**Ecosystem Type: RIVERS AND STREAMS**

**Category: Natural Hazard Mitigation**

1. **Materials**

***Supplier*** – Rivers and streams provide materials for natural hazard mitigation because they are habitats that support the life of forests and natural land cover. These vegetative buffers can mitigate the flow of water that occur from flood events, reducing the impact they may have on man-made landscapes adjacent to the river or stream (Cheng, J.D., Lin, L.L., and Lu, H.S., 2002).

***Driver*** – Land cover in the watershed of a stream or river can influence this ecosystem’s ability to mitigate natural hazards likes flood events and control microclimates that might impact human health. Replacing natural vegetative surfaces with impervious area can increase the amount of runoff going into the streams and rivers (Barnes, Morgan, and Roberge, 2001).

***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*** – Studies have shown that streams and rivers with a forested buffer zone can mediate wastes and toxics that may occur from natural hazards (Sliva and Williams, 2001). These ecosystems can also dilute wastes that accumulate in runoff after flooding (Williamson et al, 2008).

***Driver*** – Impervious surfaces near waterways can affect the ability of rivers and streams to provide important ecosystem services of trapping and transforming nutrients or capturing and settling sediments. Flooding that occurs from natural hazards is enhanced with impervious surfaces (Fletcher, Vietz, and Walsh, 2014) which decreases overall residence time of water in a river or stream. The shorter the residence time, the less effective aquatic plants and species can be at removing wastes like industrial effluents (Boopathy, 2000).

***Demander*** – not applicable

1. **Mediation of Flows**

***Supplier*** – Rivers and streams provide ecosystem services during natural hazards that increase precipitation and the intensity of runoff. These ecosystems can slow down the flow of water through natural meanders (Shankman, 1991) or by the aquatic plants (Morrice et al., 1997).

***Driver*** – Flooding that occurs from natural hazards is enhanced with impervious surfaces (Fletcher, Vietz, and Walsh, 2014). This can affect a stream or river’s ability to slow down runoff, which can make adjacent and downstream properties more susceptible to damage from flooding surges.

***Demander*** – not applicable

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

***Supplier*** – Hazards that come from extreme storm events such as water surges from flooding can be controlled by rivers and streams. Minimally disturbed, more natural river channels that contain meanders can help slow down the effects from flooding, maintaining the physical and biological structure of the adjacent land (Shankman, 1991).

***Driver*** – Intensity of storms that increase overall runoff on impervious surfaces can blow out meanders in the rivers and streams. This can negatively impact the ability of a stream to slow down flooding into adjacent and downstream properties (Shankman, 1991).

***Demander*** – not applicable

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

***Supplier*** – not applicable

***Driver*** – not applicable

***Demander*** – not applicable

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

***Supplier*** – not applicable

***Driver*** – not applicable

***Demander*** - not applicable

**Sources:**

Barnes, K.B., Morgan III, J.M., and Roberge, M.C. (2001) Impervious Surfaces and the Quality of Natural and Built Environments. Retrieved from <https://www.researchgate.net/profile/Kent_Barnes/publication/251630988_IMPERVIOUS_SURFACES_AND_THE_QUALITY_OF_NATURAL_AND_BUILT_ENVIRONMENTS/links/5512b7970cf20bfdad51d561.pdf>

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