

Citizen Science paves the way for better conservation advice: Introducing REDS (Reciprocal Environmental Decision Support)

Land managers need more support with environmental decision making

Citizen Science is going viral in ecology, with 100 million downloads worldwide of apps for identifying and reporting species.

In contrast, although there are many ecological models that can inform land management decisions, there is almost no uptake of these models by ordinary citizens. Environmental Decision Support systems proliferate, but they are not accessible to non-experts.

Given that billions of people worldwide manage land through smallholdings and gardens, this is a huge gap, which could be filled with new systems that are as innovative and accessible as the latest Citizen Science apps (as we argue in more detail in a [preprint article](#)). Reciprocal Environmental Decision Support (REDS) is one way to fill this gap.

By combining Citizen Science and Environmental Decision Support in one system, REDS links citizens and scientists into a reciprocal network. Citizens not only help science by reporting on their local ecosystem but also learn to improve it with help from tailored decision support.

Our REDS proof-of-concept system establishes that:

- Non-experts in the UK can provide data about the land they manage that automatically improves an ecological model (Citizen Science);
- While providing data, they can also receive model-based advice about management (Environmental Decision Support);
- These two processes occur together in a virtuous cycle of reciprocal improvement.

Proof of concept: contributions from gardeners improved an indicator species model, resulting in more accurate tailored conservation advice in return

We've successfully validated a REDS platform in which gardeners benefit from tailored environmental decision support, while contributing data that improves the advice they receive. Our app at garden.earthadvice.org provides information about garden suitability for house sparrows, a species that has undergone rapid decline. Users can see a sparrow score for each area of their garden, and how it would be affected by potential changes they could make to garden management. Their own reports of sparrow observations refine the advice-generating model for future users.

For example, during our test, the 71 contributed UK gardens improved the system's confidence that grass can be positive for sparrows. Further details are available in the [proof-of-concept journal article preprint](#).



Sparrow score screenshot. Users can tap or click on sparrow icons to see an explanation of the score for that area of the garden. The displayed textbox explains the tree area scoring 79%.

Our garden REDS system also features a creative and intuitive new way of providing users with information about the carbon sequestration potential of gardens. It uses estimates about [carbon storage by garden plants and soils](#) together with estimates of the [human mortality cost of carbon](#) to calculate how much human life gardens sustain by storing carbon. It can also explain how this would be affected by changes to a garden.



Carbon score screenshot. Users can tap or click each area to see how much human life is saved.

For the technically interested

REDS is implemented in the Cloud with a growing stack of docker containers. Models can be added (for example in R) and scheduled for Bayesian update through a dashboard without needing to interact with other code. A spatial database is linked to a user-friendly front end: UK gardeners who came to the app cold, with no prior training, took less than 20 minutes on average to make a map and report sparrow observations, thanks to extensive guidance available within the system.

The future of REDS: call for novel proposals

The system generalises far beyond our initial proof-of-concept system for analysing sparrows and carbon in UK gardens. We are shortly to launch our next application, for modelling red and grey squirrel populations with data contributed by residents at a case study location within the EU Horizon [PRO-COAST project](#). A version for modelling effects of agri-environment measures on wild farmland species is well-advanced too.

We are also seeking new partnerships with individuals and organisations with proposals for new applications for REDS. We invite proposals from conservation organisations, citizen science specialists, academics, community groups, or anyone with a good idea, aimed at any type of land manager, ecosystem service user, or community.

The REDS team

REDS is developed by two partners within the EU Horizon [PRO-COAST](#) consortium: the [European Sustainable Use Group](#) provides ecological and social science expertise and [Anatrack Limited](#) is the developer. REDS is based on an [original idea](#) generated within the EU-funded project TESS. Project lead: Dr. Ben Kenward. Senior advisors: Dr. Julie Ewald and Professor Robert Kenward. Full stack development: Nick Casey. Research Associate: Dr. Perline Bastid. Sparrow specialist: Dr. Francis Buner. Carbon sequestration specialist: Associate Professor Ishi Buffam. Contact us at ben@earthadvice.org.