

**Williston Dust Control Trials and Monitoring**

GMSMON-18 Williston Dust Control Monitoring Study

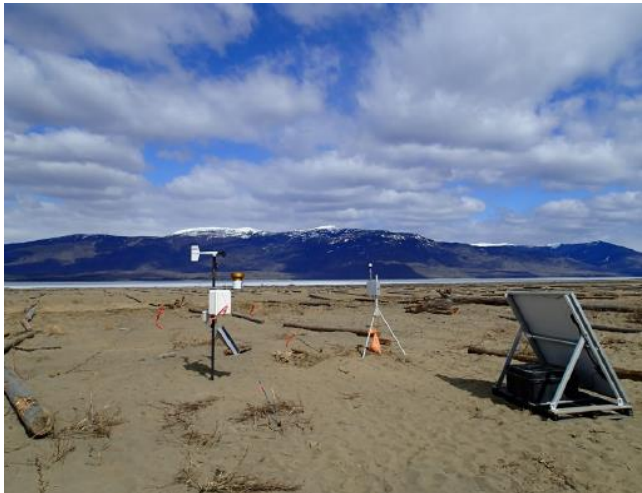
GMSWORKS-20 Williston Dust Mapping Project

GMSWORKS-21 Williston Dust Control Trial Project

## Williston Dust Control Monitoring Study

### Williston Reservoir dust monitoring

The Peace Water Use Plan Committee recommended a study to conduct long-term air quality monitoring in the Finlay Arm of the Williston Reservoir and determine if dust mitigation, including the dust control trials, were effective. This study established a regional network of air quality monitoring stations in the Finlay Arm to provide information on dust levels and meteorological data to help determine the effectiveness of dust mitigation treatments.



#### Questions we wanted to answer

1. What is the impact of dust mitigation treatments, including the dust control trials, on dust emissions from the Finlay Arm of the Williston Reservoir?



#### Study Update

- This ten year study began monitoring dust in 2008.
- Ongoing monitoring in the Finlay Arm is taking place through an established network of air quality monitoring stations.
- This study has undergone several improvements including an increased study period and the use of equipment that provides continuous monitoring.

# Williston Dust Control Monitoring Study



## Lessons Learned

- During years with low water levels and lower than average precipitation, dust emissions are higher because of the larger extent of exposed beaches and lower moisture levels.
- Multiple factors affect dust emissions including weather, humidity, reservoir level, beach exposure area, exposure duration, and beach composition. As a result, it is difficult to evaluate the effectiveness of dust mitigation.



## Key Findings and Next Steps

- Improved monitoring has shown several beaches with regular incidences of dust emissions. These locations are good candidates for erosion control.
- The wind events around Williston Reservoir vary greatly in magnitude and duration. Dust storms may last for a few minutes or hours but the dust levels of some storms can be high.
- Ongoing monitoring will continue until the end of 2017.

## Williston Dust Mapping Project

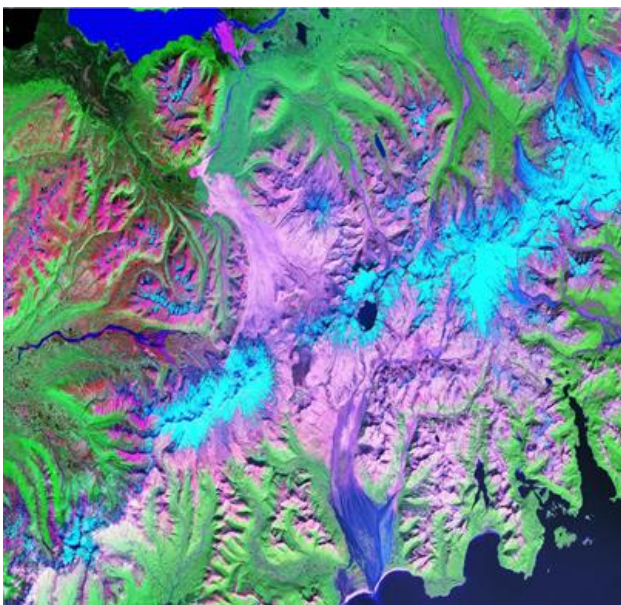
### Dust emission potential and soil characteristics

The Peace Water Use Plan Committee recommended a project to help predict the areas that might be most likely to be the cause of dust storms. The purpose of this project was to determine the soil characteristics of the beaches around the reservoir and develop a model to predict dust erosion potential of specific beaches. The predictive model would then be used to guide dust mitigation efforts.



#### Project Objectives

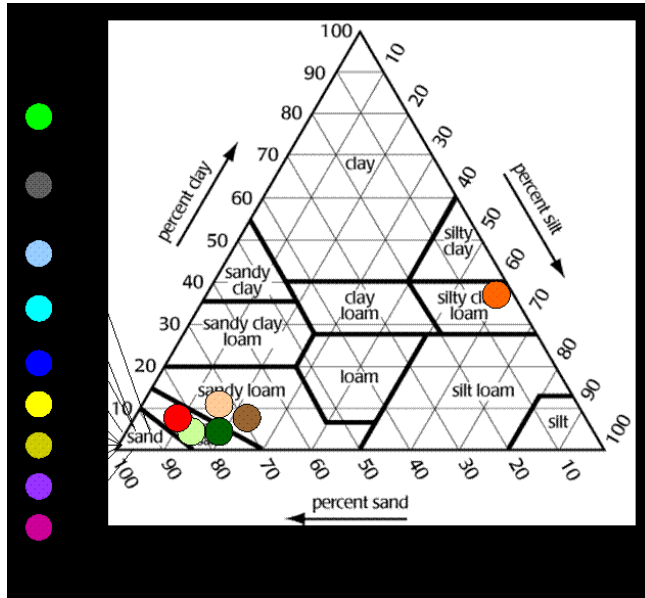
1. Conduct a soil mapping exercise to determine soil characteristics at key dust source beaches.
2. Determine how soil characteristics contribute to dust emission potential.
3. Develop a predictive model to determine potential dust emissions from key dust source beaches.



#### Project Update

- Soil samples were collected and analyzed in 2009.
- It was determined that dust emission potential is related to soil texture and meteorological conditions.
- Two different dust prediction models were developed.

# Williston Dust Mapping Project



## Lessons Learned

- The type of soil on a beach can change from year to year due to various erosion and deposition processes.
- Dust prediction models are inherently complex and require a great level of data inputs. Key forecast information such as wind speed, humidity and precipitation is required to produce forecasts of a reasonable quality.



## Key Findings and Next Steps

- Due to changing characteristics of soil composition, the dust prediction models that were developed cannot predict the key beaches accurately enough to inform the Williston Dust Mitigation Program.
- This project is complete.

## Williston Dust Control Trial Project

### Dust mitigation techniques within the Williston Reservoir

The Peace WUP Committee recommended a project to assess and validate dust mitigation techniques. The purpose of this physical works project was to evaluate a variety of dust mitigation trials.



#### Project Objectives

1. Conduct trials on tillage and engineered roughness methods using various treatments and tools.
2. Evaluate the feasibility of re-establishing vegetation, irrigation and soil binding agents to control wind erosion and dust emissions.



#### Project Update

- Four different dust control techniques have been tested since 2009, specifically;
  - 2009 to 2013: tillage techniques and vegetation trials,
  - 2010 and 2014: irrigation trials, and
  - 2014: engineered roughness trials placed rows of debris to control wind erosion.
- Use of binding agents to control dust was not trialed as no suitable proposals for this mitigation method were received.

# Williston Dust Control Trial Project



## Lessons Learned

- Some tillage techniques when matched with the correct soil characteristics can be effective in preventing wind erosion.
- Barriers to successful vegetation trials include inundation, short growing season, low soil nutrient content and mechanical destruction (i.e., ice, debris, waves).
- Blowing sand covers the rows of debris limiting the success of engineered roughness methods.
- Not every technique works year to year or beach to beach.



## Key Findings and Next Steps

- There was limited effectiveness of the vegetation and engineered roughness trials at controlling dust.
- The 2010 irrigation trials were not successful but the irrigation trial in 2014 using a high power pump and sprinkler was found to be a feasible method to keep dust down by wetting on a small scale.
- The trials are complete and have informed the Williston Dust Mitigation Program.