Cyfoeth Naturiol Cymru
Natural Resources Wales

Habitat creation and restoration work plan for Southern Damselfly *Coenagrion mercuriale* in Pembrokeshire from 2020 onwards

Jon Hudson Ecological Consultancy

NRW Evidence Report No. 441

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Comisiynwyd yr adroddiad hwn gan Cyfoeth Naturiol Cymru fel rhan o brosiect Natur Hanfodol ac mae'n darparu asesiad o addasrwydd cynefin presennol ar gyfer mursen las Penfro *Coenagrion mercuriale* ar nifer o safleoedd o amgylch Ardaloedd Cadwraeth Arbennig Preseli a Gweunydd Blaencleddau. Mae gwaith adfer cynefin ar gyfer y rhywogaeth hon wedi cael ei wneud gan Awdurdod Parc Cenedlaethol Sir Benfro ar y safleoedd hyn dros gyfnod o wyth mlynedd ers 2012. Darperir argymhellion ar gyfer rheoli'r ardaloedd hyn yn y dyfodol hefyd.

Mae'r adroddiad hefyd yn nodi nifer o safleoedd prosiect posib yng ngogledd Sir Benfro lle gallai prosiectau creu/adfer cynefin gael eu cynnal gan Cyfoeth Naturiol Cymru ac Awdurdod Parc Cenedlaethol Sir Benfro dros y **tymor byr** (1 i 10 o flynyddoedd – **20 o safleoedd**), y **tymor canolig** (10 i 20 o flynyddoedd – **19 o safleoedd**) a'r **tymor hir** (20 a mwy o flynyddoedd – **9 safle**) er mwyn cynyddu swm y cynefin addas i fursen las Penfro ac er mwyn meithrin gwydnwch drwy ddarparu cysylltedd rhwng safleoedd ar lefel y dirwedd.

Fodd bynnag, mae cwmpas yr adroddiad yn gyfyngedig i nodi a llywio'r **ymyriadau mecanyddol** y mae modd eu defnyddio i adfer a chreu ardaloedd o gynefin addas. Ymdrinnir â gofynion rheolaeth ehangach y rhywogaeth hon yn "An Overview of the Management Requirements of the Southern Damselfly (Coenagrion mercuriale – Charpentier) with Recommendations and Suggested Methodology for Habitat Improvement within and near to the Preseli SAC" (Install, 2012), sy'n parhau i fod yn berthnasol, a dylid cyfeirio at y ddogfen hon wrth ystyried y materion ehangach sy'n effeithio ar boblogaethau o fursennod glas Penfro yng ngogledd Sir Benfro.

Darperir methodoleg fonitro i gofnodi ac asesu llwyddiant gwaith adfer cynefin, ynghyd â ffurflenni cofnodi a fydd yn caniatáu i effeithiolrwydd gwaith creu/adfer cynefin yn y gorffennol a'r dyfodol gael ei werthuso. Darperir disgrifiad syml o gynefin sy'n addas i fursennod glas Penfro hefyd. Ceir crynodeb o ganlyniadau monitro diweddaraf y Gyfarwyddeb Cynefinoedd ar gyfer y boblogaeth o fursennod glas Penfro yn Ardaloedd Cadwraeth Arbennig Preseli a Gweunydd Blaencleddau.

Darperir prosiect QGIS atodol ar CD ROM, gan nodi lleoliadau'r holl ardaloedd adfer cynefin argymelledig a phosib.

2. Executive summary

This report was commissioned by Natural Resources Wales as part of a Vital Nature project and provides an assessment of the current habitat suitability for Southern Damselfly *Coenagrion mercuriale* on a number of sites in and around the Preseli and Gweunydd Blaencleddau SACs. Habitat restoration works for this species have been undertaken by the Pembrokeshire National Park Authority (PCNPA) on these sites over a period of eight years since 2012. Recommendations for the future management of these areas is also provided.

The report also identifies a number of potential project sites in north Pembrokeshire where habitat creation/restoration projects could be undertaken by Natural Resources Wales and PCNPA over the **short term** (1 to 10 years – **20 sites**), **medium term** (10 to 20 years – **19 sites**) and **long term** (20 plus years – **9 sites**) in order to increase the amount of suitable habitat available for Southern Damselfly and to build resilience by providing landscape-scale connectivity between sites.

The scope of the report is however limited to identifying and informing the **mechanical interventions** that can be used to restore and create areas of suitable habitat. The broader management requirements of this species are dealt with in "*An Overview of the Management Requirements of the Southern Damselfly* (Coenagrion mercuriale - *Charpentier*) *with Recommendations and Suggested Methodology for Habitat Improvement within and near to the Preseli SAC*" (Install, 2012) which remains relevant and should be referred to when considering the wider issues affecting the Southern Damselfly populations in North Pembrokeshire.

A monitoring methodology to record and assess the success of habitat restoration works is provided, along with recording forms that will allow the efficacy of past and future habitat creation/restoration works to be evaluated. A simple description of suitable Southern Damselfly habitat is also provided. The most recent Habitats Directive monitoring results for the Southern Damselfly population wthin Preseli and Gweunydd Blaencleddau SACs are summarised.

An accompanying QGIS project is provided on CD ROM, giving the locations of all recommended and potential habitat restoration areas.

3. Background

The aim of this report is to provide up-to-date advice on the restoration and creation of suitable habitat for the Southern Damselfly in North Pembrokeshire, mainly focussing on land in and around the Preseli and Gweunydd Blaencleddau SACs and Carn Ingli SSSI. The report identifies short-term habitat restoration projects that can be initiated immediately as well as a number of medium- and longer-term projects that could link up existing populations and help to ensure better connectivity between them, increasing the resilience, size and distribution of the populations and hopefully enable it to recolonise some of its former sites.

As with other dragonfly and damselfly species, the majority of the Southern Damselfly's lifecycle is spent in an aquatic environment. In Britain, it has a two-year lifecycle. After almost two years underwater, the final instar larvae emerge to start the terrestrial adult stage of the lifecycle. The flight season is from mid-May until early August (Purse, 2002), peaking in July at Welsh sites.

It has been calculated that the distribution of the Southern Damselfly in Britain has declined by 38% since 1985 (Purse, 2001 in Rouquette & Thompson, 2007). It is listed as Endangered in the Odonata Red Data List for Great Britain (Daguet *et al*., 2008) and is a priority species on the UK Biodiversity Action Plan as well as being on Annex II of the EU Habitats & Species Directive and a feature of the designated sites mentioned above.

The Southern Damselfly is at the edge of its range in the UK. Species on the limits of their range are known to often have very exacting habitat requirements (Evans, 1989). The major strongholds for the damselfly in Britain are the heathlands of the Preselis in Pembrokeshire and the New Forest in Hampshire. On the Pembrokeshire heaths, it generally prefers small, shallow, spring-fed, base-rich streams and runnels with a peaty substrate. The streams need to be well-vegetated, preferably with soft-stemmed plants that the damselfly uses for oviposition such as Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and Jointed Rush *Juncus articulatus* (Purse, unpublished in Thompson *et al*., 2003). It also requires well grazed and poached edges to the stream with sparse marginal vegetation and emergent vegetation where the damselfly can emerge. Adjacent to the stream, low, tussocky vegetation provides the adult damselflies with shelter. Grazing with heavy livestock such as cattle and ponies is considered necessary in order to maintain these conditions.

The Southern Damselfly was historically much more widespread in Pembrokeshire than it is today, with only one of the three historic metapopulations known from Pembrokeshire still in existence (Coker, 2002). Those at St. David's and the Western Cleddau in north-western Pembrokeshire have been lost, with the last remaining St. David's populations at Ffynnon Clegyr-boia and Pont Clegyr going extinct in the 1990s (Boyce, 2002). These populations probably represented the last remnants of a formerly much larger metapopulation that would have existed on the heaths and valley mires of the St. David's peninsula in the first half of the twentieth century, when all of these sites were actively grazed, burnt and cut (Boyce, 2002). It may be possible to attempt to spread the Preseli population out westward towards its former sites near the Western Cleddau by restoring and creating habitats and through ensuring appropriate grazing regimes are maintained at restoration sites. Returning

the species to the St. David's peninsula will be altogether more difficult. There is a shortage of suitable "stepping stone" sites between the Western Cleddau and St. David's where habitat restoration could take place and it may be unrealistic to attempt this. To ensure this species has a long-term future in Pembrokeshire, it may be best to focus efforts on building a resilient and interconnected network of sites around the Preseli/Mynachlog Ddu/Puncheston/Carn Ingli region.

3.1. The need for mechanical intervention

During the last 50 or so years, grazing with heavy livestock has progressively declined. Few if any cattle or horses are seen on most of the North Pembrokeshire sites today, only sheep and low number of ponies present. In the absence of heavy stock, many of the flushes and runnels utilised by Southern Damselfly have become unsuitable or at best sub-optimal, their channels now deeply incised, 'piped' (where streams have narrowed and run more or less underground) or shaded by vegetation (see Appendix 1 for details on the various stream types).

To counter this, PCNPA has since 2012 undertaken a number of small-scale works using mechanical diggers to restore more suitable, open and shallow conditions, with approximately 250m to 500m of flushes/streams being restored most years. The locations of these restored areas are given in Map 1 and are also digitised as a shapefile in the GIS "Mercuriale project" file. Habitat improvements will be accomplished by using a combination of methods and techniques as set out in Appendix 1. Further information about a selection of these completed restoration projects and images of the methods used to restore the habitat is available on the British Dragonfly Society website at https://british-dragonflies.org.uk/conservation-and-research/projects-2/southern-damselfly-projects-in-pembrokeshire/

Mechanical interventions are not seen as a sustainable method of providing optimal habitat for Southern Damselfly, with the securing of more favourable grazing regimes being the long-term aim. However, they are necessary in the short- and medium-term and when the habitat is in very poor condition to ensure that reasonable amounts of suitable habitat are maintained until more favourable grazing regimes can be established. In these circumstances, it is therefore seen as appropriate to:

1. Restore targeted sections of streams where suitable habitats or populations are known to have been lost;
2. To create new areas of habitat in suitable locations;
3. To restore natural flush systems that have been manipulated by drainage schemes in the past where appropriate.

All of the above-mentioned works should also aim to benefit (or at least not negatively impact) other users of the sites. Where possible, other enhancements such as access improvements (for both people and livestock) should be built into projects. All projects will need to ensure that they do not negatively impact private water supplies and should be undertaken in consultation with landowners, graziers and those living close to project sites. **All project works in areas with recent Southern Damselfly records/and or areas of suitable habitat within the known range of the species will require a species conservation licence from Natural Resources Wales (NRW). All project sites that are within designated sites may require SSSI consent. NRW should be consulted before any works take place.** It

may be possible for NRW to consent the work programme as set out in this report under a single consent.

The Freshwater Pearl Mussel *Margaritifera margaritifera* is known to be present in some streams on or around the Preseli hills and is found downstream from some of the proposed Southern Damselfly restoration sites. **Again, NRW should be contacted for advice regarding the protection of this species.** See Appendix 2 for a Pollution Control Method Statement.

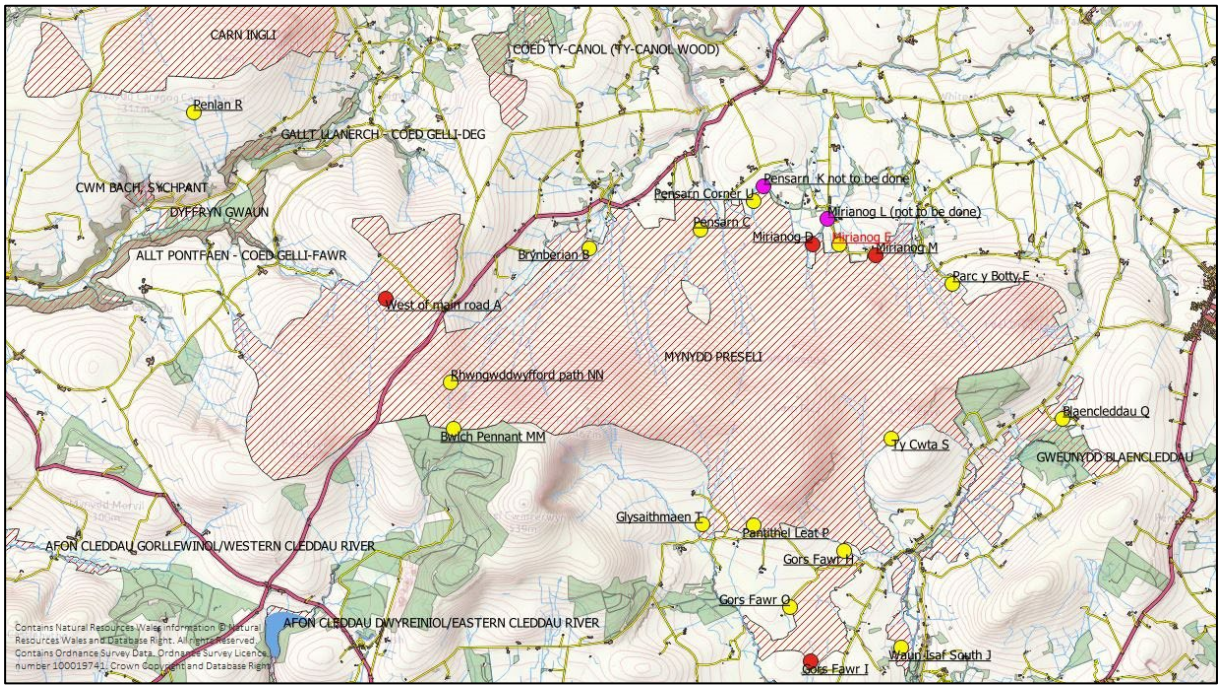
4. Assessing the condition and suitability of habitat restoration sites identified prior to 2019/20

Field visits were made over winter 2019/20 to assess the condition and suitability of all the existing Southern Damselfly habitat restoration/creation scheme locations. On sites where habitat works had been completed prior to 2109/20, the aim was to identify the date of completion of each restoration scheme, assess its current condition and make recommendations for future management. A small number of project sites that had been identified prior to 2019/20 but where work had not yet been undertaken were also visited and reassessed. The habitat assessment methods set out in Section 10 below were used to assess habitat suitability. The results of these visits are set out below. No attempt was made to assess the current status of Southern Damselfly as visits were undertaken outside the adult flight period. Table 1 below lists all the potential habitat creation/restorations sites identified prior to 2019/20 and gives the location, name and date of completion of works. The assessment of these sites showed that restored streams can take two to three years to develop suitable habitat patches and that, whilst not all project sites had been successful, none of the successful project sites showed any signs of becoming unsuitable yet, indicating that habitat restoration/creation projects that are well designed and carried out and that are located in appropriate areas could provide suitable habitat for at least eight to ten years and possibly longer.

Table 1. Name, date & location of existing habitat creation/restoration sites. Green rows highlight where suitable habitat was present in winter 2019/20.

Name	Completed	Date	Suitable habitat present winter 2019/20?	10 fig. Grid ref.
Brynberian B	No	N/a	N/a	SN1023934435
Pensarn C	Yes	2012	Yes	SN1167434679
West of main road A	no	N/a	N/a	SN0761833791
Pensarn K (no longer considered viable)	x	N/a	N/a	SN1249235238
Mirianog E	Yes	2013	Yes	SN1346534485
Mirianog D	no	N/a	N/a	SN1311934491
Parc y Botty F	Yes	2016	Yes	SN1492533984
Gors Fawr H	Yes	2017	No	SN1353130546
Gors Fawr I	no	N/a	N/a	SN1309129134
Waun Isaf South J	Yes	2018	Yes	SN1426429313
Gors Fawr O	Yes	2017	No	SN1282929823
Pantithel Leat P	Yes	2018	Yes	SN1235430883
Blaencleddau Q	Yes	2017	Yes	SN1634332247

Name	Completed	Date	Suitable habitat present winter 2019/20?	10 fig. Grid ref.
Mirianog L (no longer considered viable)	x	N/a	N/a	SN1331534812
Penlan R	Yes	2016	Yes	SN0514536189
Ty Cwta S	Yes	2018	No	SN1413831995
Glysaithmaen T	Yes	2018	Yes	SN1170530888
Pensarn Corner U	Yes	2016	Yes	SN1235735043
Mirianog M	no	N/a	N/a	SN1393634353
Bwlch Pennant MM	Yes	2017	No	SN0849532123
Rhwngwddwyfford path NN	Yes	2015?	Yes	SN0845932714



Map 1. Existing habitat creation sites.

4.1. Assessment of existing habitat creation/restoration sites

All sites that had habitat restoration works undertaken before winter 2019/20 were visited and assessed. These are listed below and an indication is given of how successful these have been and suggestions for their future management are provided.

4.1.1. Bryberian B

No works were undertaken here. This is a **priority site** that should be targeted for further works.

4.1.2. Pensan C

Approximately 735m of the stream was excavated in 2012. Around 70 to 80% of the stream length now supports suitable habitat, with the best areas being where wide and shallow online pools were excavated. This project could be extended further upstream and is a **priority site** that should be targeted for further works.

4.1.3. West of main road A
No works were undertaken here. This is a **priority site** that should be targeted for further works.

4.1.4. Pensarn K
No longer considered viable as this is now a very scrubbed over area of common with little potential for habitat restoration.

4.1.5. Mirianog E
Approximately 300m of the stream was excavated in 2013. Around 70 to 80% of the stream length now supports suitable habitat, with the best areas being where wide and shallow online pools were excavated. This project could be extended both further upstream and streams to the west (towards Mirianog D) could also be restored. This is a **priority site** that should be targeted for further works

4.1.6. Mirianog D
No works undertaken here. This is a **priority site** that should be targeted for further works.

4.1.7. Parc y Botty F
Several small runnels and pools were excavated but the extent of the works is no longer possible to ascertain but suitable habitat is still present. The works had to be revisited and changed after completion due to issues over informal paths. The area is used for private water supply and due to these issues, probably does not warrant further works and is best dropped from the Southern Damselfly habitat project.

4.1.8. Gors Fawr H
A shallow pool fed and drained by ditches. The whole of the pool looks somewhat enriched and does not support suitable habitat. Some of the ditches around the pool could perhaps be remodelled in an attempt to improve them but the area probably does not warrant further works and is probably best dropped from the Southern Damselfly habitat project.

4.1.9. Gors Fawr I
No works undertaken here. Not a priority site.

4.1.10. Waun Isaf South J
Three small streams amounting to around 570m were excavated in 2018. The two southernmost streams (150m and 170m long) still appear in an early successional stage but even so, they both have approximately 50 to 60% suitable habitat. The northernmost stream is a larger stream with a stronger flow. Again, the habitat is still developing here and is likely to take longer/provide less suitable habitat than the other two streams. Even so, it has about 20% suitable habitat. There are many more streams further north that could be targeted for restoration. This is a **priority site** that should be targeted for further works.

4.1.11. Gors Fawr O
A ditch on the edge of the common, approximately 370m of which were excavated in 2017. Suitable habitat extends along most of the southern section of the ditch whereas the northern section holds no suitable habitat apart from in two small pools Suitable habitat amounts to around 60% of the restored area but there is plenty of

scope to increase this by widening and deepening the northern section of the ditch and creating sloping sides and online pools. A **priority site** that should be targeted for further works.

4.1.12. Pantithel Leat P

A leat (ditch) that feeds water to Pantithel Farm, approximately 180m of which were excavated in 2017? Suitable habitat extends along most of the excavated section and amounts to around 70 to 80% of the restored area. This is a narrow leat that could be widened to create a number of online pools along its length – those that were excavated during the restoration works presently support the best areas of habitat. Works could be extended for approximately a further 500m along the entire length of the leat. This is a **priority site** that was targeted for further works in February 2020.

4.1.13. Blaencleddau Q

A small project site that was primarily focussed on assisting access. There are only small patches of suitable habitat here. Not a priority site.

4.1.14. Mirianog L

No longer considered viable as this is now a very scrubbed over area of common with little potential for habitat restoration.

4.1.15. Penlan R

A new stream system extending for approximately 600m was created in 2011. Approximately 50% of the restored area supports suitable habitat but some of the streams are too fast-flowing (steep) and could be remodelled to slow their flow. There are plenty of opportunities for similar habitat creation projects on this site. A **priority site** that should be targeted for further works.

4.1.16. Ty Cwta S

Works here do not appear to have been successful. Approximately 260m of streams were restored/created in 2018. However, only a few very small patches of suitable habitat were found to be present in 2020. The streams are too small and fast-flowing and no silty bed is present. Several small pools were created and these may provide some small areas of suitable habitat but these mostly appear slightly enriched and generally do not support the desired plant species. There is some potential to remodel the streams to make them wider and slower flowing.

4.1.17. Glysaithmaen T

A ditch and a small length of runnel (approximately 350m long in total) was excavated in 2018. Works here do not appear to have been successful. Only two small patches of suitable habitat exist in pools along the ditch and in the runnel. This amounts to less than 10% of the restored stream. The stream that flows in this ditch is too fast-flowing and no silty bed is present but it may be possible to excavate a series of online pools along the ditch to create suitable habitat. Not a priority site.

4.1.18. Pensarn Corner U

A flooded area of approximately 175 square metres where streams that had become overgrown feed into a shallow pool at the edge of the common. The whole (100%) of the area excavated in 2016 now supports suitable habitat. This project could be extended further upstream. A **priority site** that should be targeted for further works.

4.1.19. Mirianog M
No works undertaken here. This is a **priority site** that should be targeted for further works.

4.1.20. Bwlch Pennant MM
Two pools were excavated primarily to alleviate flooding issues along a PROW. There is no flow in these pools and therefore they may not be suitable for Southern Damselfly. However, they may be utilised by this species and they do provide habitat for a range of other Odonata species.

4.1.21. Rhwngwddwyfford path NN
Several small runnels and pools were excavated primarily to alleviate flooding issues along a PROW. The extent of the works is no longer possible to ascertain. Some suitable habitat is still present and there is plenty of scope to create more if a larger scale project were to be targeted here. This site may occupy an important connectivity position, linking the populations on the north of Preseli to those in the south.

5. March 2020 project sites

Four sites were selected for small-scale restoration works during March of 2020. These are set out in the Table 2 below. These sites are all within the core area of Southern Damselfly populations and the works aimed to expand the amount of suitable habitat at each and protect and bolster the existing populations.

Table 2. Sites where restoration works were carried out in February to March 2020.

Name	Completed	Date	6 fig GR
Pantithel Leat	Y	02/03/20	SN124308
Waun Isaf	Y	03/03/20	SN143290
Blaencleddau	Y	03/20	SN158321
Dolau Isaf	Y	03/20	SN151307

5.1. Assessment of habitat creation/restoration sites
The habitat restoration works used a digger to manipulate existing stream channels which had become unsuitable as Southern Damselfly habitat at Pantithel, Blaen Cleddau and Dolau Isaf and to create new channels at Waun Isaf. Habitat works were accomplished by using a combination of methods and techniques as set out in Appendix 1. Pollution control measures were as set out in Appendix 2.

5.1.1. Pantithel Leat (common land)
Pantithel leat (on south side of Preseli common land, above Pantithel Farm). Work was undertaken along c.600m of stream. This involved creating a more shallow, wider profile to the leat and the creation of new pools along its length. Several “cuts” were made into the downslope bank in order to allow flood waters to escape the channel to avoid road flooding issues. Along the western half of the leat, the channel was left intact and instead a series of larger pools were created as it was felt that the channel was not suitable due to its stony bottom and faster flow.

5.1.2. Waun Isaf (common land)

This site was identified with PCNPA staff to show how access opportunities could be built into habitat creation schemes on project sites. The PCNPA Public Rights of Way officer had identified access issues caused by waterlogging of the footpath at the southern end of the common. Works to attempt to remedy this were undertaken and adapted to create potential new areas of suitable Southern Damselfly habitat. A new crossing point was created for the path and water was directed into a newly-created stream (c.50m long). A ditch (c.65m long) was also dug alongside the footpath and two short (4m long) channels were created to carry water from the path into this ditch. It is anticipated that all newl- created channels will be able to support suitable habitat in time.

5.1.3. Blaencleddau (private land)

This site was selected as all streams on the site were very overgrown and “piped” apart from in a few short sections. Restoration included opening up of 126m of piped stream, 58m of shallow ditch and 55m of a stream that had reasonable amounts of suitable habitat present in patches. The surviving patches of suitable habitat were NOT excavated. Areas where suitable habitat was present were expanded (made wider) and areas of unsuitable habitat between these patches was excavated.

5.1.4. Dolau Isaf (private land)

This site was selected as it was known to be an important site for the species and all streams on the site were overgrown and “piped” apart from in a few short sections. Restoration involved opening up 517m of piped streams across the site. These streams were excavated to varying depths and profiles in order to create variety and to ensure it all does not “mature” at the same time. Any surviving patches of suitable habitat were left unexcavated.

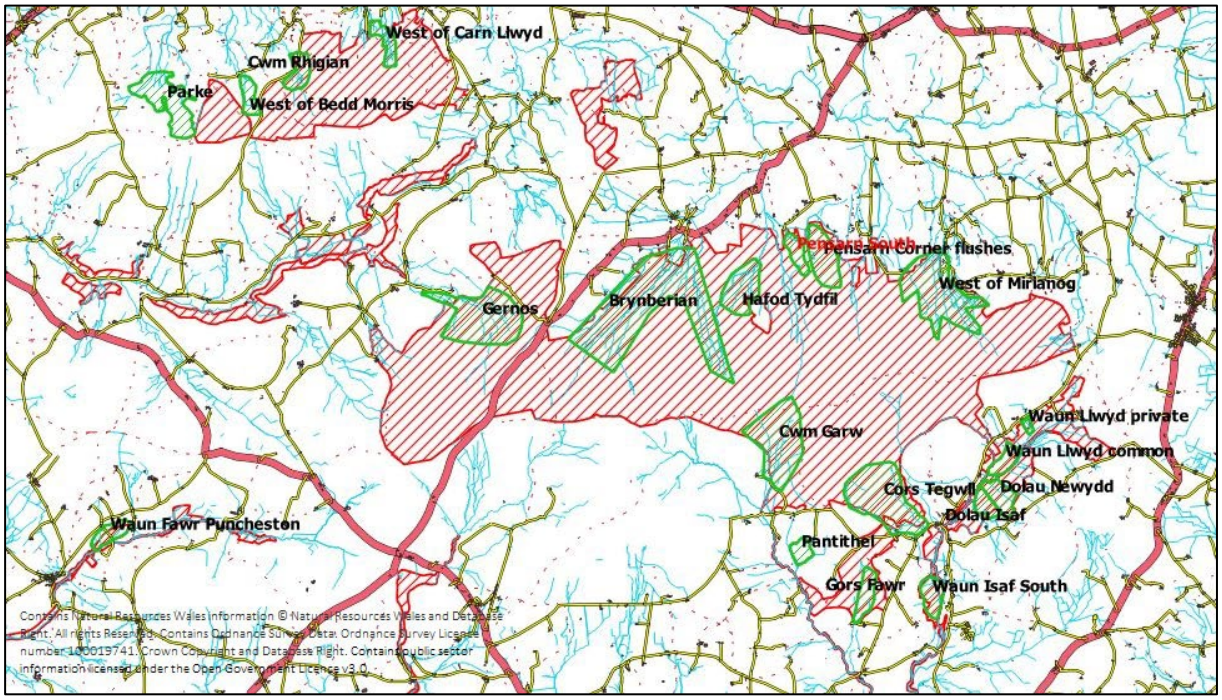
6. Short-term project sites

This section identifies areas of streams and flushes in and around the Preseli and Gweunydd Blaencleddau SACs and Carn Ingli SSSI where works can be undertaken immediately or over the next few years (1 to 10 years). These works will help safeguard the core Southern Damselfly populations. Project sites have been identified on common lands and/or private land in and around these SACs**.** Other sites (e.g. Carn Ingli SSSI) where records for Southern Damselfly exist have also been identified as priority sites where works are required in an attempt to maintain the populations until such time as the medium- and long-term projects help to reconnect them to the main Preseli populations.

Table 3. Short-term project sites.

Number	Name	6 fig GR
1	Gernos	SN074337
2	Brynberian	SN093335
3	Cwm Garw	SN119317
4	Waun Llwyd common	SN154315
5	Dolau Isaf	SN151307
6	Gors Fawr	SN132294
7	Waun Fawr Puncheston	SN016303
8	Cors Tegwll	SN134309

Number	Name	6 fig GR
9	Waun Llwyd private	SN157320
10	Waun Isaf South	SN142294
11	Pantithel	SN122301
12	Hafod Tydfil	SN113341
13	Pensarn Corner flushes	SN126346
14	Pensarn South	SN122346
15	West of Mirianog	SN144340
16	Cwm Rhigian	SN046374
17	Parke	SN026369
18	West of Bedd Morris	SN037371
19	West of Carn Llwyd	SN059378
20	Dolau Newydd	SN099338



Map 2. Short-term project sites.

6.1. Suggested short-term project works

6.1.1. Gernos (common land)

A stream and flush system to the east of Gernos Fawr Farm on the western side of Preseli. A number of streams, runnels and flushes are present, many of which contain suitable habitat. The Southern Damselfly population is monitored here by NRW who should be consulted when planning any works. Any of the flushes and smaller streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.2. Brynberian (common land)

This site is part of Preseli SAC. A very extensive network of streams, runnels and flushes are present here, many of which contain suitable habitat. The Southern Damselfly population is monitored by NRW who should be consulted when planning

any works. Any of the flushes and smaller streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

6.1.3. Cwm Garw (common land)

This site is part of Preseli SAC. There are a large number of streams and flushes here which could be restored on a cyclical basis in order to ensure that there is a succession of suitable habitat developing over time. Any of the flushes and smaller streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.4. Waun Llwyd (common land)

This site is part of Gweunydd Blaencleddau SAC. An extensive network of streams, runnels and flushes are present here, many of which contain suitable habitat. The Southern Damselfly population is monitored by NRW who should be consulted when planning any works. Any of the flushes and smaller streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition (particularly at the northern end of the site) should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.5. Dolau Isaf (private land)

This site is part of Gweunydd Blaencleddau SAC. A series of streams and flushes cross the site, many of which contain suitable habitat. The Southern Damselfly population is monitored by NRW who should be consulted when planning any works. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.6. Gors Fawr (common land)

This site is part of Preseli SAC. The whole of this site is important for Southern Damselfly which is monitored by NRW who should be consulted when planning any works. Much of the centre of the site is too wet to access unless specialist machinery is available. However, the eastern edge of the site, adjacent to Trallwyn Cottage, is drier and more accessible and works could be undertaken here and on the western ditch (Gors Fawr O).

6.1.7. Waun Fawr Puncheston (common land)

This site is part of Preseli SAC. Old aerial images show that the site was once crisscrossed by a dense network of small flushes, most of which have now become blocked and choked with dense Purple Moor-grass *Molinia caerulea* tussocks. This has led to the site becoming very overgrown and, as the flushes have blocked up, to the ground becoming dangerously wet to the extent that it is now dangerous to graze or to work on unless specialist machinery is available. Mechanical interventions here should aim to reinstate this natural drainage pattern. Very little suitable habitat now exists on the site although the southwestern section is in better condition than the northeastern section. **Consultation required with BSBI County Recorder due to**

the presence of the rare plants such as Pale Butterwort *Pinguicula lusitanica* in these flushes.

6.1.8. Cors Tegwll (common land)

This site is part of Preseli SAC. A series of streams and flushes cross the site feeding into the Afon Tegwll and Tegwll Fach. The whole area contains plenty of suitable habitat. Southern Damselfly is monitored by NRW who should be consulted when planning any works. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Much of the centre of the site is too wet to access unless specialist machinery is available. However, there are accessible areas around the edges of the site where works could be undertaken.

6.1.9. Waun Llwyd (private land)

This site is part of Gweunydd Blaencleddau SAC. This unit has been abandoned to grazing due to the very wet and dangerous nature of the ground. As a result, the vegetation is tall and tussocky and most of the flushes have closed over. Unfortunately, scrub invasion has also become a serious issue here. Flushes and small streams/runnels need opening up and some of the peripheral ditches could be remodelled in order to create habitat and to facilitate grazing. Much of the site is too wet to access unless specialist machinery is available.

6.1.10. Waun Isaf South (common land)

This site is part of Preseli SAC. A series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. There are numerous streams to the north of the existing project area (Waun Isaf South J) where further habitat restoration works could be instigated.

6.1.11. Pantithel (private land)

A series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.12. Hafod Tydfil (common land)

This site is part of Preseli SAC. A key site for Southern Damselfly where a series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

6.1.13. Pensarn Corner flushes (common land)

This site is part of Preseli SAC. A key site for Southern Damselfly where a series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and

streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

6.1.14. Pensarn South (common land)

This site is part of Preseli SAC. A key site for Southern Damselfly where a series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

6.1.15. West of Mirianog (common land)

This site is part of Preseli SAC. A key site for Southern Damselfly where a series of flushes cross the site, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

6.1.16. Cwm Rhigian (common land)

This site is part of Carn Ingli SSSI. An area of streams and flushes on the northern side of Carn Ingli known to support Southern Damselfly in the past. This was a key site on Carn Ingli for the species and many of the flushes still contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.17. Parke (private land)

An area of streams and flushes on the northern side of Carn Ingli. There are no records of Southern Damselfly from this site but many of the flushes contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.18. West of Bedd Morris (common land)

This site is part of Carn Ingli SSSI. An area of streams and flushes on the northern side of Carn Ingli known to support *C. mercuriale* in the past. Many of the flushes still contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.19. West of Carn Llwyd (common land)

This site is part of Carn Ingli SSSI. An area of streams and flushes on the northern side of Carn Ingli known to support Southern Damselfly in the past. Many of the flushes still contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

6.1.20. Dolau Newydd (private land)

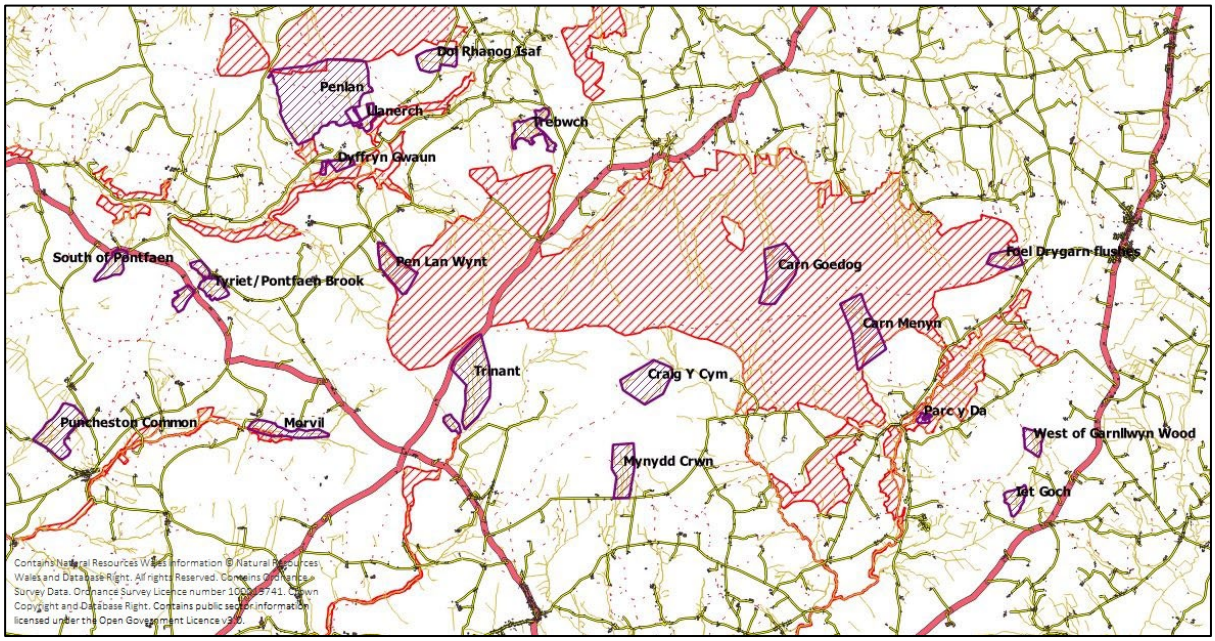
This site is a part of Gweunydd Blaen Cleddau SAC ans is known to be an important Southern Damselfly site. The site has been abandoned to grazing for many years (due to uncertainty over land ownership and use). A management agreement is required to re-establish appropriate grazing here. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

7. Medium-term project sites

This section identifies areas of streams and flushes around the peripheries of the designated sites as well as in the wider countryside. It identifies works that can be undertaken in the coming years (10 to 20 years, following completion of the short-term works). These works aim to create and restore suitable habitat to help expand the population out from is existing core areas and to increase connectivity between sites (including linking the north and south Preseli populations). There are no recent Southern Damselfly records from these sites apart from Sites 7 & 12.

Table 4. Medium-term project sites. Sites in red (sites 7 and 12) have supported Southern Damselfly.

Number	Name	6 fig GR
1	Dyffryn Gwaun	SN048348
2	Dol Rhanog Isaf	SN066366
3	Mynydd Crwn	SN097297
4	Trinant	SN072313
5	Morvil	SN037304
6	Penlanwynt	SN059331
7	Foel Drygarn flushes	SN161333
8	Craig Y Cwm	SN101312
9	South of Pontfaen	SN012332
10	Tyriet/Pontfaen Brook	SN028328
11	Puncheston Common	SN002304
12	Parc y Da	SN147306
13	Trebwch	SN081352
14	Penlan	SN047360
15	Llanerch	SN054355
16	West of Garn Llwyn Wood	SN166302
17	Iet Goch	SN163292
18	Carn Goedog	SN124331
19	Carn Menyn	SN138321



Map 3. Medium-term project sites.

7.1. Suggested medium-term project works

7.1.1. Dyffryn Gwaun (private land)

This site is designated as a SSSI for marshy grassland, wet woodland and Marsh Fritillary butterfly *Euphydryas aurinia*. The site contains a number of ditches that could be investigated for their potential to provide suitable habitat for Southern Damselfly. The ditches contain a suitable range of plant species and could be remodelled to make them wider and shallower, with a series of online pools. The site may not be suitable but it occupies a “stepping stone” position between the Preseli and Carn Ingli populations and could be an important connectivity site.

7.1.2. Dol Rhanog Isaf

The site contains a number of streams and ditches that could be investigated for their potential to provide suitable habitat for Southern Damselfly. Some streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or the ditches could be remodelled to make them wider and shallower, with a series of online pools. The site may not currently contain suitable habitat but it occupies a “stepping stone” position between the Preseli and Carn Ingli populations and could be an important connectivity site. There may be opportunities to create new habitat here by creating entirely new flush systems.

7.1.3. Mynydd Crwn (private land)

A series of streams and flushes cross the site, many of which are likely to contain suitable habitat. Any of the flushes and streams that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Some streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or the ditches could be remodelled to make

them wider and shallower with a series of online pools. There may be opportunities to create new habitat here by creating entirely new flush systems.

7.1.4. Trinant (private land)

An extensive network of streams and flushes cross the site, many of which are likely to contain suitable habitat. Any of the flushes and streams that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Some streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or the ditches could be remodelled to make them wider and shallower, with a series of online pools.

7.1.5. Morvil

The site contains a number of streams and ditches that could be investigated for their potential to provide suitable habitat for Southern Damselfly. The natural drainage pattern here has been highly modified with most of the streams having been converted into drainage ditches that feed into the Afon Anghof. These ditches could be remodelled to make them wider and shallower, with a series of online pools. The site occupies a “stepping stone” position between the Preseli and Waun Fawr populations and it could function as an important connectivity site.

7.1.6. Pen Lan Wynt (common land)

This site is part of Preseli SAC. A “neck” of common where a network of streams and flushes drain down towards the Afon Gwaun. An extensive network of streams and flushes cross the site, many of which are likely to contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

7.1.7. Foel Drygarn flushes (common land)

This site is part of Preseli SAC and has supported Southern Damselfly. An extensive network of streams and flushes drain the slopes below Foel Drygarn, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Oblong-leaved Sundew *Drosera intermedia* and Bog Orchid *Hammarbya paludosa* in these flushes**.

7.1.8. Craig y Cwm (private land)

The site contains a number of streams and flushes but the natural drainage pattern has been modified with some streams having been converted into drainage ditches. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. The ditches could be remodelled to make them wider and shallower, with a series of online pools.

7.1.9. South of Pontfaen
Two small valley wetland sites that both contain networks of streams and flushes draining the slopes below Foel Drygarn, many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

7.1.10. Tyriet/Pontfaen Brook (private land)
The site contains a number of streams and flushes but the natural drainage pattern here has been modified with many streams having been converted into drainage ditches. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. The ditches could be remodelled to create wider, more shallow water bodies and a series of pools.

7.1.11. Puncheston Common (common land)
An extensive network of streams and flushes drain the site many of which contain suitable habitat. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Despite a lack of grazing, this site remains open due to regular burning. Although this may affect the common's suitability for Southern Damselfly, the site occupies an important position adjacent to the otherwise isolated Waun Fawr Common and it could, therefore, function as an important connectivity site.

7.1.12. Parc y Da (private land)
This site is part of Gweunydd Blaencleddau SAC. A series of streams and flushes cross the site, many of which contain suitable habitat. Southern Damselfly is monitored by NRW who should be consulted when planning any works. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Unfortunately, scrub invasion has become a serious issue here and patches of vegetation and a network of stock paths need to be mown.

7.1.13. Trebwch (private land)
The site contains a number of streams that could be investigated for their potential to provide suitable habitat for Southern Damselfly. Many of the streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or any ditches could be remodelled to make them wider and shallower, with a series of online pools. The site may not currently contain suitable habitat but it occupies a “stepping stone" position between the Preseli and Carn Ingli populations and could be an important connectivity site. There may be opportunities to create new habitat here by creating entirely new flush systems.

7.1.14. Penlan (PCNPA land)
The site contains a number of streams and flushes that could be remodelled to provide suitable habitat for Southern Damselfly. Some of the streams have been run

into ditches. This water could be returned to the natural drainage channels or any ditches could be remodelled to make them wider and shallower, with a series of online pools. The site occupies a "stepping stone" position between the Preseli and Carn Ingli populations and could be an important connectivity site. There are also opportunities to create large areas of new habitat here by creating entirely new flush systems.

7.1.15. Llanerch (private land)

The site contains a number of streams that could be investigated for their potential to provide suitable habitat for Southern Damselfly. Some streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or any ditches could be remodelled to make them wider and shallower, with a series of online pools. The site may not currently contain suitable habitat but it occupies a “stepping stone" position between the Preseli and Carn Ingli populations and could be an important connectivity site. There may be opportunities to create new habitat here by creating entirely new flush systems.

7.1.16. West of Garn Llwyn Wood (private land)

This site has a network of modified streams that appear to have been deepened and dredged but that largely maintain a natural drainage pattern. These could be investigated for their potential to provide suitable habitat for Southern Damselfly. Some other streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or the modified streams and ditches could be remodelled to make them wider and shallower, with a series of online pools.

7.1.17. Iet Goch (private land)

The natural drainage pattern here has been highly modified with the streams having been run into peripheral ditches. This water could be returned to the natural drainage channels or the ditches could be remodelled to make them wider and shallower, with a series of online pools.

7.1.18. Carn Goedog (common land)

An area of existing flushes and streams that could be remodelled and extended to provide suitable habitat for Southern Damselfly. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Work in this area would help link the populations on the north and south side of the Preseli hills.

7.1.19. Carn Menyn (common land)

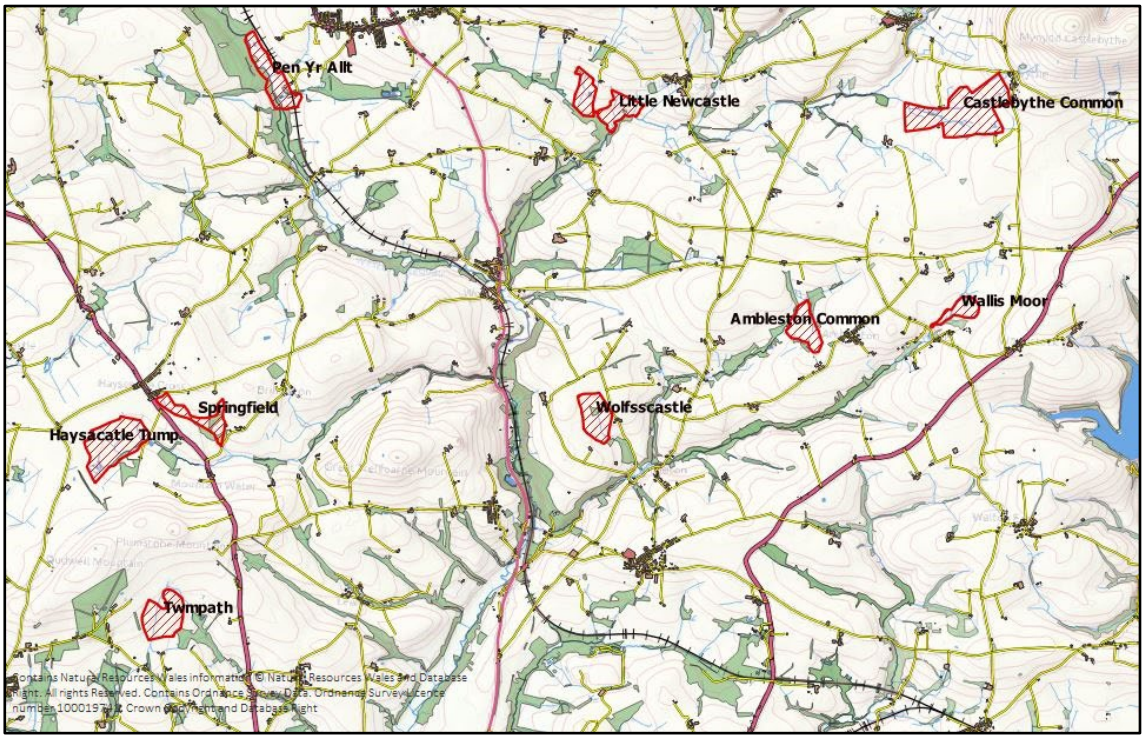
An area of existing flushes and streams that could be remodelled and extended to provide suitable habitat for Southern Damselfly. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. Work in this area would help link the populations on the north and south side of the Preseli hills.

8. Long-term project sites

This section identifies areas of streams and flushes where works can be undertaken in the coming years/decades (20+ years, following completion of the short and medium-term works). These works will build resilience into the Southern Damselfly populations by restoring some of its recent historic sites and by further increasing the connectivity between sites in the wider countryside and the core SAC populations. There are no recent Southern Damselfly records from any of these sites apart from Site 1, although there are historic records from Sites 2 & 3.

Table 5. Long-term project sites. Sites in red (sites 1, 2 and 3) have supported Southern Damselfly.

Number	Name	6 fig GR
1	Springfield	SM919247
2	Pen Yr Allt	SM928290
3	Wallis Moor	SN014260
4	Castlebythe Common	SN016286
5	Ambleston Common	SM995259
6	Little Newcastle	SM968288
7	Wolfscastle	SM969247
8	Hayscastle Tump	SM909243
9	Twmpath	SM915223



Map 4. Long-term project sites.

8.1. Suggested long-term project works

8.1.1. Springfield (private land)

A small site with recent records of Southern Damselfly. There is an extensive network of flushes draining the site, many of which contain suitable habitat. Any of the flushes

and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. This site is not considered as a priority as the grazing regime (horses and formerly cattle) maintains the habitat in suitable condition. However, should this regime change then mechanical interventions may be required more urgently. **Consultation required with BSBI County Recorder due to the presence of the rare plants such as Pale Butterwort *Pinguicula lusitanica* in these flushes**.

8.1.2. Pen Yr Allt (private land)

A small site with historic records of Southern Damselfly. Some streams have been run into peripheral ditches. This water could be returned to the natural drainage channels or any ditches could be remodelled to make them wider and shallower, with a series of online pools.

8.1.3. Wallis Moor (SSSI, common land)

A large site with historic records of Southern Damselfly. Currently, only a small part of the site supports suitable habitat in an area of wet mire and flushes in the eastern section of the common where water drains into the Western Cleddau river. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled.

8.1.4. Castlebythe Common (common land, private land)

The common land here is very scrubbed over and, unless a suitable grazing regime can be established, may not be viable as a restoration site. Large-scale scrub removal and mowing of rank vegetation would be required along with the restoration of streams and flushes. However, the private land immediately to the west of the common appears more promising being well-grazed and free of scrub. The drainage patterns here have been modified with streams put into peripheral ditches. However, the natural drainage pattern is still visible (the channels are clearly visible on aerial imagery) and could be restored by excavating the old flush channels and redirecting the ditch water to them. Otherwise, the ditches could be remodelled to make them wider and shallower, with a series of online pools.

8.1.5. Ambleston Common (common land)

A large site that, despite appearing suitable, has no records of Southern Damselfly. The central part of the common is very wet and appears to have been historically cut for peat. Much of the site is a mix of mires, flushes and runnels draining into a tributary of the Spittal Brook. Any of the flushes and streams on this site that have become unsuitable could be targeted for mechanical intervention. Those sections in poorest condition should be targeted first and allowed to develop into suitable habitat before other areas are tackled. The very wet nature of the site may require the use of specialist machinery but there may some areas around the edges of the site where works could be more easily undertaken.

8.1.6. Little Newcastle (private land)

An extensive area of semi-improved wetland/grassland with a high cover of scrub. Most of the streams have been run into peripheral ditches. This water could be returned to natural drainage channels or the ditches could be remodelled to make them wider and shallower, with a series of online pools.

8.1.7. Wolfscastle (private land)

An area of semi-improved wetland/grassland. The drainage patterns here have been modified with streams put into peripheral ditches. However, the natural drainage pattern is still visible (the channels are clearly visible on aerial imagery) and could be restored by excavating the old flush channels and redirecting the ditch water to them. Otherwise, the ditches could be remodelled to make them wider and shallower, with a series of online pools.

8.1.8. Hayscastle Tump (private land)

An extensive area of semi-improved wetland/grassland and wet heath. Suitable habitat is still present but the natural drainage patterns have been modified with streams put into peripheral ditches. The natural drainage pattern is no longer obvious and, as some of the ditches contain suitable habitat, it may be best to remodel these to make them wider and shallower, with a series of online pools. There may be some scope for restoring old flush channels and redirecting water to them where these can be identified.

8.1.9. Twmpath (private land)

An extensive area of semi-improved wetland/grassland and wet heath. Suitable habitat is still present but the natural drainage patterns have been modified with some streams put into peripheral ditches. The natural drainage pattern is no longer obvious and, as some of the ditches contain suitable habitat, it may be best to remodel these to make them wider and shallower, with a series of online pools. Some natural stream and flushes remain and there may be some scope for restoring these.

9. Meetings with Common Land Officer (PCC) and PROW Officer (PCNPA)

Grazing with heavy livestock such as cattle and ponies is considered necessary to maintain suitable habitat for the Southern Damselfly. Therefore, on the 9th January 2020, a meeting was held with the Common Land Officer for Pembrokeshire County Council to identify what types of livestock were registered on the Common Lands included in this project. This was undertaken to identify if any of the grazing regimes on the Common Land Register might not be suitable for Southern Damselfly habitat maintenance. A detailed check of the relevant register entries was made which revealed that all of the commons had rights for cattle and horses as well as sheep and that therefore the rights registered on each common should, if exercised at appropriate levels, be able to maintain suitable Southern Damselfly habitat.

On the 22nd of January, a further meeting was held with PCNPA staff to ensure that access opportunities could be built into habitat creation schemes on the project sites. Six access opportunities were identified at the following sites, where the PCNPA Public Rights of Way officer is aware of access issues caused by waterlogging of paths and where works to remedy this could be extended and adapted to create potential new areas of suitable Southern Damselfly habitat.

Short-term project sites:

1. Waun Lwyd Common (Footpath to Dolaumaen);

2. Northern end of Cwm Garw area (Bridleway across Preseli top);
3. Waun Isaf (Footpath at Southern end).

Medium-term project sites:

4. Mynydd Crwn (Fron Las Bridleway);
5. Penlanwynt (Footpath to Fynnondici);
6. Pen lan (Carn Ingli – Footpath from Pen Lan Uchaf to Bedd Morris).

10. Recording & assessing Southern Damselfly habitat restoration works

The primary purpose of this monitoring is to assess the efficacy of habitat restoration/creation works. The habitat assessment and species monitoring methods set out below are not a replacement for Habitats Directive monitoring of the designated sites features. The methodology given here is, however, based upon that used for SAC monitoring and utilises some of the same attributes. The data collected should be made available to NRW as it may be used to help inform SAC monitoring.

The Southern Damselfly in North Pembrokeshire utilises small, shallow, slow-flowing, spring-fed, base-rich streams and runnels with a peaty substrate. The streams need to be partially vegetated, with the soft-stemmed plants such as Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and Jointed Rush *Juncus articulatus*. It also requires grazed and poached edges to the stream with sparse marginal vegetation and emergent vegetation. djacent to the stream, low, tussocky vegetation should provide the adult damselflies with shelter.

10.1. Monitoring habitat creation/restoration sites

Newly-created areas may take up to 2-3 years to develop suitable habitat and therefore an initial assessment of the restoration sites should not take place until at least two years after the completion of restoration works. As a restoration site "matures" and improves, there is likely to be an increase in the extent of suitable habitat. However, as restored areas develop over time, they may begin to become less suitable again - a decline in the extent of suitable habitat may indicate that management intervention is again required. Sites should therefore be reassessed every 2-3 years.

For each Southern Damselfly restoration/creation site, the habitat suitability should be assessed along a transect. The transect should have fixed start and endpoints, these should ideally be permanent landmarks or marked with stakes. If distinctive landmarks are not present, GPS reading of these points should be taken. The whole length of the restored stream should be walked and an estimate made of the length (percentage) of it which provides suitable habitat. Where habitat restoration areas are small and non-linear (e.g. at Pensarn Corner), an estimate of the area of suitable habitat can be made.

It is important that time and resources are directed towards sites that respond well to the habitat restoration techniques. The assessment of existing sites (see Section 4)

shows that some sites respond better than others (e.g. at Pensarn C, around 70-80% of the stream provides suitable habitat whereas at Ty Cwta S there is virtually no suitable habitat and none seems likely to develop). Therefore, a provisional figure of at least 40% of each restored stream meeting the definition of suitable habitat is suggested as indicating a "successful" restoration site. When making an assessment, if for example, on walking 100m of restored stream, only 30m (30%) is found to be suitable habitat, the site should be reassessed to see if, a) more time should be allowed to allow habitat to develop, b) further works could improve it, c) the site has become unsuitable since the works took place and restoration is again required or d) the site is inherently unsuitable as a habitat creation/restoration site. It should be noted, however, that even a small area of suitable habitat in a key location could be of importance and therefore it might be worth maintaining or attempting to expand it.

A standardised habitat and species recording form is included as Appendix 3.

10.2. Definition of "suitable habitat"

- The watercourse will be open, unshaded and shallow with a visible (in summer) flow.

- There will be a cover of submerged and semi-emergent, plants including some Bogbean *Menyanthes trifoliata*, Fool's-water-cress *Apium nodiflorum*, Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and/or Spearwort *Ranunculus flammula.* Sedges *(Carex* spp.) or rushes (*Juncus* spp.) will also be present.

- There will be areas of adjacent tussocky vegetation on the banksides and/or a low cover of emergent vegetation in the stream.

- There will be some cover of bare peat or other organic substrate visible in the watercourse.

10.3. Monitoring of the Southern Damselfly population on restoration sites

To back up the habitat assessment at each Southern Damselfly restoration/creation site, searches for adult damselflies should be made using the same transect. The transect should be walked and a count made of the number of male Southern damselflies seen within 5m of the observer. The males are blue and distinctive, the females are pale brownish and easily confused with other damselfly species. If the area is over 5 metres wide, then both sides of the stream should be walked. The counts thus generated provide an indication of habitat suitability that supports the direct habitat observations.

Transects should take place during the adult flight season. This can change depending on the weather conditions. Timing should be between early June and the end of July. Transects should be undertaken between 11:00 and 14:00, with air temperature exceeding 17^{o}C and 50% sunshine and wind speed below Beaufort scale 3. There should be a few counts done at each site. However, this may prove difficult due to the often-poor weather conditions prevalent in the project area.

Newly created habitat areas may take several years to become suitable and, as it "matures" and improves, population monitoring would be expected to show an

increase in numbers. As restored areas develop over time, they may begin to become less suitable again - a sudden drop in numbers or a steady decline may indicate that management intervention is again required.

It should be noted that a licence would be required if adult damselflies were to be netted to confirm their identity. Experienced surveyors will not need to capture specimens and can confirm their identity through the "jizz" of the species and the use of close-focus binoculars and/or a camera. Inexperienced surveyors will need to be trained by someone experienced in identifying adult males and should also refer to the identification guidance set out in Install (2012).

11. Summary of monitoring results for Southern Damselfly as assessed by Natural Resources Wales

11.1. Monitoring results in Preseli SAC

The SAC feature 1044 *Coenagrion mercuriale* (Southern Damselfly) is an Annex II species present as a qualifying feature in Preseli SAC. The feature is in **unfavourable condition** (July 2012). The current condition is thought to be due primarily to a lack of suitable habitat on Waun Fawr Puncheston, and probably a lack of suitable grazing on Gors Fawr. This is the most recent monitoring information available.

Management actions identified by Natural Resources Wales in Preseli SAC:

The management actions identified by NRW in the Preseli SAC Core Management Plan are set out below.

1) At all sites, the reinstatement or continuation of an appropriate grazing regime using heavy stock such as cattle and ponies is required.
2) Habitat restoration and maintenance by mechanical channel manipulation needs to be undertaken at intervals to ensure key flushes are maintained in good condition.
3) Where ditches carry water off the common or direct it into peripheral ditches, leaving natural watercourses dry, the feasibility of rewetting the natural streams should be explored and undertaken where practical.
4) Water quality and quantity should be monitored and maintained at flush complexes.
5) Maintenance of watching brief overall developments and proposals that could have adverse hydrological and ecological effects on the flushes.

The management works that are recommended in the present report will address points 1, 2, 3 and 4 and will contribute towards restoring the *Coenagrion mercuriale* SAC feature in "Favourable Condition".

11.2. Monitoring results in Gweunydd Blaencleddau SAC

The SAC feature 1044 *Coenagrion mercuriale* (Southern Damselfly) is an Annex II species present as a qualifying feature, but not a primary reason for site selection in Gweunydd Blaencleddau SAC. The feature at this site is in **unfavourable condition**

(July 2016). The current condition is thought to be due primarily to a lack of management of Dolau Newydd and Waun Lwyd. This is the most recent monitoring information available. However, observations during March 2020 suggest that there have been further declines in the condition of the flushes and streams at other sites (including Dolau isaf) too.

Management actions identified by Natural Resources Wales in Gweunydd Blaencleddau SAC:

1. At all sites, the reinstatement or continuation of an appropriate grazing regime using heavy stock such as cattle and ponies is required.
2. Habitat restoration and maintenance by mechanical channel manipulation needs to be undertaken at intervals to ensure key flushes are maintained in good condition.
3. Where ditches carry water off the SAC or direct it into peripheral ditches, leaving natural watercourses dry, the feasibility of rewetting the natural streams should be explored and undertaken where practical.
4. Water quality and quantity should be monitored and maintained at flush complexes.

The management works that are recommended in the present report will address points 1, 2, 3 and 4 and will contribute towards restoring the *Coenagrion mercuriale* SAC feature in “Favourable Condition” at this site.

11.3. Monitoring results in Carn Ingli SSSI

The Southern Damselfly is an Independently Qualifying feature of Carn Ingli SSSI but has not been monitored here.

12. GIS data outputs

The GIS data used to generate the maps and tables used in this report is supplied on CD as a QGIS project. The QGIS project file is titled “Mercuriale Project” and has separate shapefile layers showing:

1. The distribution of all Pembrokeshire records of Southern Damselfly;
2. All pre-existing habitat creation project sites identified prior to this project (including a colour-coded layer showing those that have been completed, (including date of completion) and those that have not yet been completed and those that are no longer considered viable sites;
3. All potential habitat creation and restoration opportunities including both short, medium- and long-term project areas;
4. Restoration sites where works over winter 2019/20 were carried out.

13. References

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Purse, B. 2002. The Ecology and Conservation of the Southern Damselfly (*Coenagrion mercuriale* – Charpentier) in Britain. EA R&D Technical Report **W1-021/TR.** Environment Agency, Bristol.

Roquette, J.R. & Thompson, D.J. 2007. Patterns of movement and dispersal in an endangered damselfly and the consequences for its management. *Journal of Applied Ecology*. **44**: 692-701.

Thompson, D.J., Roquette, J.R. & Purse, B.V. 2003. Ecology of the Southern Damselfly. Conserving Natura 2000 Rivers Ecology Series No. **8**. English Nature, Peterborough.

14. Appendix 1. Techniques of Stream Restoration

From: Coker (2002)

Most of the natural watercourses utilised by Southern Damselfly are either very small natural streams or flush-lines. Over much of the North Pembrokeshire area, these tiny watercourses are not mapped, even on the largest scale O.S. maps. Once streams are large enough to be mapped, they generally do not provide suitable habitat for the damselfly. On some sites, the natural watercourses have been dried up as the water has been diverted into ditches. Work can often improve both the natural watercourses and the drainage ditches. Most mechanical interventions used to restore these watercourses focus on using a digger to strip away the turf/peat/top-soil from along one or both sides the watercourse to create a wide (1 to several metres), shallow, slow-flowing watercourse. In essence, the work will target streams similar to those shown in Figure 1 (below) and turn them into streams like those shown in Figure 2. The methods of achieving this are shown in Figures 3 and 4.

Watercourse types

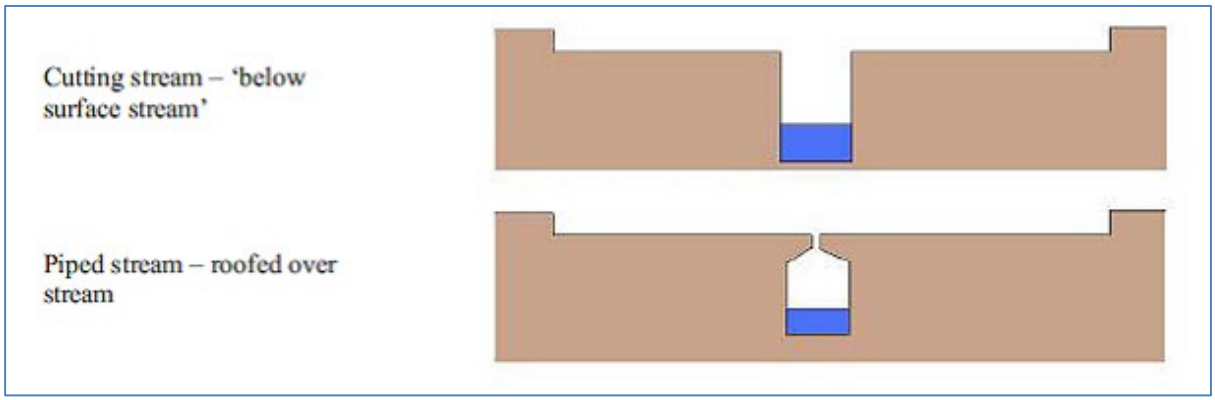


Figure 1. Stream/flush types that are unsuitable or sub-optimal for Southern Damselfly.

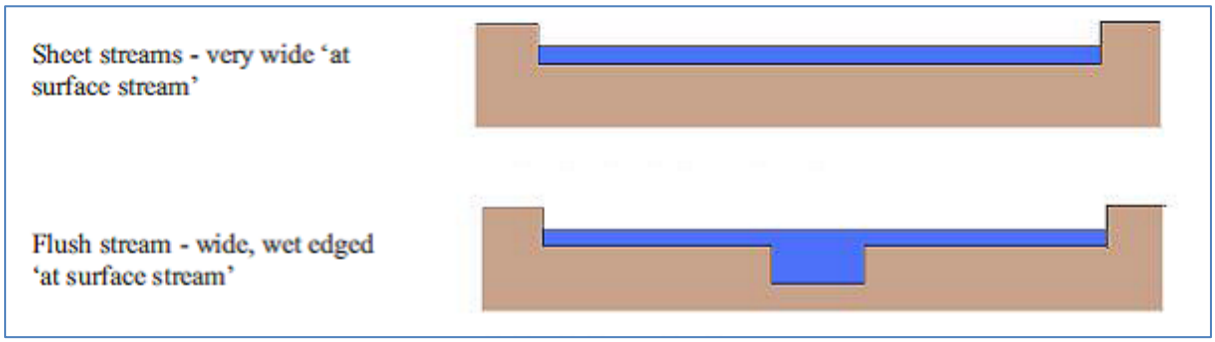
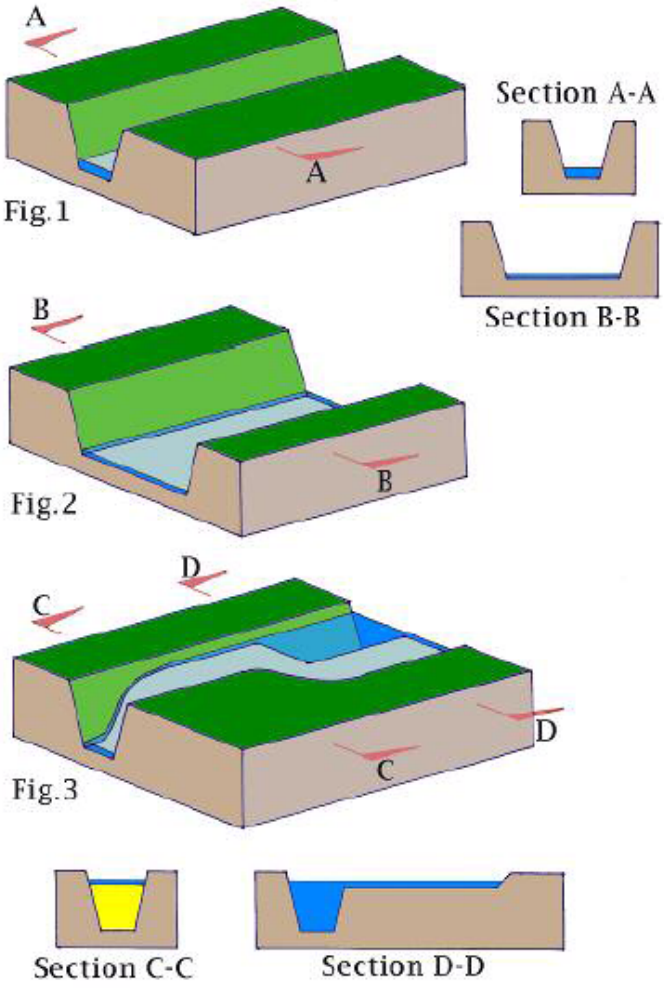


Figure 2. Stream/flush types that are suitable for Southern Damselfly.

Stream habitat manipulation.
Below is described a series of options that may be implemented to return water bodies that have developed passed the point where they were suitable for *Coenagrion mercuriale* back to suitable habitat.

Most of these suggestions merely replicate features that can be seen in the range of water bodies found on the sites and can be are created 'naturally' with the presences of grazing cattle.

Deep cut stream options.



Existing deep cut stream.
Fig. 1 represents diagrammatically a deep cut stream that is no longer suitable for *Coenagrion mercuriale*. The depth of the stream below the ground surface means that it is heavily shaded and the flow itself is concentrated with high currents. This results in little vegetative growth and the erosion of the finer material from the streambed.

Stream widening.
Fig. 2 represents the same stream that has been widened. The stream is no longer shaded by its banks and a wider channel allows the same flow but with much slower currents. If the new bed is formed from the peat/clay excavated to form the new channel, this should encourage the development of stream vegetation. If the bed itself is irregular, with deeper pockets both laterally and longitudinally, with the occasional low bund, erosion of the finer material can be limited until a vegetated cover is established.

Figure 3. Stream habitat manipulation methods.

dry weather flow, hence reducing flow speeds. The ponding effect will trap silt and promote stream vegetation. The local raising of the water table will result in softer banks that may allow poaching by grazing stock. The stripping of the soil/clay to form the plug will result in a widening of the stream at the surface.

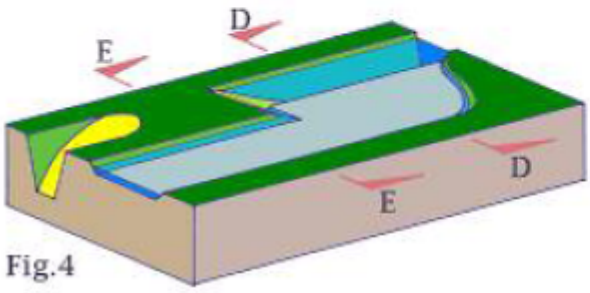


Fig.4

Section E-E

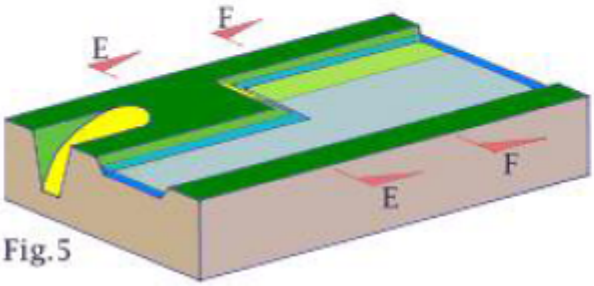


Fig.5

Section F-F

Stream plugging with bay and side channel.

Fig. 4 is the similar to Fig. 3 but with a side channel added. In many situations storm flows can be quite substantial and reconstituted channel substrate susceptible to erosion under storm flows. The addition of a channel formed over unaltered ground (and hence able to resist erosion better than made ground) would not only protect the construction from these forces but also provide an opportunity to improve the habitat further.

Stream plugging with plugged bay and side channel.

Fig. 5 is similar to Fig. 4 but the bay is extended upstream from the plug by excavation using the excavated material to fill the old stream channel. This option provides the cheapest scheme and probably the optimum enhancement of the existing stream.

All these options are greatly enhanced by the introduction of local variation. The above diagrams give the impression of smooth banks, straight edges and uniform stream depths, but these diagrams are just to illustrate the concepts behind each option. An actual stream improvement would have rough and irregular banks, irregular edges, depths and widths.

Figure 4. Further stream habitat manipulation methods.

Piped stream options.

Fig. 6 Existing stream course all below surface

Fig. 6 represents an existing piped stream. Flow is entirely below the surface from right to left.

Fig. 7 Stream with upstream plug and depression channel

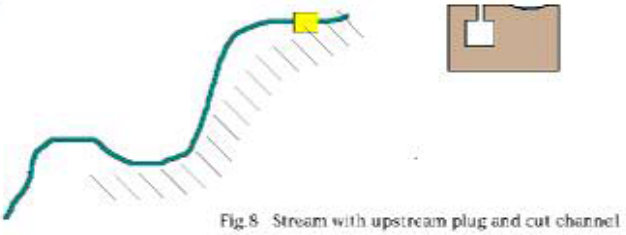
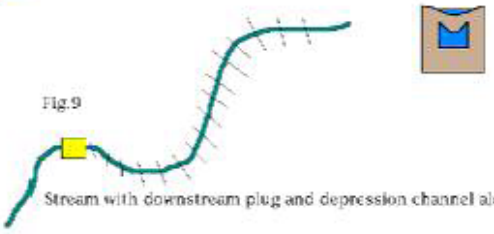


Fig. 7 represents the same stream with a plug formed in the 'channel' to completely block it. With a depression channel added alongside the old course the stream flow is forced to the surface by the plug to flow down to channel. A depression channel is formed by just pressing to soil. This is only practicable at soft locations.

Fig.8 Stream with upstream plug and cut channel

Fig. 8 is as above but with the depression channel replaced with a cut channel. The excavated material might be used to fill in the old course.

Fig.9



Stream with downstream plug and depression channel along stream line

Fig. 9 represents the stream with a plug created downstream and a depression channel formed upstream. Flow backs behind the plug to reach the surface at the start of the depression channel.

15. Appendix 2. Pollution control method statement

Prior to the commencement of any habitat restoration/creation works, silt traps (pools) will be dug in the stream a short distance upstream of the point where it joins a larger stream to prevent any silt disturbed during works from causing pollution problems further down the river. A minimum of two silt trap pools will be created in each stream course. A hay bale will be placed in the stream to catch silt and the turves excavated from the silt traps will be placed upside down where the water flows out of the silt traps to assist with filtering sediments from the water. Release of silts from within the stream will be minimised by working at a time of low flow (i.e. not immediately following rain) and by leaving one 4m long unexcavated section of stream bank in place along every 30m of the stream. Silt traps will be placed upstream of each unexcavated section. Works should take place when weather conditions are suitable – a dry day following a reasonably dry period when flows are relatively low.

PCNPA, NRW or their agents will be on-site to supervise works and will be responsible for halting works if conditions/events arise that make the work unduly difficult, unsafe or that increase the risk of downstream siltation pollution occurring.

A spill kit will be kept on-site whilst vehicles are present for use in the event of spills of fuels and hydraulic oils etc. No spare fuels or oils will be stored on-site or near any watercourse.

16. Appendix 3. Southern Damselfly habitat restoration works and assessment form

Use one form per project site. For each Southern Damselfly restoration/creation site, the habitat suitability should be assessed along a fixed transect. The transect should have fixed start and endpoints, these should ideally be permanent landmarks or marked with stakes. If distinctive landmarks are not present GPS reading of these points should be taken. The whole length of the restored stream should be walked and an estimate made of the length (percentage) of it which provides suitable habitat.

Site name	**Date of works**
GPS position of start and endpoints?	**Start:** **End:**
Brief description of works and sketch map	
Length of restored habitat	

First condition assessment	
Recorder: Date	
Habitat assessment	
Length of restored stream? (metres)	m
Is the watercourse open, unshaded and shallow with a permanent (summer), discernible flow?	Y/N
Are there areas of adjacent tussocky vegetation on the banksides and/or a low cover of emergent vegetation in the stream?	Y/N
Is bare peat or other organic substrate visible in the watercourse?	Y/N
How much of the stream has **SUITABLE HABITAT** - a cover of submerged and semi-emergent, plants including some Bogbean *Menyanthes trifoliata*, Fool's-water-cress *Apium nodiflorum*, Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and/or Spearwort *Ranunculus flammula*. Sedges (*Carex* spp.) or rushes (*Juncus* spp.).	m %
Species assessment Transects should take place between early June and the end of July, between 11:00 and 14:00. Air temperature should be above 17oC and 50% sunshine.	
Number of adult male *C. mercuriale* counted within 5m of restored watercourse?	
Time spent counting (Hrs. and mins.)	
Notes	

Subsequent condition assessment 1	
Recorder: Date	
Habitat assessment	
Length of restored stream? (metres)	m
Is the watercourse open, unshaded and shallow with a permanent (summer), discernible flow?	Y/N
Are there areas of adjacent tussocky vegetation on the banksides and/or a low cover of emergent vegetation in the stream?	Y/N
Is bare peat or other organic substrate visible in the watercourse?	Y/N
How much of the stream has **SUITABLE HABITAT** - a cover of submerged and semi-emergent, plants including some Bogbean *Menyanthes trifoliata*, Fool's-water-cress *Apium nodiflorum*, Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and/or Spearwort *Ranunculus flammula*. Sedges (*Carex* spp.) or rushes (*Juncus* spp.).	m %
Species assessment Transects should take place between early June and the end of July, between 11:00 and 14:00. Air temperature should be above 17oC and 50% sunshine.	
Number of adult male *C. mercuriale* counted within 5m of restored watercourse?	
Time spent counting (Hrs. and mins.)	
Notes	

Subsequent condition assessment 2	
Recorder: Date	
Habitat assessment	
Length of restored stream? (metres)	m
Is the watercourse open, unshaded and shallow with a permanent (summer), discernible flow?	Y/N
Are there areas of adjacent tussocky vegetation on the banksides and/or a low cover of emergent vegetation in the stream?	Y/N
Is bare peat or other organic substrate visible in the watercourse?	Y/N
How much of the stream has **SUITABLE HABITAT** - a cover of submerged and semi-emergent, plants including some Bogbean *Menyanthes trifoliata*, Fool's-water-cress *Apium nodiflorum*, Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and/or Spearwort *Ranunculus flammula*. Sedges (*Carex* spp.) or rushes (*Juncus* spp.).	m %
Species assessment Transects should take place between early June and the end of July, between 11:00 and 14:00. Air temperature should be above 17oC and 50% sunshine.	
Number of adult male *C. mercuriale* counted within 5m of restored watercourse?	
Time spent counting (Hrs. and mins.)	
Notes	

Subsequent condition assessment 3	
Recorder: Date	
Habitat assessment	
Length of restored stream? (metres)	m
Is the watercourse open, unshaded and shallow with a permanent (summer), discernible flow?	Y/N
Are there areas of adjacent tussocky vegetation on the banksides and/or a low cover of emergent vegetation in the stream?	Y/N
Is bare peat or other organic substrate visible in the watercourse?	Y/N
How much of the stream has **SUITABLE HABITAT** - a cover of submerged and semi-emergent, plants including some Bogbean *Menyanthes trifoliata*, Fool's-water-cress *Apium nodiflorum*, Marsh St. John's-wort *Hypericum elodes*, Bog Pondweed *Potamogeton polygonifolius* and/or Spearwort *Ranunculus flammula*. Sedges *(Carex* spp.) or rushes (*Juncus* spp.).	m %
Species assessment Transects should take place between early June and the end of July, between 11:00 and 14:00. Air temperature should be above 17oC and 50% sunshine.	
Number of adult male *C. mercuriale* counted within 5m of restored watercourse?	
Time spent counting (Hrs. and mins.)	
Notes	

17. Data Archive Appendix

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] QGIS files.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue http://libcat.naturalresources.wales or http://catllyfr.cyfoethnaturiol.cymru by searching 'Dataset Titles'. The metadata is held as record no 124750.