BDS

British Dragonfly Society

Southern Damselfly

Management Handbook

Pensarn Corner, Preseli Hills © Stephen Coker

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Summary

The Southern Damselfly (*Coenagrion mercuriale*) is found in south and west Europe and North Africa. The species is threatened throughout its range; it is extinct, or close to extinct, in seven countries in Europe and declining in three. In the UK, the species declined by 30% between 1960-2000[13].The Southern Damselfly is listed as Near Threatened in the European and Global Red Lists and as Endangered in the British Red List.

The Southern Damselfly is protected throughout Europe, with several countries, including the UK, extending this protection through legislative measures. In Europe, the species is listed as an Annex II species of the European Community Habitats and Species Directive (1992). This requires the protection of important species, such as the Southern Damselfly, through the designation of Special Areas of Conservation (SACs). The Southern Damselfly is also listed under Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats (1979). This is implemented in the UK through the Wildlife and Countryside Act (1981) Schedule 5 which protects both the species and its habitat. It is also listed as a species of principal importance under Section 41 & 42 of the Natural Environment and Rural Communities Act (2006).

In the UK, the Southern Damselfly is found in scattered locations in Hampshire, Dorset, Devon, Oxfordshire, Pembrokeshire, the Gower Peninsula and Anglesey.

The Southern Damselfly has very particular habitat requirements for a mid-successional, management dependent habitat. It is important to ensure that sites holding Southern Damselfly populations are managed according to these requirements, as well as potentially suitable adjacent land. Due to their limited dispersal ability, only small areas of the watercourse should be managed in any one year. In addition, potentially suitable areas close to existing populations or between current populations can be managed to reconnect them.

This document aims to provide information on the habitat requirements of the Southern Damselfly and the habitat management techniques practised in order to fulfil these requirements. The use of these techniques will be demonstrated through a series of case studies of sites which are currently managed for Southern Damselfly. This will be achieved by drawing together information from non-governmental organisations (NGOs), statutory agencies, individuals and academic institutions with experience in the habitat requirements and management of Southern Damselfly.

The most important method of sustainable management for Southern Damselfly is the implementation of appropriate grazing. Many sites are no longer suitable for the species due to inadequate grazing. This causes encroachment of the vegetation and, in some cases canalisation, of the watercourse. Grazing also creates the marginal habitat the species requires, with tussocky vegetation for roosting and mating.

The majority of Southern Damselfly sites are Sites of Special Scientific Interest (SSSIs). Management on a SSSI can only be carried out prior to consultation with Natural England or Natural Resources Wales, unless in accordance with an agreed management plan.

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Habitat Requirements

The Southern Damselfly is found in three main habitat types: small streams on heathland (e.g. The Preseli Hills, Pembrokeshire), old water meadow ditch systems on chalk and chalk streams (e.g. Itchen Valley Country Park, Hampshire) and fen habitat (e.g. Dry Sandford Pit, Oxfordshire). However, within these three broad habitat types are found the same conditions required by the Southern Damselfly: unpolluted, base-rich, shallow streams with a constant, moderate flow rate and relatively high water temperatures. Many sites are also at a low altitude[3]. These physical and vegetative requirements are described in more detail below.

Channel profile

Studies in the UK have shown that on heathland and fen, Southern Damselfly larvae are most abundant in shallow (<40cm deep), relatively narrow (usually <5m wide) streams, flushes and runnels[1]. On chalk meadow ditch systems, the species is also found on larger water courses, with shallow ledges along the edge of the ditch[2]. These conditions help provide the warm waters that the species requires, while also reducing water flow and creating a variety of niches and vegetation structures used by the species throughout its life-cycle[3].

Channel bed

Southern Damselfly populations are found to thrive on streams with a bed of inorganic substrate, such as gravel, overlain with peat or silt, up to 30cm in depth[1]. In chalk meadow ditches, larvae are found in silty deposits in ditch edges[2].

Channel temperature

Southern Damselfly larvae require warm minimum water temperatures and are intolerant of freezing of the water course[3]. The small streams and shallow water favoured by the species provides warmer water temperatures, with the ability to increase in temperature at a faster rate than larger rivers.

Permanent flow

Southern Damselflies require channels with a permanent flow[4]. The larvae cannot tolerate the drying out of a watercourse during their two year life cycle and a permanent flow also prevents freezing during colder months.

Unpolluted water

Southern Damselfly larvae require unpolluted water with a high oxygen content[3].

Unshaded streams

Both oviposition and emergence takes place in open and exposed water courses[4]. In addition, heavy shading of a stream reduces water temperature and water can be lost through evapotranspiration by nearby trees, creating unsuitable habitat for both larvae and adults.

Habitat Restoration at Brynberian, Preseli Hills
© Claire Install

Vegetation

The Southern Damselfly is not particularly associated with a specific plant species across its range. However, it is often found in association with certain plants at different sites and different stages of its life cycle. The Southern Damselfly requires sites with moderate to high emergent plant cover but with open banksides, with vegetation heights of generally less than 75cm. Nearby roosting habitat for the adult damselflies is also necessary[3].

Submerged and emergent vegetation

On heathland sites, the Southern Damselfly is particularly associated with Bog Pondweed (*Potamogeton polygonifolius*) and Marsh St-John's-wort (*Hypericum elodes*)[3]. On chalk stream and chalk meadow ditch sites, the species is largely associated with Water Mint (*Mentha aquatica*), Fool's Watercress (*Apium nodiflorum*), Watercress (*Rorippa nasturtium-aquaticum* agg), Water Forget-me-not (*Myosotis scorpioides*) and the speedwell family (*Veronica* species)[3]. These plants are used by adults for ovipositing and perching and the roots are used as shelter by larvae.

Emergent plants are used for emergence, perching, foraging and shelter. On heathland sites, Common Spike-rush (*Eleocharis palustris*) and Jointed Rush (*Juncus articulatus*) are associated with Southern Damselflies. On chalk streams and ditches, they are particularly associated with Reed Sweet-grass (*Glyceria maxima*), Reed Canary-grass (*Phalaris arundinacea*), Yellow Iris (*Iris pseudacorus*) and Branched Bur-reed (*Sparganium erectum*)[3].

Southern Damselfly resting on Bog Myrtle (*Myrica Gale*) © Phil Watts

Bankside and surrounding vegetation

Southern Damselflies require suitable surrounding vegetation for roosting and feeding, with adults roosting up to 50m away from the watercourse. Commonly used plants are tussocky species. On chalk sites, this is predominantly represented by Hard Rush (*Juncus inflexus*) and Tufted Hair-grass (*Deschampsia cespitosa*), while on heathland sites Soft Rush (*Juncus effusus*) and Purple Moor-grass (*Molinia caerulea*) is commonly used. Gorse (*Ulex* species) and Bog Myrtle (*Myrica gale*) are also frequently utilised by roosting adults[3]. Dense scrub and woodland is not desirable on Southern Damselfly sites as it creates unsuitable shaded conditions and also impedes dispersal, preventing population expansion and exchange of individuals between adjacent populations. However, a small amount of scrub or a few trees are useful to provide a degree of shelter on exposed sites[3].

A tandem pair of Southern Damselflies resting on Water Mint (*Mentha aquatica*) © Dave Smallshire

Habitat Management

In order to provide the ideal habitat conditions for Southern Damselfly populations, three main influencing factors must be managed appropriately. These are the physical characteristics, the vegetative characteristics and the chemical characteristics of the site.

Management of physical characteristics

The management techniques discussed in this section are concerned with providing the Southern Damselfly with the shallow, warm water and moderate, permanent water flow they require.

Many of these management techniques are usually required to return a site to its former condition after a period of neglect or in lieu of the necessary conditions. In ideal circumstances, the correct physical conditions should be maintained through a reliable water supply and the poaching actions of grazing hardy ponies or cattle.

Use of livestock

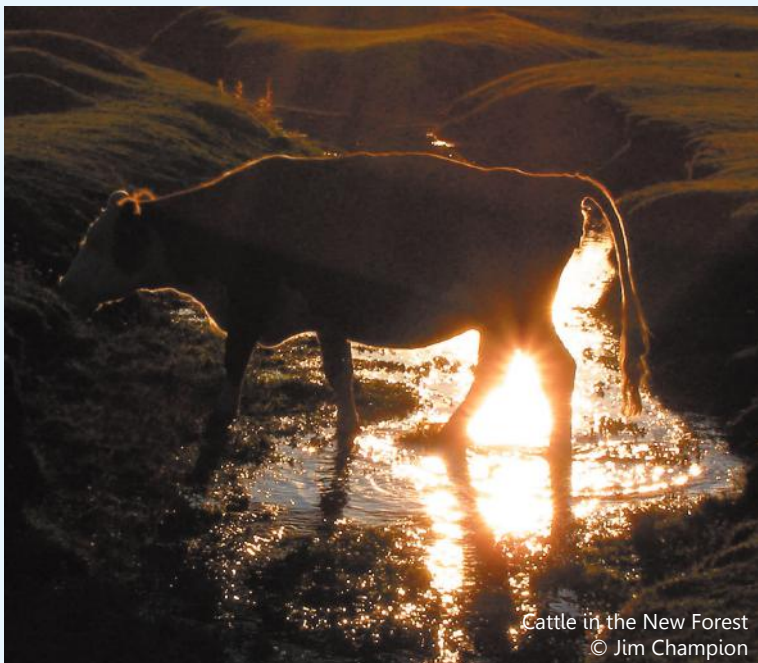
Heavy livestock (particularly hardy cattle) poaching the sides of streams, flushes and ditches used by Southern Damselfly is vital in creating the conditions required by the species[3]. Sheep can also be used effectively on some relatively exposed moorland-edge sites, such as at Prewley Moor, Devon. The action of livestock creates a shallow, open-edged watercourse with a slow to moderate flow. Poaching by livestock sometimes provides the only suitable habitat in watercourses with too high a flow rate in the main channel[3]. In addition, poaching opens up areas of bare silt or mud, encouraging the colonisation and growth of the submerged and emergent plants with which the Southern Damselfly is associated[3,5].

Re-profiling of the watercourse

A common problem with both current and potential Southern Damselfly sites is channel deepening and/or the encroachment of vegetation on watercourses due to a lack of trampling and grazing by heavy livestock. This causes watercourses to become steep sided channels with increased shading and flow rates. Streams, flushes or ditches which have been intentionally canalised through historical management are similarly changed from shallow, slow flowing and meandering water bodies to fast, steep-sided channels. These conditions are not suited to the Southern Damselfly and, additionally, do not support the plants that the species relies upon. It is therefore important to return any streams that have reached this condition to a more suitable profile.

Re-profiling of a water course should not be undertaken lightly. Excavations on current Southern Damselfly sites have negative impacts upon the resident population, which can take several years to recover, and only if nearby populations can act as a refuge[3]. However, such re-profiling is an important last resort for sites whose channels have become greatly overgrown by both vegetation and peat or whose stream profile is not currently suitable for the species. If it is used carefully, such management can have a very positive long-term effect.

When carrying out re-profiling work, it is important to bear in mind the end goal. The intention is not to create bigger, deeper channels but instead to create shallow watercourses with gentle, shallow margins. Methods of re-profiling are site specific, but below are some general guidelines and considerations when planning such work.



Cattle in the New Forest
© Jim Champion

Methods of re-profiling

The fragile nature of Southern Damselfly habitat means care must be taken to cause the least collateral disturbance as possible. It is advised that reconstruction work only be carried out on streams where the Southern Damselfly is not currently present or carried out only on a small proportion of a channel which is inhabited by the Southern Damselfly, with as little disturbance as possible to adjoining areas. Reconstruction work can be costly and complicated due to issues of site access with mechanical diggers, the removal and disposal of large volumes of spoil and potential for damage to surrounding habitat and other protected species.

Before carrying out restoration work, it is important to consider whether intrusive re-profiling work is necessary. Watercourses can sometimes be returned to suitable condition by the addition of heavy livestock with access to the watercourse. A greater than usual stock density, or concentration of stock in the desired area of the site, for a very limited period can have the required effect. A small change to a site's hydrology can also allow the natural regeneration of suitable conditions without invasive reconstruction work. It is also worth considering whether a site can be improved through manual re-profiling using spades. This has been achieved on small sites with a strong volunteer workforce, such as at Moortown Bottom, Devon[7].

Aylesbeare Common © Col Ford & Natasha de Vere

CASE STUDY

By 1998, runnels on heathland at Aylesbeare Common RSPB Reserve, Devon, which had previously supported Southern Damselfly, had become overgrown with tussocks of Black Bog-rush (*Schoenus nigricans*) and Purple Moor-grass (*Molinia caerulea*). For a limited period of two weeks during the following winter, 17 Red Ruby Devon cows intensively grazed the site. Trampling of tussocks and grazing of *Schoenus nigricans* successfully re-opened the runnels and created the shallow, open habitat that the Southern Damselfly requires. The site has since been grazed less intensively by hardy ponies and cattle. In response, the peak count has increased from single figures to more than 300 individuals, without the need for mechanical reconstruction of the habitat[6].

CASE STUDY

Venn Ottery Common, a Wildlife Trust reserve in Devon, held Southern Damselfly populations until intrusive ditch digging and relaxed grazing caused the species to go extinct in 1989[16]. As part of efforts to re-establish the Southern Damselfly here, holes were created in the sides of one such artifical ditch, allowing the water to run down the slope. This has naturally recreated a network of braided, shallow runnels which have since been populated by Southern Damselflies following a successful reintroduction programme[6].

© Gills San Martin

On chalk meadow sites, derelict ditches sometimes lack the shallow edges which the damselfly and its associated plant species require. Such ditches can be re-profiled to provide these conditions. This can be through re-profiling the whole channel, creating shallow edges, or by the creation of shallow ledges ('berms'), between 0.6 and 0.9m wide, excavated in the existing bank of a ditch[3]. These ledges become populated by a broad fringe of emergent vegetation, perfect for the needs of Southern Damselfly. The additional benefits of creating berms in a ditch bank are reduced water flow speed and a reduction in headwater erosion and siltation[3]. A number of other invertebrate and bird species also benefit from the additional habitat provided by poached, shallow ditch margins[8].

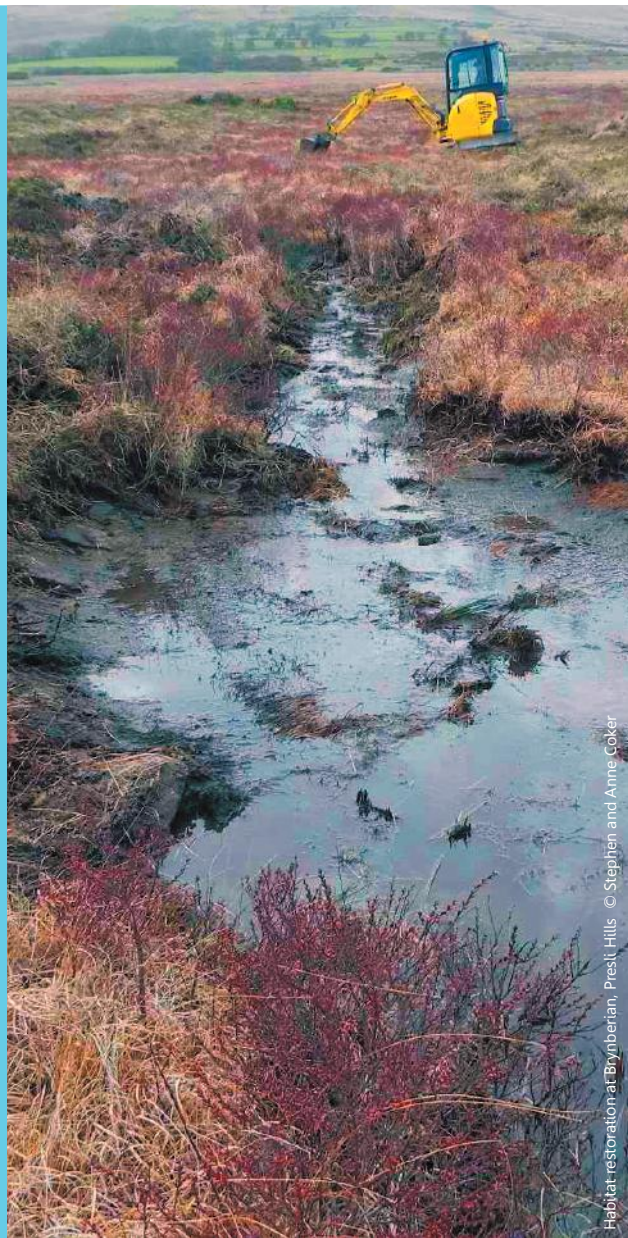
On heathland, re-profiling often involves drawing back encroaching peat and vegetation, creating gently sloping edges to the stream. These shallow edges should continue to the bottom of the channel, ensuring that shallow edge habitat will be available despite differing water levels throughout the year. However, the bottom of the channel itself should not be excavated. It is often necessary to widen the stream in order to create this shallow edge profile. Widening will also prevent rapid re-encroachment of surround peat and vegetation in the absence of sufficient grazing.

It is important when undertaking re-profiling work to consider how quickly the vegetation will once more impinge on the stream. Ideally, grazing livestock should be re-introduced to a site once re-profiling has taken place, maintaining open conditions. However, if this is not possible, a substantial amount of vegetation should be removed and the stream widened significantly in order to achieve suitable conditions for a reasonable amount of time after reconstruction work.

Once re-profiled, small interventions can be carried out rotationally on a regular basis to maintain the required conditions.

CASE STUDY

The Preseli Hills SAC, Pembrokeshire, is one of only three areas in Wales with Southern Damselfly populations. A reduction in traditional grazing in the SAC has caused many of the historic Southern Damselfly streams to become deeply incised, with layers of peat and vegetation covering the surface in many places. This has caused a serious decline in numbers of the species across the SAC. In partnership with Natural Resources Wales and the Pembrokeshire Coast National Park Authority (PCNPA), the British Dragonfly Society undertook work in 2015 to restore targeted areas of stream where known habitat had been lost, as well as to create new areas of habitat. Mechanical diggers were used to draw peat and vegetation back from the streams, to widen streams and to create extra pools and channels. The PCNPA have been working with local graziers to establish a more appropriate grazing regime on the site to maintain the conditions needed for Southern Damselfly.



Habitat restoration at Brynberian, Presli Hills © Stephen and Anne Coker

In addition to creating a gentle stream profile, it is sometimes also necessary to recreate meanders, or reconnect historical meanders, to a stream. This allows silt deposition, which slows water flow, creating further deposition, and supports emergent plant growth. Similarly, the creation of braided channels can slow water flow and create additional suitable habitat within an area. This can be effective, but success is site specific, dependent upon its particular hydrology. In some cases, a lack of sufficient control over the inflowing water can cause one side of the channel to become dominant over the other, leading to the other branch of the channel drying out in periods of decreased water availability. This creates a population sink, as Southern Damselfly adults may lay eggs on the channel which later dries out, killing the larvae[9].

Use of dams

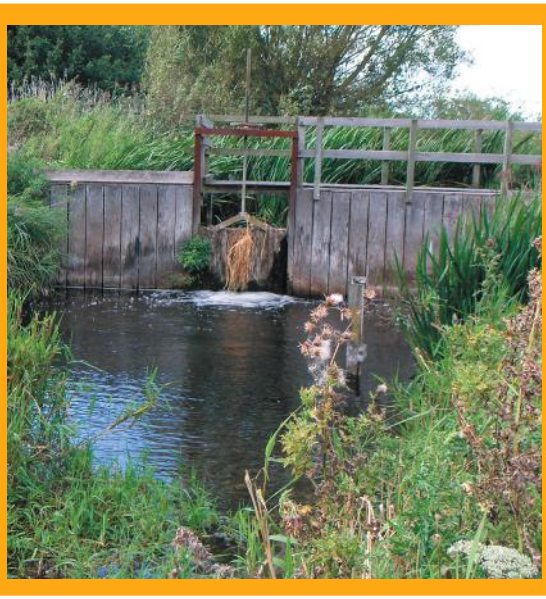
Dams are a useful means by which to slow the flow of a watercourse, create high water levels year round or force a single watercourse to spread, creating an area of shallow runnels. Dams can also be used effectively as silt traps. However, it is not desirable to create sequences of still pools through damming. Furthermore, damming is not suitable on very shallow heathland runnels due to an insufficient water supply[3].

Various materials have been used to create dams on Southern Damselfly sites, including tongue and groove wooden planks, Purple Moor-grass *(Molinia caerulea)* tussocks, earth dams[6] and heather bales[10], which are effective silt traps in addition to slowing the water flow. On chalk meadow ditches a variety of dams can be used. Drop-board weirs are a particularly useful means by which to control water availability, providing high water levels in spring and summer and shallow surface flooding in winter[3].

Mating pair of Southern Damselfly © Paul Ritchie

CASE STUDY

The Itchen Valley Country Park in Hampshire is a key site for the Southern Damselfly with suitable ditches through water meadow habitat. The site receives water via carrier streams coming from the main River Itchen. A number of different types of dam are used to control the flow of water onto the site from the carriers. Some examples from the site are: a small dam with a through-pipe and rotating elbow, allowing fine adjustment on small carrier streams and drop-board weirs, which control water levels but not flows.



Weir at Itchen Valley Country Park © Kevin Young

Management of vegetative characteristics

The management techniques described under management of physical characteristics should provide the conditions needed, at appropriate sites, for suitable plants to develop for the Southern Damselfly. For example, the emergent plants which develop on shallow berms in ditches. The majority of this section is therefore concerned with maintaining the correct sward height and preventing encroachment by vegetation on watercourses.

Grazing

Grazing by hardy cattle and/or ponies is the most important tool in managing a site for Southern Damselfly. As well as creating poached conditions on the edge of a watercourse, grazing livestock maintain a suitable sward height, preventing vegetation from encroaching on the watercourse. Hardy cattle are particularly effective for this purpose as they are more inclined to venture into boggy areas and their weight creates the poached habitat desired[3]. The livestock should be allowed access to the watercourse. The density and timing of stocking will be site specific and vary with annual fluctuations in conditions. Moderate grazing should generally be provided, depending on the degree to which the site has become overgrown; a brief hit of heavy grazing in the winter has been used effectively to break up heavily overgrown sites. The correct levels of grazing can often lead to improved conditions for other species too. For example, the open conditions created by cattle grazing for Southern Damselfly on Aylesbeare Common also benefited plants such as Bog Pimpernel (*Anagallis tenella*) and Round-leaved Sundew (*Drosera rotundifolia*)[6].

It can be useful to have methods by which to focus grazing animals on a particular area of need. This can be achieved in a number of ways, such as using temporary fencing to direct cattle to certain areas, using strategic placement of supplementary feed or drinking water sources (such as pools) to encourage livestock to pass through a certain area or by removing unpalatable vegetation in areas where poaching and grazing are desirable.

CASE STUDY

Colaton Raleigh Common, Devon, has a small population of Southern Damselfly which is maintained largely through the action of cattle, poaching the runnels and controlling the Purple Moor-grass (*Molinia caerulea*) and Black Bog-rush (*Schoenus nigricans*) tussocks through grazing. It had been observed that the cattle created particularly ideal habitat where vegetation had been brushcut for the instatement of an electric fence, encouraging the livestock to venture into these areas. In response to this, runnels which specifically needed targeting for Southern Damselfly were brushcut in winter and the vegetation removed, encouraging cattle to graze and poach here. Additionally, cattle opened up other areas through repeated tracking to and from supplementary feed and water[14].

© Lawrence Wright

Controlled burning

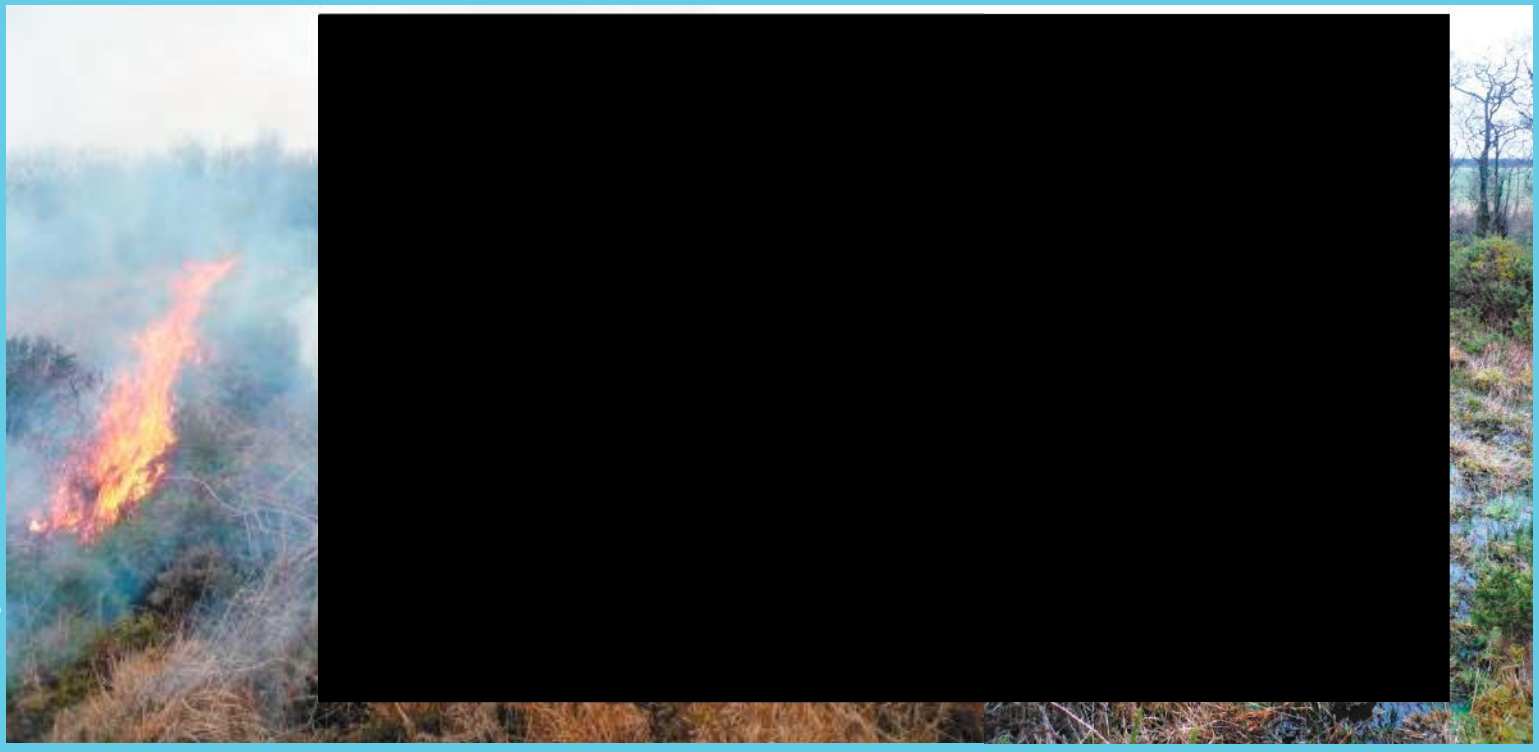
Winter burning on heathland is used at some sites to improve the quality of the grazing[11], particularly in the vicinity of Southern Damselfly channels to encourage grazing in those areas. It can also be used to prevent or reverse the encroachment of scrub on heathland channels[12].

However, there is research to suggest that burning can be detrimental to Southern Damselflies, showing that it can reduce the amount of aquatic vegetation, damage bog-mosses (*Sphagnum* species) and pollute the stream[3].

If burning is to be used at a site supporting Southern Damselflies it should be in small amounts on large sites whose management has featured successful controlled burning in the past. Burning should strictly not be carried out on areas with bare peat, marshy areas or those with rare plant features. The burning codes for England and Wales state that burning should not take place within 5 or 10 metres, respectively, of a watercourse, unless as part of an agreed restoration or environmental management project[17,18]. Therefore, burning should be considered very carefully and on a site by site basis.

CASE STUDY

Dartmoor National Park includes areas of lowland heath supporting populations of Southern Damselfly. Since first finding the Southern Damselfly there in 1995, the Dartmoor National Park Authority (DNPA) have been directly managing relevant habitat for the species. As part of this management work, the DNPA has implemented burning of Gorse and Purple Moor-grass (*Molinia caerulea*) adjacent to runnels at two Southern Damselfly sites. Removing this vegetation has encouraged the livestock to graze near runnels, creating poached areas and controlling the vegetation[7].



Controlled burning at Tor View Moor, Dartmoor © DNPA

Tree and scrub control

Many sites have declining Southern Damselfly populations due to the encroachment of scrub on the channel. This has multiple negative effects, including overshading, reduced water availability due to transpiration, excess nutrients in the channel and an impediment to adult damselfly dispersal to adjacent sites. Therefore, scrub and tree removal is an effective, and very important, management tool in restoring suitable habitat for the species and in long-term management of such habitat, particularly in the absence of sufficient grazing.

Trees should be removed from alongside channels. It may be necessary to also remove stumps, if the tree species is question is likely to re-grow, for example willow. Tree stumps away from the watercourse can be treated with herbicide to prevent regrowth.

Regular removal of scrub and herbaceous plants along channels, both on heathland and chalk meadow sites, in sections on a rotational basis, can keep them sufficiently clear for Southern Damselfly, although establishing a grazing regime is preferable. This can be achieved with a brush cutter and/ or pulling, simulating the effects of grazing. It may be necessary occasionally to mechanically remove vegetation from banksides even with a grazing regime in place as cattle can sometimes avoid plant species, such as Black Bog Rush (*Schoenus nigricans*) which are known to shade out channels[6].

It is important to retain scattered areas of scrub within 20 metres of, but not directly adjacent to, the channel, as this is used by adults for shelter and roosting sites. However, scrub should not be retained when it lies between adjacent sites or between a current site and potential future habitat as this will prevent dispersal. All cleared material must be removed from the site to prevent enrichment of the watercourse[12]. If cut material is burnt on site, the fire should be positioned away from the water and all ash removed afterwards to prevent enrichment of the watercourse and surrounding soil.

CASE STUDY

Clearance work at Creech Heath © Chris Dresh (ARC)

Creech Heath in Dorset is about 80 hectares of old clay workings, with a mix of permanent pools, running water and seepages. It is home to a small colony of Southern Damselfly but in recent history much of the site had become overgrown with vegetation and no longer suitable for the species. In 1994, Amphibian and Reptile Conservation (ARC) opened up 120 metres of stream, with 80% of the Willow scrub removed, leaving small clumps for roosting and shelter. Further work in 1998-9 cleared a number of hollows and gullies which linked adjacent sites. Chainsaws were used to clear some trees, while those nearest to the channel were removed using bow saws, avoiding contamination of the watercourse with petrol and/or chain oil. Material was removed and burned while large logs and some stumps were removed using a winch. Stumps away from the channel were treated with Triclopyr herbicide to prevent regrowth. Further channels were dug by hand and additional pine and birch removed, further decreasing shading.

Prior to this work, around 40-70 Southern Damselflies had been counted with the population centred on the few remaining open areas. Within two years of the clearing work, however, Southern Damselflies were seen on the cleared channels, with numbers at around 150-200 in the early 2000s[15].

Management of chemical characteristics

Southern Damselflies are sensitive to water pollution, making clean water with a high oxygen content an important part of their habitat requirements. Whilst water pollution does not account for the majority of recent declines in Southern Damselfly populations in the UK, it is thought to have had a detrimental impact in the past[3] and is therefore an important consideration when managing sites for the species.

Regular monitoring of a Southern Damselfly site should pick up changes in vegetation signalling eutrophication of the water course, such as algal blooms and an abundance of plants species indicative of site enrichment[1].

Nutrient run-off from farmland is the usual source of enrichment in the water course. This should be kept to an absolute minimum in farmland in the surrounding catchment, through negotiations with local farmers on the level of artificial fertiliser use[3] and use of land management schemes. Some worm treatments are also harmful to invertebrates and care must be taken that local farmers are not using such treatments[12].

Siltation is a potential problem. Re-profiling watercourses, from fast flowing, deep and steep channels to meandering shallow channels with slower flow, and using dams such as heather and straw bales, can reduce siltation. It is particularly important to prevent siltation when carrying out reprofiling work upstream of a Southern Damselfly population.

An additional concern at clay extraction sites is increased suspended solids in the water, which can be harmful to Southern Damselfly populations. These should be kept below 25mg/litre[3].

Egg laying female Southern Damselfly © Paul Ritchie

Straw bales acting to prevention siltation downstream © Mair Rees

CASE STUDY

At Cefn Bryn, on the Gower Peninsula, south Wales, the Southern Damselfly is threatened by lack of sufficient grazing. In January 2016, reprofiling work was carried out by the Swansea Natural Resources Management Team, part of Natural Resources Wales, with advice from the BDS and Pembrokeshire Coast National Park Authority. Small sections of the streams were made wider and more shallow using a mechanical digger. The area most in need of work was upstream of one of the remaining Southern Damselfly populations. To prevent siltation downstream of the management area, straw bales were placed in the channel, effectively catching any sediment released into the waterbody.

Monitoring of populations

In order to understand the strength and size of a site's population of Southern Damselflies, and it's response to habitat management, it is vital to undertake regular population monitoring. This can either be done at the larval or the adult stage. Larval monitoring can be done at any time of the year and can give a more accurate reflection of those areas of stream used for breeding, as adults are often found elsewhere on the site, roosting or hunting. However, it can be more time consuming and difficult to identify the larvae and small populations can be missed as only small sections of the watercourse will be sampled. Monitoring using counts of adult males has the disadvantage of being only possible within a very small time window and within narrow weather conditions. However, it is a quicker method and can highlight small populations which may otherwise be missed. Habitat monitoring is also important to assess the suitability of habitat, both on current sites and potential sites. Population and habitat monitoring on occupied sites should be carried out annually[12].

As the Southern Damselfly is protected under Schedule 5, it is essential for all surveyors who may disturb Southern Damselfly populations/ habitat or catch and handle Southern Damselflies, to be licensed by the relevant statutory conservation agency (Natural England or Natural Resources Wales) before any work begins. Only the licence holder or their accredited agent must carry out the survey, complying with the licence conditions and carrying a copy of the licence at all times.

Larval monitoring

A fixed transect should be conducted at each site with a larval survey carried out at marked 10m intervals. The suryevor should work upstream, starting from 2m downstream of the 10m interval marker, so all dislodged larvae are washed into the sieve by the water flow. At each 10m interval, the 2m survey section should be split into three with each surveyed in succession for a minute. A kitchen sieve, or similar equipment, should be drawn through the water, in particular focusing on disturbing water plants and bottom sediment to dislodge larvae. The contents should be emptied into a white tray and any dragonfly/ damselfly larvae identified.The contents of the white tray from each minute long survey section should be emptied into the same section before the next is carried out. By working upstream, double counting returned larvae will be avoided.

Left: Southern and Small Red Damselfly larvae © Genevieve Dalley; Right: Southern Damselfly larvae monitoring at Moortown Bottom, Devon © Genevieve Dalley

Adult monitoring

For each Southern Damselfly site, a fixed transect should be walked while counting the number of mature males within 5m of the observer. The idea is that, regardless of who the observer is, the transect should be carried out in exactly the same way. It should be a fixed distance with a set start and end point marked using permanent landmarks and GPS readings. On larger sites, transects should cover 100m of every 500m of stream or mire. On smaller sites, transects should cover the whole site. If the watercourse is wider than 5m, both sides should be walked. This count will provide an Index of Abundance that can be used to assess population changes over time[12].

Transects should be carried out during the peak adult flying period, between early June and the end of July. They should be conducted in warm (>17°C with 50% sunshine), dry and still weather conditions between 11.00 and 14.00[12]. Ideally multiple counts should be conducted at the same site on different days. Counts of adult males should be the priority. If the observer is confident with mature female identification, a separate count can be conducted at the same time for these. Additional behaviour, such as mating and ovipositing, can be recorded.

Experienced surveyors can identify mature male Southern Damselflies using close focus binoculars or a camera. However, inexperienced surveyors may, at times, wish to use a net to confirm identification. Prior to using a net, an experienced dragonfly surveyor should be consulted for advice on how to net an individual without causing harm. It is also important to remember to obtain a Schedule 5 licence prior to this.

Habitat Monitoring

This can be done at the same time as adult monitoring but only needs to be undertaken once per site annually[12]. Recording a set of key habitat attributes is a quick and easy way to monitor the state of the habitat on site. The key habitat attributes are as follows[3]:

Key Habitat Attributes	**Definition of upper and lower limits for favourable condition**
Open, unshaded lengths of ditch with slow water velocity or only moderate velocity in the central channel and shallow, slow flowing areas at the edges	Upper limit of extent on site: 100% of ditch/stream. Lower limit of extent on site: Same % of ditch/stream covered by such habitat in last survey or 50% of ditch/stream.
Ditch edges with broad fringes of herbaceous emergent and submerged macrophytes, typically including some cover of Reed Sweet-grass (*Glyceria maxima*), Water Mint (*Mentha aquatica*), Fool's Watercress (*Apium nodiflorum*), Watercress (*Rorippa nasturtium-aquaticum*) and brooklime/water speedwell (*Veronica* spp.).	Lower and upper limit of cover: 20–80% for both emergent and submergent portions. Upper limit of extent on site: 100% of ditch/stream. Lower limit of extent on site: Same % of ditch/stream covered by such habitat in last survey or 50% of ditch/stream.
Areas of adjacent bankside vegetation with medium-height tussocks.	Lower and upper limit of height: 0.2–0.6 m. Upper limit of extent on site: 100% of bankside. Lower limit of extent on site: Same % of watercourse/mire covered by such habitat in last survey or at least 30% of bankside.
Ditch largely unshaded by bankside shrubs and trees.	Lower and upper limit of scrub or trees shading ditch: 0–40% cover.
Unpolluted conditions indicated by absence of encroaching algae and bacterial film. No invasive tall emergents such as Reed Canary-grass (*Phalaris arundinacea*).	Upper limit of extent on site: 25% of watercourse. Lower limit of extent on site: 0% of watercourse
Some cover of silt or other organic substrate in ditch/stream.	Upper limit of extent of encroachment on site: 100% of ditch/stream Lower limit of extent on site: Same % of mire or watercourse covered by such habitat in last survey or at least 50% of ditch/stream

Left: Southern Damselfly habitat at Moortown Bottom, Devon © Genevieve Dalley

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Left: Southern Damselfly habitat at Moortown Bottom, Devon © Genevieve Dalley, Southern Damselflies © Paul Ritchie, Southern Damselfly Habitat, Preseli Hills © Claire Install, Pair of Southern Damselfly, ©Dave Smallshire

The British Dragonfly Society was founded in 1983 and has since grown substantially, with a current membership of around 1,600. Through its various committees, local groups and members, the society is the principal body overseeing the study, recording, conservation and education effort focused on Dragonflies in the UK.

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