

SECTION 5.6

CHANNEL EXCAVATION/DREDGING

Overview

Practice 601

Channel Bottom Dipping

Practice 602

Channel Bank Excavation

Practice 603

Channel Overbank Excavation

SECTION 5.6

CHANNEL EXCAVATION/DREDGING

This section consists of three common excavation/dredging practices. The first two practices, Channel Bottom Dipping (Practice 601) and Channel Bank Excavation (Practice 602), pertain to situations where the channel portion of a stream or ditch needs to be modified. The effectiveness of these two practices is normally limited to low flows or smaller floods. The third practice, Channel Overbank Excavation (Practice 603), is normally performed to increase the floodway conveyance either as a compensatory measure for floodway encroachment or as a means of lowering the flood stages. Because a large portion of floodflows associated with larger, less frequent floods is conveyed by channel overbanks, the overbank excavation has the largest effect on flood stages.

Bottom Dipping is normally performed in man-made ditches or those regulated drains that are subject to periodic maintenance. When channel excavation/dredging is required to increase the capacity of a natural stream or to reshape the channel to a more stable configuration, negative impacts on the aquatic habitat and the riparian corridor are inevitable. The one-sided construction technique (explained below) as well as erosion control measures prescribed for these practices would minimize some of this impact. However, in many instances it may be necessary to mitigate for unavoidable negative impacts resulting from this type of project. The overbank excavation involves the least amount of disturbance to the channel and the natural habitat associated with it. However, it sometimes impacts the riparian habitat where excavation is occurring and will also normally require some degree of mitigation.

In certain conditions, especially in regularly maintained, man-made drainage ditches where no trees or shading vegetation currently exist along the banks (Exhibit 3.3a), working on both sides of the ditch could be considered. However, even under these circumstances, it is recommended that the work be limited to only one side of the stream so that permanent, shade-producing trees have a chance to be established on the non-worked side. Aside from water quality and habitat benefits, maintaining a shade canopy over the stream inhibits the growth of weeds in the streambed. Growth of dense weeds in the stream channel slow the flow of water and promote sediment deposition in the main channel, increasing the annual maintenance costs.

Where channel or overbank modifications are taking place along natural streams or shaded drainageways, part of the natural aquatic and streamside habitat should be preserved, and some shade retained, by limiting construction to one side of the stream (Exhibit 5.6a). When conditions allow, limiting work to north and east sides would be environmentally more beneficial, as leaving trees on south and west sides will provide shading to the stream. When feasible, vegetative filter strips (Practice 804) should be installed along the work-side of the bank, both to reduce sedimentation and to provide maintenance access for any future work.

When compared with two-sided modification, single-bank modification has fewer adverse impacts on terrestrial wildlife habitat, though aquatic habitat is still affected. In some instances, single-bank modification also costs less to construct and revegetate. Therefore, all the practices provided in this section assume that the entire work will be done from one side of the channel with spoil deposited along the work-side. However, when the two-sided modification is considered, despite its drawbacks noted earlier, work may be done and spoil deposited on both sides of the ditch.



Exhibit 5.6a: One-sided construction lessens the environmental impact on the stream
(Source: Ohio Stream Management Guide)

PRACTICE 601 CHANNEL BOTTOM DIPPING

- DESCRIPTION**
- Dipping, dredging and/or removing sediment from the channel bottom with a bucket from one side of the channel without disturbing the ditch banks.



Exhibit 601a: Channel Bottom Dipping (Source: NRCS files)

PURPOSE	<ul style="list-style-type: none"> ● To lower the grade of the ditch bottom to match the upstream or downstream reaches by means of excavating or dredging the sediments accumulated at the ditch bottom over time.
WHERE APPLICABLE	<ul style="list-style-type: none"> ● Where in-channel obstruction such as sediment or vegetative debris have eliminated a positive hydraulic grade. ● Where stream banks and adjacent overbanks are well defined and stable while in-channel alignment and condition are not conducive for effective low flow.
ADVANTAGES	<ul style="list-style-type: none"> ● Improve low flow conveyance capacity of stream. ● Provides hydraulic benefit to low flow conditions. ● Prevents stagnation or sedimentation pools by providing positive flow conditions. ● Eliminates impact to inflow structures such as tile drains or surface flow systems.
CONSTRAINTS	<ul style="list-style-type: none"> ● Need for extensive in-channel erosion control measures. ● May temporarily impact well established aquatic habitat. ● Has minimal hydraulic benefit for flood flow conditions.
DESIGN AND CONSTRUCTION GUIDELINES	<p>Materials</p> <ul style="list-style-type: none"> ● In-channel sediment basin. <p>Installation</p> <ul style="list-style-type: none"> ● Install In-channel Sediment Basin (Practice 801) if necessary.

- Remove all in-channel obstructions (Practice 401 or 402).
- Excavate low flow channel below existing flow line to grades shown in design plans or specifications. Cross section geometry should, in general, be trapezoidal with positive grade. Side slopes of excavated low flow area should be cut away from edge of water so as not to compromise channel bank stability.
- Spoil material should be disposed of adjacent to excavated area unless required differently in design plans or specifications. Spoil shall be placed landward of channel bank by a distance of five feet or more (outside of the floodway) and leveled to a slope of 5:1 (1V:5H) or flatter so as not to severely impact stream system and applied erosion control measures. From the maximum height, the soil should have an 8:1 (1V:8H) back slope to field level. Grading of spoil material should coincide with adjacent stream overbank topography.
- All spoil deposition areas shall be same-day seeded or mulched immediately after final grading if not in agricultural production.

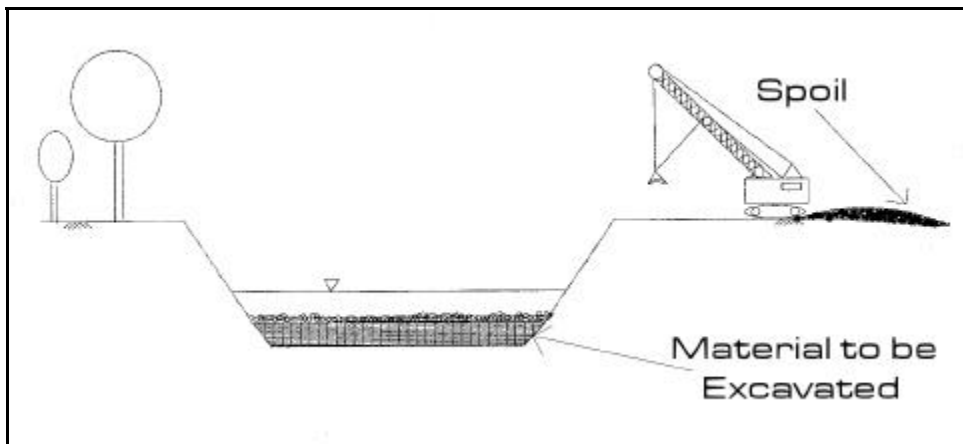


Exhibit 601b: Illustration of Bottom Dipping practice (Source: CBBEL Files)

Special Considerations

- Transitions in size or dimension of excavated area should be gradual to prevent unstable flow conditions and to avoid sedimentation problems.
- Disposal of spoil material should consider additional factors of land ownership or right-of-way, land use (particularly agricultural or crop production), environmentally sensitive areas, or related impacts due to placement of the material.
- Spoil material should not be placed in floodway or in wetlands. Additional permits are required for placement of fill in floodway or wetlands. (See Practice 1301 Debris Disposal.)
- When feasible, consider installing vegetative filter strip (Practice 804) along the work-side of the bank. Channel excavation practices create a unique opportunity to install filter strips with minimal costs.

MAINTENANCE

- Inspect excavated area after major flow events to remove collected debris, as necessary.
- Inspect excavated reach to confirm stability in channel cross section, particularly the channel banks for location of excessive erosion or

streambank failure.

- Remove sediment and debris from excavated area as necessary to maintain cross section and grade to prevent additional sedimentation or erosion.
- Reduce sediment delivery to the ditch by regrading eroded ditch banks and by installing erosion control practices in the contributing watershed.

REFERENCES**Related Practices**

- Practice 401 Logjam Removal Using Hand-held Tools .
- Practice 402 Logjam Removal Using Heavy equipment.
- Practice 704 Channel Transitions (Tie-Ins).
- Practice 801 In-channel Sediment Basin .
- Practice 1001 Tile Drain Outlet Extension.
- Practice 1301 Debris Disposal.
- Practice 1303 Permanent Maintenance Access.

Other Sources of Information

- Illinois Urban Manual.
- NRCS Standard Specifications.

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PRACTICE 602

CHANNEL EXCAVATION/DREDGING

- DESCRIPTION**
- Excavating the banks (side slopes) and bottom of a channel through one-sided construction methods.



Exhibit 602a: Channel Excavation/Dredging (Source: NRCS Files)

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- PURPOSE**
- To increase the cross section of a ditch or reshape the channel to a more stable configuration by means of channel excavation/ dredging from one side of channel.

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- WHERE APPLICABLE**
- Where flood flow conditions warrant additional conveyance capacity in the channel area itself.
 - Where channel, soil or site conditions allow for extensive excavation of material for entire stream cross section.

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- ADVANTAGES**
- Maximizes available flow conveyance capacity of stream system.
 - Provides hydraulic benefit to adjacent lands.
 - Can provide a stable stream cross section for entire channel width.
 - Can provide for larger in-channel and overbank habitat.

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- CONSTRAINTS**
- May require reconstruction of all side outlets to main stream.
 - May require extensive erosion control measures.
 - May need extensive overbank area to perform construction.
 - May negatively impact well established riparian corridor.

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- DESIGN AND CONSTRUCTION GUIDELINES**
- Materials**
- Vegetative stabilization material.
 - Erosion control blankets or matting.

Installation

- Work should be performed from one side of channel only. When conditions allow, limiting work to north and east sides would be environmentally more beneficial as leaving trees on south and west sides provides shading to the stream. Cross section excavation should start from top of the bank of work side, continue to the ditch bottom, and then proceed to the top of the other bank.
- Install In-channel Sediment Basin (Practice 801), if necessary.
- Remove all in-channel obstructions (Practice 401 or 402).
- Remove brush and vegetative matter to be disposed of by appropriate means (Activity 5.3)
- Clear and Grub channel bank (Practice 107). Brush and debris to be disposed of by appropriate means (Practice 1301)
- Note all points of concentrated inflow to channel for special excavation/protection of these outlets.
- Excavate cross section to grades shown in design plans or specifications. Cross section geometry should in general be trapezoidal with consideration for geotechnical stability of side slopes and adjacent topography. Side slopes of excavated area should be preferably 3:1 (1V:3H) or flatter but never greater than 2:1 (1V:2H).
- Apply applicable excavated area lining as required by design plans or specifications. These linings should conform to guidelines noted for the specific requirements stated in rip-rap, vegetative, or concrete linings noted in Practices 701, 702 and 703.
- Remove piped or surface outflow structures to a point equal to the excavation limits. Re-establish outlet and applicable outfall structures while applying appropriate energy dissipators or erosion resistant linings to allow positive grade and free flow to main channel (Practices 704, 705, 1001, and 1002).
- Spoil material should be disposed of adjacent to excavated area unless required differently in design plans or specifications. Spoil shall be placed away from newly excavated bank by a distance of five feet or more (outside of the floodway) and leveled to a slope of 5:1 (1V:5H) or flatter so as not to severely impact erosion control measures and to coincide with adjacent stream overbank topography. From the maximum height, the spoil should have an 8:1 (1V:8H) slope to field level.
- All spoil deposition areas shall be same-day seeded or mulched immediately after final grading if not in agricultural production.
- All excavated areas shall be revegetated immediately after final grading using erosion control matting (Practice 1104) to the extent feasible. Same-day seeding or mulching may be considered where conditions allow rapid establishment of vegetation.

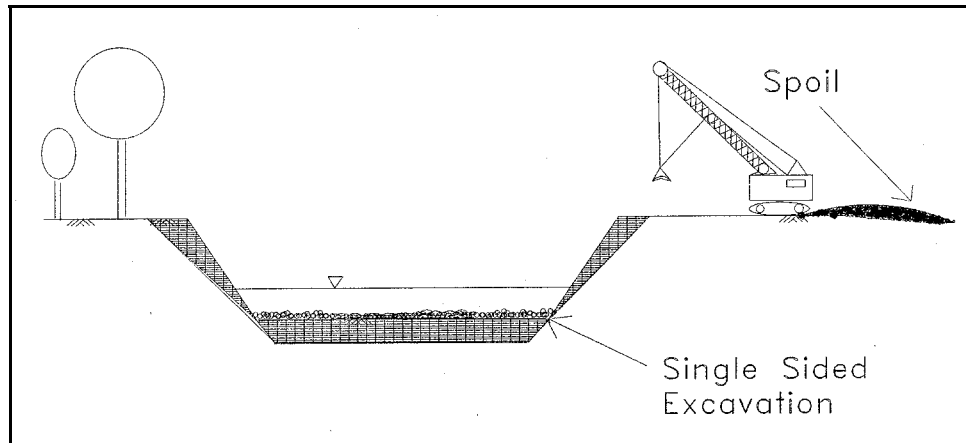


Exhibit 602b: Illustration of one-side channel excavation practice (Source: CBBEL Files)

Special Considerations

- Transitions in size or dimension of excavated area should be gradual to prevent unstable flow conditions and to avoid sedimentation problems.
- Disposal of spoil material should consider additional factors of land ownership or right-of-way, land use (particularly agricultural or crop production), environmentally sensitive areas, or related impacts due to placement of the material.
- Spoil material should not be placed in floodway or in wetlands. Additional permits are required for placement of fill in floodway or wetlands. (See Practice 1301 Debris Disposal.)
- When feasible, consider installing vegetative filter strip (Practice 804) along the work-side of the bank. Channel excavation practices create a unique opportunity to install filter strips with minimal costs.

MAINTENANCE

- Inspect excavated reach after major flow events to repair damaged areas, as necessary.
- Inspect transition areas to confirm stability in channel cross section and for points of erosion.
- Remove sediment and debris from excavated area as necessary to maintain cross section and grade to prevent additional sedimentation or erosion.

REFERENCES

Related Practices

- Practice 107 Clearing and Grubbing.
- Practice 701 Channel with Grass Lining.
- Practice 702 Channel with Riprap Lining.
- Practice 703 Channel with Concrete Lining.
- Practice 704 Channel Transitions (Tie-Ins).
- Practice 705 Grade Transitions.
- Practice 801 In-channel Sediment Basin.
- Practice 1001 Tile Drain Outlet Extension.
- Practice 1002 Riprap-Lined Apron.
- Practice 1102 Vegetative Stabilization.
- Practice 1103 Bonded Fiber Matrix.

- Practice 1104 Erosion Control Blankets and Matting.
- Practice 1301 Debris Disposal.
- Practice 1303 Permanent Maintenance Access.
- Activity 5.3 Debrushing.
- Activity 5.4 Logjam Removal and River Restoration.

Other Sources of Information

- Illinois Urban Manual.
 - NRCS Standard Specifications.
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PRACTICE 603

CHANNEL OVBANK EXCAVATION

- DESCRIPTION**
- Excavating channel overbank areas only (this practice may also include excavation of a portion of the bank that is above the ordinary high water line).



Exhibit 603a: Overbank excavation on one side of channel increases the flood carrying capacity of the stream (Source: CBBEL Files)

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- PURPOSE**
- To increase the conveyance capacity of a stream or ditch by means of excavating a portion of the channel's overbank area without disturbing the channel itself.

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- WHERE APPLICABLE**
- Where flood flow conditions warrant additional conveyance capacity in the stream or ditch or where compensatory floodplain storage has been required to maintain floodway conveyance or floodplain storage.
 - Where channel, soil, or site conditions limit ability to excavate material for entire stream cross section.

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- ADVANTAGES**
- Improve flow conveyance capacity of stream system.
 - Provides hydraulic benefit without impacting aquatic environment.
 - Disposal of relatively dry dredged material is easier.
 - Channel cross section and flow less likely to be impacted by stream sediment loads.
 - Provides for larger, improved overbank habitat.

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- CONSTRAINTS**
- May require reconstruction of all side outlets to main stream.
 - May require extensive erosion control measures.
 - May need extensive overbank area to perform construction.
 - May negatively impact well established riparian corridor.
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DESIGN AND CONSTRUCTION GUIDELINES

Materials

- Vegetative stabilization material.
- Erosion control blankets/matting or another suitable method to stabilize the bank.

Installation

- Install in-channel sediment basin (Practice 801), if necessary.
- Clear and Grub channel bank areas (Practice 107). Brush to be disposed of by appropriate means (Practice 1301)
- Note all points of concentrated inflow to channel for special excavation/protection of these outlets.
- Excavate cross section above normal flow line to grades shown in design plans or specifications. Cross section geometry should in general be trapezoidal with slight grade sloping to channel centerline. Side slopes of excavated area should be preferably 3:1 (1V:3H) or flatter but never greater than 2:1 (1V:2H).
- Apply applicable excavated area lining as required by design plans or specifications. These linings should conform to guidelines noted for the specific requirements stated in rip-rap, vegetative, or concrete linings noted in Practices 701, 702 and 703.
- Remove piped or surface outflow structures to a point equal to the excavation limits. Reestablish outlet and applicable outfall structures while applying appropriate energy dissipators or erosion resistant linings to allow positive grade and free flow to main channel (Practices 704, 705, 1001, and 1002).
- Spoil material should be disposed of adjacent to excavated area unless required differently in design plans or specifications. Spoil shall be placed away from newly excavated bank by a distance of five feet or more (outside of the floodway) and leveled to a slope of 5:1 (1V:5H) or flatter so as not to severely impact erosion control measures and to coincide with adjacent stream overbank topography. From the maximum height, the spoil should have an 8:1 (1V:8H) slope to field level.
- All spoil deposition areas shall be same-day seeded or mulched immediately after final grading if not in agricultural production.
- All excavated areas shall be revegetated immediately after final grading using erosion control matting (Practice 1104) to the extent feasible. Same-day seeding or mulching may be considered where conditions allow rapid establishment of vegetation.

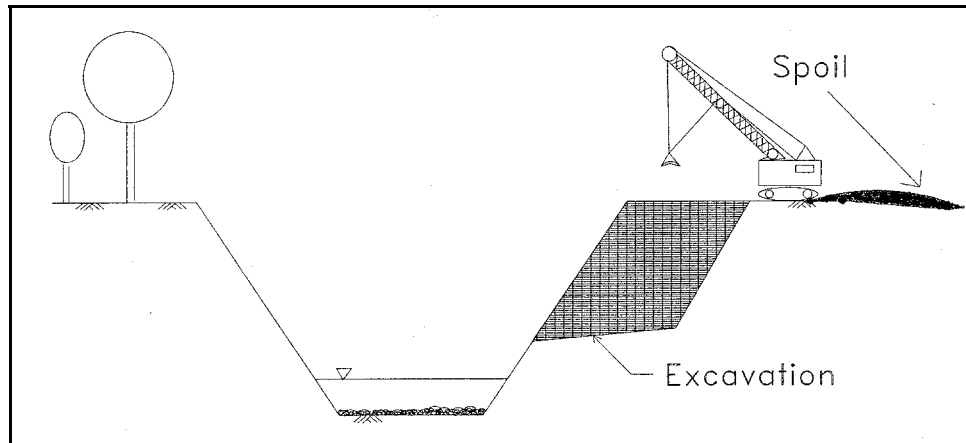


Exhibit 603b: Typical cross section of stream showing overbank area subject to excavation (Source: CBEL Files)

Special Considerations

- Maximum permissible velocities for vegetative linings should not exceed those noted in Practice 701.
- Transitions in size or dimension of excavated area should be gradual to prevent unstable flow conditions and to avoid sedimentation problems.
- Disposal of spoil material should consider additional factors of land ownership or right-of-way, land use (particularly agricultural or crop production), environmentally sensitive areas, or related impacts due to placement of the material.
- Spoil material should not be placed in floodway or in wetlands. Additional permits are required for placement of fill in floodway or wetlands. (See Practice 1301 Debris Disposal.)
- When feasible, consider installing vegetative filter strip (Practice 804) along the work-side of the bank. Channel excavation practices create a unique opportunity to install filter strips with minimal costs.

MAINTENANCE

- Inspect excavated area after major flow events to repair damaged reaches as necessary.
- Inspect transition areas to confirm stability in channel cross section and for points of erosion.
- Remove sediment and debris from excavated area as necessary to maintain cross section and grade to prevent additional sedimentation or erosion.

REFERENCES

Related Practices

- Practice 107 Clearing and Grubbing.
- Practice 701 Channel with Grass.
- Practice 702 Channel with Riprap Lining.
- Practice 703 Channel with Concrete Lining.
- Practice 704 Channel Transitions (Tie-Ins).
- Practice 705 Grade Transitions.
- Practice 801 In-channel Sediment Basin.
- Practice 1001 Tile Drain Outlet Extension.
- Practice 1002 Riprap-Lined Apron.

- Practice 1102 Vegetative Stabilization.
- Practice 1103 Bonded Fiber Matrix.
- Practice 1104 Erosion Control Blankets and Matting.
- Practice 1301 Debris Disposal.
- Practice 1303 Permanent Maintenance Access.
- Activity 5.3 Debrushing.
- Activity 5.4 Logjam Removal and River Restoration.

Other Sources of Information

- Illinois Urban Manual.
 - NRCS Standard Specifications.
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