

Chapter 5

Gravel Mining

- Level 1 Volunteer Water Quality Monitoring Training Notebook –

Missouri stream channels and their floodplains are economical sources of sand and gravel. Commercial excavation (also called mining) of sand and gravel from streams accounts for millions of dollars in revenue in Missouri. This important commodity is required for a variety of purposes, including making concrete, backfill for house footings, maintenance of public and private roads and driveways, landscaping, and septic fields. It is used in place of crushed quarry rock in areas where quarries are not close by, or where the local quarry rock does not meet the engineering standards required for the intended construction purpose – for example, it may be too soft or porous.

Although this is a needed commodity, research on sand- and gravel-bedded streams has shown that in-stream excavation of these minerals, if done improperly, can reduce water quality and destabilize the channel bed and streambanks. The challenge is to balance the need for these important commodities with maintaining the health of our streams. This chapter will provide you with guidance as to how you can help protect our streams through understanding proper and improper gravel mining methods, current regulations, and who to contact with what information about questionable mining operations.

Mining Methods and Effects

Sand and gravel are regulated as “industrial minerals” in Missouri. Other industrial minerals commonly mined in Missouri include limestone, clay, and some sandstone and granite. Most industrial minerals are mined from “open pits” – like the quarry-type operations you are most familiar with. However, sand and gravel can be mined from either open pits only in river floodplains or from sand and gravel bars located along streams.

Proper Mining Methods

When removing gravel from streams, operators are required to conduct bar skimming mining when they remove the material from the gravel bars that build up (deposit) along the sides of the channel. Bar skimming is recommended as a means for advancing stream resource conservation while maintaining a viable extraction industry. This type of gravel removal operation lowers the risk of headcutting upstream and sedimentation downstream. In addition, the practice of removing gravel at periods of low water flow will aid in protecting wildlife. Sand and gravel miners are required to excavate sand and gravel in ways consistent with the In-Stream Sand and Gravel Excavation Plan requirements that the Missouri Department of Natural Resources supports and enforces.

The proper technique is to “shave” off the tops of the bars, being careful not to take them down lower than the water level. In other words, they should not dig pits deep into the water itself. Also, they should leave untouched strips of ground, called “buffer zones”. A buffer zone of adequate distance must be left between the mined area and the highbank, usually at least two feet from the highbank. Another buffer zone is to be left between the mined area and the flowing water (see Figure 1).

A distinction needs to be made between permitted operators (who are mining gravel for a commercial purpose) and non-permitted operators who are mining gravel for personal use. Non-permitted operators are *encouraged* to follow the rules and regulations of the Land Reclamation Act, and permitted operators are *required* to do so.

Improper Mining Methods and Resulting Negative Impacts

The effects of improper mining can cause problems miles upstream and downstream from a mining site. The extent of the impacts depends on the size, scope, and number of operations on a stream. Mining (digging) in the wrong places (such as in the channel) or using improper techniques may have several negative impacts.

Negative effects that can result from digging into the streambanks, digging a pit in the channel or on a gravel bar, digging into the banks, or straightening (channelizing) a stream may include:

1. Deepening (incision) of the channel over great distances upstream (called headcutting) and downstream (bed degradation) from the mining site (see Figure 2.).
2. Accelerated bank erosion due to channel incision, and the resulting loss of streamside land and real estate.
3. Damage to bridges and utility lines as the channels erode.
4. When banks erode, or when water levels rise to wash over mined gravel bars, sediment can be released into the water flow. This material is deposited downstream, causing sedimentation of various habitats.
5. As sediment fills up all the little spaces between the rocks in the bottom of the stream, the variety of available types of aquatic habitat is reduced. As a result, you end up with a reduced variety of aquatic organisms, which means a decrease in species biodiversity and/or numbers. You eliminate populations of aquatic species as you eliminate the areas in which they live, feed, and breed.
6. Fish production can be reduced for the same reasons. Fish feed on aquatic organisms and if you reduce the critters they eat, you impact the fish. Also, many fish need clean gravel on which to spawn, and their eggs can be smothered if covered with sediment before they hatch.

Negative effects that can result from open pit mining in a river's floodplain. Extraction of these minerals from floodplains is achieved by their excavation from deep pits. They first remove the topsoil to get to the gravel. If these pits are dug too close to the flowing stream channel, the walls between the pit and the channel may crumble during flood events and stream water breaks through into the pit. If the breakthroughs are situated at both the up- and downstream ends of the pit, and the pit bottom is deeper than the existing stream channel, it can result in an abrupt relocation of the main water flow from the main channel into the pit area. In essence, this is a form of channelization that shortens the stream reach, and will result in extensive channel instability.

More research is needed to provide information about the effects of mining in order to develop strategies to protect streams while allowing a workable sand and gravel mining industry.

Who Regulates Sand and Gravel Mining in Missouri?

Missouri Department of Natural Resources

The Missouri Department of Natural Resources' Division of Environmental Quality, Land Reclamation Program has authority over the regulation of all commercial surface mining in Missouri. They have this authority through The Land Reclamation Act 444.760 to 444.790 RSMo, a state (not federal) law enacted in 1972 with recent revisions. The regulation of sand and gravel mining is split into two categories, open pits (mostly in floodplains) or in-stream. What the Land Reclamation Permit refers to as in-stream mining by no means promotes mining in the wetted channel.

In this context, the term *reclamation* means the process by which an operator (here meaning the individual or company who does the mining) puts the mined site back in order, or reclaims the land, after mining is complete. The required reclamation process is dependent on the type of mining.

To reclaim an open pit sand or gravel mining site, the operator must grade the pit walls down to no steeper than a 3:1 slope, replace any removed topsoil on the slopes, and seed the slopes in order to reestablish grasses. They must also clean up the site by removing any debris or other trash left at the site as a by-product of the mining process. Each individual site may have a custom reclamation plan.

But, what about in-stream mining sites? In general, in-stream operators are not required to reclaim their sites because it is assumed that the river will eventually wash over the site and reclaim it. Generally, if the rules and regulations are followed, there should be no reclamation at in-stream sites.

The U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers is involved with the regulation of some of the activities that may be associated with in-stream gravel mining operations. Through Section 404 of the federal Clean Water Act, the Environmental Protection Agency (EPA), with the assistance of the Corps of Engineers, has authority over any addition of “fill material” to “waters of the United States,” including most rivers and streams and naturally occurring wetlands. They have authority over anything below the normal high banks of the stream.

During the 1990s, there was a lot of back and forth as to whether or not the Clean Water Act gave the Corps authority over “excavation.” But now, as a result of a series of court decisions, EPA and the Corps no longer have any authority to regulate excavation. However, the Corps of Engineers may require a permit under Section 404 of the Clean Water Act from any operator who does not simply lift the gravel off of a bar, load it into a truck, and haul it away.

If stockpiling of gravel occurs below the normal high water mark (e.g., on the gravel bars) or if the gravel is moved around within the stream in any way, the operator has crossed into an area under which the Corps has authority and these types of activities may or may not be allowed under the authority of a 404 permit.

Some of the other activities that come under the Corps’ jurisdiction include shoving gravel around to make low water crossings, shoving gravel up against the banks, or grading the gravel where the over- and undersized rock falls through the grading screens back onto the gravel bars.

Exemptions from Obtaining a Land Reclamation Program Permit

Operations that are NOT required to obtain a permit from the Land Reclamation Program include:

1. Individuals mining on their own property for their personal use on that property (e.g., gravel for farm roads, for concrete to use while building a house on the property, etc.).
2. Any Political Subdivision
 - City, County or State
 - Branch of the military

Note: In case 2., in order to remain exempt from permitting requirements, the entity must use their own equipment and personnel to mine and haul the sand/gravel. For example, a county road commission may mine without a Land Reclamation Program permit as long as they use county personnel and equipment to do so. If the county hires a contractor to do the mining with the contractor’s equipment or the contractor’s hauling trucks, the contractor is NOT exempt and must obtain a permit.

3. Operations on the Missouri and Mississippi Rivers or operations on rivers or sections of rivers covered under Section 10 of the Rivers and Harbors Act of 1899 that have obtained a permit from the Corps of Engineers.

4. Operators (miners) who can show proof that they already have a permit with another agency (e.g., Corps of Engineers) that covers all the mining-related activities that the Land Reclamation Program would normally regulate. (This exemption was added to the Land Reclamation Act in 1990.)

Unless exempt under the above-mentioned circumstances, all commercial sand and gravel mining operations must be permitted (i.e., obtain a permit to conduct the activity) from the Land Reclamation Program.

National Scenic Rivers and Endangered Species

Any time federal money is used by a state to help support a state law, it is often under the assumption that the state must honor other related federal laws (e.g., the Endangered Species Act). However, currently there is no federal law covering the regulation of industrial mineral mining in the United States. There is nothing like The Clean Water Act, or The Clean Air Act, which all states must follow. Instead, the laws change from state-to-state, and some states have no law regulating the mining of industrial minerals at all.

Since the Land Reclamation Program does not receive federal funds for the administration of Missouri's Land Reclamation Act, they are not required to honor related federal laws in their administration of the act. Prior to October 1, 2004, the Land Reclamation Program had no jurisdiction regarding gravel mining in National Scenic Riverways or in areas supporting populations of endangered species. However, on October 1, 2004, additional state rules supporting the Land Reclamation Act went into effect and relate to the National Scenic Riverways and endangered species.

As of that date, the Land Reclamation Program will deny all permits for gravel mining located in the National Scenic Riverways. In addition, no mining of gravel is allowed in segments of *Outstanding State Resource Waters* (as defined in rules enforced by the Missouri Department of Natural Resources' Water Protection Program) that are owned or managed by a state or federal agency.

In addition, applications received after October 1, 2004, will be reviewed for mining in areas known to support populations of rare and endangered species. The Land Reclamation Program will consult with the Missouri Department of Conservation and the U.S. Fish & Wildlife Service during the review of the application in an effort to promote protection of these species and their habitats.

The Land Reclamation Program's Permitting Process

Industrial mineral mining permits are issued by the Land Reclamation Program to cover a period of twelve months from the time of permit issuance. Permitted operators can apply for renewal of their permit for additional twelve-month periods as necessary.

Required Permit Application Information

- *Company information* (e.g., name, main officers, office address, telephone, contact person)
- *Site information*, which includes a physical and legal description of the site ("legal" meaning Section, Township, and Range), as well as appropriate maps
- *Site name or site number*
- *Acres to be permitted*
- *List of any other permits* with the Land Reclamation Program currently or previously held by the permittee
- *Historical list* of associated permit violations and bond forfeitures
- *Bonding*: Bonds are required for operations thought to have a reclamation liability. By liability, they mean that the operator has the legal responsibility to reclaim their mining site. Bonds are required for all open pit mines and are meant to cover the state's cost to reclaim the site if the operator fails to do so, for whatever reason. The state holds onto the bond until the mining site is approved for bond release. Bond release only occurs after the state inspector has certified that the

operator has successfully accomplished all of the reclamation requirements listed in the operator's permit. The Land Reclamation Commission must officially agree that reclamation requirements have been met before the bond is returned to the operator. Be aware, however, that although bonds are required for all open pit operations, they are not initially required for in-stream mining operations. In-stream operations are not generally thought to have a reclamation liability because it is assumed that the river will eventually wash over the site and reclaim it.

- *Sand & Gravel Excavation Plan:*

The Land Reclamation Program has developed a Sand & Gravel Excavation Plan that is an integral part of the permit application and replaces the old Stream Protection Plan. It must be signed and notarized by the applicant in order to be valid. As of October 1, 2004, the plan includes descriptions of how the applicant will comply with regulations over how they physically accomplish the mining of sand and/or gravel from Missouri streams. The regulations address such issues as:

- The maintenance of a buffer zone between the flowing water and the area to be excavated.
- Bank vegetation must not be disturbed by the excavation.
- Restrictions on how deep the operator can excavate.
- Protection of the riparian (streamside) zone and its vegetation adjacent to the excavation.
- Restoration of roads created by operators to access the mining site.
- The angle/direction in which streams may be crossed to facilitate the mining process.

The information in the Sand & Gravel Excavation Plan provides guidance for Land Reclamation Program Inspectors during field visits to each site so they can determine if the operator is in compliance with their approved permit. In order to be considered in compliance the operator must be following their approved mining and reclamation plan as stated in their permit. If a noncompliance is noted, enforcement actions, such as Notices of Violation (NOVs) may be issued.

For information regarding the rules (regulations) in effect prior to October 1, 2004, contact the Land Reclamation Program using the contact information provided at the end of this chapter.

Permit Fees

Permit fees are very low. The resulting lack of income is the main reason there are so few inspections of these sites - there is not enough money coming in to pay for adequate staff. The Land Reclamation Program will continue to lobby for changes in the rules that would allow for fee increases. At present, the following annual fees are required:

- Mining less than 5,000 tons per year: \$300.00
- Mining 5,000 tons or more per year -
 - Land Reclamation Fee:
 - Annual Permit Fee: \$800.00
 - Site Fee: \$400.00 per site mined 6 months per year or more or \$200.00 per site mined 6 months per year or less
 - Acreage Fee: (only for bonded acreage) \$10.00 per acre
 - Geological Resources Fee:
 - Annual Permit Fee: \$50.00
 - Site Fee: \$50.00 per site
 - Acreage Fee: (only for bonded acreage) \$6.00 per acre on the first 300 acres, \$3.00 per acre in excess of 300 acres

Public Notice in the Newspaper

Another item required for a permit is a public notice. This notice must be printed once per week for four consecutive weeks in a newspaper whose circulation includes the area where they intend to mine. The purpose of the notice is to make the public aware that the operator has submitted an application for a permit to mine in their area. The public has fifteen days after the last of the four publications to submit written comments regarding the proposed mining, including any protests, to the Land Reclamation Program. A permit cannot be issued until the end of the public comment period and certain types of comments must be responded to prior to the issuance of a permit. So, at a minimum, it takes 45 days for a permit to be issued once a complete application is submitted.

Site Inspection

As of 2012, the Land Reclamation Program has only 6.65 Full-Time Employees (FTEs) dedicated to regulating industrial mineral mining (sand, gravel, limestone, clay, etc.) in the State of Missouri. These employees are responsible for permit review and issuance, all on-site inspections, and issuing recommendations for enforcement actions as well as other duties.

The number of employees is limited by the amount of permit-related fees collected from permitted operations. A lot of commercial sand and gravel miners are operating without permits. This is not only illegal but it cheats the state out of funds that help them protect the resource. The department's Land Reclamation Program needs your eyes to help identify illegal mining operations.

Please visit: <http://dnr.mo.gov/env/lrp/permits/> to see if an operators is permitted.

All industrial minerals inspectors are dedicated to industrial mineral mining site inspections; however they have other duties as well. In-stream sites are given equal priority to open pit sites. The Land Reclamation Program typically responds to complaints within two weeks, and it is generally much quicker than that.

What To Do If You See A “Questionable” Operation?

Feel free to make copies of the guidelines found on the following link to keep in your sampling kits or vehicle for future reference:

<http://www.sos.mo.gov/adrules/csr/current/10csr/10c40-10.pdf>

Volunteers should not approach gravel miners if they see a problem. You do not have the authority to trespass or demand copies of a miner's permit.

However, if you see an operation that gives you concern, you might want to collect some information on the operation before you make a phone call. This information can be of help to the regulating authority in answering your questions, and determining if the operation has a permit and if they are mining in an appropriate manner.

1. The date you saw the site.
2. Stream name, location of the operation (e.g., Just upstream from the Highway H bridge over Big Creek in Ozark County). If possible, location information should also include the section, township, and range. And, if known, the name of the landowner on which the disturbance is taking place can be helpful. A permit could be issued to either the landowner or operator, so agencies may have the activity registered under either one.
3. Copy down business names off any equipment or trucks. License numbers are very useful. Do they appear to be county trucks (often yellow) or private operators? County operations are not required to have a Land Reclamation Program permit, but depending on their mining techniques, they may have to have a U.S. Army Corps of Engineers 404 permit.

4. Are they stockpiling gravel? If so, where? On the gravel bars or up in the floodplain? How big are the stockpiles – what are the dimensions of the pile? Example: “The pile was about 5 feet tall and the base of the pile about 10 square feet when I saw it on July 30th.”
5. Are they shoving gravel up against the banks or otherwise moving gravel around (e.g., shoving it up to make temporary low-water crossings)?
6. Are they mining in the water? Are they digging a pit in the gravel bar (down below the water table)? If so, the pit will be filled with water.

If you have questions regarding a sand and gravel mining operation, contact the Land Reclamation Program in Jefferson City:

**Bill Zeaman, Chief of Industrial and Metallic Minerals Unit
Land Reclamation Program
Mo. Dept. of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176
Office telephone: (573) 751-4041
FAX (573) 751-0534
Email address: bill.zeaman@dnr.mo.gov**

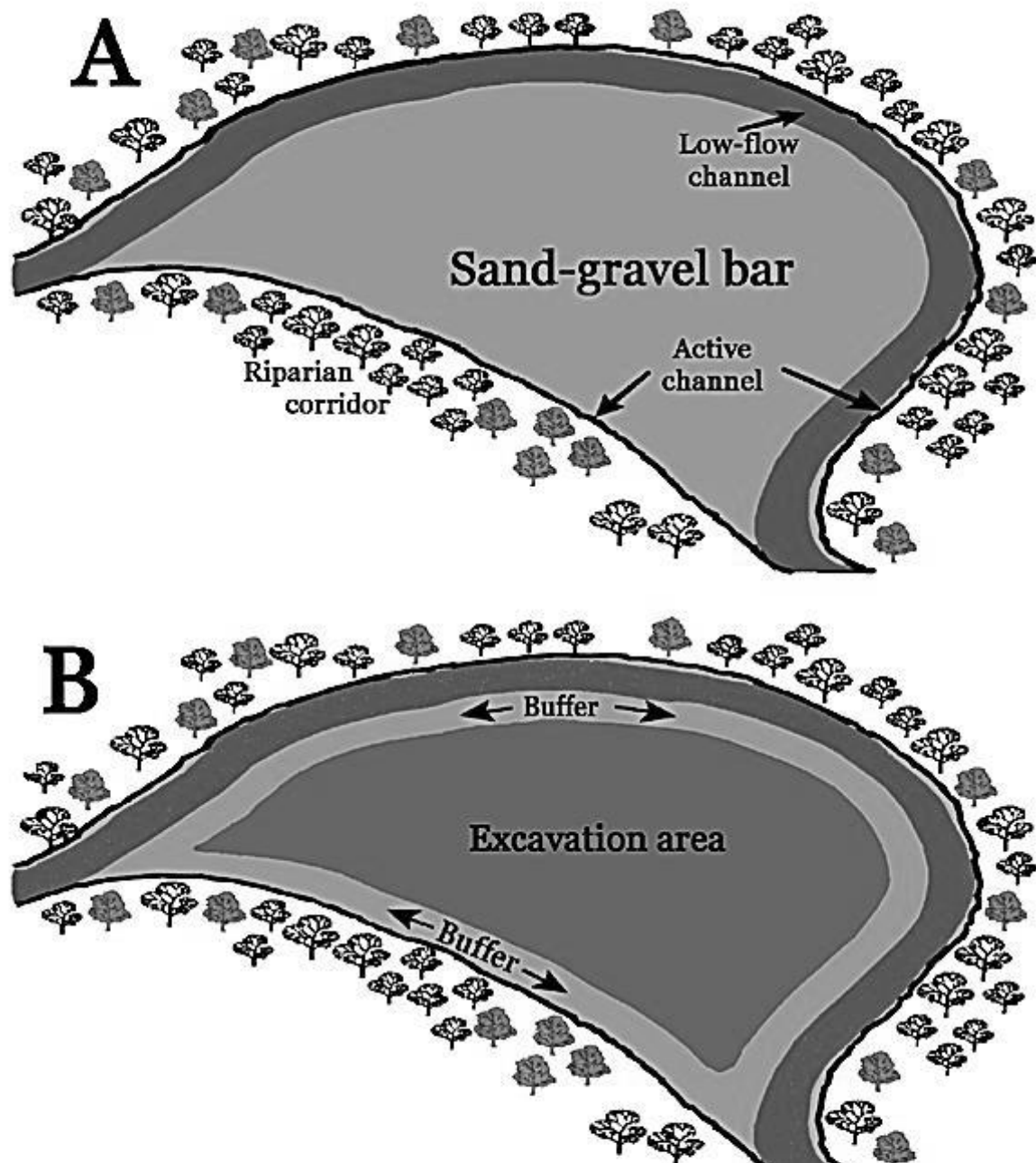


Figure 1. Diagram of a typical sand-gravel bar showing (A) the relative positions of the bar, the riparian corridor, the active (or bankfull) channel, and (B) the area of excavation defined by a no-disturbance buffer of designated with.

(Figure courtesy of the Missouri Department of Conservation)

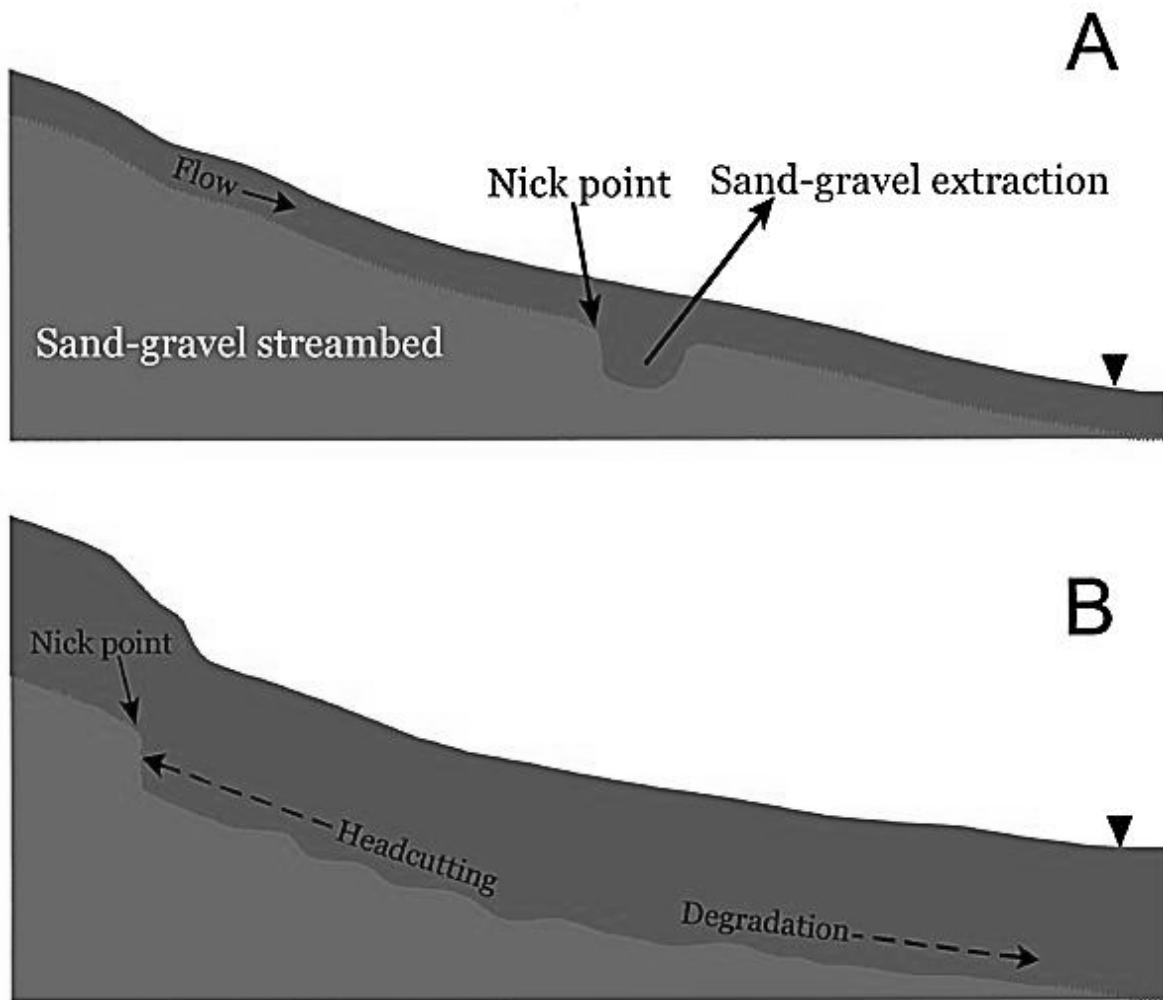


Figure 2. Diagram of a sand-gravel streambed showing (A) the nick point that develops when pit excavation is used to mine sand and gravel from the channel during low flows, and (B) the upstream headcutting and downstream bed degradation that develop during high flows. Inverted triangles denotes the water surface.

(Figure courtesy of the Missouri Department of Conservation)