

Pauls Hill Wind Farm Monitoring Results

Wind farm developments have the potential to impact on hydrology, hydrochemistry and sediment transport by altering water run-off processes. Thus, the Spey Fishery Board was concerned when plans were announced in 2001 to establish a large wind farm on Pauls Hill, Ballindalloch. The proposed development is within the Pitchroy Burn catchment, an important tributary of the Spey supporting both salmon and sea trout stocks. The Board felt that any detrimental effects on water quality arising from the development would not only directly affect the fish stocks in the Pitchroy burn, but potentially those further downstream in the mainstem River Spey.

The Spey is designated as a Special Area of Conservation and is afforded the very highest level of environmental protection available under EC legislation. Any proposed development within the Spey SAC which could affect the water quality or quantity must demonstrate that all appropriate measures have been taken to protect the water course and the designated SAC species within it. As well as Atlantic Salmon, Sea Lamprey, Otters and Freshwater Pearl Mussels are also designated within the Spey SAC.

The Spey Fishery Board and the developers, Pauls Hill Wind Ltd, signed a monitoring plan agreement which encompassed three key elements: water quality, invertebrate and fish populations.

Baseline data was collected in 2003 and 2004 and monitoring of all three elements continued throughout the construction and operation phases of the development. A key aspect to the program was the inclusion of the nearby Tulchan Burn as a "control".

Overall the construction of the Pauls Hill wind farm was carried out to a very high standard and only a few isolated incidents of increased siltation running into the burns were recorded. Water quality monitoring results did indicate a small change in pH after the construction of the wind farm. However, this was well within the tolerable range for the fish and invertebrate populations. Most of the variations in water quality, invertebrate and fish populations within the Pitchroy Burn were attributable to natural variability and were indistinguishable from the control sites on the nearby Tulchan Burn.



Pauls Hill wind farm (Photo Stuart Naylor, Natural Power)

The Spey Fishery Board was impressed with the control measures implemented to safeguard the nearby watercourses during the construction of the wind farm and the support from the developers throughout the monitoring program. There are a number of other wind farm developments proposed within the Spey catchment and the Board continues to work to ensure that the same high standards and a full monitoring programme are applied to these new proposals should they proceed.

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Water Sampling



Spey Research Trust biologist, Steve Burns, collects water samples from one of the four composite samplers installed on the Pitchroy and Tulchan Burns. (Photo R. Laughton)

Water samples were collected from a number of sites on both burns during low and high flow conditions to characterize spatial variability in the catchments. Following these initial assessments, a lesser number of sites were selected for continued monitoring (Figure 1). Composite samplers were placed at an upper and lower location on each burn. These devices collect water samples throughout a two week period, proportional to flow (greater sample collected when water levels are higher), and were operated from the start of the monitoring program in 2003 through the construction period (2004-06) to completion and will continue until 2010. The water samples were collected by SRT staff and analysis was then completed by the Marine Scotland Freshwater Laboratory, Pitlochry. Data was collected on pH, alkalinity, nutrients, DOC, conductivity and a range of major ions. Stream stage (water height) and temperature were also monitored continuously on site.

Throughout the monitoring period most of the variation in hydrochemistry was associated with natural changes in hydrological conditions. However statistical analysis indicated that pH had been reduced in the Upper Pitchroy catchment, by up to 1.5 pH units at highflow. Impacts in the lower catchment were less marked, up to approximately 0.75 pH units.

There was some indication that other parameters associated with perturbation of the catchment soils (nitrate, phosphate and suspended solids) showed some response to the wind farm development. In particular, short lived increases in suspended solids, phosphate and nitrate could be observed. However these impacts were not statistically significant.

Invertebrate Sampling



Janey Keay (Marine Scotland) collects invertebrates using a HESS sampler. The HESS sampler has a drum of known area which is placed on the river bed. The substrate is then agitated within the drum and the dislodged invertebrates are washed into the downstream net. (Photo: R. Laughton)

Six locations on the Pitchroy Burn and two on the Tulchan Burn were established for long term monitoring of invertebrates (Figure 1). These were collected using a Hess sampler and 3 minute kick samples from each location by MS-FL, Pitlochry staff. All the invertebrates were indentified to species level and measures of abundance and diversity determined using a range of standard methods.

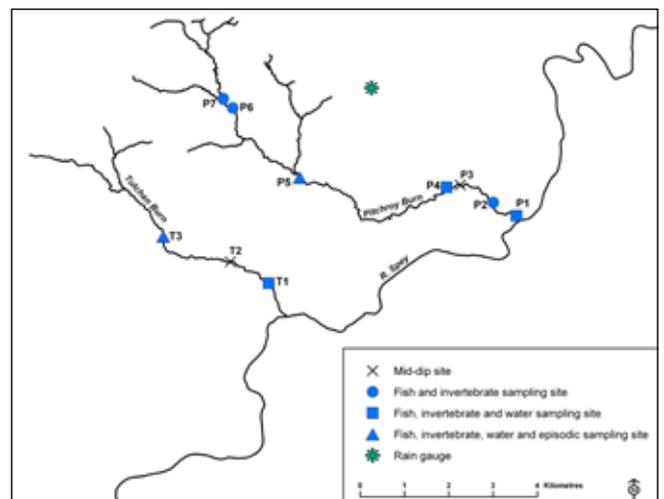


Figure 1: Sampling sites on the Pitchroy and Tulchan burns

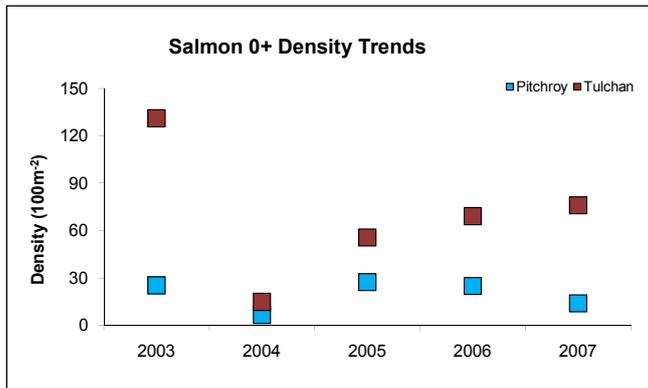
Invertebrate studies indicated that both the Pitchroy and Tulchan Burns had diverse and abundant communities. During the pre-construction years of 2003-2004 patterns of

inter-annual variability were inconsistent between catchments, making pre- and post construction comparisons difficult. Further analysis of the invertebrate data will be carried out to assess whether it is possible to determine environmental impacts of wind farm development beyond the normal background noise seen in the pre-construction period.

Fish Sampling

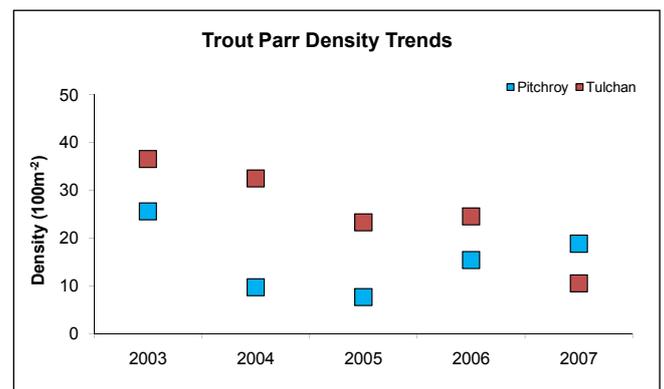
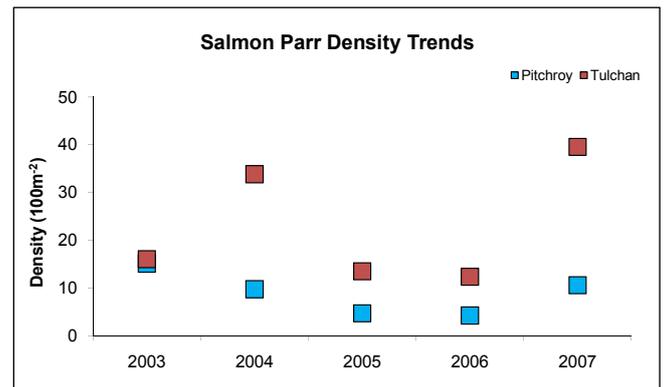
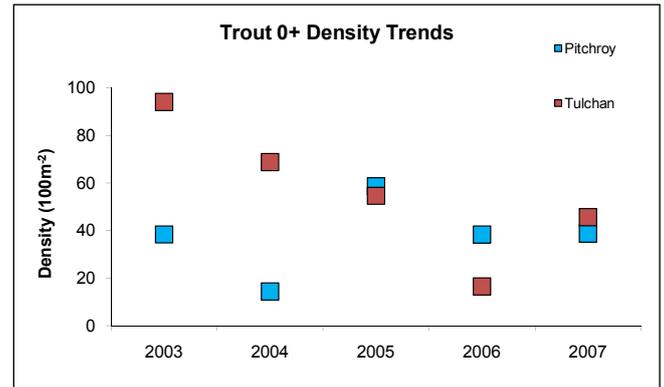
Six locations on the Pitchroy and two locations on the Tulchan Burn were established for the long term monitoring of fish populations (Figure 1). These locations corresponded to the invertebrate sites. Each site was electrofished using Scottish Fisheries Co-ordination Centre (SFCC) methodology. Data on the species present, distribution, age classes and density was collected along with associated habitat information. Each site was also photographed to allow accurate revisits in subsequent years.

Results from the fish surveys indicated both burns had good populations of salmon and trout; salmon dominate in the lower reaches of each burn with trout more prevalent in the upper headwaters. Figures 2 to 4 show population densities of salmon and trout fry varied widely from year to year but in general the patterns of variability in the two burns were similar before, during and after wind farm construction.



Figures 2 and 4 indicates a sharp drop in salmon and trout fry densities in 2004. This coincides with the main construction period of the wind farm and initial reactions would suggest that the fish populations in the Pitchroy were affected in some way. However, the same pattern was also recorded in the Tulchan Burn which was not within the wind farm area. In the end it was concluded that the decline relates to the very dry summer and autumn conditions in 2003 rather than any

construction activities. The dry autumn limited adult salmon and trout access to only the lower reaches of both burns and so spawning distribution was poor leading to lower densities of fry in 2004.



MONTHLY BRIEFING

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Pauls Hill wind farm (Photo Stuart Naylor, Natural Power)

Acknowledgements

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