

Appendix 1. List of management interventions for maintaining or enhancing regulating ecosystem services

AIR QUALITY REGULATION

This section considers interventions to maintain non-climate related services concerned with air quality, including the extraction of chemicals such as particulates and direct air contaminants, and the emission of chemicals, such as oxygen.

Forests

1. Protect and expand forested area to absorb gaseous pollutants and trap particulates.

Coastal

2. Maintain vegetation in coastal wetlands, especially mangrove systems, to absorb gaseous pollutants and trap particulates.

Agricultural land

3. Plant shelter belts to absorb gaseous pollutants, intercept aerosols from pesticides and trap particulates.
4. Use soil conservation measures (such as cover crops, wind breaks and minimum or conservation tillage) to reduce wind erosion and hence airborne particulates.

Urban

5. Protect urban green spaces, to absorb gaseous pollutants and trap particulates.

CLIMATE REGULATION

This section covers interventions relating to the control of greenhouse gases (particularly carbon dioxide, methane and nitrous oxide), through reducing emissions and/or enhancing removal of such gases from the atmosphere. It incorporates more local climatic controls, such as ecosystem controls over temperature or precipitation. Ecosystem services relating to impacts of climate change such as storm surges and sea level rise are considered under natural hazard regulation.

Forests

6. Protect the area and condition of existing forest areas from clearing and degradation from logging, fire and unsustainable levels of non-timber resource extraction.
7. Adopt reduced impact logging techniques (including logging inventories, directional felling, liana clearance, low-impact extraction techniques, retention of roots, off-cuts and dead wood) in forestry operations to reduce collateral damage from timber extraction.
8. Reforest degraded land and encourage benign abandonment of low productivity or disused land.
9. Encourage enrichment planting in degraded and regenerating forests.

Terrestrial wetlands

10. Maintain and enhance natural wetlands.
11. Install dams in drains to restore degraded peatlands and avoid further drainage of undisturbed areas.
12. Re-vegetate bare peat to prevent oxidation.

13. Use geo-textiles to arrest peat erosion.
14. Practise controlled removal of peatland vegetation or use appropriate grazing to reduce the risk of wild-fire.
15. Avoid planting forests on peat.
16. Limit use of fire in agriculture on or near peat soils.
17. Avoid over-grazing of vegetation.

Coastal

18. Protect remaining intertidal muds, saltmarshes and mangrove communities, seagrass beds and vegetated dunes from further degradation, fragmentation and loss.
19. Re-establish and restore previous intertidal habitat by de-poldering or coastal realignment.
20. Prohibit new aquaculture developments in intertidal areas.
21. Restore micro-topography, creek networks, sediment inputs and nutrient exchange in abandoned aquaculture ponds.
22. Create new intertidal habitat through planting of mangroves, saltmarsh or seagrass at appropriate elevations in the tidal frame.
23. Enhance or facilitate habitat expansion, including the facilitated range expansion of mangroves, as warming conditions and changes in storminess permit.
24. Establish appropriate levels of saltmarsh grazing pressure to stimulate below-ground biomass production and carbon uptake.
25. Encourage development of early successional sand dune habitats (dry dunes and wet slacks) where carbon sequestration rates are high.
26. Restore or enhance sediment supplies from riverine or coastal sources to encourage carbon sequestration by coastal wetlands.

Marine

27. Fertilise oceans to increase carbon removal and deep ocean storage through enhanced phytoplankton productivity.

Agricultural land

28. Use soil conservation measures (such as cover crops, wind breaks, deep-rooted plants and minimum or conservation tillage) to enhance storage of soil carbon.
29. Produce and integrate biochar into agricultural soils.
30. Reduce management intensity on permanent grassland (in particular reduce fertilizer inputs) to promote botanically-diverse swards and enhance carbon sequestration to soil.
31. Promote inter-cultivation in perennial and agroforestry cropping systems with deeper rooting systems that create carbon stocks.
32. Provide herbicide-free strips in orchards and vineyards to increase carbon sequestration.
33. Reintroduce or enhance populations of deep-burrowing (anecic) worms to help sequester carbon.
34. Increase soil organic matter by incorporating green manure, slurry or incorporating crop residues to enhance carbon storage.
35. Reduce stocking rates of livestock.
36. Grow crops with a lower harvest index so more biogenic carbon is returned to the soil
37. In seasonal environments use supplementary animal feed from on-farm crops, such as maize

and sugar cane, to reduce soil erosion.

38. Use sub-soil drainage to reduce emissions of nitrous oxide from wet soils.
39. Adjust soil pH and add lime to enhance organic storage.
40. Reduce use of chemical pesticides that have adverse effects on soil microflora.
41. Avoid conversion of permanent grassland to arable.

Urban

42. Protect urban green spaces to store carbon.

WATER FLOW REGULATION

Interventions that support the role of ecosystems in altering the magnitude and timing of water runoff and flooding as well as the recharge of aquifers (see also natural hazard regulation for regulator services linked to coastal defence and flooding).

Forests

43. Limit use of heavy machinery in forestry operations to avoid soil compaction.
44. Retain forest cover on steep slopes.
45. Avoid felling operations during rainy seasons
46. Switch plantation forests from coniferous to deciduous to reduce acidification.
47. Plant forests at lower densities.
48. Practise alternatives to clearfell, such as continuous cover forestry.

Terrestrial Wetlands

49. Maintain and enhance natural wetlands.
50. Restore wetlands in areas of groundwater recharge.
51. Re-vegetate bare peat to increase surface roughness.
52. Use geo-textiles to arrest peat erosion.
53. Reconnect rivers with floodplains to enhance natural water storage.

Freshwater

54. Encourage re-vegetation of riverbanks (such as through livestock exclusion, and/or direct planting).
55. Restore riparian vegetation to assist in reconnecting rivers with floodplains and to provide greater instream ecosystem complexity.
56. Increase up-stream structural diversity (such as through the re-introduction of beavers).
57. Reduce canalisation and create channel diversity to reduce speed of flood transmission.
58. Re-meander rivers (where they have been artificially straightened) to help reduce speed and height of flood peaks.

Coastal

59. Re-connect river systems to coastal wetlands through controlled breaching of river levees or construction of river control structures that allow periodic flooding of wetlands.

Agricultural land

60. Use soil conservation measures (such as cover crops, wind breaks, deep-rooted plants and minimum or conservation tillage) to increase soil structure and infiltration rates.

61. Increase soil organic matter by incorporating green manure, slurry or incorporating crop residues to increase water infiltration (although high quantities of soil organic matter can lead to soil complexes with impeded drainage).
62. Reduce soil-water repellency (e.g. avoid burning, and enhance soil microbial activity) to limit run-off and increase soil-water capture.
63. Plant trees / hedges /perennial grass strips to intercept surface run-off.
64. Reduce stocking rates of livestock.
65. Reduce soil compaction by machinery, by reducing machinery use, using lighter machinery, low pressure tyres or controlled traffic techniques
66. Alleviate soil compaction by sub-soiling.
67. Plant biomass crops in locations where they can enhance water interception (such as slopes).
68. Increase average sward heights in pasture to reduce surface run-off, perhaps by adjusting stock type or density.
69. Use cultivars with deeper rooting systems to maximise rainfall use.
70. Balance the use of evergreen and deciduous trees to enhance seasonal water regulation.
71. Modify cultivation practices (e.g. siting of animal feed sites, ploughing regimes) to avoid ready downslope transfer and loss of water.
72. Reduce use of chemical fertilisers where they reduce soil organic matter.

Urban

73. Plant green roofs to encourage interception of rainfall.
74. Establish rain gardens (planted depressions or swales allowing runoff from impervious urban areas to be absorbed).
75. Greater use of balancing ponds to contain surges and release slowly.
76. Use underground water storage systems.

EROSION REGULATION

Interventions to maintain restore or enhance the role of ecosystems in reducing erosion of soil and sediments and in encouraging maintenance or growth of the same.

Forests

77. Retain and restore forest cover on steep slopes.
78. Retain vegetation on margins of water courses.
79. Limit use of heavy machinery in forestry operations.
80. Carry out felling or forest clearance at appropriate seasons.
81. Leave leaf litter and dead wood on the forest floor, prohibit or limit salvage logging.
82. Practise alternatives to clearfell, such as continuous cover forestry.

Terrestrial wetlands

83. Install small dams in surface drains to prevent eroded material leaving peatlands.
84. Re-vegetate bare peat to prevent peat oxidation.
85. Use geo-textiles to arrest peat erosion.
86. Practise controlled removal of vegetation to reduce the risk of wild-fire.

Freshwater

87. Encourage re-vegetation of riverbanks (such as through stock exclusion, and/or direct planting).
88. Increase up-stream structural diversity.
89. Re-establish and/or encourage beaver populations.
90. Reduce canalisation and create channel diversity.
91. Manage sediment problems (fine and coarse) at source (e.g. on agricultural land) rather than through dredging.
92. Replace hard engineered river stabilisation with softer alternatives (e.g. willow-based).
93. Allow for natural erosion processes rather than trying to prevent them (e.g. set back river defences and allow natural river migration within the defence line).

Coastal

94. Protect remaining intertidal muds, saltmarshes and mangrove communities, seagrass beds and vegetated dunes from further degradation, fragmentation and loss.
95. Re-establish and restore previous intertidal habitat by depoldering or coastal realignment to increase resilience to wind and storm waves.
96. Encourage increased use of mangroves within and around existing extensive tropical aquaculture ponds.
97. Retain coastal forest and beachridge vegetation to minimize sedimentation problems on nearby reefs.
98. Create new intertidal habitat through afforestation, or planting of saltmarsh or seagrass at appropriate elevations in the tidal frame.
99. Maintain, restore and create coastal wetlands of sufficient areal extent to allow natural cycles of erosion/sedimentation to compensate one another within the wetland complex.
100. Re-connect river systems to coastal wetlands through breaching of river levees or river control structures to re-introduce river sediments to coastal wetlands.
101. Introduce dredged spoil material from estuarine waterways to coastal wetland surfaces.
102. Allow erosion of soft rock cliffs (cease armouring and stabilization), coupled to un-interrupted alongshore sediment transport, to supply coarse sediments to beaches and offshore banks and fine sediments to coastal wetlands.
103. Allow natural alongshore dynamics of large-scale coastal sediment accumulations (nesses, spits and cusped forelands). Assist if necessary with sand and gravel by-passing and re-charge operations.
104. Use beach nourishment (repetitive artificial replenishment of beaches) to rebuild eroding beaches.
105. Maintain dunes and the beaches fronting them, in part by allowing sediment exchange across beach-dune boundaries.
106. Actively repair and construct sand dunes.
107. Adopt measures for topsoil inversion and deliberate dune destabilization (including introduction of appropriate grazing levels) to rejuvenate stabilized dune systems.
108. Control groundwater abstraction that affects water and nutrient flows through wetlands and accelerates subsidence.
109. Reduce direct threats to biogenic reefs (notably coral reefs, but also shellfish, vermitid and algal reefs) from unsustainable fishing practises.
110. Reduce proximate and remote threats to reefs from watersheds through appropriate

measures to minimize agricultural chemicals, livestock waste, urban and industrial effluents entering rivers and estuaries.

111. Restore or create shellfish reefs in coastal locations where they may enhance sediment deposition
112. Restore or enhance coral reef growth or recovery using artificial substrates, electro-accumulation or coral transplantation at reef scales.
113. Avoid construction work in tropical wet seasons to minimize excessive terrestrial sediment inputs into the nearshore zone.
114. Control anchoring through provision of fixed moorings and anchorage zones in areas of soft sediments to reduce structural damage to reefs.
115. Locate access channels through reefs to minimize impact on reef hydrodynamics and sediment transport.

Agricultural land

116. Encourage ploughing across rather than down slopes subject to floods.
117. Use strip tillage.
118. Plant cover crops in inter-row strips.
119. Maintain permanent plant or crop residue cover.
120. Use minimal tillage / direct drilling to increase soil structure and infiltration rates.
121. Avoid harvesting in wet conditions.
122. Reduce soil compaction by machinery, by reducing machinery use, using lighter machinery, low pressure tyres or controlled traffic techniques.
123. Plant trees / hedges /perennial grass strips to intercept surface run-off.
124. Provide livestock with hard-standing access to watercourses to prevent erosion of stream-banks.
125. Provide livestock with water pumped to troughs set away from water bodies, to prevent erosion of stream-banks.
126. Reduce stocking rates of livestock (e.g. through pasture rotation) and consider timing of grazing, to prevent over-grazing.
127. Control over-abundant wildlife to reduce competition for grazing and overall grazing pressure.
128. Encourage soil management practices to develop surface-vented macropores to trap surface-ponded and reduce runoff by routing water into the rootzone.
129. Include buffer strips and site farm gates to prevent eroded material leaving fields.
130. Install small dams in ditch systems, to prevent eroded material leaving farmland.

Urban

131. Use phytoremediation and phytostabilisation on contaminated sites.
132. Use of permeable surfaces and vegetation where possible in hard landscape construction.

WATER PURIFICATION AND WASTE TREATMENT

Interventions to enhance the role of ecosystems in removing chemical and particulate compounds from the water, including the breakdown of toxic wastes and the assimilation of chemicals and particulates into soils or marine sediments.

Terrestrial Wetlands

133. Use engineered reedbeds/wetlands for tertiary treatment of effluent.
134. Target ponds/wetland creation to trap sediment/pollution runoff in farmed landscape.
135. Create marginal wetlands to trap and/or cycle nutrients.
136. Dam to restore upland bogs to reduce dissolved and particulate organic carbon and coloured humic substances leaving catchments.
137. Replant wet woodland to provide enhanced nutrient uptake.
138. Re-vegetate bare peat.

Coastal

139. Protect remaining intertidal habitats, especially saltmarshes and mangroves,
140. Re-establish and restore previous intertidal habitat by depoldering or coastal realignment to reduce particulate contamination of water, eutrophication and toxic pollution in coastal waters.
141. Encourage increased use of mangroves within and around existing extensive tropical aquaculture ponds.
142. Restore or create shellfish reefs to restore active filtration of suspended sediments and removal of nitrates and other pollutants.

Marine

143. Use bioremediation at locations of intense pollution, notably oil spills, through nutrient amendment (biostimulation), bioaugmentation, photoremediation and oxygen enhancement.

Agricultural land

144. Plant trees/hedges/perennial grass strips to increase nutrient uptake.
145. Plant biomass crops in locations where they can enhance nutrient uptake.
146. Restore grassland/low input arable in drinking water catchments.
147. Intercrop with legumes.
148. Increase soil organic matter by incorporating green manure, slurry or incorporating crop residues to enhance carbon storage.
149. Produce and integrate biochar into agricultural soils.
150. Use hyper-accumulator phytoremediation plants to remove contaminants from the soil, or to reduce their bioavailability.
151. Reduce use of veterinary pharmaceutical products including antibiotics and hormone regulators/growth promoters.

Urban

152. Create ponds and wetlands to collect, store and clean water before gradual release into water courses (Sustainable Urban Drainage Systems).
153. Reduce output and improve treatment of industrial and municipal effluent through biodegradation and bioconversion.
154. Improve remediation of wastes before disposal in soil or water by greater use of biological, physical and chemical methods.
155. Improve treatment of contaminated land through phytoremediation.

DISEASE REGULATION

Following the Millennium Ecosystem Assessment, this section covers regulation of human infectious diseases, hosts and vectors. We used the criteria: does this intervention enhance or protect the capacity of the ecosystem to regulate human diseases? Interventions to enhance regulation of diseases of crops and trees are included under Pest Regulation.

Forests

156. Remove invasive plants, with particular attention to those that are favourable environments for ticks and other vectors.
157. Protect and expand forested area to maintain species diversity in order to reduce disease transmission either via predator-mediated control or dilution of competent hosts.
158. Construct habitat corridors to promote predator populations over large areas in order to regulate host populations.

Coastal

159. Maintain vegetation in coastal wetlands, especially mangrove systems, to trap particulates.

Agricultural land

160. Reduce use of veterinary pharmaceutical products including antibiotics and hormone regulators/growth promoters.
161. Use soil conservation measures (such as cover crops, wind breaks and minimum or conservation tillage) to reduce wind erosion and hence airborne particulates.
162. Reduce stocking rates of livestock to minimise opportunity for pathogen spillover and pressures on virulence/selection.
163. Plant fruit trees or provide other forms of roosting and feeding habitat (for bats) away from livestock areas in order to minimise transmission opportunities
164. Reduce agrichemical inputs to reduce development of pest resistance and to maintain biodiversity in target and non-target systems, especially aquatic systems.
165. Provide bat houses and bird feeders to promote establishment of species for mosquito (or other insect vector) regulation.
166. Improve the connectivity of non-crop habitats to enhance dispersal of predators of disease host species.
167. Decrease the level of land-use intensity in the landscape, e.g. through large-scale conversion to organic farming.
168. Reduce sources of standing water and hence limit the establishment of vector populations.

Urban

169. Reduce output and improve treatment of industrial and municipal effluent through biodegradation and bioconversion.
170. Improve remediation of wastes before disposal in soil or water by greater use of biological, physical and chemical methods.

171. Protect urban green spaces to encourage biodiversity and the establishment of vector-feeding species, in particular.
172. Use permeable surfaces and vegetation where possible in hard landscape construction in order to reduce sources of standing water and limit the establishment of vector populations.
173. Provide bat houses, and bird feeders and housing, to promote establishment of species for mosquito (or other insect vector) regulation.

PEST REGULATION

Interventions to enhance the role of ecosystems in reducing the damage to crops and livestock caused by pests and diseases. The interventions listed for each habitat type consider regulation of pests or diseases causing damage within that habitat type, but includes interventions both within that habitat and in the surrounding landscape.

Forests

174. Reduce use of insecticides (especially broad spectrum) to maintain abundance and diversity of natural enemies and alternative hosts for entomopathogens.
175. Increase resistance of trees by forest management (e.g. thinning for bark beetle pests).
176. Use natural regeneration with seed trees.
177. Practise continuous cover forestry.
178. Promote mixed tree species stands to increase diversity of natural enemies and to reduce density of host trees for pests.
179. Promote deciduous trees, repellent for conifer insect pests and preferred as food by browsing herbivores, in conifer stands.
180. Avoid high proportion of susceptible age classes of forest stands at the landscape level (e.g. over-mature conifer stands susceptible to bark beetle attacks).
181. Use dispensers releasing attractants to enhance densities of natural enemies and competitors at attacked trees or stands.
182. Enhance densities of generalist natural enemies, and competitors, by providing breeding substrates exclusively utilized by non-pest prey species (e.g. tree species or parts of cut trees).
183. Avoid sanitation cutting of trees from which pests have emerged while natural enemies remain.
184. Avoid thinning to reduce the risk of infestation of the stand by pathogens (e.g. root rot).
185. Plant a diverse range of nectar and pollen-providing plants (including shrubs) to increase efficacy of omnivorous natural enemies.
186. Use food spray to increase efficacy of omnivorous natural enemies.
187. Release native natural enemies or competitors (augmentative biological control) to increase their population sizes.
188. Favour large predators (e.g. by reducing hunting) to reduce populations of browsing herbivores.

Agricultural land

189. Create grass margins / beetle banks to promote predatory invertebrates.
190. Leave field margins unsprayed and uncropped.

191. Divide crops into smaller areas.
192. Increase the perimeter-to-area ratio of agricultural fields to facilitate spillover of natural enemies of agricultural pests.
193. Rotate crops to reduce build up of crop-specific pests and pathogens.
194. Deploy flower strips, or plants with extra-floral nectaries to promote omnivorous natural enemies (e.g. parasitoids and hoverflies).
195. Use mulching to provide shelter and alternative food for natural enemies, and to suppress weeds.
196. Intercrop with plants that repel or confuse pests and/or attract natural enemies and that reduce dispersal of pathogen propagules.
197. Plant a trap crop that is more attractive to the pest than the crop.
198. Use push-pull technique: combining plants repellent for the pest within the field with attractive plants (trap crop) around the field.
199. Conduct periodic harvesting, leaving strips of the crop as refuges for natural enemies.
200. Plant a cover crop that maintain populations of natural enemies in the crop, make it more difficult for pests to locate crops, reduce dispersal of plant pathogens and suppress weeds.
201. Reduce tillage to conserve soil-dwelling natural enemies.
202. Reduce use of insecticides (especially broad spectrum), to maintain abundance and diversity of natural enemies and alternative hosts for entomopathogens.
203. Reduce herbicide use to increase the availability of nectar, pollen and alternative prey for natural enemies of agricultural pests.
204. Provide bird perches for predatory birds to rest and to look for prey.
205. Ploughing under of live (green manuring) and dead organic material to provide shelter and alternative food for natural enemies of pests and to make the soil more suppressive against plant pathogens.
206. Provide holes in the soil to enhance habitat for spiders.
207. Practise timely cutting of non-crop plants utilized by natural enemies (for food, shelter etc) to encourage dispersal into the crop.
208. Use dispensers releasing attractants to enhance densities of natural enemies and competitors in the crop.
209. Use artificial food-sprays (carbohydrates and protein) to enhance food availability for natural enemies within the crop.
210. Release native natural enemies or competitors (augmentative biological control) to increase their population sizes.
211. Provide set-aside areas of natural habitat on farmland.
212. Increase heterogeneity in agricultural landscapes, including natural habitat remnants.
213. Improve landscape-scale connectivity between natural or non-crop habitat remnants to enhance dispersal of natural enemies of pests.
214. Increase the availability of shelter belts, hedgerows and other woody habitats in the landscape to provide habitat for natural enemies.
215. Manage hedges and habitat corridors to benefit natural enemies (keep unsprayed, fill gaps, plant flowering hedge plants).
216. Increase the availability of perennial crops in the landscape (e.g. through crop rotation with ley) to enhance natural enemies.
217. Decrease the level of land-use intensity in the landscape, e.g. through large-scale conversion to organic farming.

218. Restore flower-rich natural habitats such as species-rich grassland in farmed areas (including linear sites such as road verges, beneath power lines or on field margins) to benefit omnivorous natural enemies of pests.

POLLINATION

Interventions to maintain or enhance biodiversity-mediated pollination

Forests

219. Protect existing areas of forest from further clearance or degradation
220. Restore natural forests through managed regeneration or benign abandonment.
221. Maintain areas with open under-storey and gaps in forests/woodland.
222. Protect large native trees.
223. Conserve dead and down trees as nesting sites.

Agricultural land

224. Restore flower-rich natural habitats such as species-rich grassland in farmed areas (including linear sites such as road verges, beneath power lines or on field margins).
225. Change intensity of grazing, cutting or burning to increase flowering.
226. Reduce shrub cover through grazing, cutting or burning.
227. Protect and enhance trees/hedges/perennial grass strips to provide suitable materials or vegetation for bee nesting and hibernation.
228. Provide set-aside areas of natural habitat on farmland.
229. Increase heterogeneity in agricultural landscapes, including natural habitat remnants.
230. Improve landscape-scale connectivity between natural or non-crop habitat remnants.
231. Manage hedges and habitat corridors to benefit pollinators (keep unsprayed, fill gaps, plant flowering hedge plants).
232. Protect bat roosts, where bats are important pollinators.
233. Create bare ground (well-drained) for ground-nesting bees.
234. Provide soft earth for bees to hibernate in.
235. Use drip- or spray irrigation rather than flooding.
236. Provide nest boxes or nest sites (drilled holes) for cavity-nesting solitary bees.
237. Reduce tillage (benefits ground-nesting bees).
238. Leave field margins unsprayed and uncropped.
239. Plant a diverse range of nectar and pollen-providing plants, as well as caterpillar food plants, and leguminous fallow crops, such as clover.
240. Reduce fertilizer, pesticide and herbicide use generally.
241. Reduce management intensity on permanent grassland (in particular reduce fertilizer inputs).
242. Restrict certain pesticides, such perhaps as neonicotinoids.
243. Apply pesticides at night.
244. Avoid applying pesticides during flowering.
245. Apply pesticides at ground level.
246. Avoid microencapsulated formulations that mimic pollen.
247. Keep bodies of water (ponds and ditches) pesticide-free to provide habitat for pollinating flies, water sources for bats and butterflies, and insect food for hummingbirds.

Urban

248. Encourage planting of appropriate resource plants and caterpillar food plants in gardens and municipal areas.
249. Retain areas of rough ground or old built structures for nesting habitat.

NATURAL HAZARD REGULATION

Interventions to maintain, enhance or restore the ability of ecosystems to reduce the impacts of natural hazards including storm surges, hurricanes, floods, fires, tsunamis and the impact of rising sea levels.

Forests

250. Protect the area and condition of existing forest areas from clearing and degradation.
251. Impose strict limitations or bans on the use of fire to manage agricultural land adjoining forested areas.
252. Limit or carefully manage salvage logging to prevent dangerous build-up of fuel loads.
253. Reforest degraded land and encourage benign abandonment of low productivity or disused land.
254. Encourage enrichment planting in degraded and regenerating forests.

Terrestrial wetlands

255. Use wetlands to create emergency flood capacity.
256. Maintain and enhance natural wetlands.
257. Install small dams in surface drains to reduce hydraulic connectivity and improve habitat structure to slow overland flow.
258. Restore floodplain forest or other semi-natural features, such as wet grassland, to increase hydraulic roughness and so slow conveyance and enhance storage of floodplains.
259. Reconnect rivers with floodplains to enhance natural water storage.
260. Practise controlled removal of peatland vegetation or use appropriate grazing to reduce the risk of wild-fire.
261. Limit use of fire in agriculture on or near peat soils.

Freshwater

262. Encourage re-vegetation of riverbanks (such as through stock exclusion, and/or direct planting).
263. Restore riparian vegetation to assist in reconnecting rivers with floodplains and to provide greater instream ecosystem complexity.
264. Increase up-stream structural diversity (such as through the re-introduction of beavers, or restoring boulders and large woody debris in upland rivers) to increase flood interception potential.
265. Reduce canalisation and create channel diversity to reduce speed of flood transmission.
266. Re-meander rivers (where they have been artificially straightened) to help reduce speed and height of flood peaks.

Coastal

267. Protect remaining intertidal muds, saltmarshes and mangrove communities, seagrass beds and vegetated dunes from further degradation, fragmentation and loss.
268. Re-establish and restore previous intertidal habitat by de-poldering or coastal realignment, to provide both renewed defence against incident waves and enhance storm water storage.
269. Create new intertidal habitat through afforestation, or planting of saltmarsh or seagrass at appropriate elevations in the tidal frame.
270. Prioritise protection or restoration of mangroves in areas close to human settlement.
271. Set back estuarine defences to enhance storage to accommodate tidal surges.
272. Retain or acquire a coastal buffer zone to allow coastal barriers (gravel ridges, beaches and dunefields) to 'roll-over' landward under sea level rise and storms.
273. Introduce dredged spoil material from estuarine waterways to coastal wetland surfaces.
274. Allow erosion of soft rock cliffs (cease armouring and stabilization), coupled to un-interrupted alongshore sediment transport, to supply coarse sediments to beaches and offshore banks and fine sediments to coastal wetlands.
275. Allow natural alongshore dynamics of large-scale coastal sediment accumulations (nesses, spits and cusped forelands). Assist if necessary with sand and gravel by-passing and re-charge operations.
276. Use beach nourishment (repetitive artificial replenishment of beaches) to rebuild eroding beaches.
277. Maintain dunes and the beaches fronting them, in part by allowing sediment exchange across beach-dune boundaries.
278. Actively repair and construct sand dunes.
279. Adopt measures for topsoil inversion and deliberate dune destabilization (including introduction of appropriate grazing levels) to rejuvenate stabilized dune systems.
280. Re-connect river systems to coastal wetlands through controlled breaching of river levees or use of river control structures to re-introduce river sediments to coastal wetlands.
281. Control groundwater abstraction that affects water and nutrient flows through wetlands and accelerates subsidence.

Agricultural land

282. Plant trees/hedges/perennial grass strips to intercept surface runoff.
283. Use minimal tillage / direct drilling to increase soil structure and infiltration rates.
284. Increase soil organic matter by incorporating green manure, slurry or incorporating crop residues to increase water infiltration.
285. Reduce soil-water repellency (e.g. avoid burning, and enhance soil microbial activity) to limit run-off and increase soil-water capture.
286. Reduce stocking rates of livestock.
287. Reduce soil compaction by farm machinery.
288. Alleviate soil compaction by sub-soiling.
289. Increase average sward heights in pasture to reduce surface run-off, perhaps by adjusting stock type or density.
290. Use cultivars with deeper rooting systems to maximise rainfall use and reduce runoff.

Urban

291. Increase use of Sustainable Urban Drainage Systems.

292. Reduce garden paving.
293. Increase use of green roofs.
294. Increase tree planting in urban locations.
295. Increase use of balancing ponds and underground storage systems.
296. Use permeable surfaces in hard landscape construction to provide aquifer recharge.