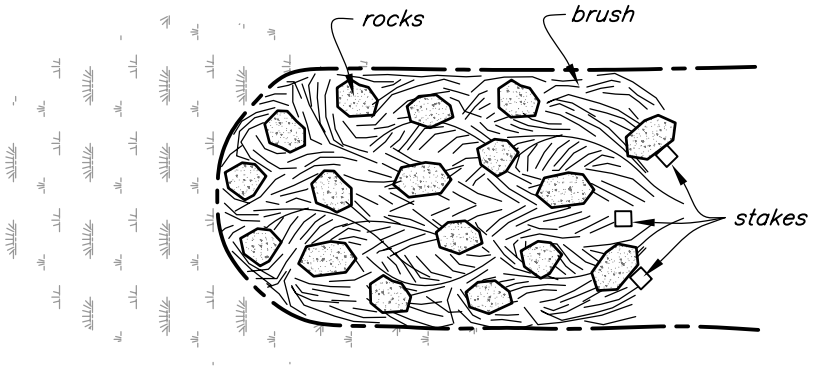
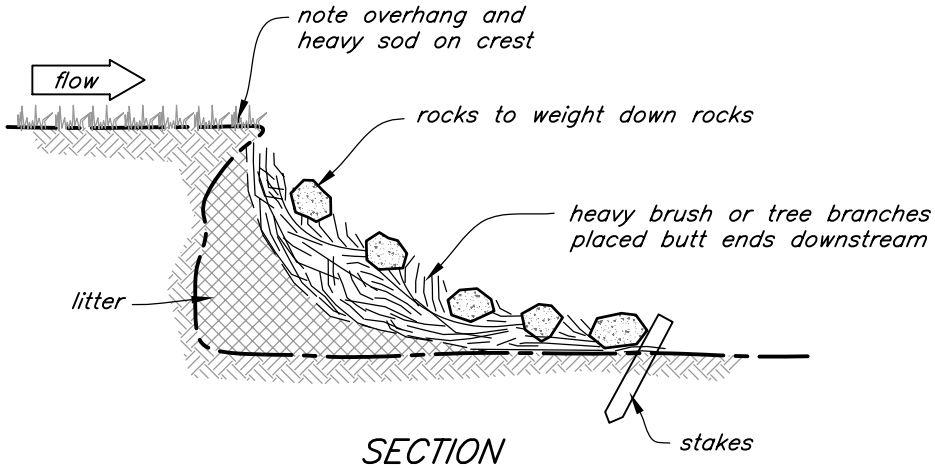


PLAN VIEW



SECTION

FIGURE 9

CONSTRUCTION PROCEDURE

1. Place a thick, solidly packed mat of "litter" against the undercut portions of the gully–head and extending downstream about two and one–half times the height of the head, as shown in figure 9.

2. Place a layer of "apron brush" on top of the litter, as shown in the sketch. The butt–ends should point downstream. Tamp down by walking back and forth on top.

3. If the gully may be subjected to heavy flood flows, set a row of stout stakes or posts across the gully to prevent the rocks from rolling downstream. The spacing of the stakes can vary from one to two feet. Willows or cottonwoods can be used for the stakes or posts, care being taken to set them with butt–ends down so that they will grow (see Chapter VII, PLANTING CLIPPINGS). Part of the work of vegetative control as thus taken care of.

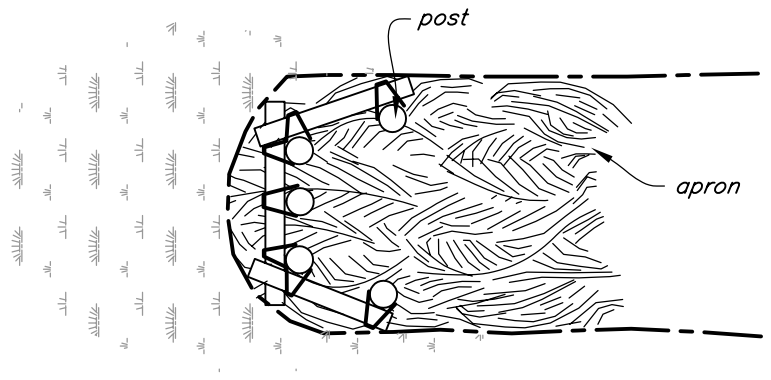
4. Cover the dam brush with a layer of rocks, sufficiently heavy to stabilize the whole plug against the force of expected flood waters. Use flat rocks where possible.

5. Where it is found that the litter has fallen out of place, leaving an opening between the top of the head and the plug, this crack or opening should be packed solidly with litter and a heavy stick used to pound the material down into the opening.

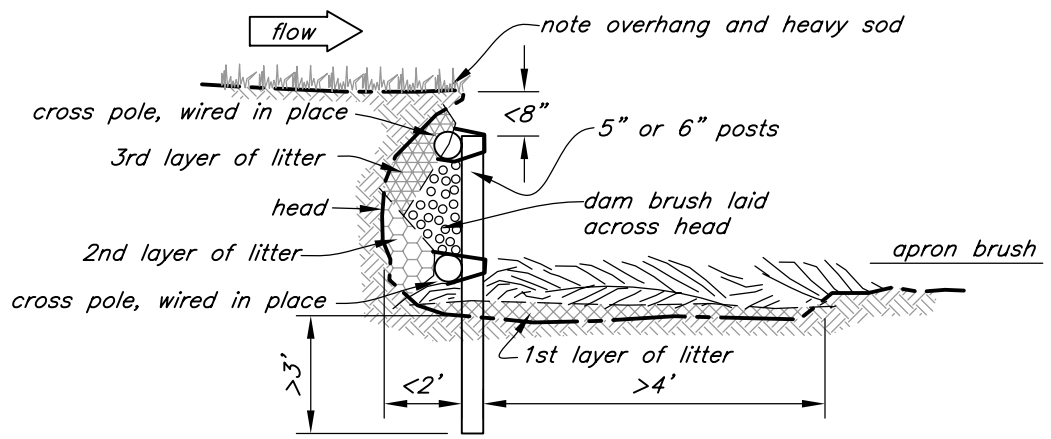
This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	BRUSH AND ROCK PLUG
Designed		or_mtn_meadow_details.dwg	
Drawn	6/2006	DRAWING NO. 1	(for use where crest is well sodded and overhangs 6" or more)
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	



PLAN VIEW



SECTION

FIGURE 10

CONSTRUCTION PROCEDURE

1. Cut posts 5 to 6 inches in diameter and long enough to come within 8 inches of the crest of the head and to be buried at least 3 feet. Dig post holes 2 to 3 feet apart as close to the head as possible (within 2 feet) and set posts in place.

2. Place a mat of "litter" 1 to 6 inches deep over the bottom of the gully, shown in the sketch as "1st layer of litter".

3. Place a 4 inch layer of "apron brush" on top of the litter, as shown in the sketch. Extend the butt-ends as far as possible upstream from the posts, with the top ends downstream. This brush, with the underlying litter, constitutes the apron.

4. Place lower cross poles on top of the butt-ends of the brush on the upstream side of the posts, and wire to posts and apron brush No. 9 wire is satisfactory.

5. Place the second layer of "litter" as shown in the sketch, packing well against the gully-head.

6. Place "dam brush" across the gully on the upstream side of the posts and weight in place with upper cross poles, as shown in the sketch. If necessary, wire cross poles to posts. The cross poles must be below the crest of the bead. Be sure to leave a space so that the third layer of litter can be filled in against the head.

7. Pack the third layer of litter into the space between the cross brush and the head, as shown in the sketch. A post or stout stake will be handy to pound this material into a compact mass.

8. It is essential that all brush be placed to "interlace" as much as possible. To accomplish this, place a few branches at a time, by hand, rather than to drop in thick bundles with all butts together so that they cannot interlock with tops or butts of other adjacent bundles. Also, never pitch the brush into place carelessly with a pitchfork.

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

POST AND BRUSH PLUG

(for use where crest is well sodded, and overhangs 6" or more)

ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)

Date

Designed

Drawn

Checked

Approved

Title

NRCS

Natural Resources Conservation Service

United States Department of Agriculture

File Name
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Drawing No.
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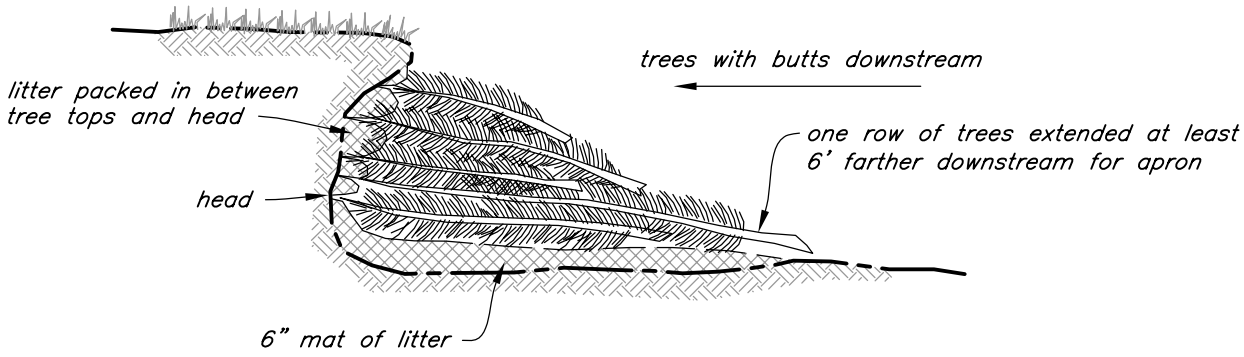


SECTION

FIGURE 11

Where trees are available from thinning or from clearing right-of-way for truck trails, etc., they can be used successfully for plugs provided they have heavy trunks and dense, green foliage. To be used on heads with a well-sodded overhang of 6 Inches or more.

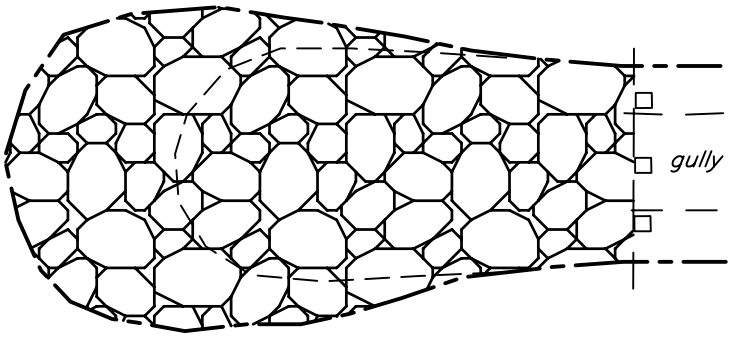
CONSTRUCTION PROCEDURE

1. *Lay a 6 inch mat of "litter" over the gully bottom extending from the head to a point about 15 feet downstream.*
2. *Lay a row of trees on the gully bottom with the butts downstream and the tops up against the head. The bottom limbs of all trees placed should be partially lopped down to make then as compact as possible.*
3. *Place a second row of trees about 6 feet farther downstream than the first row, with the butts downstream to serve as an apron. Branches on the under side should be partially lopped to enable trees to settle firmly into stream bed.*
4. *Pile trees into the gully-head with the tops as close to the head as possible, and the butts downstream. They should be piled up to the top of the gully at the banks, but should be one or two feet lower in the middle.*
5. *Fill in any cracks between' the tree branches and the head itself with litter. Pack firmly.*

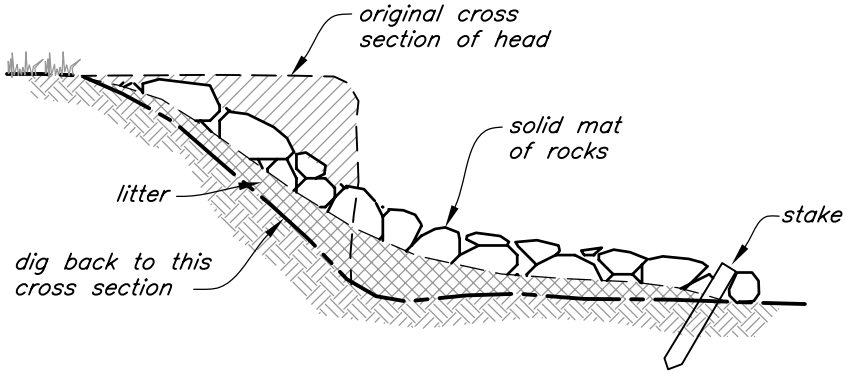
This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	TREE PLUG
Designed		*or_mtn_meadow_details.dwg*	
Drawn	6/2006	DRAWING NO. 3	
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	



PLAN VIEW



SECTION

FIGURE 12

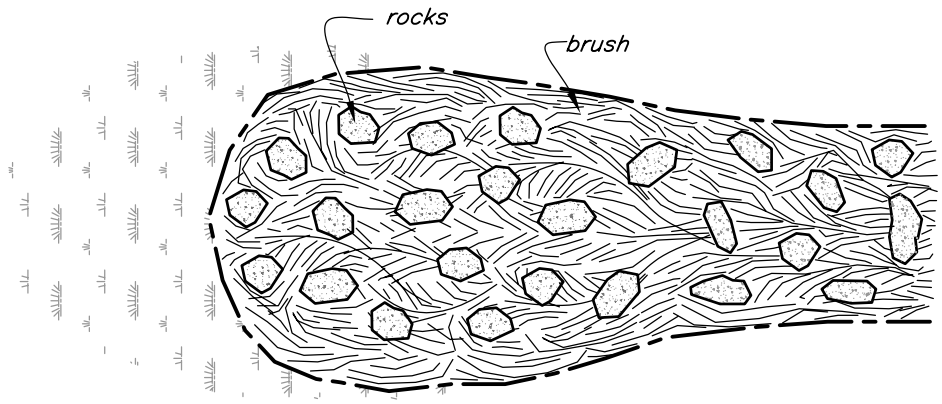
CONSTRUCTION PROCEDURE

1. Slope back the gully–head and the banks near the head as shown in figure 12. This can be done by hand or with scraper or plow.
2. Place a thick layer of "litter" over, the slope created and for a distance of at least 5 feet along the gully bottom.
3. Lay a solid mat of rock over the fine litter, starting at the bottom, and working upstream. Flat rocks are preferred.
4. It there is danger of the rooks being moved in floods, drive strong stakes spaced about one foot apart across the gully bottom as shown.

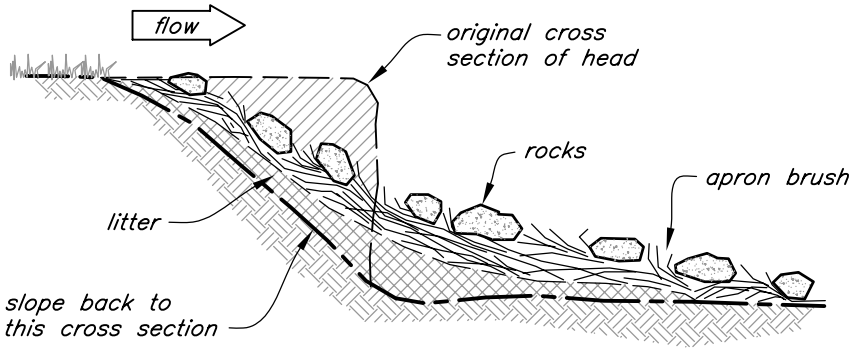
This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	ROCK MATTRESS
Designed		or_mtn_meadow_details.dwg	
Drawn	6/2006	DRAWING NO. 4	(For use on heads with slight or no overhang, in places where rock and litter are the only readily available materials.)
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	



PLAN VIEW



SECTION

FIGURE 13

CONSTRUCTION PROCEDURE

1. Slope back the gully–head and the banks near the head as shown in figure 13. This can be done by hand or with scraper or plow.

2. Place a thick layer of "litter" over the slope created and at least 5 feet along the gully bottom.

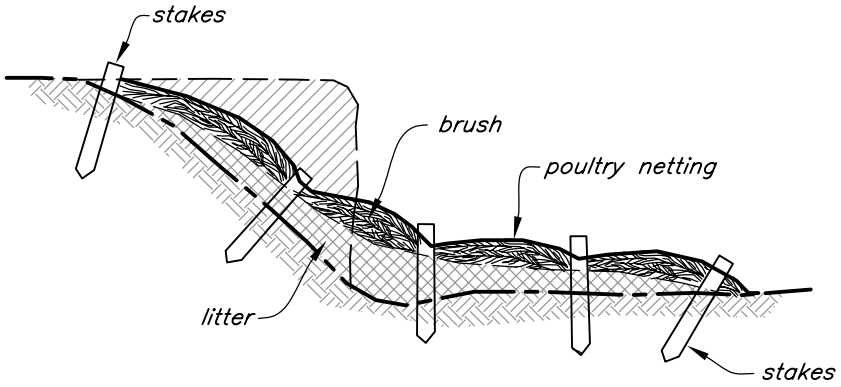
3. Cover this material with a layer of 'apron brush". Start at the downstream end, and work upstream. The butts should point downstream in all cases.

4. Weight the brush down with a sufficient number of rocks to keep the mass from being shifted by maximum floods which may flow over it. Flat rocks should be used if procurable.

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	BRUSH AND ROCK MATTRESS
Designed		or_mtn_meadow_details.dwg	(For use on heads with alight or no overhang, where brush and rock are both available.)
Drawn	6/2006	DRAWING NO. 5	
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS	U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE



SECTION

FIGURE 14

CONSTRUCTION PROCEDURE

1. Slope back the gully–head and the banks near the head as shown in figure 13. This can be done by hand or with scraper or plow.

2. Place a thick layer of "litter" over the slope created and at least 5 feet along the gully bottom.

3. Cover this material with a layer of 'apron brush". Start at the downstream end, and work upstream. The butts should point downstream in all cases.

4. Place one thickness of poultry netting over the entire mattress. Where two sections are joined, overlap about one foot.

5. Stake down as shown, forcing the netting down tight against the brush. Set downstream row of stakes first, pull netting tight, and stand on netting while setting each successive row of stakes. The stakes should be spaced about one foot apart across the mattress. They should be about two feet long. A small notch in the upstream side of the stake will aid in holding the netting down but staples, firmly driven, are more satisfactory for this purpose.

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	BRUSH AND POULTRY NETTING MATTRESS
Designed		or_mtn_meadow_details.dwg	
Drawn	6/2006	DRAWING NO. 6	(For use on heads with slight or no overhang, where rocks are not readily available.)
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	

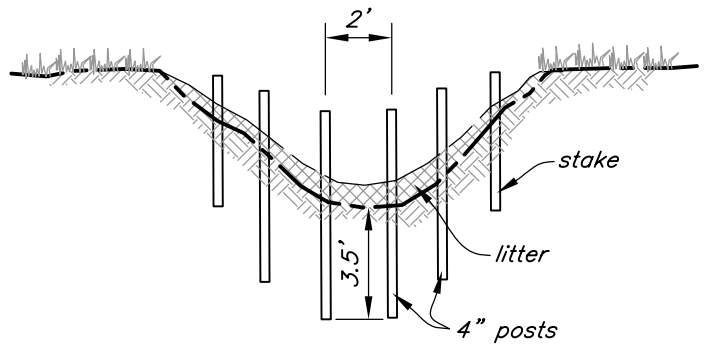


FIGURE 21

Elevation of gully after banks have been dug back. The posts have been set, and the layer of litter has been placed.

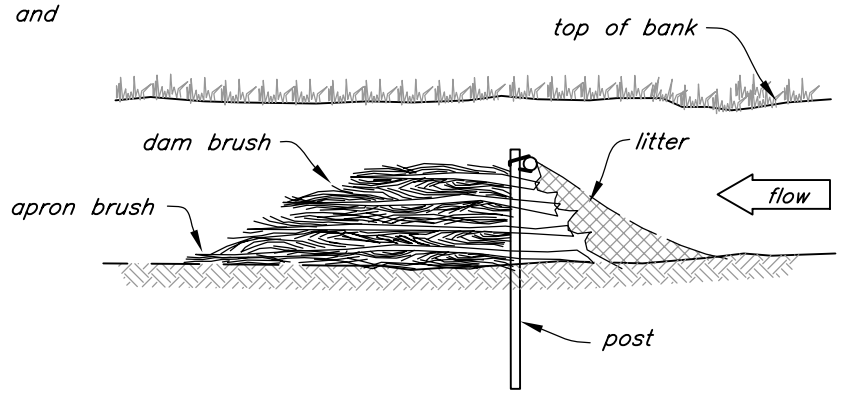


FIGURE 22

Side section of completed dam. Note that the longer brush is on the bottom to form an apron.

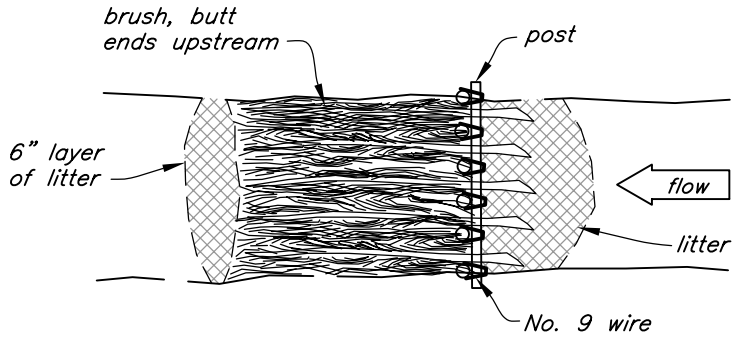


FIGURE 23

Plan of completed dam. Note that the brush is carefully piled and tramped, with the butt ends laid upstream between the posts.

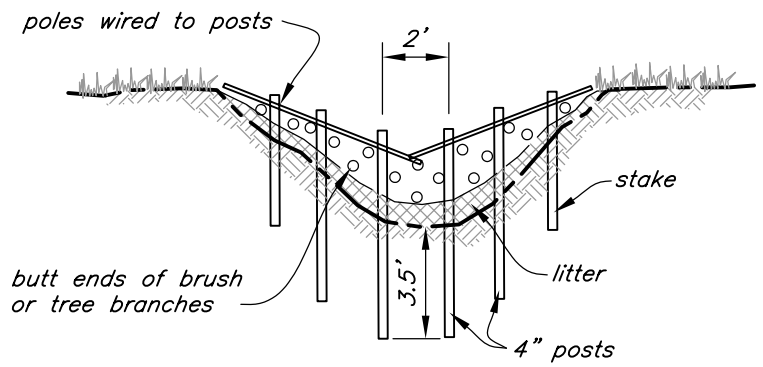


FIGURE 24

Elevation of dam, looking downstream, complete except for litter against upstream face.

This dam is suitable for gullies up to 5 feet deep and up to 15 feet wide, as shown in figure 20. Figures 21 to 24 illustrate the method of construction.

Materials required:

2 to 4 – posts with 4 inch tops and about 6 feet long

2 to 4 – stakes, 3 inches diameter, 3 feet long

(Note: Posts and stakes cut from willow trees and planted right side up are excellent because they will sprout and grow. If willows are not available, cedar makes good posts.)

2 – poles, 3 to 4 inches in diameter, 6 feet long
20 – staples
15 – feet of No. 9 galvanized wire
– dam brush, apron brush and litter.

CONSTRUCTION PROCEDURE

1. Slope back the banks, if too steep, as shown in figure 20. Throw the fresh dirt upstream from the dam.
2. Set posts of sound wood with 4–inch tops. The center posts should be long enough so that they can be buried 3 to 3–1/2 feet, and extend up to within one or two feet of the top of the gully bank. The outer posts need not be set quite so deep but should extend higher as shown in figure 21. Space the posts 2 feet apart. Willow posts are recommended.
3. Set 2 to 4 stakes 3 inches in diameter and 3 feet long, as shown in figure 21. Use willow, if possible, and plant right side up so they will sprout.
4. Place a 6 inch layer of "litter" between the posts, and on the gully bottom and sides downstream from the posts for about 6 feet.
5. Place brush or green tree branches as shown in figures 22 to 24, inclusive. The long, straight limbs, "apron brush", should be placed in a layer across the bottom. For the rest of the dam, the shorter "dam brush" should be used. The butt ends should be placed upstream. Usually, the gully can be almost filled with brush and when the cross poles are placed, the brush will be forced down into a compact mass.
6. Place the cross poles on the upstream side of the posts. One or two men should stand on these poles to compress the brush properly while the poles are being wired to the posts and stakes with No. 9 galvanized wire.
7. Place a layer of "litter" against the upstream face of the dam, and carefully pack into the openings between the butt–ends of the brush.

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

Date
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Title

SINGLE–ROW POST–BRUSH DAM

(for use where crest is well sodded, and overhangs 6" or more)

ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name
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Drawing No.
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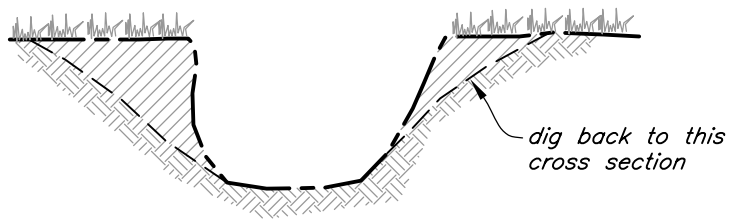

FIGURE 25

Sectional elevation of gully showing how banks should be sloped back.

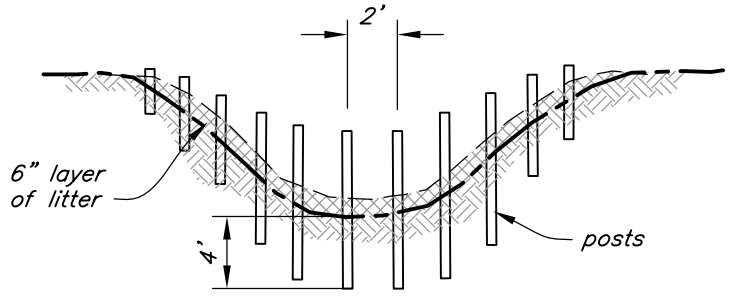

FIGURE 26

Sectional elevation of gully showing posts and litter in place for dam. Note that the posts are lower in the center.

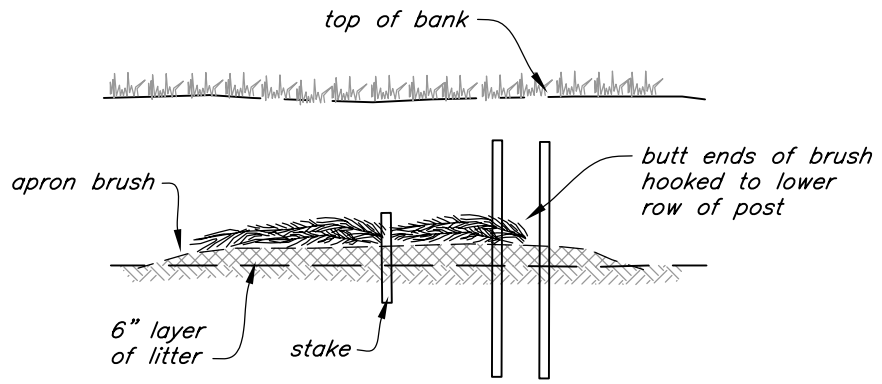

FIGURE 27

Side section of dam after apron brush has been placed.

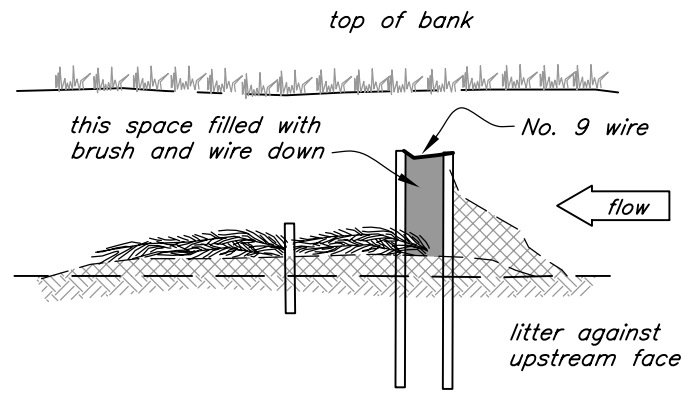

FIGURE 28

Side section of completed dam.

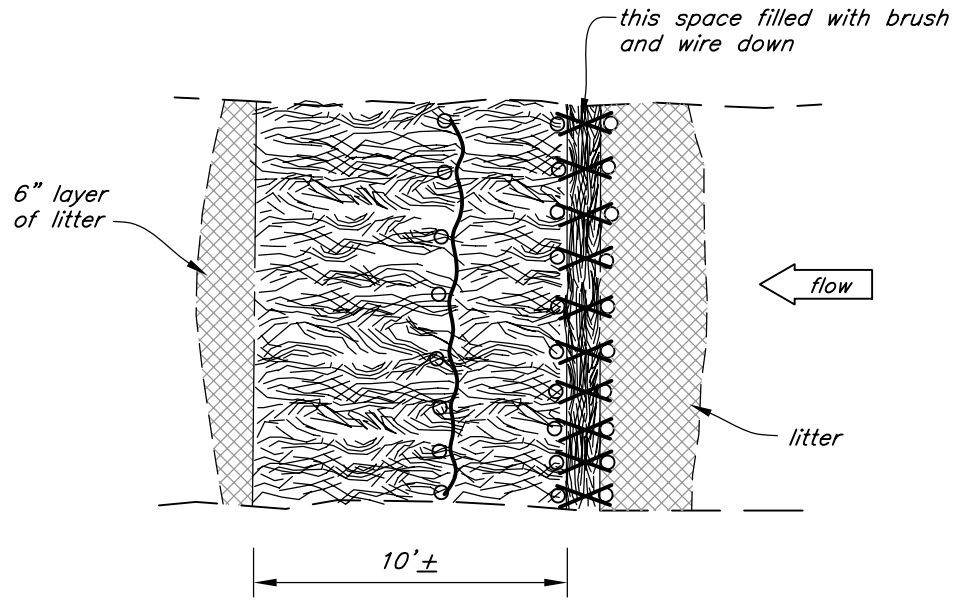

FIGURE 29

Plan of completed dam.

This type of dam has been used most on gullies fifteen to twenty feet– wide and five to seven feet deep. However, it may safely be used on much larger mountain meadow gullies, provided the center height of the dam does not exceed about four feet.

Materials required:

Posts: The center posts should be 8 to 8–1/2 feet long and 6 to 8 inches in diameter, but shorter posts may be used at the side of the ditch and may be only 4 to 6 inches in diameter. Willow posts are excellent.

Wire: About 3–1/2 feet of No. 9, soft, galvanized wire is required for each foot of width of the gully from bank to bank.

"Apron brush", "dam brush" and "litter".

Stakes: 2 to 3 feet long. Use willow if possible.

CONSTRUCTION PROCEDURE

1. *Slope banks back, if too steep, as shown in figure 25. Throw the loose dirt upstream from the dam.*
2. *Set posts as shown in figure 26.*
3. *Place 6 inch layer of "litter" on gully bottom and banks extending about ten feet downstream from the posts, as shown in figures 26 and 27.*
4. *Place about one layer of "apron brush", butts upstream and hooked to the lower row of posts as shown in figure 27. This brush should extend downstream about ten feet or more.*
5. *Drive a row of stakes across the gully through the middle of the apron and wire the limbs down to form a dense mat. Willow stakes are preferable.*
6. *Entirely fill the space between the two lines of gully. Thoroughly pack and pile above the tops of the posts for a foot or more.*
7. *Staple wires to a post at one end, stretch tight, and thread back and forth as shown in figure 29. It is usually necessary to have one or more men stand on the brush while wiring to help force the brush into a compact mass.*
8. *Place litter against the upstream face of the dam, as shown in figures 28 and 29.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

Date
Designed
Drawn
Checked
Approved
Title

DOUBLE–ROW POST–BRUSH DAM

(for use where crest is well sodded, and overhangs 6" or more)
ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

File Name
or_mtn_meadow_details.dwg

Drawing No.
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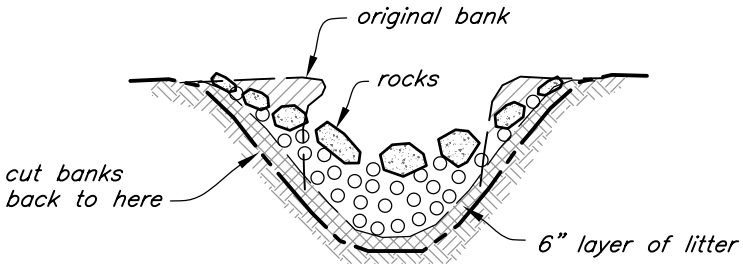


FIGURE 30

Sectional elevation of gully shopwing brush and rock dam.

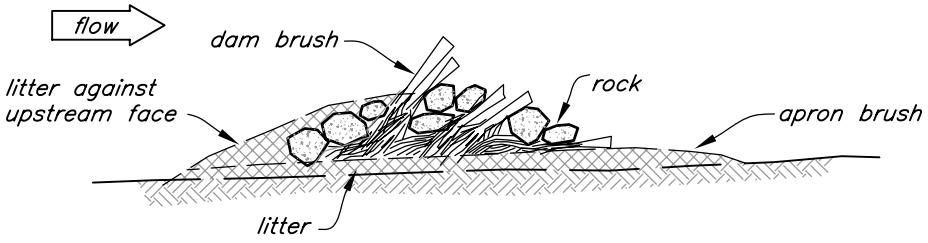


FIGURE 31

Side section of brush and rock dam.

Materials: Apron brush, dam brush, litter and rook.

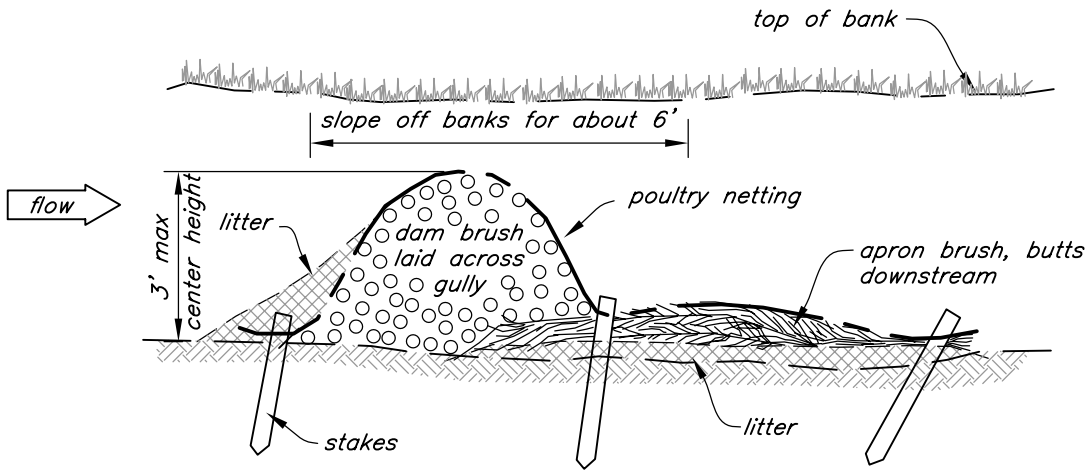
CONSTRUCTION PROCEDURE

1. *If banks where the dam is to be located are nearly vertical, they should be sloped back for a distance of 12 to 15 feet as shown in figure 30. The loose earth should be thrown upstream from the dam.*
2. *Place a 6 inch layer of "litter" along the gully bottom and sides for a distance of 12 to 15 feet, as shown in figures 30 and 31.*
3. *Across the gully, on top of the downstream end of the layer of litter, place an 8 inch layer of "apron brush", as shown in figure 31. The butt-ends of the brush should point downstream.*
4. *Near the upstream end of the apron brush lay a row of rocks about one foot high across the gully on top of the brush. Flat rocks are superior to round rocks.*
5. *Place about a 4 foot layer of loose "dam brush" across the gully with the butt-ends pointing downstream and extending just over the top of the row of rocks.*
6. *Lay a row of rocks across the middle of this layer of dam brush at the same time walking on the brush to tamp it down. Flat rocks should be used if available, and the row should be about 1-1/2 feet high. The weight of the rocks should compress the brush until the dam is only about 2 feet high.*
7. *In a similar manner, place a layer of "dam brush" on the upstream side of this row of rock.*
8. *Weight this last layer of brush down with sufficient rock to hold the brush in place.*
9. *Place a 4 inch layer of "litter" against the upstream face of the dam.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	BRUSH AND ROCK DAM
Designed		*or_mtn_meadow_details.dwg*	
Drawn	6/2006	DRAWING NO. 9	
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	



SECTION

FIGURE 34

Materials required: Dam brush, poultry netting, staples and stakes or a few rocks.

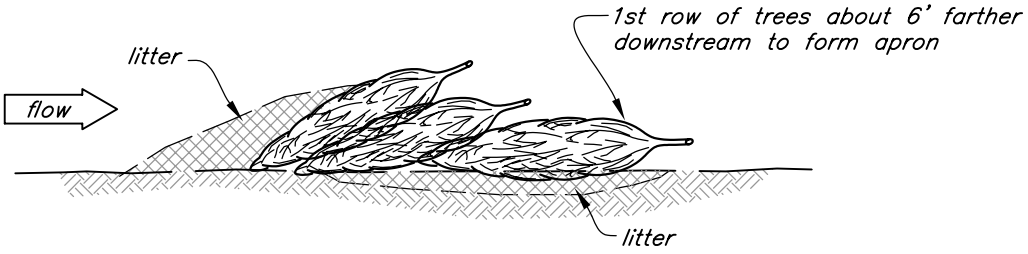
CONSTRUCTION PROCEDURE

1. *If banks are vertical, slope them back to the natural angle of repose for a distance of about 6 feet where the dam is to be located,*
2. *Place a 4 to 8 inch layer of 'litter" for a distance of 8 or 10 feet along the bottom and sides of the gully.*
3. *Cover the litter with a layer of "apron brush" about 8 or 10 inches thick when loose and with the butt-ends pointing downstream. If necessary, "damn brush" can be used in place of apron brush.*
4. *Cut poultry netting into about 18 foot lengths. Lay over the apron, as shown in figure 34, and stake, at the downstream end of the apron. The stakes should be at least 3 feet long. They should be of willow, if possible. Before the stakes are completely driven, staple the netting to them so that it will be firmly anchored down as the stakes are driven the rest of the way.*
5. *Similarly, stake the netting down at a point 6 feet upstream, walking on the apron so that it is more readily forced down into a compact layer. If necessary, put in additional stakes wherever the apron tends to bulk up. Fold the remaining lengths of poultry netting back over the apron while the "dam brush" is being placed.*
6. *Place the "darn brush" in a compact interwoven mass across the gully and up the banks, building up so that it will have a center height of about 3 feet when finally forced down by the netting. This will require that the brush be piled loosely to a height of 6 feet or more. The branches should be laid crosswise of the gully.*
7. *Pull the loose ends of the poultry netting over the "dam brush" and stake down as shown in figure 34. The stakes should be similar to those previously used. It will probably be necessary to have one or two men stand on top of the dam while staking the netting down, otherwise the brush may not be forced into a compact mass.*
8. *Place a layer of litter across the upstream face of the dam when the structure is complete.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	BRUSH AND POULTRY NETTING DAM
Designed		*or_mtn_meadow_details.dwg*	*(A satisfactory dam in small gul1ies up to 10 or 12 feet wide where "dam brush" is plentiful, but rock is scarce.)*
Drawn	6/2006	DRAWING NO. 10	
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS	U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE



SECTION

FIGURE 36

Materials required: Small green, densely foliated trees and "litter".

CONSTRUCTION PROCEDURE

1. *Slope banks back if nearly vertical. Throw the loosened earth upstream from the darn.*
2. *If needed, lay a 6 inch layer of "litter" along the bottom and sides of the gully for a distance of about 8 feet. This should be under where the first row of trees is to be placed for the apron.*

   (Note: The layer of litter under the apron is unnecessary if there is a good cover of sod on the gully bottom.)
3. *Lay the first row of trees, butts downstream, across the gully and up the sides to provide the apron.*
4. *As shown in figure 36, lay several layers of trees, butts downstream, across the gully bottom and up the sides so that the butt-ends are up on the apron trees and the top ends are in the gully bottom. They should be piled 3 to 4 feet high in the center and several feet higher on the banks.*
5. *The effectiveness of the dam will be improved if a layer of litter is placed against the upstream face of the dam.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	TREE DAM
Designed		or_mtn_meadow_details.dwg	
Drawn	6/2006	DRAWING NO. 11	*(A good type of dam in localities where small trees are plentiful, need thinning or where they are being out to clear rights-of-way, etc.)*
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	

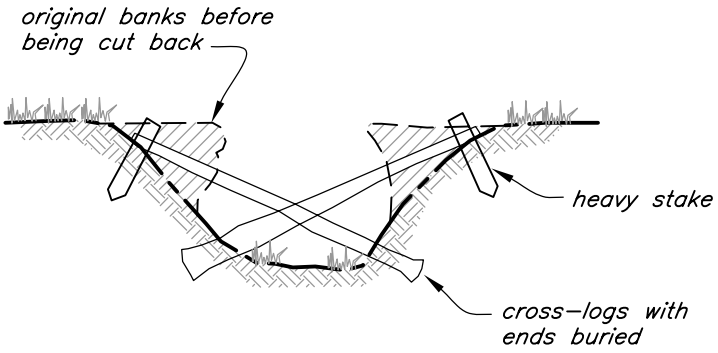


FIGURE 37

Sectional elevation of gully showing cross–logs placed for a simple tree dam.

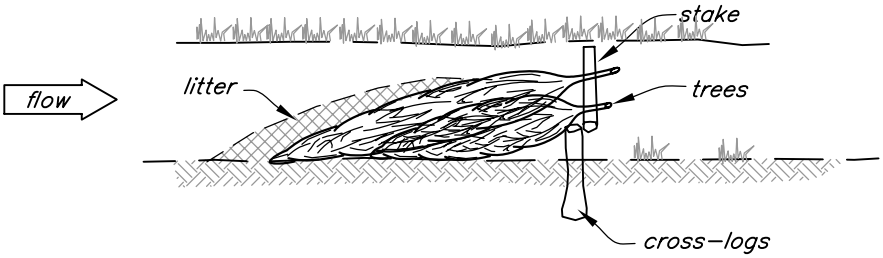


FIGURE 38

Side section of gully showing simple tree dam.

Materials required: Small green trees, 2 long loge or poles, and litter.

CONSTRUCTION PROCEDURE

1. *If banks are steep and unstable, cut back as shown in figure*
2. *Place two stout cross–logs (or poles) across the gully, burying the butt–ends as shown in figure 37.*
3. *Drive stout stakes in the ground on the downstream side of the logs near the top of the banks, as shown in figure 37. Willow stakes should be used, if available. They should be at least 3 feet long and about 4 inches in diameter.*
4. *Place the butt–ends of the trees up on, and extending 2 or 3 feet over, the cross–logs. The top ends should rest on the gully bottom upstream from the cross–logs. Pile in sufficient trees to make a dense dam. They should be extended on up the sides of the gully so that there will be no danger of side cutting.*
5. *The dam will often be somewhat more effective if a layer of "litter" is placed against the upstream face.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	SIMPLE TREE DAM
Designed		*or_mtn_meadow_details.dwg*	*(A satisfactory dam in small gul1ies up to 10 or 12 feet wide where "dam brush" is plentiful, but rock is scarce.)*
Drawn	6/2006	DRAWING NO. 12	
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS	U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

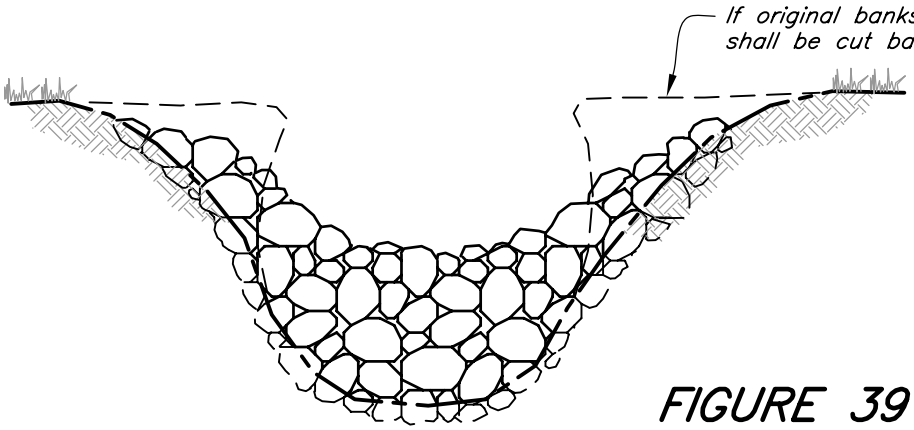


FIGURE 39

Section of gully showing loose rock dam.

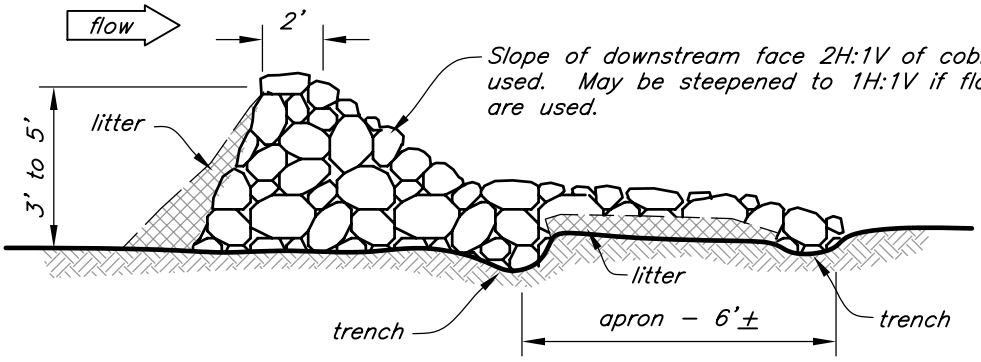


FIGURE 40

Side section of gully showing loose rock dam.

Materials required: Rock and litter.

CONSTRUCTION PROCEDURE

1. *If banks are too steep, slope back as shown in figure 39. Throw loose dirt upstream from the dam.*
2. *Cut a 4 to 6 inch trench across gully and up the aides to anchor the heavy rocks on the downstream toe of the dam.*
3. *Place a row of large rocks along this trench to form the downstream toe. Build back from this row. The rocks, especially on downstream face, should be toed upward so that they will be keyed in as shown in figure 40. Note that the flatter rocks are used on this face.*
4. *About 6 feet downstream from the downstream toe of the dam cut a 4 to 6 inch trench across the gully, as shown in figure 40.*
5. *Lay a row of heavy rocks in this trench across the gully.*
6. *Place a 4 inch layer of litter in the space between this row of rocks and the row at the toe of the dam. Extend this layer well up the banks.*
7. *Cover the litter with a solid pavement of rock.*
8. *Place a thick layer of litter over the face of the dam when completed.*

This drawing requires supporting technical documentation prior to use and must be adapted to the specific site.

DRAWING NOT TO SCALE

	Date	CAD FILE NAME	LOOSE ROCK DAM
Designed		*or_mtn_meadow_details.dwg*	
Drawn	6/2006	DRAWING NO. 13	*(Suitable where there is ample rock and very little brush.)*
Checked		SHEET OF	ADAPTED FROM: HANDBOOK OF EROSION CONTROL IN MOUNTAIN MEADOWS (1934)
Approved		NRCS U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE	