



# Stream Rehabilitation Practices Photo Guide

## FY2024 Funding Cycle

The following stream rehabilitation project types are eligible for StRAP funding:

- **Vegetative Debris Removal**
  - Removal of downed trees or log jams (and artificial structures when necessary) that are exacerbating flooding, impacting stream health, or otherwise reducing drainage integrity
- **Streambank Stabilization**
- **Stream Restoration**
- **In-stream Sediment Removal**
- **Other projects**
  - Includes other miscellaneous projects that do not fall into one of the above categories, but would benefit streams and drainage infrastructure.
  - EX: replacing undersized culverts

# Vegetative Debris Removal

## Debris to Remove

The logjam (both the fallen trees, and smaller branches accumulating on them) should be removed.



Logjam causing erosion

Logjam causing ponding and backing up water during normal flow levels.

**Before**



**After**



Riparian vegetation should be left intact, except where it must be removed to access the stream

Logs that are imbedded in the streambed or bank should be left in place to avoid disturbing sediment

**Before**



**After**



**Before**



**After**

Trees on bank that aren't at immediate risk of falling and creating blockages should be left standing to protect riparian habitat and streambanks



**Before**



**After**



Areas where riparian  
vegetation is disturbed  
should be reseeded or  
otherwise repaired.



# Vegetative Debris Removal

- Artificial debris can be removed from the stream channel as part of a debris removal project
  - Artificial debris that is large enough to create blockages/impairments (like the photos below) should be removed as part of a debris removal project.
  - Small trash/artificial debris (such as bottles, trash, etc.) does not have to be removed from the channel if it is not contributing to stream impairment.
- All artificial debris (building lumber, concrete, construction debris) that is removed from the stream must be removed from the 100-year floodplain.

**Before**



Collapsed wooden bridge removed where it was blocking the stream

**After**



## Vegetative Debris Removal

- Stumps should be left in place. Leaving a stump in place will help stabilize the stream bank and reduce erosion.
- Cut the stump close to the stream edge so it will not catch floating debris, but leave the root ball in place. Do not pull out stumps or roots.

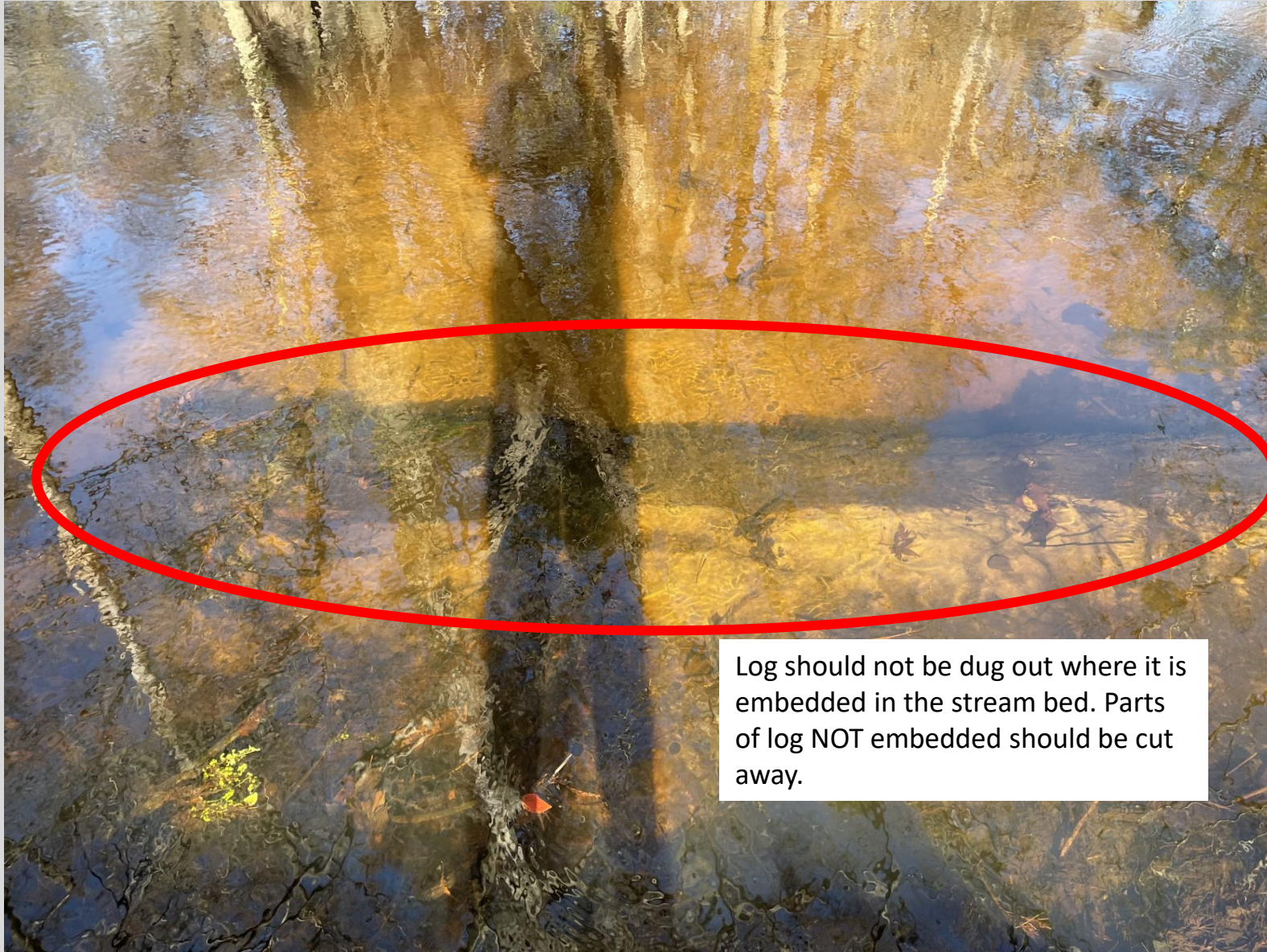


Stump should be left in place.



Cut stump close to the edge of the stream, but do not pull out stumps or roots.

# Vegetative Debris Removal



Log should not be dug out where it is embedded in the stream bed. Parts of log NOT embedded should be cut away.

- Logs that are embedded in the streambed should be left in place. Excavating out imbedded logs would cause significant disturbance of the stream bed.
- If there are branches/limbs sticking off an embedded log: cut away to branches, and leave the embedded portion in place



Debris submerged beneath a beaver pond must be removed from the channel once the dam is removed.

- StRAP funds can be used for beaver dam removal or beaver trapping on stream segments that are listed on your scope of work. Beaver dam removal would fall under vegetative debris removal.
  - Removal of beavers/dams on sites NOT listed on your scope of work is not a reimbursable project cost.
- Beaver dams must be fully dismantled, and all logs/branches removed from the dam **MUST** be removed from the 100-year floodplain or cabled/chipped/burned.
- If you choose to trap beavers, it is highly encouraged to trap beavers before debris removal begins, so the beavers do not rebuild dams while work is underway.
- On stream segments being worked on, any logs that are uncovered after a beaver pond is drained must be removed from the channel. In the photo to the left, these previously submerged logs were revealed when a beaver pond was drained. Since they are blocking the channel, these logs must be removed from the channel before the site can pass inspection.



- Vegetative debris removal primarily focuses on removing debris within the stream. However, standing trees that overhang the stream can be removed if:
  - They are leaning over the channel at an angle greater than 30 degrees
  - They are dead or severely undercut
  - They appear likely to fall into the channel within 1 year and risk creating blockages to flow.
- Refer to [Army Corps of Engineers BMPS for Selective Clearing and Snagging.pdf](#) for additional information
- If uncertain if a standing tree should be removed, consult StRAP staff.

- This tree was considered for removal, but was ultimately left in place. Factors considered in making this decision include:
  - While tree is dead, it is standing vertically and not leaning over the stream. Dead standing trees provide habitat to roosting birds and bats.
  - Tree is partially undercut, but most of the root mass is still in the bank, and only a portion of the roots have been exposed by erosion.
  - Removing the tree may risk destabilizing the roots and the streambank.





- Work can be completed by hand, or by using equipment.
- Tracked or wheeled equipment should be kept out of the stream channel and may work from the bank using a manipulator arm or cables.
- Boat mounted equipment (such as barges or floating excavators) may be an effective option in larger streams, as long as they do not disturb the streambed.



- Equipment should be placed far enough back from the bank that it will not erode/damage the stream bank.
- Any areas where vegetation is damaged by project work (especially by equipment use) should be revegetated before the project can pass inspection. Your contract with a contractor can require them to reseed the work area as part of their job requirements.



- ALL debris removed from a stream must be managed so that it will not wash back into the stream in future floods and cause future blockages.
- Approve debris processing methods include:
  - Removal from the 100-year floodplain
  - Burning
  - Chipping
  - Cabling/Strapping
- For full details, consult the StRAP debris removal guide:
  - <https://www.ncagr.gov/soil-water/swcstrapdebris-removal-and-processing-guide/open>
- Grantees can use any of the approved debris processing methods, based on the logistics and needs of each site.

## 1. Removal from the 100-year Floodplain

- If you choose to remove debris from the 100-year floodplain, please consult the FEMA National Flood Hazard Layer map to determine the extent of the floodplain
  - <https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd>
- Once debris is removed from the 100-year floodplain, it can be left on the same property, cut to firewood, stacked, hauled to a dump site on a different property, etc.
- If you work on a stream with no mapped 100-year floodplain (per the FEMA NFHL Map), then debris only needs to be set back 30' from the top of the bank (and would not need to be cabled/chipped/burned).

## 2. Chipping

- If you choose to chip debris:
  - Woody debris can be chipped and left in the floodplain.
    - Woodchips/mulch can be left in the floodplain starting at the top of the bank.
    - Wood chips should be removed from the stream. Wood chips should not be placed below the top of bank or in side channels that drain from the floodplain
    - Wood chips should be distributed in a layer no more than 3 inches thick. Chips should not be left in piles taller than 3 inches.
  - Wood chips can also be removed from the 100-year floodplain.



### 3. Burning

- Debris removed from streams can be burned on site as an approved method of disposing of woody/vegetative debris.
- The grantee/contractor is responsible for obtaining and processing a valid burn permit (if applicable), and for following any other necessary laws or statues related to burning.
- Any large debris that does not burn completely (large tree trunks, root balls) must be processed further (EX: removed from 100-year floodplain) so that partially-burned debris is not left unsecured in the floodplain.

## 4. Cabling/Strapping

- Cabling or strapping refers to the practice of anchoring logs or other woody debris in place in the floodplain so that it will not be washed back into the stream in future floods.
- If you choose to cable/strap your debris after it is removed from the stream:
  - Cabled/strapped debris should be set back so the ENTIRE log or log pile is at least 30 feet from the top of the bank.
  - Logs can be anchored individually or in groups. If a group of logs or branches are anchored together, wrap the cable/rope around the log pile at least 2 times and pull rope tight to prevent logs from slipping out of the pile.
  - Anchors: the most common anchor is to tie the log/log pile to a live tree in the floodplain.
  - Cable material: you can use any rope, cable, or strap material with a break strength of at least 1,700 pounds. The most common example of an appropriate material is ¼ inch braided nylon rope.



# Streambank Stabilization

- Streambank stabilization protects the banks of streams and channels to reduce erosion and stabilize the stream.
- Natural Resource Conservation Service defines streambank stabilization as:
  - *“treatment(s) used to stabilize and protect banks of streams or constructed channels” for the purpose of “preventing the loss of land or damage to land uses, or facilities adjacent to the banks of streams or constructed channels; .... maintaining the flow capacity of streams or channels; reducing the offsite or downstream effects of sediment resulting from bank erosion; and improving or enhancing the stream corridor for fish and wildlife habitat, aesthetics, recreation.”*
- As necessary, vegetative debris can be removed from streambank stabilization sites.
- Work should be completed following the design plan established for your site.
  - StRAP grantees are responsible for hiring engineers to develop a design plan for your project.

- Streambank Stabilization activities:
  - Bank shaping/earthwork
  - Natural bank stabilization/soft bank protection:
    - Live stakes
    - Native species planting
    - Seeding
    - Buffer strips
  - Structural/hard bank protection
    - Rip-rap
    - Gabions
    - Concrete retaining walls
  - Other considerations: erosion control, channel bed stabilization
  - Other practices as outlined in your engineering design and approved by StRAP staff.

Cost estimates are often based on a combination of linear footage and bank height. However, add-on costs such as added rip-rap or mobilization of large equipment should be added to estimates.



Before



After



**Before**

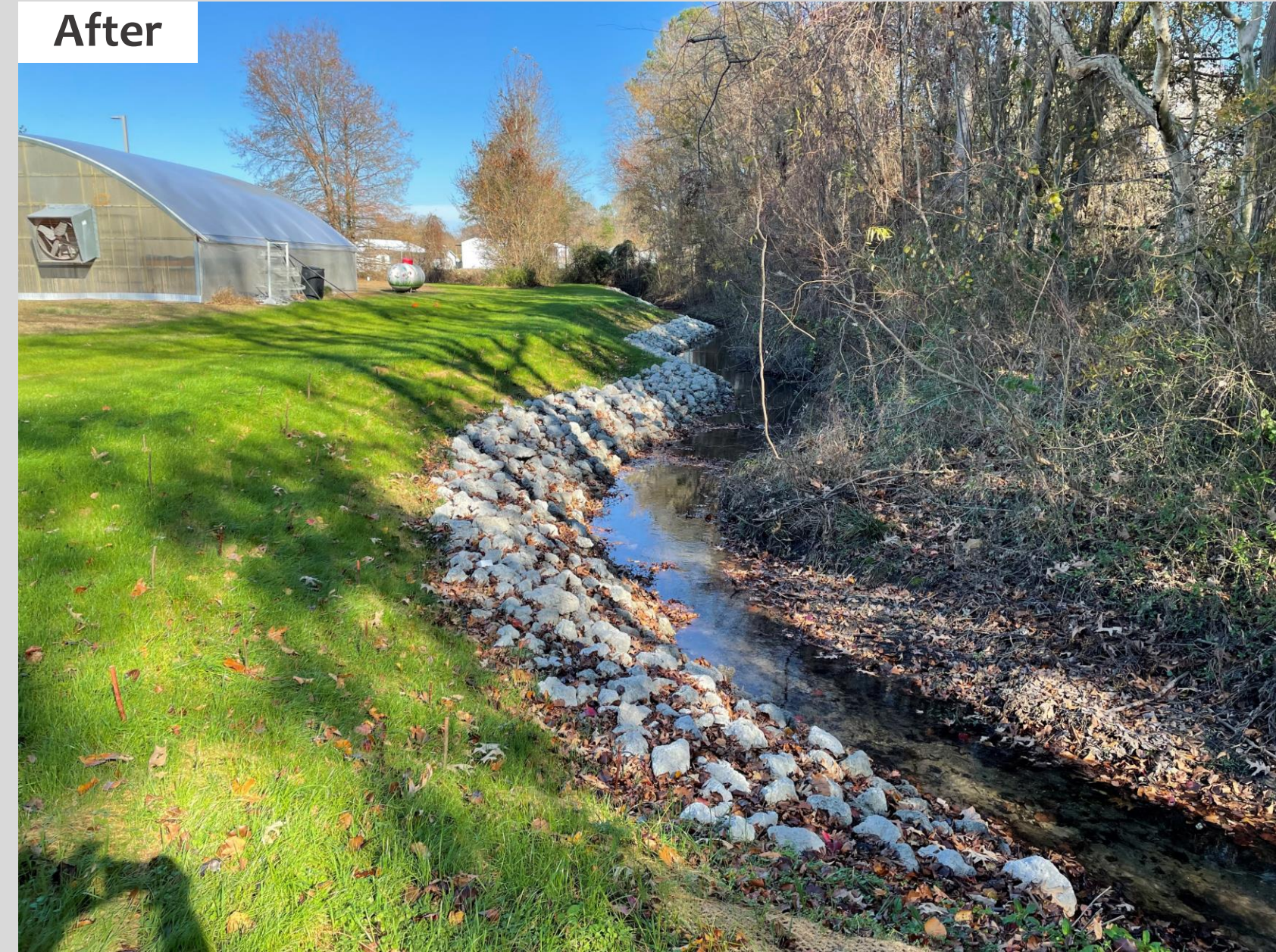


Area of streambank eroding towards building and depositing excess sediment in stream

**After**



After



Work completed on example project:

- Bank shaping
- Rock rip-rap placed to protect bank toe (hard/structural protection)
- Grass established to prevent erosion (natural/soft bank protection)
- Live stakes planted to re-established riparian vegetation (natural/soft bank protection)

# Stream Restoration

- Stream restoration is the process of re-establishing the structure and function of a stream to the conditions that existed prior to disturbance.
- Stream restoration practices include:
  - Removal of disturbances
  - Installation of structures and vegetation to protect streambanks
  - Reshaping unstable stream segments
- Learn more using guidance from the NC Stream Restoration Institute and NC Sea Grant:  
<https://semspub.epa.gov/work/01/554360.pdf>
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