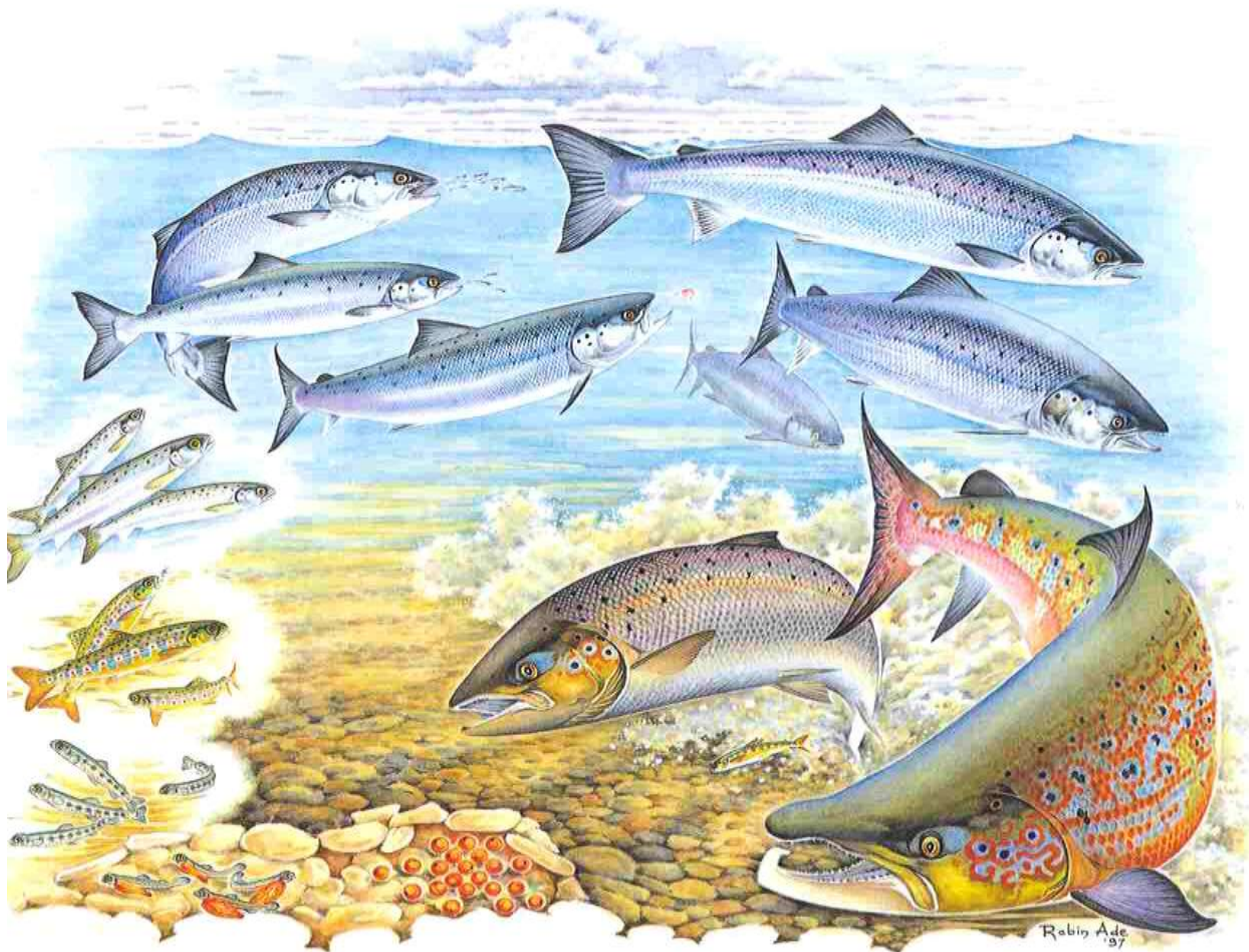


Salmon and the marine nutrient pump

by Simon Mckelvey

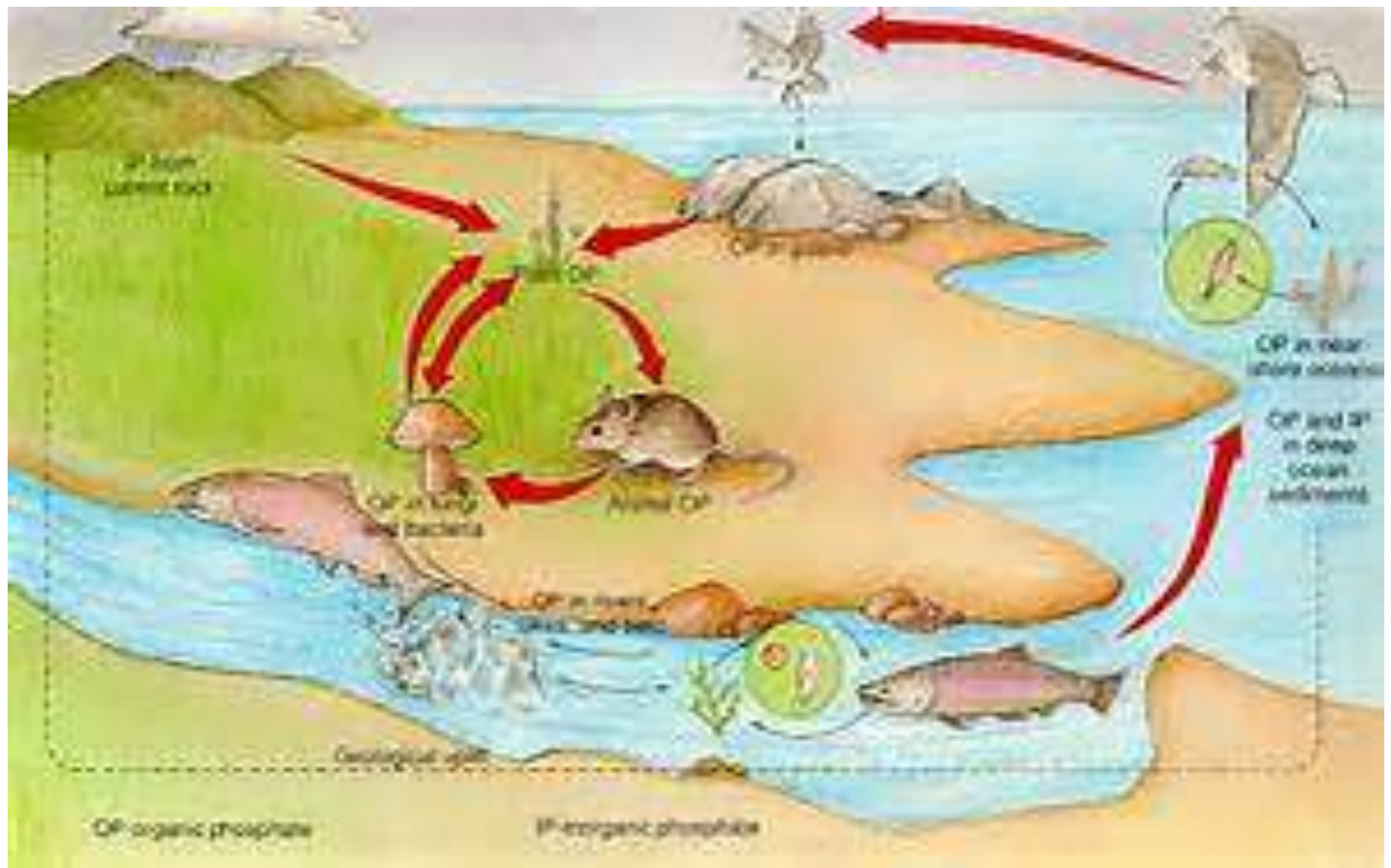
Cromarty Firth Fisheries Board and Trust



Robin Ade
'97

Stockner, John G., and Kenneth I. Ashley. 2003. Salmon nutrients: closing the circle. Pages 3-15 in John G. Stockner, editor. *Nutrients in Salmonid Ecosystems: Sustaining Production and Biodiversity*, Stockner, John G. (editor), American Fisheries Society, Symposium 34, Bethesda, Maryland.

Salmon are a vector by which marine nutrients are captured and conveyed against the force of gravity into freshwater ecosystems. Especially in the upper reaches of watersheds where salmon are able to spawn and their offspring spend their early lives, these nutrients, in both organic and inorganic forms, play an important, perhaps essential, role in maintaining viable salmon runs along with numerous other ecosystem components. For example, a substantial proportion of the nitrogen in plants and animals in streams where salmon are abundant is probably derived from decomposed spawned salmon. This "anadromous nutrient pump" has been attenuated considerably because salmon runs have been reduced substantially in the Pacific Northwest for decades and, in some places, for more than a century. Thus, the addition of nutrients to watersheds, lakes, or streams where salmon runs are now much reduced would replace, at least partially, the "missing" marine-derived nutrients and would likely enhance salmon runs and overall aquatic productivity.

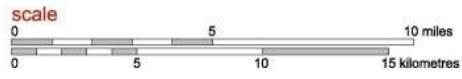






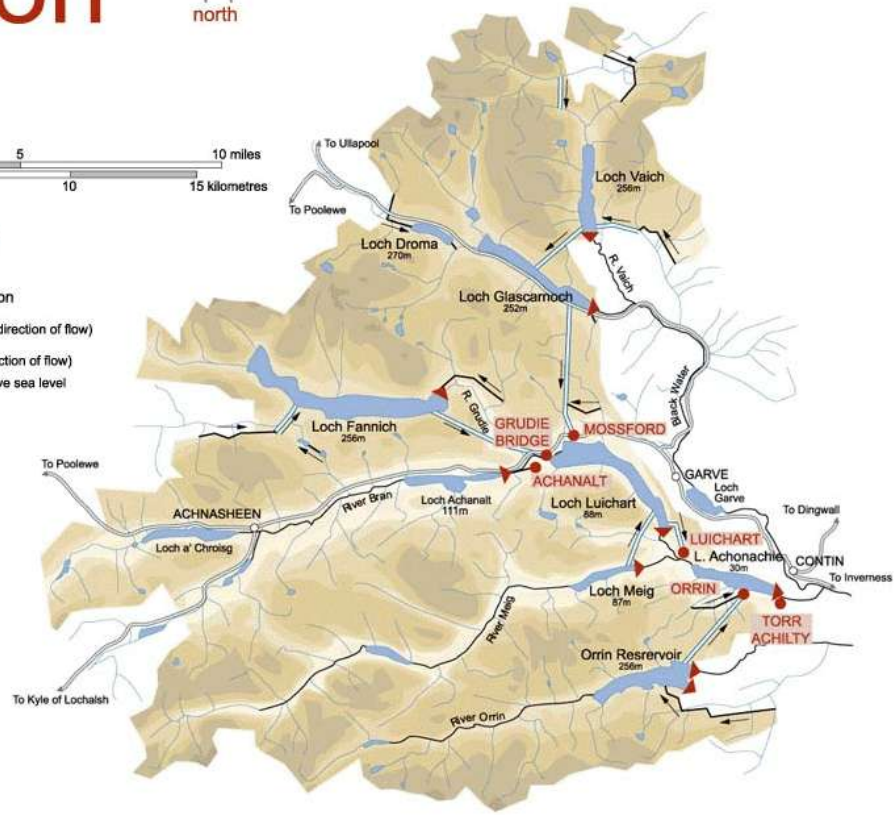


Conon

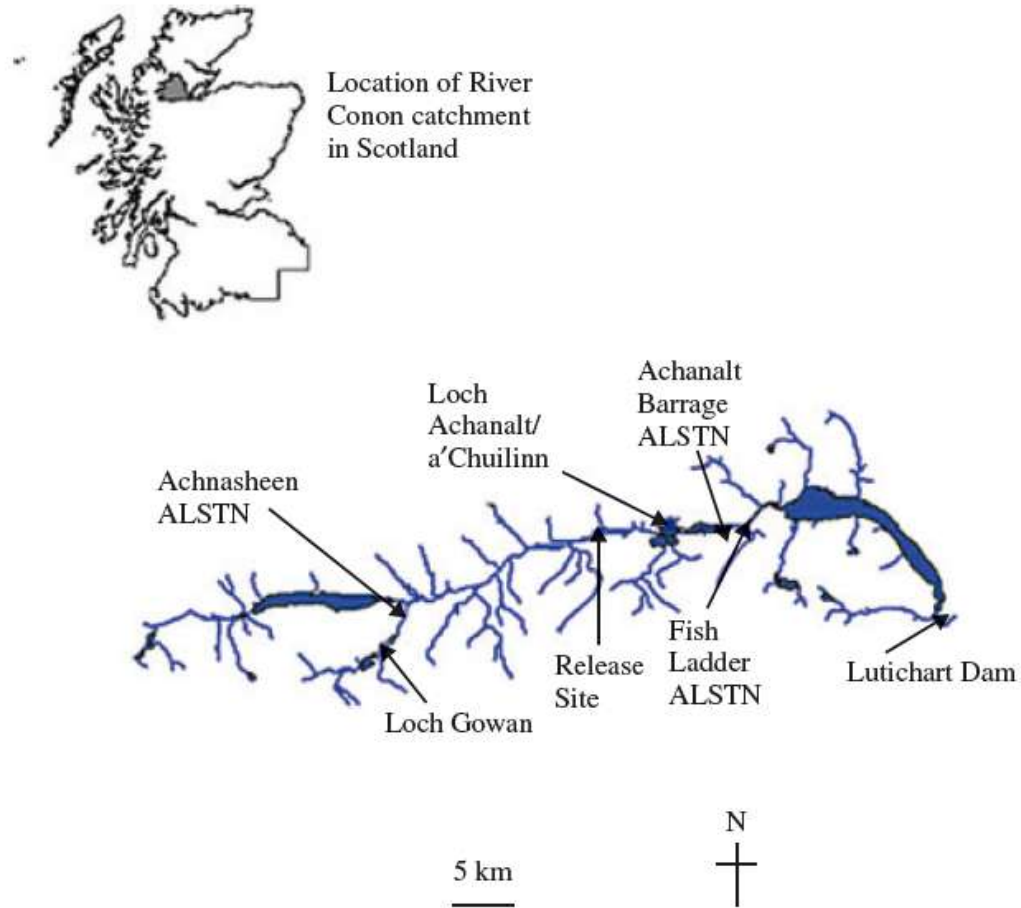


key to map symbols:

- Dam
- Power station
- Aqueduct (direction of flow)
- Tunnel (direction of flow)
- Reservoir levels in metres above sea level



Where do Atlantic salmon die



Williams et al.

In 2003 and 2004 38 adult salmon were radio-tagged and tracked until after spawning in the River Bran.

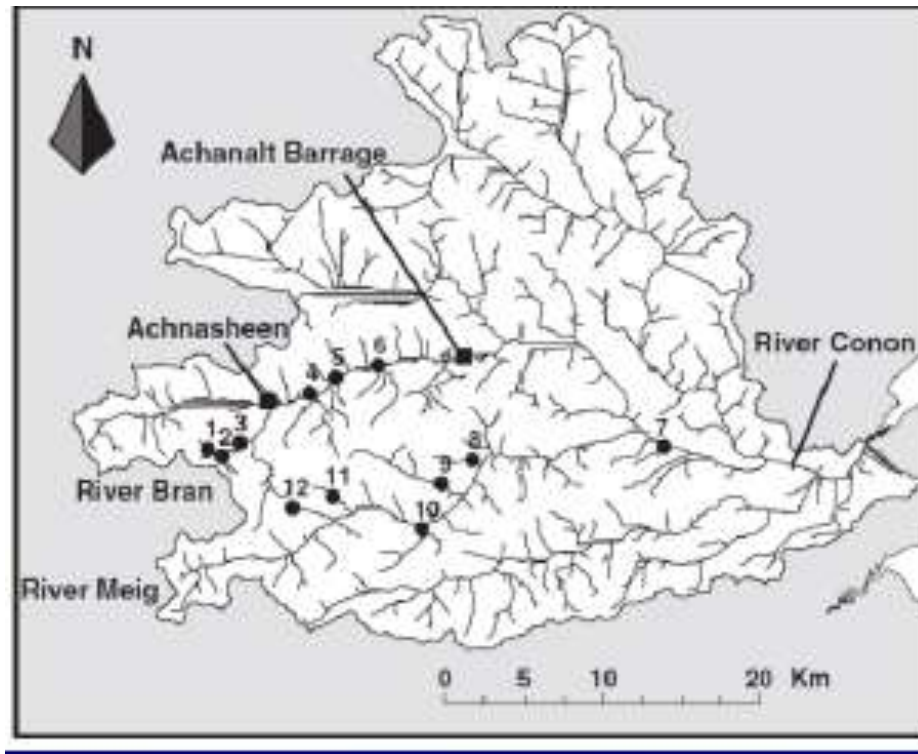
35% left the system after spawning

30% died in the lochs in the Bran system

35% died in the River Bran and tributaries.

A total of 65% died in freshwater habitats.

Kelt Carcass addition



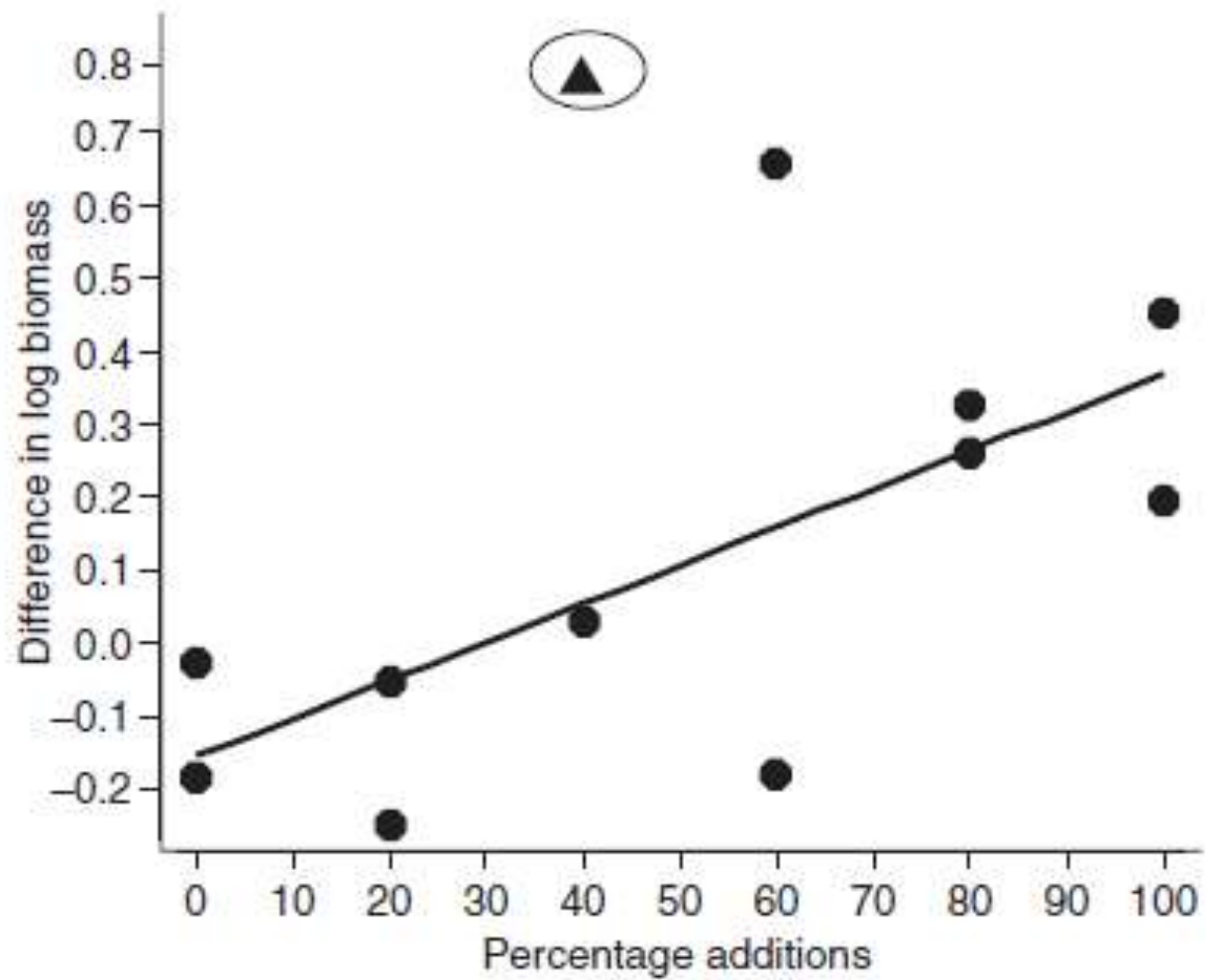




Stable isotope analysis $^{15}\text{N}/^{14}\text{N}$







Next steps in research







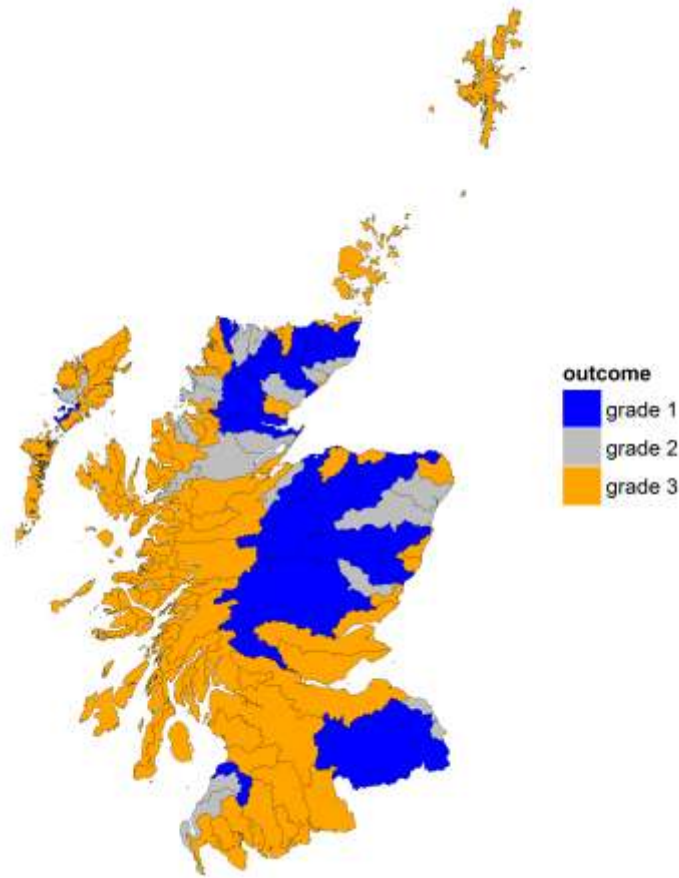








Salmon Conservation Regulations 2016



- Conon wetted area 3,161,876 m².
- Conservation limit / egg target 17,000,000.
- Number of 2.5 kg salmon needed 9,714.
- 24.285 tonnes of salmon, 15.75 retained in freshwater.
- What is the cumulative effect of years of missing egg target on nutrient status.