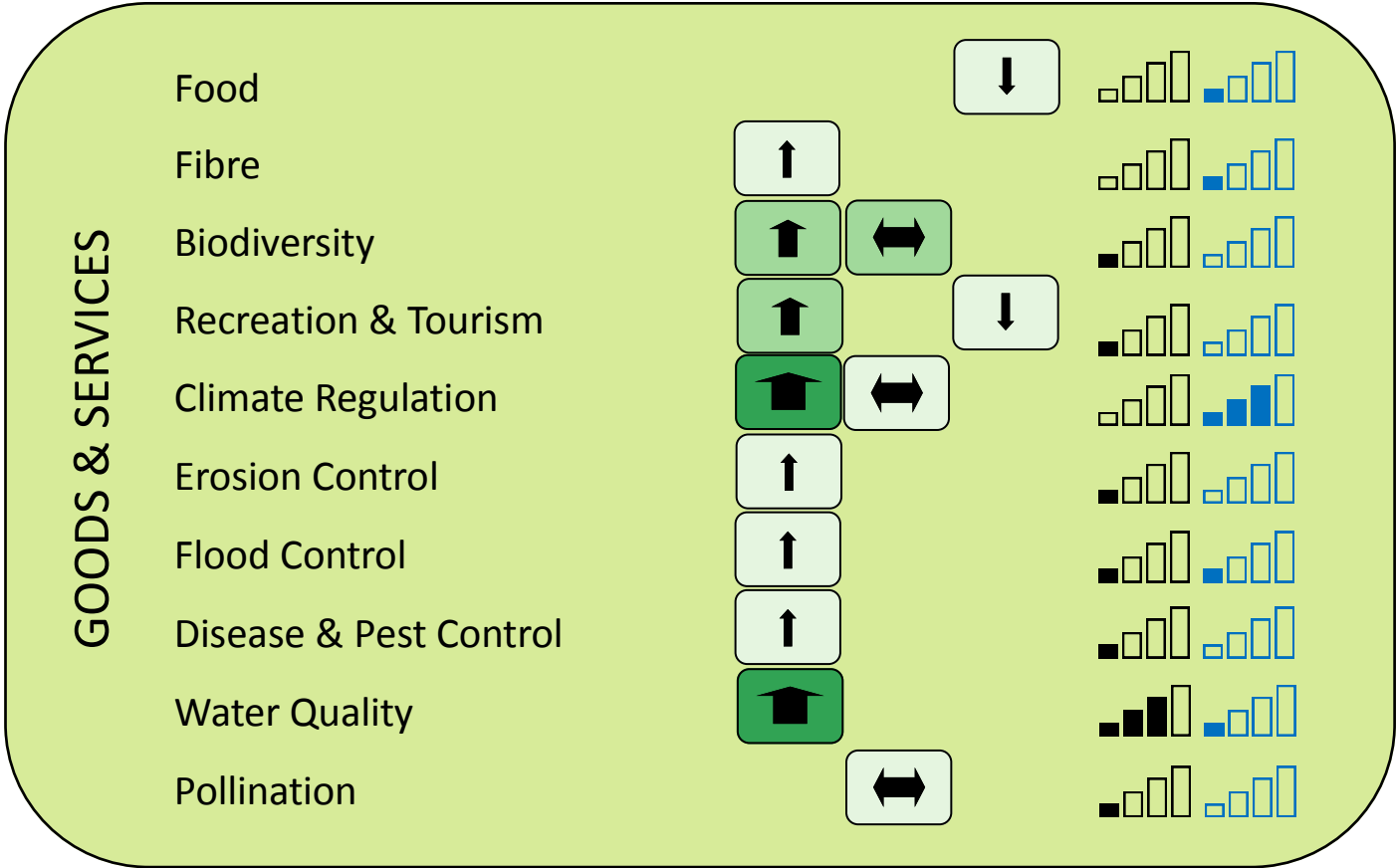


Reduce livestock densities or only allow restricted seasonal grazing.

**MANAGING ECOSYSTEM SERVICES**

**LOWLAND AGRICULTURE**

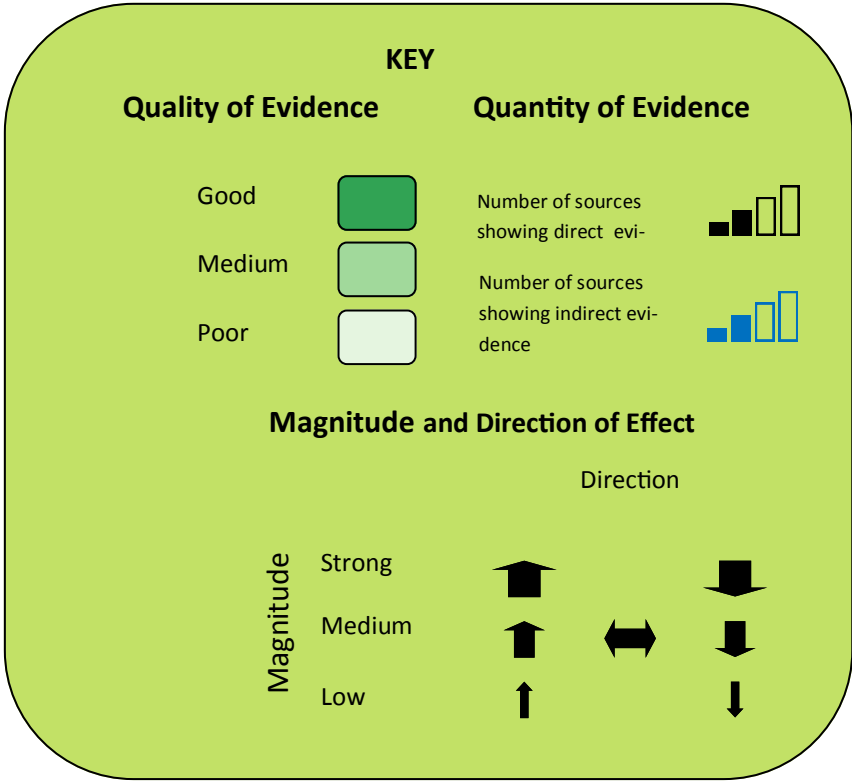
**REDUCE GRAZING INTENSITY**



These pages represent a review of the available evidence linking management of habitats with the ecosystem services they provide. It is a review of the published peer-reviewed literature and does not include grey literature or expert opinion. There may be significant gaps in the data if no published work within the selection criteria or geographical range exists. These pages do not provide advice, only review the outcome of what has been studied.

Full data is available in electronic form from the [Evidence Spreadsheet](#).

Data are correct to March 2015.



## MANAGING ECOSYSTEM SERVICES

### LOWLAND AGRICULTURE

### REDUCE GRAZING INTENSITY

**Provisioning Services**—providing goods that people can use.

**Cultural Services**—contributing to health, wellbeing and happiness.

**Regulating Services**—maintaining a healthy, diverse and functioning environment.

## PROVISIONING

**Food: *Weak Evidence***:- A study of ecosystem service provision on the Somerset levels suggests that reduced grazing may benefit a number of services but at the cost of reduced food production<sup>1</sup>.

**Fibre: *Weak evidence***:- Reduction of grazing on the Somerset levels would result in more land being available for the production of willow crops for fibre<sup>1</sup>.

## CULTURAL

**Biodiversity: *Strong Evidence***:- The effectiveness of European initiatives on restoring meadow-breeding waders in the Netherlands found that field heterogeneity and low grazing density was important for populations of lapwings and black-tailed godwits<sup>2</sup>. Plots with grazing at lower density (6 cows ha<sup>-1</sup> rather than 20 cows ha<sup>-1</sup>) but for longer (30 days vs 2 days) had higher densities of incubating birds. In the West Midlands, birds on agricultural grasslands responded favourably to grazing, those utilizing soil-dwelling invertebrates favoured short grazed swards, while granivorous birds would benefit from reduced grazing and more weed species<sup>3</sup>.

**Recreation and Tourism: *Moderate Evidence***:- Two catchments in Scotland were compared with regards to the concentration of faecal indicator organism (FIO) bacterial contamination which can impact recreational activities on the river<sup>4</sup>. High stocking rates were a significant risk, and the FIOs in the streams of two catchments with low stocking density was 4-8 times lower than that in streams from catchments with high stocking densities. ***Weak Evidence***:- There is a suggestion from a study of ecosystem services on the Somerset levels, that grazing is viewed as a traditional management technique that has tourist value<sup>1</sup>.

**Climate Regulation: Strong Evidence:-** Measurements of methane (CH<sub>4</sub>) from grazing sheep found that each animal typically produced 7.4 kg CH<sub>4</sub> sheep<sup>-1</sup> year<sup>-1</sup>. Fluxes from the pasture were 0.34 mmol CH<sub>4</sub> m<sup>-2</sup> which is equivalent to 134.3g CO<sub>2</sub> m<sup>-2</sup> in terms of greenhouse gas potential. A reduction in the total number of sheep would therefore significantly reduce the levels of greenhouse gas emissions<sup>5</sup>. A study of a temperate steppe ecosystem found that sheep grazing turned the steppe from a net greenhouse gas (GHG) sink into a significant source<sup>6</sup>. This was mainly due to changes in soil carbon but also, secondarily due to methane emissions. An analysis across Europe of the effects of grazing on GHG emissions found that light grazing instead of heavy grazing could reduce greenhouse gas emissions which were from CH<sub>4</sub> emissions from livestock and nitrous Oxide (N<sub>2</sub>O) production by the grassland<sup>7</sup>. An analysis of N<sub>2</sub>O production from Scottish farms found that there was an association between N<sub>2</sub>O emissions and wetter soils with higher levels of grazing<sup>8</sup>. It is suggested that a good abatement strategy would be to reduce grazing intensity and improve soil drainage. In the Netherlands, a study looked at more indirect effects of high levels of livestock due to the high nitrogen applications to silage and maize fields. Relatively low emissions of N<sub>2</sub>O were found, and the emissions did not scale linearly with nitrogen application<sup>9</sup>. Natural background emissions, especially from clay soils may mask N<sub>2</sub>O balance. In Germany, the overall GHG budgets of crops vs livestock farms were analysed<sup>10</sup>. Crop producing farms produced 2.3-3.6 Mg CO<sub>2</sub> equivalent ha<sup>-1</sup> while livestock based systems produced 3.5-7.1 Mg CO<sub>2</sub> equivalent ha<sup>-1</sup>. Strategies to reduce GHG emissions are to reduce animal feed, reduce manure loads and to reduce the numbers of animals. Reduction of grazing also had no measurable effects on soil carbon storage in a UK coastal grassland<sup>11</sup>. **Moderate Evidence:-** A review of GHG abatement strategies for Methane (CH<sub>4</sub>) and Nitrous Oxide N<sub>2</sub>O for livestock suggests that a range of solutions such as reduced nitrogenous fertilizer input, land drainage management and reduced compaction would all help. Reduced numbers of livestock is not directly mentioned<sup>12</sup>.

**Erosion Control: Weak Evidence:-** Limited evidence from coastal grazing meadows suggests that high stocking densities creates more compaction and surface water run-off that could increase erosion<sup>11</sup>.

**Flood Control: Weak Evidence:-** A link between soil compaction and potential flooding is mentioned in relation to the Somerset Levels<sup>1</sup> and UK coastal grazing marshes<sup>11</sup> but no direct link is demonstrated.

**Disease & Pest Control: Strong Evidence:-** Two catchments in Scotland were compared with regards to the concentration of faecal indicator organism (FIO) bacterial contamination which can impact recreational activities on the river<sup>4</sup>. High stocking rates were a significant risk, and the FIOs in the streams of two catchments with low stocking density were 4-8 times lower than that in streams from catchments with high stocking densities.

**Water Quality: Strong Evidence:-** An ADAS review of nitrate pollution suggests that within grassland systems there are opportunities to reduce nitrate loss but that the major determinant of nitrate loss is the stocking density and the associated input necessary to maintain that density<sup>13</sup>. A study from the Yorkshire Dales suggested that a 20% cut in livestock density would result in a 10% reduction in diffuse nitrate pollution<sup>14</sup>. In Slovenia, spring water from areas with more than two livestock units per hectare regularly exceeds 50 mg l<sup>-1</sup> nitrate concentration. The areas with the highest intensity of animal husbandry also have the highest net surplus of nitrogen, largely due to high levels of application of organic manures<sup>15</sup>. A Europe-wide study also found that nitrogen emissions were tightly correlated with production intensity, but that this could be mitigated to some extent by re-coupling crop and animal production<sup>16</sup>. A study from Denmark compared nitrogen surpluses per unit of meat and milk between conventional and organic farms<sup>1</sup>. Pig farming was found to have a higher Nitrogen efficiency than dairy farming. Organic dairy farming had a higher nitrogen efficiency and a lower nitrogen surplus per kg milk than conventional dairy farming. The study concluded that nitrogen surplus per hectare could be reduced by 50% by moving to a lower stocking density of organic cattle, and nitrogen surplus per tonne of milk could be reduced by 25%<sup>17</sup>. Phosphorus pollution was compared in two lowland UK catchments with different levels of agricultural land use<sup>18</sup>. Catchments with higher levels of intensive arable production or dairy and beef production had higher levels of total phosphorus input into the water courses.

**Moderate Evidence:-** A modelling approach to faecal indicator organisms in the Humber river basin district suggests that fencing watercourses to prevent livestock access to the riverbank may be the single most effective management method to reduce potentially harmful bacterial loads<sup>19</sup>. By implication, a reduction in grazing intensity should produce the same results.

**Pollination: Weak Evidence:-** A study of UK coastal grazing meadows found no obvious link between cattle grazing intensity and numbers of pollinators<sup>11</sup>.

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