**Ecosystem Type: RIVERS AND STREAMS**

**Category: Food, Fuel, and Materials**

1. **Materials**

***Supplier*** – Water from rivers and streams can be used to create substances that are enjoyed for human consumption like beer and soda (Fillaudeau, Blanpain-Avet, and Daufin, 2006). These ecosystems also supply aquatic plant and animal species that can be hunted and used as materials for food or decoration (Moyle, 1986; Willis and Garrod, 1999). Additionally, the aquatic plants, such as algae, can be harvested for fuel production (Sheehan et al., 1998; Dismukes et al., 2008).

***Driver*** – Flooding that occurs from increased impervious area in a watershed can change the assemblage of aquatic species living in rivers and streams, therefore affecting the available materials for food and fuel. Algal species used to support the life of consumable aquatic animals, are susceptible to disturbance from higher flows depending on their location within a stream channel (Power and Stewart, 1987). Further, the value of materials for food and fuel that require water, such as cotton, influences the use and thus the availability of aquatic resources to supply alternative consumables (Chapagain et al., 2006).

***Demander*** – not applicable

1. **Nutrition**

***Supplier*** – Rivers and streams provide resources that are used to grow food and supply aquatic species and water for direct consumption (Prat and Munne, 2000). Water from rivers and streams can be used to create substances enjoyed for human consumption like beer and soda (Fillaudeau, Blanpain-Avet, and Daufin, 2006).

***Driver*** - The quality of streams and rivers can be affected by pollutants and nearby impervious surfaces (Walsh, Fletcher, and Ladson, 2009; Dosskey et al., 2010), which can negatively affect the ecological and physical make up of a stream and river. Not only can a degraded stream experience a decline in available species consumed as food, poor water quality affects the potential supply of water extracted for drinking and food production.

***Demander*** - not applicable

1. **Energy**

***Supplier*** – The flow of water in rivers and streams plays an integral part in the support of aquatic species’ life cycle (Karr and Chu, 2000). Certain river species can be used for fuel production, such as formulating biodiesel from microalgae (Abou-Shanab et al., 2011).

***Driver*** – Flooding that occurs from increased impervious area in a watershed can change the assemblage of aquatic species living in rivers and streams, therefore affecting the available materials for fuel. For example, algal species used as potential resources for biodiesel production are susceptible to disturbance from higher flows depending on their location within a stream channel (Power and Stewart, 1987).

***Demander*** – not applicable

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

***Supplier*** – not applicable

***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*** – not applicable

***Driver*** – Land use in a stream or river’s watershed impacts the flow of water, sediment, and aquatic species that occur in the ecosystem; thus, this impacts the supply of materials for food and fuel. Impervious surfaces are increasing with population and cause issues like flash flooding—disrupting habitat for aquatic wildlife used for food or fuel (Power and Stewart, 1987)—and polluted runoff from sources like roads and private property (Arnold and Gibbons, 1996), which impact the quality of waters needed for the survival of sensitive aquatic species harvested for human consumption.

***Demander*** – not applicable

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

***Supplier*** – not applicable

***Driver*** – Land use in a stream or river’s watershed impacts the physical, chemical, and biological components of the ecosystem’s potential supply of materials for food and fuel. Impervious surfaces are increasing with population and cause issues like flash flooding—disrupting habitat for aquatic wildlife used for food or fuel (Power and Stewart, 1987)—and polluted runoff from sources like roads and private property (Arnold and Gibbons, 1996), which impact the quality of waters needed for the survival of sensitive aquatic species harvested for human consumption.

***Demander*** – not applicable

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

***Supplier*** – Rivers and streams provide materials used for spiritual and religious reasons such as the water in baptisms. They also provide aquatic plants and animals that are consumed in by social groups. For example, the indigenous Altaian people have relied upon the fish and water resources of the Katun River in Siberia for survival. These resources have also been observed in traditional ceremonies, honoring the water resources and its native plants and animals (Klubnikin et al., 2000).

***Driver*** – The quality of streams and rivers can be affected by pollutants and nearby impervious surfaces (Walsh, Fletcher, and Ladson, 2009; Dosskey et al., 2010), which can negatively affect spiritual and religious activities utilizing these resources such as baptisms. Man-made structures like dams can also affect the quality of the ecological and physical make up of a stream and river. The knowledge of this impact has prevented dams from taking place along river systems, such as the Katun dam project that was delayed due to the unity of international social groups who protested the planned development (Klubnikin et al., 2000).

***Demander*** – not applicable

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

***Supplier*** – The flow of water in rivers and streams plays an integral part in the support of aquatic species’ life cycle (Karr and Chu, 2000). Aquatic plants and animals can be used experientially in settings like swimming and boating. River species can also be subjects for fuel production, such as formulating biodiesel from microalgae (Abou-Shanab et al., 2011).

***Driver*** – Pollutants affect the quality of a stream (Dosskey et al., 2010), impacting an individual’s use of the resource. 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 gastrointestinal illness (Calderon, Mood and Dufour, 1991). This bacteria can also influence the quality of the water for aquatic plants and animals used for food and fuel production.

***Demander*** - not applicable

**Sources:**

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