

**European Community Directive
on the Conservation of Natural Habitats
and of Wild Fauna and Flora
(92/43/EEC)**

Supporting documentation for the
Third Report by the United Kingdom under
Article 17

on the implementation of the Directive
from January 2007 to December 2012
Conservation status assessment for

Species:

S1833 - Slender naiad (*Najas flexilis*)

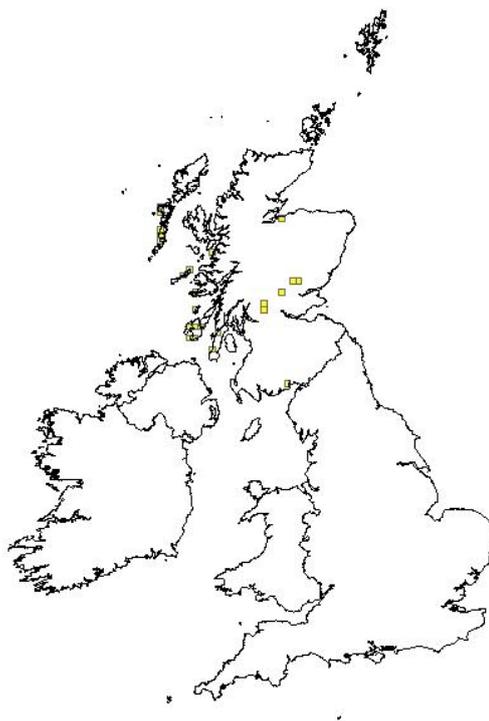
IMPORTANT NOTE – PLEASE READ

- The country-level reporting information contained in this document is a contribution to the Article 17 UK report for the habitat/species concerned.
- It has been provided by **Scottish Natural Heritage** and refers only to the state of the habitat/species in **Scotland** - it does not constitute an assessment for the whole of the UK.
- The Article 17 UK Approach document provides details on how this information has been used and, combined with information supplied by other Statutory Nature Conservation Bodies
- The format of the document is closely aligned to that set out by the European Commission for Member State reporting – as a result, some of the fields are not applicable at a country-level and have deliberately been left blank – in addition, the content of most fields is constrained by the EC reporting categories.

Reporting format on the 'main results of the surveillance under Article 11' for Annex II, IV & V species

<i>Field name</i>	<i>Brief explanations</i>	
0.2 Species	0.2.1 Species code	S1833
	0.2.2 Species scientific name	<i>Najas flexilis</i>
	0.2.3 Alternative species scientific name Optional	
	0.2.4 Common name Optional	Slender naiad

1.1 Maps		
1.1.1 Distribution map		Sensitive False
	<p>All known sites are located in Scotland. The species has been recorded in the Western Isles, Argyll, Dumfries, Perthshire, Stirlingshire and Inverness-shire.</p> <p>There was a record for Esthwaite Water in north-west England, but Natural England has confirmed that the species is no longer growing in the site.</p> <p>Data have been collected using a number of methods including use of a boat and bathyscope, grapnel (though this is discouraged as a destructive technique), strandline search, snorkelling.</p> <p>There is a new record for Loch Flemington in Inverness-shire. Plants were not recorded growing, but remains of the species were found in surface sediment and the sediment record suggests that the species has been growing in the Loch for some time. This record expands the known distribution of the species, as this site is the only one for which there is a record in this part of the country.</p>	



1.1.2 Method used - map	Estimate based on partial data with some extrapolation and/or modelling
1.1.3 Year or period	1994-2012 The date range selected was 1994 - 2012. This is considered sufficiently up-to-date to be relevant, whilst also taking into account the fact that surveys over all known supporting habitats are not frequent and some lochs are visited less frequently than others.
1.1.4 Additional distribution map	False
1.1.5 Range map	

2.1 Biogeographical region & marine regions	ATL
2.2 Published sources	<p>"Bennion, H., Clarke, G., Davidson, T., Morley, N., Rose, N., Turner, S. and Yang, H. (2008). Palaeoecological study of seven mesotrophic lochs. ECRC research report 121. Final report to SEPA and SNH</p> <p>Dale, K. (1997). Survey of slender naiad, <i>Najas flexilis</i>, in Loch of Butterstone and Loch of Craiglush. Contract number HT/97/98/17. Final report to Scottish Natural Heritage</p> <p>James, V.A. and Barclay, A.M. (1996). The occurrence and distribution of <i>Najas flexilis</i> in Loch of Craiglush, Loch of the Lowes and Loch of Butterstone. Report to Scottish Natural Heritage</p>

	<p>Wingfield, R., Murphy, KJ., Hollingsworth, P. and Gaywood, M.J. (2004). The Ecology of <i>Najas flexilis</i>. Scottish Natural Heritage Commissioned Report No. 017 www.snh.org.uk/pdfs/publications/commissioned_reports/f98pa02.pdf</p> <p>Also unpublished sources"</p>
	<p>Bennion, H., Clarke, G., Davidson, T., Morley, N., Rose, N., Turner, S. and Yang, H. (2008). Palaeoecological study of seven mesotrophic lochs. ECRC research report 121. Final report to SEPA and SNH</p> <p>Dale, K. (1997). Survey of slender naiad, <i>Najas flexilis</i>, in Loch of Butterstone and Loch of Craiglush. Contract number HT/97/98/17. Final report to Scottish Natural Heritage</p> <p>James, V.A. and Barclay, A.M. (1996). The occurrence and distribution of <i>Najas flexilis</i> in Loch of Craiglush, Loch of the Lowes and Loch of Butterstone. Report to Scottish Natural Heritage</p> <p>Wingfield, R., Murphy, KJ., Hollingsworth, P. and Gaywood, M.J. (2004). The Ecology of <i>Najas flexilis</i>. Scottish Natural Heritage Commissioned Report No. 017 www.snh.org.uk/pdfs/publications/commissioned_reports/f98pa02.pdf</p> <p>Also unpublished sources</p>

2.3 Range	
2.3.1 Surface area Range	All remaining UK sites are in Scotland. Its main sites are the machair lochs in the Western Isles, with other mainland lochs in Argyll, Dumfries, Perthshire, Stirlingshire, Westernness (Preston et al., 2002) and near Inverness (Bennion et al., 2008)
2.3.2 Method used Surface area of Range	Estimate based on partial data with some extrapolation and/or modelling
2.3.3 Short-term trend Period	1994-2012
2.3.4 Short term trend Trend direction	stable <p>The range is considered stable, as from the data available from 1994 to 2012, there would be low confidence in stating that the species had been lost from any of its known sites, though there have been decreases in numbers of plants in individual lochs. No statistical analysis is available. The assessment of trend is by expert judgement. No percentage change data are available. The record at Loch Flemington does not represent an increase in range, only within known range.</p> <p>The most comprehensive report on present sites and ecology of the species is as follows: Wingfield, R., Murphy, KJ., Hollingsworth, P. and Gaywood, M.J. (2004).</p>

	<p>The Ecology of <i>Najas flexilis</i>. Scottish Natural Heritage Commissioned Report No. 017. www.snh.org.uk/pdfs/publications/commissioned_reports/f98pa02.pdf However, a number of other surveys have been carried out which cover multiple site.</p> <p>The new record for Loch Flemington was documented in the following reference: Bennion, H., Clarke, G., Davidson, T., Morley, N., Rose, N., Turner, S. and Yang, H. (2008). Palaeoecological study of seven mesotrophic lochs. ECRC research report 121. Final report to SEPA and SNH.</p>	
2.3.5 Short-term trend Magnitude	a) Minimum	
	No percentage change data are available.	
	b) Maximum	
2.3.6 Long-term trend Period		
2.3.7 Long-term trend Trend direction	stable	
	Reporting under the Biodiversity Action Plan reporting the longer term trend has been that range is relatively stable.	
2.3.8 Long-term trend Magnitude Optional	a) Minimum	
	b) Maximum	
2.3.9 Favourable reference range	a) Value in km²	
	b) Operator for FRR	
	c) FRR is unknown (indicated by "true")	False
	d) Method used to set FRR	

2.3.10 Reason for change Is the difference between the reported value in 2.3.1 and the previous reporting round mainly due to...	a) Genuine change?	False
	b) Improved knowledge/more accurate data?	False
	c) Use of different method (e.g. "Range tool")?	False

2.4 Population		
2.4.1 Population size estimation (using individuals or agreed exceptions where possible)	a) Unit	number of individuals
	b) Minimum	
	c) Maximum	
2.4.2 Population size estimation (using population unit other than individuals) Optional (<i>if 2.4.1 filled in</i>)	a) Unit	number of localities
	b) Minimum	38
	c) Maximum	46
2.4.3 Additional information on population estimates / conversion Optional	a) Definition of "locality"	Occupied lochs
	b) Method to convert data	
	c) Problems encountered to provide population size estimation	
2.4.4 Year or period	1994-2012	
2.4.5 Method used Population size	Estimate based on partial data with some extrapolation and/or modelling	

	<p>SCM surveys, surveys by SEPA to support Environmental Improvement Action Plan work, BSBI surveys.</p> <p>Many of the sites have been surveyed relatively recently. Different survey methods have been used, including snorkel surveys. Records for Loch Flemington and Loch Monzievaired are from palaeoecological data. The population size is based on the 46 Scottish sites that have been known to support populations during the period 1994 - 2012. The number of sites is greater than in the previous reporting round, because subsequent to the last reporting round, <i>N. flexilis</i> was found at a number of sites which had not been surveyed for a long time. It was also re-found in Tangy Loch. Of the lochs in designated sites which were examined during the second cycle of SCM, the surveyors failed to find <i>N. flexilis</i> in 8 of them (hence the minimum population size is estimated as 38). It is unclear if the failure to find <i>N. flexilis</i> at so many sites indicates that the species has been lost, or whether it had not been found due to the type of survey method employed, combined with the difficulties in recording this annual, submerged species. However, beyond illustrating something of the nature of its population dynamics and the limitations of surveys, it would seem to indicate that the species is suffering from local pressures at many sites and that this may have led to the species at least becoming rarer in certain locations. SCM surveys, surveys by SEPA to support Environmental Improvement Action Plan work, BSBI surveys and PhD surveys contributed to the data held.</p>	
2.4.6 Short-term trend Period	2001-2012	
2.4.7 Short-term trend Trend direction	decrease	
2.4.8 Short-term trend Magnitude	a) Minimum	0
	b) Maximum	17
	c) Confidence interval	
	<p>The confidence interval needs to be as large as the potential difference in short-term trend magnitude. This is because it is not certain that populations have been lost from lochs during recent failures to record them in the latest surveys. Evidence for that is in the re-finding of <i>N. flexilis</i> in Tangy Loch during 2010, for the first time since 1998.</p>	
2.4.9 Short-term trend Method used	Estimate based on partial data with some extrapolation and/or modelling <p>Recent failures to record <i>N. flexilis</i> from 8 lochs suggest a decrease in population trend. However the magnitude of decrease is unclear because of the difficulties in recording this dynamic plant species. The methods used in the surveys in which <i>N. flexilis</i> was not recorded did not include snorkelling, so despite the indications that the populations</p>	

	within these lochs have declined, there is doubt that the populations have been lost.	
2.4.10 Long-term trend – Period	1989-2012	
2.4.11 Long-term trend Trend direction		
2.4.12 Long-term trend Magnitude Optional	a) Minimum	
	b) Maximum	
	c) Confidence interval	
2.4.13 Long term trend Method used		
2.4.14 Favourable reference population	a) Number of individuals/agreed exceptions/other units	46
	The Favourable Reference population is considered to be 46. The last estimate of populations in 2005 was 39. Since then, evidence of contemporary populations has been found in Loch Flemington and Loch Monzievairst through examination of palaeoecological remains in sediment cores (Bennion et al., 2008). However, note that vegetation surveys have failed to record the species from Loch Flemington and Loch Monzievairst. A number of additional sites have been surveyed since the last reporting round, with the result that further occupied lochs have been found.	
	b) Operator	
	c) FRP is unknown indicated by "true"	False
	d) Method used to set FRP	
2.4.15 Reason for change	a) Genuine	True

Is the difference between the value reported at 2.4.1 or 2.4.2 and the previous reporting round mainly due to:	change?	
	Favourable reference population has changed because surveys have been conducted of a number of lochs which had not been surveyed for many years. In addition, recent application of macro-plant fossil analysis to sediment cores also detected contemporary evidence of the species in Loch Flemington and Loch Monzievairst.	
	b) Improved knowledge/more accurate data?	True
	c) Use of different method (e.g. "Range tool")?	True

2.5 Habitat for the species

2.5.1 Area estimation

This aquatic plant is an annual found in deep, clear mesotrophic lochs, and where the water receives some base-enrichment from nearby basalt, limestone or calcareous dune-sand (other associated rocks are Old Red Sandstone and Lewisian Gneiss). The majority of its sites are in the machair lochs of the Western Isles which are composed of a variety of loch habitat types.

The majority of sites for this species could be classified as :

3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea.

However the species is also often found in the following Annex 1 habitat types:

3110: Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation

There is thought to be a sufficient amount of habitat in the UK to support a viable population of the species.

As the plant may be found in water bodies of any of these types and the entire habitat resource has not been defined (Scotland has in the region of 30,000 lochs identifiable on the OS 1:50,000 series), it is not possible to indicate the area of habitat potentially available. Added to this, habitat within suitable water bodies does not represent the entire area of the loch.

	There is thought to be a sufficient amount of habitat in the UK to support a viable population of the species.	
2.5.2 Year or period		
2.5.3 Method used Habitat for the species	Absent data	
2.5.4 Quality of the habitat	a) Habitat quality	
	The quality of the habitat in many remote locations (e.g. Western Isles) is considered to be good. On mainland lochs, several have a predominantly agricultural landuse and enriched runoff has reduced habitat quality - therefore it is considered to be moderate at present. This aquatic plant is an annual found in deep, clear mesotrophic lochs, and where the water receives some base-enrichment from nearby basalt, limestone or calcareous dune-sand (other associated rocks are Old Red Sandstone and Lewisian Gneiss). The majority of its sites are in the machair lochs of the Western Isles which are composed of a variety of loch habitat types.	
	b) Assessment method	
2.5.5 Short-term trend Period	2001-2012	
2.5.6 Short-term trend Trend direction	stable The lochs are located in basins with gentle rolling hills. Especially on the Scottish mainland, surrounding landuse is predominantly agriculture and therefore run-off has reduced habitat quality. In recent years, management initiatives have been implemented to improve the condition of the Lunan Lochs (Dunkeld-Blairgowrie Lochs), and under SEPA's environmental improvement action plan, address catchment issues in many other sites. However, the land-use pressures continue to be a problem at a number of locations for this species and it is still too early to determine if the above management initiatives have had a positive impact on the local <i>N. flexilis</i> populations. This highlights the ongoing need for good, high quality surveillance of this important species.	
2.5.7 Long-term trend Period		
2.5.8 Long-term trend Trend direction		
2.5.9 Area of suitable habitat for the species	a) Value in km²	
	b) Absence of data indicated as '0'	
2.5.10 Reason for change Is the difference between the value reported at 2.5.1 and the previous reporting round mainly due to	a) Genuine change?	True
	The habitat is assessed as moderate since the habitat quality continues to be of concern, particularly in many mainland locations. It is improving	

	since management measures should be improving habitat quality, or at least slowing decline, particularly in the suite of lochs targeted by SEPA's mesotrophic lochs environmental improvement action plan. Although most of the sites in the Western Isles are in good condition, the concern lies with the inland lochs, which are suffering from eutrophication, largely due to agricultural run-off from the surrounding land for which we have yet to record evidence of recovery.	
	b) Improved knowledge/more accurate data?	False
	c) Use of different method (e.g. "Range tool")?	False

2.6 Main pressures		
a) Pressure	b) Ranking	c) Pollution qualifier
	H = high importance M = medium importance L = low importance	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	H	P
I01: invasive non-native species	H	
J02: human induced changes in hydraulic conditions	M	
B02: Forest and Plantation management & use	L	

The selected pressures have been identified principally from SNH SCM information and SEPA's mesotrophic loch environmental improvement action plan. The principal pressure on a number of populations is eutrophication. This arises mainly from agricultural diffuse pollution (H01.05) and septic tank discharges (H01.08). These pressures are being addressed through catchment management. A further widespread pressure is invasive non-native species (I01). The most widespread pressure from INNS comes from *Elodea* species, which are established in a number of lochs which are occupied by *N. flexilis*, including some in the Western Isles. More recently, *Crassula helmsii* has also been recorded from Loch Flemington, from which there are palaeoecological data indicating contemporary occupation of the site by *N. flexilis*. There is no known effective technique for managing these invasive species, but research is ongoing. Other pressures, such as abstraction and forestry land use are less prevalent within the catchments of lochs supporting *N. flexilis* and therefore have been ranked of less overall importance across the species' range.

2.6.1 Method used – Pressures

based exclusively or to a larger extent on real data from sites/occurrences or other data sources

2.7 Threats		
a) Threat	b) Ranking	c) Pollution qualifier
	H = high importance M = medium importance L = low importance	
H01: Pollution to surface waters (limnic & terrestrial, marine & brackish)	H	P
I01: invasive non-native species	H	
J02: human induced changes in hydraulic conditions	M	
B02: Forest and Plantation management & use	L	
M01: Changes in abiotic conditions	L	

Despite conservation/restorative action being taken to address the pressures already identified it is considered likely that the issues will persist to some degree into the future. For example, at present, there is no known effective method to manage *Elodea canadensis*, although efforts are underway to trial shading as a potential management technique. Catchment management measures to reduce diffuse pollution may be extremely effective, but it is recognised that they may take a long time to be effective and therefore the diffuse pollution issues have been identified as ongoing threats. Similarly, it is unclear whether the identified pressures from abstraction and forestry land use will be addressed sufficiently quickly for those pressures not to remain as future threats. M01 Changes in abiotic conditions has been included because likely elevated temperatures as a result of future climate change have been identified as being a particular risk to *N. flexilis*. The effect of climate change on standing waters and their biota will be to mimic or exacerbate the effects of other pressures, including eutrophication. Therefore climate change is a likely future threat to the species, particularly as it is likely to exacerbate the problems posed by some other identified threats.

2.7.1 Method used – Threats	expert opinion
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2.8 Complementary information

2.8.1 Justification of % thresholds for trends

2.8.2 Other relevant information

In some locations, such as Loch Flemington, there is an ongoing PhD that, in the near future, will provide further valuable information to help inform management of *N. flexilis*.

A greater number of *N. flexilis* sites now also contain *Elodea* species which are now recognised as a significant pressure and threat to the species. Work is ongoing and planned to try and establish some practical management techniques for *Elodea*, but at present there is no known technique for managing this pressure.

	<p>Many sites that support <i>N. flexilis</i> have established management agreements in place or are the subject of specific catchment management initiatives that should help address the problems in many areas where the species is known to be suffering from enrichment. In some locations (especially Tangy Loch and Loch Flemington) there is already considerable enrichment and it will likely take a considerable period of time before conditions are restored such that <i>N. flexilis</i> could flourish.</p> <p>Reintroduction to former sites has been suggested as a possible conservation measure (inc using any viable fossil seeds) but would require the full restoration of the habitat and has not been pursued to date.</p>
	<p>In some locations, such as Loch Flemington, there is an ongoing PhD that, in the near future, will provide further valuable information to help inform management of <i>N. flexilis</i>.</p> <p>A greater number of <i>N. flexilis</i> sites now also contain Elodea species which are now recognised as a significant pressure and threat to the species. Work is ongoing and planned to try and establish some practical management techniques for Elodea, but at present there is no known technique for managing this pressure.</p> <p>Many sites that support <i>N. flexilis</i> have established management agreements in place or are the subject of specific catchment management initiatives that should help address the problems in many areas where the species is known to be suffering from enrichment. In some locations (especially Tangy Loch and Loch Flemington) there is already considerable enrichment and it will likely take a considerable period of time before conditions are restored such that <i>N. flexilis</i> could flourish.</p> <p>Reintroduction to former sites has been suggested as a possible conservation measure (inc using any viable fossil seeds) but would require the full restoration of the habitat and has not been pursued to date.</p> <p>Bennion, H., Clarke, G., Davidson, T., Morley, N., Rose, N., Turner, S. and Yang, H. (2008). Palaeoecological study of seven mesotrophic lochs. ECRC research report 121. Final report to SEPA and SNH</p> <p>Dale, K. (1997). Survey of slender naiad, <i>Najas flexilis</i>, in Loch of Butterstone and Loch of Craiglush. Contract number HT/97/98/17. Final report to Scottish Natural Heritage</p> <p>James, V.A. and Barclay, A.M. (1996). The occurrence and distribution of <i>Najas flexilis</i> in Loch of Craiglush, Loch of the Lowes and Loch of Butterstone. Report to Scottish Natural Heritage</p> <p>Wingfield, R., Murphy, KJ., Hollingsworth, P. and Gaywood, M.J. (2004). The Ecology of <i>Najas flexilis</i>. Scottish Natural Heritage Commissioned Report No. 017 www.snh.org.uk/pdfs/publications/commissioned_reports/f98pa02.pdf</p>

	<p>M. Robinson, BSBI recorder east Perthshire</p> <p>Martin Gaywood, Scottish Natural Heritage - survey data from the Western Isles, 1994</p> <p>SLSP - NCC/SNH Scottish Loch Survey Project</p> <p>SCM - Site Condition Monitoring (data ownership: SNH & Centre for Ecology and Hydrology)</p> <p>SNH licence reports</p> <p>Ursula King, Trinity College Dublin</p>
2.8.3 Trans-boundary assessment	

2.9 Conclusions (*assessment of conservation status at end of reporting period*)

Please refer to the United Kingdom assessment for this species.

3 Natura 2000 coverage & conservation measures - Annex II species (*only applies to species listed under Annex II of the Directive*)

3.1 Population		
3.1.1 Population size	a) Unit	number of localities
Estimation of population size included in the SAC network		
	b) Minimum	16
	c) Maximum	22
3.1.2 Method used	Estimate based on partial data with some extrapolation and/or modelling	
3.1.3 Trend of population size within the network	decrease	

(short-term trend)	<p>The population estimate uses the unit of the number of localities/lochs.</p> <p>There may have been a decline in the population size because, during the last SCM, <i>N. flexilis</i> was not recorded from 6 lochs. As <i>N. flexilis</i> has considerable variation in its abundance between years it is not clear if the failure to record the species indicates its local extinction, but it would seem likely to at least indicate that it may have become rare at many locations. Therefore the trend in population size has been assessed as having been a decline in the short-term.</p>
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3.2 Conservation measures

Conservation measures taken (i.e. already being implemented) within the reporting period and provided information about their importance, location and evaluation.

3.2.1 Measure	3.2.2 Type					3.2.3 Ranking H = high importance M = medium importance L = low importance	3.2.4 Location where the measure is PRIMARILY applied			3.2.5 Broad evaluation of the measure						
	a) Legal/statutory	b) Administrative	c) Contractual	d) Recurrent	e) One-off		a) Inside	b) Outside	c) Both inside & outside	a) Maintain	b) Enhance	c) Long term	d) No effect	e) Unknown	f) Not evaluated	
1.3: No measure known/impossible to carry out specific measures																Y
4.1: Restoring/improving water quality		Y	Y			H			Y			Y				

Ongoing SNH research and SEPA's mesotrophic loch environment improvement action plan
4.1 - Measures to reduce diffuse pollution from septic tanks and agricultural land use are ongoing at many sites. However the benefits are expected to only be seen in the long term.

1.3 - Research is ongoing to identify a technique that can be implemented to successfully manage or eradication *Elodea* species. This has yet to be evaluated but, if successful, would likely be deployed in sites with *N. flexilis* to improve their conservation status. However, at present there is no known measure for managing *Elodea* in *N. flexilis* sites.