

# Configuration matters: connecting ecosystems within a landscape



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2017 Forest Ecosystem Services Forum





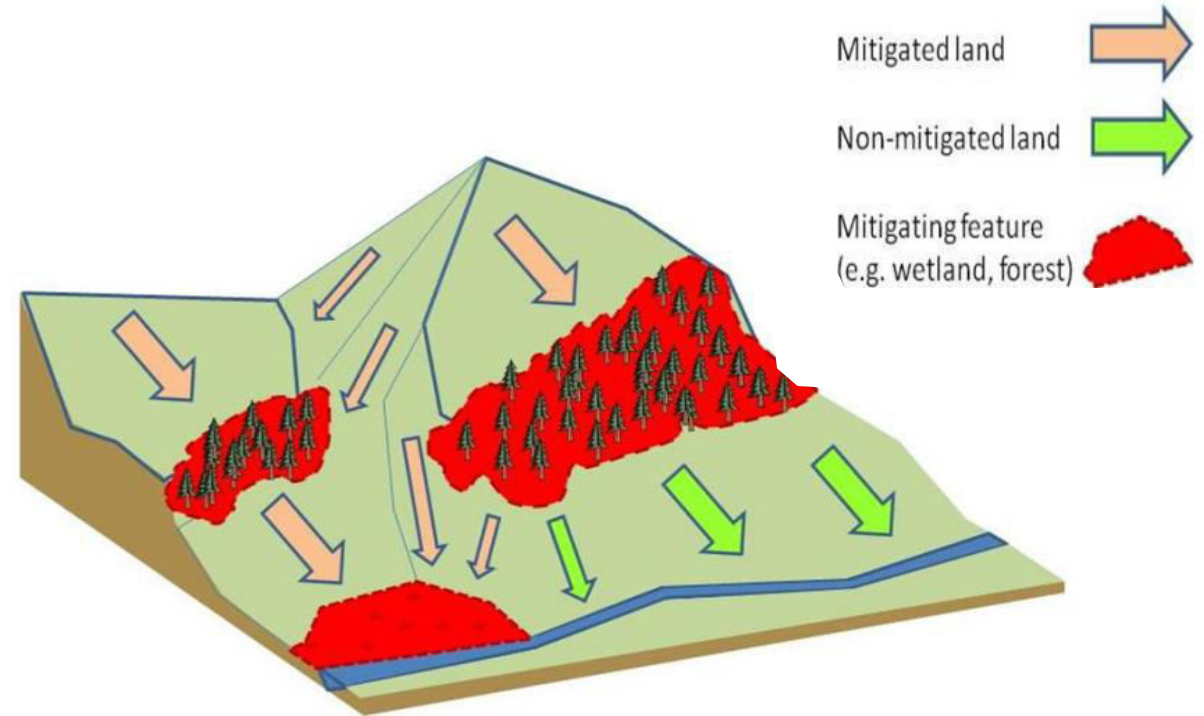
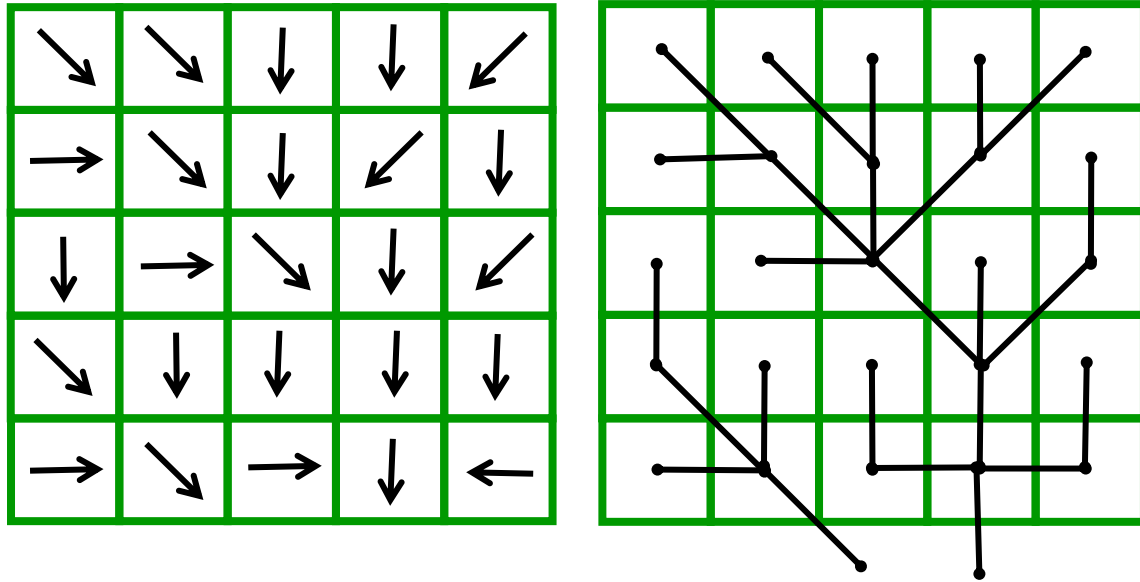
## Is a spatially explicit GIS framework that considers impacts of land use on ecosystem services

- ▶ Uses readily available national data
- ▶ Functions at sub-field to national scale simultaneously
- ▶ Modular – can embed external models & export aspects to other models
- ▶ Values features and potential interventions
- ▶ Addresses spatial tradeoffs & searches for “win-win” solutions

# Services currently modelled

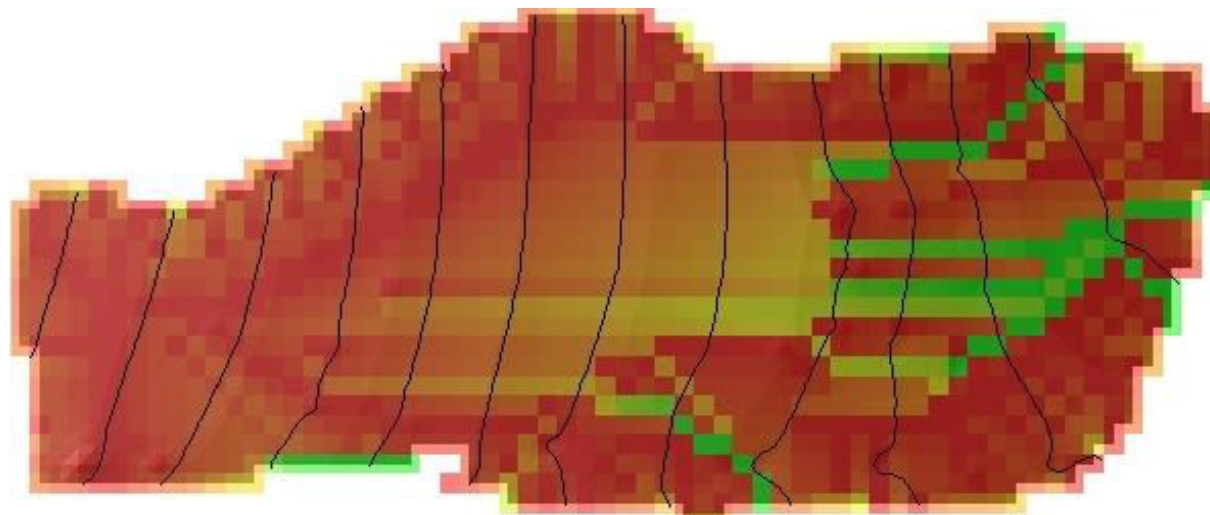
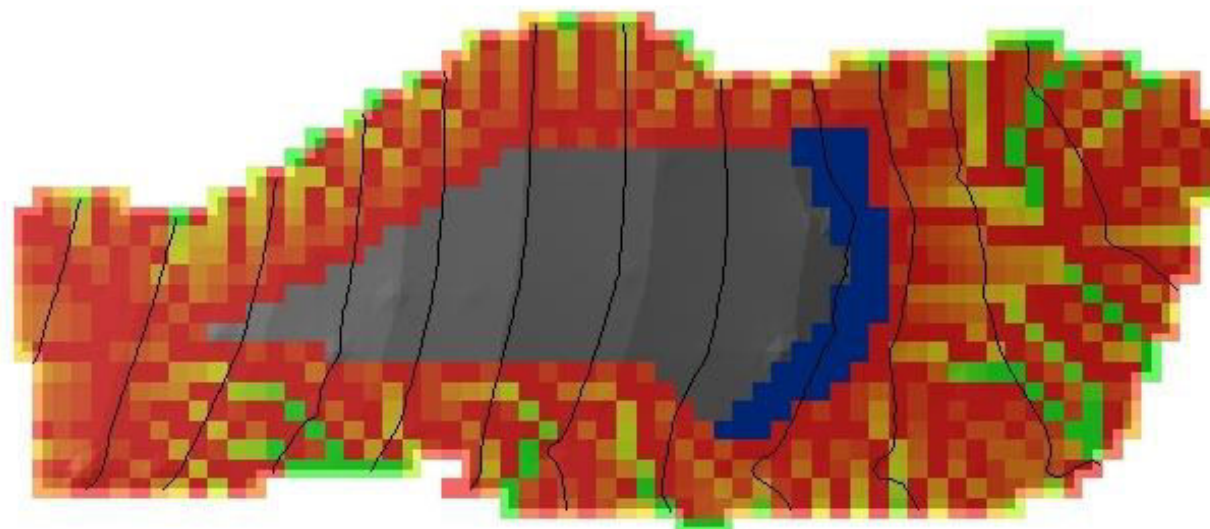
Service	Method
<b>Agricultural production</b>	Based on slope, fertility, drainage, aspect, climate
<b>C stock/emissions</b>	IPCC Tier 1 compatible – based on soil & vegetation
<b>CH<sub>4</sub>/N<sub>2</sub>O emissions</b>	IPCC Tier 1 compatible– soils, veg, stocking rate, fertiliser
<b>Water supply and floods/ droughts</b>	Topographical routing of water accounting for storage and infiltration capacity as function of soil & land use.
<b>Erosion</b>	Slope, curvature, contributing area, land use, soil type
<b>Sediment delivery</b>	Erosion combined with detailed topographical routing
<b>Water quality</b>	Export coefficients (land cover, farm type, fertiliser, stocking rate info) combined with water and sediment delivery models
<b>Habitat Approaches</b>	<ol style="list-style-type: none"> <li>1) Cost-distance approach: dispersal, fragmentation, connectivity.</li> <li>2) Identification of priority habitat by biophysical requirements e.g. wet grassland</li> <li>3) Measures of habitat richness, evenness, patch size etc</li> </ol>
<b>Coast/ floodplain inundation risk</b>	Based on topography and input height of storm surge/long term rise etc: surface and groundwater impacts estimated
<b>Tradeoffs/synergy identification</b>	Various layering options with categorised service maps; e.g. Boolean, conservative, weighted arithmetic, distribution plots

## Targets landscape *organisation*

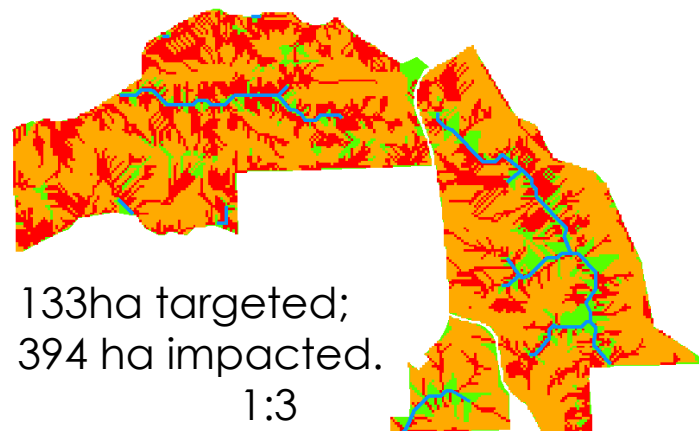
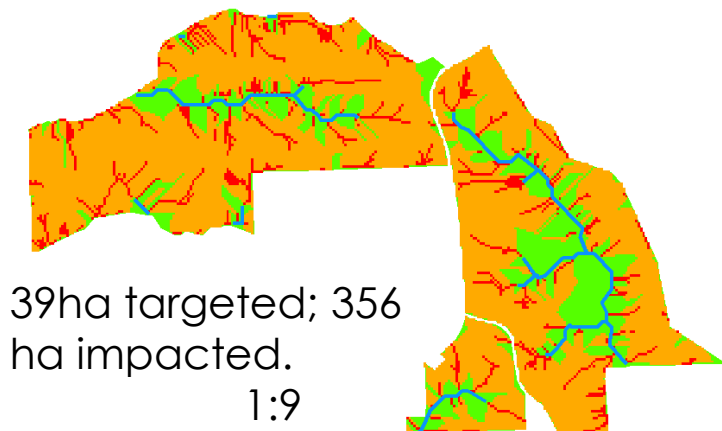
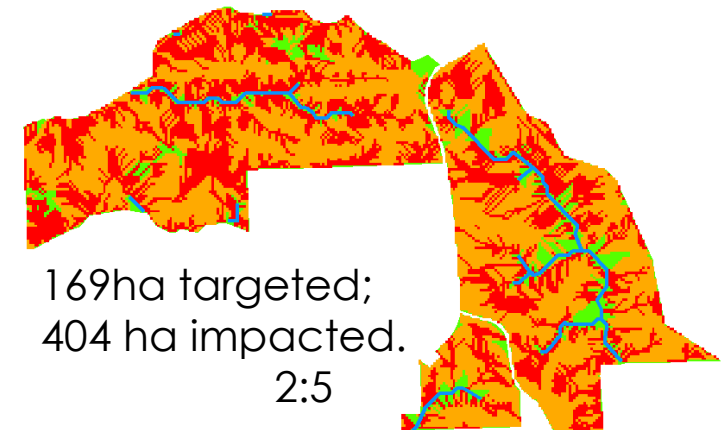
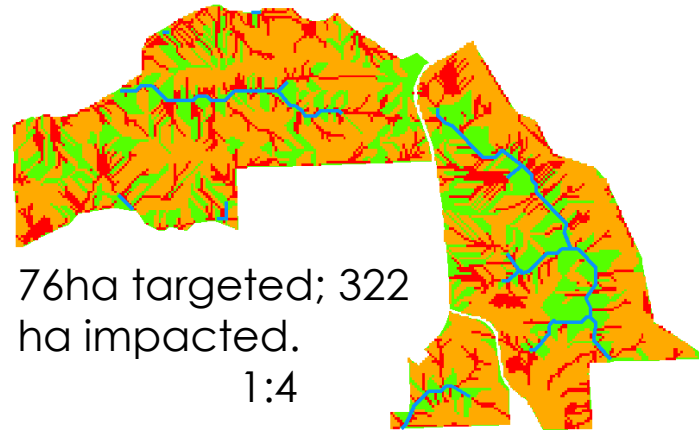
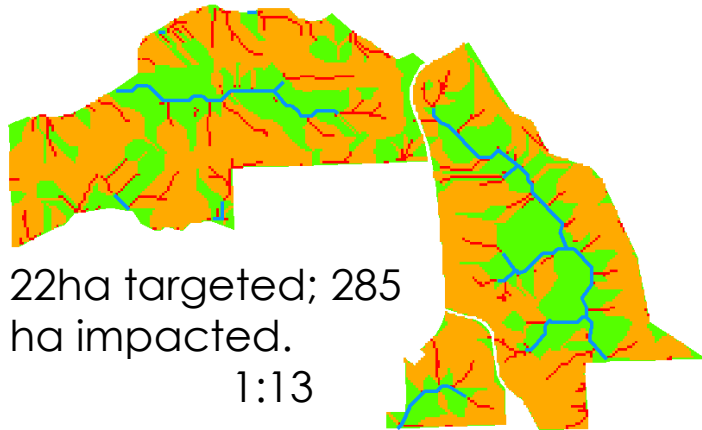


## Half moon field example





- ▶ Tree area covers 4% of field
  - ▶ Provides benefit to approx. 30% of field
  - ▶ Highest value accumulates 0.18 hectares of overland flow
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- ▶ Accumulation values three times higher with tree removed (0.56 hectares of overland flow)
  - ▶ Optimal placement changes as landscape elements change



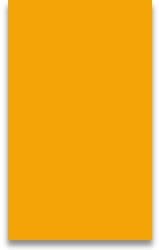
# Mitigation opportunity optimisation



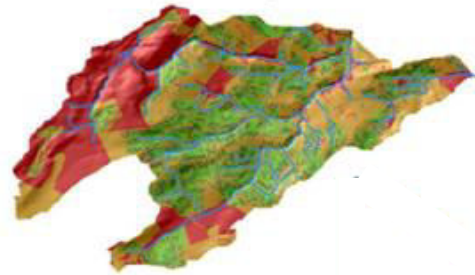
## Legend

-  Mitigation targets
-  Area receiving mitigation benefits
-  Streams
-  Non-mitigated areas

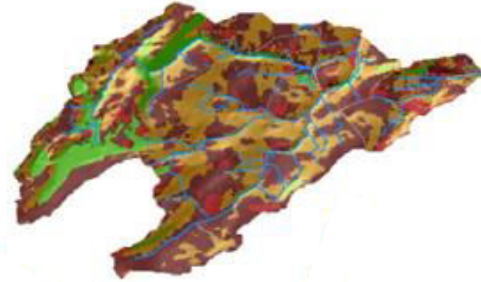
# Identifies tradeoffs & synergies



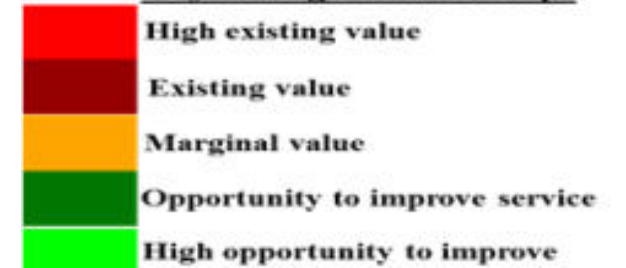
**Flood mitigation**



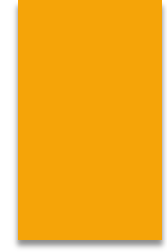
**Farm production**



Key to single service maps



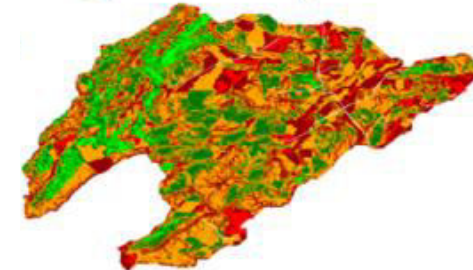
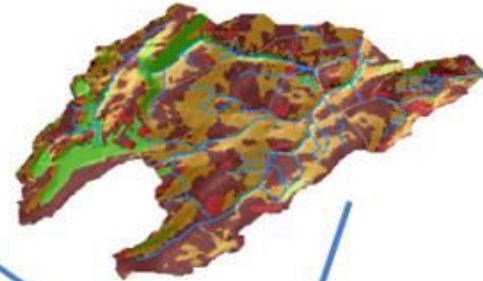
# Identifies tradeoffs & synergies



**Flood mitigation**

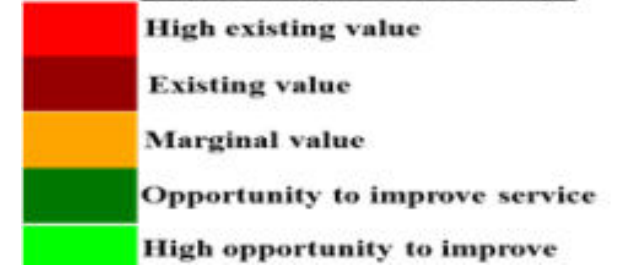


**Farm production**

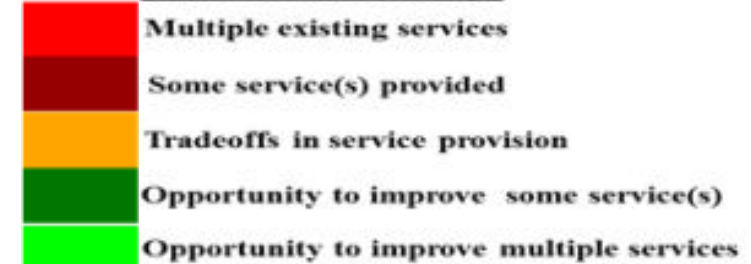


**Flood/farm tradeoffs**

**Key to single service maps**

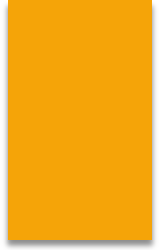


**Key to trade-off maps**

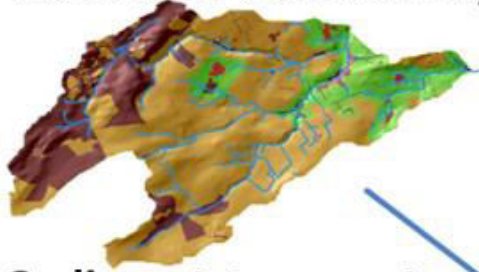




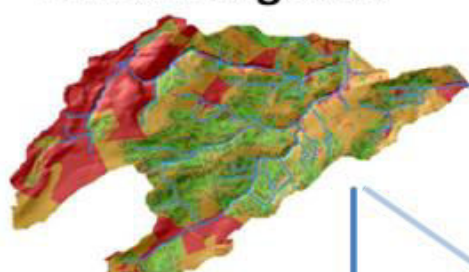
# Identifies tradeoffs & synergies



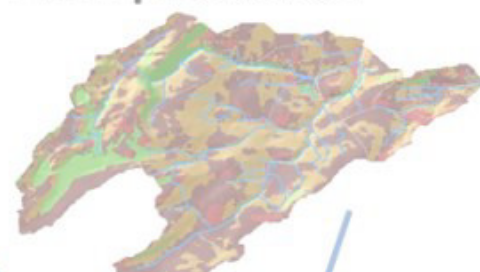
**Woodland connectivity**



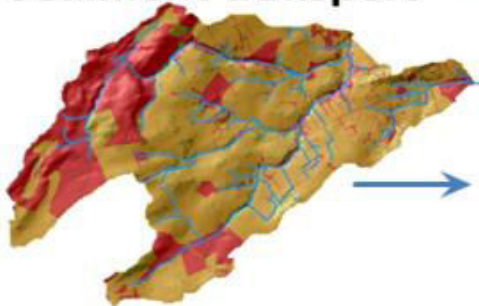
**Flood mitigation**



**Farm production**



**Sediment transport**



**4-way tradeoff map**



**Flood/farm tradeoffs**

**Sequestered carbon**



**Key to single service maps**

- High existing value
- Existing value
- Marginal value
- Opportunity to improve service
- High opportunity to improve

**Key to trade-off maps**

- Multiple existing services
- Some service(s) provided
- Tradeoffs in service provision
- Opportunity to improve some service(s)
- Opportunity to improve multiple services