker hawks less and settles more frequently than other Hawkers and consequently territorial males have a higher population density than other *Aeshnids*.

After mating, females lay their eggs alone, almost exclusively favouring the leaves and flowers stalks of Water Soldier and occasionally Frogbit or organic debris. The larvae probably take two years to develop and although little is known about the larval habitats, it is thought that the larvae survive best in association with Water Soldier. During emergence, the insects use a variety of marginal plants, although most emerge on Water Soldier leaves. Norfolk Hawkers usually begin to emerge in late May and they are on the wing until mid August.

Management of Dyke Vegetation

Although dykes and ditches containing breeding Norfolk Hawkers need to be cleared periodically, it is important to undertake this on a rotational basis to ensure that there are always undisturbed areas with suitable vegetation for refuge. Furthermore, care should be taken to avoid restricting water flow. Where practical, alternate banks should be cleared in different years, leaving a reservoir of larvae whilst maintaining the flow. Under these circumstances, succession should be prevented, allowing Water Soldier to become dominant, although too frequent dyke clearance (three to four years) does not allow this to happen. A longer term management regime could be effective, but dykes should not be allowed to become choked with vegetation. In all cases, emergent vegetation encroaching from the dyke banks may have to be controlled. Any material removed from the dykes should be spread thinly on the bank and allowed to drain for a day or two before being removed from the site. This allows larvae and other invertebrates to make their way back to the water.

8. References

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Taylor, P., Moore, N.W., Silsby J. 1996. Management Guidelines: Norfolk Hawker - *Anaciaeshna isosceles* Müller 1767. In: *The Species and Habitats Handbook*, Environment Agency.

9. Contacts

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