

Part 6

BIOTECHNICAL SLOPE PROTECTION



- **Vegetation** plays a crucial role in soil conservation and erosion control



HYDROSEEDING

Hydroseeding using fescue and wildflower mixes are commonly applied to graded slopes for “**erosion control.**”

The effectiveness of grass seeding depends on the maturity, depth, and density of the **root mat** BEFORE heavy precipitation impacts the slope. **Watering** may be required prior to onset of the rainy season.





- **Biotechnical slope protection** emanated from the humid climates of western Europe, where it has been employed for hundreds of years. This view shows a fill embankment above Berkeley in 1934, before it was planted.



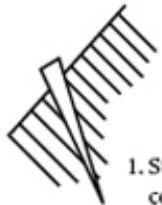
- Growth of **willow wattles** planted on Grizzly Peak fill slope during summer of 1935. The wattles were not irrigated during 7 months of dry weather, so losses were significant.



- **Willow wattles** planted along contours of fill slope depicted above, as viewed in 1937, two years later. Similar schemes were successfully employed along the Angeles Crest Highway (State Route 2) in southern California during this same period (1937-40).



Prepare Wattling: Tube-shaped bundles of live brush with butts alternating.
8-10" diameter, tied 12-15" across



1. Stake on contour



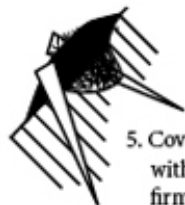
2. Trench above stakes 1/2 diameter of bundles



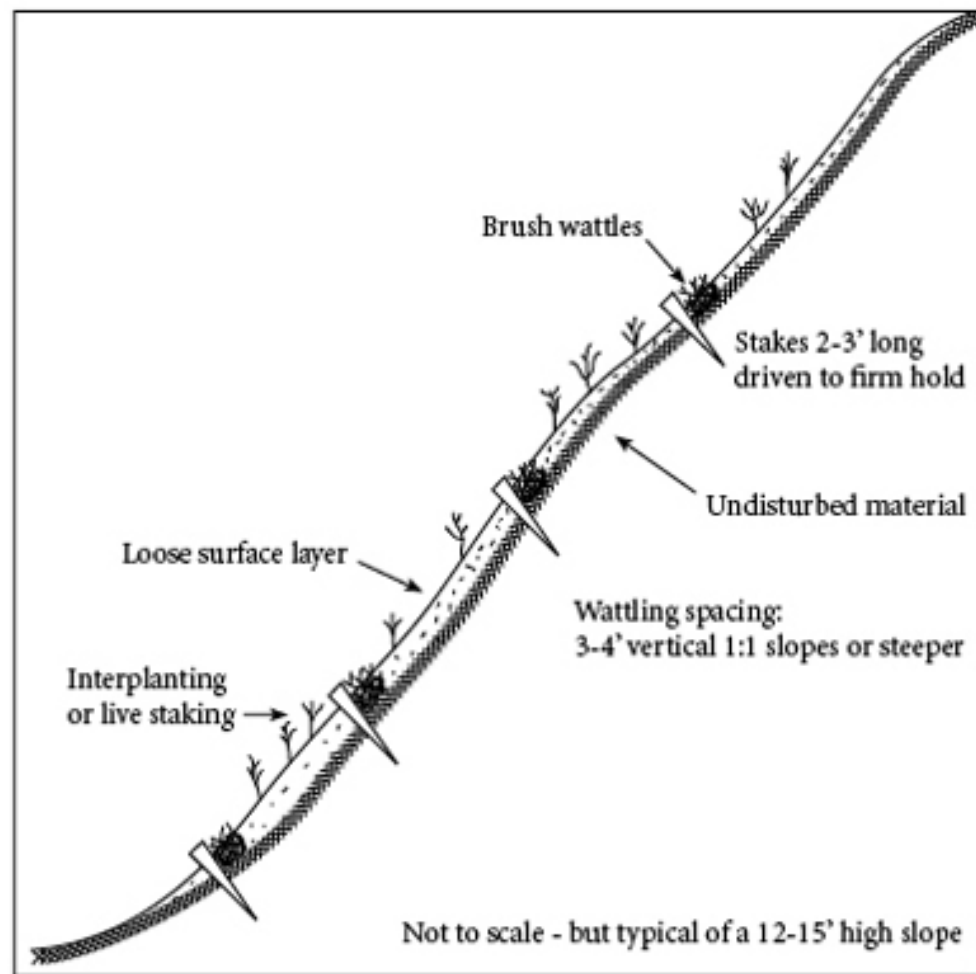
3. Place bundles in trench



4. Add stakes through and below bundles



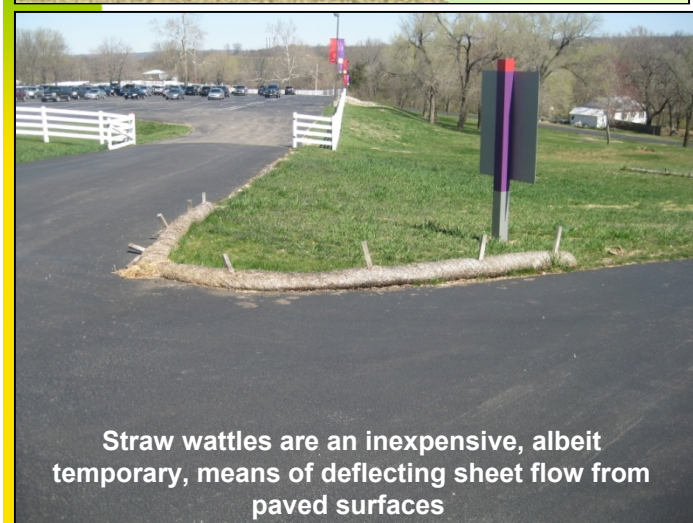
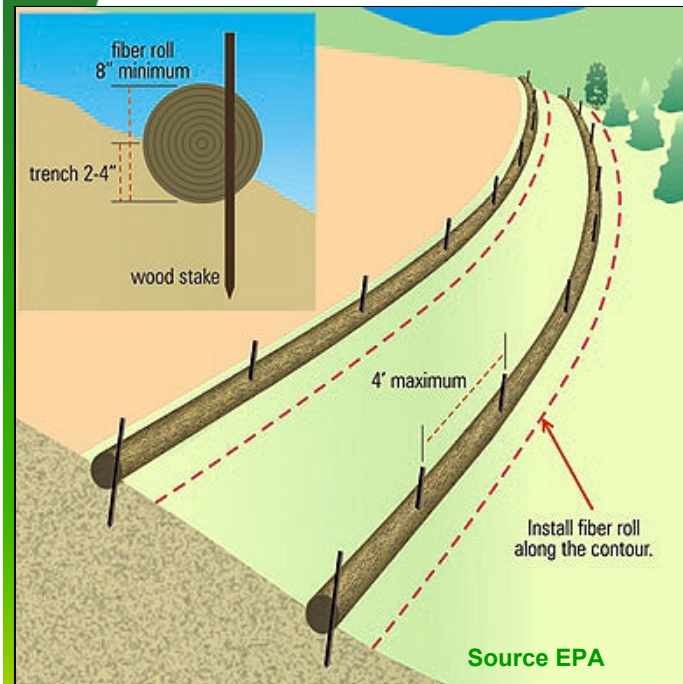
5. Cover wattle with soil, tamp firmly



- Live **Willow wattles** are prepared by wrapping tube-shaped bundles with alternating butts (left), then staking these into shallow trenches and covering with loose soil, as shown at left and right.



Straw Wattles



Straw wattles or “fiber rolls” are organic biodegradable enhancements that are commonly employed to assist erosion control, until deeper rooting vegetation is established. They can be affixed to the slope using wood stakes (shown here) or “live stakes,” (willow shoots) usually, in creek bank settings.

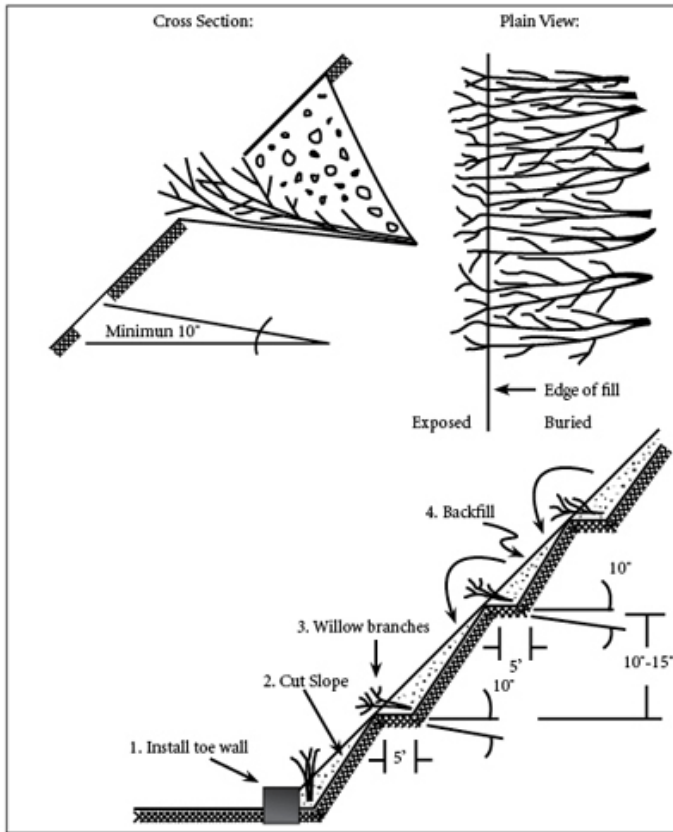
Harvesting willows to make wattles

- Creek willows can be harvested in the springtime to construct wattles or fachines
- They are usually kept moist until after typing and burial





- **Bamboo fascines** are used extensively to protect cut slopes in Asia, such as this example in Taiwan. In Europe fascines are usually made of creek willow chutes.



BRUSH LAYERS

- Brush layers are made of freshly cut creek willows, with their butts buried in the bank, as shown
- They can be very cost-effective for creek bank stabilization when the slopes are accessible by tracked excavators or backhoes
- Note the negative backslope >10 degrees





- **An expandable stinger attached to an excavator boom, as shown above, can plant nursery stock on steep slopes or in riprap (image from Dan Culley of Dayton Tractor & Crane Co., via FHWA)**