

RIVER GRAVEL EXCAVATION

When, Where and Why it Should or Should Not Be Done

Vermont Department of Environmental Conservation
Water Quality Division
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Rivers are complex natural systems. River systems are profoundly influenced by the physical attributes of and processes taking place within their watersheds. Rivers and people share the same landscape. Rivers and people are dependent upon each other for their well-being.

The livelihood and property values of people who live or own land along rivers and streams and the natural resource values of these waters are strongly associated with the stability of the river system. A stable river is able to consistently transport the flow *and sediment* produced by its watershed such that its dimensions (width and depth), pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring down).

Sediment transport capacity refers to the ability of a river to move its sediment load (gravel) through any segment of the system.

Under a number of influences or system stresses, i.e. major storm events, watershed land use changes, channel modifications, flood plain encroachments; a river system or a particular section of a river may become unable to consistently transport its sediment load. The sediment supply volume may increase drastically, for instance, due to bank erosion or land slide thereby exceeding the stream sediment transport capacity or the ability of the river to carry the material away.

In contrast, sediment supply can be trapped above an in-stream impoundment or other transport constriction (such as an undersized culvert) or reduced by dredging or mining such that the streambed degrades and undermines streambanks downstream of the point of excavation. This is because the energy of flowing water will continue scouring gravel out of a reach even if there is an insufficient supply being introduced from upstream to maintain the balance of sediment inputs and outputs required for channel stability.

The sediment transport capacity of any watercourse is significantly influenced by flow velocity and varies from one reach to another of the same stream depending primarily on the channel dimensions and slope. A deep, narrow and steep channel will have higher sediment transport capacity than a shallow, wide and flat configuration.

How does the Department of Environmental Conservation (DEC) determine when, where and how much gravel should or should not be removed from a river or stream?

The primary consideration is that gravel removal should be performed wherever the practice accomplishes property protection *and* contributes to stream stability as defined above in the second paragraph. This is as expressed in DEC regulatory policy.

It is an objective of all DEC's river management decisions to encourage and achieve, to the extent possible, natural channel stability. This does not mean leaving the river untouched or unmanaged. Rather, it represents a management approach that seeks to reduce conflicts with river systems by recognizing the way rivers "want" to be and striving to reconstruct channels to match the naturally stable dimensions, pattern and profile to which an unstable or damaged stream would ultimately evolve. This acknowledges that the developed land along rivers oftentimes precludes full achievement of this objective in many areas.

We can try and try and try to make the river the way we "want" it to be, but if that condition conflicts with the naturally stable form, the river will eventually dominate our efforts resulting in immense public expense, property loss and public safety hazards.

Important guidance for DEC evaluations is provided by the historical perspectives of landowners and residents. This helps in understanding why the river may be in the condition it is. Of equal importance is the use of stable reference reaches. Knowing what the river dimensions, pattern and profile was like or would be like in a stable condition greatly improves the potential for long term success of the river management project and the property protection desired.

Gravel removal may be an appropriate practice when performed:

- In cases where there has been a significant reduction in channel cross sectional area as compared to a stable reference reach. Restore stable channel dimensions.
- In applications where channel reshaping or realignment may be necessary to restore a naturally stable pattern (sinuosity or meander bends) or vertical profile.
- To maintain or protect approaches to stream crossing structures. Although if aggradation is caused by a deficient or undersized structure, gravel removal should be performed in association with replacement and upgrade of the deficient structure wherever feasible.
- In reach specific applications where loss of natural channel stability is to be addressed through restoration of stable dimensions, pattern and profile.

Gravel removal may not be an appropriate practice when performed:

- Where streambed degradation is the primary cause of the instability. Gravel removal would only exacerbate the problem.
- Where proposed to address a site specific streambank erosion problem. Gravel removal might not provide the property protection desired. May need to address channel pattern and profile issues also or instead.
- Where upstream structures or property would be endangered by "headcutting" or undermining associated with a lowered streambed elevation or profile.