

YETI

Yukon Environment Target of Intent

Group 5

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UAPP411/611: Regional Watershed Management

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April 6th, 2022



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Mission Statement

YETI's goal is to assess the Yukon watershed basin and provide recommendations on how to better the quality of the water.. With these recommendations we hope to improve the health of the water overall so that the water is not negatively impacting the ecological surrounding habitat, as well as bring awareness to mercury pollution. Our goal is to solutions, granted federal funding from both countries is appropriated, to be implemented by 2040.

Background

The Yukon River Basin (YRB) is located in Alaska, US and the territory of Yukon, Canada. It is approximately 330, 000 square miles. YRB is home to thousands of species of plants and animals. Indigenous people and local communities live off the YRB and rely on it for food, drink, and recreation. The YRB flows out to the Pacific Ocean and Bering Sea.

The first to habitat Yukon were the Russiams, however, the population exploded in 1896 due to the Klondike River gold rush in Fairbanks, Alaska and Dawson, Canada. Canada built infrastructure to support the influx of population. Today, YRB also has 5 national parks and preserves along with 9 Nation Wildlife Refuges.

Military Installations and waste facilities have been polluting the Yukon River for many years. As there are studies that prove bioaccumulation of compounds including but not limited to PCBs, pesticides, and organochlorine. However, they are not yet at levels of concern.

Policies and Mandates

The YRB is an international watershed. Both nations have control over their respective territories however, they do collaborate on many strategies to protect and benefit the YRB.

- National Environmental Policy Act: Requires federal agencies to assess the environmental impact of prospective federal projects before implementing them

- Endangered Species Act: A law to protect species and their habitats that are threatened by extinction.
- Clean Water Act: A federal standard that regulates how much pollution can enter waterways. It helps protect the chemical, biological, and physical stability of flowing water.
- National Historic Preservation Act: Protects land with historic, cultural, archaeological value.
- Archaeological Resources Protection Act: Protects archaeological sites on Federal and Tribal lands.
- Wild and Scenic Rivers Act: Preserves free-flowing water bodies that have recreational, geological, agricultural and other likewise significance.
- Federal Land Policy and Management Act: Establishes that the Bureau of Land Management (BLM) to manage federal lands.
- Executive order 13007, "Indian Sacred Sites": Oversees the physical integrity of sacred and cultural sites on Indian land.
- Canadian Constitution Act of 1982: Canada is required to defend the rights of the indigenous Yukon peoples.
- Canadian Fisheries Act: The Department of fisheries and ocean is to protect the Fisher and fish habitats of Canada.
- Devolution Transfer Agreement: The management and control of the Yukon's resources belongs to the territorial government.
- Environmental Canada: This Federal agency conserves the natural environment flora and fauna and resources of Canada.

- Environment Act: Included many regulations to control emissions, waste and contaminated sites.
- Yukon Environmental and Socio-Economic Assessment Act: Assessment of all projects in the Yukon Territory.
- Yukon River Salmon Agreement: Passed in 2001, this policy recognizes the need to maintain viable salmon fisheries in both the US and Canada, and works to rebuild, conserve, manage, and maintain the fisheries more effectively.
- Pacific Salmon Treaty: commitment made by Canada and the US to ensure both countries prevent overfishing, provide optimum production, and ensure both countries receive benefits equal to the production of salmons in their waterways.

Governance Structure

Much of the land in the Yukon River Basin is under tribal and indigenous jurisdiction, which creates challenges when assessing water quality and ensuring that communities in the basin are able to receive the same benefits as others in their efforts to protect and preserve the basin and its resources. Tribes are often required to qualify as states in order to receive benefits from United States federal statutes and regulations such as the Clean Water Act or the Safe Drinking Water Act, but in order to qualify as states, tribes 1) be federally recognized; (2) have a governing body capable of carrying out substantial duties and powers; (3) have jurisdiction over the area or resources proposed for regulation; and (4) be capable of carrying out the regulatory functions consistent with the statute. As a result, due to regulatory jurisdiction challenges and statuses, support from federal programs is difficult to come by. Despite this, it is crucial for tribes and indigenous nations to familiarize themselves with federal policies to assist in watershed conservation, protection, and preservation.

There are a variety of regional and local organizations that oversee the continued preservation, conservation, and general welfare of the basin, its resources, and the communities located within the basin. The Yukon River Inter-Tribal Watershed Council (YRITWC) focuses on sustaining habitats and ecological functions for fish and wildlife in the basin; sustaining the health of all people that come into contact with or drink water from the basin; and sustaining the traditional and subsistence uses of the watershed through a combination of modern science and policy and traditional indigenous knowledge and processes. The Yukon River Drainage Fisheries Association (YRDFA) works towards policy advocacy, cultural preservation, economic opportunity, and information sharing, with a heavy focus on research techniques. This organization ensures that indigenous communities have a role in decision-making processes. The Yukon River Panel is composed of 12 members - 6 from both the United States and Canada - that represent the interests of a variety of stakeholders in the basin. This panel was developed in 2001 to coordinate the implementation of the Yukon River Salmon Agreement. Organizations such as the Association of Village Council Presidents (AVCP), Council of Athabaskan Tribal Governments (CATG), and Tanana Chiefs Conference (TCC) predominantly focus on issues and service provisions pertaining to community and economic development, social services, self-determination and -governance, and regional unity. As cultural and community support is largely connected to the preservation of the basin, it is important for organizations to support these less traditional, social-based aspects of governance.

Problems

Problem	Description:	Causes:
P1: Increase of nutrients like sulfate, magnesium, and phosphorous	The loss of permafrost is releasing very nutrient and mineral rich water. This changes the chemistry of the water that flows out of the basin, flowing into the Arctic Ocean and Bering Sea. Phosphorus increased by 200% in December of 2016.	A warming climate in Alaska Permafrost loss Decreased levels of dissolved Oxygen or Eutrophication
P2: Erosion	As more permafrost is lost, more water is being released. The water weathers down the bedrock and soil. With warmer and warmer weather each year, the permafrost is melted earlier and earlier. This in turn allows for more eroding of the river banks.	Permafrost loss A warming climate in Alaska Increase in Sea Level rise Sediment buildup
P3: Increasing mercury levels	The river basin has unusually high amounts of mercury that is being dumped out to the Arctic Ocean. Permafrost soil stores double the amount of mercury as normal soil. Several fish found had over 0.300 ppm of THg (maximum concentration threshold set by EPA).	Permafrost loss A warming climate in Alaska Emissions from Asia brought in by the wind Impacts on fishing industry-less fish to eat

Problem 1: Nutrient Pollution

Permafrost forms beneath the surface in the Yukon River Basin. Thousands of years worth of nutrients and minerals, as well as contaminants, are stored in the permafrost. When permafrost thaws out, water escapes and flows out, releasing the chemicals that had previously

been trapped. This increases the concentration of nutrients. Studies show that the Yukon and Tanana River have seen major increases in nutrients such as calcium, magnesium, and sulfite have increased by 60% and phosphorus by 100%. All these changes have had significant effects on wildlife and the natural environment. This nutrient pollution is also spreading to the Arctic Ocean and Bering Sea, resulting in an increase in the likelihood of red tides. Globally, melting permafrost releases 300 to 600 metric tons of carbon, resulting in increased air and sea surface temperatures. Nutrient pollution is mainly caused by climate change in Alaska, permafrost loss, decreased levels of dissolved oxygen, eutrophication, and the mining industry.

Goal 1: Stop Rapid Melting of Permafrost

Plants like moss, trees and shrubs help to control the temperature of the soil and help to shade it from the sun. In turn, this keeps the ground cooler protects the permafrost. Climate change is the main contributor to melting permafrost and would need to be addressed in order to slow the melting.

Problem 2: Erosion

The Kaskawulsh Glacier in Yukon has retreated so much that the water from melting glaciers has altered the direction of flow. This concept is known as stream capture, and has led to an imbalance of water levels - one stream is seeing increased flooding, and another is seeing reduced levels of water. Erosion also leads to sediment deposition in streams, and increases in sediment often disrupt the food chain and/or cause habitat loss. A decrease in habitat leads to a decline in fish populations. As permafrost melts, more liquid water is released into surrounding streams, increased flow velocities and increasing the speed of erosion processes. With warmer and warmer weather each year, the permafrost is melted earlier and earlier. This in turn allows for more eroding of the river banks, as the water weathers down the bedrock and soil.

Goal 2: Reduce Erosion

Solutions to reduce erosion include enhancing riparian buffers by planting more native species along the watershed. The roots of plants will help create and hold more compact soils. Check dams are also helpful in slowing surface runoff. This runoff can also be redirected and captured before it reaches areas that have been typically affected by erosional processes. Stricter mandates on mining and fracking industries and surrounding areas may preserve the strength of rock structures.

Problem 3: Increasing Mercury Levels

Alaska is a biological and physical resource that millions of animals like birds, fish and marine mammals migrate to reproduce. These migrating animals also serve as a huge food source for the human population in this area. The Yukon river itself is dumping about five tons of mercury a year. The river itself is distributing 32 times more mercury into the environment than water basins that are of similar size. The mercury is being caused by the melting permafrost and the placement of the Yukon basin being the catchment of pollution from Asia. Mercury comes from varied sources but the most prominent one is by the burning of fossil fuels, mainly coal. Usually mercury is not an issue because permafrost absorbs the naturally occurring mercury, however permafrost is melting 70 years ahead of schedule. Permafrost soil stores double the amount of mercury as normal soil. Several fish found had over 0.300 ppm of THg (maximum concentration threshold set by EPA).

Goal 3: Removing Mercury

Efforts to remove mercury from the waters in the Yukon River Basin include facility solutions. These include processes such as coagulation, which uses aluminum sulfate to combine with the mercury and form a solid, which then precipitates out of the water with the sludge

disposed into a hazardous waste landfill; reverse osmosis technology, which removes all of the volatile compounds in the carbon material and leaving behind the carbon skeleton; lime softening, which removes the hardness in water through the addition of limewater, or calcium hydroxide; and granular activated carbon, which is made from raw organic materials that are high in carbon and removes certain chemicals dissolved in water as they pass through a filter containing granular activated carbon. Regulatory solutions include reducing the use of coal and through a shift to cleaner energy sources, making international treaties to reduce overall emissions to minimize the impact of mercury-containing pollutants, and increased investments in mercury free products.

Summary of Goals

In order to improve the overall quality of the Yukon River Basin, we need to understand all the factors that relate to one another that would lead to progress towards achieving these goals. This includes not only identifying what the problem is but also using data to identify the root of the issues that the goals were created to solve. In order to follow through with actual change or action, one needs to understand the policy side of the issues involving the YRB. Policies make sure that there is collaborative effort working towards the common goal at hand. YETI identifies the three main goals to be to stop rapid melting of permafrost, reduce erosion and remove mercury from the waters. YETI believes these goals are important because they will help the health of surrounding communities and indigneous tribes, as well as improve habitat for endangered animals in the area.

Recommendations

To reduce the melting of permafrost, YETI recommends:

- Focusing on the flora of the area and plant communities such as tree, shrubs and mosses

that would provide shade and lower soil temperatures.

- Studying the composition of soil and find out what areas need greater amounts of soil to protect the permafrost from the infrared heat.
- Providing evidence-based, regional solutions related to the reduction of greenhouse gas emissions that perpetuate the effects of climate change

To help reduce erosion impacts, YETI recommends:

- Enhancing riparian buffers, which would include planting more native species of trees and other plants.
- Building check dams which is a small dam across a drainage ditch.
- Implementing policy mandates on mining and fracking industries.

To remove mercury, YETI recommends:

- The use of coagulation, granular activated carbon, lime softening, and reverse osmosis technologies.
- Regulatory solutions, such as stricter environmental laws that reduce overall pollution levels and limit mercury emissions.

Conclusion

Overall, the Yukon River Basin contains a vast degree of culture, scenery, and social importance to the local region it serves in both the United States and Canada. As the YRB has problems that are manageable on a collaborative level, when their degrading magnitudes work together in the living environment, they threaten the quality of life.

The YETI plan implements several solutions in order to reduce the effects that permafrost, nutrients and mercury are having on the environment. YETI comprehends the dynamics between wildlife, indigenous populations, and the natural environment and

understands the importance of ameliorating present issues. YETI wishes to not only make efforts to solve these problems, but as well make sure that those being most impacted are being protected and advocated for in the best possible way.

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