![NASCO logo]	**Council** *The Future for the NASCO Rivers Database*	**CNL(21)13** **Agenda item: 3f**

The Future for the NASCO Rivers Database

1. Purpose of the Paper

To set out the challenges and concerns faced by Parties / jurisdictions in providing data to the NASCO Rivers Database and to consider options for future updates of the status of salmon in North Atlantic rivers, to provide the basis for future quinquennial 'State of North Atlantic Salmon' reports.

2. Decisions

a. To confirm that the Council agrees that 'NASCO should be the source of information on salmon stock status around the North Atlantic….'

b. To agree the need to develop a consistent and robust approach to presenting information on stock status; and

c. To agree the approach for the next update of the status of salmon in North Atlantic rivers (see section 10 below).

3. Background

In 2019, Council agreed that:

'*with regard to the legacy of the IYS, a periodic Symposium and State of Salmon Report should be delivered by the Secretariat. ... The State of Salmon report statistics should be populated with data from sources including the Rivers Database and ICES data. To this end, Parties / jurisdictions should be encouraged to update their data in the Rivers Database on a regular basis. To enable this, the Secretariat will explore working towards a database that can be updated by Parties and jurisdictions'* CNL(19)46.

At the 2020 Annual Meeting of the Council, it was agreed that the Secretary would work with the Parties / jurisdictions to explore why they had not used the NASCO Rivers Database as had been agreed in 2016, CNL(20)51.

The Council first established a database of salmon rivers in 1989. Initially it comprised a listing of all salmon rivers flowing into the Convention area where stocks had been lost or were threatened with loss. In 1990, the Council agreed a system of categorising these rivers and since then numerous revisions to the way that rivers have been classified in the Rivers Database, have taken place.

The history of the Rivers Database is well described in Section 3 of CNL(16)11, and is copied, with some limited updates, in Annex 1 for convenience.

4. Background to the 2016 Working Group on Stock Classification

The stock classification system that was agreed for the Rivers Database in 2016 was the culmination of a number of reports and Council decisions in the preceding years.

Concern relating to the Rivers Database was noted in NASCO's External Performance Review in 2012, CNL(12)11. That report highlighted the value of the Rivers Database but noted some difficulties in reconciling the information it contained with other information on stock status.

In 2013, the Council stated that it '*believes that NASCO should be the source of information*

on salmon stock status around the North Atlantic' and noted that the stock categories used in the Rivers Database were outdated. The Council agreed on the importance of developing a consistent and uniform approach to presenting information on stock status, in the Action Plan for taking forward the 'recommendations of the External Performance Review and the review of the 'Next Steps' for NASCO, CNL(13)38.

In 2013 NASCO made a request to ICES, CNL(13)10, to:

'*provide a review of the stock status categories currently used by the jurisdictions of NASCO, including within their Implementation Plans, and advise on common approaches that may be applicable throughout the NASCO area.*'

The ICES response can be found in the 2014 ICES advice, which provides 'a preliminary and tentative example' of a common approach (more information below) CNL(14)8.

The Working Group on Stock Classification was established in 2014 and was asked, among other things, to:

- recommend a classification system to be used by jurisdictions to indicate stock status relative to conservation limits, or where these have not been established, other reference points or indicators of abundance; and

- recommend changes to the NASCO Rivers Database to implement the recommended classification system, CNL(14)61.

The Working Group reported in 2016 and its recommendations were adopted by the Council, CNL(16)11. Their stock classification system was based on a Stock Classifications Score (SCS), which itself was based on a Conservation Limits Attainment Score (CAS) and an Impacts Assessment Score (IAS). More information on this stock classification system is provided in Annex 2. The Council recognised that updating this information would be a substantial undertaking and agreed that the Parties / jurisdictions should be asked to complete the update using the new stock categories by 31 December 2017, CNL(16)68.

5. **The Process of the Update using the 2016 Stock Classification System**

On 7 September 2016 the Secretariat emailed Parties explaining the new system and requesting their updates by 31 December 2017. Additional information and assistance were offered.

Many Parties / jurisdictions replied in December 2017 and early 2018. However, responses often did not include the full data as set out in the Working Group's report. Given the requirement to use the data in the State of North Atlantic Salmon Report, which was to be published in the International Year of the Salmon (2019), the Secretariat reminded and assisted Parties / jurisdictions throughout 2018 and was still seeking updates until March 2019.

The following anonymised quotes from emails to the Secretariat indicate some of the challenges faced by Parties in providing the information requested:

- 'Please find attached the updated … information for the Rivers database. Reliable data for conservation requirements are unfortunately not available.' *(6 July 2017)*

- 'Because … is currently working on several projects related to salmon … we have postponed the new classification of the rivers considered as "Not Threatened With Loss" and "Threatened With Loss", which are the most numerous, to the future salmon plan in order to have the best possible expertise of this classification.' *(30 January*

2018) and 'here is the list of … rivers, with the new classification determined **by appraisal**, when it was possible to do it. (*18 April 2018)*'

- 'While average CL compliance has been used to assign scores in the database, we would like to point out that management of stocks in … applies a more precautionary approach based on a pre-determined compliance risk level. Thus stocks are assessed against a Management Objective that requires stocks to achieve CL in 4 years out of 5 (i.e. 80% of the time), on average. As such, stock classification scores in the NASCO Rivers Database are unlikely to fully match our own published stock assessments. This will no doubt also apply to other parties and jurisdictions; an appropriate footnote in the updated version of the database would seem appropriate to highlight this issue.

  Impact assessment scores were inevitably assigned on a somewhat subjective basis, particularly for the smaller catchments. However, available evidence has been used wherever possible; this has included previous catchment-based evaluations and consultation with local area staff.' *(19 January 2018)*

- 'due to the complexity of this task … and the possible implications given the public nature of the classification status, this will require additional time to finalize.' (*9 April 2018)*

- '… we remain unable to update the database … Our inability to do so is principally founded on the need to dedicate our scientific resources on further developing our existing adult assessment model… In addition to prioritising the above work, you may recall that we also raised concerns about the subjectivity of the process.' *(10 May 2018)*

6. The Outcome of the Update using the 2016 Stock Classification System

In response to the September 2016 request for updates, a total of 2,359 rivers were reported on. However, not all fields in the spreadsheet were completed and the data provided were inconsistent between Parties / jurisdictions. For example, of the 2,359 rivers reported:

- the main impact factors were reported only for 264 rivers (11%);

- no data were available for 830 of the rivers (35%);

- contributions from two Parties / jurisdictions were received in late 2018 / early 2019 after agreement that a 'read across' from national river assessments, rather than NASCO's agreed stock classification, would be acceptable; and

- data for a number of Parties / jurisdictions were taken from the Implementation Plan submissions and confirmed via correspondence.

7. The current Rivers Database and the State of North Atlantic Salmon Report

Given the need for stock classification data to provide the basis for the State of North Atlantic Salmon Report in 2019, the updates provided by Parties / jurisdictions were used, despite concerns about consistency and robustness. However, rather than using the 2016 Stock Classification Categories in full, it was decided to consolidate the seven categories into four, as shown in the table below. This was considered a more robust and less problematic interpretation.

2016 Stock Classification Category	Status of Salmon Stocks, used in State of North Atlantic Salmon Report
Not at Risk	Currently sustainable
Low Risk	
Moderate Risk	Currently at risk
High Risk	
Artificially Sustained	
Lost	No longer have salmon
Unknown	No data available

8. Longstanding Challenges in Updating the Rivers Database

It appears that Parties' / jurisdictions' challenges related to the update using the 2016 Stock Classification Categories are consistent with challenges that have been noted throughout the lifetime of the Rivers Database.

In 1990 Council agreed a system of categorising rivers. Parties were asked to contribute information and, by 1995, information had been provided by all Parties.

In 2004, an expanded Rivers Database was developed which allowed for inclusion of river data, salmon production data, and habitat impact data. It is reported that:

'*Some progress was made over a number of years in populating the Rivers Database, but this was a substantial undertaking given the extensive information sought. However, given that reporting was still incomplete after several years, Parties/jurisdictions were reporting on habitat issues through their new Implementation Plans and Focus Area Reports (now Annual Progress Reports) and the Rivers Database was incomplete but publicly available via the NASCO website, the Council decided to revert to the simpler listing.*' (CNL(16)11, paragraph 3.2).

In 2012, the External Performance Review highlighted difficulties in reconciling the information the Rivers Database contained with other information on stock status, CNL(12)11. The Council agreed on the importance of developing a consistent and uniform approach.

The challenges encountered in 2017 / 2018 are detailed in the previous section.

In summary, throughout the life of the Rivers Database, efforts to increase its quality and consistency have encountered the following challenges:

- the task is large and complex, with limited resources available;

- the Rivers Database assessment of stock status can be inconsistent with published national assessments;

- full, reliable data are not always available; and

- in 2016, there was the additional concern about the subjectivity of the assessment, particularly the Impacts Assessment Score.

9. ICES Advice on Stock Status Categories

Prior to the establishment of the 2016 Working Group, NASCO made a request to ICES, CNL(13)10, to:

> '*provide a review of the stock status categories currently used by the jurisdictions of NASCO, including within their Implementation Plans, and advise on common approaches that may be applicable throughout the NASCO area.*'

The ICES response can be found in the 2014 ICES advice, CNL(14)8 (see in particular Section 10.1.6, Table 10.1.8.1 and Table 10.1.8.4). The report provides 'a preliminary and tentative example' of a common approach in the final two columns of Table 10.1.8.4. The report states:

> '*NASCO has recommended the development of CLs for all stocks. However, these have not yet been developed by some jurisdictions, where alternative stock abundance indicators may be used in management. The implementation of any standardized classification scheme may also be difficult given the differences in the way national management advice is presented in different jurisdictions and it is unlikely that a standardized system for providing catch advice at the national level will be developed in the near future. Nevertheless, ICES considered that it might be possible to develop a classification more closely reflecting the generally applied categories used for describing stock status and providing management advice (i.e. CLs). A preliminary and tentative example of this is shown in the final two columns of Table 10.1.8.4. However, approaches would need to be developed to enable compliance with the classification criteria to be averaged over time periods and thus avoid the need for assessment and updating of the Rivers Database on an annual basis. In addition, some degree of expert judgement would also be required for stocks that do not currently have CLs.*'

In 2016, the Working Group considered that any stock classification system that is based only on attainment of CLs and that fails to take into account other considerations would not be consistent with NASCO's goals and visions, but also stated that '*such a system may potentially be an improvement on the current categories used in the Rivers Database.*' CNL(16)11, paragraph 4.1.

NASCO's recurring request for Scientific Advice from ICES includes a request for the North-East Atlantic Commission area and the North American Commission area to '*describe the status of the stocks, including updating the time series of trends in the number of river stocks meeting CLs by jurisdiction*' e.g. CNL(20)13.

In 2020 this resulted in the following information for the North American Commission area:

> '*River-specific assessments are provided for 86 rivers in 2019. Egg depositions by all sea ages combined in 2019 exceeded or equaled the river-specific CLs in 42 of the 86 assessed rivers (49%) and were at or less than 50% of CLs in 28 rivers (33%) (Figure 12). The number of rivers assessed annually in Canada has ranged from 61 to 91, and the annual percentages of these rivers achieving CL has ranged from 26% to 67% (59% in 2019) with no temporal trend (Figure 7). Sixteen rivers in the USA are assessed against CL attainment annually, with none meeting CLs to date (Figure 7).*' CNL(20)10rev, p55.

The following table provides the information for the North-East Atlantic Commission area, CNL(20)10rev, p32.

Table 4   Summary of the attainment of CLs in 2019 (2018 for Norway and UK [Scotland]) and trends based on all available data in the NEAC area. Further details can be found in ICES (2020).

Country /Jurisdiction	Number of rivers with CLs	Number of rivers assessed for compliance	Number of rivers attaining CL	% of assessed rivers attaining CL	Trend statement
Northern NEAC					
Russia	85	8	7	88	No trend
Finland/Norway (Teno/Tana)	25	15	5	33	Stable
Norway	439	193	171	89	Increasing
Sweden	24	24	6	25	Stable (data for 2016 to 2019 only)
Iceland	13	1	1	100	Not applicable as only one river assessed
Southern NEAC					
UK (Scotland)	173	173	51	29	Decreasing
UK (Northern Ireland)	19	18	6	33	Decreasing
UK (England and Wales)	64	64	8	13	Decreasing
Ireland	143	143	40	28	Decreasing
France	35	35	1	3	No trend (2018 and 2019 data only)

Additionally, the ICES Working Group on North Atlantic Salmon is currently considering an alternative model for estimating stock status and is beginning to utilise a data call system (as used widely for other stock assessments throughout ICES) to gather data for its work. These processes may be relevant to the work required for updating the NASCO Rivers Database, or its successor.

10. The Next Update of the Rivers Database, or its Successor

In light of the decision by the Council in 2019 that a periodic State of North Atlantic Salmon (SoS) report should be delivered by the Secretariat, and that the report should be populated with data from sources including the Rivers Database and ICES data, Council may wish to consider the following possible next steps:

A. Agree to use the 2016 Stock Classification Categories for the next update, acknowledging the challenges set out above; OR

B. Make a non-recurring advice request to ICES (possibly in 2021) to review the stock status categories currently used by NASCO Parties / jurisdictions and advise on the best approach to use for a consistent and robust stock classification system for NASCO's salmon rivers, utilising data provided to WGNAS, where possible, for efficiency;

   • if this approach is accepted as the basis for the SoS report, the initial review could be followed by a five-yearly non-recurring advice request to ICES to produce the data required to populate a quinquennial SoS report;

   • the Periodic Projects Special Fund should be used to pay for the non-recurring advice requests; OR

C. Develop and adopt some other approach to providing a stock classification for NASCO's salmon rivers, to be used consistently as the basis for regular updates of the state of wild north Atlantic salmon.

Secretariat
Edinburgh
9 April 2021

The History of the NASCO Rivers Database

The history of the Rivers Database is well described in Section 3 of CNL(16)11, and copied, with some limited updates, below for convenience.

The Council first established a database of salmon rivers in 1989 and over the last 32 years it has undergone several changes. Initially, the Rivers Database comprised a listing of all salmon rivers flowing into the Convention area where stocks had been lost or were threatened with loss. In 1990, the Council agreed a system of categorising rivers (Lost, Maintained, Restored, Threatened with Loss, Not Threatened with Loss) together with definitions for each category. Parties were asked to contribute information, but it was recognised that it would take some time to assemble the information and once that was done it should be updated every 5 to 10 years. By 1995, information had been provided by all Parties (approximately 1,800 rivers).

In 2001, following the adoption of NASCO's Plan of Action for Habitat Protection and Restoration, CNL(01)51, a major change was proposed to the Rivers Database. This plan required, *inter alia*, the establishment of inventories of salmon rivers and reporting on progress.

In 2004, an expanded Rivers Database, developed by the United States in consultation with the other Parties, and which reflected the information requirements detailed in the Plan of Action, was adopted and made available on the NASCO website. The new Rivers Database format allowed for inclusion of river data, salmon production data, and habitat impact data. Additionally, two new stock categories were added – 'Unknown' and 'Not Present but Potential'. Some progress was made over a number of years in populating the Rivers Database, but this was a substantial undertaking given the extensive information sought. However, given that reporting was still incomplete after several years, Parties / jurisdictions were reporting on habitat issues through their new Implementation Plans and Focus Area Reports (now Annual Progress Reports) and the Rivers Database was incomplete but publicly available via the NASCO website, the Council decided to revert to the simpler listing which has been used since. The Rivers Database fields used prior to the adoption of the 2016 stock classification, including the seven stock categories and their definitions, are shown in Annex 3.

All Parties / jurisdictions (with the exception of Portugal) had contributed information and the Rivers Database contained information for ~2,550 rivers. Complete information was included for all rivers for river name, location and stock category. However, only partial information was provided for catchment area, river length, mean annual flow, main impact factors, special stock characteristics and conservation requirements (data was provided for 13 - 59% of rivers, depending on the information concerned).
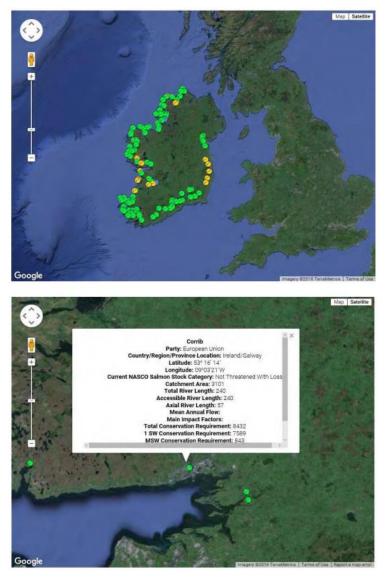
Figure 1. Screen captures showing information for EU - Ireland and the detailed information held for the River Corrib from before the adoption of the 2016 stock classification.

The Stock Classification System Adopted in 2016

The Council established a Working Group on Stock Classification to develop a new classification system for use in the Rivers Database. The Group's recommendations were adopted by the Council, CNL(16)11.

The stock classification system is based on a Stock Classifications Score (SCS), based on:

- a Conservation limits Attainment Score (CAS); and

- an Impacts Assessment Score (IAS):

A Conservation limits Attainment Score (CAS) was assigned based on available information concerning the extent to which the conservation limit is being attained as in the table. Where CLs had not been established, the Parties / jurisdictions were asked to use the best available information to assign such rivers to an appropriate CAS category based on an assessment of the abundance of the stock, recognising that smaller stocks might be more vulnerable than larger stocks.

Range of CL attainment	Risk Description	CAS
<50%	High	3
50 – 75%	Moderate	2
>75 – 100%	Low	1
>100%	None	0

An Impacts Assessment Score (IAS) was assigned based on an assessment to be made of the known impacts affecting the stock including: habitat degradation e.g. deterioration in water quality or obstacles to migration; over-harvest or selective harvest; diseases and parasites, e.g. sea lice; *G. salaris*; impacts on genetic integrity e.g. due to aquaculture escapees; or a steadily declining stock trend where the causes are unknown.

Level of Impacts	IAS
Heavily impacted	3
Moderately impacted	2
Lightly impacted	1
Not impacted	0

An overall Stock Classification Score (SCS) was then assigned by adding the CAS and an IAS together, but where the combined CAS and IAS was 3 or greater, an SCS of 3 was assigned. There are, therefore, four categories of SCS, as follows:

CAS Score	IAS Score			
	0	1	2	3
3	3	3	3	3
2	2	3	3	3
1	1	2	3	3
0	0	1	2	3

The SCS would assign the river to one of four categories as indicated by the different colours in the table below. The lowest three categories of SCS are defined by a single numerical score (0 (Green) = Not at Risk; 1 (Yellow) = Low Risk; 2 (Orange) = Moderate Risk) but the highest risk category (3 or higher (Red) = High Risk) would apply to all rivers with an SCS of 3 or greater.

The four SCS categories, together with categories for 'Lost', 'Artificially Maintained' and 'Unknown', result in seven categories being used in the Rivers Database as follows:

Stock Classification Score	Salmon Classification Category	Description	Map Colour
0	Not at Risk	Rivers in which there are stocks of Atlantic salmon for which Stock Classification Scores of 0 have been assigned because there are no risks to the abundance and/or diversity of the stocks	Green
1	Low Risk	Rivers in which there are stocks of Atlantic salmon for which Stock Classification Scores of 1 have been assigned because risks to the abundance and/or diversity of the stocks are considered to be low	Yellow
2	Moderate Risk	Rivers in which there are stocks of Atlantic salmon for which Stock Classification Scores of 2 have been assigned because risks to the abundance and/or diversity of the stocks are considered to be moderate	Orange
3	High Risk	Rivers in which there are stocks of Atlantic salmon for which Stock Classification Scores of 3 have been assigned because risks to the abundance and/or diversity of the stocks are considered to be high	Red
N/A	Artificially Sustained	Rivers which are known to have had stocks of Atlantic salmon which have been lost and in which the current stocks are only sustained through hatchery stocking	Grey
N/A	Lost	Rivers which are known to have previously had stocks of Atlantic salmon that currently have none	Black
N/A	Unknown	Rivers in which there are known to be stocks of Atlantic salmon but for which there is no information on which to assess their abundance.	Blue

Pre-2016 River Categories as Agreed by the Council of NASCO for use with the Original Non-Web-Based Rivers Database

CATEGORY 1: LOST [Red]

Rivers in which there is no natural or maintained stock of salmon but which are known to have contained salmon in the past.

CATEGORY 2: MAINTAINED [Blue]

Rivers in which there is no natural stock of salmon, which are known to have contained salmon in the past, but in which a salmon stock is now only maintained through human intervention.

CATEGORY 3: RESTORED [Purple]

Rivers in which the natural stock of salmon is known to have been lost in the past but in which there is now a self-sustaining stock of salmon as a result of restoration efforts or natural recolonization.

CATEGORY 4: THREATENED WITH LOSS [Amber]

Rivers in which there is a threat to the natural stock of salmon which would lead to loss of the stock unless the factor(s) causing the threat is(are) removed.

CATEGORY 5: NOT THREATENED WITH LOSS [Green]

Rivers in which the natural salmon stocks are not considered to be threatened with loss (as defined in Category 4).

Note: Following adoption in 2002 of the NASCO Plan of Action for Habitat Protection and Restoration an expanded web-based database was developed by the US. In accordance with the Plan of Action two additional categories were proposed (but not defined) as follows and we have proposed definitions for these below:

CATEGORY 6: UNKNOWN [White/Grey]

Rivers in which there is no information available as to whether or not it contains a salmon stock.

CATEGORY 7: NOT PRESENT BUT POTENTIAL [Black]

Rivers in which it is believed there has never been a salmon stock but which it is believed could support salmon if, for example, natural barriers to migration were removed.

Source: Report of the Working Group on Stock Classification, CNL(16)11.