Woody riparian buffers - potential for multiple ecosystem services provision

Mary Kelly-Quinn, University College Dublin

Width & natural vegetation cover vary with valley form, geology, soils and topography

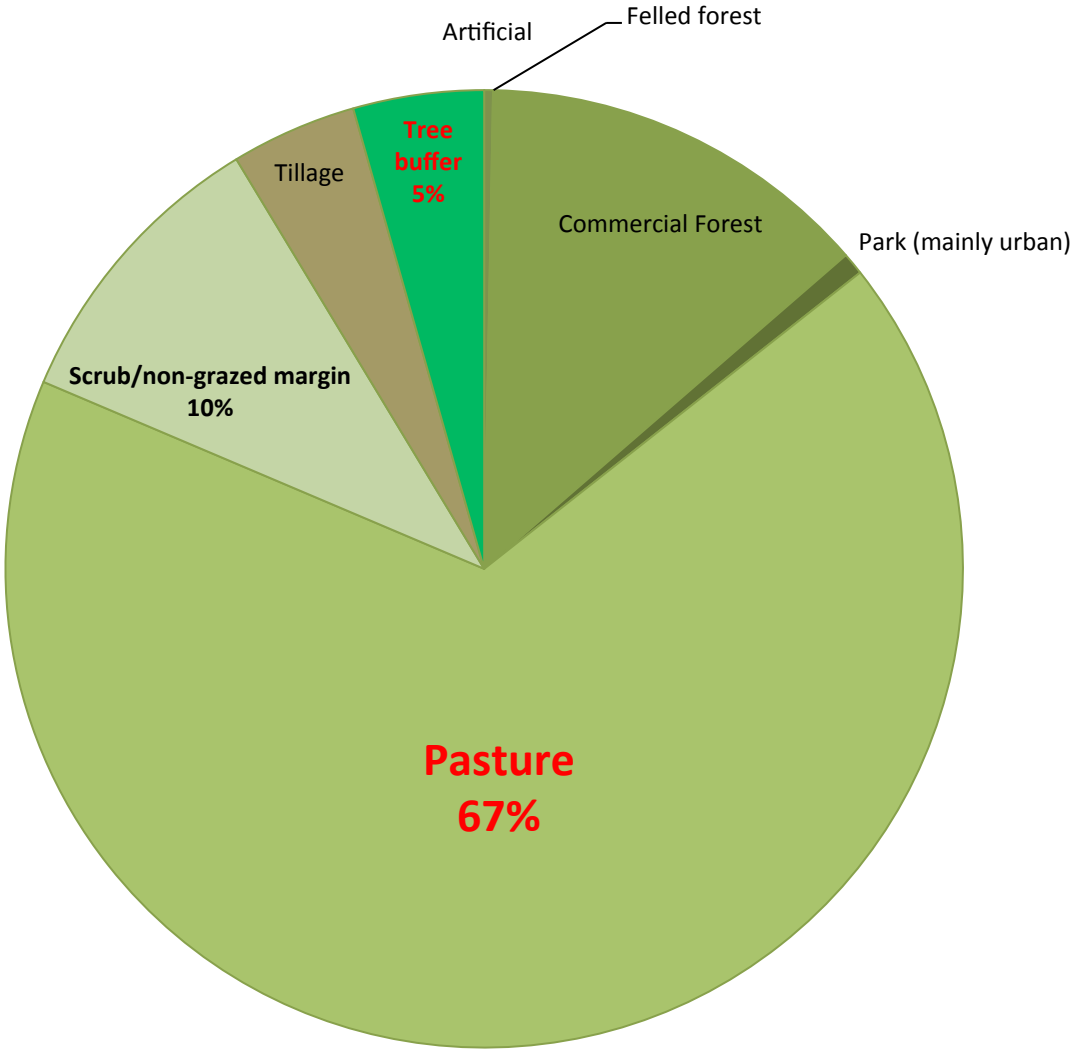
Riparian zones especially those that are wooded have the capacity to deliver multiple ecosystem services

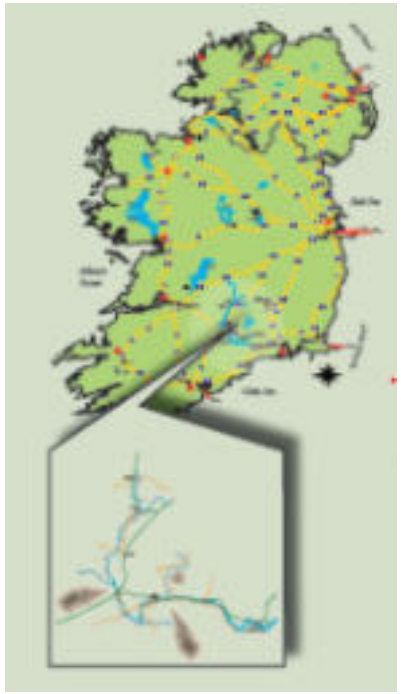
benefits that humans derive from nature

Riparian zones provide a disproportionately large amount of ecosystem services (benefits) relative to their extent on the landscape

Over the past 200 years, approximately **80% of all riparian ecosystems** across North America and Europe **have either been removed or destroyed leaving just bare, cultivated or grazed land.**


COUNTY TIPPERARY





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Climate Regulation — ^{0}C/Wind Humidity

Wildlife Corridor

Biodiversity

Flow Regulation

Carbon Sequestration

H_2O Temp. Regulation — ^{0}C

Nutrient Loss — P & N

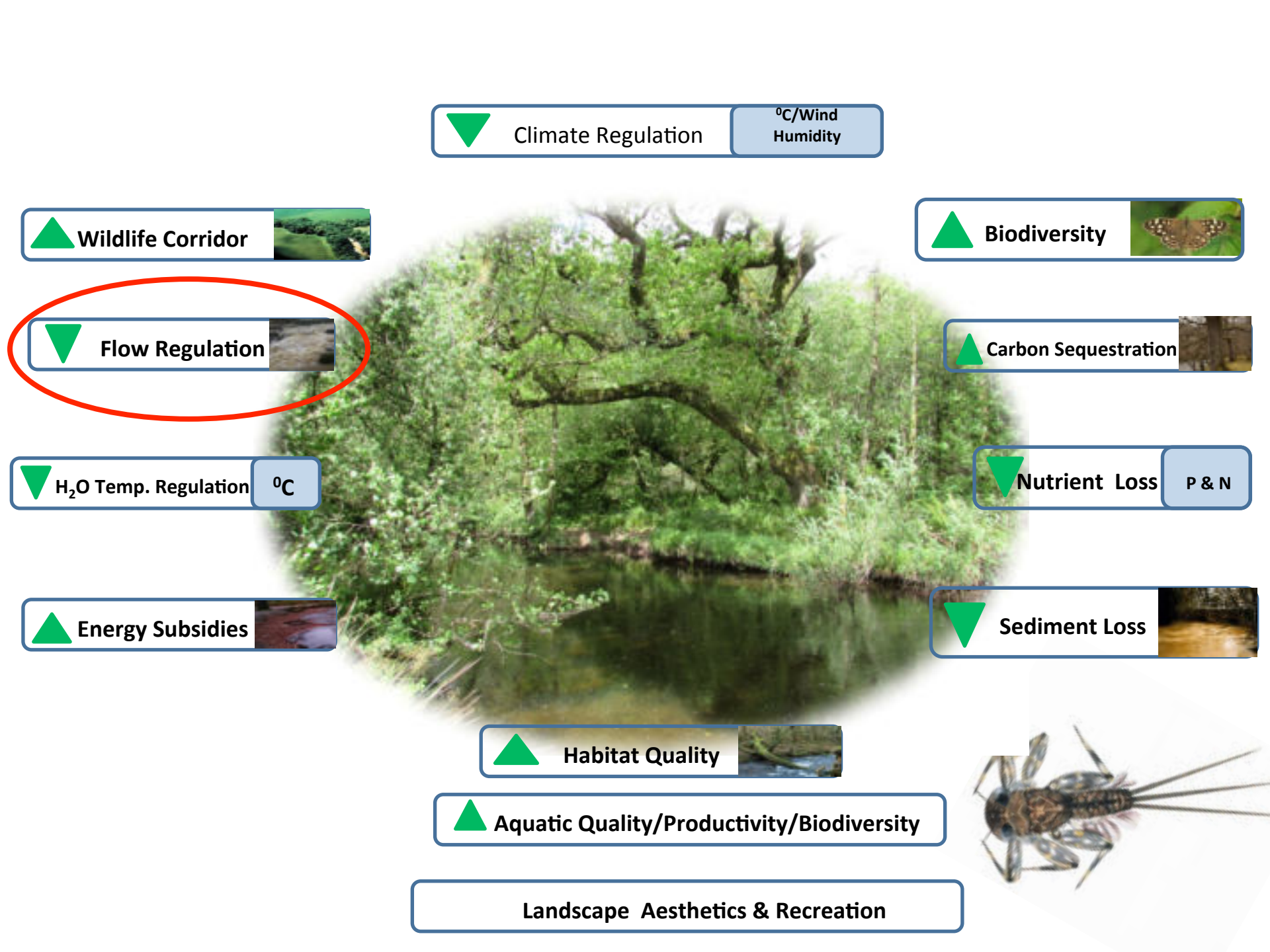
Energy Subsidies

Sediment Loss

Habitat Quality

Aquatic Quality/Productivity/Biodiversity

Landscape Aesthetics & Recreation


Climate Regulation
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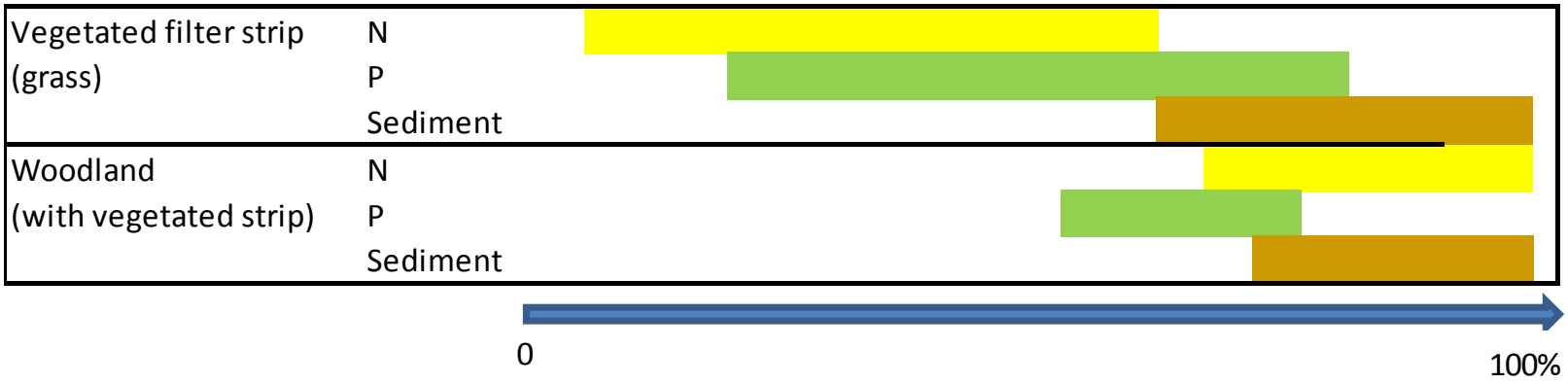
Landscape Aesthetics & Recreation

Nutrient & Sediment Loss

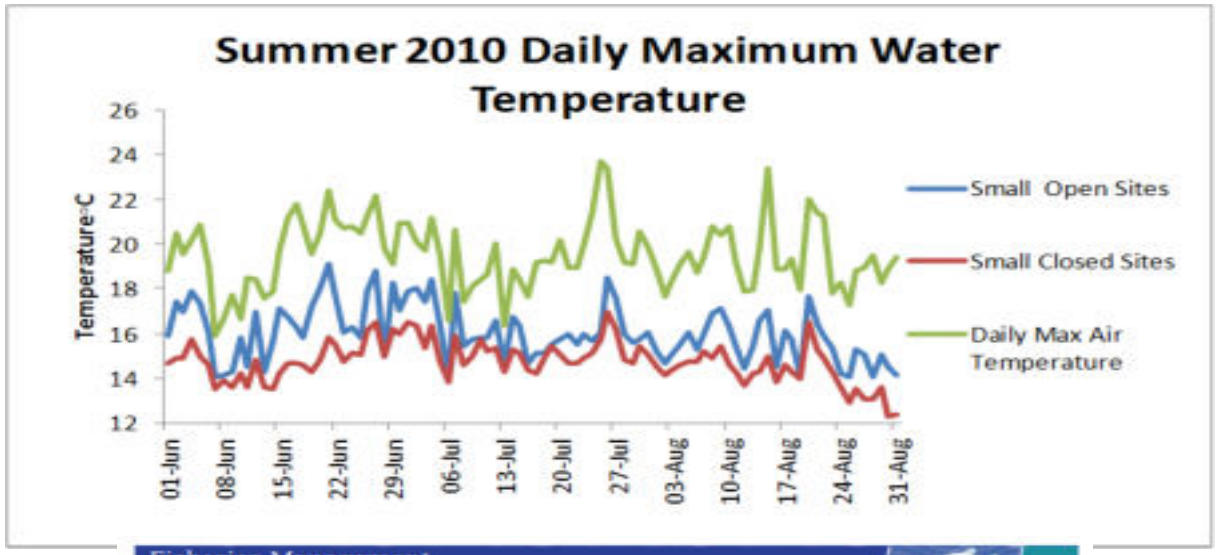
Effectiveness



Modified from: Hawes & Smith (2005) Riparian Buffer Zones: Functions and Recommended Widths Yale School of Forestry and Environmental Studies


Water Temperature Regulation

Water Temperature Regulation



Fisheries Management and Ecology

Quantifying the effect of semi-natural riparian cover on stream temperatures: implications for salmonid habitat management

D. K. RYAN, J. M. YEARSLEY & M. KELLY-QUINN

UCD School of Biology & Environmental Science, University College Dublin, Belfield, Dublin, Ireland

Short strips (300 m) of semi-natural woody riparian planting can cool small nursery streams by up to 1°C

Habitat Quality

Trees stabilise banks & reduce erosion

Stable banks together with flow moderation helps to protect stream hydromorphology

Inputs of material, large wood, leaf litter & other energy subsidies have marked effects

Large wood – increases habitat diversity and complexity in rivers

Energy Subsidies

- Leaf litter fuels aquatic foods webs both locally further downstream.
- It can increase secondary production and is particularly important in the autumn and through the winter when primary production slows down.

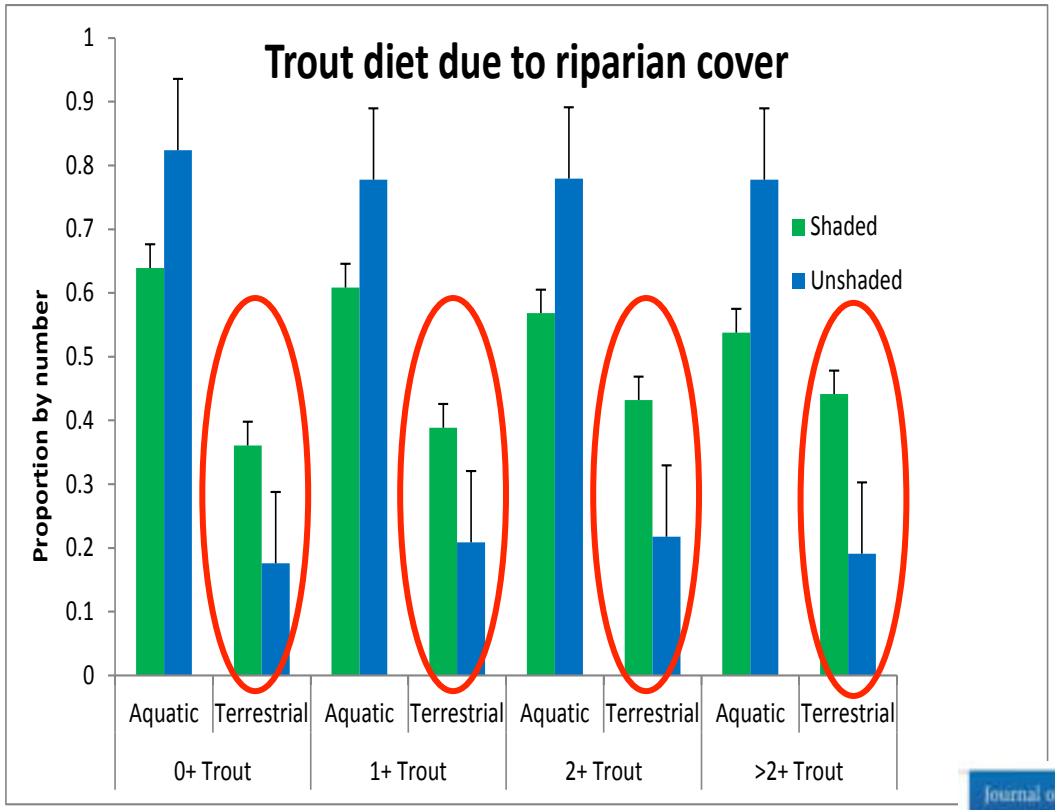
- Woody debris dams help retain leaf litter.

Energy Subsidies

In summer months insects of terrestrial origin - 80% of diet

(Kelly-Quinn, M. and Bracken, J.J. (1990) A seasonal analysis of the diet and feeding dynamics of brown trout, *Salmo trutta* L., in a small nursery stream. *Aquaculture Research* 21, 107-124.

Energy Subsidies



Insects of terrestrial origin – higher proportion in the diet of trout in shaded reaches (September)

Journal of FISH BIOLOGY
fsbi
REGULAR PAPER

Effects of riparian canopy cover on salmonid diet and prey selectivity in low nutrient streams

D. K. Ryan, M. Kelly-Quinn

Energy Subsidies: two-way

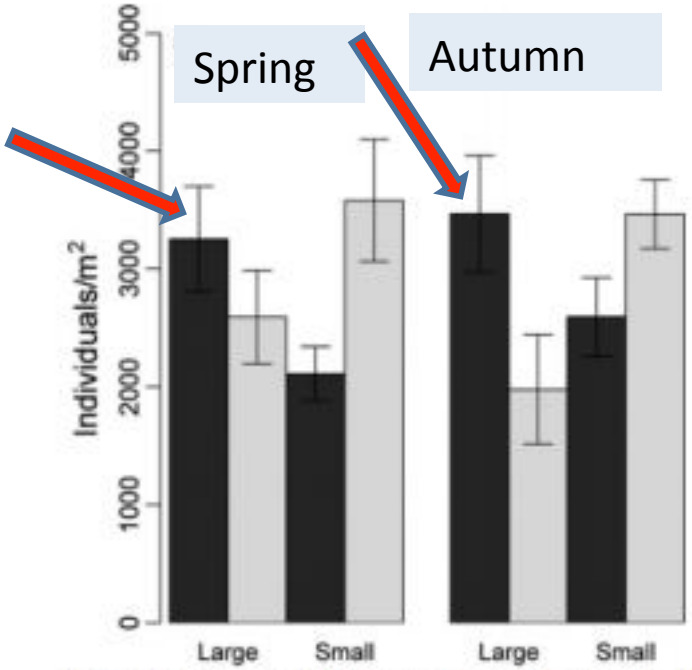


Figure 2. The average total benthic invertebrate density, in small and large stream sections when sampling time = spring (a) and autumn (b). Light grey and dark grey bars correspond to unshaded and shaded riparian cover, respectively. Error bars represent ±1 standard error.

Fisheries Management and Ecology

Riparian vegetation management for water temperature regulation: implications for the production of macroinvertebrate prey of salmonids

DIARMUID K. RYAN

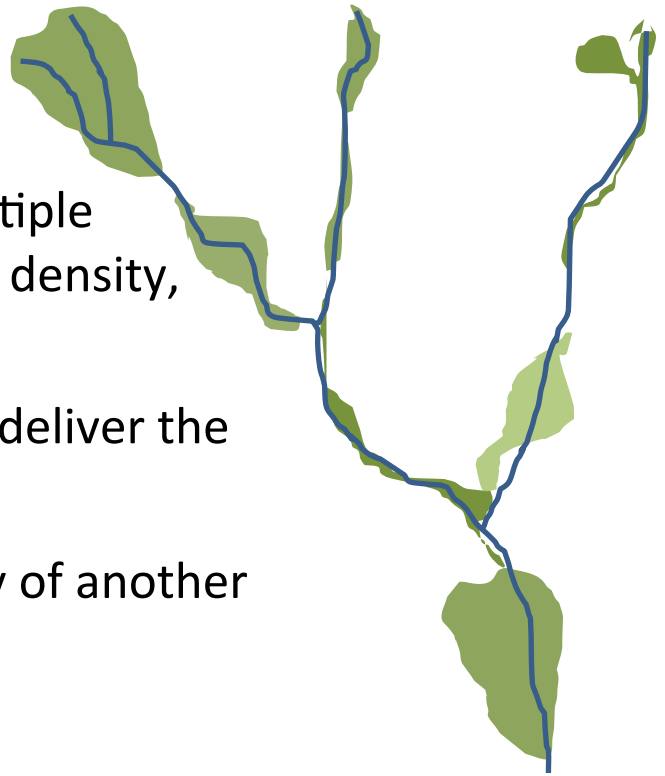
MARY KELLY-QUINN

Emerged aquatic insects make a significant contribution to the diet of riparian arthropods (e.g. spiders) bats and birds

Tree planting to optimize water-related ecosystem services

Need to consider

1. Benefits are scale-dependent. Different ES bundles will be delivered at local vs catchment scale – need targeted planting



2. Planting design at local scale to ensure delivery of multiple services, in particular pollutant capture? – width, length, density, species composition, zonation, etc.

3. Configuration of planting across a catchment that will deliver the required services?

4. How will buffer features upstream affect the efficiency of another buffer feature immediately downstream

5. Management into the future

6. How is planting best incentivised – payment for ecosystem services

Thank you for your attention

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Thank you for your attention