Region 7

Iowa
Kansas
Missouri
Nebraska

FACT SHEET
Number 1

Stream Channelization

Definition: Stream channelization describes any activity that moves, straightens, shortens, cuts off, diverts, or fills a stream channel, whether natural or previously altered. Such activities include the widening, narrowing, straightening, or lining of a stream channel that alters the amount and speed of the water flowing through the channel. Examples of channelization are: lining channels with concrete; pushing gravel from the stream bed and placing it along the banks; and placing streams into culverts.

Social and Economic Implications of Channelizing Streams:
Straightening even small reaches of streams can cause adverse stream impacts. Those impacts may require expensive private or public remedies. Channelization can:

- **Pose threats to human safety.** This can occur especially in concrete channels where banks lack measures for people and animals to escape.

- **Damage public or private roads and bridges due to undercutting, which can make them unsafe.**

- **Damage utilities and pipelines from uplifting and/or bank erosion, which can rupture lines and threaten human health and aquatic life.**

- **Increase flooding either upstream or downstream due to the decreased capacity of the stream to carry flows.**

- **Damage public or private property as a result of bank erosion or increased flooding, increasing maintenance costs for landowners.**

- **Increase the amount and speed of water leaving impervious surfaces paved with concrete and asphalt, if the purpose of channelization is to develop property.**

- **Reduce dollars spent on tourism, recreation and associated industries.** Less stream habitat can result in fewer sport fish.

- **Increase costs for treatment of drinking water due to more nonpoint source pollution in runoff.**

- **Decrease property values in areas where flooding is more frequent.**

Permit Requirements: Channelization projects in streams may require a permit from the Corps of Engineers under Section 404 of the Clean Water Act. Please contact your local Corps District to find out if your project requires a permit. You can find the nearest Corps office via the Internet at: http://www.usace.army.mil/faq.html#Permits

"For if one link in nature's chain might be lost, another might be lost, until the whole of things will vanish by piecemeal." - Thomas Jefferson
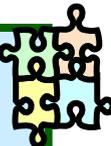
**Straightening a stream or placing it into a pipe tends to transfer problems from one area to another.**

◄ Natural stream

Straightened stream that has undercut its cement lining ▶

Environmental Impacts: Generally, the adverse impacts created by channelization projects far outweigh the benefits they intend to create. They tend to transfer problems from one area to another, either above, below or within a project area. For instance, shortening the reach of a stream moves flooding from the channelized reach to a downstream reach.
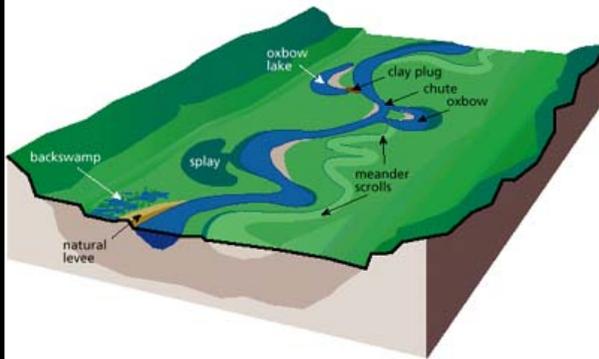
Natural Stream Conditions	*Channelized Streams*
✍ **Natural streams are free-flowing systems.** They have meanders, swifter flowing areas (riffles) and deeper, quiet areas (pools). ✍ **The length and spacing of meanders and the size of the channel match normal stream flows.** ✍ **Trees and vegetation provide natural protection against flood damage and bank erosion, as well as trap sediments. They also help regulate the quality of the stream ecosystem.**	☎ **Shorten and steepen streams.** Channelization usually results in shorter and steeper streams, which then cause faster stream flows and increased erosion (usually eroding the bed downward and outward, and cutting banks). ☎ **Reduce the ability of the stream to slow floods and absorb flood damage.** Meanders help slow flowing waters. Removing vegetation along banks reduces the ability of the stream to buffer adjacent areas against floods and flood damage, also reducing the quality of the stream ecosystem. ☎ **Change flood heights and frequency.** A channelization project may target the faster removal of water, but the removal of water in this manner can not only adversely affect adjacent wetlands, but the stream itself. During drier periods of the year, wetlands tend to discharge (slow release) water into streams, helping maintain flows. (See picture below at right ▲) ☎ **Affect drinking water quantities.** When water moves away from an area faster, the recharge of groundwater may not occur (slow release of water into the ground water table). Where groundwater is important as a source of drinking water, the supply of water to drinking water wells may not be replenished at the same rate. WETLANDS RELEASE FLOODWATERS SLOWLY, WITHIN DOWNSTREAM CHANNEL

Natural Stream Conditions	Channelized Streams

Natural Stream Conditions

✍ **Provide habitat for birds, fish, other wildlife, and plants.**

Intermittent streams or streams in the upper portions of a watershed have the ability to remove nitrogen more quickly, reducing the amount that is transported downstream in shorter distances.

✍ These streams also play an important role in the primary production of plant and animal food for downstream areas.

✍ They also provide spawning and rearing habitat for fish species.

✍ **Provide sources of drinking water for most urban areas; water for industrial use, including water to cool energy plants; and water for domestic uses, such as cooking, bathing, dishwashing, and cleaning.**

Channelized Streams

☎ **Cause changes in the type and amount of habitat.** When changes occur to the material forming the stream bed (e.g., lining a stream with concrete or forcing flows into a pipe, etc.), the plants and animals that depended on that specific habitat are replaced by others that are able to survive the habitat changes. It is the cumulative (additive) impact of many projects that can significantly affect species in terms of their diversity and the numbers of individuals.

Natural stream bed materials and plants → **Concrete**

☎ **Cause changes in plant and animal communities** (number of individuals in a population and species that are present). This is a direct result of changes in habitat and water flow patterns and duration. Plant species can be affected by changes in the quantity and timing of flooding (either annually or seasonally) and changes in the amount of sediment in flows, which can alter the overall plant community. Plant community changes can adversely impact the quality of wetland and riparian areas (areas that parallel stream banks). When plants are affected, changes can occur in the animal species in the area that use plants for food, cover, and resting. Removing plants in and along streams also reduces the amount of leaf litter (detritus) that serves as food for animals at the bottom of food webs.

☎ **Cause declines in species.** Water quality changes can affect species. Increased sediments in a waterbody can smother benthic (bottom-dwelling) organisms and limit light penetration, which reduces microscopic plant production and disrupts the aquatic food chain. Turbidity from bed and bank erosion can impact species that are less tolerant to sediment in stream flows.

☎ **Increased accumulations of nutrients in streams can create algal blooms which can affect human and animal health (e.g., livestock).**

Natural Stream Conditions	Channelized Streams

Natural Stream Conditions

☏ **Provide water quality benefits**
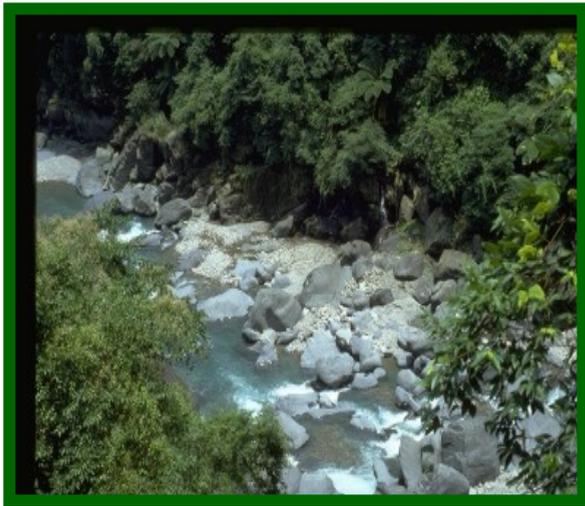
Rocks in streams help add oxygen to flows ▲

☏ **Provide economic benefits to communities through tourist attractions and associated services and industries.** The City of Great Bend, Kansas, has capitalized on bird-watching in wetlands.

Channelized Streams

☏ **Produce changes in water quality.** Intermittent and ephemeral streams are especially valuable in filtering out pollutants because more pollutants are filtered when a larger portion of the water is in contact with such stream beds. When portions of these streams are lost, especially the cumulative loss of many small segments of a stream, adverse impacts to water quality can occur.
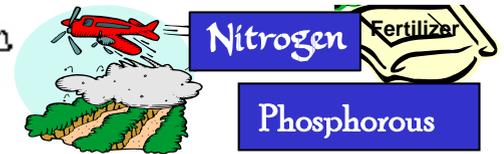
☏ **Cause changes in pollutants in streams.** ✉ When streams are channelized for development, flooding problems can increase, and the water running off the land picks up pollutants such as phosphorous, nitrogen, pesticides, sediment and heavy metals. This degrades the stream water quality and can increase the cost of drinking water treatment. ✉ Removal of trees and vegetation along the stream bank can increase the amount of pollutants in streams (such as nitrogen, phosphorous, E-coli bacteria, pesticides, and sediment, etc.) and can result in increased water temperature and decreased oxygen. Temperature is critical to many aquatic species, as it triggers fish spawning ✉ Added nutrients can result in algal blooms, which increase bacteria and decrease the amount of available oxygen, often resulting in fish kills.

☏ **Reduce ecotourism dollars through wetland loss (as a result of flow changes) or the loss of sport fisheries (due to loss of free-flowing habitat).** Loss of wetlands can reduce tourism associated with nature-related recreation, such as hunting, bird-watching, nature photography, and associated service industries (food, gas, lodging, etc.).

Alternatives to channelizing a stream can be more environmentally friendly and less expensive!

🔑 **Design projects to the lay of the land instead of cookie-cutter designs.**

🔑 **Use watershed best management practices**, such as leaving a buffer width of trees along each side of the stream and retaining wetlands. These are better solutions for reducing sediment and the effects of flooding.

🔑 **See our Fact Sheet on Urban Project Planning!**

For additional information about streams or wetlands:
Contact the EPA WETLANDS HELPLINE at 1-800-832-7828 or visit our Web site at http:\\www.epa.gov/owow
Fact Sheet Source: EPA Region 7, Section 404 of the Clean Water Act/Wetlands Program, February 2005

For additional information about this Fact Sheet, other educational materials about streams or wetlands, and alternatives to stream channelization: Contact: Carl Stevens, EPA Region 7.   Phone: 913-551-7569; E-mail: stevens.carl@epa.gov