Rivers overview

MN DNR

Example of a very large river

F. Harris MN DNR

Example of a moderate river

Distribution

See individual distribution maps in the sections for:

River – Very large
River – Headwater to Large

General Description

Rivers are ribbons of life—complex, productive, valuable communities of terrestrial and aquatic plants and animals joined and sustained by the many forces, interactions, and pathways that make up a living stream. Five major components influence stream structure and function: hydrology, geomorphology, water quality, connectivity, and biology (Annear et al. 2004). Plant and animal communities have coevolved with these components. The diversity of aquatic plants and animals depends on the variety of stream habitats.

Hydrology refers to the source, amount, and rate of water, both spatially and temporally, in a stream channel. It impacts the development of aquatic and riparian vegetation, microhabitat features, as well as the other four main stream components. Human activities such as land use, wetland drainage, channelization, and water withdrawal alter the hydrology of streams.

Geomorphology refers to the shape of the stream channel itself, such as meanders, oxbows, backwater areas, secondary channels, and overbank flow areas (areas inundated during high-water events). It reflects the dynamic nature of stream systems and is important in the maintenance and creation of habitat necessary for many aquatic species. Stream geomorphology directly impacts a river's hydrology and water quality as well: An unaltered, complex geomorphology helps to attenuate sedimentation and river flooding downstream. Human activities such as channelization, dams, and alteration of stream bank vegetation can severely impact a stream's geomorphology and its concomitant impacts on other aspects of the stream system.

Water quality refers to the stream's chemical balance, water temperature, sediment load, chemical pollutants, and nutrient load. Aquatic species may be adapted to a certain set of water-quality conditions such as needing cold-water streams, or may be deleteriously impacted by unnatural water quality components, such as the input of estrogen-mimicking compounds. Water quality is impacted by a suite of human activities related both to direct stream impacts, such as discharge of nutrients or pollutants directly into the stream, and surrounding land-use practices, such as increased sediment and pollutant input from row crop agriculture.

Connectivity refers to the flow, exchange, and pathways of organisms, energy, and matter in a river system. Many aquatic organisms, such as mussels and fish, use different parts of a river system during different stages of their life cycle. Depending on the organism, connectivity can range in scale from a few feet to hundreds of miles. Barriers to connectivity are most often considered in terms of the physical effects of dams, but they can be other physical barriers such as flow reduction resulting from water withdrawal, chemical barriers such as zones of poor water quality, or biological barriers such as competition from invasive species or fragmented microhabitat.

The *biology* of river systems is both a reflection of, and an influence on, the other four river system components highlighted above. In addition, aquatic species require habitat components of water depth, water velocity, substrate, and cover. Pools, riffles, and runs have been well studied for fish communities, particularly game fish. The presence, amount, and arrangement of these microhabitat features are directly related to the river's hydrology and geomorphology. Water quality and connectivity also impact the presence and persistence of aquatic species. Plant communities form a mosaic, depending on conditions along the stream and in the floodplain. Terrestrial plants along the stream, in its floodplain, and in its valley are vital to the character of the stream. Plants are critical components of nitrogen, carbon, and oxygen cycles, serving as production sites and conversion centers for life-sustaining elements. Throughout a stream's length, the vegetation along the riparian corridor intercepts flows of incoming runoff, nutrients, and contaminants.

Examples of Important Features for Species in Greatest Conservation Need

In addition to purely aquatic species (e.g., fish and mussels) that benefit from good streams, many other species in greatest conservation need rely on a combination of upland and stream habitats to complete their life cycles. Both wetlands and sandy uplands are necessary for the **Blanding's turtle** to complete its life cycle. Fluvial outwash plains, such as those in Weaver Bottoms along the Mississippi River, provide nesting habitat for Blanding's turtles, **gopher snakes**, **hognose snakes**, **map turtles**, **tiger beetles**, **jumping spiders** and more. **Fox snakes** live in forested riparian habitats. The wood turtle hibernates in rivers, nests on undisturbed sandy banks, but spends much of its time in nearby upland forests.

Many birds are also attracted to the river corridor; the diversity of species depends on the plant diversity, age classes and width of the corridor. Research has shown that older, larger trees are important habitat for nesting **herons**, **egrets**, **eagles**, and a variety of declining songbirds such as the **wood thrush**.

Management Options to Support Species in Greatest Conservation Need

Since many animals require both upland and stream habitats for their life cycles, it is essential to keep these physical habitats connected. Management options include near shore riparian corridor conservation, as well as larger scale watershed actions.

It is important to also protect habitats along the river corridor to allow movement of wildlife and facilitate movement of nutrients and energy between the stream and surrounding landscape. Management options include modified lock or dam construction and operation, as well as removal of obsolete dam structures.

It is also important to protect and enhance water quality parameters, such as water temperature, sediment loads, and chemical pollution. Management options include improved stormwater systems, soil erosion control techniques, and point - nonpoint source pollution abatement.