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What Works in Conservation

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6. PEATLAND CONSERVATION

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Global evidence for the effects of interventions to conserve peatland vegetation

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Scope of assessment: for the conservation of vegetation in wet peatlands, including bogs, fens, fen meadows and tropical peat swamps. The focus is on overall communities and habitat-defining species, rather than rare species.
Assessed: 2018.
Effectiveness measure is the median % score. How effective is the intervention at conserving peatland vegetation in the collated evidence?
Certainty measure is the median % certainty for the effectiveness score across all peatlands that are appropriate targets of the intervention, determined by the quantity and quality of the evidence in the synopsis.
Harm measure is the median % score. Are there any negative side effects of the intervention, on peatland vegetation, in the collated evidence?
Each **effectiveness category** assumes that the aims of the intervention match your management goals. For example, planting trees/shrubs is likely to be beneficial assuming that you want to create forested/shrubby peatland. This might not be a desirable outcome on all peatland types or in all locations.

 https://doi.org/10.11647/OBP.0191.06

This book is meant as a guide to the evidence available for different conservation interventions and as a starting point in assessing their effectiveness. The assessments are based on the available evidence for the target habitat for each intervention. The assessment may therefore refer to different habitat to the one(s) you are considering. Before making any decisions about implementing interventions it is vital that you read the more detailed accounts of the evidence in order to assess their relevance for your study species or system.

Full details of the evidence are available at
www.conservationevidence.com

There may also be significant negative side-effects on the target habitats or other species or communities that have not been identified in this assessment.

A lack of evidence means that we have been unable to assess whether or not an intervention is effective or has any harmful impacts.

6.1 Threat: Residential and commercial development

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for residential/commercial development?	
No evidence found (no assessment)	• Remove residential or commercial development from peatlands • Retain/create habitat corridors in developed areas

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Remove residential or commercial development from peatlands
- Retain/create habitat corridors in developed areas.

6.2 Threat: Agriculture and aquaculture

6.2.1 Multiple farming systems

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for multiple farming systems?	
Unknown effectiveness (limited evidence)	• Retain/create habitat corridors in farmed areas
No evidence found (no assessment)	• Implement 'mosaic management' of agriculture

Unknown effectiveness (limited evidence)

Retain/create habitat corridors in farmed areas

- *Vegetation structure:* One study in Indonesia found that a peat swamp forest corridor contained 5,819 trees/ha: 331 large trees, 1,360 saplings and 4,128 seedlings.
- *Overall plant richness/diversity:* The same study recorded 18–29 tree species (depending on size class) in the peat swamp forest corridor.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 45%; certainty 15%; harms 4%). Based on evidence from: tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1730

No evidence found (no assessment)

We have captured no evidence for the following intervention:

- Implement 'mosaic management' of agriculture.

6.2.2 Wood and pulp plantations

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for wood and pulp plantations?	
Likely to be beneficial	• Cut/remove/thin forest plantations • Cut/remove/thin forest plantations and rewet peat

Likely to be beneficial

Cut/remove/thin forest plantations

- *Herb cover:* Three replicated studies (two also paired and controlled) in bogs in the UK and fens in Sweden reported that tree removal increased cover of some herbs, including cottongrasses *Eriophorum* spp. and sedges overall. One of the studies reported no effect on other herb species, including purple moor grass *Molinia caerulea*.
- *Moss cover:* Two replicated studies, in bogs in the UK and a drained rich fen in Sweden, reported that tree removal reduced moss cover after 3–5 years (specifically fen-characteristic mosses or *Sphagnum* moss). However, one replicated, paired, controlled study in partly rewetted rich fens in Sweden reported that tree removal increased *Sphagnum* moss cover after eight years.
- *Overall plant richness/diversity:* Two replicated, paired, controlled studies in rich fens in Sweden reported that tree removal increased total plant species richness, especially in rewetted plots.
- *Assessment: likely to be beneficial (effectiveness 60%; certainty 50%; harms 10%). Based on evidence from: fens (three studies); bogs (one study).*

https://www.conservationevidence.com/actions/1731

Cut/remove/thin forest plantations and rewet peat

- *Plant community composition:* Of three replicated studies in fens in Finland and Sweden, two found that removing trees/rewetting did not affect the overall plant community composition. One reported only a small effect. Two site comparison studies, in bogs and fens in Finland, found that removing trees/rewetting changed the community composition: it became less like forested/drained sites.
- *Characteristic plants:* Two before-and-after studies (one site comparison, one controlled) in bogs and fens in Finland and Sweden reported that removing trees/rewetting increased the abundance of wetland-characteristic plants.
- *Moss cover:* Five studies (four replicated, three site comparisons) in Sweden and Finland examined the effect of removing trees/rewetting on *Sphagnum* moss cover. Of these, two studies in bogs and fens found that removing trees/rewetting increased *Sphagnum* cover. One study in forested fens found no effect. Two studies in a bog and a fen found mixed effects amongst sites or species. Four studies (three replicated, two paired) in the UK and Finland examined the effect of removing trees/rewetting on other moss cover. Of these, three found that removing trees/rewetting reduced moss cover, but one study in forested fens found no effect.
- *Herb cover:* Seven studies (two replicated, paired, controlled) in bogs and fens in the UK, Finland and Sweden reported that removing trees/rewetting increased cover of at least one group of herbs. This included cottongrasses *Eriophorum* spp. in four of five studies and other/total sedges in three of three studies. One study reported that tree removal/rewetting reduced cover of cottongrass (where it was rare before intervention) and purple moor grass *Molinia caerulea*.
- *Vegetation structure:* One replicated study in a bog in the UK found that removing trees/rewetting increased ground vegetation height, but another in a fen in Sweden reported no effect on canopy height after eight years. Two replicated, paired, site comparison studies in bogs and fens in Finland reported that thinning trees/rewetting reduced the number of tall trees present for 1–3 years after intervention (but not to the level of natural peatlands).
- *Overall plant richness/diversity:* Of four replicated studies in fens in Sweden and Finland, two (also paired and controlled) reported that

removing trees/rewetting increased plant species richness. The other two studies found that removing trees/rewetting had no effect on plant species richness or diversity.

- *Assessment: likely to be beneficial (effectiveness 60%; certainty 60%; harms 10%). Based on evidence from: fens (six studies); bogs (two studies); mixed peatlands (three studies).*

https://www.conservationevidence.com/actions/1732

6.2.3 Livestock farming and ranching

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for livestock farming and ranching?	
Likely to be beneficial	• Exclude or remove livestock from degraded peatlands
Unknown effectiveness (limited evidence)	• Reduce intensity of livestock grazing
No evidence found (no assessment)	• Use barriers to keep livestock off ungrazed peatlands • Change type of livestock • Change season/timing of livestock grazing

Likely to be beneficial

Exclude or remove livestock from degraded peatlands

- *Plant community composition:* Of two replicated, paired, controlled studies in bogs in the UK, one found that excluding sheep had no effect on the plant community. The other found that excluding sheep only affected the community in drier areas of the bog, favouring plants typically found on dry moorlands.
- *Herb cover:* Seven studies (six replicated, paired, controlled) in bogs and fens in the UK, Australia and the USA found that excluding/removing livestock did not affect cover of key herb groups: cottongrasses *Eriophorum* spp. in five of five studies and true sedges

Carex spp. in two of two studies. However, one before-and-after study in a poor fen in Spain reported that rush cover increased after cattle were excluded (along with rewetting). One site comparison study in Chile found that excluding livestock, along with other interventions, increased overall herb cover but one replicated, paired, controlled study in bogs in Australia found that excluding livestock had no effect on herb cover.

- *Moss cover:* Five replicated, paired, controlled studies in bogs in the UK and Australia found that excluding livestock typically had no effect on *Sphagnum* moss cover. Three of the studies in the UK also found no effect on cover of other mosses. One before-and-after study in a poor fen in Spain reported that *Sphagnum* moss appeared after excluding cattle (along with rewetting).
- *Tree/shrub cover:* Five replicated, paired, controlled studies in bogs in the UK and Australia found that excluding livestock typically had no effect on shrub cover (specifically heather *Calluna vulgaris* or heathland plants). However, one of these studies found that heather cover increased in drier areas. Three studies (two site comparisons) in bogs in the UK, fens in the USA and a peatland in Chile found that excluding/removing livestock increased shrub cover.
- *Vegetation structure:* One replicated, paired, controlled study in a bog in the UK found that excluding sheep increased total vegetation, shrub and bryophyte biomass, but had no effect on grass-like plants.
- *Assessment: likely to be beneficial (effectiveness 40%; certainty 50%; harms 12%). Based on evidence from: bogs (seven studies); fens (two studies); unspecified peatlands (one study).*

https://www.conservationevidence.com/actions/1734

Unknown effectiveness (limited evidence)

Reduce intensity of livestock grazing

- *Vegetation cover:* One replicated, paired, controlled study in bogs in the UK found greater cover of total vegetation, shrubs and sheathed cottongrass *Eriophorum vaginatum* under lower grazing intensities.
- *Vegetation structure:* The same study found that vascular plant biomass was higher under lower grazing intensities.

- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 25%; harms 1%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1735

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Use barriers to keep livestock off ungrazed peatlands
- Change type of livestock
- Change season/timing of livestock grazing.

6.3 Threat: Energy production and mining

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for energy production and mining?	
Unknown effectiveness (limited evidence)	• Replace blocks of vegetation after mining or peat extraction
No evidence found (no assessment)	• Retain/create habitat corridors in areas of energy production or mining

Unknown effectiveness (limited evidence)

Replace blocks of vegetation after mining or peat extraction

- *Plant community composition:* Two studies, in a bog in the UK and a fen in Canada, reported that transplanted blocks of peatland vegetation retained their overall community composition: over time in the UK, or relative to an undisturbed fen in Canada.
- *Vegetation cover:* One before-and-after study in the UK reported that bare peat next to translocated bog vegetation developed vegetation cover (mainly grasses/rushes). *Sphagnum* moss cover declined in the translocated blocks. One site comparison study in a fen in Canada reported that replaced vegetation blocks retained similar *Sphagnum* and shrub cover to an undisturbed fen.

- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 35%; harms 10%). Based on evidence from: bogs (one study); fens (one study).*

https://www.conservationevidence.com/actions/1738

No evidence found (no assessment)

We have captured no evidence for the following intervention:

- Retain/create habitat corridors in areas of energy production or mining.

6.4 Threat: Transportation and service corridors

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for transportation and service corridors?	
Unknown effectiveness (limited evidence)	• Maintain/restore water flow across service corridors
No evidence found (no assessment)	• Backfill trenches dug for pipelines • Retain/create habitat corridors across service corridors

Unknown effectiveness (limited evidence)

Maintain/restore water flow across service corridors

- *Characteristic plants:* One before-and-after study in a fen in the USA found that after restoring water inflow across a road, along with general rewetting, cover of wet peatland sedges increased whilst cover of grasses preferring drier conditions decreased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 20%; harms 1%). Based on evidence from: fens (one study).*

https://www.conservationevidence.com/actions/1741

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Backfill trenches dug for pipelines
- Retain/create habitat corridors across service corridors.

6.5 Threat: Biological resource use

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for biological resource use?	
Unknown effectiveness (limited evidence)	• Reduce intensity of harvest
No evidence found (no assessment)	• Reduce frequency of harvest • Use low impact harvesting techniques • Use low impact vehicles for harvesting • Implement 'mosaic management' when harvesting wild biological resources • Provide new technologies to reduce pressure on wild biological resources

Unknown effectiveness (limited evidence)

Reduce intensity of harvest

- *Moss cover:* One replicated, controlled study in a bog in New Zealand reported that *Sphagnum* moss cover was higher, three years after harvesting, when some *Sphagnum* was left in plots than when it was completely harvested.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 70%; certainty 25%; harms 0%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1744

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Reduce frequency of harvest
- Use low impact harvesting techniques
- Use low impact vehicles for harvesting
- Implement 'mosaic management' when harvesting wild biological resources
- Provide new technologies to reduce pressure on wild biological resources.

6.6 Threat: Human intrusions and disturbance

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for human intrusions and disturbance?	
Unknown effectiveness (limited evidence)	• Physically exclude vehicles from peatlands
No evidence found (no assessment)	• Restrict vehicle use on peatlands • Restrict pedestrian access to peatlands • Physically exclude pedestrians from peatlands • Install boardwalks/paths to prevent trampling • Wear snowshoes to prevent trampling • Adopt ecotourism principles/create an ecotourism site

Unknown effectiveness (limited evidence)

Physically exclude vehicles from peatlands

- *Vegetation structure:* One replicated, paired, controlled, site comparison study in a floating fen in the USA reported that fencing off airboat trails allowed total and non-woody vegetation biomass to increase, up to levels recorded in undisturbed fen. Woody plant biomass did not recover.

- *Overall plant richness/diversity:* The same study reported that fencing off airboat trails allowed overall plant diversity to increase, recovering to levels recorded in undisturbed fen.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 70%; certainty 35%; harms 0%). Based on evidence from: fens (one study).*

https://www.conservationevidence.com/actions/1750

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Restrict vehicle use on peatlands
- Restrict pedestrian access to peatlands
- Physically exclude pedestrians from peatlands
- Install boardwalks/paths to prevent trampling
- Wear snowshoes to prevent trampling
- Adopt ecotourism principles/create an ecotourism site.

6.7 Threat: Natural system modifications

6.7.1 Modified water management

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for modified water management?	
Beneficial	• Rewet peatland (raise water table)
Unknown effectiveness (limited evidence)	• Irrigate peatland
No evidence found (no assessment)	• Reduce water level of flooded peatlands • Restore natural water level fluctuations

Beneficial

Rewet peatland (raise water table)

- *Plant community composition:* Ten of thirteen studies reported that rewetting affected the overall plant community composition. Six before-and-after studies (four also replicated) in peatlands in Finland, Hungary, Sweden, Poland and Germany reported development of wetland- or peatland-characteristic communities following rewetting. One replicated, paired, controlled study in the Czech Republic found differences between rewetted and drained parts of a bog. Three site comparison studies in Finland and Canada reported

differences between rewetted and natural peatlands. In contrast, three replicated studies in peatlands in the UK and fens in Germany reported that rewetting typically had no effect, or insignificant effects, on the plant community.

- *Characteristic plants:* Five studies (including one replicated site comparison) in peatlands in Canada, the UK, China and Poland reported that rewetting, sometimes along with other interventions, increased the abundance of wetland- or peatland-characteristic plants. Two replicated site comparison studies, in fens and fen meadows in Europe, found that rewetting reduced the number of fen-characteristic plant species. Two studies (one replicated, paired, controlled, before-and-after) in fens in Sweden reported that rewetting had no effect on cover of fen-characteristic plants.
- *Moss cover:* Twelve studies (two replicated, paired, controlled) in peatlands in Europe and Canada reported that rewetting, sometimes along with other interventions, increased *Sphagnum* moss cover or abundance. However two replicated studies, in bogs in Latvia and forested fens in Finland, reported that rewetting did not affect *Sphagnum* cover. Five studies (one paired, controlled, before-and-after) in bogs and fens in Finland, Sweden and Canada reported that rewetting did not affect cover of non-*Sphagnum* mosses/lichens. However two controlled studies, in bogs in Ireland and the UK, reported that rewetting reduced cover of non-*Sphagnum* bryophytes. One study in Finland reported similar moss cover in rewetted and natural peatlands, but one study in Canada reported that a rewetted bog had lower moss cover than target peatlands.
- *Herb cover:* Twenty-one studies (four replicated, paired, controlled) reported that rewetting, sometimes along with other interventions, increased cover of at least one group of herbs: reeds/rushes in five of seven studies, cottongrasses *Eriophorum* spp. in eight of nine studies, and other/total sedges in 13 of 15 studies. The studies were in bogs, fens or other peatlands in Europe, North America and China. Of four before-and-after studies in peatlands in the UK and Sweden, three reported that rewetting reduced cover of purple moor grass *Molinia caerulea* but one reported no effect. One replicated site comparison study, in forested fens in Finland, reported that rewetting had no

effect on total herb cover. Two site comparison studies in Europe reported that rewetted peatlands had greater herb cover (total or sedges/rushes) than natural peatlands.

- *Tree/shrub cover:* Ten studies (two paired and controlled) in peatlands in Finland, the UK, Germany, Latvia and Canada reported that rewetting typically reduced or had no effect on tree and/or shrub cover. Two before-and-after studies in fens in Sweden and Germany reported that tree/shrub cover increased following rewetting. One before-and-after study in a bog in the UK reported mixed effects of rewetting on different tree/shrub species.
- *Overall vegetation cover:* Of four before-and-after studies (including three controlled), two in bogs in Ireland and Sweden reported that rewetting increased overall vegetation cover. One study in a fen in New Zealand reported that rewetting reduced vegetation cover. One study in a peatland in Finland reported no effect.
- *Overall plant richness/diversity:* Six studies (including one replicated, paired, controlled, before-and-after) in Sweden, Germany and the UK reported that rewetting increased total plant species richness or diversity in peatlands. However, five studies found no effect: in bogs in the Czech Republic and Latvia, fens in Sweden and Germany, and forested fens in Finland. One study in fen meadows in the Netherlands found scale-dependent effects. One paired, controlled, before-and-after study in a peatland in Finland reported that rewetting reduced plant diversity. Of four studies that compared rewetted and natural peatlands, two in Finland and Germany reported lower species richness in rewetted peatlands, one in Sweden found higher species richness in rewetted fens, and one in Europe found similar richness in rewetted and natural fens.
- *Growth:* One replicated site comparison study, in forested fens in Finland, found that rewetting increased *Sphagnum* moss growth to natural levels.
- *Assessment: beneficial (effectiveness 80%; certainty 80%; harms 10%). Based on evidence from: bogs (fifteen studies); fens (fourteen studies); fen meadows (one study); mixed or unspecified peatlands (six studies).*

https://www.conservationevidence.com/actions/1756

Unknown effectiveness (limited evidence)

Irrigate peatland

- *Vegetation cover:* One replicated, paired, controlled, before-and-after study in a bog in Canada found that irrigation increased the number of *Sphagnum* moss shoots present after one growing season, but had no effect after two. One before-and-after study in Germany reported that an irrigated fen was colonized by wetland- and fen-characteristic herbs, whilst cover of dryland grasses decreased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 55%; certainty 30%; harms 1%). Based on evidence from: bogs (one study); fens (one study).*

https://www.conservationevidence.com/actions/1859

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Reduce water level of flooded peatlands
- Restore natural water level fluctuations.

6.7.2 Modified vegetation management

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for modified vegetation management?	
Likely to be beneficial	• Cut/mow herbaceous plants to maintain or restore disturbance • Cut large trees/shrubs to maintain or restore disturbance
Trade-off between benefit and harms	• Use grazing to maintain or restore disturbance
Unknown effectiveness (limited evidence)	• Remove plant litter to maintain or restore disturbance • Use prescribed fire to maintain or restore disturbance

Likely to be beneficial

Cut/mow herbaceous plants to maintain or restore disturbance

- *Plant community composition:* Six replicated studies in fens and fen meadows in the UK, Belgium, Germany and the Czech Republic reported that mowing altered the overall plant community composition (vs no mowing, before mowing or grazing). One site comparison study in Poland reported that mowing a degraded fen, along with other interventions, made the plant community more similar to target fen meadow vegetation.
- *Characteristic plants:* Four studies (including one replicated, paired, controlled, before-and-after) in fens and fen meadows in Switzerland, Germany, the Czech Republic and Poland found that cutting/mowing increased cover of fen meadow- or wet meadow-characteristic plants. One replicated before-and-after study, in fens in the UK, found that a single mow typically did not affect cover of fen-characteristic plants. In Poland and the UK, the effect of mowing was not separated from the effects of other interventions.
- *Moss cover:* Four replicated, paired studies (three also controlled) in fens and fen meadows in Belgium, Switzerland and the Czech Republic found that mowing increased total moss or bryophyte cover. Two replicated studies (one also controlled) in fens in Poland and the UK found that a single mow typically had no effect on bryophyte cover (total or hollow-adapted mosses).
- *Herb cover:* Six replicated studies (three also randomized and controlled) in fens and fen meadows in Belgium, Germany, Poland and the UK found that mowing reduced cover or abundance of at least one group of herbs (including bindweed *Calystegia sepium*, purple moor grass *Molinia caerulea*, reeds, sedges, and grass-like plants overall). One before-and-after study in a fen in Poland found that mowing, along with other interventions, increased sedge cover. One replicated, randomized, paired, controlled study in fen meadows in Switzerland found that mowing had no effect on overall herb cover.
- *Tree/shrub cover:* Of three replicated studies in fens, two in the UK found that a single mow, sometimes along with other interventions,

reduced overall shrub cover. The other study, in Poland, found that a single mow had no effect on overall shrub cover.

- *Vegetation structure:* In the following studies, vegetation structure was measured 6–12 months after the most recent cut/mow. Three replicated studies in fens in Poland and the UK reported that a single mow, sometimes along with other interventions, had no (or no consistent) effect on vegetation height. One replicated, paired, site comparison study in fen meadows in Switzerland found that mowing reduced vegetation height. Three studies in fen meadows in Switzerland, Poland and Italy found mixed effects of mowing on vegetation biomass (total, moss, sedge/rush, or common reed *Phragmites australis*). One replicated, paired, site comparison study in Germany reported that vegetation structure was similar in mown and grazed fen meadows.
- *Overall plant richness/diversity:* Eight studies in fens and fen meadows in the UK, Belgium, Switzerland, Germany, the Czech Republic and Poland found that mowing/cutting increased plant species richness (vs no mowing, before mowing or grazing). Three studies (two replicated, randomized, paired, controlled) in fens in Poland and the UK found that a single mow, sometimes along with other interventions, typically did not affect plant richness/diversity.
- *Assessment: likely to be beneficial (effectiveness 70%; certainty 60%; harms 10%). Based on evidence from: fens (seven studies); fen meadows (seven studies).*

https://www.conservationevidence.com/actions/1759

Cut large trees/shrubs to maintain or restore disturbance

- *Plant community composition:* One study in a fen in Poland found that where shrubs were removed, along with other interventions, the plant community became more like a target fen meadow over time.
- *Characteristic plants:* One study in a fen in Poland found that where shrubs were removed, along with other interventions, the abundance of fen meadow plant species increased over time.
- *Vegetation cover:* One replicated, paired, controlled study in a forested fen in the USA found that cutting and removing trees increased herb cover, but did not affect shrub cover.

- *Vegetation structure:* One replicated, paired, controlled study in a forested fen in the USA found that cutting and removing trees increased herb biomass and height.
- *Assessment: likely to be beneficial (effectiveness 60%; certainty 45%; harms 5%). Based on evidence from: fens (two studies).*

https://www.conservationevidence.com/actions/1761

Trade-off between benefit and harms

Use grazing to maintain or restore disturbance

- *Plant community composition:* One replicated, paired, site comparison study in Germany found that the overall plant community composition differed between grazed and mown fen meadows.
- *Characteristic plants:* One replicated, paired, controlled study in Germany reported that the abundance of bog/fen-characteristic plants was similar in grazed and ungrazed fen meadows. One replicated before-and-after study, in a fen in the UK, reported that cover of fen-characteristic mosses did not change after grazers were introduced. One replicated, paired, site comparison study in Germany found that grazed fen meadows contained fewer fen-characteristic plant species than mown meadows.
- *Herb cover:* Two before-and-after studies in fens in the UK reported that grazing increased cover of some herb species/groups (common cottongrass *Eriophorum angustifolium*, carnation sedge *Carex panicea* or grass-like plants overall). One of the studies found that grazing reduced cover of purple moor grass *Molinia caerulea*, but the other found that grazing typically had no effect on this species.
- *Moss cover:* One replicated before-and-after study, in a fen in the UK, reported that cover of fen-characteristic mosses did not change after grazers were introduced. One controlled, before-and-after study in a fen in the UK found that grazing reduced *Sphagnum* moss cover.
- *Tree/shrub cover:* Of two before-and-after studies in fens in the UK, one found that grazing reduced overall shrub cover but the other found that grazing typically had no effect on overall shrub cover.

- *Overall plant richness/diversity:* Of two before-and-after studies in fens in the UK, one (also controlled) reported that grazing increased plant species richness but the other (also replicated) found that grazing had no effect. One replicated, paired, site comparison study in Germany found that grazed fen meadows contained fewer plant species than mown meadows.
- *Assessment: trade-off between benefit and harms (effectiveness 40%; certainty 40%; harms 25%). Based on evidence from: fens (two studies); fen meadows (two studies).*

https://www.conservationevidence.com/actions/1762

Unknown effectiveness (limited evidence)

Remove plant litter to maintain or restore disturbance

- *Plant community composition:* Two studies (including one replicated, paired, controlled, before-and-after) in a fen meadow in Germany and a fen in Czech Republic found that removing plant litter did not affect plant community composition.
- *Vegetation cover:* One replicated, paired, controlled, before-and-after study in a fen in the Czech Republic found that removing plant litter did not affect cover of bryophytes or tall moor grass *Molinia arundinacea*.
- *Overall plant richness/diversity:* Of two replicated, controlled studies, one (also randomized) in a fen meadow in Germany reported that removing plant litter increased plant species richness and diversity. The other study (also paired and before-and-after) in a fen in the Czech Republic found that removing litter did not affect vascular plant diversity.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 35%; certainty 38%; harms 7%). Based on evidence from: fens (one study); fen meadows (one study).*

https://www.conservationevidence.com/actions/1760

Use prescribed fire to maintain or restore disturbance

- *Characteristic plants:* One replicated before-and-after study in a fen in the UK reported that burning, along with other interventions, did not affect cover of fen-characteristic mosses or herbs.
- *Herb cover:* One replicated, controlled study in a fen in the USA reported that burning reduced forb cover and increased sedge/rush cover, but had no effect on grass cover. One replicated before-and-after study in a fen in the UK reported that burning, along with other interventions, reduced grass/sedge/rush cover.
- *Tree/shrub cover:* Two replicated studies in fens in the USA and the UK reported that burning, sometimes along with other interventions, reduced overall tree/shrub cover.
- *Overall plant richness/diversity:* Two replicated, controlled studies in a fen in the USA and a bog in New Zealand found that burning increased plant species richness or diversity. However, one replicated before-and-after study in a fen in the UK reported that burning, along with other interventions, typically had no effect on plant species richness and diversity.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 35%; harms 20%). Based on evidence from: fens (two studies); bogs (one study).*

https://www.conservationevidence.com/actions/1763

6.7.3 Modified wild fire regime

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for modified wild fire regime?	
No evidence found (no assessment)	• Thin vegetation to prevent wild fires • Rewet peat to prevent wild fires • Build fire breaks • Adopt zero burning policies near peatlands

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Thin vegetation to prevent wild fires
- Rewet peat to prevent wild fires
- Build fire breaks
- Adopt zero burning policies near peatlands.

6.8 Threat: Invasive and other problematic species

This section includes evidence for the effects of interventions on peatland vegetation overall. Studies that only report effects on the target problematic species are, or will be, summarized in separate chapters (like Chapter 10).

6.8.1 All problematic species

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for all problematic species?	
No evidence found (no assessment)	• Implement biosecurity measures to prevent introductions of problematic species

No evidence found (no assessment)

We have captured no evidence for the following intervention:

- Implement biosecurity measures to prevent introductions of problematic species.

6.8.2 Problematic plants

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for problematic plants?	
Trade-off between benefit and harms	• Use prescribed fire to control problematic plants

Unknown effectiveness (limited evidence)	• Physically remove problematic plants • Use cutting/mowing to control problematic herbaceous plants • Change season/timing of cutting/mowing • Use cutting to control problematic large trees/ shrubs • Use herbicide to control problematic plants • Introduce an organism to control problematic plants
No evidence found (no assessment)	• Physically damage problematic plants • Use grazing to control problematic plants • Use covers/barriers to control problematic plants

Trade-off between benefit and harms

Use prescribed fire to control problematic plants

- *Plant community composition:* One replicated, paired, site comparison study in Germany found that the overall plant community composition differed between grazed and mown fen meadows.
- *Moss cover:* One replicated, paired, controlled study in bogs in Germany found that burning increased moss/lichen/bare ground cover in the short term (2–7 months after burning). Three replicated, paired studies in one bog in the UK found that moss cover (including *Sphagnum*) was higher in plots burned more often.
- *Herb cover:* Four replicated, paired studies (two also controlled) in bogs in Germany and the UK examined the effect of prescribed fire on cottongrass *Eriophorum* spp. cover. One found that burning had no effect on cottongrass cover after 2–7 months. One found that burning increased cottongrass cover after 8–18 years. Two reported that cottongrass cover was similar in plots burned every 10 or 20 years. The study in Germany also found that burning reduced cover of purple moor grass *Molinia caerulea* after 2–7 months but had mixed effects, amongst sites, on cover of other grass-like plants and forbs.
- *Tree/shrub cover:* Four replicated, paired studies (two also controlled) in bogs in Germany and the UK found that burning, or burning

more often, reduced heather *Calluna vulgaris* cover. Two replicated, controlled studies in the bogs in Germany and fens in the USA found that burning, sometimes along with other interventions, had no effect on cover of other woody plants.

- *Vegetation structure:* One replicated, paired, controlled study in a bog in the UK found that plots burned more frequently contained more biomass of grass-like plants than plots burned less often, but contained less total vegetation, shrub and bryophyte biomass.
- *Overall plant richness/diversity:* Two replicated, controlled studies in fens in the USA and a bog in the UK found that burning reduced or limited plant species richness. In the USA, burning was carried out along with other interventions.
- *Assessment: trade-off between benefit and harms (effectiveness 45%; certainty 40%; harms 20%). Based on evidence from: bogs (five studies); fens (one study).*

https://www.conservationevidence.com/actions/1774

Unknown effectiveness (limited evidence)

Physically remove problematic plants

- *Characteristic plants:* One replicated, randomized, controlled study in a fen in Ireland reported that cover of fen-characteristic plants increased after mossy vegetation was removed.
- *Herb cover:* Three replicated, controlled studies in fens in the Netherlands and Ireland reported mixed effects of moss removal on herb cover after 2–5 years. Results varied between species or between sites, and sometimes depended on other treatments applied to plots.
- *Moss cover:* One replicated, randomized, controlled study in a fen in Ireland reported that removing the moss carpet reduced total bryophyte and *Sphagnum* moss cover for three years. Two replicated, controlled, before-and-after studies in fens in the Netherlands reported that removing the moss carpet had no effect on moss cover 2–5 years later in wet plots, but reduced total moss and *Sphagnum* cover in drained plots.
- *Overall plant richness/diversity:* One replicated, controlled, before-and-after study in a fen in the Netherlands reported that removing

moss from a drained area increased plant species richness, but that there was no effect in a wetter area.

- *Assessment: unknown effectiveness – limited evidence (effectiveness 48%; certainty 35%; harms 12%). Based on evidence from: fens (three studies).*

https://www.conservationevidence.com/actions/1768

Use cutting/mowing to control problematic herbaceous plants

- *Plant community composition:* Two replicated, randomized, paired, controlled, before-and-after studies in rich fens in Sweden found that mowing typically did not affect plant community composition. One controlled study in a fen meadow in the UK reported that mown plots developed different communities to unmown plots.
- *Characteristic plants:* One replicated, randomized, paired, controlled, before-and-after study in a fen in Sweden found that mown plots contained more fen-characteristic plant species than unmown plots, although their overall cover did not differ significantly between treatments.
- *Vegetation cover:* Of two replicated, randomized, paired, controlled, before-and-after studies in rich fens in Sweden, one found that mowing had no effect on vascular plant or bryophyte cover over five years. The other study reported that mowing typically increased cover of *Sphagnum* moss and reduced cover of purple moor grass *Molinia caerulea*, but had mixed effects on cover of other plant species.
- *Growth:* One replicated, controlled, before-and-after study in a bog in Estonia found that clipping competing vegetation did not affect *Sphagnum* moss growth.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 35%; harms 10%). Based on evidence from: fens (two studies); fen meadows (one study); bogs (one study).*

https://www.conservationevidence.com/actions/1770

Change season/timing of cutting/mowing

- *Plant community composition:* One replicated, randomized, paired, before-and after study in a fen meadow in the UK reported that

changes in plant community composition over time were similar in spring-, summer- and autumn-mown plots. One study in a peatland in the Netherlands reported that summer- and winter-mown areas developed different plant community types.

- *Overall plant richness/diversity:* One replicated, randomized, paired, before-and after study in a fen meadow in the UK found that plant species richness increased more, over two years, in summer-mown plots than spring- or autumn-mown plots.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 25%; harms 10%). Based on evidence from: fen meadows (one study); mixed peatlands (one study).*

https://www.conservationevidence.com/actions/1771

Use cutting to control problematic large trees/shrubs

- *Plant community composition:* Two studies (one replicated, controlled, before-and-after) in fens in the USA and Sweden reported that the plant community composition changed after removing trees/shrubs to less like unmanaged fens or more like undegraded, open fen.
- *Characteristic plants:* One study in a fen in Sweden found that species richness and cover of fen-characteristic plants increased after trees/shrubs were removed.
- *Vegetation cover:* One study in a fen in Sweden found that bryophyte and vascular plant cover increased after trees/shrubs were removed. One replicated, controlled, before-and-after study in fens in the USA found that removing shrubs, along with other interventions, could not prevent increases in total woody plant cover over time.
- *Overall plant richness/diversity:* One study in a fen in Sweden found that moss and vascular plant species richness increased after trees/shrubs were removed. However, one replicated, controlled, before-and-after study in fens in the USA found that removing shrubs, along with other interventions, prevented increases in total plant species richness.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 30%; harms 15%). Based on evidence from: fens (two studies).*

https://www.conservationevidence.com/actions/1772

Use herbicide to control problematic plants

- *Plant community composition:* One replicated, controlled, before-and-after study in fens in the USA found that applying herbicide to shrubs, along with other interventions, changed the overall plant community composition.
- *Tree/shrub cover:* The same study found that applying herbicide to shrubs, along with other interventions, could not prevent increases in total woody plant cover over time.
- *Overall plant richness/diversity:* The same study found that applying herbicide to shrubs, along with other interventions, prevented increases in plant species richness.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 20%; certainty 20%; harms 30%). Based on evidence from: fens (one study).*

https://www.conservationevidence.com/actions/1776

Introduce an organism to control problematic plants

- *Plant community composition:* One controlled, before-and-after study in a fen meadow in Belgium found that introducing a parasitic plant altered the plant community composition.
- *Vegetation cover:* The same study found that introducing a parasitic plant reduced cover of the dominant sedge *Carex acuta* but increased moss cover.
- *Overall plant richness/diversity:* The same study found that introducing a parasitic plant increased overall plant species richness.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 20%; harms 15%). Based on evidence from: fen meadows (one study).*

https://www.conservationevidence.com/actions/1777

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Physically damage problematic plants
- Use grazing to control problematic plants
- Use covers/barriers to control problematic plants.

6.8.3 Problematic animals

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for problematic animals?	
Unknown effectiveness (limited evidence)	• Exclude wild herbivores using physical barriers
No evidence found (no assessment)	• Control populations of wild herbivores

Unknown effectiveness (limited evidence)

Exclude wild herbivores using physical barriers

- *Vegetation cover:* One replicated, paired, controlled study in a fen meadow in Poland reported that the effect of boar- and deer exclusion on vascular plant and moss cover depended on other treatments applied to plots.
- *Vegetation structure:* The same study reported that the effect of boar- and deer exclusion on total vegetation biomass depended on other treatments applied to plots.
- *Overall plant richness/diversity:* The same study reported that the effect of boar- and deer exclusion on plant species richness depended on other treatments applied to plots.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 30%; certainty 25%; harms 10%). Based on evidence from: fen meadows (one study).*

https://www.conservationevidence.com/actions/1860

No evidence found (no assessment)

We have captured no evidence for the following intervention:

- Control populations of wild herbivores.

6.9 Threat: Pollution

6.9.1 Multiple sources of pollution

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for multiple sources of pollution?	
Likely to be beneficial	• Divert/replace polluted water source(s)
Unknown effectiveness (limited evidence)	• Clean waste water before it enters the environment • Slow down input water to allow more time for pollutants to be removed
No evidence found (no assessment)	• Retain or create buffer zones between pollution sources and peatlands • Use artificial barriers to prevent pollution entering peatlands • Reduce fertilizer or herbicide use near peatlands • Manage fertilizer or herbicide application near peatlands

Likely to be beneficial

Divert/replace polluted water source(s)

- *Characteristic plants:* One study in a fen in the Netherlands found that after a nutrient-enriched water source was replaced, along with other interventions to reduce pollution, cover of mosses characteristic of low nutrient levels increased.

- *Vegetation cover:* Two studies in bogs in the UK and Japan reported that after polluting water sources were diverted, sometimes along with other interventions, *Sphagnum* moss cover increased. Both studies reported mixed effects on different species of herbs.
- *Assessment: likely to be beneficial (effectiveness 70%; certainty 50%; harms 10%). Based on evidence from: bogs (two studies); fens (one study).*

https://www.conservationevidence.com/actions/1779

Unknown effectiveness (limited evidence)

Clean waste water before it enters the environment

- *Characteristic plants:* One study in the Netherlands found that cleaning water entering a floating fen, along with other interventions to reduce pollution, allowed cover of mosses characteristic of low nutrient levels to increase.
- *Vegetation structure:* The same study found that after the input water began to be cleaned, along with other interventions to reduce pollution, vascular plant biomass decreased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 25%; harms 0%). Based on evidence from: fens (one study).*

https://www.conservationevidence.com/actions/1778

Slow down input water to allow more time for pollutants to be removed

- *Characteristic plants:* One before-and-after study in a floating fen in the Netherlands found that after input water was rerouted on a longer path, along with other interventions to reduce pollution, cover of mosses characteristic of low nutrient levels increased.
- *Vegetation structure:* The same study found that after the input water was rerouted on a longer path, along with other interventions to reduce pollution, vascular plant biomass decreased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 20%; harms 5%). Based on evidence from: fens (one study).*

https://www.conservationevidence.com/actions/1780

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Retain or create buffer zones between pollution sources and peatlands
- Use artificial barriers to prevent pollution entering peatlands
- Reduce fertilizer or herbicide use near peatlands
- Manage fertilizer or herbicide application near peatlands.

6.9.2 Agricultural and aquacultural effluents

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for agricultural/aquacultural effluents?	
No evidence found (no assessment)	• Convert to organic agriculture or aquaculture near peatlands • Limit the density of livestock on farmland near peatlands • Use biodegradable oil in farming machinery

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Convert to organic agriculture or aquaculture near peatlands
- Limit the density of livestock on farmland near peatlands
- Use biodegradable oil in farming machinery.

6.9.3 Industrial and military effluents

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for industrial and military effluents?	
No evidence found (no assessment)	• Remove oil from contaminated peatlands

No evidence found (no assessment)

We have captured no evidence for the following intervention:

- Remove oil from contaminated peatlands.

6.9.4 Airborne pollutants

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for airborne pollutants?	
Unknown effectiveness (limited evidence)	• Remove pollutants from waste gases before they enter the environment • Add lime to reduce acidity and/or increase fertility • Drain/replace acidic water

Unknown effectiveness (limited evidence)

Remove pollutants from waste gases before they enter the environment

- *Plant richness/diversity:* One study in bogs in Estonia reported that after dust filters were installed in industrial plants, along with a general reduction in emissions, the number of *Sphagnum* moss species increased but the total number of plant species decreased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 20%; harms 0%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1789

Add lime to reduce acidity and/or increase fertility

- *Vegetation structure:* One replicated, controlled study in a fen meadow in the Netherlands found that liming increased overall vegetation biomass (mostly velvety bentgrass *Agrostis canina*).
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 15%; harms 20%). Based on evidence from: fen meadows (one study).*

https://www.conservationevidence.com/actions/1790

Drain/replace acidic water

- *Vegetation cover:* Two controlled studies in fens in the Netherlands reported that draining acidic water had mixed effects on cover of *Sphagnum* moss and herbs after 4–5 years, depending on the species and whether moss was also removed.
- *Overall plant richness/diversity:* One controlled, before-and-after study in a fen in the Netherlands reported that draining and replacing acidic water increased plant species richness.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 35%; harms 10%). Based on evidence from: fens (two studies).*

https://www.conservationevidence.com/actions/1791

6.10 Threat: Climate change and severe weather

Based on the collated evidence, what is the current assessment of the effectiveness of interventions for climate change and severe weather?	
No evidence found (no assessment)	• Add water to peatlands to compensate for drought • Plant shelter belts to protect peatlands from wind • Build barriers to protect peatlands from the sea • Restore/create peatlands in areas that will be climatically suitable in the future

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Add water to peatlands to compensate for drought
- Plant shelter belts to protect peatlands from wind
- Build barriers to protect peatlands from the sea
- Restore/create peatlands in areas that will be climatically suitable in the future.

6.11 Habitat creation and restoration

Remember, the effectiveness category for each intervention assumes that the aims of the intervention match your management goals. You should consider whether each intervention is necessary and appropriate in your focal peatland.

6.11.1 General habitat creation and restoration

Based on the collated evidence, what is the current assessment of the effectiveness of general habitat creation and restoration interventions?	
Likely to be beneficial	• Restore/create peatland vegetation (multiple interventions) • Restore/create peatland vegetation using the moss layer transfer technique

Likely to be beneficial

Restore/create peatland vegetation (multiple interventions)

- *Plant community composition:* One replicated, controlled, before-and-after study in the UK reported that the overall plant community composition differed between restored and unrestored bogs. One replicated, controlled, site comparison study in Estonia found that restored and natural bogs contained more similar plant communities than unrestored and natural bogs. However, one site comparison

study in Canada reported that after five years, bogs being restored as fens contained a different plant community to natural fens.

- *Characteristic plants:* One controlled study, in a fen in France, reported that restoration interventions increased cover of fen-characteristic plants.
- *Moss cover:* Five studies (one replicated, paired, controlled, before-and-after) in bogs or other peatlands in the UK, Estonia and Canada found that restoration interventions increased total moss or bryophyte cover. Two studies (one replicated and controlled) in bogs in the Czech Republic and Estonia reported that restoration interventions increased *Sphagnum* moss cover, but one replicated before-and-after study in bogs in the UK reported no change in *Sphagnum* cover following intervention. Two site comparison studies in Canada reported that after 1–15 years, restored areas had lower moss cover than natural fens.
- *Herb cover:* Five studies (one replicated, paired, controlled, before-and-after) in peatlands in the Czech Republic, the UK, Estonia and Canada reported that restoration interventions increased cover of herbs, including cottongrasses *Eriophorum* spp. and other grass-like plants.
- *Overall vegetation cover:* Three studies (one replicated, controlled, before-and-after) in bogs in the UK and France reported that restoration interventions increased overall vegetation cover.
- *Assessment: likely to be beneficial (effectiveness 75%; certainty 60%; harms 5%). Based on evidence from: bogs (six studies); fens (one study); mixed or unspecified peatlands (two studies).*

https://www.conservationevidence.com/actions/1803

Restore/create peatland vegetation using the moss layer transfer technique

- *Plant community composition:* One replicated study in bogs in Canada reported that the majority of restored areas developed a community of bog-characteristic plant species within eleven years. One controlled, before-and-after study in a bog in Canada reported that a restored area (included in the previous study) developed a more

peatland-characteristic plant community over time, and relative to an unrestored area.

- *Vegetation cover:* Two controlled studies in one bog in Canada reported that after 4–8 years, a restored area had greater cover than an unrestored area of mosses and bryophytes (including *Sphagnum* spp.) and herbs (including cottongrasses *Eriophorum* spp.), but less cover of shrubs. One of the studies reported that vegetation in the restored area became more similar to local natural bogs.
- *Overall plant richness/diversity:* One controlled, before-and-after study in a bog in Canada reported that after eight years, a restored area contained more plant species than an unrestored area.
- *Assessment: likely to be beneficial (effectiveness 70%; certainty 60%; harms 1%). Based on evidence from: bogs (four studies).*

https://www.conservationevidence.com/actions/1804

6.11.2 Modify physical habitat only

Based on the collated evidence, what is the current assessment of the effectiveness of interventions that modify the physical habitat only?	
Likely to be beneficial	• Fill/block ditches to create conditions suitable for peatland plants • Remove upper layer of peat/soil
Unknown effectiveness (limited evidence)	• Excavate pools • Reprofile/relandscape peatland • Disturb peatland surface to encourage growth of desirable plants • Add inorganic fertilizer • Cover peatland with organic mulch • Cover peatland with something other than mulch • Stabilize peatland surface to help plants colonize • Build artificial bird perches to encourage seed dispersal
No evidence found (no assessment)	• Roughen peat surface to create microclimates • Bury upper layer of peat/soil • Introduce nurse plants

Likely to be beneficial

Fill/block ditches to create conditions suitable for peatland plants

- *Vegetation cover:* Two studies, in a bog in the UK and a fen in the USA, reported that blocked or filled ditches were colonized by peatland vegetation within 2–3 years. In the USA, vegetation cover was restored to natural, undisturbed levels. One replicated study in bogs in the UK reported that plants had not colonized blocked gullies after six months.
- *Overall plant richness/diversity:* One site comparison study in a fen in the USA found that after two years, a filled ditch contained more plant species than adjacent undisturbed fen.
- *Assessment: likely to be beneficial (effectiveness 60%; certainty 50%; harms 0%). Based on evidence from: bogs (two studies); fens (one study).*

https://www.conservationevidence.com/actions/1805

Remove upper layer of peat/soil

- *Plant community composition:* Five studies (one replicated, randomized, paired, controlled) in a peatland in the USA and fens or fen meadows in the Netherlands and Poland reported that plots stripped of topsoil developed different plant communities to unstripped peatlands. In one study, the effect of stripping was not separated from the effect of rewetting. Two studies in fen meadows in Germany and Poland reported that the depth of soil stripping affected plant community development.
- *Characteristic plants:* Four studies (one replicated, randomized, paired, controlled) in fen meadows in Germany and the Netherlands, and a peatland in the USA, reported that stripping soil increased cover of wetland- or peatland-characteristic plants after 4–13 years. In the Netherlands, the effect of stripping was not separated from the effect of rewetting. One replicated site comparison study in fens in Belgium and the Netherlands found that stripping soil increased fen-characteristic plant richness.

- *Herb cover:* Three studies (one replicated, paired, controlled) in fens or fen meadows in Germany, the UK and Poland found that stripping soil increased rush, reed or sedge cover after 2–6 years. One controlled study in a fen meadow in the Netherlands reported that stripping soil had no effect on cover of true sedges *Carex* spp. or velvety bentgrass *Agrostis canina* after five years. Two controlled studies, in fens or fen meadows in the Netherlands and the UK, found that stripping soil reduced cover of purple moor grass *Molinia caerulea* for 2–5 years.
- *Vegetation structure:* Two studies, in fens or fen meadows in the Netherlands and Belgium, found that stripping soil reduced vegetation biomass (total or herbs) for up to 18 years. One replicated, randomized, paired, controlled study in a peatland in the USA found that stripping soil did not affect vegetation biomass after four years.
- *Overall plant richness/diversity:* Three studies (one replicated, paired, controlled) in fens or fen meadows in the UK, Belgium and the Netherlands reported that stripping soil increased total plant species richness over 2–18 years. In one study, the effect of stripping was not separated from the effect of rewetting. One replicated, controlled study in a fen in Poland found that stripping soil had no effect on plant species richness after three years. One replicated, randomized, paired, controlled study in a peatland in the USA found that stripping soil increased plant species richness and diversity, after four years, in one field but decreased it in another. One replicated study in a fen meadow in Poland reported that plant species richness increased after soil was stripped.
- *Assessment: likely to be beneficial (effectiveness 55%; certainty 50%; harms 10%). Based on evidence from: fen meadows (six studies); fens (three studies); unspecified peatlands (one study).*

https://www.conservationevidence.com/actions/1809

Unknown effectiveness (limited evidence)

Excavate pools

- *Plant community composition:* One replicated, before-and-after, site comparison study in bogs in Canada reported that excavated pools were colonized by some peatland vegetation over 4–6 years, but

contained different plant communities to natural pools. In particular, cattail *Typha latifolia* was more common in created pools.

- *Vegetation cover:* One replicated, before-and-after, site comparison study in bogs in Canada reported that after four years, created pools had less cover than natural pools of *Sphagnum* moss, herbs and shrubs.
- *Overall plant richness/diversity:* One replicated, before-and-after, site comparison study in bogs in Canada reported that after six years, created pools contained a similar number of plant species to natural pools.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 45%; certainty 38%; harms 5%). Based on evidence from: bogs (two studies).*

https://www.conservationevidence.com/actions/1806

Reprofile/relandscape peatland

- *Plant community composition:* One site comparison study in Canada reported that after five years, reprofiled and rewetted bogs (being restored as fens) contained a different plant community to nearby natural fens.
- *Vegetation cover:* The same study reported that after five years, reprofiled and rewetted bogs (being restored as fens) had lower vegetation cover than nearby natural fens (specifically *Sphagnum* moss, other moss and vascular plants).
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 20%; harms 10%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1807

Disturb peatland surface to encourage growth of desirable plants

- *Plant community composition:* Two replicated, paired, controlled, before-and-after studies (one also randomized) in fens in Germany and Sweden reported that soil disturbance affected development of the plant community over 2–3 years. In Germany, disturbed plots developed greater cover of weedy species from the seed bank than undisturbed plots. In Sweden, the community in disturbed and undisturbed plots became less similar over time.

- *Characteristic plants:* The same two studies reported that wetland- or fen-characteristic plants colonized plots that had been disturbed (along with other interventions). The study in Germany noted that no peat-forming species colonized the fen.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 45%; certainty 30%; harms 20%). Based on evidence from: fens (two studies).*

https://www.conservationevidence.com/actions/1811

Add inorganic fertilizer

- *Vegetation cover:* One replicated, randomized, paired, controlled, before-and-after study in a bog in New Zealand reported that fertilizing typically increased total vegetation cover.
- *Vegetation structure:* One replicated, paired, controlled study in a fen meadow in the Netherlands found that fertilizing with phosphorous typically increased total above-ground vegetation biomass, but other chemicals typically had no effect.
- *Overall plant richness/diversity:* One replicated, randomized, paired, controlled, before-and-after study in a bog in New Zealand reported that fertilizing typically increased plant species richness.
- *Growth:* One replicated, controlled, before-and-after study in a bog in Germany found that fertilizing with phosphorous typically increased herb and shrub growth rate, but other chemicals had no effect.
- *Other:* Three replicated, controlled studies in a fen meadow in Germany and bogs in Germany and New Zealand reported that effects of fertilizer on peatland vegetation were more common when phosphorous was added, than when nitrogen or potassium were added.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 30%; harms 15%). Based on evidence from: bogs (two studies); fen meadows (one study).*

https://www.conservationevidence.com/actions/1812

Cover peatland with organic mulch

- *Vegetation cover:* One replicated, randomized, paired, controlled, before-and-after study in a bog (being restored as a fen) in Canada found that mulching bare peat did not affect cover of fen-characteristic

plants. One replicated, controlled, before-and-after study in a bog in Australia reported that plots mulched with straw had similar *Sphagnum* moss cover to unmulched plots.

- *Characteristic plants:* One replicated, randomized, paired, controlled, before-and-after study in a bog (being restored as a fen) in Canada found that covering bare peat with straw mulch increased the number of fen characteristic plants, but not their overall cover.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 30%; harms 5%). Based on evidence from: bogs (two studies).*

https://www.conservationevidence.com/actions/1813

Cover peatland with something other than mulch

- *Vegetation cover:* One replicated, controlled, before-and-after study in a bog in Germany reported that covering bare peat with fleece or fibre mats did not affect the number of seedlings of five herb/shrub species. One replicated, controlled, before-and-after study in bogs in Australia reported that recently-burned plots shaded with plastic mesh developed greater cover of native plants, forbs and *Sphagnum* moss than unshaded plots.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 40%; certainty 30%; harms 5%). Based on evidence from: bogs (two studies).*

https://www.conservationevidence.com/actions/1814

Stabilize peatland surface to help plants colonize

- *Vegetation cover:* One controlled, before-and-after study in a bog in the UK found that pegging coconut fibre rolls onto almost-bare peat did not affect the development of vegetation cover (total, mosses, shrubs or common cottongrass *Eriophorum angustifolium*).
- *Assessment: unknown effectiveness – limited evidence (effectiveness 20%; certainty 20%; harms 5%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1815

Build artificial bird perches to encourage seed dispersal

- *Vegetation cover:* One replicated, paired, controlled study in a peat swamp forest in Indonesia found that artificial bird perches had no significant effect on tree seedling abundance.

- *Assessment: unknown effectiveness – limited evidence (effectiveness 20%; certainty 20%; harms 1%). Based on evidence from: tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1817

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Roughen peat surface to create microclimates
- Bury upper layer of peat/soil
- Introduce nurse plants.

6.11.3 Introduce peatland vegetation

Based on the collated evidence, what is the current assessment of the effectiveness of interventions that introduce peatland vegetation?	
Beneficial	• Add mosses to peatland surface • Add mixed vegetation to peatland surface
Likely to be beneficial	• Directly plant peatland mosses • Directly plant peatland herbs • Directly plant peatland trees/shrubs • Introduce seeds of peatland herbs • Introduce seeds of peatland trees/shrubs

Beneficial

Add mosses to peatland surface

- *Sphagnum moss cover:* Eleven studies in bogs in the UK, Canada, Finland and Germany and fens in the USA reported that *Sphagnum* moss was present, after 1–4 growing seasons, in at least some plots sown with *Sphagnum*. Cover ranged from negligible to >90%. Six of these studies were controlled and found that there was more *Sphagnum* in sown than unsown plots. One additional study in

Canada found that adding *Sphagnum* to bog pools did not affect *Sphagnum* cover.

- *Other moss cover:* Four studies (including one replicated, randomized, paired, controlled, before-and-after) in bogs in Canada and fens in Sweden and the USA reported that mosses other than *Sphagnum* were present, after 2–3 growing seasons, in at least some plots sown with moss fragments. Cover ranged from negligible to 76%. In the fens in Sweden and the USA, moss cover was low (<1%) unless the plots were mulched, shaded or limed.
- *Assessment: beneficial (effectiveness 78%; certainty 70%; harms 1%). Based on evidence from: bogs (eleven studies); fens (two studies).*

https://www.conservationevidence.com/actions/1821

Add mixed vegetation to peatland surface

- *Characteristic plants:* One replicated, randomized, paired, controlled, before-and-after study in a degraded bog (being restored as a fen) in Canada found that adding fen vegetation increased the number and cover of fen-characteristic plant species.
- *Sphagnum moss cover:* Seventeen replicated studies (five also randomized, paired, controlled, before-and-after) in bogs in Canada, the USA and Estonia reported that *Sphagnum* moss was present, after 1–6 growing seasons, in at least some plots sown with vegetation containing *Sphagnum*. Cover ranged from <1 to 73%. Six of the studies were controlled and found that *Sphagnum* cover was higher in sown than unsown plots. Five of the studies reported that *Sphagnum* cover was very low (<1%) unless plots were mulched after spreading fragments.
- *Other moss cover:* Eight replicated studies (seven before-and-after, one controlled) in bogs in Canada, the USA and Estonia reported that mosses or bryophytes other than *Sphagnum* were present, after 1–6 growing seasons, in at least some plots sown with mixed peatland vegetation. Cover ranged from <1 to 65%.
- *Vascular plant cover:* Ten replicated studies in Canada, the USA and Estonia reported that vascular plants appeared following addition of mixed vegetation fragments to bogs. Two of the studies were controlled: one found that vascular plant cover was significantly

higher in sown than unsown plots, but one found that sowing peatland vegetation did not affect herb cover.

- *Assessment: beneficial (effectiveness 78%; certainty 68%; harms 1%). Based on evidence from: bogs (eighteen studies).*

https://www.conservationevidence.com/actions/1822

Likely to be beneficial

Directly plant peatland mosses

- *Survival:* One study in Lithuania reported that 47 of 50 *Sphagnum*-dominated sods planted into a rewetted bog survived for one year.
- *Growth:* Two before-and-after studies, in a fen in the Netherlands and bog pools in the UK, reported that mosses grew after planting.
- *Moss cover:* Five before-and-after studies in a fen in the Netherlands and bogs in Germany, Ireland, Estonia and Australia reported that after planting mosses, the area covered by moss increased in at least some cases. The study in the Netherlands reported spread of planted moss beyond the introduction site. The study in Australia was controlled and reported that planted plots developed greater *Sphagnum* moss cover than unplanted plots.
- *Assessment: likely to be beneficial (effectiveness 75%; certainty 60%; harms 0%). Based on evidence from: bogs (six studies); fens (one study).*

https://www.conservationevidence.com/actions/1818

Directly plant peatland herbs

- *Survival:* Three replicated studies, in a fen meadow in the Netherlands and fens in the USA, reported that planted herbs survived over 2–3 years. However, for six of nine species only a minority of individuals survived.
- *Growth:* Two replicated before-and-after studies, in a bog in Germany and fens in the USA, reported that planted herbs grew.
- *Vegetation cover:* One replicated, controlled, before-and-after study in Canada found that planting herbs had no effect on moss, herb or shrub cover in created bog pools relative to natural colonization.

- *Assessment: likely to be beneficial (effectiveness 50%; certainty 40%; harms 0%). Based on evidence from: bogs (two studies); fens (two studies); fen meadows (one study).*

https://www.conservationevidence.com/actions/1819

Directly plant peatland trees/shrubs

- *Survival:* Eight studies (seven replicated) in peat swamp forests in Thailand, Malaysia and Indonesia and bogs in Canada reported that the majority of planted trees/shrubs survived over periods between 10 weeks and 13 years. One study in a peat swamp forest in Indonesia reported <5% survival of planted trees after five months, following unusually deep flooding. One replicated study in a fen in the USA reported that most planted willow *Salix* spp. cuttings died within two years.
- *Growth:* Four studies (including two replicated, before-and-after) in peat swamp forests in Thailand, Indonesia and Malaysia reported that planted trees grew. One replicated before-and-after study in bogs in Canada reported that planted shrubs grew.
- *Assessment: likely to be beneficial (effectiveness 70%; certainty 50%; harms 0%). Based on evidence from: tropical peat swamps (seven studies); bogs (three studies); fens (one study).*

https://www.conservationevidence.com/actions/1820

Introduce seeds of peatland herbs

- *Germination:* Two replicated studies (one also controlled, before-and-after) reported that some planted herb seeds germinated. In a bog in Germany three of four species germinated, but in a fen in the USA only one of seven species germinated.
- *Characteristic plants:* Three studies (two controlled) in fen meadows in Germany and a peatland in China reported that wetland-characteristic or peatland-characteristic plants colonized plots where herb seeds were sown (sometimes along with other interventions).
- *Herb cover:* Three before-and-after studies (one also replicated, randomized, paired, controlled) in a bog in New Zealand, fen meadows in Switzerland and a peatland in China reported that plots sown with herb seeds developed cover of the sown herbs (and, in

New Zealand, greater cover than unsown plots). In China, the effect of sowing was not separated from the effects of other interventions. One replicated, randomized, paired, controlled study in a fen in the USA found that plots sown with herb (and shrub) seeds developed similar herb cover to plots that were not sown.

- *Overall vegetation cover:* Of three replicated, controlled studies, one in a fen in the USA found that sowing herb (and shrub) seeds increased total vegetation cover. One study in a bog in New Zealand found that sowing herb seeds had no effect on total vegetation cover. One study in a fen meadow in Poland found that the effect of adding seed-rich hay depended on other treatments applied to plots.
- *Overall plant richness/diversity:* Two replicated, controlled studies in fens in the USA and Poland found that sowing herb seeds had no effect on plant species richness (total or vascular). Two replicated, controlled, before-and-after studies in a bog in New Zealand and a fen meadow in Poland each reported inconsistent effects of herb sowing on total plant species richness.
- *Assessment: likely to be beneficial (effectiveness 50%; certainty 50%; harms 0%). Based on evidence from: fen meadows (four studies); fens (three studies); bogs (two studies); unspecified peatlands (one study).*

https://www.conservationevidence.com/actions/1823

Introduce seeds of peatland trees/shrubs

- *Germination:* Two replicated studies in a bog in Germany and a fen in the USA reported germination of heather *Calluna vulgaris* and hoary willow *Salix candida* seeds, respectively, in at least some sown plots.
- *Survival:* The study in the bog Germany reported survival of some heather seedlings over two years. The study in the fen in the USA reported that all germinated willow seedlings died within one month.
- *Shrub cover:* Two studies (one replicated, randomized, paired, controlled) in bogs in New Zealand and Estonia reported that plots sown with shrub seeds, sometimes along with other interventions, developed greater cover of some shrubs than plots that were not sown: sown manuka *Leptospermum scoparium* or naturally colonizing heather *Calluna vulgaris* (but not sown cranberry *Oxycoccus palustris*).

One replicated, randomized, paired, controlled study in a fen in the USA found that plots sown with shrub (and herb) seeds developed similar overall shrub cover to unsown plots within two years.

- *Overall vegetation cover:* Two replicated, randomized, paired, controlled studies in a bog in New Zealand and a fen in the USA reported that plots sown with shrub (and herb) seeds developed greater total vegetation cover than unsown plots after two years. One site comparison study in bogs in Estonia reported that sowing shrub seeds, along with fertilization, had no effect on total vegetation cover after 25 years.
- *Overall plant richness/diversity:* One site comparison study in bogs in Estonia reported that sowing shrub seeds, along with fertilization, increased plant species richness. However, one replicated, randomized, paired, controlled study in a bog in New Zealand reported that plots sown with shrub seeds typically contained fewer plant species than plots that were not sown. One replicated, randomized, paired, controlled study in a fen in the USA found that sowing shrub (and herb) seeds had no effect on plant species richness.
- *Assessment: likely to be beneficial (effectiveness 45%; certainty 40%; harms 5%). Based on evidence from: bogs (three studies); fens (two studies).*

https://www.conservationevidence.com/actions/1824

6.12 Actions to complement planting

Based on the collated evidence, what is the current assessment of the effectiveness of actions to complement planting peatland vegetation?	
Likely to be beneficial	• Cover peatland with organic mulch (after planting) • Cover peatland with something other than mulch (after planting) • Reprofile/relandscape peatland (before planting)
Trade-off between benefit and harms	• Add inorganic fertilizer (before/after planting)
Unknown effectiveness (limited evidence)	• Introduce nurse plants (to aid focal peatland plants) • Irrigate peatland (before/after planting) • Create mounds or hollows (before planting) • Add fresh peat to peatland (before planting) • Remove vegetation that could compete with planted peatland vegetation • Add root-associated fungi to plants (before planting)
Likely to be ineffective or harmful	• Add lime (before/after planting)
No evidence found (no assessment)	• Add organic fertilizer (before/after planting) • Rewet peatland (before/after planting) • Remove upper layer of peat/soil (before planting) • Bury upper layer of peat/soil (before planting) • Encapsulate planted moss fragments in beads/gel • Use fences or barriers to protect planted vegetation • Protect or prepare vegetation before planting (other interventions)

Likely to be beneficial

Cover peatland with organic mulch (after planting)

- *Germination:* One replicated, controlled, before-and-after study in a bog in Germany found that mulching after sowing seeds increased germination of two species (a grass and a shrub), but had no effect on three other herb species.
- *Survival:* Two replicated, paired, controlled studies in a fen in Sweden and a bog in the USA reported that mulching increased survival of planted vegetation (mosses or sedges). One replicated, paired, controlled study in Indonesia reported that mulching with oil palm fruits reduced survival of planted peat swamp tree seedlings.
- *Growth:* One replicated, randomized, paired, controlled, before-and-after study in a fen in the USA reported that mulching increased growth of transplanted water sedge *Carex aquatilis*.
- *Cover:* Six studies (including four replicated, randomized, paired, controlled, before-and-after) in bogs in Canada and the USA, and a fen in Sweden, found that mulching after planting increased vegetation cover (specifically total vegetation, total mosses/bryophytes, *Sphagnum* mosses or vascular plants after 1–3 growing seasons). Three replicated, randomized, paired, controlled, before-and-after studies in bogs in Canada found that mulching after planting had no effect on vegetation cover (*Sphagnum* mosses or fen-characteristic plants).
- *Assessment: likely to be beneficial (effectiveness 60%; certainty 60%; harms 10%). Based on evidence from: bogs (nine studies); fens (two studies); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1828

Cover peatland with something other than mulch (after planting)

- *Germination:* One replicated, controlled, before-and-after study in a bog in Germany reported mixed effects of fleece and fibre mats on germination of sown herb and shrub seeds (positive or no effect, depending on species).

- *Survival:* Two replicated, randomized, controlled studies examined the effect, on plant survival, of covering planted areas. One study in a fen in Sweden reported that shading increased survival of planted mosses. One study in a nursery in Indonesia reported that shading did not affect survival of most studied peat swamp tree species, but increased survival of some.
- *Growth:* Three replicated, randomized, controlled, before-and-after studies examined the effect, on plant growth, of covering planted areas. One study in a greenhouse in Switzerland found that covers, either transparent plastic or shading mesh, increased growth of planted *Sphagnum* moss. One study in a fen in Sweden found that shading with plastic mesh reduced growth of planted fen mosses. One study in a nursery in Indonesia reported that seedlings shaded with plastic mesh grew taller and thinner than unshaded seedlings.
- *Cover:* Two replicated and paired studies, in a fen in Sweden and a bog in Australia, reported that shading plots with plastic mesh increased planted moss cover. One study in a bog in Canada found that covering sown plots with plastic mesh, but not transparent sheets, increased *Sphagnum* moss abundance. Another study in a bog in Canada reported that shading sown plots with plastic mesh did not affect cover of vegetation overall, vascular plants or mosses.
- *Assessment: likely to be beneficial (effectiveness 50%; certainty 50%; harms 10%). Based on evidence from: bogs (five studies); fens (two studies); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1829

Reprofile/relandscape peatland (before planting)

- *Survival:* One replicated, paired, controlled study in a bog in Canada found that over one growing season, survival of sown *Sphagnum* mosses was higher in reprofiled basins than on raised plots.
- *Cover:* Two replicated, controlled, before-and-after studies in bogs in Canada found that reprofiled basins had higher *Sphagnum* cover than raised plots, 3–4 growing seasons after sowing *Sphagnum*-dominated vegetation fragments. One controlled study in a bog in Estonia reported that reprofiled and raised plots had similar *Sphagnum* cover, 1–2 years after sowing. All three studies found that

reprofiled and raised plots developed similar cover of other mosses/ bryophytes and vascular plants.

- *Assessment: likely to be beneficial (effectiveness 60%; certainty 40%; harms 5%). Based on evidence from: bogs (four studies).*

https://www.conservationevidence.com/actions/1833

Trade-off between benefit and harms

Add inorganic fertilizer (before/after planting)

- *Survival:* Two replicated, randomized, paired, controlled studies in bogs in Canada examined the effect, on plant survival, of adding inorganic fertilizer to areas planted with peatland plants. One study reported that fertilizer increased survival of two planted tree species. The other study found that fertilizer had no effect on three planted tree species and reduced survival of one.
- *Growth:* Five studies (three replicated, randomized, paired, controlled) in bogs in the UK, Germany and Canada found that fertilizer typically increased growth of planted mosses, herbs or trees. However, for some species or in some conditions, fertilizer had no effect on growth. One replicated, randomized, controlled, before-and-after study in a nursery in Indonesia found that fertilizer typically had no effect on growth of peat swamp tree seedlings.
- *Cover:* Three replicated, randomized, paired, controlled studies in bogs examined the effect, on vegetation cover, of adding inorganic fertilizer to areas planted with peatland plants. One study in Canada found that fertilizer increased total vegetation, vascular plant and bryophyte cover. Another study in Canada found that fertilizer increased cover of true sedges *Carex* spp. but had no effect on other vegetation. One study in New Zealand reported that fertilizer typically increased cover of a sown shrub and rush, but this depended on the chemical used and preparation of the peat.
- *Assessment: trade-off between benefit and harms (effectiveness 45%; certainty 40%; harms 20%). Based on evidence from: bogs (eight studies); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1826

Unknown effectiveness (limited evidence)

Introduce nurse plants (to aid focal peatland plants)

- *Survival:* One replicated, paired, controlled study in Malaysia reported that planting nurse trees did not affect survival of planted peat swamp tree seedlings (averaged across six species).
- *Cover:* Two replicated, randomized, paired, controlled, before-and-after studies in bogs in the USA and Canada found that planting nurse herbs had no effect on cover, after 2–3 years, of other planted vegetation (mosses/bryophytes, vascular plants or total cover).
- *Assessment: unknown effectiveness – limited evidence (effectiveness 30%; certainty 38%; harms 1%). Based on evidence from: bogs (two studies); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1830

Irrigate peatland (before/after planting)

- *Cover:* One replicated, paired, controlled, before-and-after study in a bog in Canada found that irrigation increased the number of *Sphagnum* moss shoots present 1–2 growing seasons after sowing *Sphagnum* fragments.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 20%; harms 5%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1832

Create mounds or hollows (before planting)

- *Growth:* One controlled study, in a peat swamp in Thailand, reported that trees planted into mounds of peat grew thicker stems than trees planted at ground level.
- *Cover:* Two replicated, randomized, paired, controlled, before-and-after studies in bogs in Canada found that roughening the peat surface (e.g. by harrowing or adding peat blocks) did not significantly affect cover of planted *Sphagnum* moss, after 1–3 growing seasons.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 30%; certainty 38%; harms 5%). Based on evidence from: bogs (two studies); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1834

Add fresh peat to peatland (before planting)

- *Cover:* One replicated, controlled, before-and-after study in New Zealand reported that plots amended with fine peat supported higher cover of two sown plant species than the original (tilled) bog surface.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 45%; certainty 25%; harms 5%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1837

Remove vegetation that could compete with planted peatland vegetation

- *Survival:* One controlled study in a bog the UK reported that some *Sphagnum* moss survived when sown, in gel beads, into a plot where purple moor grass *Molinia caerulea* had previously been cut. No moss survived in a plot where grass had not been cut.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 20%; harms 2%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1840

Add root-associated fungi to plants (before planting)

- *Survival:* Two controlled studies (one also replicated, paired, before-and-after) in peat swamps in Indonesia found that adding root fungi did not affect survival of planted red balau *Shorea balangeran* or jelutong *Dyera polyphylla* in all or most cases. However, one fungal treatment increased red balau survival.
- *Growth:* Two replicated, controlled, before-and-after studies of peat swamp trees in Indonesia found that adding root fungi to seedlings, before planting, typically had no effect on their growth. However, one controlled study in Indonesia found that adding root fungi increased growth of red balau seedlings.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 30%; certainty 35%; harms 0%). Based on evidence from: tropical peat swamps (three studies).*

https://www.conservationevidence.com/actions/1841

Likely to be ineffective or harmful

Add lime (before/after planting)

- *Survival:* One replicated, controlled study in the Netherlands reported that liming reduced survival of planted fen herbs after two growing seasons. One replicated, randomized, paired, controlled study in Sweden found that liming increased survival of planted fen mosses over one season.
- *Growth:* Two controlled, before-and-after studies found that liming did not increase growth of planted peatland vegetation: for two *Sphagnum* moss species in bog pools in the UK, and for most species of peat swamp tree in a nursery in Indonesia. One replicated, controlled, before-and-after study in Sweden found that liming increased growth of planted fen mosses.
- *Cover:* Of two replicated, randomized, paired, controlled studies, one in a fen in Sweden found that liming increased cover of sown mosses. The other, in a bog in Canada, found that liming plots sown with mixed fen vegetation did not affect vegetation cover (total, vascular plants or bryophytes).
- *Assessment: likely to be ineffective or harmful (effectiveness 35%; certainty 40%; harms 20%). Based on evidence from: bogs (two studies); fens (two studies); fen meadows (one study); tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1825

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Add organic fertilizer (before/after planting)
- Rewet peatland (before/after planting)
- Remove upper layer of peat/soil (before planting)
- Bury upper layer of peat/soil (before planting)
- Encapsulate planted moss fragments in beads/gel
- Use fences or barriers to protect planted vegetation
- Protect or prepare vegetation before planting (other interventions).

6.13 Habitat protection

Based on the collated evidence, what is the current assessment of the effectiveness of actions to protect peatland habitats?	
Likely to be beneficial	• Legally protect peatlands
Unknown effectiveness (limited evidence)	• Pay landowners to protect peatlands • Increase 'on-the-ground' protection (e.g. rangers)
No evidence found (no assessment)	• Create legislation for 'no net loss' of wetlands • Adopt voluntary agreements to protect peatlands • Allow sustainable use of peatlands

Likely to be beneficial

Legally protect peatlands

- *Peatland habitat:* Two studies in Indonesia reported that peat swamp forest was lost from within the boundaries of national parks. However, one of these studies reported that forest loss was greater outside the national park. One before-and-after study in China reported that peatland area initially decreased following legal protection, but increased in the longer term.
- *Plant community composition:* One before-and-after study in a bog in Denmark reported that the plant community composition changed over 161 years of protection. Woody plants became more abundant.
- *Vegetation cover:* One site comparison study in Chile found that protected peatland had greater vegetation cover (total, herbs and shrubs) than adjacent grazed and moss-harvested peatland.

- *Overall plant richness/diversity:* One before-and-after study in Denmark reported that the number of plant species in a protected bog fluctuated over time, with no clear trend. One site comparison study in Chile found that protected peatland had lower plant richness and diversity, but also fewer non-native species, than adjacent grazed and harvested peatland.
- *Assessment: likely to be beneficial (effectiveness 60%; certainty 40%; harms 1%). Based on evidence from: tropical peat swamps (two studies); bogs (one study); unspecified peatlands (two studies).*

https://www.conservationevidence.com/actions/1796

Unknown effectiveness (limited evidence)

Pay landowners to protect peatlands

- *Peatland habitat:* One review reported that agri-environment schemes in the UK had mixed effects on bogs, protecting the area of bog habitat in three of six cases.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 50%; certainty 20%; harms 10%). Based on evidence from: bogs (one study).*

https://www.conservationevidence.com/actions/1799

Increase 'on the ground' protection (e.g. rangers)

- *Behaviour change:* One before-and-after study in a peat swamp forest in Indonesia reported that the number of illegal sawmills decreased over two years of anti-logging patrols.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 20%; harms 0%). Based on evidence from: tropical peat swamps (one study).*

https://www.conservationevidence.com/actions/1800

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Create legislation for 'no net loss' of wetlands
- Adopt voluntary agreements to protect peatlands
- Allow sustainable use of peatlands.

6.14 Education and awareness

Based on the collated evidence, what is the current assessment of the effectiveness of actions to educate/raise awareness about peatlands?	
Unknown effectiveness (limited evidence)	• Raise awareness amongst the public (general) • Provide education or training programmes about peatlands or peatland management • Lobby, campaign or demonstrate to protect peatlands
No evidence found (no assessment)	• Raise awareness amongst the public (wild fire) • Raise awareness amongst the public (problematic species) • Raise awareness through engaging volunteers in peatland management or monitoring

Unknown effectiveness (limited evidence)

Raise awareness amongst the public (general)

- *Behaviour change:* One before-and-after study in the UK reported that following awareness-raising activities (e.g. publishing reports, organizing seminars and using education volunteers in garden centres), the percentage of the public buying peat-free compost increased.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 25%; harms 0%). Based on evidence from: unspecified peatlands (one study).*

https://www.conservationevidence.com/actions/1844

Provide education or training programmes about peatlands or peatland management

- *Behaviour change:* One study in peat swamps in Indonesia reported that over 3,500 households adopted sustainable farming practices following workshops about sustainable farming. One before-and-after study in peat swamps in Indonesia reported that a training course increased the quality of rubber produced by local farmers.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 30%; harms 0%). Based on evidence from: tropical peat swamps (two studies).*

https://www.conservationevidence.com/actions/1848

Lobby, campaign or demonstrate to protect peatlands

- *Peatland protection:* Two studies in the UK reported that the area of protected peatland increased following pressure from a campaign group (including business meetings, parliamentary debates, publishing reports and public engagement).
- *Behaviour change:* One study in the UK reported that following pressure from the same campaign group, major retailers stopped buying compost containing peat from important peatland areas and horticultural companies began marketing peat-free compost.
- *Attitudes/awareness:* One study in the UK reported that following pressure from the same campaign group, garden centres and local governments signed voluntary peatland conservation agreements.
- *Assessment: unknown effectiveness – limited evidence (effectiveness 60%; certainty 35%; harms 0%). Based on evidence from: unspecified peatlands (two studies).*

https://www.conservationevidence.com/actions/1849

No evidence found (no assessment)

We have captured no evidence for the following interventions:

- Raise awareness amongst the public (wild fire)
- Raise awareness amongst the public (problematic species)
- Raise awareness through engaging volunteers in peatland management or monitoring.