

Impacts on Salmon and Trout Populations Associated with Onshore Wind Farm Developments in Scotland

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Fish

Salmon and trout are:

- species of high conservation value; and
- support important fisheries and contribute to the Scottish economy.



Brown trout with a selection of flies used for angling.

Renewable Energy in Scotland

- the recently approved Climate Change Bill has set an ambitious target of Scotland achieving net-zero emissions by 2045;
- onshore wind continues to be the largest contributor of renewable electricity in Scotland (71% in the fourth quarter of 2018) (Scottish Renewables 2019);
- Marine Scotland Science (MSS), in our role as internal SG advisors, assesses the likely risks that wind farm developments and their construction pose to the water quality, fish habitats and populations. MSS also carries out research to underpin our advice.

How fish populations may be impacted by onshore wind farms

The main processes, associated with wind farm construction activities, which can impact fish populations are:

- deterioration in water quality, which can have an effect on spawning success, hatching of eggs, production of juveniles and angling success. Poor water quality can be the result of:
 - the release of sediment when excavating turbine and control building/substation foundations, access and cable tracks and borrow pits;
 - fuel spillage;
 - concrete spillage when used in the construction of turbine and control buildings/substations foundations and bridges;
 - use of flocculants (for sediment control); and
 - tree felling which forms part of the enabling works;
- poorly designed watercourse crossings such as culverts/bridges/fords, which can prevent fish migration; and
- alteration of surface water runoff and drainage rates due to the construction of impenetrable surfaces which can lead to an increased risk of flooding, or dewatering affecting fish survival.



Carefully siting turbines and associated infrastructure away from watercourses can mitigate impacts on the water quality and fish populations.

Advice

- MSS provides advice on the above fish species to the SG Energy Consents Unit (ECU) in relation to the potential impacts of onshore wind farm developments;
- ECU has the responsibility for processing applications for electricity generating stations of 50 megawatts or more, power lines and associated infrastructure for Scottish Ministers' consent;
- MSS often advises that a monitoring programme is carried out before, during and after construction to help ensure mitigation measures are effective in avoiding and/or minimising potential impacts on fish populations;
- MSS has issued guidelines for developers which outline:
 - fisheries related issues that should be considered throughout the application process; and



Excavation works at borrow pits can potentially lead to the release of sediment and hydrocarbons into adjacent watercourses. Following best construction practice techniques and pollution prevention guidelines will help to ensure minimal impact on fish populations.

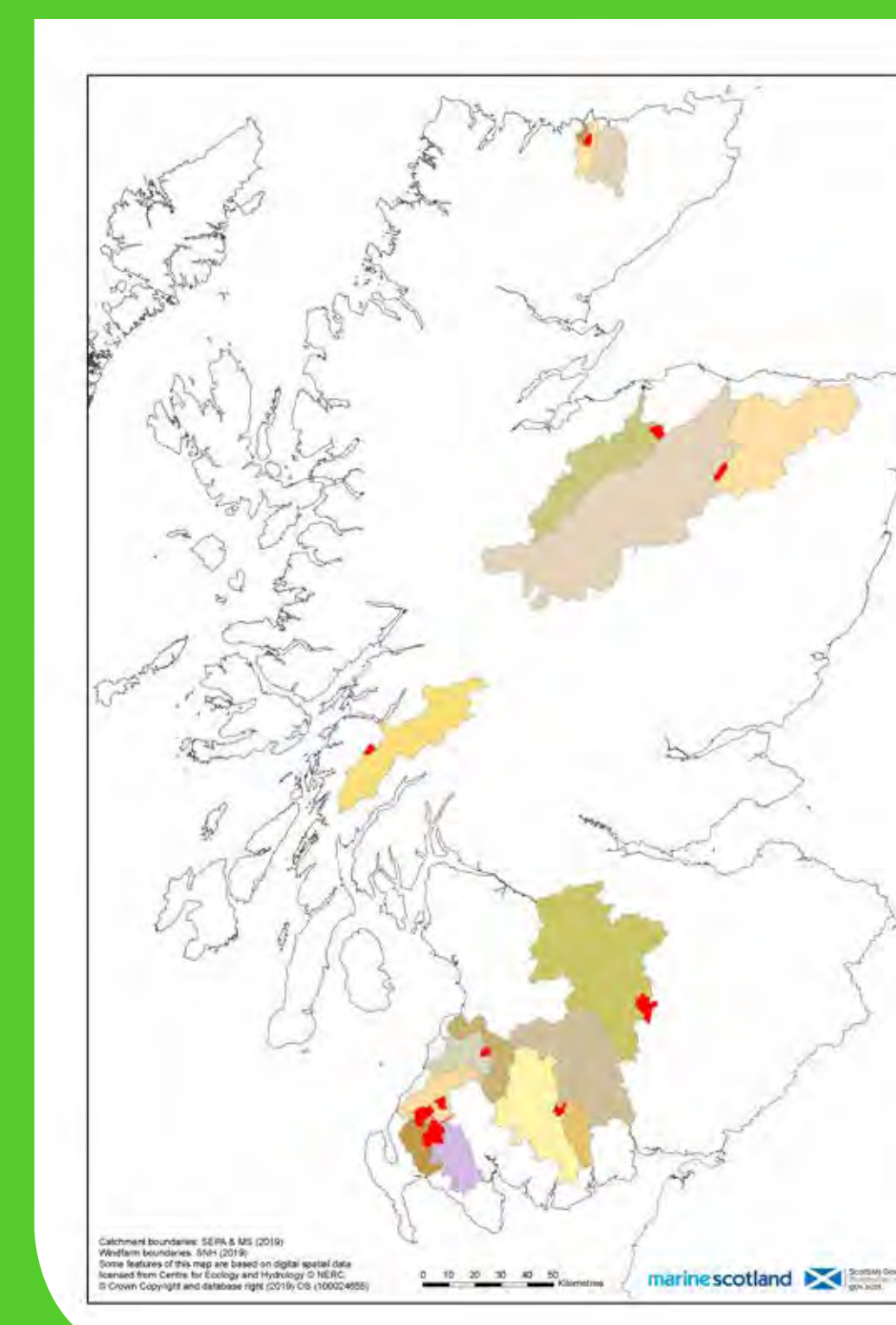


Careful design and maintenance of watercourse crossings (e.g. the depicted culvert in the onsite access track) is required to ensure that fish migration is not impeded.

- a full description of a well-designed robust integrated water quality and fish population monitoring programme (<http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/onshoreren>).

Research

- MSS is investigating the impacts of consented/operational onshore wind farm developments on fish populations;
- a statistical model has been developed to describe the association between the density of salmon and trout with the construction of 15 wind farms;
- using ESRI ArcGIS techniques a quantification has been made as to how much of the watercourse catchment could potentially be impacted by wind farm infrastructure located upstream of each fish monitoring site;
- this information will be used as covariates in the above model;
- similar techniques will be used to assign land use type, forestry operations and acid sensitivity for watercourse catchments for each fish monitoring site;
- the results of the research will underpin MSS advice and inform the assessment of future development proposals.



Map outlining the location of 10 wind farm developments (red colour) and 16 river catchments for each of the 123 fish monitoring sites.