

## RIVER GRAVEL EXCAVATION

### Historical Perspective and Current Practices

Concerns about river gravel and flooding have been raised by many different groups that utilize rivers or live near a river. This document helps provide a historical, political and technical perspective on this important issue.

The 1986 Rivers Act resulted in only the prohibition of commercial gravel mining activities in rivers and streams. Since that date gravel excavation has continued to be routinely approved for the purpose of property protection wherever it is determined that removal will provide the intended relief and will not significantly contribute to increased system instability.

Through the late '70's and early '80's the practice of gravel mining from rivers proliferated. The price of gravel had risen substantially and rural development trends increased significantly. This exerted pressure on towns to improve and expand their rural road systems to accommodate the increased traffic demands.

By 1985 and after a decade or more of extensive activity the agency and other resource users observed and became concerned about the high degree of instability being exhibited by virtually all river systems in which mining was being practiced. Instability manifested as: streambed degradation; undermining of streambanks, bridge abutments and culvert headwalls; loss of bank vegetation; and increased rates of bank erosion and lateral movement with consequent property damages.

Agency observations of stream channel response to mining coincided with the conclusions of studies done by others and the results of geomorphological modeling. During the period of the most extensive mining, concepts of river morphology, sediment transport and stream stability were poorly understood.

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.

This explains why mining or dredging operations which remove a significant volume of the sediment available for transport throws the system out of balance. The river continues to move sediment out of the reach, but if an equal volume of sediment cannot replenish that which is scoured away because it has been mechanically removed from the system, increased bed degradation, bank erosion and instability will result.

Under stress (i.e.; mining, floods, human encroachments and constraints, stormwater, and loss of streambank vegetation) river systems may convert from stable to unstable forms. Vermont's rivers, particularly those damaged in the past by mining and more recently by flooding, increasingly exhibit the unstable form.

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Attempts to control flooding through dredging or mining will only exacerbate the problem. River management, flood damage prevention and property protection efforts must be focused on restoration of the stable stream form, keeping a balance between sediment supply and sediment transport, and the protection of river corridors from incompatible forms of development.

We can try and try and try to make the river the way we “want” it to be, static in the landscape, 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. Knowing what the river dimensions, pattern and profile was like or would be like in a stable condition and the corridor necessary to maintain those conditions, greatly improves the potential for long term success of the river management project and the property protection desired.

Limited 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 to 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. If aggradation is caused by a deficient or undersized structure then 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. Channel pattern and profile issues may need to be addressed in addition to removal or instead of removal.
- Where upstream structures or property would be endangered by “headcutting” or undermining associated with a lowered streambed elevation or profile.