AI for the Environment Hackathon Festival 2023

Problems to Solve

Recording Restoration Activities - at Baring Head, Wainuiomata, and beyond

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New Zealand has two web-based databases and apps that allow people in restoration groups to record vital information, and that we use at Baring Head:

- Inaturalist, which is used to record biodiversity observations
- TrapNZ which is used to record trap locations and catches.

Inaturalist is an international system, with the NZ system run by a charitable trust. It can be accessed through https://inaturalist.nz/.

Individual observations are added through the website or the app. Experts look at those and provide identifications. Projects can be set up within the system (e.g. for a specific place), and it can be used for specific activities (e.g. the recent city nature challenge). Location of rare species can be hidden, but otherwise the data is all available to anyone to use for any purpose. jon.sullivan@lincoln.ac.nz is the site administrator and can answer questions on how the system is maintained, links to the international system, etc.

Having all the groups use these has some major advantages:

- There is a single system that agencies can invest in, rather than having investment spread across a lot of competing systems.
- By having everyone put their data in these, others can easily access that data and use it for other purposes. For example, someone may put an observation on inaturalist because they want an ID, but it then becomes part of the overall record of where that species is in NZ and what species are in the place it was found.
- Data isn't lost when restoration groups fold or change personnel.
- Where linked to an international system, we get their expertise and observations as well.
- There are some other national systems recently developed or in development, such as one for recording fish passage barriers.

Problem to Solve #1 - Recording Restoration Activities

What we don't have is a good system for recording activities we do – planting, weed surveillance (that fails to find anything), weed control, installation of equipment, and so on. The council as landowner has developed a system for mapping the work we do, but it is bespoke and only they can access and add to the maps. And adjacent groups are presumably using their own systems (or not recording), so there's no way to look at the whole catchment and what has been done.

This makes the data for or project less secure and harder to collect. But it also means there is no easy way to compile data from a lot of groups (e.g. for international convention reporting purposes).

It also makes it very difficult for those involved to see the impact of their actions over time – and for us to celebrate that.

Problem to Solve #2 - Recording progress

Increasingly, we are setting objectives for biodiversity, catchment restoration, and community outcomes, that will be delivered through multiple actions by multiple parties.

To efficiently track progress towards these objectives, we need to:

1. **Translate the objective into actions.** For example, the objective might to be to reduce sediment in a river by 80%, but the actions might be to have 60% of the riparian margin in woody vegetation. We have some algorithms that allow that to be done, but probably need more. We want to have the actions deliver the objectives at lowest possible cost. For example, you might get more benefit from planting headwater tributaries rather than the main river. So algorithms or models need to address that as well.

   Walk Score is an interesting example of how an objective (walkability) can be measured using existing data. This international system uses publicly available data to provide a "walkability" score for every property in a lot of countries. That takes into account things like access to public transport, and even to things like coffee shops. For example my apartment has a walk score of 91/100 and a transit score of 79/100. The methodology can be found here https://www.walkscore.com/methodology.shtml. It breaks down the walk score according to things like access to parks, groceries, etc.

   In **Freshwater Ecosystems of NZ**, DOC (John Leathwick) developed algorithms to relate easily identified parameters like woody tree cover to likely river condition.

1. **Have an easy way to measure whether the actions have been done.** That gets away from every landowner or volunteer group having to say what they have done, and instead have an annual survey of overall change. For example, using drone footage, satellite data (e.g. LCDB), etc.

1. **Have a place that the progress is recorded**, so people can celebrate, look at trends over time, and look at where effort is still needed.

Problem to Solve #3 - Recording progress towards an objective

In many cases, the same system can be used for multiple places that have a related objective (e.g. multiple rivers that need sediment reduction, multiple cities that want to increase people's access to green spaces). So we should develop the system once and make it available.

Examples for Wainuiomata River and Baring Head:
For our Wainuiomata River whole catchment process, it would be great to be able to track riparian vegetation and overall closed canopy vegetation in the catchment. For Baring Head to be able to track coverage of native plants that have achieved canopy closure.

Some other examples of where NZ could benefit from this sort of system are:

- Catchment vegetation.
- River edge that doesn't have major modifications (rock wrap, stop banks, channelisation).
- Extent of weed cover (e.g. for wilding pines, broom).
- Urban tree cover.
- Access of people to certain types of recreation/wellbeing opportunities, such as children's play areas, green space.
- Impervious surface equivalence (i.e. how much of the rainfall hitting a city goes directly into natural water bodies via stormwater drains, rather than being soaked in stormwater gardens, green roofs, water harvesting systems, etc.). It is considered that if there is more than about 7-10%, urban streams will be severely impacted.
- Wilding pine coverage.
- Range reduction of a new incursion – so recording where it has been searched for and not found, and where it is known to be, hoping that over time it will be present in fewer places.