WaterLANDS
Irish action site

Blanket bog restoration Toolkit

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INTRODUCTION

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SOLUTIONS

WaterLANDS

Funded through the EU Horizon programme, WaterLANDS will contribute to the restoration of wetland habitats across Europe.

Wetlands retain and purify water, remove pollutants and excess nutrients, store atmospheric carbon, moderate flooding and coastal storm surges, support an immense variety of wildlife, and offer recreational, well-being and economic benefits to surrounding communities. When mismanaged, these essential ecosystem services for landscapes and society are lost. Scaling up the restoration of isolated wetlands can work towards re-establishing former wetland landscapes and realising new opportunities for local communities.

WILD ATLANTIC NATURE LIFE

LIFE IP Wild Atlantic Nature is responsible for one of the WaterLANDS project 'Action Sites' at Cuilcagh-Anierin Uplands Special Area of Conservation (SAC), where restoration will be carried out in collaboration with farmers and local communities. Restoration actions are building on a Results-Based agri-environmental Payment Scheme (RBPS), whereby farmers receive funding in exchange for improving habitat quality and biodiversity, where necessary.

The RBPS programme is delivered through the Common Agricultural Policy by locally-based ACRES (Agri-Climate Rural Environment Scheme) CP (Cooperation Project) teams. WaterLANDS is assisting farmers undertake restoration measures to improve their RBPS payments. The focus is on integrated land use for the delivery of enhanced ecosystem services including water quality, climate regulation and biodiversity, as well as benefits for farmers and wider society.

Main functions of blanket bogs:

water + carbon storage

carbon sink *(when in good condition)*

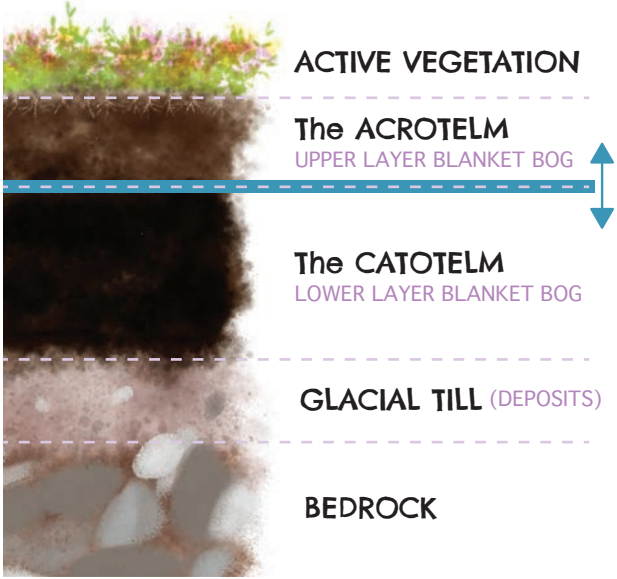
supporting biodiversity

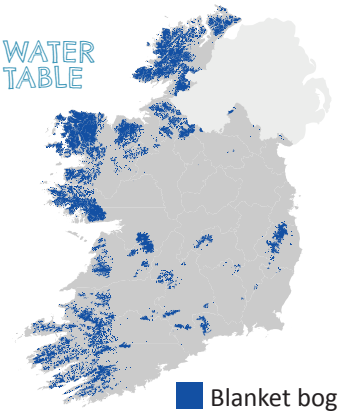
Peatlands account for:

<3% of the earth's land surface

>20% of the earth's terrestrial carbon stores

BLANKET BOG PROFILE



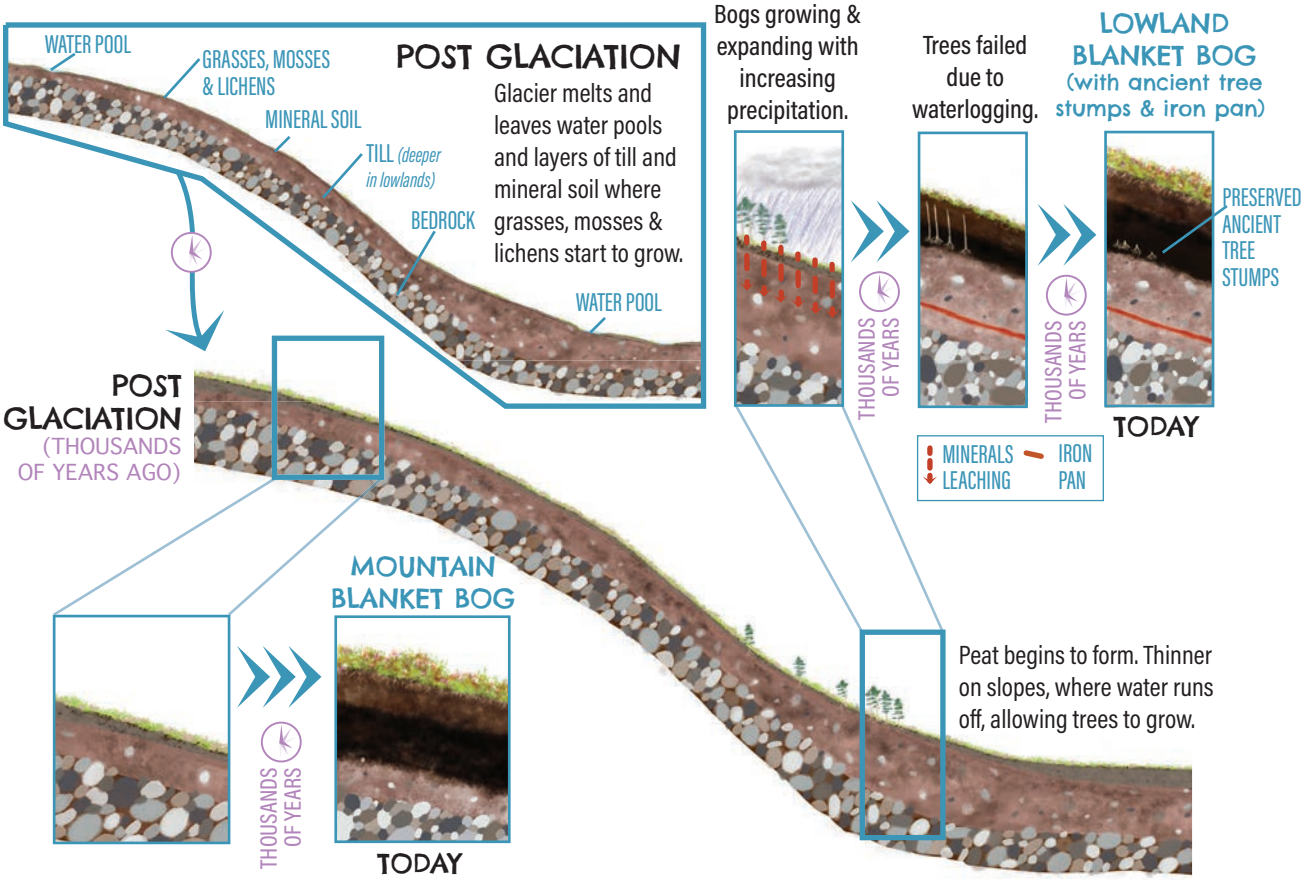


Distribution of blanket bogs in the Republic of Ireland.

Blanket bogs are a type of peatland found mainly in oceanic areas with high precipitation and low temperatures.

In Europe, they are common in Ireland, United Kingdom and Norway, with some occurrence in Spain, Azores and the Alps.

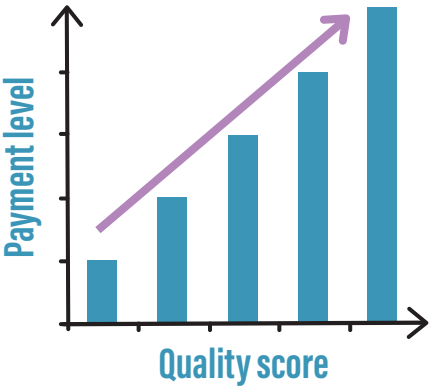
BLANKET BOG FORMATION



Results-Based Payment Schemes (RBPS)

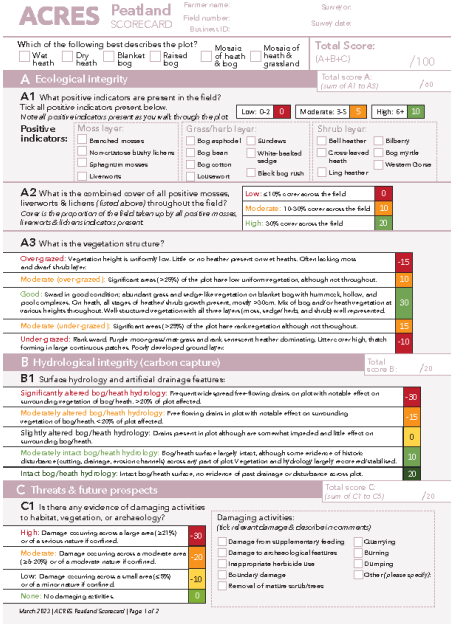
Results-Based agri-environmental Payment Schemes (RBPS), such as the ACRES CP agri-environment programme, pay farmers for the delivery of ecosystem services.

RBPS payments are based on scores of 0-10. Scores of 0-3 get no payment. Scores of 4 or more attract a payment. The higher the score, the higher the payment. Scoring of fields captures high and low habitat quality, which reflects past and current management.



Farmers are provided with financial and technical support to improve environmental quality of their land, if they wish.

Sample scorecard:

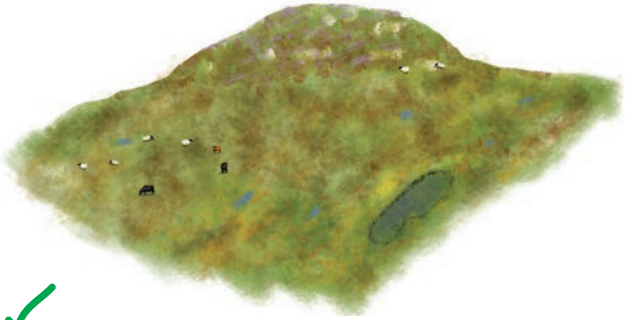


Payments are linked to nature quality of your farm.

Higher nature quality = Higher payment level

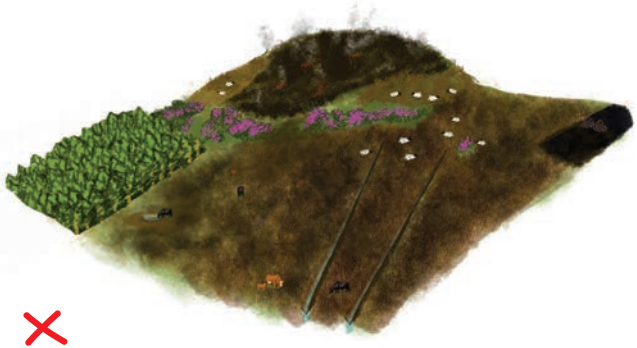
Features of high & low scoring fields

HIGHER SCORING fields:



- Positive indicator plants
- Good vegetation structure
- No artificial drainage
- Natural wet features
- No bare soil
- Absence of invasive non-native species
- Absence or very few negative indicator plants
- No active turbary
- No evidence of damaging activities *(e.g. dumping, quarrying, herbicide use)*

LOWER SCORING fields:



- Negative indicator plants
- Poor vegetation structure
- Artificial drainage
- Poached or bare ground
- Scrub encroachment
- Invasive non-native species *(e.g. self-sown conifers, rhododendron)*
- Turbary
- Burning
- Damaging activities *(e.g. dumping, quarrying, herbicide use)*

The following examples are calculated using ACRES Peatland Scorecard 2023.

EXAMPLE A C5 Is there any evidence of **damage due to turbary activity**?

-30 Active turf cutting

High: Active peat cutting and associated works >10% of the field affected. High proportion of bare peat due to peat extraction.

1yr

10 No turf cutting

Low: No evidence of peat cutting during the most recent season. Vertical face of bank has no bucket marks and has clear signs of weathering. Spreadlands revegetating.

By stopping turf cutting on this plot, the score has **increased by 4**, in just one year.

EXAMPLE B C4a Are **non-native invasive species present**? C4b What is the cover of **non-native invasive species**?

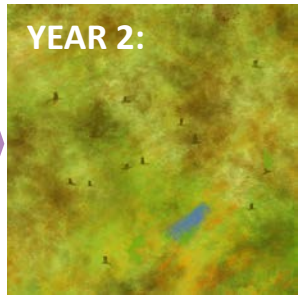
-10 Present (C4a)

-20 Abundant (C4b)

High: Abundant. Some forming dense clumps, many seedlings.

☑ Self-sown conifers

1yr



0 Absent (C4a)

0 None (C4b)

None: None present.

By removing non-native invasive species from the field, the score has **increased by 3**, in just one year.

THREATS & PRESSURES

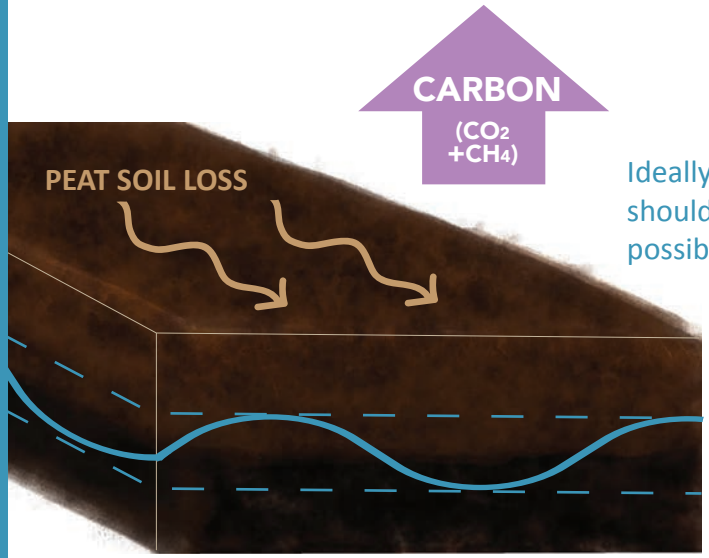
Bare Peat

POOR WATER QUALITY
as peat soil runs-off into watercourses

DISSOLVED ORGANIC CARBON (DOC)
Carbon loss through run-off into streams & rivers

Bare peat is a common issue, particularly in the uplands, as a consequence of several natural and man-made pressures including overgrazing and fires.

In many areas, bare peat is now mainly eroded by natural agents such as wind, ice or water.



Ideally, the **water table** should sit as close as possible to the surface.

WATER TABLE:
- LOWER *(>30cm below surface)*
- HIGH FLUCTUATION

Follow the flow chart to identify a suitable action for each area of bare peat.

START

Is there >2m² *(2.4yd²)* **BARE** peat?

- **NO** → **NO ACTION REQUIRED**
- **YES** →

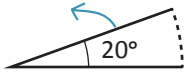
Is the bare peat area **FLAT?**

- **YES** → **GEOTEXTILE** Pg. 23-24
- **NO** →

Is there visible **water flow**?

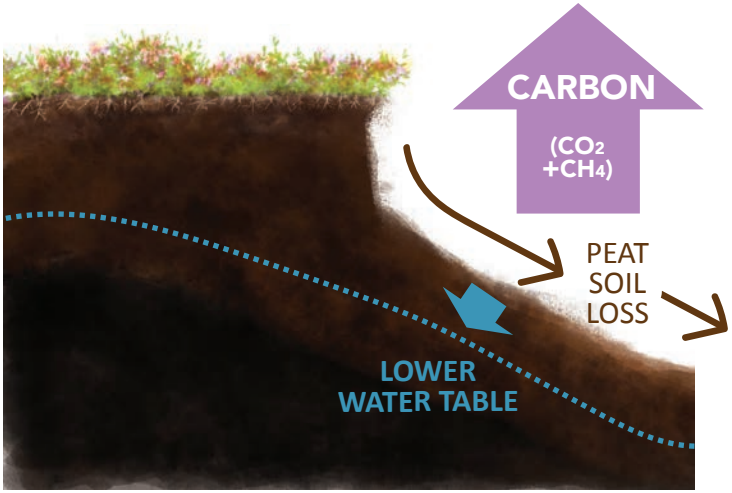
- **YES** → **DRAIN MANAGEMENT** Pg. 16
- **NO** →

Is the gradient of the slope **>20°**?



- **YES** → **MATTING** Pg. 25-26
- **NO** → **COIR LOGS** Pg. 21-22 + **GEOTEXTILE** Pg. 23-24

Peat Hags



POOR WATER QUALITY
as peat soil runs-off into watercourses

DISSOLVED ORGANIC CARBON (DOC)
Carbon loss through run-off into streams & rivers

Peat hags can be a common feature of blanket bogs.

They are active eroding areas where natural agents such as wind, ice and water contribute to the problem. Some human and animal (e.g. deer or sheep) activities can increase the erosion in these areas.

Follow the flow chart to identify a suitable action for each peat hag.

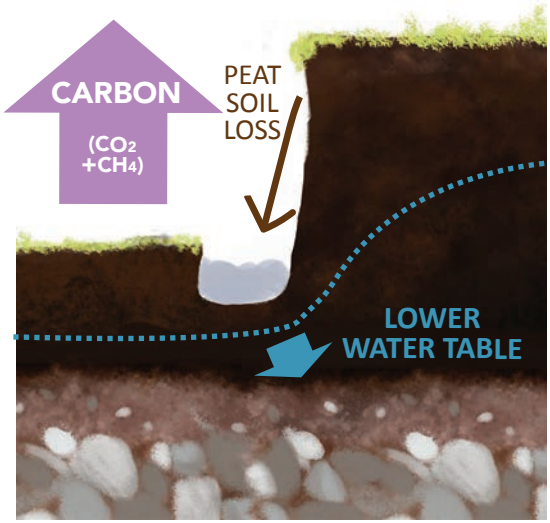
START

Is the peat hag **>2m** *(6.5ft)* **TALL**?

- NO → Is the area **accessible with a digger**?
  - NO → **MATTING** Pg. 25-26
  - YES → Is the peat hag **covered with vegetation?**
    - YES → **FURTHER ASSESSMENT REQUIRED**
    - NO → Is there **water flowing** at the bottom of the peat hag *e.g. a drain*?
      - YES → **DRAIN MANAGEMENT** Pg. 16
      - NO → **REPROFILING** Pg. 27-28 ⚠
- YES → Is there a **vertical face** on the hag?
  - NO → **MATTING** Pg. 25-26
  - YES → **NO ACTION POSSIBLE**

REPROFILING Pg. 27-28 ⚠ **Peat stability risk**

Turf Banks



POOR VEGETATION GROWTH

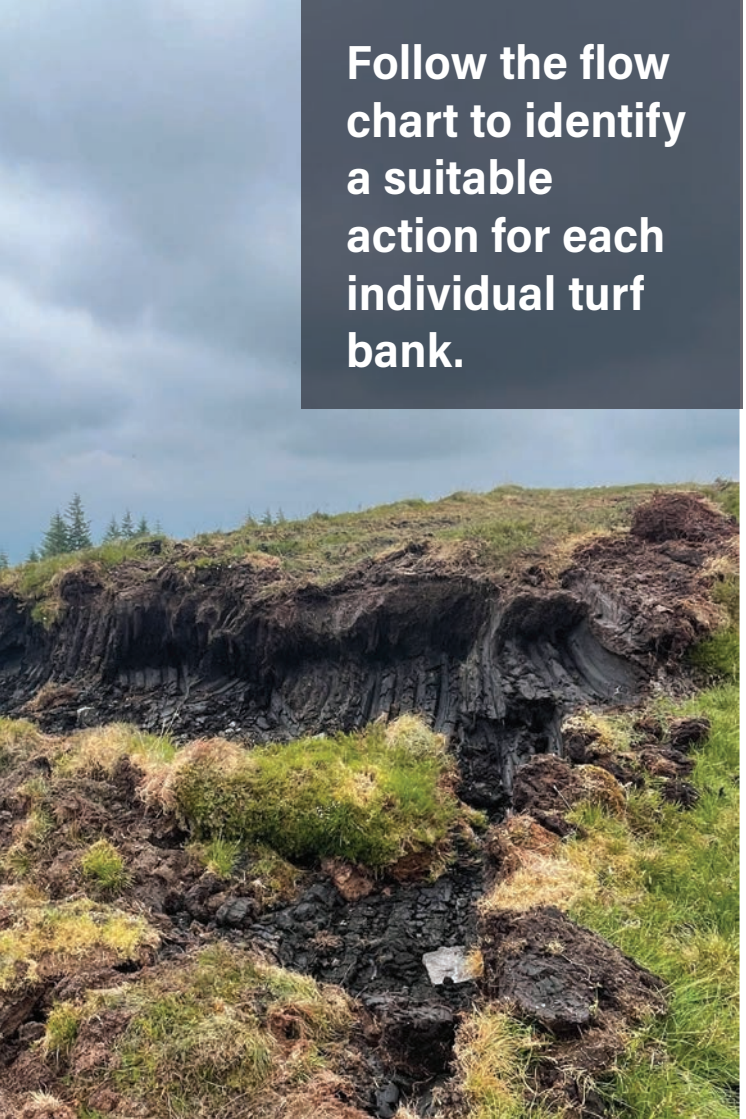
Ideally, the **water table** should sit closer to the surface.

POOR WATER QUALITY
as peat soil runs-off into watercourses

DISSOLVED ORGANIC CARBON (DOC)
Carbon loss through run-off into streams & rivers

Turf banks are an artificial feature in blanket bogs as a consequence of turf cutting activities.

They create open areas of bare peat and also drain the bog, increasing the carbon emissions and affecting the water levels.



Follow the flow chart to identify a suitable action for each individual turf bank.

START

Is the turf bank **>2m** *(6.5ft)* **TALL**?

- YES → **NO ACTION POSSIBLE**
- NO ↓

Is the area **accessible with a digger**?

- NO → **MATTING** Pg. 25-26
- YES ↓

Is the turf bank **covered with vegetation?**

- YES → **FURTHER ASSESSMENT REQUIRED**
- NO ↓

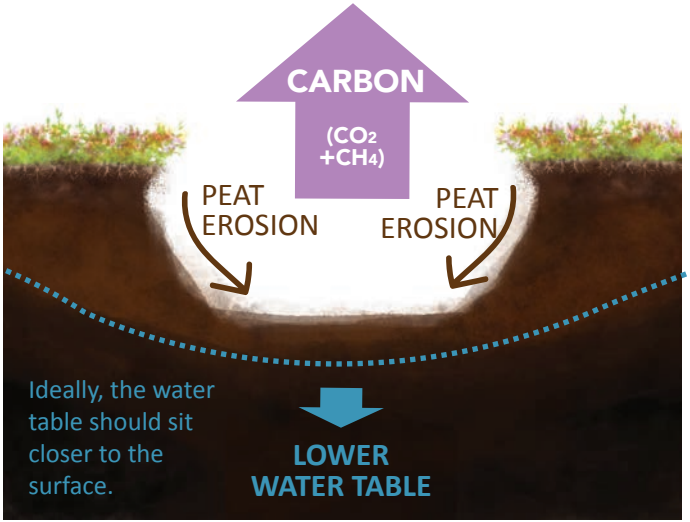
Is there **water flowing** at the bottom of the turf bank *e.g. a drain*?

- YES → **DRAIN MANAGEMENT** Pg. 16
  REPROFILING Pg. 27-28 ⚠
- NO ↓

REPROFILING Pg. 27-28 ⚠

⚠ **Peat stability risk**

N.B. It is important to ensure that, where possible, the cause of continued erosion is addressed (e.g. reduce grazing pressure or divert flow of undercutting watercourses).



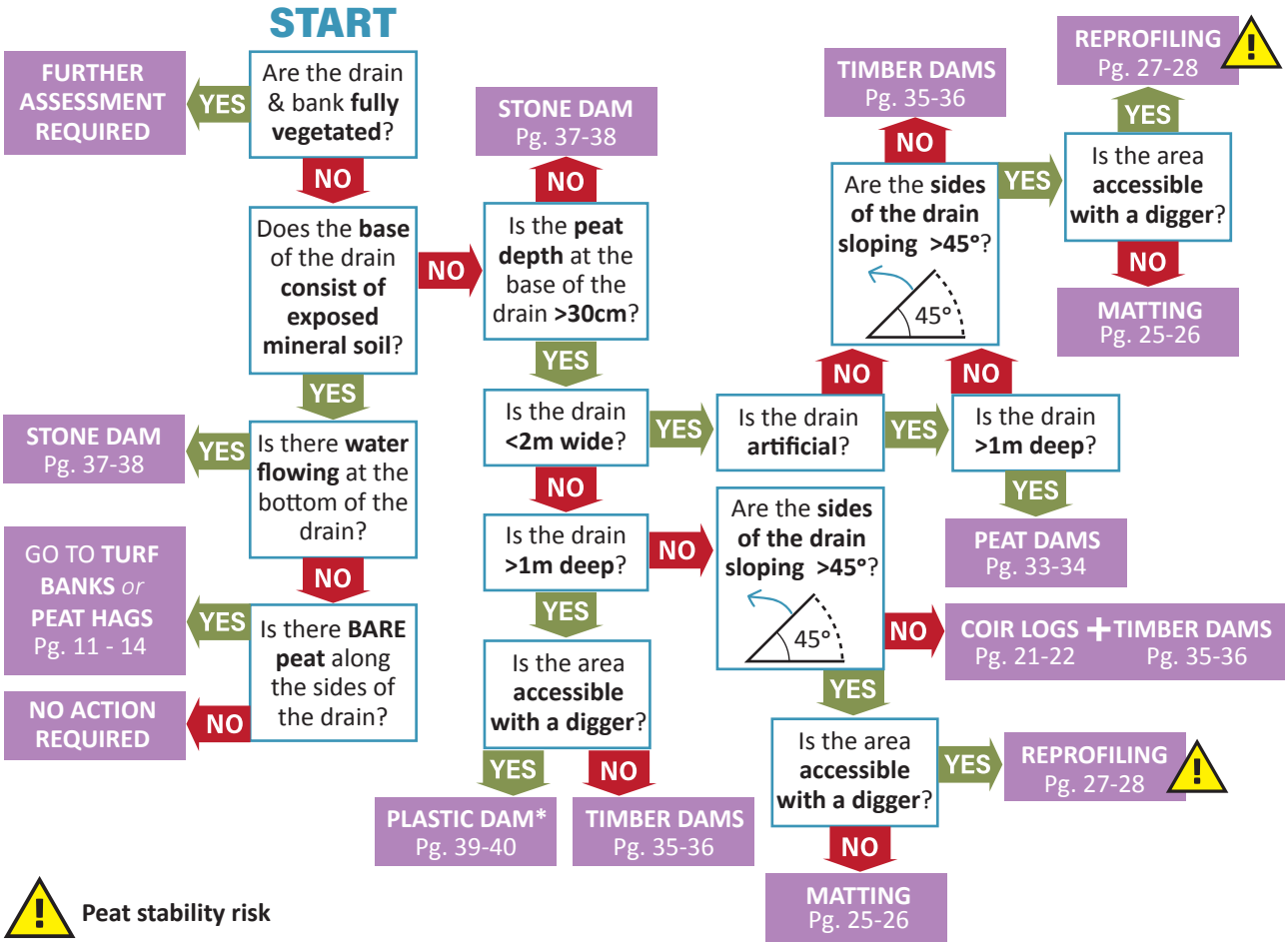
POOR WATER QUALITY
as peat soil runs-off into watercourses

DISSOLVED ORGANIC CARBON (DOC)
Carbon loss through run-off into streams & rivers

Drains can strongly affect blanket bogs. They impact water levels, reduce water quality and increase carbon emissions.

However, naturalised drains can be an important feature and should generally not be altered without specialist advice.

Follow the flow chart overleaf to identify a suitable action for each drain.


START
Are the drain & bank fully vegetated?
YES
FURTHER ASSESSMENT REQUIRED
NO
Does the base of the drain consist of exposed mineral soil?
NO
Is the peat depth at the base of the drain >30cm?
NO
STONE DAM Pg. 37-38
YES
Is the drain <2m wide?
YES
Is the drain artificial?
YES
Are the sides of the drain sloping >45°?
45°
YES
Is the area accessible with a digger?
NO
MATTING Pg. 25-26
YES
REPROFILING Pg. 27-28
NO
TIMBER DAMS Pg. 35-36
NO
Is the drain >1m deep?
YES
PEAT DAMS Pg. 33-34
NO
Are the sides of the drain sloping >45°?
45°
NO
COIR LOGS + TIMBER DAMS Pg. 21-22 Pg. 35-36
YES
Is the area accessible with a digger?
YES
REPROFILING Pg. 27-28
NO
MATTING Pg. 25-26
NO
Is the drain >1m deep?
YES
Is the area accessible with a digger?
YES
PLASTIC DAM* Pg. 39-40
NO
TIMBER DAMS Pg. 35-36
YES
STONE DAM Pg. 37-38
NO
Is there water flowing at the bottom of the drain?
NO
Is there BARE peat along the sides of the drain?
YES
GO TO TURF BANKS or PEAT HAGS Pg. 11 - 14
NO
NO ACTION REQUIRED
Peat stability risk

Examples of invasive non-native species found in blanket bogs:

INVASIVE NON-NATIVE SPECIES

Outcompete native species

Leading to degraded soil

CARBON

(CO_2 +CH_4)

CARBON LOSS

SELF-SOWN CONIFER

INVASIVE SPECIES CONTROL Pg. 29-30

RHODODENDRON PONTICUM

INVASIVE SPECIES CONTROL Pg. 31-32

SOLUTIONS

Personal protective equipment

At least two people

Training

Hand tools

Licence

Materials

Chemicals

Machinery

Helicopter

Works **cannot** be carried out during bird nesting season, between 1st March and 31st August annually.

IN ADVANCE

- Select an area with open bare peat and potential water flow.
- If there is a clear open water flow, consider other drain management options before installing coir logs.

WHAT YOU NEED

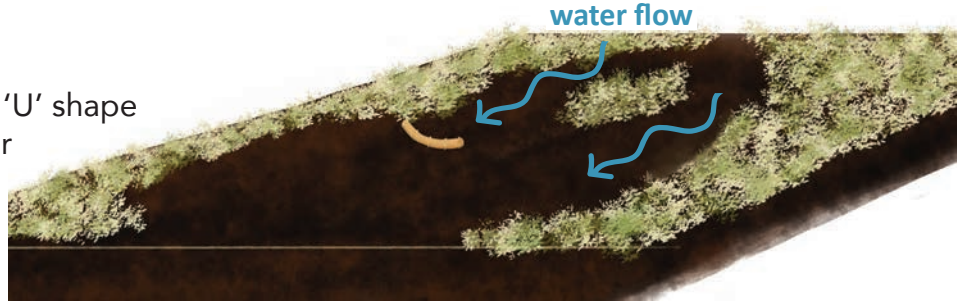
- [x] Coir logs.
- [x] Long wooden pegs *(approx 50cm/1.5ft).*
- [x] Mallet for driving in wooden pegs.

BENEFITS

- **Reduces peat loss**
- **Increases water levels**
- **Improves soil stability**
- **Vegetation regeneration** of bare peat surfaces.

METHOD

1. Position log in a 'U' shape against the water flow.



2.

Use mallet to drive in approximately 8 wooden pegs to secure 3 metre coir logs. Approximately 6 pegs for 1 metre and 2 metre coir logs.

3.

Position and peg more logs to cover the bare peat area in a pattern suiting the terrain, such as illustrated here. Ensure you reach the edge of the bare peat.

IN ADVANCE

- Select an area with over 2m^2 of bare peat and no clear water flow.
- Make sure the slope of the area is less than 20° *(see back page for reference)*.
- Determine cause of erosion. *If bare peat has resulted from overgrazing or spreadlands for drying turf, removal of these pressures may be sufficient for natural revegetation, without using geotextile.*

WHAT YOU NEED

- ☑ Geotextile that will not degrade faster than the time it takes the peat to be revegetated *(700g)*.
- ☑ Long wooden pegs approx 50cm *(ideally with a U-shaped end)*.
- ☑ Mallet for driving in wooden pegs.

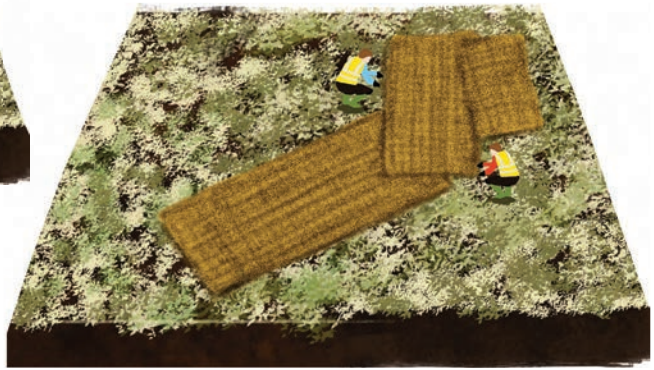
This technique is usually combined with techniques such as; coir logs and small dams.

BENEFITS

- Supports **revegetation and reduces erosion** in large areas of exposed peat.
- **Increases the humidity and stability** of the ground.
- **Reduces the erosion and carbon loss** during high rainfall events.
- **Reduces the carbon** in the water.
- **Helps to retain water** during dry periods.
- In winter, it will **reduce the ice formation and erosion**.

METHOD

1. Roll geotextile out like a carpet over exposed peat areas and cut to size.



2. Pull tight and make sure there is overlap between the different geotextile sheets, leaving no gaps.

3. Secure with the wooden pegs *(at least 2 pegs per linear metre)*.

IN ADVANCE

- Select areas where there is peat hag/turf bank but where machinery access is not possible.
- This technique is less effective on vertical bare peat faces.
- If there is running water at the base of the hag/turf bank, please consider drain management in conjunction with this technique.

WHAT YOU NEED

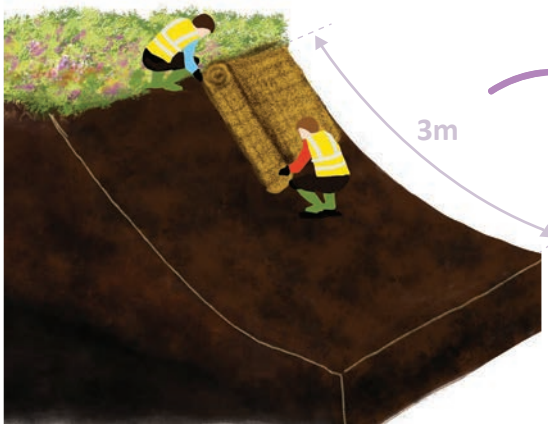
- ☑ Special geotextile that will not degrade faster than the time it takes the peat to be revegetated.
- ☑ Long wooden pegs approx 50cm *(1.5ft) (ideally with a U-shaped end).*
- ☑ Mallet for driving in wooden pegs.

BENEFITS

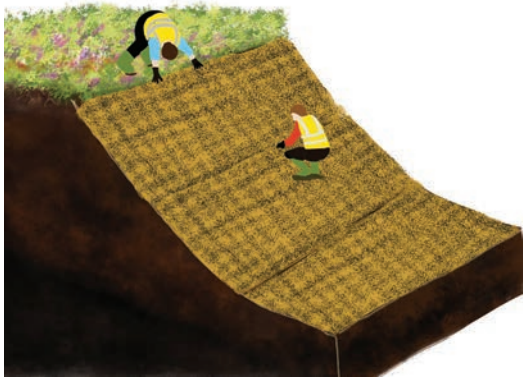
- Can be **used on turf banks and peat hags that are not suitable** for reprofiling, due to limited machinery access or excess size.
- Supports **revegetation**.
- Increases the **humidity and stability** of the hag or turf bank.
- **Reduces the erosion and carbon loss.**
- **Reduces the carbon** in the water.

Matting can be used in some cases where geotextile is not suitable due to the sloping profile of an area of bare peat.

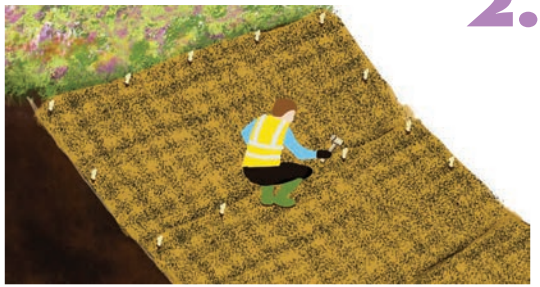
METHOD



1. Roll matting out like a carpet over exposed peat areas and cut to size.



2. Pull tight and make sure there is overlap between the different matting sheets, leaving no gaps.



3. Secure with the wooden pegs *(at least 2 pegs per linear metre)*.

IN ADVANCE

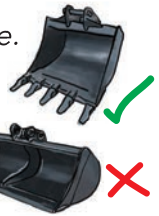
- Carefully plan machinery access and routes *(requires ground surveys).*
- Assess height and length of the peat hag/turf bank every 5 metres.
- Assess potential pressures related to land use *(i.e. animals crossing)* and propose management when required.

N.B. Any drains associated with the peat hag/turf bank will also need to be restored, to avoid erosion.

Any plans needing plant machinery should be approved by appropriate experts and works should be carried out by suitably trained operators

WHAT YOU NEED

- ☑ Appropriate machinery with low ground pressure.
- ☑ Toothed digging bucket.
  Grading/shuck bucket is not suitable.
- ☑ Experienced machine operator.



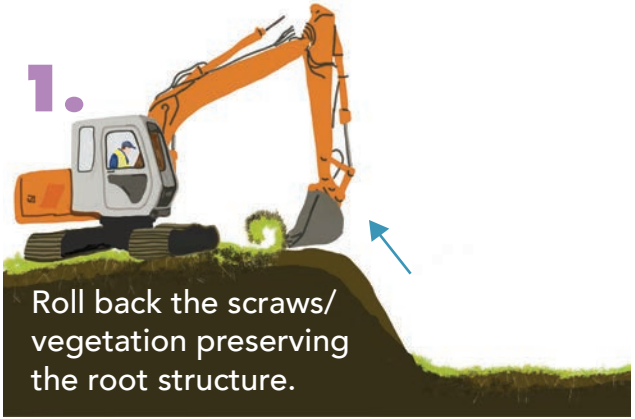
PPE

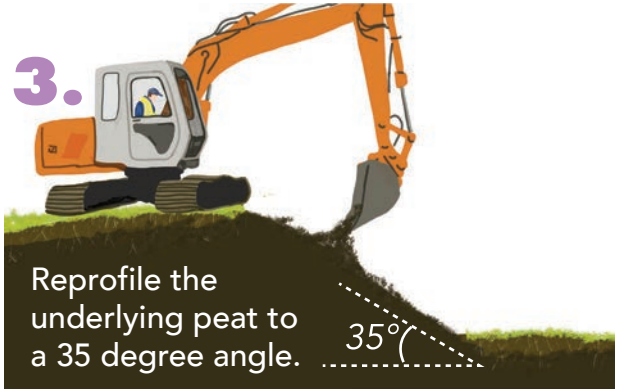
BENEFITS

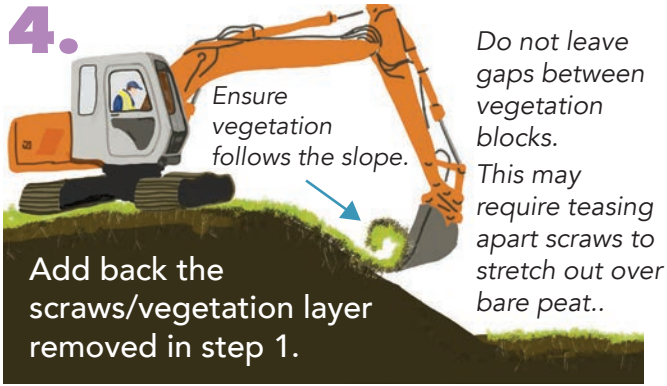
- **Reduces peat erosion & carbon loss on exposed faces**.
- Helps **prevent carbon emissions.**
- Reduces amount of carbon entering water courses.
- **Potential to improve water quality.**
- **Reduces risk of greater erosion** issues in the future.

METHOD

1.

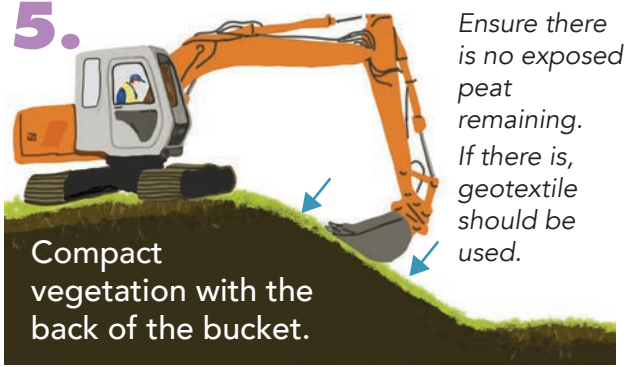






Do not leave gaps between vegetation blocks.

This may require teasing apart scraws to stretch out over bare peat..



Ensure there is no exposed peat remaining.

If there is, geotextile should be used.

This technique is usually combined with other techniques such as; geotextile, coir logs and small dams (drain management).

SELF-SOWN CONIFERS

IN ADVANCE

- Assess the area to determine the size of the conifers.
- Conifers greater than 2 metres *(6.5ft)* tall will need to be felled and removed from site.

WHAT YOU NEED

☑ Chainsaw/hand saw

BENEFITS

- Conifers can have negative impact on hydrological & ecological integrity of the bog.

METHOD

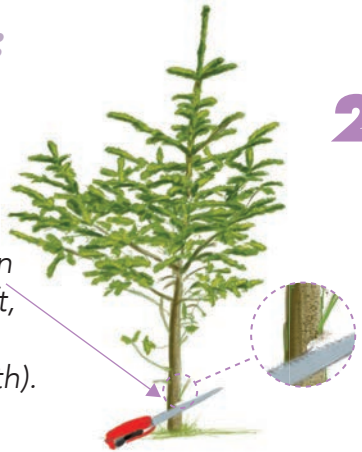
*Tree felling **cannot** be carried out during bird nesting season, between 1st March and 31st August annually.*

TREES <2m:

1. Cut through tree trunk under the lowest green shoot *(if any green shoots are left, this will allow for new growth).*

TREES >2m:

1. Cut through tree trunk under the lowest green shoot *(if green shoots are left, this will allow for new growth).*



2. Chop felled tree into manageable pieces and remove from site, leaving the tree stump in situ.

RHODODENDRON PONTICUM

IN ADVANCE

Mapping:

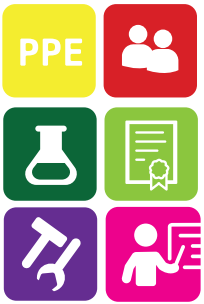
- Determine the distribution and extent of Rhododendron in target areas.
- Mapping of infestation levels is critical to work planning and management

WHAT YOU NEED

Requirements differ depending on the method chosen. Rhododendron control experts need to be consulted.

Possible requirements:

- ☑ Herbicide & applicator.
- ☑ Training & certification.
- ☑ Hatchet or chainsaw.
- ☑ Native replacement plants *(may be required where rhododendron is used as a shelter belt).*



CONSIDERATIONS

Herbicide use requires training and certification. Additional training/certification may be required with chainsaw work, forestry first aid, manual handling, safe pass and tree planting.

Follow-up treatment costs and treatment timescale need to be factored into long term planning. There is an estimated 5-10 year timescale for full eradication.

Replacement planting may be required where Rhododendron is used as a shelter belt .

METHODS

DENSITIES can be categorised as:

Slight
Some rhododendron, but plants scattered and mostly small and not flowering

Moderate
Rhododendron frequent but not clumping. Some flowering, many seedlings present

Severe
Rhododendron abundant, some forming dense clumps, many seedlings

Very Severe
Mature Rhododendron abundant, forming dense thickets

STEM treatment using herbicide concentration (up to 20:1) is most suitable for slight to severe infestations.

- Make several cuts in base of stem.
- Apply herbicide mix using targeted application, as soon as possible after cutting.

STUMP treatment and mechanical mulching may be more feasible in very severely infested stands.

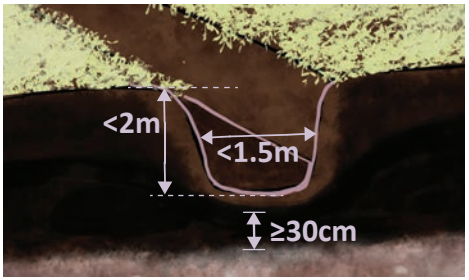
- Full cut at base of plant.
- Apply herbicide mix to stump face

Stump treatment may also be necessary in riparian zones where leaf fall into watercourses is a potential concern.

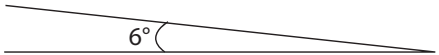
However, there is no explicit guidance for treatment of riparian infestations of Rhododendron.

IN ADVANCE

In order to be suitable for peat dam, a drain must:



- ☑ Be less than 2 metres *(6.5ft)* deep.
- ☑ Be less than 1.5 metres *(5ft)* wide.
- ☑ Have at least 30cm *(12")* depth of dark peat at the base.
- ☑ Be on an incline no greater than 6°.



WHAT YOU NEED

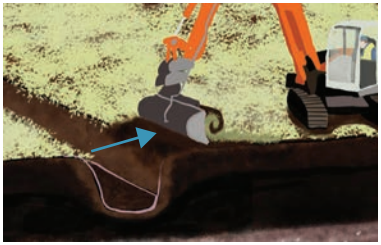
- ☑ Low ground pressure excavator.
- ☑ Bucket size depends on size of drain and size of dam required.
- ☑ A tilting bucket is useful for dressing of the dams and in some cases a swivel head bucket can be very useful.

BENEFITS

- No need to bring any extra materials onto site, you just use peat that is already there.

METHOD

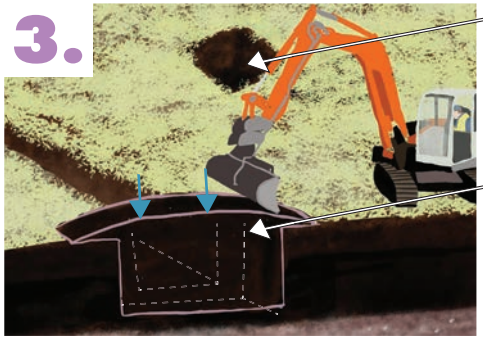
1. Remove scraws.



2.

Remove any dry peat from base and sides & create key shapes in the dark wet peat. *This will increase the stability and longevitiy of the dam.*

3.

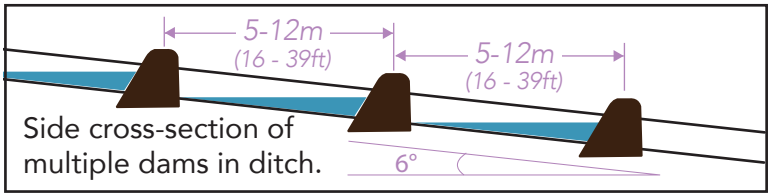


Obtain peat from borrow pit dug a little distance from the drain.

Use the **dark, wet peat** to create wedge shaped dam. Do not use dry peat.

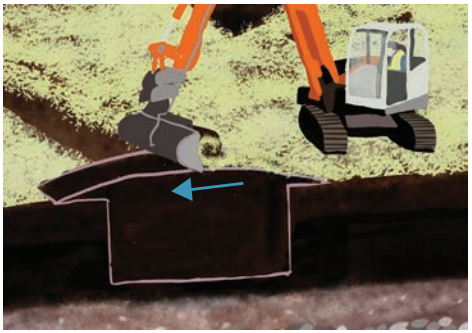
Compress peat regularly.

Ensure dam is 40cm (1'4") above the surface + wider than the ditch.



Side cross-section of multiple dams in ditch.

4. Stretch scraws over the top of dam and compress again.

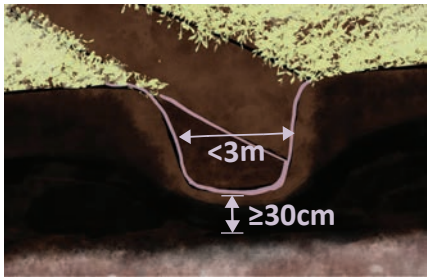


5. Reinstate borrow pit. Stretch scraws over the top and compress.

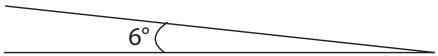
It is important not to leave bare peat exposed.

IN ADVANCE

In order to be suitable for a timber dam, a drain must:



- ☑ Be less than 3 metres/10ft wide.
- ☑ Have at least 30cm/12" depth of peat at the base.
- ☑ Be on an incline no greater than 6°.



- Choose the narrowest point of the drain.

WHAT YOU NEED

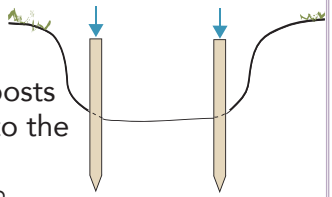
- ☑ **Untreated timber planks** *approx. 25cm (10") wide, 3.75 cm (1.5") thick.*
- ☑ **Wooden posts** *0.5-2m (1-6.5ft) long, 10cm (4") thickness.*
- ☑ **Mallet/sledge** for driving in posts.

BENEFITS

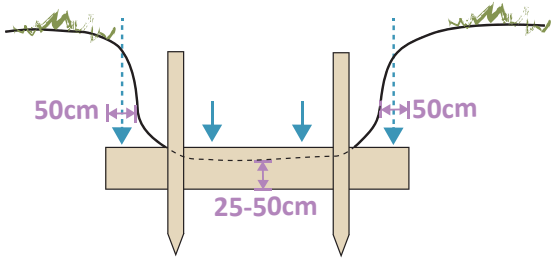
- Can be used where construction of peat dams would cause unnecessary damage.
- Timber is a degradable material.

METHOD

1. Drive supporting posts about 1m apart into the base of the drain.
These will be used to stabilise the dam.

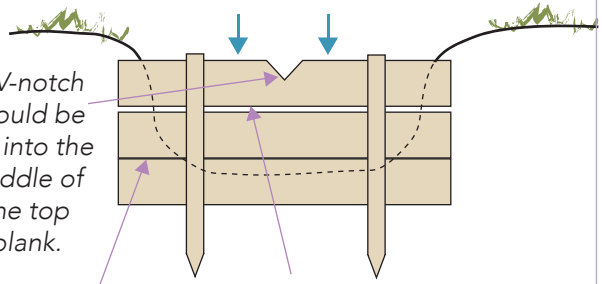


2. Drive the first plank straight down, upstream of the supporting posts, overlapping the sides of the drain by 50cm.



Make sure to drive plank straight down to avoid creating cracks in the side of the drain.
This bottom plank should be embedded into the base of the dam by 25-50cm.

3. Drive the next two (*or three, if necessary*) planks straight down on top of the first. Fix all planks to the supporting posts.

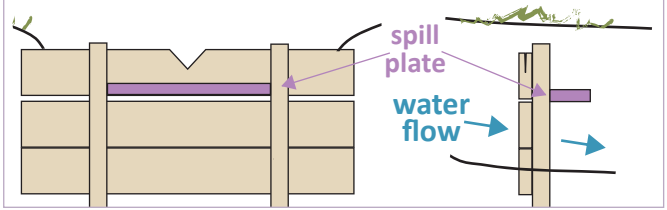


A V-notch should be cut into the middle of the top plank.

The bottom two planks should fit closely together.

Gaps of approx. 1-2cm should be left between the second board and the third board (and the fourth board, if using).

4. Create a 'spill plate' below the V-notch on the top plank to evenly distribute any overflowing water.



IN ADVANCE

- Select area with **high water flow and mineral soil on the base** of the drain or gully.

WHAT YOU NEED

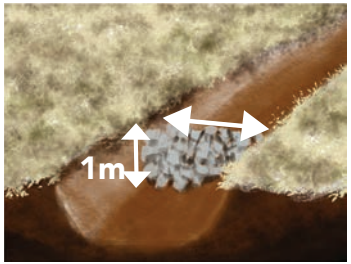
- ☑ Helicopter to deliver rocks to site.
- ☑ Rocks approx. 20cm *(8")* in diameter *(smaller rocks are more likely to be washed away).*

BENEFITS

- Can be used where there is not enough peat depth in the base of the gully to key in peat or wooden dams, as stone dams do not need to be keyed into the gully sides or base.
- These are leaky dams, which should capture and stabilise suspended peat sediment behind the dam, allowing vegetation to develop over time, which further stabilises both the gully base and the dam.

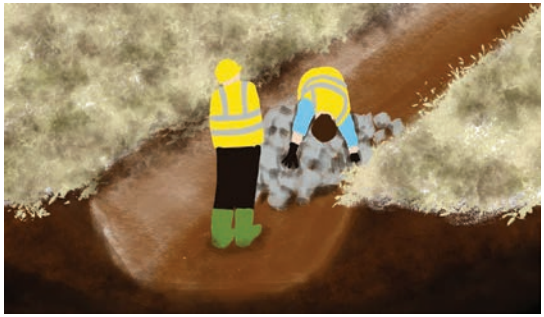
METHOD

1. Drop rocks into the chosen spot in the gully.

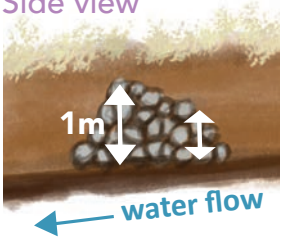


Stack rocks up to 1m *(3ft 5")* high, covering the full width of the gully.

2. Position the rocks by hand.



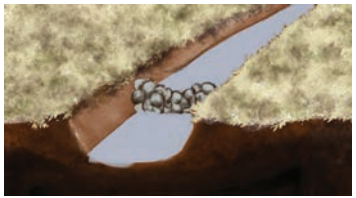
Side view



Create a higher face <u>downstream</u>.

Front view

Keep the sides of the dam higher than the centre.

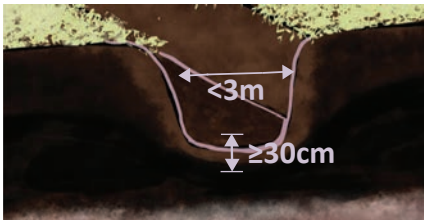


Finished dam.

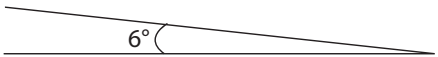
IN ADVANCE

- Plastic dams should ***only*** ***be used*** when ***no other options are viable***.
- Choose the narrowest point of the drain.
- Estimate the depth of the drain using a rod/stick.
- Add 50cm to this length to establish the correct length for the plactic piles.

In order to be suitable for a plastic dam, a drain must:



- ☑ Be less than 3 metres/10ft wide.
- ☑ Have at least 30cm/12" depth of peat at the base.
- ☑ Be on an incline no greater than 6°.



BENEFITS

Good option when:

There is no machinery access.

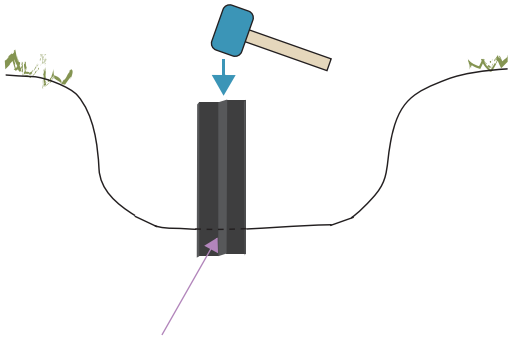
There is risk of peat slide.

WHAT YOU NEED

- ☑ **Rod/stick** for measuring the depth of the drain.
- ☑ **Plastic piles** the correct length *(the depth of the drain + 50cm).*
- ☑ **Mallet** or the bucket of an excavator for driving in the plastic piles.
- ☑ **Wooden support beams**

METHOD

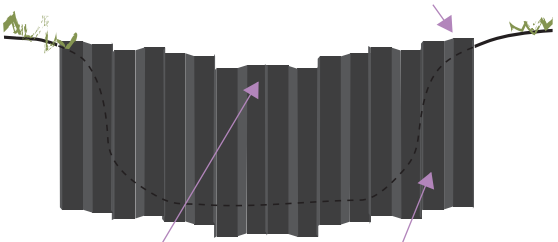
1. Start in the middle of the drain. Drive the first plastic pile using a mallet or the bucket of an excavator.



Piles should sink approx. 50cm into firm (dark) peat at the base of the drain.

2. Drive the remaining plastic piles into the base, working from the centre out.

The piles should be just higher than the peatland surface.



Position the central piles lower than the side piles to allow water to run over the top.

Piles should extend into the sides of the bank (50cm)

WaterLANDS