

Appendix A - Repairing Erosion Scars

Introduction

One of the most common tasks to be carried out on archeological earthworks in grassland management is the repair of erosion scars. These are often the result of natural slippage or borrowing animal scrapes being exacerbated by livestock erosion. If left to develop they can become significant scars disfiguring the monument and resulting in the continued loss of archeological information. It is therefore important to stabilise the scar and restore a grass sward.

Method of Repair

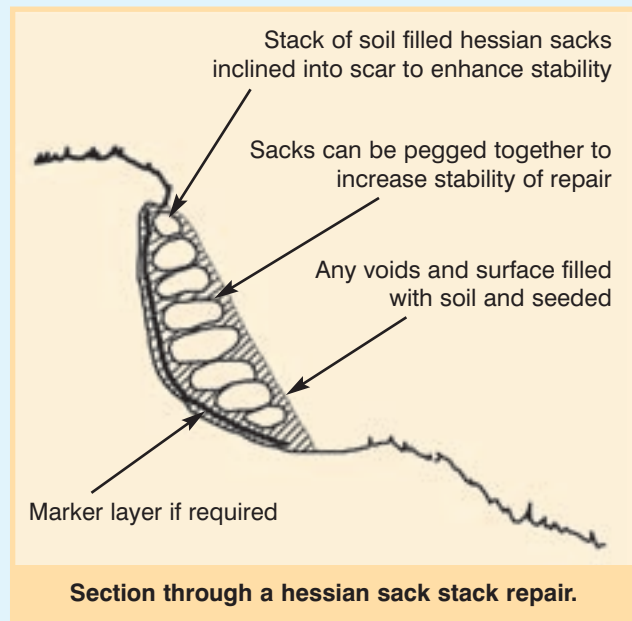
There are a variety of methods available for the repair of erosion scars. There are;

- Soil infill
- Undercut lip of scar and natural recovery or soil infill
- Turf stack or soil filled sack sack

Soil fill can only be used where the erosion scars are minor and shallow, as greater depths are relatively unstable and will be prone to slippage and settlement that may permit the erosion to restart. The technique is best applied to areas where there are a large number of minor scars or the scar is too shallow for any other method. The soil is added as a spread over the scars and re-seed with an appropriate grass seed mix.

Undercutting the lip of an erosion scar lessens the steepness of the scar and therefore aids its stability and ability to recover. The scar can either then be re-seeded if the angle is sufficiently stable or infilled with soil and then re-seeded if not. The disadvantage of this method is that it does necessitate further damage to the monument to achieve stability, which rarely acceptable and therefore this method should only be used where other solutions are impractical or inappropriate.

Turf or stacks are very effective repair methods. The stack is built up at a slight angle so the layers recline slightly into the erosion scar increasing the repair stability. Any voids are filled to reduce settlements and the surface seeded with a suitable grass seed mix.



This method of repair has the advantage that it does not necessarily aim to restore the original profile of the monument, rather it aims to achieve the minimum repair to achieve the stability of the movement.

Therefore it is often easy to recognise that damage has occurred at the site even after the repair has established. The other advantages of the method are that it is very stable and in the case of turf stacks, very quick to establish.



Turf stack repair being constructed.

A variation of the soil infill is the revetment infill. Here a variety of materials are available to create a revetment that then supports the infill behind. This method of repair is best suited to areas of gully erosion where commonly a timber or hessian sack revetment pegged or wedged into the gully is used. The infill materials can then build up behind and re-seeded.

Is a marker layer needed?

A marker layer is only required where there is the potential to confuse in future assessment the repair with the in situ archaeological remains. An example of this would be where the monument is a bank that has been created between two turf stacks. A turf stack repair would therefore have the potential to be confused with the archaeology.

If a marker layer is required then this will need to be a layer of material that is easily distinguished from the archaeology, eg. sand, gravel or geotextile. If the sand or gravel is used then care will need to be taken to ensure that the materials does not alter the burial environment.

Aftercare

With all repair work there will need to be some aftercare work to ensure successful establishment of the repair. The most common operations to consider are;

- Watering: during periods of drought it may be necessary to artificially water to ensure successful germination and establishment of a grass sward on the repair.
- Over-seeding and adding soil may be necessary as there will commonly be some settlement in any repair and germination of grass seed may not always be successful
- Fencing out livestock is one of the critical considerations. If cattle or high stock rates of sheep are present then it will be necessary to exclude livestock by fencing off the repair while it establishes. Fencing is less critical where low stocking rates of sheep are present as any damage to the repair will be minor and can be adding soil and over-seeding.

- Control of scrub growth may be required as the removal of grazing and the presence of bare ground will provide the potential for scrub vegetation to establish.

Preventing Future Erosion

Fundamental to management of the earthwork is the prevention of future erosion scars developing. Ideally action needs to be taken as soon as a new scar starts to develop.

At this point it will be sufficient to dress the developing scar with soil, re-seed and exclude livestock for a couple of months with some form of temporary barrier. However, this level of management needs regular monitoring of the monument that is not always practical.

An alternative method is to reduce or remove livestock when the monument is most vulnerable, normally in winter and carry out an annual programme of minor repair to prevent erosion developing.



Turf stack repair on completion



Turf stack repair two months later

Appendix B - A Guide to Stocking Levels for Lowland Grassland

No. of grazing weeks per year	Calcareous Grassland		Neutral Grassland		Acidic Grassland		Wet/Marshy Grassland	
	S	C	S	C	S	C	S	C
2	60	15	100	25	50	12	50	12
4	30	8	50	12.5	25	6	25	6
6	20	5	33	8	16	4	16	4
8	15	4	25	6	12	3	12	3
10	12	3	20	5	10	2.5	10	2.5
12	10	2.5	17	4	8	2	8	2
14	8.5	2	14	3.5	7	1.5	7	2
16	7.5	2	12.5	3	6	1.5	6	1.5
20	6	1.5	10	2.5	5	1	5	1
24	5	1	8	2	4	1	4	
36	3.5	1	5.5	1.5	3	0.5	3	
52	2.5	0.5	4	0.5	2	0.4	2	
Annual Stocking Rate LU/ha/yr	0.25		0.5		0.2		0.2	

Numbers of animals per hectare

S = sheep (c60kg) c = cattle (c250kg LW)

Source: Jefferson and Croft 1999.

Appendix C - List of Suppliers

The following is a list of suppliers and manufacturers that the author has encountered through this project and a review of the companies listed in Berry and Brown (1994).

ABG LIMITED

E7, Meltham Mills Road, Meltham,
Holmfirth, West Yorkshire, HD9 4DS
Tel: 01484 852096, Fax: 01484 851562
Website: www.abg-geosynthetics.com
Email: geo@abg-geosynthetics.com
Producer of geotextiles including geotextile membranes,
drainage membranes, cellular pavers and erosion control
matting.

ADVANTA SEEDS UK LTD

Sleaford, Lincolnshire, NG34 7HA
Tel: 01529 304511, Fax: 01529 413137
Website: www.advantaseeds.co.uk
Email: amenity@advanta-seeds.co.uk
Grass seed supply company

BARENBURG UK LTD

33 Perkins Road, Rougham, Bury St.Edmunds, Suffolk, IP30 9ND
Tel: 01359272000, Fax: 01359 272001
Website: www.barenburg.co.uk
Email: info@baruk.co.uk
Grass seed supply company

BRITISH SEED HOUSES LTD

Camp Road, Withan St.Hughs, Lincoln, LN6 9QJ
Tel: 01522 868714, Fax: 01522 868382
Website: www.britishseedhouses.com
Email: seeds@bshlincoln.co.uk
Grass seed supply company

CEBECO SEEDS

The Old Wood South, Skellingthorpe, Lincoln, LN6 5UA
Tel: 01522 507300, Fax: 01522 507319
Grass seed supply company

COMPLETE WEED CONTROL

Hackling House, Bouton Industrial Park, Bourton-on-the-Water,
Gloucestershire, GL54 2EN.
Tel: 01451 822897, Fax: 01451 822587
Website: www.completeweedcontrol.co.uk
Email: cwc.ho@completeweedcontrol.co.uk
Weed control service.

COOPER CLARKE GROUP LTD

Bloomfield Road, Farnworth, Bolton, BL4 9LP
Tel: 01204 862222, Fax: 01204 793856
Website: www.cooperclarke.com
Email: groundeng@cooperclarke.co.uk
Produce a heavy-duty cellular paver called ecoblock. Suitable
for car park projects, particularly used by larger vehicles.

DJ TURFCARE EQUIPMENT LTD

MJF Yard, Chiddingfold, Dunsfold, nr. Goldaming,
Surrey, GU8 4PB
Tel: 01483 200976, Fax: 01483 200983
Email: sales@djturfcare.co.uk
Supplier of turfcare equipment including seed slotters, spikers,
and germination blankets.



Coir Matting used to stabilise a section
of Hadrian's Wall ditch

DEKOWE

Schurholz, Teppichfabrik GmbH, Marienstr 51-53, D-46286
Dorsten, Germany
Tel: +49 2362 600164, Fax: +49 2362 600186
Email: info@dekowe.de

Manufacturer of range of biodegradable coir fibre erosion control
fabrics including matting and fencing (Recultex). Greenfix supply
Recultex in the UK.

DLF PERRYFIELDS LTD/JOHNSONS

Thorn Farm, Inkberrow, Worcestershire, WR7 4LJ
Tel: 01386 793135, Fax: 01386 792715
Website: www.perryfields.co.uk
Email: amenity@perryfields.co.uk
Grass seed supply company

GEOFABRICS LTD

PO Box 7, Wellington Mills, Huddersfield Road, Liversedge, West
Yorkshire, WF15 7XA
Tel: 01924 412477, Fax: 01924 412375
Website: www.geofabrics.com
Email: info@geofabrics.co.uk
Manufacturer of a range of geotextiles for ground reinforcement,
drainage, erosion protection and separation.

GREENFIX

Laverham House, 77 St.George's Place, Cheltenham,
Gloucestershire. GL50 3PP.
Tel: 01242 700094, Fax: 01242 700093
Website: www.greenfix.co.uk
Email: cheltenham@greenfix.co.uk
Manufacturer of a wide range of materials including
biodegradable coir and jute erosion control matting for various
situations. Also produce an expandable plastic cellular material
for retaining materials on slopes.

GREENKEEPER LTD

Shelford Manor, Shelford, Nottingham, NG12 1ER
Tel: 01949 21144
Website: www.greenkeeperltd.co.uk
Supplier of a range of turf products including turf carpet and
rubber crumb turf.

GREEN-TECH

Sweethills Park, Nun Monkton, York, YO26 8ET
Tel: 01423 332100, Fax: 01423 332101
Website: www.green-tech.co.uk
Email: sales@green-tech.co.uk
General supplies, including cellular pavers, ground stabilising mesh, erosion control matting, geotextile membranes, bark mulches, soils, top-dressings, fertilisers, seed mixtures and pesticides.

GROUNDSMAN INDUSTRIES

30 Ballybrakes Road, Ballymoney, County Antrim, Northern Ireland, BT53 6LG
Tel: +28 276 67049, Fax: +28 276 66855
Website: www.groundsmanindustries.co.uk
Manufacturer of mechanical aerators.

HOOFMARK (UK) LTD

First Floor, Unit 24, Philadelphia Complex, Philadelphia, Houghton-le-Spring, Tyne & Wear, DH4 4UG
Tel: 0191 584 5556, Fax: 0191 584 5577
Website: www.hoofmark.co.uk
Email: info@hoofmark.co.uk
Supplier of cellular pavers.

LOTTRAK GEOTEXTILES

Don & Low Ltd., Newfordpark House, Glamis Road, Forfar, Angus, DD8 1FR
Tel: 01307 452200, Fax: 01307 452300
Website: www.lottrak.com
Email: lottrak@donlow.co.uk
Manufacturer of a range of geotextiles for ground reinforcement, drainage, erosion protection and separation.

LAUDERDALE ENGINEERING

Whitlaw Road Industrial Estate, Lauder, Berwickshire, TD2 6PA
Tel: 01578 718718, Fax: 01578 718719
Manufacturers of the Leader Rabbit Trap, a drop box trap.

MICRON SPRAYERS LIMITED

Bromyard Industrial Estate, Bromyard, Herefordshire, HR7 4HS
Tel: 01885 482397, Fax: 01885 483043
Website: www.micron.co.uk
Email: micron@micron.co.uk
Manufacturer of weedwipers and sprayers for the control of weeds and bracken.

NETLON TURF SYSTEMS

New Wellington Street, Blackburn, Lancashire, BB2 4P3
Tel: 01254 266833, Fax: 01254 266868
Website: www.netlon.co.uk
Email: turf@netlon.co.uk
Manufacturer of a range of cellular pavers and advanced turf (soil with plastic mesh mixed into it).

NOTTS SPORT

Premier House, 18 Mandervell Road, Oadby, Leicester, LE2 5LQ
Tel: 0116 272 0222, Fax: 0116 272 0617
Website: www.nottssport.com
Email: info@nottssport.co.uk
Manufacturer of a grass reinforcement fabric.

POWERSEEDS (UK) LTD

Honeybourne Trading Estate, Honeybourne, Evesham, Worcestershire, WR11 7QF
Tel: 01386 832000, Fax: 01386 834343
Website: www.powerseeds.co.uk
Grass seed supply company

RIGBY TAYLOR LTD

Rigby Taylor House, Garside Street, Bolton, Lancashire, BL1 4AE
Tel: 01204 377777, Fax: 01204 377715
Website: www.rigbytaylor.com
Grass seed supply company



Expandable cellular mesh used to provide vehicle access across Hadrian's Wall Ditch

SOMMERFELD FLEXBOARD LIMITED

New Works Lane, Arleston Hill, Wellington, Telford, Shropshire, TF1 2JY
Tel: 01952 503737, Fax: 01952 630132
Website: www.sommerfeld.co.uk
Suppliers and hirers of portable roadways.

SOURCE CONTROL SYSTEMS LIMITED

5 Horninglow Street, Burton upon Trent, Staffordshire, DE14 1NG
Tel: 01283 509021, Fax: 01283 562941
Website: www.sourcecontrol.co.uk
Email: mail@sourcecontrol.co.uk
Manufacturer of cellular pavers designed for wet environments and storm water management blocks.

TENAX UK LIMITED

Ash Road, Wrexham Industrial Estate, Wrexham, LL13 9JT
Tel: 01978 664667, Fax: 01978 664748
Website: www.tenax.co.uk
Email: info@tenax.co.uk
Manufacturer of a grass protection systems, ground stabilising mesh and cellular retaining fabrics.

TERRAM LIMITED

Mamhilad, Pontypool, Gwent, NP4 0YR
Tel: 01495 757722, Fax: 01495 762383
Website: www.terram.com
Email: info@terram.co.uk
Manufacturer of a range of geotextiles for ground reinforcement, drainage, erosion protection and separation.

TOPGREEN

c/o Nickerson (UK) Ltd, Rothwell, Market Rasen, Lincolnshire, LN7 6DT
Tel: 01472 371471, Fax: 01472 371195
Grass seed supply company

TURF SEED EUROPE LTD

17 Earlsfort Terrace, Dublin 2, Republic of Ireland
Tel: +39 348 4760940, Fax: +39 011 9723420
Website: www.turf-seed.com
Grass seed supply company