NOSE CREEK WATERSHED WATER AND SEDIMENT MONITORING SUMMARY, AND WATER MANAGEMENT PLAN UPDATE

Nose Creek Watershed Partnership

INTRODUCTION

The Nose Creek Watershed Partnership completed the Nose Creek Watershed Water Management Plan in 2007 to better protect riparian areas and improve water quality in the Nose Creek watershed. As part of the Plan's implementation strategy, a Long-Term Water Monitoring Program was proposed.

The monitoring program aims to:

- Integrate the monitoring conducted by various agencies, municipalities and organizations and avoid duplication of effort,
- Promote sharing of information,
- Measure ambient water quality and quantity and compare to Bow River Basin Council objectives (2008) and provincial guidelines (AENV 1999 and ESRD 2014), and
- Maintain long-term records to examine trends in relationship to land cover and land use activities within the watershed.

Since 2009, water quality and discharge data has been collected at 7 sites at Nose Creek and 3 sites at West Nose Creek (Figure 1). Samples were collected twice per month from April through June and once per month July through October (10 samples). Four of the sites were monitored monthly by The City of Calgary. Water was analysed for *in situ* water chemistry (temperature, pH, dissolved oxygen, specific conductivity, total dissolved solids), and nutrients (total phosphorus, total dissolved phosphorus), total suspended solids and fecal coliform bacteria (*Escherichia coli* at sites monitored by The City of Calgary).

The results of the water monitoring program were compared to applicable provincial water quality guidelines and to Bow River Basin Council (BRBC) Water Quality Objectives (Table 1). Results were presented as the number of samples exceeding the guidelines. Note there is no guideline for total suspended solids concentration.

In 2013, a project was undertaken to measure phosphorus concentrations in Nose Creek watershed sediments. Sediments were analysed to help interpret water monitoring results. The results of the sediment analysis is also reported in this summary report.

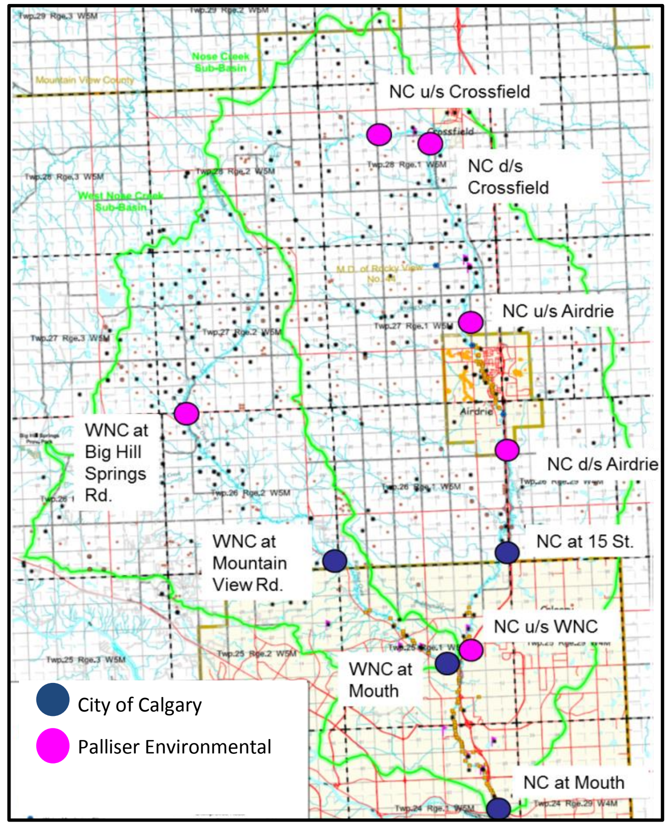

Figure 1. Water monitoring locations in the Nose Creek watershed.

Table 1. Summary of select federal (a), provincial (b) and BRBC (c) water quality objectives.

Parameter	Objective	Relevance
pH (Value)	$\geq$6.5 to $\leq$9.0^{a}	Aquatic Life
Dissolved Oxygen (mg/L)	$\geq$5.0 to 9.5	Aquatic Life
Specific Conductivity (µS/cm)	$\leq$700 or $\leq$1000^{a,b}	Irrigation
Total Phosphorus (mg/L)	$\leq$0.05	Aquatic Life
Fecal Coliform Bacteria (cfu/100 mL)	No single value to exceed 400 cfu/100 mL or $\leq$200 cfu/100 mL (geometric mean of 5 samples/30 d)	Recreation

WATER MONITORING PROGRAM RESULTS

Precipitation

Total precipitation, from April through October, ranged from a low of 234 mm in 2009 to a high of 439 mm in 2011. The years 2010, 2012 and 2013 had similar precipitation but the distribution of precipitation among the months differed (Table 2). In 2010, rainfall was fairly evenly distributed among the months from April through September. In 2011, more rain fell in July, while September and October were quite dry. In 2012, about 36% of the precipitation during the monitoring period came in June, and a similar trend occurred in 2013 when May and June rain resulted in severe flooding in many parts of southern Alberta, including in The City of Calgary.

Table 2. Monthly total precipitation (mm) at the Calgary Airport, Alberta, for the years 2009 to 2013.

Month	Total Precipitation (mm)				
	2009	2010	2011	2012	2013
April	11.4	52	56.4	57	9.0
May	14.2	63.8	87.6	72.2	104.8
June	42.6	63.8	78.6	146.8	146.6
July	70.6	66	108.4	38.6	47.0
August	62.2	86.6	83	28.4	21.0
September	2.2	62.4	10.6	4.4	56.0
October	30.8	11.2	14	54.4	23.3
Total	**234**	**405.8**	**438.6**	**401.8**	**407.7**

Discharge

Discharge is a measure of streamflow and is reported as cubic metres per second. Discharge is influenced by precipitation, topography and land use characteristics. At Nose Creek, discharge increased in the downstream direction (Figure 2) and was greatest in 2011 and lowest in 2009, corresponding to high and low rainfall years, respectively (Figure 3). There was a higher range of flows above the median downstream of Airdrie and in Calgary compared to the upstream reach likely due to increased stormwater volumes. Typically, discharge volume increases below urban areas due to a higher percentage area covered by impermeable surfaces (i.e., pavement) that prevents water from infiltrating into soils.

Collecting streamflow data at Nose Creek.

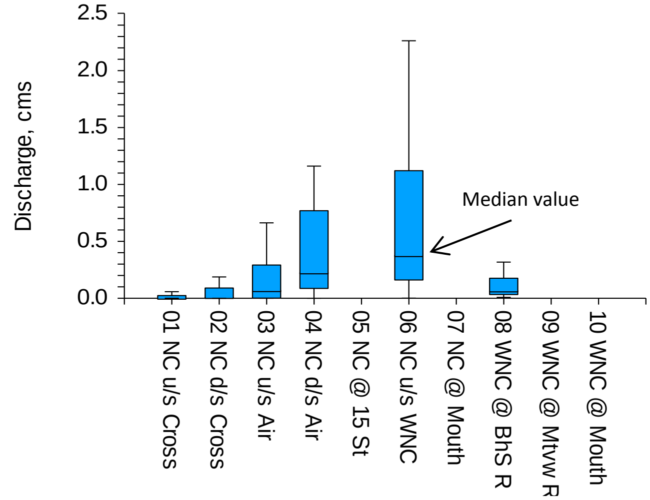

Figure 2. Discharge at Nose and West Nose Creeks, 2009 to 2013 (5 years of individual site data combined).

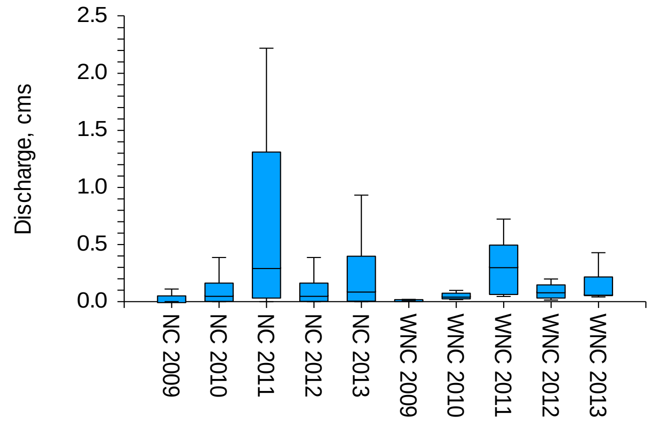

Figure 3. Annual discharge at Nose Creek and West Nose Creek, 2009 to 2013 (all site data combined each year).

Water temperature

Water temperature affects nearly all aspects of aquatic ecology. Water temperature partly governs the amount of oxygen that can be dissolved in water and it influences the rate of photosynthesis by algae and aquatic plants (BRBC 2008). Fish species also have specific water temperature preference and tolerances. Cold water species (e.g., trout) select summer water temperatures from 10 to 18°C whereas cool water species (e.g., pike, fathead minnow, brook stickleback) select summer water temperatures from 18 to 26°C (Nelson and Paetz 1992).

At Nose Creek, median water temperature from April to October was generally highest at NC d/s Airdrie (about 15°C in each study year) (Table 2). Maximum water temperatures recorded during the period 2009 to 2013 were 24.3°C at NC d/s Airdrie and 24.6°C at NC u/s WNC; both were observed in July. No trend in water temperature was observed at West Nose Creek. Generally, the lowest median temperature was recorded at WNC at Mtn View Rd. Temperature results were likely influenced by the time of day the sample was collected. The site NC d/s Airdrie was the last sample collected on each sample day allowing more time for water temperatures to increase during the day.

While trout have been observed in Nose Creek, maximum summer water temperatures may be too warm to maintain these cold water fish. However, trout will selectively choose areas of preferred water temperature to maintain them in the favoured range. Maintaining healthy riparian areas that contain trees and shrubs will help to shade the water resulting in cooler water temperatures and better habitat.

Brown Trout, Laycock Park, Calgary

Dissolved Oxygen

Oxygen is vital to aquatic life. The solubility of oxygen in water increases with decreasing water temperature (i.e., cold water holds more oxygen). Oxygen enters the water mainly by aquatic plant/algae photosynthesis and is removed by the respiration of plants and by organic decomposition. The provincial oxygen guideline for the protection of freshwater aquatic life is 5 mg/L (acute: 1 day minimum) and 6.5 mg/L (chronic: 7 day mean). The federal cold water biota oxygen guideline is 6.5 mg/L (other life stages) to 9.5 mg/L (early life stages) (AENV 1999).

At Nose Creek, median dissolved oxygen concentrations from 2009 to 2013 were generally within applicable guidelines (greater than 6.5 mg/L). The lowest median dissolved oxygen concentrations were observed at the site NC u/s Crossfield in 2012 (5.87 mg/L; just above the acute guideline) and 2013 (6.42 mg/L; just below the chronic guideline. The median dissolved oxygen concentration was also low at the site NC u/s WNC in 2012 (6.55 mg/L; just above the chronic guideline. At West Nose Creek, median dissolved oxygen concentrations were well above the guideline at all sites throughout the 5-year monitoring period with concentrations ranging from 9.3 mg/L to 12.9 mg/L.

pH

pH is a logarithmic scale based on Hydrogen Ion concentration. The midpoint of the scale is pH 7.0 and is neutral. Readings from 0 to <7.0 are acidic with lower numbers indicating a more acid solution. Readings from >7.0 to 14 are alkaline with higher numbers indicating a strongly basic/alkaline solution.

The pH at Nose and West Nose creeks tends to be alkaline, but generally within the applicable guideline for the protection of freshwater aquatic life. Median pH values ranged from 7.64 to 9.01 from 2009 to 2013 and were similar among the years at each site with minor fluctuations.

Specific Conductivity

Specific conductivity is the measure of minerals (e.g., sodium, potassium) dissolved in water or the salinity. Sources include soil and mineral weathering, surface runoff from saline soils, groundwater discharge, municipal and industrial effluents, agricultural runoff and aerosol fallout. Excessive salts applied to soils may interfere with extraction of water by plants and affect taste and palatability of drinking water. High conductivity water is also undesirable in most industrial process waters.

At Nose Creek, median specific conductivity was above the irrigation guideline of 1000 µS /cm at most sites with the exception of some of the sites in the upper watershed, particularly in 2011. At West Nose Creek, median specific conductivity values are lower than those observed at Nose Creek. Generally, values are below the irrigation guideline, except at the WNC at Mouth site in 2012 when the median value was 1025 µS/cm.

Phosphorus

Total phosphorus enriches freshwater (known as eutrophication), and contributes to the growth of aquatic plants. Although aquatic plants produce oxygen through photosynthesis during the day, on cloudy days or at night, the plants use up oxygen for respiration. Oxygen is also consumed when plant material decomposes.

At Nose Creek, median total phosphorus concentrations generally exceed the provisional water quality objective of 0.05 mg/L established by the BRBC (2012) at all sites. A comparison of the past 5 years of monitoring shows an increasing trend in total phosphorus concentrations likely in response to the higher precipitation received in 2011 and high June rainfall in 2012 and 2013 (Figure 4).

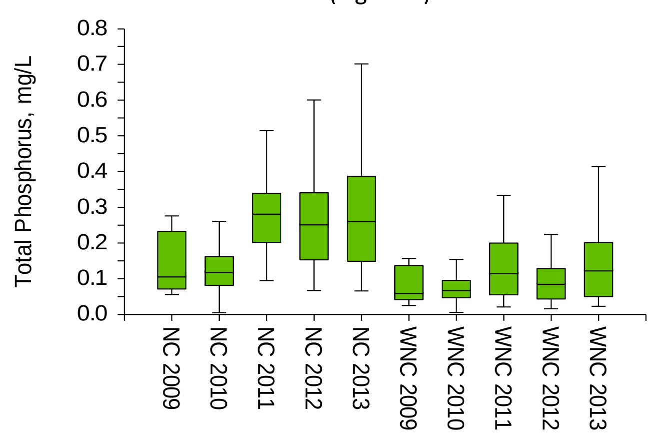

Figure 4. Summary of total phosphorus at Nose Creek and West Nose Creek by year (all sites combined each year).

Long-term water monitoring data at the Nose Creek sites NC d/s Airdrie (Figure 5) and NC u/s WNC (Figure 6) shows that total phosphorus concentrations have remained high.

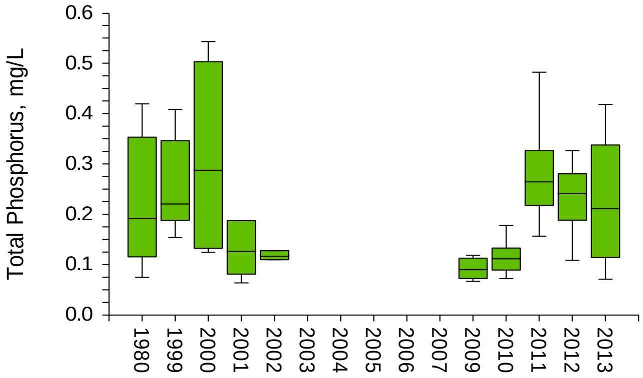

Figure 5. Summary of total phosphorus data at Nose Creek site NC d/s Airdrie, 1980 to 2013. Note that 2009 data only represents data collected from July through October.

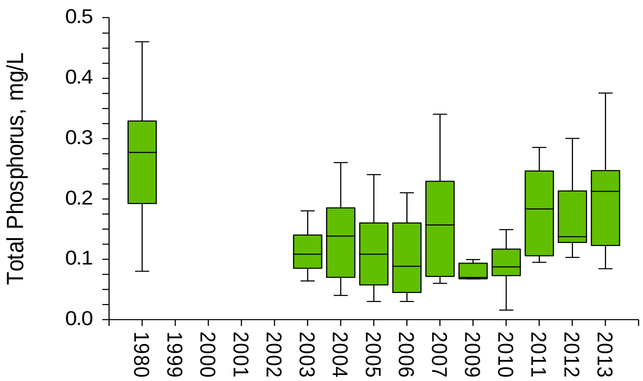

Figure 6. Summary of total phosphorus data at Nose Creek, site NC u/s WNC, 1980 to 2013. Note that 2009 data only represents data collected from July through October.

Data from 2009 to 2013 shows that total phosphorus concentrations generally decrease in a downstream direction; concentrations are generally highest at the sites NC U/S Crossfield and NC U/S Airdrie, and lowest at NC at Mouth (Figure 7). At West Nose Creek, no strong trends were observed, although total phosphorus concentrations were highest at the upstream site WNC at Bighill Springs Rd. (Figure 7).

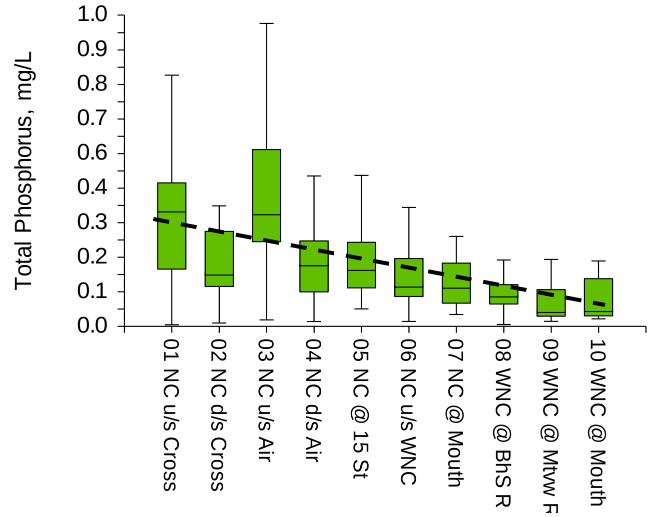

Figure 7. Summary of total phosphorus data by site at Nose and West Nose Creeks, 2009 to 2013.

Dissolved phosphorus comprised an average of 35 to 80% of the total phosphorus in Nose Creek. Generally, a higher percentage of phosphorus was in the dissolved form at sites upstream of Airdrie compared to sites downstream of Airdrie. At the site NC u/s WNC, 65% of the total phosphorus was in the particulate form. Urban areas tend to have a higher percentage of particulate phosphorus likely due to increased streambank erosion and stormwater runoff.

Total Suspended solids

Total suspended solids (TSS) are a measure of suspended particles (e.g., silt, clay, organic matter) in water. Suspended solids can transport nutrients and contaminants downstream and may be aesthetically undesirable. High TSS can interfere with the treatment of drinking and industrial process water, as well as reduce benthic invertebrate abundance and species richness when deposited in streams. Deposited sediment can fill in deep pools and bury spawning gravels leading to reduced survival of fry fish and have other sub-lethal effects (e.g., reduced feeding/growth). In very high concentrations, suspended sediment can result in direct mortality of fish (Waters 1995). For the protection of aquatic life, the provincial chronic guideline indicates TSS should not be increased by more than 25 mg/L above background for short-term exposure (ESRD 2014).

At Nose Creek, TSS concentrations tend to increase in the downstream direction, with lower concentrations observed upstream of Airdrie and higher concentrations downstream of Airdrie. TSS concentrations at NC D/S Crossfield have remained similar during the monitoring period. No other trends emerge at the other Nose Creek sites, where TSS concentrations fluctuate annually. At West Nose Creek, median TSS concentration tended to decrease at the site WNC at Mouth from 2009 to 2012. No TSS trends were observed at the other two sites.

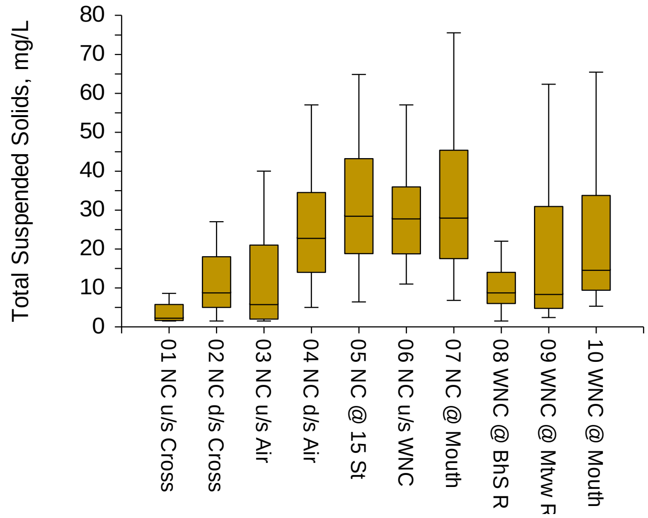

Figure 6. Summary of total suspended solids data by site at Nose and West Nose Creeks, 2009 to 2013.

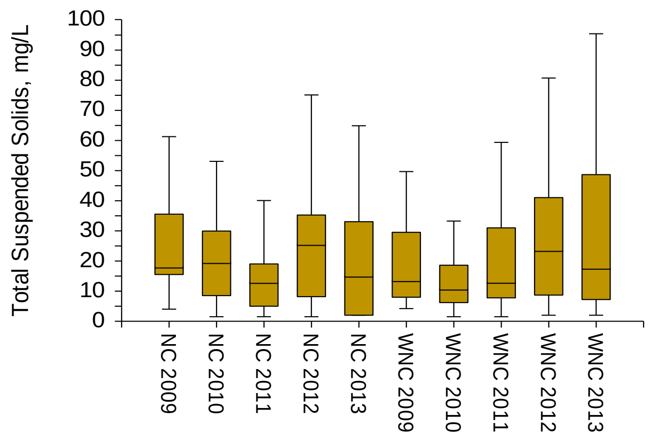

Figure 7. Summary of total suspended solids data by year, 2009 to 2013 at Nose Creek (NC) and West Nose Creek (WNC).

Fecal Coliform Bacteria

Fecal coliform bacteria (FCB) are specific to the intestinal tracts of warm-blooded animals (cattle, birds, pets) and humans and are a specific test for animal waste or sewage contamination. *Escherichia coli* (*E. coli*) is one species of FCB. Bacteria also indicate the potential presence of viral and parasitic contamination which can affect drinking water, irrigation, livestock watering and recreation. FCB can be a concern for fresh garden produce. Fecal coliform bacteria levels are expressed as the number of bacteria colonies (cfu) per 100 mL of water. The FCB (or *E.coli*) recreation guideline is no single value to exceed 400 cfu/100 mL or <200 cfu/100 mL (geometric mean of 5 samples/30 d) (BRBC 2012).

At Nose Creek, median fecal coliform bacteria counts have decreased from 2009 to 2013 at the site NC at Mouth. No other fecal coliform bacteria trends have developed at the other Nose Creek sites. At West Nose Creek, fecal coliform bacteria counts were substantially higher at the site WNC at Mountain View Rd. compared to the other two WNC sites. Observations from 2009 to 2013 show a decreasing trend in fecal coliform bacteria counts at each of the three sites.

SUMMARY

Median total phosphorus concentrations remain above the provisional water quality objectives at Nose Creek, and to a lesser extent at West Nose Creek. In wet years, poorer water quality is expected compared to dry years as nutrients, sediments and other contaminants are transported to the creek with overland runoff water. Even though 2011, 2012 and 2013 were wetter years, a decrease in median fecal coliform bacteria counts at NC at Mouth and WNC sites was observed during the monitoring period suggesting some water quality improvements within the watershed. Continued efforts should be made to reduce phosphorus inputs to Nose Creek and West Nose Creek. All jurisdictions in the Nose Creek watershed are actively working to protect riparian areas and improve water quality at Nose and West Nose creeks.

EXAMINATION OF PHOSPHORUS IN NOSE CREEK SEDIMENTS

Objective

To determine the phosphorus concentration within Nose and West Nose creek sediments at surface water quality monitoring sites to better understand phosphorus dynamics in the watershed.

Methods

On September 24th and 27th 2013, sediment in the top 0-15 cm layer was collected from Nose Creek and West Nose Creek stream beds. Three sediment replicates were collected at each site, representing the left side, middle and right side of the stream channel. The samples were combined, stored on ice and brought to an accredited laboratory for total phosphorus analysis.

Results

Phosphorus concentrations in the sediments at Nose Creek ranged from 675 to 914 mg/kg (Figure 8). The highest concentrations were measured at the sites NC d/s Crossfield and NC u/s Airdrie. The lowest sediment phosphorus concentration was measured at the site NC at Mouth (Figure 8). Sediment phosphorus concentrations generally decreased downstream of the site NC u/s Airdrie.

At West Nose Creek, phosphorus concentrations in sediments ranged from 588 to 909 mg/kg (Figure 8). Similar to Nose Creek, the sediment phosphorus concentration was highest at the upstream site WNC at Bighill Springs Rd., and lowest at the WNC at Mouth site. The higher phosphorus concentration at WNC at Bighill Springs Rd. was similar to the site NC U/S Airdrie (Figure 8).

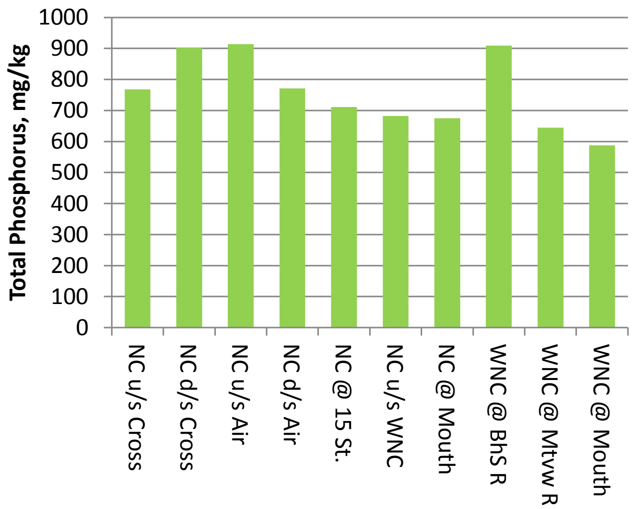

Figure 8. Total phosphorus concentrations in Nose Creek (NC) and West Nose Creek (WNC) sediments, 2013.

Discussion

At Nose Creek, sources of phosphorus in sediments include agricultural and urban runoff, and an annual release of treated municipal effluent by the Town of Crossfield. Sediment phosphorus concentrations were highest at the site NC u/s Airdrie which is the first site located downstream of the Town of Crossfield's treated effluent outfall and at the site NC d/s Crossfield that is located downstream of the Town of Crossfield and a golf course where inorganic fertilizers are applied. At West Nose Creek, the highest sediment phosphorus concentrations were observed at the most upstream site WNC @ Bighill Springs Rd. Unlike the site Nose Creek u/s Airdrie, West Nose Creek does not receive treated effluents. Agricultural activity, combined with deep deposits of organic sediment is likely the major contributing factor.

Nose Creek watershed sediment phosphorus concentrations (median: 740 mg/kg; range: 588 to 914 mg/kg) are within the range reported for rivers and creeks in Alberta. Sediment phosphorus at 13 sites (median: 405 mg/kg; range: 104 to 897 mg/kg) from a northern Alberta oilsands site were lower compared to the Nose Creek watershed. Lower phosphorus export from the northern Alberta watershed likely results in lower sediment phosphorus. Phosphorus concentrations in Bow River sediment (N=5) were slightly higher than the Nose Creek watershed (median: 866 mg/kg; range: 615 to 1735 mg/kg) (Cross et al. 1986). A larger watershed influenced by large urban centres and agricultural runoff probably results in higher phosphorus sediment in the Bow River. ESRD (Unpublished) collected sediments (N=9) from East Lake (Airdrie) in 1992 and found phosphorus concentrations similar to this study (median: 875 mg/kg; range 680 to 1050 mg/kg). Concentrations tended to be highest where sediments contained a higher percentage of total organic carbon.

Phosphorus cycling in surface water involves the uptake and release of phosphorus by sediments and the conversion of phosphorus between organic, inorganic, particulate and dissolved forms. The majority of particulate phosphorus that enters a creek is deposited and stored as bed sediment whereas soluble phosphorus can be transferred by direct adsorption and desorption (Howell 2010).

A study in the Lake Okeechobee basin showed that phosphorus assimilation by sediments was independent of sediment/soil type in the short-term, but was dependent on phosphorus concentration in the overlying water. Inorganic phosphorus added to surface water in concentrations that are greater than sediment porewater concentrations is retained by oxides and hydroxides of iron and aluminum, and calcium carbonate. However, when phosphorus loadings are low, stream sediments release phosphorus back to the water column (Reddy et al. 1995). For most of the sediments studied, 2 to 28% of the retained phosphorus was released back to the water column. Klotz (1988) reported that while sediments were able to remove excess P from solution, fine-grained sediments had the greatest capacitv for removing excess P from the water, despite their already high P content. At an oilsands site in northern Alberta, the highest sediment phosphorus concentrations were associated with fine-textured sediments, and the lowest with coarse textured sediments (Athabasca Oil Corporation 2013).

Summary

Although not measured, the sediment in the upper sites of the Nose Creek watershed is likely formed of finer material that has the greatest capacity to retain phosphorus. It can be expected that Nose and West Nose creek sediments will retain a high percentage of phosphorus while overlying phosphorus concentrations are high. Should the phosphorus concentrations decrease in the overlying water, the sediment will likely release phosphorus back to the water column; therefore, no improvement to surface water concentration may be observed while sediment phosphorus concentrations remain high. Nose Creek sediments likely become a source of phosphorus to surface water when:

- Overlying water column P concentrations are low
- Sediments are exposed and wetting/drying cycles occur

Continued effort should be made to reduce nutrient loading to Nose Creek and West Nose Creek in the long-term.

NOSE CREEK WATERSHED WATER MANAGEMENT PLAN – IMPLEMENTATION UPDATE

Significant progress has been made by municipalities to implement recommendations within the Nose Creek Watershed Water Management Plan (NCWWMP). In addition to the water monitoring program reported in this report, the following summarizes other activities and initiatives undertaken in each of the Partnership's jurisdictions.

City of Airdrie

The City of Airdrie is integrating NCWWMP recommendations and stewardship strategies into strategic guidance and statutory plans that include: AirdrieOne Sustainability Plan, Municipal Development Plan (MDP) and Master Stormwater Drainage Plan. In addition, the Planning and Development Department is aligning policies with the NCWWMP, particularly the City Plan, Community Structure Plans and Neighborhood Structure Plans.

An Ecological Inventory was completed in 2013 to identify environmentally significant areas, including wetlands, riparian areas and tributaries of Nose Creek, which will be considered in any future land use planning within Airdrie.

Airdrie has implemented a Salt Management Plan to reduce the environmental effects of snow and ice management through implementation of beneficial management practices (BMPs) for salt storage and application and snow disposal in vulnerable areas. Operational training is also provided to improve understanding of the impacts of salt. In addition, a new salt/sand storage facility is proposed for construction in 2014.

Airdrie also strives to improve stormwater quantity and quality and has implemented a street sweeping program that removes 600 to 700 tonnes of winter road sediments and other debris from city streets, annually. The sweeping program includes a residential Tag and Tow component to ensure that the sweep is thorough. A minimum of 300 mm top soil depth is also required in the Standard Landscape Guidelines and Specifications to encourage absorbent landscaping. Stormwater is also reused for irrigation of parks and green spaces.

Community programs have been implemented in Airdrie to manage stormwater quantity and quality. An Annual Stamp out Poo Shoe! event is held in off-leash areas to clean up dog waste leftover from the winter season and raise awareness of the importance of cleaning up after pets. Airdrie also sells rain barrels to help residents reduce the amount of runoff coming from their yards. An annual toxic roundup and paint exchange program also provides residents a way to safely dispose of harmful household chemicals.

A Stormwater Infrastructure Maintenance Program was implemented to ensure the cleaning of piping and ponds and the inspection and repair of outfall structures. In addition, a natural biological process is being used to reduce the occurrence of algae-causing nutrients in stormwater.

Commercial and residential developments such as Creekside Crossing and Williamstown in Airdrie have taken steps to protect Nose Creek by establishing riparian setbacks and/or using Low Impact Development techniques for managing stormwater runoff. Various local businesses and community groups host Nose Creek cleanup events to engage citizens and their own staff in environmental stewardship.

The City of Calgary

The City of Calgary is also incorporating, recommendations from the NCWWMP into planning documents. In the Keystone and Westview Municipal MDPs, natural wetlands and drainage courses are protected by delivering treated, pre-development flows to these natural features. Development setbacks are also applied and water re-use (for irrigation) will be implemented to conserve potable water. In 2007, the City created the Environmental Reserve Setback Policy and the Parks Department developed the Wetland Conservation Policy.

As per the NCWWMP, the runoff volume and peak runoff controls are requested through policies in several community plans (South Shaganappi Community Area Plan and Keystone Area Structure Plan). In addition, Transit Functional Planning Studies have incorporated runoff volume and release rate targets to guide development.

The City of Calgary also strives to improve stormwater quality and volume. Two stormwater quality retrofit projects have been constructed in the Nose Creek watershed: the Coventry Hills Stormwater Wetland and the McCall/Greenview Storm Pond. These projects reduce peak flows and improve water quality entering Nose Creek.

Rain gardens (biofiltration) were constructed in the communities of Mountainview and Winston Heights (both drain to Nose Creek). These rain gardens capture stormwater runoff, improve water quality, and reduce stormwater runoff volume to the creek.

Mountainview rain garden.

A Community Outreach and Education Program was also incorporated into the rain garden projects. Citizens helped to develop the rain gardens while learning about their connection to Nose Creek and actions that can be taken to protect the creek. Information postcards, booklets and door-to-door visits by Water Educators were part of the program. The Mountainview and Winston Heights rain gardens are frequently featured in newsletters, promoted through various media sources and featured at local and regional conferences.

The City of Calgary continues to undertake research to improve management of waterways and riparian areas. In 2012, a Streambank Slope Stability and Riparian Assessment Study was completed. Baseline information on riparian health and streambank condition at West Nose and Nose creeks within Calgary was compiled. About 230 km of streambank and selected riparian areas were assessed and priority sites for restoration and restoration techniques were identified. In addition, a comprehensive GIS database and design guidelines for erosion control and riparian restoration were developed. The study synthesized the results of riparian health inventory data from 2007 and 2010 and will be used to inform the "Integrated Bank Stability and Flood Control Structure Development and Maintenance Program". In 2012, the City also initiated a riparian mapping project in the watershed to create digital riparian maps that will be used for planning and communication.

Rocky View County

In October 2008, the NCWWMP was approved by Rocky View County (RVC) as a guidance document and planning tool. The County has taken numerous steps to implement actions that support the Plan recommendations.

The interim Runoff Volume Control Targets of 90 mm for typical residential and industrial areas, and 50 mm for country residential and low density commercial developments, are now required in Stormwater Management Plans that accompany development proposals and applications submitted to RVC.

Policies, guidelines and procedures were also amended to include integrated stormwater management recommendations as minimum standards. Amendments took effect for all new developments, with existing approvals grandfathered. RVC now requires a Stormwater Management Plan for all new developments at the early Concept or Outline Plan stage of development approval. Sediment and erosion control measures for construction sites are also required within all development plans submitted to the County. Some staff from RVC attend the City of Calgary's Sediment and Erosion Control course to provide better review of plans. Parks and open space classifications and maintenance service levels and schedules have been revised to reflect the goals of the NCWWMP.

Riparian setback widths, as defined in the NCWWMP, are required as part of new developments adjacent to Nose and West Nose creeks. A county-wide Riparian Conservation and Management Policy was approved in 2010. All large-scale development approvals adhere to this policy. In spring 2014, bylaw changes are proposed to implement this riparian policy on all new developments for houses, garages, barns and septic systems near all flowing water in RVC.

Furthermore, RVC has adopted the "No net loss" of channel length to limit channelization of Nose and West Nose creeks. A county-wide Wetland Conservation and Management Policy was approved in 2010, and has since been implemented on all large-scale development approvals. This policy requires mitigation, compensation and restoration as per the provincial Wetland Policy.

Agricultural exemptions for building permits were reviewed and now all buildings will be subject to bylaw changes being proposed. Floodplain mapping and riparian setback distances will be made available to the public upon approval of the bylaw changes being approved. Additional recycling streams for agricultural waste are now available to enhance proper disposal of pesticides, empty pesticide containers, used oil, plastics (twine, bale wrap, grain bags), wire, tires and tarps.

Field days for watershed residents are held annually. Awareness and stewardship programs, including incentives, are available to residents in the watershed, with support from the provincial Growing Forward program and RVC funding.

For more information about the Nose Creek Watershed Partnership and its initiatives please visit www.nosecreekwatershedpartnership.com