

Integrating ecosystem services research in forest planning using simulation models and open source tools

Louise Sing^{1,2}, Stephen Bathgate¹,
Marc J. Metzger², Duncan Ray¹ and Christina Tracey³

¹ Forest Research, Northern Research Station, Scotland, UK

² The University of Edinburgh, School of Geosciences, Scotland, UK

³ Forestry and Land Scotland, Torlundy, Scotland, UK

Overview

I will describe the **co-development process**

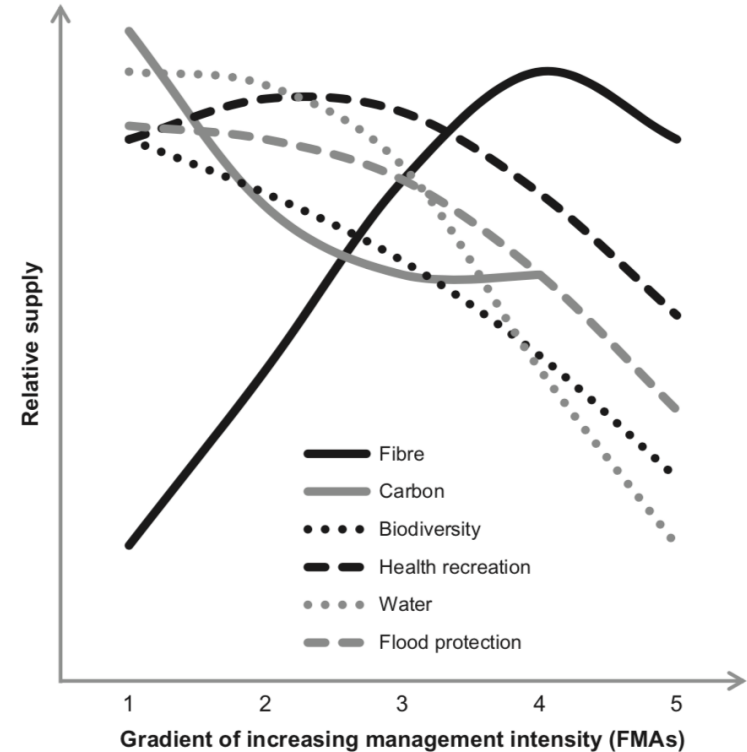
The web-based **tool** for exploring the results of the multiple **simulations**

Reflect on the lessons learnt from the case study for **forest planning** and other research projects.



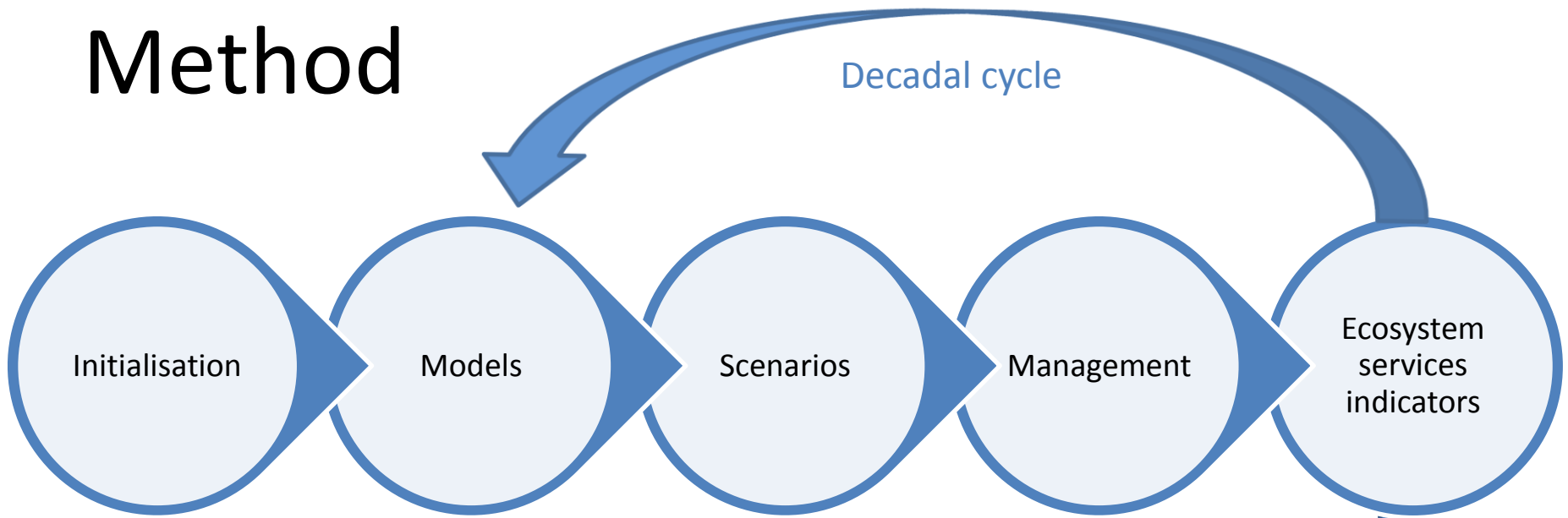
Rationale

- Tension between increased production & other benefits
- Forest planner: “How much change can be made without affecting current benefits or how much change is needed to increase/maintain them into the future?”



Sing *et al* (2018) *Forestry* 91(3)

Method



Initialisation

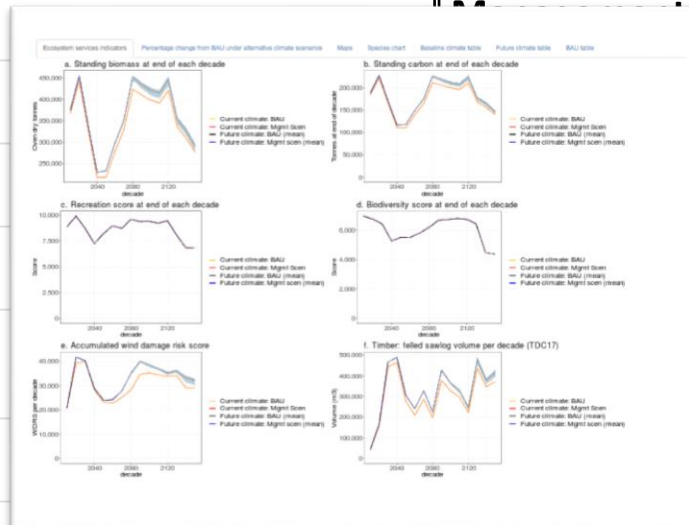
Forest inventory data

Climate projections

Soil

Models

ESC, ForestYield, ForestGALES, ASORT, BSORT, CSORT



Scenario

... yield $\geq 80\%$ *Picea sitchensis*

... yield $\geq 90\%$ *Picea sitchensis*

system

ual



Forest Enterprise Scotland

Managing the National Forest Estate



Lochaber Forest District

Leanachan Land Management Plan

Objectives Map

Date: 21/03/2018

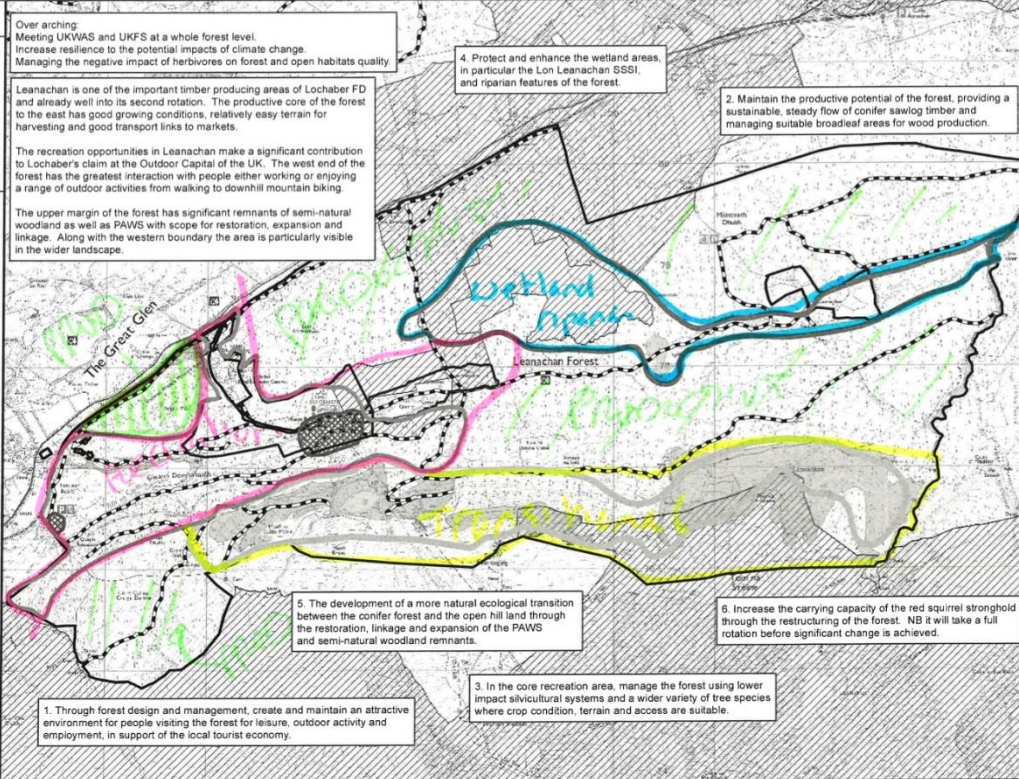
Scale: 1:30,000

Legend

-  Wetland_Important_Habitat
-  Recreation_Focus
-  Natural Transition Zone
-  Nevis Forest Masterplan
-  Recreation Hubs
-  Quarry Lease
-  Leanachan LMP Area
-  Road Segments
-  PAWS
-  sssi



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R Shiny decision support tool

- R Shiny app (a **free** and **open source** visualisation package with RStudio) to share the results with the forest planner.
- Specify management scenario by zone,
- Tool calculates the total value of each ecosystem service indicator for the whole forest and plots it over time.



Access for free here:
https://lochaber.shinyapps.io/leanachan_forest_totals_toolv2

Shiny from  Studio

https://lochaber.shinyapps.io/leanachan_forest_totals_toolv2

Ecosystem services indicators Percentage change from BAU under alternative climate scenarios **Maps** Species chart Baseline climate table

Future climate table BAU table

Select management scenario for each forest zone. Tool calculates forest totals

Production zone

BAU business as usual

Recreation zone

BAU business as usual

Wetland zone

NAT native species only

Transition zone

NAT native species only

Select decade and climate projection for map below:

Decade

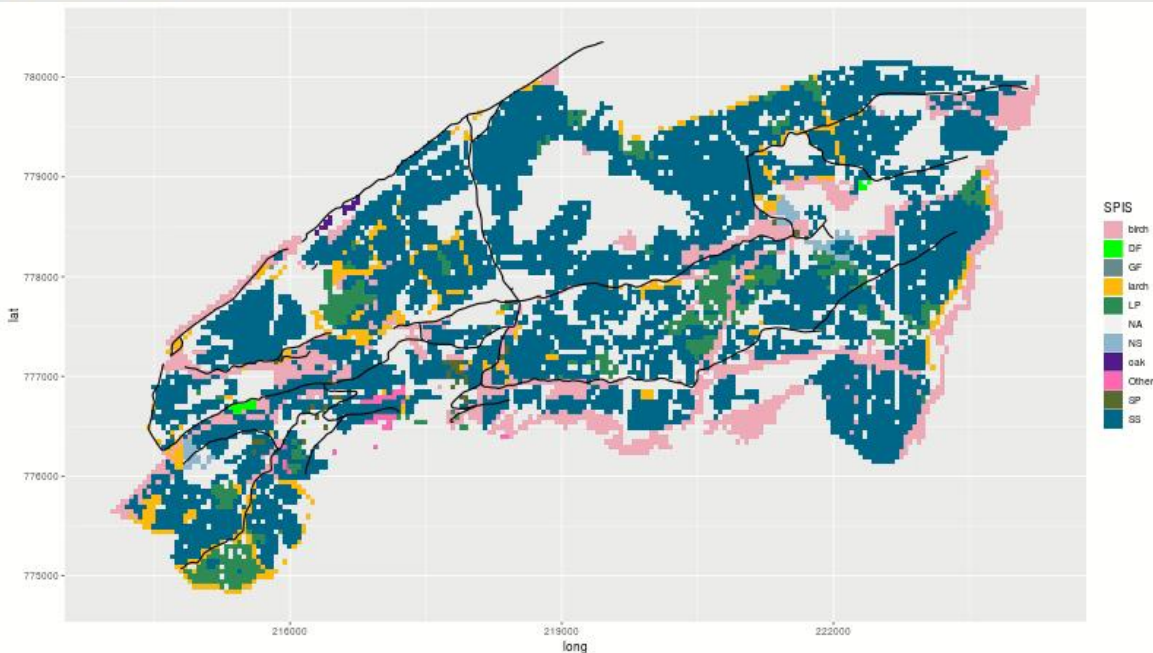
- 2020
- 2060
- 2100
- 2150

Climate projection

- Baseline climate
- Future climate

Latest update 7/2/19

Alternative conifers are NS, SP, RC, DF.



Conclusions

- Impact: Forest planner used the outputs to inform species restocking decisions (instrumental) and has gained knowledge that can be applied to other land management plans (conceptual).
- The project has shown the importance of **collaboration** between researchers and practitioners; the **co-development** process increased decision support system uptake in decision making.
- Shiny tool is intuitive, adaptable and easy to share online (free or low cost)

Acknowledgements



More information:

<https://www.forestresearch.gov.uk/research/land-use-and-ecosystem-services/>

