Designing and Installing Streambank Stabilization Practices

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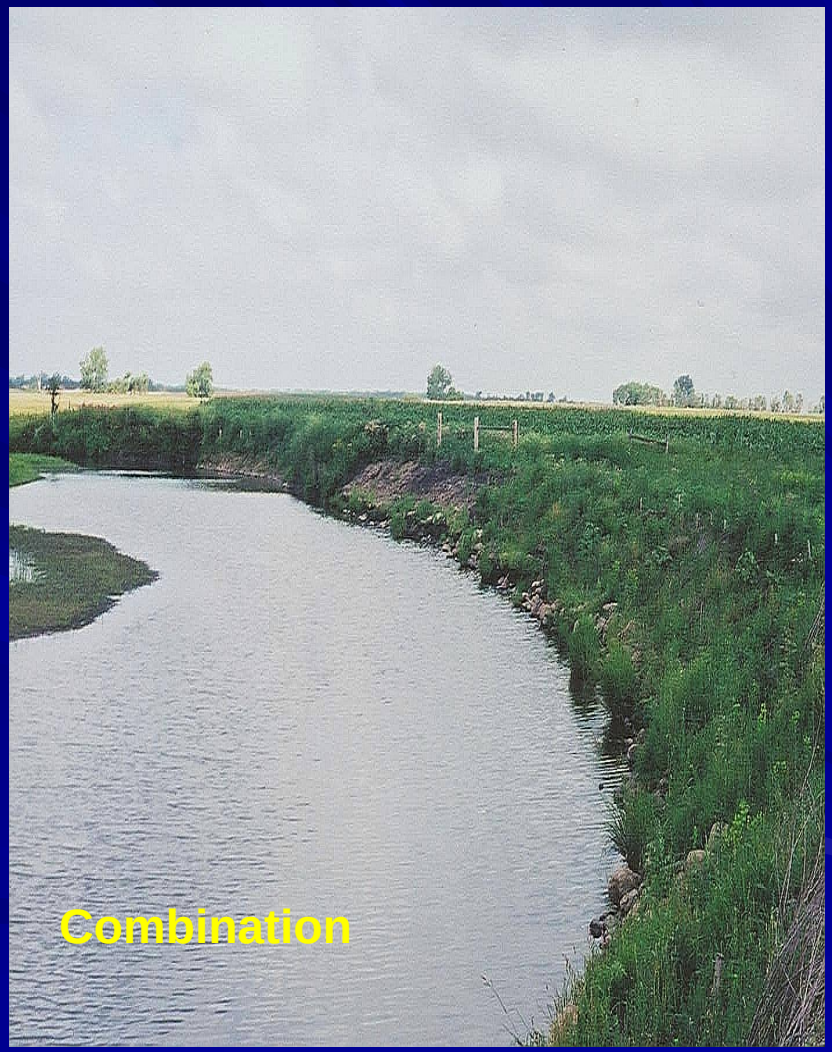
Practice Options



Use of plants and plant materials (brush) and engineered structures for slope protection and erosion control.

By What Name?

- Soft Practices
- Nonstructural Practices
- Biotechnical
- Bioengineering
- Biogeotechnical

Applications

- Gully Erosion
- Slope Protection
- Lakeshore Protection
- Streambank/Riparian Restoration

General Rules

- Read Nature
  - What's growing in the area?
  - Is it something that can or should be "fixed"?
- Never disturb a site unnecessarily
  - Do no harm.
  - If it ain't broke don't fix it!
- Remember – "Big plants come from little plants."

Planning

- Fit the system to the site
  - Vegetation
  - Hydrology
  - Geology and soils
  - Topography and exposure
- Limit removal of vegetation
- Stockpile and protect top soil/materials
- Protect exposed areas during construction
- Obtain required permits and clearances
  - 401/404
  - Storm Water Construction and Dewatering
  - Cultural and Historic Resources
  - T & E Species

Design Considerations

- Earthwork
- Scheduling/timing
- Moisture requirements and effects
- Vegetative damage to inert structures
- Auxiliary practices on severely eroded sites
  - Gabions
  - Riprap

Wattles/Fascines

Long branch cuttings bound into sausage-shaped bundles placed in a shallow trench to stabilize stream banks and slopes.

- Dissipate energy
- Trap and hold soil on the bank
- Reduce long to series of short slopes
- Immediate surface and rill erosion control
- Suited to steep rocky slopes where digging is difficult
- Protect from shallow slides (1-2 foot depth) on stabile slopes

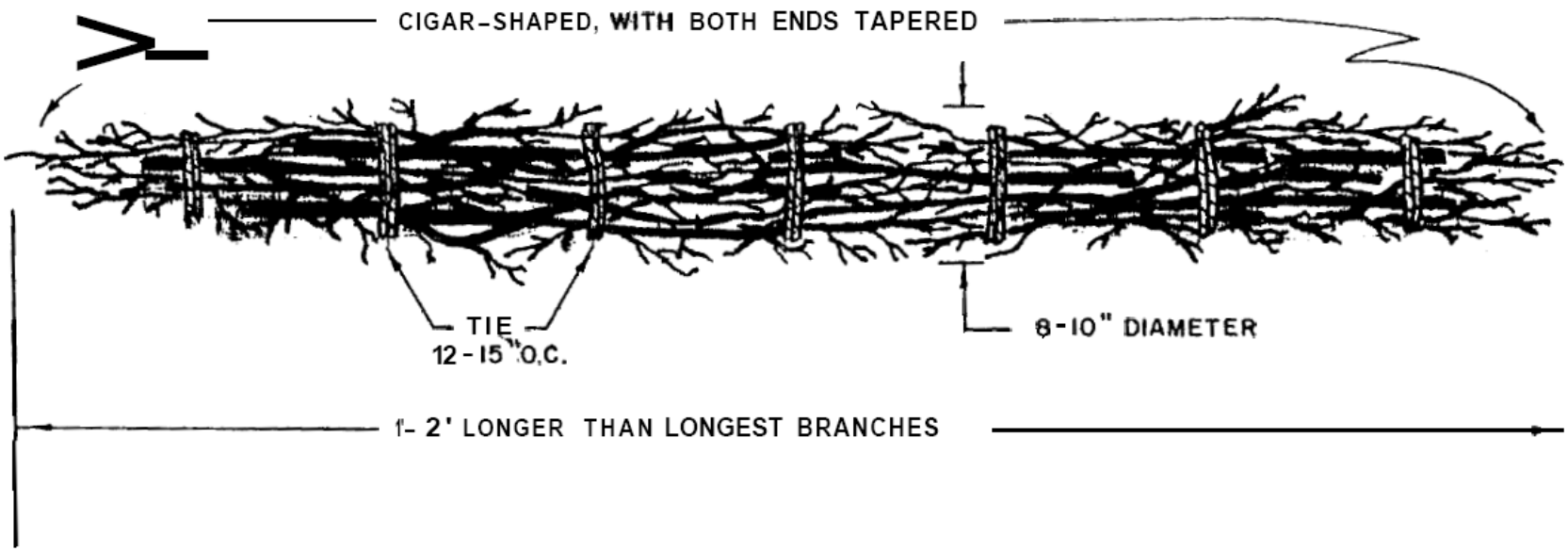
Installation Guidelines

- Prepare wattles and live stakes immediately before installation
- Start at base of slope
- Distance between trenches (wattles)

Slope	Distance Between Trenches (ft)	Maximum Slope Length (ft)
1:1 - 1.5:1	3 - 4	15
1.5:1 - 2:1	4 - 5	20
2:1 - 2.5:1	5 - 6	30
2.5:1 – 3:1	6 - 8	40
3.5:1 – 4:1	8 - 9	50
4.5:1 – 5:1	9 -10	60

- Dig trenches 12 -18 inches wide and 6 - 8 deep
- Stake in front and through wattle.
- Drive live stakes on down slope side of bundle
- Overlap bundles 12 inches and stake between last two ties of bundles

WATTLING BUNDLES

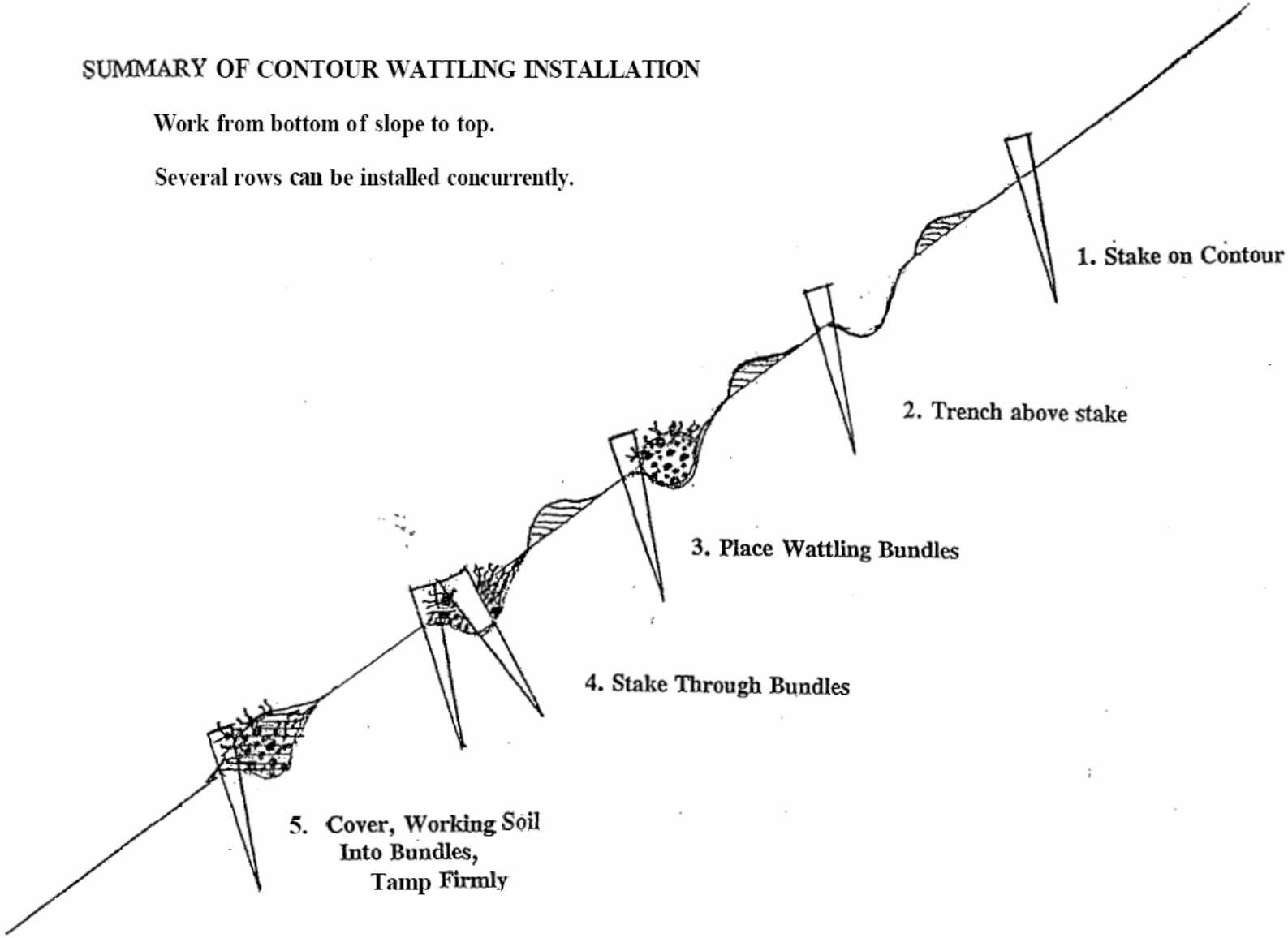


BUNDLES OF LIVE BRUSH, SPECIES WHICH ROOT PREFERRED

SUMMARY OF CONTOUR WATTLING INSTALLATION

Work from bottom of slope to top.

Several rows can be installed concurrently.



Brush Layering/Branch Packing

Live branches placed more or less perpendicular to the contour in small trenches excavated into new fills, shallow mass failures, deep and/or narrow gullies, holes in streambanks

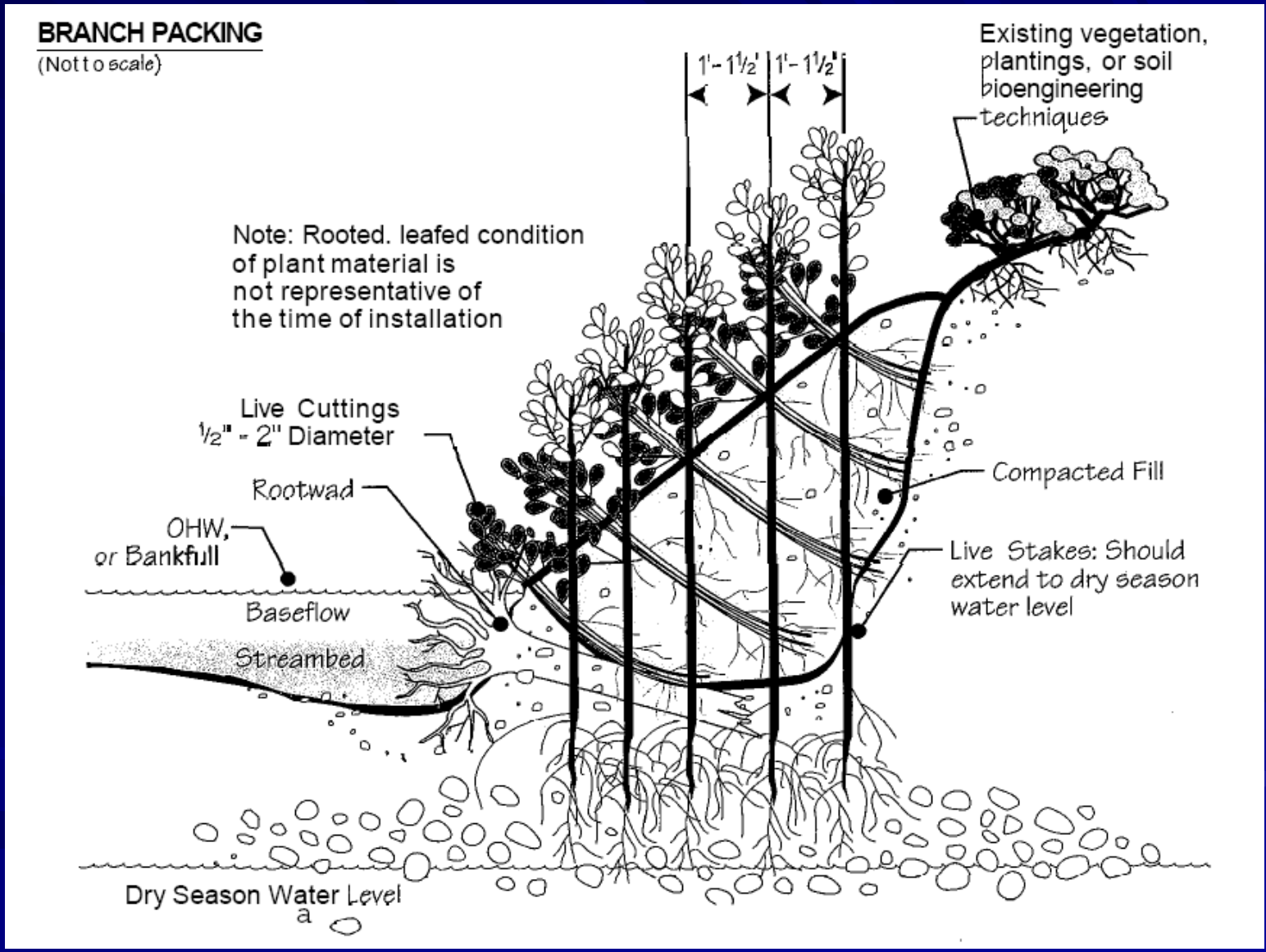
- Trap debris on the slope
- Reinforce soil with unrooted branches
- Redirect seepage (act as horizontal drains)
- Aid infiltration on dry sites and drying on wet
- Provide stability and microclimate for vegetation establishment
- Reduce long to series of short slopes separated by brush layers

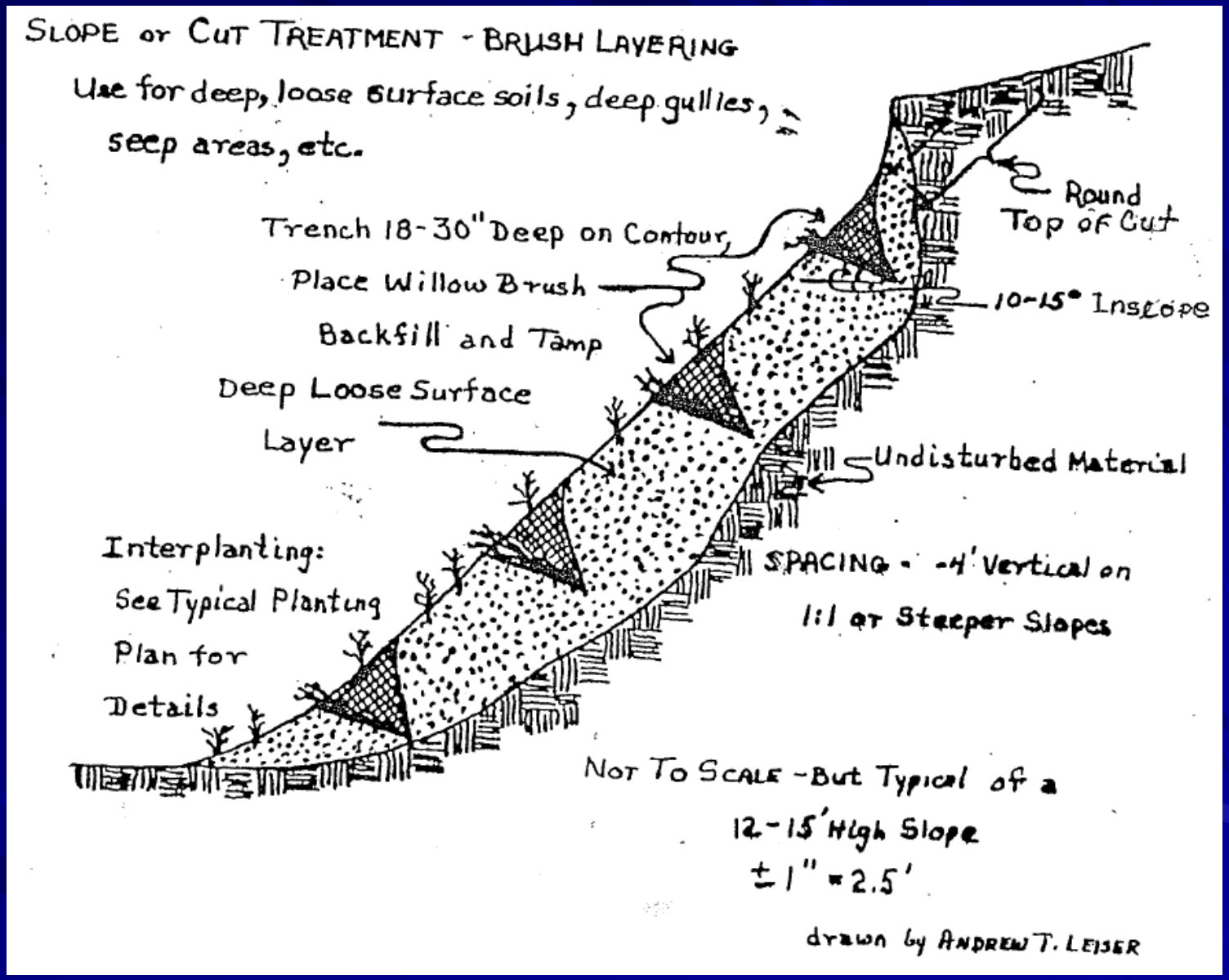
Installation Guidelines

- Start at toe of slope
- Excavate horizontally on contour or slightly down slope
- Distance between Benches (Brush rows)

Slope	Distance Between Benches (ft)		Maximum Slope Length (ft)
	Wet Slopes	Dry Slopes	
2:1 - 2.5:1	3	3	15
2.5:1 - 3:1	3	4	15
3:1 - 4:1	4	5	20

- Dig trenches 2-3 ft deep
- Slope bench so outside edge is higher than inside
- Criss-cross branches
- Butt of branch in back of trench; tips exposed
- Fill lower benches with soil removed from next lift
- Mulch/seed between lifts
- Use mesh on slopes >3:1


BRANCH PACKING
(Not to scale)
1'- 1½'
1'- 1½'
Existing vegetation, plantings, or soil bioengineering techniques
Note: Rooted. leafed condition of plant material is not representative of the time of installation
Live Cuttings ½" - 2" Diameter
Rootwad
OHW, or Bankfull
Baseflow
Streambed
Compacted Fill
Live Stakes: Should extend to dry season water level
Dry Season Water Level


SLOPE or CUT TREATMENT - BRUSH LAYERING
Use for deep, loose surface soils, deep gullies, seep areas, etc.
Trench 18-30" Deep on Contour, Place Willow Brush Backfill and Tamp
Deep Loose Surface Layer
Round Top of Cut
10-15° Insloope
Undisturbed Material
Interplanting: See Typical Planting Plan for Details
SPACING - 4' Vertical on 1:1 or Steeper Slopes
NOT TO SCALE - But Typical of a 12-15' High Slope
± 1" = 2.5'
drawn by ANDREW T. LEISER

Brush Mattress

Layer of dormant branches laid on and secured to a bank or slope surface

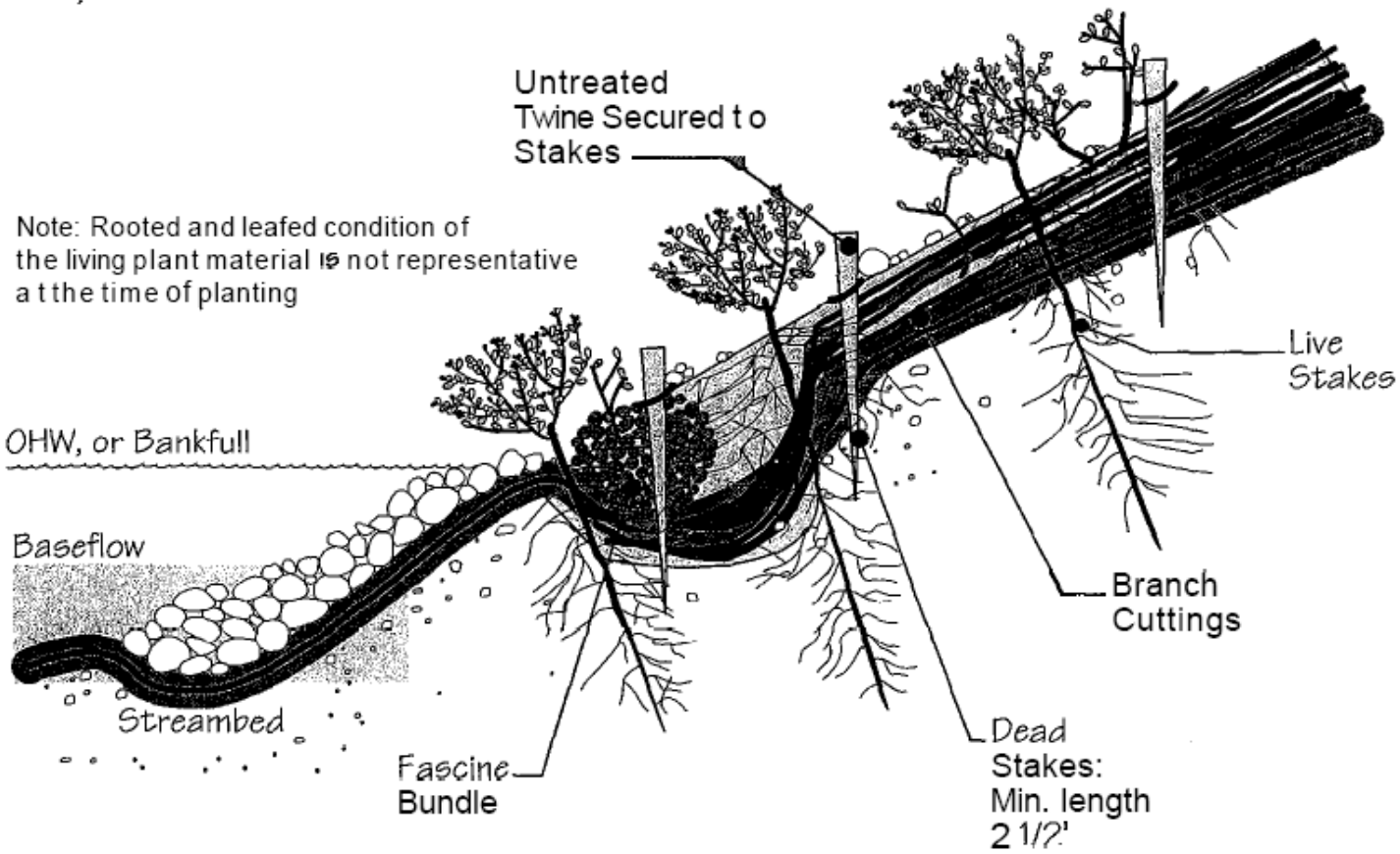
- Capture sediment
- Provide an immediate, protective cover
- Work well along steep, fast moving streams
- Restore riparian vegetation and habitat rapidly
- Establish conditions favorable for colonization by native plants

Installation Guidelines

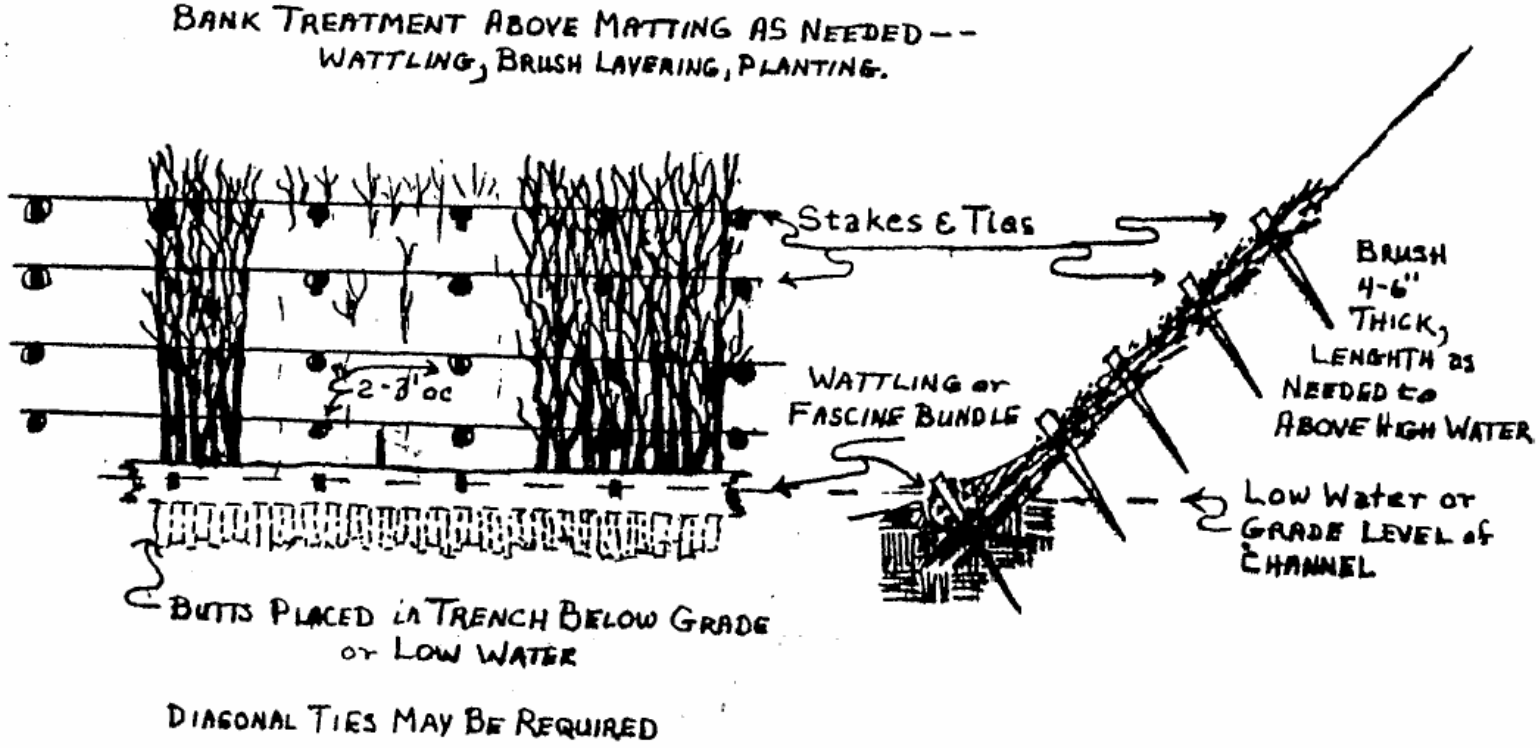
- Grade the area to be treated
- Trench
  - 8-12 inches deep just below low water line
  - flush to plane of slope face
- Place brush
  - butt down in trench,
  - perpendicular to baseline
  - 2-4 inch layer of 6 -9 ft long cuttings when compressed
- Anchor by placing rock, wattle or log on top of butts
- Stake and tie
  - 3-4 ft centers
  - extend beyond sides of mat
  - 1 ft above anchoring row to 1 ft below top of mat
  - tie between stakes with #12 wire or untreated twine
  - drive stakes until no more than 4 inches above mat
- Fill space between branches with soil

BRUSH MATTRESS

(Not to scale)



CHANNEL PROTECTION - BRUSH MATTING



Streambank Restoration Projects

2002

Dolph Creek

Lake Poinsett Watershed Project

Hamlin Conservation District

Hamlin County, South Dakota

adidas

Streambank Restoration Projects

2001 - 2002

Big Sioux River

Upper Big Sioux Watershed Project

City of Watertown

Codington County, South Dakota

Streambank Restoration Projects

1998

Spring Creek

Pennington County, South Dakota

Streambank Restoration Projects

1997

Rapid Creek

Pennington County, South Dakota

References

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- Bio-Technology for Slope Protection and Erosion Control. Leiser 1998.
- *The Practical Streambank Bioengineering Guide – User's Guide for Natural Streambank stabilization Techniques in the Arid and Semi-Arid Great Basin and Intermountain West.* Bentrup and Hoag 1998.
- USDA NRCS Engineering Field Handbook (1996). http://www.info.usda.gov/CED/ftp/CED/EFH-Ch16.pdf

Questions?