**Ecosystem Type: RIVERS AND STREAMS**

**Category: Recreation, Culture, and Aesthetics**

1. **Materials**

***Supplier*** – Rivers and streams provide materials for recreation, culture, and aesthetics. Aquatic plant and animal species that live in these ecosystems can be hunted recreationally (Willis and Garrod, 1999) and captured to enhance the aesthetics of existing habitats (Moyle, 1986).

***Driver*** – Nutrients like nitrogen affect the quality of water in streams and rivers because they can increase harmful bacteria such as cyanobacteria. Thus, this impacts recreational activities from occurring due to health problems that they pose (Falconer, 1989). For example, scientists have found that contamination sources from animal fecal wastes can harm individuals who swim in waters polluted from coliform bacteria and have a high chance of gastrointenstinal illness (Calderon, Mood and Dufour, 1991).

***Demander*** – not applicable

1. **Nutrition**

***Supplier*** – not applicable

***Driver*** -not applicable

***Demander*** - not applicable

1. **Energy**

***Supplier*** – not applicable

***Driver*** – not applicable

***Demander*** – not applicable

1. **Mediation of Waste, Toxics, and Other Nuisances**

***Supplier*** – Rivers and streams dilute freshwater resources that are used during recreational and cultural activities and in the provision of aesthetic experiences for humans. Naturally flowing rivers and streams are more effective at dilution, which helps to maintain the biological integrity of the water that provides additional resources like aquatic plants and animals for human enjoyment (Poff et al., 1997).

***Driver*** – The quality of the water in a stream or river is a factor that affects its mediation of wastes, toxics, and other nuisances. Nitrogen can alter the chemistry of a stream and river’s water quality if they are polluted with wastes from sources like dairy farms (Danalewicha et al. 1998). The cleanliness of water determines the level of recreational use that can occur in this ecosystem type.

***Demander*** – not applicable

1. **Mediation of Flows**

***Supplier*** – Rivers and streams mediate the flow of water, sediment, and aquatic species, which provide resources for recreational and cultural activities. The availability of water in rivers and streams provides a space for activities to occur like swimming, fishing, and boating. Vegetative buffers within these ecosystems mediate the flow of sediment, which keeps the water at a high enough quality for swimming and fishing (Osborne and Kovacic, 1993). Rivers and streams also provide a passage between upstream and downstream aquatic species so that they can breed, maintaining a population available for human use or enjoyment.

***Driver*** – Rivers and streams provide water that can be used in or as sources of plants and animals implemented for recreational, cultural, and aesthetic activities. The amount of water retained in these ecosystems depends on the flow and exchange between upstream and downstream sources, which is affected by damming of water resources (Koel and Sparks, 2002). Dams also reduce the abundance of fish and other aquatic wildlife because they disconnect the upstream and downstream populations from each other, reducing the potential breeding (Koel and Sparks, 2002).

***Demander*** – not applicable

1. **Maintenance of Physical, Chemical, and Biological Indicators**

***Supplier*** – Rivers and streams are habitats that maintain the population of fish and crustacean spawn (Jensen, 1991), which can be enjoyed recreationally, culturally, and aesthetically. A river’s cool, flowing habitat (Morrice et al., 1997) and its ability to trap and transform nutrients (Williamson et al., 2008) to be used by aquatic plants can help support the life cycle of these species.

***Driver*** – The water in rivers and streams as well as the species within their habitat can be enjoyed recreationally, culturally, and aesthetically. However, pollutants affect the quality of a stream (Dosskey et al., 2010), impacting an individual’s use of the resource. Dams built on these ecosystems can inhibit a river’s flow (Koel and Sparks, 2002), which disrupts the physical habitat to support the life cycle of species enjoyed during activities.

***Demander*** – not applicable

1. **Spiritual, Symbolic, Religious, and Social Experiences**

***Supplier*** – Rivers and streams can be used for social activities like swimming and boating (Ditton and Goodale, 1973), spiritual and religious activities like baptism, and as symbolic ecosystems to support the inspiration for historical Greek and Roman poetry (Crowther, 1979).

***Driver*** – The water in rivers and streams as well as the species within their habitat can be enjoyed recreationally, culturally, and aesthetically. However, pollutants affect the quality of a stream (Dosskey et al., 2010), impacting an individual’s social, spiritual, and religious use of the resource. Dams built on these ecosystems can also inhibit a river’s flow (Koel and Sparks, 2002), which disrupts the physical habitat to support the life cycle of species enjoyed during these activities.

***Demander*** – not applicable

1. **Physical and Intellectual Interactions w/ Biota, Ecosystems, and Land/Seascapes**

***Supplier*** – Water from rivers and streams can be used to create substances enjoyed recreationally and culturally for human consumption like beer and soda (Fillaudeau, Blanpain-Avet, and Daufin, 2006). Rivers and streams can be physically interacted with for recreational reasons like swimming and cultural reasons like religious baptisms. Researchers have found that people prefer to interact with these ecosystems when they have higher water quality and are willing to pay for improvement of smelly, polluted waters to increase interaction (Magat et al., 2000).

***Driver*** – The desire to use water for varying interests has historically created wars, and continues to be a problem as stream length and densities are depleted from increased demand (Wolf, 1998). Further, pollutants highly influence stream chemistry and may decrease the ability of chemical uptake by stream soils and species to support clean and plentiful waters (Dosskey et al, 2010). This may prevent individuals from enjoying water for these experiences.

***Demander*** - not applicable

**Sources:**

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