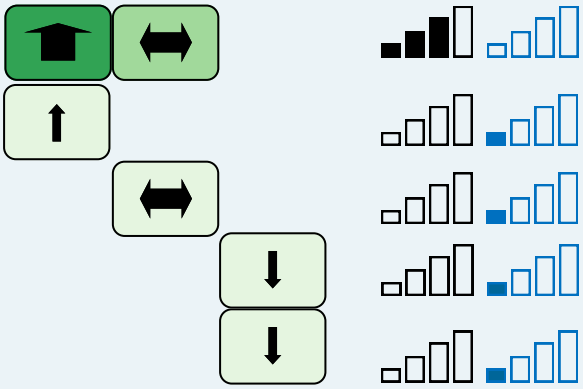
Allow or encourage the grazing of coastal marshes by cattle or sheep.

MANAGING ECOSYSTEM SERVICES

COASTAL & MARINE

GRAZE COASTAL MARSHES

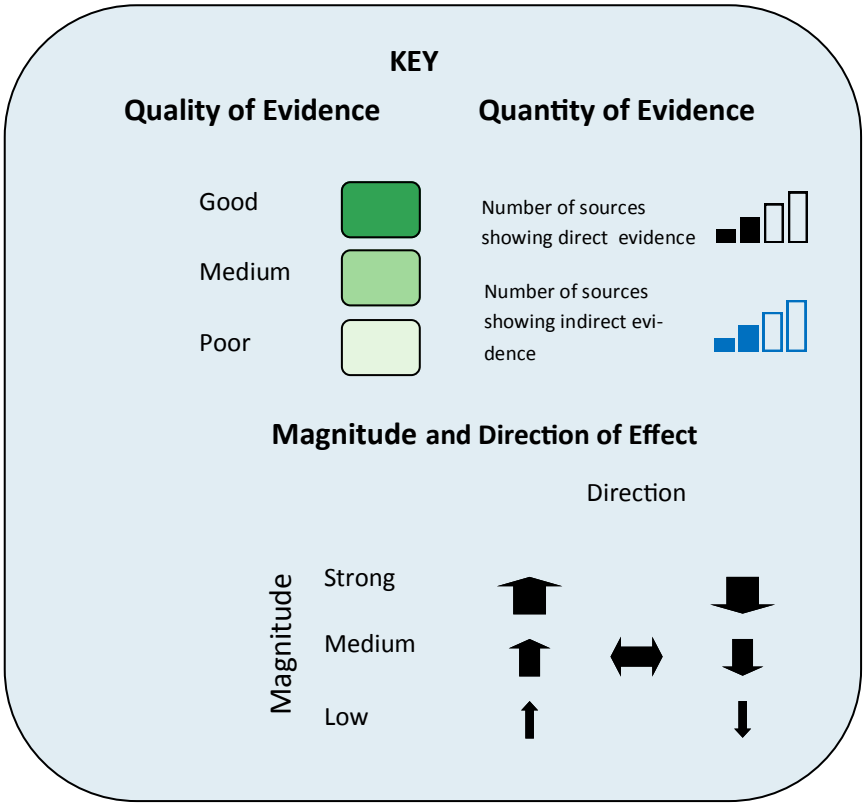
GOODS & SERVICES



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 are available in electronic form from the Evidence Spreadsheet.

Data are correct to March 2015.



MANAGING ECOSYSTEM SERVICES

COASTAL & MARINE

GRAZE COASTAL MARSHES

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.

CULTURAL

Biodiversity: ***Strong Evidence:-*** A Finnish study compared vascular plant diversity in grazed and un-grazed plots in coastal marshes[1]. It found that away from the seaward side, species richness was higher in grazed than un-grazed plots. However, in sites more exposed to the sea, the opposite was true. A study of marshes in the Netherlands found that most plant species had greater incidence in grazed treatments[2]. Grazing negatively influenced *Atriplex portulacoides* and *Elymus athericus*, whereas *Puccinellia maritima* and *Festuca rubra* showed a positive response. The communities dominated by *Elymus athericus*, *Artemisia maritima* and *Atriplex portulacoides* were restricted to the un-grazed marsh. An analysis of a range of environmental variables related to grazing pressure found that species richness was significantly greater in fully grazed grasslands, with more forbs and higher levels of flowering forbs that less grazed sites[3]. Around the Wash, UK, grazed plots had higher sea-couch grass abundances with a structurally diverse vegetation which supported the highest breeding densities of redshank[4]. Cattle densities are around 1 animal ha^{-1}, any higher than this and there is a risk of nests being trampled. The risks of trampling was explored in Baltic coastal meadows[5]. It was found that only 21% of nests would have survived being trampled at a cattle density of 0.83 LU (Livestock Units) ha^{-1} but that timing, putting cattle late on to the meadow, would have helped. In terms of arthropod diversity, a study from German coastal marshes found that grazed mosaics with greater vegetation structural diversity did not have a significantly greater arthropod diversity than homogenous tall vegetation[6]. The study concluded that arthropod diversity is greater when stocking density is reduced but that cessation of grazing can lead to the disappearance of some species. The effect of grazing on arthropods is complex. Predatory, zoophagus and detritivorous beetles were more abundant on un-grazed marsh, while Hemiptera and spiders were more abundant on the grazed marsh[7]. The effects of mixed grazing by horses and cattle was investigated in French coastal marshes[8]. It was found that mixed grazing produced the most species-rich and structurally diverse swards. Mixed grazing regimes were found to be most beneficial in managing sand-dune communities as well[9]. A study from Newborough Warren, Wales, found that cattle grazing had a positive effect on species diversity in dry dunes, but not in dune slacks, although it did increase the abundance of some species of conservation interest[10]. A comparison between rabbit and sheep grazing in dune slacks found that sheep could replace rabbit management for the maintenance of vegetation diversity, but they could not be used to restore it[11].

CULTURAL

Environmental Settings: ***Weak Evidence:-*** A study of a range of ecosystem services provided by British grazed marshland suggested that the more species rich meadows produced by grazing would be more aesthetically pleasing[3].

REGULATING

Climate Regulation: ***Weak Evidence:-*** A study of carbon cycling in grazed and un-grazed marshes in Britain found that grazing slowed down the turnover of microbial biomass meaning that carbon had longer turnover times, potentially increasing storage[12]. However, another British study showed that there was no difference in total carbon stock between grazed and un-grazed treatments[3].

Erosion Control: ***Weak Evidence:-*** The effects of large (cattle) and small (hare and goose) grazers on saltmarsh vegetation and accretion rates in the Netherlands was investigated[13]. Vegetation height is affected by both grazer types, but grazing did not affect sediment deposition, though it did affect accretion rates through soil compaction.

Flood Control: ***Weak Evidence:-*** Water infiltration rates are greater in British un-grazed coastal marshes than grazed, suggesting that flood control may be better in un-grazed areas[3]. In addition, soil compaction in Dutch grazed saltmarshes causes a reduced rate of marsh elevation through soil accretion, potentially reducing its effectiveness in flood control[13].

REFERENCES

1. Jutila, H., 1997. Vascular plant species richness in grazed and ungrazed coastal meadows, SW Finland, Annales Botanici Fennici 34, 245-263.
2. Bos, D., Bakker, J., de Vries, Y., van Lieshout, S., 2002}. Long-term vegetation changes in experimentally grazed and ungrazed back-barrier marshes in the Wadden Sea, Applied Vegetation Science, 5, 45-54,. doi: 10.1658/1402-2001(2002)005{[0045:LTVCIE]2.0.CO;2.
3. Ford, H., Garbutt, A., Jones, D.L., Jones, L., 2012. Impacts of grazing abandonment on ecosystem service provision: Coastal grassland as a model system, Agriculture Ecosystems & Environment 162, 108-115. doi: 10.1016/j.agee.2012.09.003.
4. Norris, K., Cook, T., ODowd, B., Durdin, C., 1997. The density of redshank *Tringa totanus* breeding on the salt-marshes of the Wash in relation to habitat and its grazing management, Journal of Applied Ecology 34, 999-1013. doi: 10.2307/2405289.
5. Pakanen, V., Luukkonen, A., Koivula, K., 2011. Nest predation and trampling as management risks in grazed coastal meadows, Biodiversity and Conservation 20, 2057-2073. doi: 10.1007/s10531-011-0075-3.
6. van Klink, R., Rickert, C., Vermeulen, R., Vorst, O., WallisDeVries, M.F., Bakker, J.P., 2013. Grazed vegetation mosaics do not maximize arthropod diversity: Evidence from salt marshes, Bioliological Conservation 164, 150-157. doi: 10.1016/j.biocon.2013.04.023.
7. Ford, H., Garbutt, A., Jones, L., Jones, D.L., 2013. Grazing management in saltmarsh ecosystems drives invertebrate diversity, abundance and functional group structure, Insect Conservation and Diversity 6, 189-200. doi: 10.1111/j.1752-4598.2012.00202.x.
8. Loucougaray, G., Bonis, A., Bouzille, J., 2004. Effects of grazing by horses and/or cattle on the diversity of coastal grasslands in western France, Biological Conservation 116, 59-71. doi: 10.1016/S0006-3207(03)00177-0.
9. Boorman, L., Boorman, M., 2001. The Spatial and Temporal Effects of Grazing on the Species Diversity of Sand Dunes. In: Coastal Dune Management. Shared Experience on European Conservation Practice. Ed. J.A. Houston, S.E. Edmondson and P.J. Rooney. Liverpool University Press. 161-167.
10. Plassmann, K., Jones, M.L.M., Edwards-Jones, G., 2010. Effects of long-term grazing management on sand dune vegetation of high conservation interest, Applied Vegetation Science 13, 100-112. doi: 10.1111/j.1654-109X.2009.01052.x.
11. Millett, J., Edmondson, S., 2013. The impact of 36 years of grazing management on vegetation dynamics in dune slacks, Journal of Applied Ecology 50, 1367-1376. doi: 10.1111/1365-2664.12113.
12. Olsen, Y.S., Dausse, A., Garbutt, A., Ford, H., Thomas, D.N., Jones, D.L., 2011. Cattle grazing drives nitrogen and carbon cycling in a temperate salt marsh, Soil Biology & Biochemistry 43, 531-541. doi: 10.1016/j.soilbio.2010.11.018.
13. Elschot, K., Bouma, T.J., Temmerman, S., Bakker, J.P., 2013. Effects of long-term grazing on sediment deposition and salt-marsh accretion rates, Estuarine Coastal and Shelf Science 133, 109-115. doi: 10.1016/j.ecss.2013.08.021.