**Ecosystem Type: WETLANDS**

**Category: Clean Air**

1. **Materials**

***Supplier*** – Wetlands supply oxygen for clean air. Wetland plants supply oxygen because of their ability to transpire water through their leaves (Shoemaker, W.B. et al., 2015; Huryna, H., Brom, J., and Pokorny, J, 2014). The release of this water into the atmosphere provides a source of clean oxygen. There are many species of wetland plants with varying transpiration rates including those found on croplands, forested woody wetlands, and natural land cover. For example, one study found that a wet meadow released 30% more energy through evapotranspiration than a field or pasture (Huryna, H., Brom, J., and Pokorny, J., 2014). The higher the rate of transpiration, the greater amount of clean oxygen released back into the atmosphere.

***Driver*** – not applicable

***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*** – Wetlands supply materials that adsorb metals and organic materials in their soils to ensure clean air. These ecosystems take several forms, including croplands (e.g., rice paddies) and forested woody. While there are many types of wetlands, peatlands represent an ecosystem that can serve as a sink for sulfur (Mikutta, C. and Rothwell, J.J., 2016). Sulfur is an important mineral because of its ability to bind to arsenic, which is a source of air contamination that contributes to issues with human health (Mikutta, C. and Rothwell, J.J., 2016; Langner, P., Mikutta, C., Kretzschmar, R., 2012; IPCS, 2001). Arsenic’s gaseous form originates from natural sources, such as volcanic ash, and human sources, such as metal smelting operations (IPCS, 2001). When arsenic is in the air, it attaches to particulate matter and falls to the earth in either wet or dry deposition (IPCS, 2001). If the arsenic falls onto a wetland, it can adsorb into the soil preventing it from returning to the atmosphere.

***Driver*** – not applicable

***Demander*** – no literature review available at this time

1. **Mediation of Flows**

***Supplier*** – Wetlands supply natural vegetation that provides air ventilation for clean air. Wetlands adsorb greenhouse gases, such as carbon dioxide and nitrous oxide (Olsson, L. et al., 2015; Nui, X., Wang, B., and Wei, W., 2016; Mikutta, C. and Rothwell, J.J., 2016), and transform them back into their organic state. Once these gases transform, the wetlands release the oxygen back into the atmosphere. Additionally, wetland plants with a high transpiration rate are most efficient at removing toxins from the air. The rate of transpiration is important because it describes the ability of a plant to evaporate water back into the atmosphere, which is an important source of clean oxygen.

***Driver*** – not applicable

***Demander*** – no literature review available at this time

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

***Supplier*** – Wetlands maintain clean air by reducing greenhouse gas concentrations. Greenhouse gases, such as carbon dioxide, methane and nitrous oxide, are air pollutants under the Clean Air Act (Center for Climate and Energy Solutions, n.d.). These gases come from human activity (e.g., fossil fuel fired power plants), animals (e.g., manure), and even wetlands themselves (Olsson, L. et al., 2015). Wetlands produce greenhouse gases because they are important ecosystems that adsorb and store organic materials like carbon, also known as carbon sequestration (Olsson, L. et al., 2015; Nui, X., Wang, B., and Wei, W., 2016; Mikutta, C. and Rothwell, J.J., 2016). Carbon sequestration happens because wetlands are full of plant varieties and autotrophic microorganisms. These plants and autotrophic microorganisms create their own food from using carbon dioxide or light energy (i.e., photosynthesis). This use of carbon dioxide is what fixes the greenhouse gas into the wetland (Olsson, L., 2015). While there are many types of wetlands (e.g., croplands, forested woody), peat bogs are particularly important for carbon sequestration because water saturates them and slows down microbe activity and decomposition rates (Nui, X., Wang, B., and Wei, W., 2016). This means that carbon is stored for a longer period, reducing the presence of this greenhouse gas in the atmosphere.

***Driver*** – no literature review available at this time

***Demander*** – no literature review available at this time

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:**

Center for Climate and Energy Solutions. (n.d.). EPA Greenhouse Gas Regulation FAQ. Retrieved from <https://www.c2es.org/federal/executive/epa/greenhouse-gas-regulation-faq>.

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Olsson, L., Ye, S., Yu, X., Wei, M., Krauss, K.W., Brix, H. (2015). Factors influencing CO2 and CH4 emissions from coastal wetlands in the Liaohe Delta, Northeast China. *Biogeosciences, 12*(16), 4965-4977. <https://doi.org/10.5194/bg-12-4965-2015>.

Shoemaker, W.B., Anderson, F., Barr, J.G., Graham, S.L., Botkin, D.B. (2015). Carbon exchange between the atmosphere and subtropical forested cypress and pine wetlands. *Biogeosciences, 12,* 2285-2300. doi:10.5194/bg-12-2285-2015.