

Report under The Conservation of Habitats and  
Species Regulations 2017 (as amended),  
Regulation 9A

**2019-2024**

Conservation status assessment for the species:

**S1099 - River lamprey**

***(Lampetra fluviatilis)***

**England**



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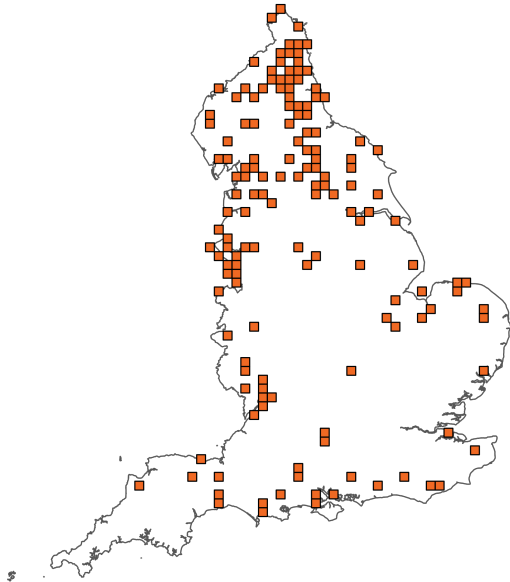
### **Important note - Please read**

- The information in this document represents the England Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural England, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the species are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this species (section 12 National Site Network coverage for Annex II species).

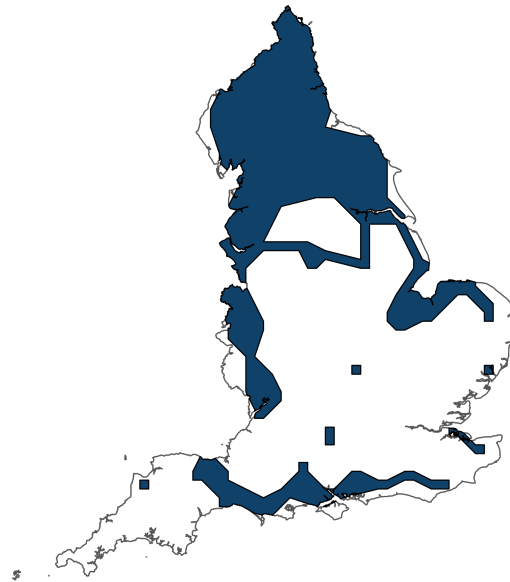
Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the [JNCC website](#).

## Assessment Summary: River lamprey

### Distribution Map



### Range Map



**Figure 1:** England distribution and range map for S1099 - River lamprey (*Lampetra fluviatilis*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available species records within the current reporting period.

**Table 1:** Table summarising the conservation status for S1099 - River lamprey (*Lampetra fluviatilis*). Overall conservation status for species is based on assessments of range, population, habitat for the species, and future prospects.

### Overall Conservation Status (see section 11)

Favourable (FV)

### Breakdown of Overall Conservation Status

Range (see section 5)

Favourable (FV)

Population (see section 6)

Unfavourable-inadequate (U1)

Habitat for the species (see section 7)

Favourable (FV)

Future prospects (see section 10)

Favourable (FV)

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## National Level

### 1. General information

1.1 Country	England
1.2 Species code	S1099
1.3 Species scientific name	<i>Lampetra fluviatilis</i>
1.4 Alternative species scientific name	
1.5 Common name	River lamprey
Annex(es)	II, V

### 2. Maps

2.1 Sensitive species	No
2.2 Year or period	2000-2024
2.3 Distribution map	Yes
2.4 Distribution map; Method used	Based mainly on extrapolation from a limited amount of data

### 2.5 Additional information

Data contained within the National Biodiversity Network Database has been used to produce distribution maps for river lamprey. This data has been collated from both routine and ad-hoc fish surveys. Both adult and transformers are captured during routine electric fishing surveys (although the techniques may be refined for lamprey specific surveys) and benthic samples, therefore, recording effort across England is relatively high. However, they may be under recorded in some habitats due to operational difficulties deploying survey gear in these areas. In addition, river lamprey distribution is likely to be under-represented in England as lamprey ammocoetes are unlikely to be speciated due to difficulties with identification. As it is not possible to distinguish between *Lampetra planeri* and *Lampetra fluviatilis*, only *L. fluviatilis* records have been used in the range assessment, therefore, additional *Lampetra* records may be *L. planeri*.

### 3. Information related to Annex V Species

3.1 Is the species taken in the wild / exploited?	Yes
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### 3.2 What measures have been taken?

a) Regulations regarding access to property	Yes
b) Temporary or local prohibition on the taking of specimens in the wild and exploitation	Yes
c) Regulation of the periods and/or methods of taking specimens	Yes
d) Application of hunting and fishing rules which take account of the conservation of such populations	Yes
e) Establishment of a system of licences for taking specimens or of quotas	Yes
f) Regulation of the purchase, sale, offering for sale, keeping for sale, or transport for sale of specimens	Yes
g) Breeding in captivity of animal species as well as artificial propagation of plant species	No
Other measures	Yes

#### Other measures description

### 3.3: Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit                      number of map 1x1 km grid cells

**Table 2:** Quantity taken from the wild during the reporting period (see 3.3a for units). For species with defined hunting seasons, Season 1 refers to 2018/2019 (autumn 2018 to spring 2019), and Season 6 to 2023/2024. For species without hunting seasons, data are reported by calendar year: Year 1 is 2019, and Year 6 is 2024.

	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
<b>b) Minimum</b>	135	683	1,213	1,182	6	-
<b>c) Maximum</b>	-	-	-	-	-	-
<b>d) Unknown</b>	-	-	-	-	-	Yes

**3.4: Hunting bag or quantity taken in the wild; Method used**

Complete survey or a statistically robust estimate

**3.5: Additional information**

Authorisations for river lamprey fishing have been issued annually since 2011 when the authorisation scheme brought about by the Marine and Coastal Access Act 2009 came into force. This is the only licenced river lamprey fishery in England.

Since 2011, the quotas for authorisations have been based on the exploitation of a percentage of the population. A maximum exploitation rate of 5% for all non-natural removal of lamprey from the Humber catchment was set by expert judgement. The 2017 and 2018 fishing seasons were non-consumptive as lamprey were returned and the information used to estimate run size, however, consumptive fishing resumed in the 2019 season.

When the quota for commercial exploitation was developed in 2011 it allowed for 1.5% entrainment impacts from hydropower schemes and a further 0.06% for other, unknown, impacts. Deducting these two values from the 5% maximum for non-natural removal gave a quota of 3.44% (rounded to 3.5%) available to the fishery.

Translating this percentage to a catch limit kg for the fishery relies upon a series of assumptions including, the size of the river lamprey population, the mean weight of a lamprey (to convert fishery catches kg to numbers of individuals) and the scale of losses to hydropower schemes and other entrainment.

A condition of the licence is that catch returns must be submitted to inform future population assessments and exploitation rates

**Biogeographical Level**

**4. Biogeographical and marine regions**

**4.1 Biogeographical or marine region where the species occurs** ATL

**4.2 Sources of information**

See section 14 References

**5. Range**

**5.1 Surface area (km<sup>2</sup>)** 47,140.92

<b>5.2 Short-term trend; Period</b>	2013-2024
<b>5.3 Short-term trend; Direction</b>	Stable
<b>5.4 Short-term trend; Magnitude</b>	
<b>a) Estimated minimum</b>	
<b>b) Estimated maximum</b>	
<b>c) Pre-defined range</b>	
<b>d) Unknown</b>	
<b>e) Type of estimate</b>	
<b>f) Rate of decrease</b>	Decreasing <=1% (one percent or less) per year on average
<b>5.5 Short-term trend; Method used</b>	Based mainly on extrapolation from a limited amount of data
<b>5.6 Long-term trend; Period</b>	2000-2024
<b>5.7 Long-term trend; Direction</b>	Stable
<b>5.8 Long-term trend; Magnitude</b>	
<b>a) Minimum</b>	
<b>b) Maximum</b>	
<b>c) Rate of decrease</b>	
<b>5.9 Long-term trend; Method used</b>	Based mainly on expert opinion with very limited data
<b>5.10 Favourable Reference Range (FRR)</b>	
<b>a) Area (km<sup>2</sup>)</b>	
<b>b) Pre-defined increment</b>	Current range is less than 2% smaller than the FRR
<b>c) Unknown</b>	No
<b>d) Method used</b>	Expert opinion
<b>e) Quality of information</b>	moderate

### 5.11 Change and reason for change in surface area of range

a) Change No

---

b) Genuine change

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c) Improved knowledge or more accurate data

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d) Different method

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e) No information

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f) Other reason

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g) Main reason

### 5.12 Additional information

Although the distribution of river lamprey is still well below historical / pristine condition, due to improvements in water quality and fish passage, river lamprey populations may be slowly expanding within their natural range.

Records for river lamprey are common throughout the trend period, however, survey effort is not consistent across the species range. It is therefore impossible to accurately assess a trend direction. The species is being regularly recorded across its natural range and there has been no significant increase in pressures, which suggests that the population is at least stable. The likelihood of an improving trend seems low because many of the artificial physical barriers to upstream migration that have blocked passage to historical upstream spawning grounds are still in place. Where fish passes have been added, they are generally unsuitable for river lamprey. However, the water quality of a number of English rivers has improved in recent years, and this may have removed chemical barriers for migrating adults and improved ammocoete survival

## 6. Population

6.1 Year or period 2000-2024

### 6.2 Population size (in reporting unit)

a) Unit number of map 1x1 km grid cells

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b) Minimum

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c) Maximum

d) Best single value	230
6.3 Type of estimate	Best estimate
6.4 Quality of extrapolation to reporting unit	low
<b>6.5 Additional population size (using population unit other than reporting unit)</b>	
a) Unit	
b) Minimum	
c) Maximum	
d) Best single value	
e) Type of estimate	
6.6 Population size; Method used	Based mainly on expert opinion with very limited data
6.7 Short-term trend; Period	2013-2024
6.8 Short-term trend; Direction	Stable
6.9 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
6.10 Short-term trend; Method used	Based mainly on expert opinion with very limited data
6.11 Long-term trend; Period	2000-2024
6.12 Long-term trend; Direction	Stable
6.13 Long-term trend; Magnitude	

a) Minimum

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b) Maximum

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c) Confidence interval

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d) Rate of decrease

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**6.14 Long-term trend; Method used**

**6.15 Favourable Reference Population (FRP)**

ai) Population size

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aii) Unit

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b) Pre-defined increment	Current population is less than 5% smaller than the FRP
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c) Unknown	No
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d) Method used	Expert opinion
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e) Quality of information	low
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**6.16 Change and reason for change in population size**

a) Change	No
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b) Genuine change

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c) Improved knowledge or more accurate data

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d) Different method

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e) No information

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f) Other reason

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g) Main reason

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**6.17 Additional information**

Records for river lamprey are common throughout the short term trend period, however, survey effort is not consistent across the species range. It is therefore impossible to accurately assess a trend direction. The species is being regularly recorded across its natural range and there has been no significant increase in pressures, which suggests that the population is at least stable. The likelihood of an improving trend seems low

because many of the artificial physical barriers to upstream migration that have blocked passage to historical upstream spawning grounds are still in place. Where fish passes have been added, they are generally unsuitable for river lamprey. However, the water quality of a number of English rivers has improved in recent years, and this may have removed chemical barriers for migrating adults and improved ammocoete survival.

**6.18 Age structure, mortality and reproduction deviation**      Unknown

## 7. Habitat for the species

### 7.1 Sufficiency of area and quality of occupied habitat (for long-term survival)

a) Is area of occupied habitat sufficient?      Yes

b) Is quality of occupied habitat sufficient?      Yes

c) If No or Unknown, is there a sufficiently large area of unoccupied habitat of suitable quality?

### 7.2 Sufficiency of area and quality of occupied habitat; Method used

a) Sufficiency of area of occupied habitat; Method used      Based mainly on expert opinion with very limited data

b) Sufficiency of quality of occupied habitat; Method used      Based mainly on extrapolation from a limited amount of data

7.3 Short-term trend; Period      2013-2024

7.4 Short-term trend; Direction      Stable

7.5 Short-term trend; Method used      Based mainly on expert opinion with very limited data

7.6 Long-term trend; Period      2000-2024

7.7 Long-term trend; Direction      Stable

## 7.8 Long-term trend; Method used

## 7.9 Additional information

River lamprey populations are reduced across England when compared with their natural/unimpacted reference condition. This decline is generally attributed to historical reductions in habitat quality due to poor water quality which are still on-going, and the historical introduction of physical barriers which stop river lamprey reaching some areas of habitat which would previously have been available for spawning. However, there is still likely to be sufficient habitat, of a suitable quality, for the species to persist in the long term. In addition there is increasing acceptance of the need for, and delivery of, multi-species fish passage solutions. This will benefit the dispersal of river lamprey and allow the recolonisation of areas within its natural range.

# 8. Main pressures

## 8.1 Characterisation of pressures

**Table 3:** Pressures affecting the species, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PK01: Mixed source pollution to surface and ground waters (limnic and terrestrial)	Ongoing and likely to be in the future	High (H)
PI01: Invasive alien species of Union concern	Ongoing and likely to be in the future	High (H)
PL01: Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PJ14: Other climate related changes in abiotic conditions	Ongoing and likely to be in the future	High (H)

PL03: Old barriers or other obsolete infrastructures (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PJ03: Changes in precipitation regimes due to climate change	Ongoing and likely to be in the future	High (H)
PL06: Physical alteration of water bodies (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PD02: Hydropower (dams, weirs, run-off-the-river and respective infrastructure)	Ongoing and likely to be in the future	Medium (M)
PG06: Freshwater fish and shellfish harvesting (professional)	Only in future	High (H)

## 8.2 Sources of information

See section 14 References

## 8.3 Additional information

No additional information

# 9. Conservation measures

## 9.1: Status of measures

### a) Are measures needed?

Yes

### b) Indicate the status of measures

Measures identified and taken

## 9.2 Main purpose of the measures taken

Restore the habitat of the species (related to 'Habitat for the species')

## 9.3 Location of the measures taken

Both inside and outside National Site Network

## 9.4 Response to measures

Medium-term results (within the next two reporting periods, 2025–2036)

## 9.5 List of main conservation measures

**Table 4:** Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MK01: Reduce impact of mixed source pollution	High (H)
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities	High (H)
MK03: Restoration of habitats impacted by multi-purpose hydrological changes	High (H)
MF09: Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (incl. restoration of habitats)	Medium (M)
MJ01: Implement climate change mitigation measures	High (H)
MG02: Management of hunting, recreational fishing, and the recreational or commercial harvesting or collection of plants and fungi (incl. restoration of habitats)	Medium (M)

## 9.6 Additional information

No additional information

## 10. Future prospects

### 10.1a Future trends of parameters

<b>ai) Range</b>	Overall stable
<b>bi) Population</b>	Positive - increasing $\leq 1\%$ (one percent or less) per year on average
<b>ci) Habitat for the species</b>	Positive - slight/moderate improvement

### 10.1b Future prospects of parameters

<b>aii) Range</b>	Good
<b>bii) Population</b>	Good
<b>cii) Habitat for the species</b>	Good

## 10.2 Additional information

The species may expect to become increasingly distributed and abundant within its natural range, assuming no further increases in barriers to upstream migration associated with hydropower development and unsuitable fish passage solutions. Assumes that water quality improvements and physical habitat restoration continues, with no further increases in barriers to upstream migration associated with hydropower development and unsuitable fish passage solutions.

## 11. Conclusions

<b>11.1 Range</b>	Favourable (FV)
<b>11.2 Population</b>	Unfavourable-inadequate (U1)
<b>11.3 Habitat for the species</b>	Favourable (FV)
<b>11.4 Future prospects</b>	Favourable (FV)
<b>11.5 Overall assessment of Conservation Status</b>	Favourable (FV)
<b>11.6 Overall trend in Conservation Status</b>	Stable

### 11.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

### 11.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

### 11.8 Additional information

No additional information

## 12. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex II species

### 12.1 Population size inside the pSCIs, SCIs and SACs network

<b>a) Unit</b>	number of map 1x1 km grid cells
<b>b) Minimum</b>	
<b>c) Maximum</b>	
<b>d) Best single value</b>	36
<b>12.2 Type of estimate</b>	Best estimate
<b>12.3 Population size inside the network; Method used</b>	Based mainly on expert opinion with very limited data
<b>12.4 Short-term trend of population size within the network; Direction</b>	Stable
<b>12.5 Short-term trend of population size within the network; Method used</b>	Based mainly on expert opinion with very limited data
<b>12.6 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Direction</b>	Stable
<b>12.7 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Method used</b>	Based mainly on expert opinion with very limited data

## **12.8 Additional information**

The situation within the SAC network broadly reflects the general situation within higher quality areas of the river resource outside of the network. As improvements continue to be made regarding water quality and re-establishment of natural riverine processes in England and plans are developed and implemented to improve fish passage for river lamprey in rivers throughout England, the area of freshwater habitat suitable for lamprey spawning and ammocoete development may be expected to increase. The rate of improvement may be expected to be greater within the SAC network than outside of it. Set in opposition to this generally positive outlook are the unknowns of climate change effects which may lead to more extreme flow variations and the potential for continued diffuse agricultural pollution resulting in inputs of nutrients and fine sediment. However, it is less likely that future barriers to river lamprey movement would be permitted within the SAC site series.

## **13. Complementary information**

### **13.1 Justification of percentage thresholds for trends**

No justification information

### **13.2 Trans-boundary assessment**

No trans-boundary assessment information

### **13.2 Other relevant information**

No other relevant information

## 14. References

### Biogeographical and marine regions

#### 4.2 Sources of information

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## Main pressures

### 8.2 Sources of information

No sources of information

## 15. Explanatory Notes

Field label	Note
2.5: Additional information	<p>The river lamprey is intermediate in size between the larger sea lamprey and the smaller brook lamprey, with adults normally in the range of 30 – 40cm but occasionally reaching 50cm. They require clean, flowing water with a gravel substrate for spawning. This enables the lamprey to excavate a depression in the gravel to form a nest. Spawning takes place from March to April when water temperatures reach 10-11°C. After 15-30 days the larvae hatch, drift downstream and burrow into silty substrates. Here they feed on fine particulate matter and remain for 3 – 5 years before metamorphosis. Metamorphosis occurs between July – September followed by downstream migration to the marine / estuarine environment. River lampreys spend 1-2 years, mainly in estuaries, feeding on the flesh of a variety of fish hosts before they stop feeding and migrate into freshwater rivers in October - December. The homing behaviour of anadromous lampreys is poorly understood, however, tagging studies of sea lampreys indicates that they may not return to their natal rivers but instead locate rivers with lamprey ammocoetes present.</p> <p>In addition to clean flowing water with a loose gravel/pebble substrate for nest building and spawning, the sedentary river lamprey ammocoetes require silty areas in which to seek refuge, build burrows and feed. River lampreys tend to be associated with medium to large rivers and may penetrate a considerable distance upstream where barriers to migration are absent.</p> <p>The river lamprey is widespread throughout Britain. Its range frequently overlaps with that of the sea lamprey and potentially brook lamprey.</p>
6.18: Age structure, mortality and reproduction	<p>The lack of a coordinated monitoring programme which encompasses all lifestages of river lamprey makes it impossible to accurately assess whether the population is</p>

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recruiting efficiently. However, the continued presence of adult river lamprey within a river catchment would indicate that the population has remained viable over time and is recruiting successfully

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7.5: Short-term trend;  
Method used

River lamprey have complex habitat requirements as their eggs are laid in well oxygenated gravels, the ammocoetes require soft sediments and upstream migratory passage, with relatively low flow velocities and turbulence, must be maintained for adults. These factors, combined with the widespread distribution of river lamprey within England, make a detailed assessment of habitat quality trends impossible at the present time. However, Progress has been made with reducing nutrient and organic pollution levels in many rivers across England within the short-term trend period, which may have a beneficial effect on the quality of spawning and ammocoete substrates. However, issues of siltation of spawning gravels, physical barriers to upstream migration and physical habitat degradation are still significant stressors for river lamprey populations within England. In addition, the increased focus on run of river hydropower schemes may result in man-made barriers to upstream lamprey migration being perpetuated for the foreseeable future, however, there is an increasing awareness of the need to implement multi-species fish passage solutions suitable for lamprey.

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8.3: Additional  
information

Diffuse agricultural pollution has increased the input of fine sediment, phosphate and nitrate to rivers leading to eutrophication issues such as increased algal production in spawning areas and smothering of spawning gravels. Urbanization and industrialization have resulted in discharges of both raw and treated sewage effluent, industrial effluents and diffuse urban pollution. These discharges may prove acutely toxic to river lamprey or produce lethal effects due to deoxygenation. A wide variety of other chemicals, including pesticides and endocrine disrupters, have been released into the aquatic environment. These may result in obvious lethal effects, however, a wide variety of sub-lethal effects, such as

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reduced fertility may affect the overall fitness of river lamprey. Due to the diverse array of sources and impacts, the severity and contribution of each individual stressor on the population as a whole is unknown.

Invasive non-native crayfish species such as signal crayfish *Pacifastacus leniusculus* have the potential to increase predation pressure on both lamprey and their eggs. Invasive non-native crayfish may be more aggressive, more tolerant of poor water quality, better adapted to silty substrates and achieve greater biomasses than the indigenous white clawed crayfish *Austropotamobius pallipes* which may have co-existed with lamprey in many areas across its English range. The invasion of habitats by INNS crayfish and the displacement of indigenous crayfish species may therefore have led to an increase in interspecific competition between crayfish and lamprey.

River lamprey move through a number of English rivers, particularly in the lower areas of the catchment, and may pass water abstraction points while migrating to their upstream spawning grounds. River lamprey may be directly entrained or impinged in these abstractions.

River lamprey require clean, well oxygenated gravels for spawning and silt substrates for ammocoetes. Changes to the hydrological regime may increase deposition rates of fine sediment on gravels, increase the resistance of structures to passage by river lamprey and lead to stranding of ammocoetes during low flows. In addition river engineering works may increase spate flows within the catchment which may result in both adult and juvenile river lamprey being washed out of areas of favourable habitat within the river system. If low flows are maintained over long periods of time, elevated water temperatures, deoxygenation, siltation and bed armouring may become evident. Conversely very high flows may scour gravel spawning beds and deposited eggs or silt substrates for ammocoetes.

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Increases in temperature may produce synergistic effects with other environmental stresses such as increased toxicity of pollutants and more rapid deoxygenation. Low flows may reduce the ability of brook lamprey to pass barriers and high spate flows may lead to adults, ammocoetes and eggs being washed out of areas of suitable habitat. Future climate change scenarios indicate a shift to a pattern of increasingly extreme events such as more prolonged low flows and higher, more energetic spate flows. This is likely to add further stress to river lamprey populations by making migratory barriers harder to pass and the ability to utilise high quality in-river habitats more difficult.

Physical barriers which prevent river lamprey reaching their upstream spawning grounds have been a pressure on many populations throughout their range. These barriers may also act synergistically with water quality problems such as increased sediment and nutrient load. Impoundments behind structures may lead to increased deposition of fine sediment on gravels and dissolved oxygen sags due to a lack of turbulent flow. In some areas fish passes have been added to barrier structures, however, these tend to be focused on increasing turbulent flows for the passage of salmonid species and are not suited to the passage of river lamprey which generally require lower flow velocities. Hydro-electric schemes may form major obstructions as river lamprey populations are denied passage over spillways, through turbines and impoundments. Impounding structures may disrupt sediment movement down river, deepen and stabilise water levels, reduce hydraulic scour and increase siltation behind the structure. They may restrict the free movement of river lamprey up and down the river. Designs may require the abstraction of water out of the channel through an off-line turbine, leaving a depleted reach. Other designs divert water within the channel through the turbine which may create current velocities that attract migrating lamprey.

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Bank reinforcements affect riparian habitats, whilst turbine arrangements without suitable screening can entrain lamprey, generating injuries and mortalities. Turbine offtakes may attract migrating lamprey resulting in delays to migration and increased predation.

A commercial fishery for river lamprey in the Humber catchment operated in the 19th and early 20th centuries. The fishery re-emerged in the 1990s to supply river lamprey as bait for angling, from this time until 2011 river lamprey were legally caught as a by-catch in an authorised European eel fishery. Authorisations for river lamprey fishing have been issued annually since 2011. Fishing during 2017 and 2018 has been for population research only and captured lamprey have been released, however, outside of these years lamprey have been removed from the fishery for commercial purposes.

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9.5: List of main conservation measures

Work has continued to reduce point and diffuse discharges to both the national site network and wider river network. Major infrastructure projects to improve sewerage, such as removal or upgrade of combined sewer overflows and improved phosphorus removal from treated sewage effluent, has been funded via the water industry's programme of strategic improvements such as AMP and PR rounds. However, further investigations are needed into the application of new best available technology for phosphorus removal and the increased availability of mains sewerage for rural populations. The England Catchment Sensitive Farming Initiative is continuing to promote a range of best agricultural practices to reduce pollution loads to priority aquatic sites. A combination of Habitats Site, SSSI and Water Framework objectives continues to drive improvements in water quality with diffuse water pollution prevention plans developed for many sites. New Countryside Stewardship payments are being developed to incentivise good agricultural practices.

A major programme of physical restoration has been

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implemented on the designated river network, involving the development of a long-term strategic plan for each river and its programmed implementation. These plans address key issues such as dams and weirs, floodplain reconnection, channel modifications, lack of riparian habitat, lack of riparian trees and lack of woody debris in the channel. Outside of the designated site network, river restoration schemes have focused on addressing channel modifications and the many weirs and dams on the river network in England. A further driver for river restoration has been the increased prominence of natural flood management. If properly implemented, NFM has the potential to enable widespread improvements in many previously degraded riverine habitats.

The rationale behind restoring river habitat in England is the restoration of natural riverine processes, which creates characteristic habitats and provides for individual species to an extent dependent on the natural character of the river. This rationale is also the main adaptation response for combatting climate change. Some aspects of restoring natural function are also seen as climate change mitigation measures, such as the re-establishment of natural tree cover and riparian vegetation which is being implemented as part of many river restoration schemes and agri-environment schemes. These interventions may result in moderated extremes of flow, reductions in water temperature and increased water quality.

Improvements have been achieved with limiting abstraction volumes and improving flow regimes by altering compensation flows from water company assets via AMP and PR rounds. However, further improvements are required to naturalise flows at many sites. As part of the ongoing abstraction reform process, abstraction licences will become environmental permits and a greater emphasis will be given to environmental considerations. Since 2022 many previously exempt abstractions require a permit.

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Detailed assessments are being made of potential risks to river lamprey due to abstractions from existing and new water supply infrastructure. Where problems are highlighted mitigation measures such as improved screening or modified operating procedures are being implemented.

Fisheries in all rivers are subject to exploitation controls. River lamprey are listed in Annexes II and V of the Habitats Directive. Annex II requires that Special Areas of Conservation are designated for river lamprey, with the appropriate management of these and other sites where they are known to occur so that the favourable conservation status of the species can be secured. Additional fishery specific issues are addressed by the 'Salmon and freshwater fisheries act 1975' and the Marine and Coastal Access Act. Under these legislation the Environment Agency has powers to licence netting/trapping of lamprey. Fishery byelaws regulate when, where and how fishing can take place. The licencing approach limits exploitation pressure on river lamprey populations. Recent research has allowed catch per unit effort to be assessed with the aim of better quantifying the Humber lamprey population. In addition it is likely that fishing effort may reduce over time as fishers cease to operate and no new entrants to the fishery are licenced.