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SEFARI delivering leading ideas
on water for better lives



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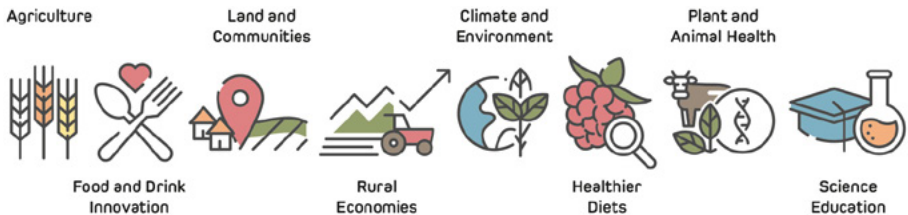
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Scottish Environment, Food and Agriculture Research Institutes (SEFARI) is a collective of six globally renowned research institutes: the James Hutton, Moredun and Rowett Institutes, Biomathematics and Statistics Scotland, Scotland's Rural College and the Royal Botanic Garden Edinburgh.

SEFARI with Scottish Universities and also other institutional partners, delivers the Scottish Government funded Strategic Research Portfolio (the Portfolio). The Portfolio addresses major challenges for Scotland's environment, agriculture, land use, food and rural communities. It provides a unique national research capability, underpinning research capacity, delivering mid to long term research need through the Strategic Research Programme (SRP), and targeted policy responsive work through Scotland's Centres of Expertise.

SEFARI-Gateway is the Knowledge Exchange and Impact Centre for SEFARI, working across the Portfolio to support SEFARI and its partners in delivering research and expertise for impact to policy, industry, economy and civic society.

SEFARI focuses its work under eight 'leading ideas':



SEFARI, in collaboration with Scotland's Centre of Expertise in Water (CREW), sponsors collaborative projects on Scotland's water quality, water supply and the influence of climate change.





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#LeadingIdeas

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Example outcomes of projects:



CASE STUDY 1

River Temperatures are Rising

Ina Pohle & Rachel Helliwell, James Hutton Institute

Sustaining cool river temperatures in Scotland is essential for salmonid habitat and health, also critical for sport fishing (contributing around £113 million per year to the Scottish rural economy) and whisky production.

- Long-term monitoring in the river Spey identified a 2 degree increase in the river temperature over the past 105 years
- This could mainly be explained by increasing air temperature and less snow melt

It is important that land managers and policy makers take action to make rivers more resilient to change in the future through the implementation of adaptation measures at a catchment scale. Practical guidance in the form of a factsheet and short film were produced to raise awareness and instigate change in policy and practice.





CASE STUDY 2

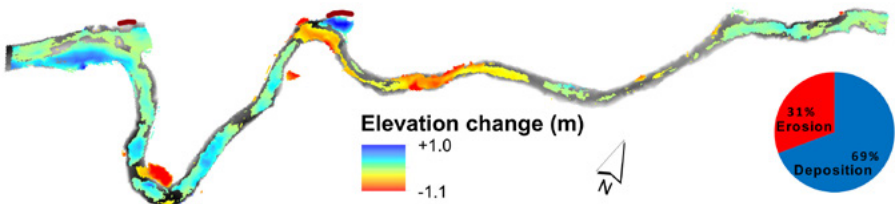
River Restoration in the River Dee Catchment

Steve Addy, James Hutton Institute

Investigations of the effects of reach scale restoration on hydromorphology and habitat have taken place at two scales in the Aberdeenshire Dee catchment - a small tributary (Logie Burn) and on the main stem River Dee.

- Over 3 years the restored Logie Burn reach gained approximately 64 cubic metres of sediment and the diversity of stream bed habitats improved
- Due to the removal of a flood embankment and several large floods, the water storage capacity of the floodplain at the River Dee site improved. The bed of the channel also adjusted to a more natural shape and rose by up to 1m

Monitoring at both sites shows that rapid morphological and hydrological responses following works can occur by letting 'nature do the work'. This research could help managers anticipate responses to restoration in other similar rivers.



Erosion and deposition responses between 2011 and 2014 following restoration in the Logie Burn.



The restored reach* of the Logie Burn in 2012

* Reach is any length of a stream or river.



CASE STUDY 3

New Analysis to Detect Sources of River Sediments

Miriam Glendell et al., James Hutton Institute

The applicability of vegetation derived *n*-alkanes alone and in combination with their compound-specific isotopic signatures were used to distinguish sediment sources in river systems.

- Alkanes and their isotopic signature allow sediments derived from arable, grassland, mixed forest, coniferous forest and upland moorland land cover types in the Tarland burn to be clearly distinguished
- Modelling will evaluate the temporal sediment dynamics at the various locations and provide improved source apportionment to help understand and act on sedimentation impacts

This work will help managers to identify sources of sedimentation to rivers and lakes, addressing important causes of diffuse water pollution.



CASE STUDY 4

Emerging Contaminants Assessed in Scottish Waters

Zulin Zhang, James Hutton Institute

Emerging contaminants were measured in waters and these results help to understand the pollution status of these chemicals in the aquatic environment.

- Different techniques (passive and spot sampling) have been applied to monitor emerging contaminants including pharmaceuticals and personal care products (PPCPs), hormones and pesticides in a Scottish priority catchment (River Ugie) over 12 months
- The annual flux and risk of emerging contaminants were estimated for the River Ugie and to the adjacent estuary and North Sea

The trends and data analysis suggested that human activities and medication usages were the primary source of the contaminants.



CASE STUDY 5

Evidence of the Parasite *Toxoplasma gondii* in Scottish Water Supplies

Beth Wells and Lee Innes, Moredun Research Institute

Waterborne transmission of the parasite *Toxoplasma gondii* is a potential public health risk, but there is currently a lack of prevalence data which reflects the lack of effective, optimised methods for the recovery, processing and detection of *T. gondii* oocysts in water samples.

- Development of a sensitive method of DNA detection for *T. gondii*, established a prevalence of 9% in over 1000 water samples collected from public water supplies
- This DNA was derived from oocysts, the potentially infective, environmental stage of this parasite

This study provided the first evidence of *T. gondii* contamination in Scottish water supplies and highlighted that existing techniques for extracting oocysts from raw or turbid water samples are ineffective. Future research will investigate technologies to assist with this problem.



CASE STUDY 6

On the Deep Wealth of this Nation, Scotland. A Collaboration in Ecological Art.

Susan Cooksley et al., James Hutton Institute, the Barn, RGU, RBGE and SRUC

SEFARI is supporting work by internationally acclaimed ecological artist Newton Harrison entitled 'On the Deep Wealth of this Nation, Scotland'.

- The project has involved a touring exhibition of 10 works, seminars and discussions, an animated short film, and poetics
- It presents an original vision for how one small country can mobilise as a nation to be the first industrialised country to give back more to the global environment than it consumes
- Exhibitions and seminars have engaged local communities, landowners, agencies, NGOs, students, environmentalists, politicians and scientists

The works provoke consideration of the long-term consequences of climate change and describe the major changes in land use that will be needed to enable a thriving population to persist.