

How potential future land uses may affect water quality and growth of South West aquaculture.

sweep
Project Output

Working with stakeholders across South West England, this [SWEEP project](#) has developed a range of future land-use scenarios that will be used to model water quality in freshwater catchments (from source to sea). Findings will contribute to a better understanding of how water quality impacts on the viability and potential for growth in the South West's estuarine and marine shellfish aquaculture sectors.

The issue

Shellfish aquaculture in the South West has significant potential to boost employment, produce sustainable food, and deliver vital ecosystem services, such as habitat and fisheries enhancement, coastal protection and nutrient cycling. Despite this, it is currently an underexploited industry.

One of the key factors limiting its growth and long term viability is variable, and poor water quality, as a result of frequent agricultural and urban run-off, and sewer overflow events. These events elevate concentrations of nutrients, pesticides, suspended sediment and faecal indicator organisms (FIOs) breaching water quality standards. Climate change is further exacerbating the problem and this can result in wetter winters and more frequent flooding and storm water events.

Identifying potential future land-use management scenarios in the South West is therefore key to understanding future changes in freshwater catchment water quality, and the impact of this on the potential growth of the region's aquaculture sector. We approach this by considering both historic land-use change and key incentives driving current and future land-use decision making. The last 50 years, for example, has seen a rapid expansion and intensification of farming, with 80% of England's total land cover now under rural/agricultural land-use. The figures opposite reflect this but also show specific changes in the South West in recent decades, such as a significant decrease in grassland - a known contributing factor to higher run-off rates. Lower grade agricultural land is also being targeted for growing energy crops and direct energy generation in the form of wind and solar farms.

At the same time, drivers now exist to support the growth of England's aquaculture industry. The [English Aquaculture Strategy 2020](#) supports a ten-fold increase in production by 2040, whilst the UK government's [25 year Environment Plan](#), [Agriculture Act 2020](#) and [Clean Growth Strategy 2017](#) encourage improvements in agricultural and land management practices that reverse environmental decline and improve water quality.

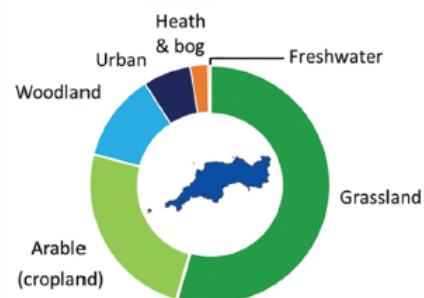
What we did

A stakeholder workshop was held in October 2020 to elicit views and insights on likely future scenarios for rural land-use management in South West England. These were used to develop realistic best and worst case land-use and water quality scenarios, over the next 10-30 years that could be used to model effects on key mariculture species.

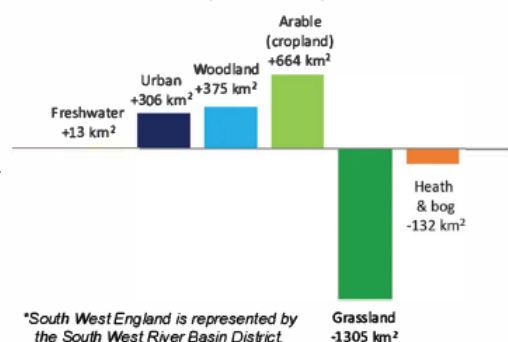
Over 100 attendees represented views from farming, waste and water industries, conservation authorities, environmental regulators and academic researchers. ['Future outlook' video presentations](#) were given by representatives from the Food Farming and Countryside Commission, National Farmers Union, South West Water, West Country Rivers Trust and Natural England.

Please see our report ['Future scenarios for modelling water quality and impacts on aquaculture in South West England'](#) for an expanded read on the policy context, Expo workshop and stakeholder opinions.

Current land-use in South West England* (2019)



Land-use changes in South West England* (1990-2019)



*South West England is represented by the South West River Basin District.

Future land-use/management scenarios in the South West

Five future land-use/management scenarios were identified, along with a set of climate change futures. Corresponding UK National Ecosystem Assessment scenarios are given in parenthesis ([UK NEA 2014](#))



1. Business as usual (**Go with the flow**)

The business as usual scenario represents the current expected trajectory of land-use change in South West England, based on trends from the past 30 years. Combined Sewer Overflow (CSO) rates follow current trends (CSO rates are modified according to urban development in the following land-use scenarios 2-5).



2. Extensive regenerative agriculture (**Nature at work**)

Widespread agricultural regeneration includes increased soil quality and extent of best, most versatile agricultural land and reduced agricultural run-off to water courses via best management practices.



3. Intensive agriculture (**World markets**)

Intensified agriculture (indoor livestock rearing and fodder cropping) will create pollution hotspots, compensated for to some extent by land sparing in upland areas. (Pollution hotspots may interconnect via flooding).



4. Increased renewable energy capacity (**National security**)

Opportunities to increase renewable energy capacity in South West England include bio-energy crops, solar and wind power, which will require trade-offs in terms of available land-use.



5. Strategic tree planting (**Local stewardship**)

Increased tree planting across the UK and South West England is a key component of the UK's 25 Year Environment Plan. This scenario considers the resulting changes in land-use and hydrology.



Climate change futures

Climate change is likely to affect the hydro-meteorological conditions governing flow regimes, temperature and runoff in South West England. Scenarios are taken from UKCP18 and superimposed on each of the above land-use scenarios (1-5).

Climate change futures

See [Future land-use scenarios \(PDF\)](#) for more detail about the above scenarios.

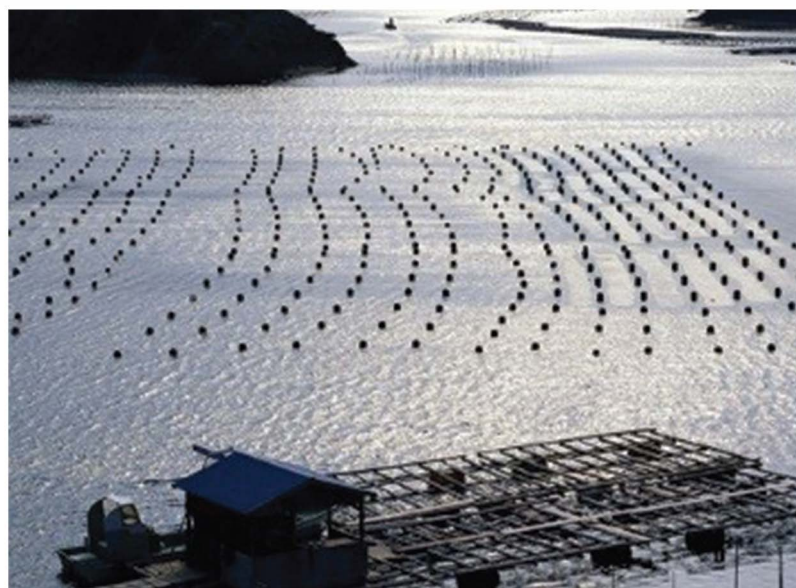
Next steps

These future land-use/management scenarios will feed into modelling developed to better understand the causes and effects of water quality changes on downstream stakeholders, particularly the aquaculture industry, but also water, recreation and tourism industries, which are all vital components of the South West economy.

Links

In addition to the linked-content in this report, you can also explore:

- [SWEEP Aquaculture Resource Hub](#) for more information, tools and resources.
- Published journal article: *Impacts of land use on water quality and the viability of bivalve shellfish mariculture in the UK: A case study and review for SW England*



For more information on this project please contact Project Lead and SWEEP Impact Fellow - Dr. Ross Brown (Ross.Brown@exeter.ac.uk)



About SWEEP

The South West Partnership for Environment & Economic Prosperity (SWEEP) is a partnership between the University of Exeter, the University of Plymouth and Plymouth Marine Laboratory. Funded by the Natural Environment Research Council, SWEEP brings stakeholders and experts together to solve challenges faced by those working with our natural resources.

