

Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, Alaska 99709

**Total Maximum Daily Load (TMDL)
for Residue in the Waters of
Noyes Slough in Fairbanks, Alaska**

March 2008

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Total Maximum Daily Load for Residue in the Waters of Noyes Slough in Fairbanks, Alaska

TMDL AT A GLANCE:

<i>Water Quality-limited?</i>	Yes
<i>Hydrologic Unit Code:</i>	19040506
<i>Criteria of Concern:</i>	Residues (debris)
<i>Designated Uses Affected:</i>	Water supply; water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife
<i>Major Source(s):</i>	Littering and urban runoff from residential and commercial development
<i>Loading Capacity:</i>	Zero (0); the standard for residues prohibits deposits on or in the streambeds and streambanks
<i>Wasteload Allocation:</i>	Zero (0)
<i>Load Allocation:</i>	Zero (0) residues above natural condition
<i>Margin of Safety:</i>	Zero (0)

Executive Summary

Noyes Slough is located in the City of Fairbanks and is a tributary to the Chena River. The state of Alaska has included Noyes Slough on its section 303(d) list since 1994 as water quality-limited due to sediment, petroleum hydrocarbons, oil and grease, and residues (in the form of debris). The slough (Alaska ID Number 40506-003) is currently classified as a Category 5 waterbody (i.e., TMDL is needed). A Total Maximum Daily Load (TMDL) is established in this document to meet the requirements of section 303(d) of the Clean Water Act (CWA) and the U.S. Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (at Title 40 of the *Code of Federal Regulations* [CFR] Part 130), which require the establishment of a TMDL for the achievement of water quality standards when a waterbody is water quality-limited. A TMDL is composed of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background loads. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. A TMDL represents the amount of a pollutant the waterbody can assimilate while maintaining compliance with applicable water quality standards (USEPA 1991).

This document addresses only the debris impairment to Noyes Slough. The sediment, petroleum hydrocarbons, and oil and grease impairments will either be established in a separate TMDL document or will be delisted in the future based on data sources available. It is important to note that the term *debris* used in this document refers only to human-caused residues, and should not be confused with naturally occurring woody debris. The major source of debris in the watershed is urban runoff. The debris typically consists of appliances, scrap building materials, concrete, and asphalt (Burrows et al. 2000) as well as

shopping carts, tires, litter, paper products, cans and empty barrels. The debris enters Noyes Slough directly from littering or indirectly from stormwater runoff and snowmelt.

Noyes Slough does not fully support its designated uses of water supply, water recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife due to elevated in-stream debris levels. The presence of debris detracts from recreation and can introduce contaminants to the water column. Debris deposited in the stream can also block culverts and fish passage, which inhibits the designated use of growth and propagation of fish.

Since the water quality standard for debris does not allow for any unpermitted, human-caused inputs to the system, the TMDL for debris in Noyes Slough is set to zero. Similarly, the loading capacity and waste load allocation are also set to zero, and the margin of safety is implicit in the TMDL. Due to the nature of debris impairment, the main focus of this TMDL is to develop strategies for reducing the presence of debris in Noyes Slough. Solving the debris problem in Noyes Slough includes clean-up activities and the prevention of debris entering the waterbody. A number of actions, including increased public awareness of the importance of Noyes Slough as a resource, increased use of appropriate garbage receptacles by private land owners, and increased enforcement of local ordinances, can significantly reduce the amount of debris input into the stream. However, as it is not practical to expect that all debris will be controlled even with the best preventative measures, cleanup activities will likely be an integral, ongoing part of the solution to the debris problem in Noyes Slough. Many of these activities are already ongoing through the work of the Tanana Valley Watershed Association (TVWA) and the municipal separate storm sewer system (MS4) permits for the co-permittees of the City of Fairbanks, the City of North Pole, the University of Alaska - Fairbanks, and the Alaska Department of Transportation and Public Facilities - Northern Regional Office (AKS-053406) and for the Fairbanks North Star Borough (FNSB) (AKS-053414).

1. Overview

Section 303(d)(1)(C) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130) require the establishment of a Total Maximum Daily Load (TMDL) for the achievement of state water quality standards when a waterbody is water quality-limited. A TMDL identifies the amount of pollution control needed to maintain compliance with standards and includes an appropriate margin of safety. The focus of the TMDL is reduction of pollutant inputs to a level (or "load") that fully supports the designated uses of a given waterbody. The mechanisms used to address water quality problems after the TMDL is developed can include a combination of best management practices (BMPs) and/or effluent limits and monitoring required through National Pollutant Discharge Elimination System permits. This report presents TMDL for residue (debris) in Noyes Slough, Alaska.

1.1. Scope of the TMDLs

The state of Alaska has included Noyes Slough on its section 303(d) list since 1994 as water quality-limited due to sediment, petroleum hydrocarbons, oil and grease, and residues (in the form of debris). The slough (Alaska ID Number 40506-003) is currently classified as a Category 5 waterbody. A Category 5 waterbody constitutes the Clean Water Act section 303(d) list of waters impaired by a pollutant(s) for which one or more TMDLs are needed. Alaska's Final 2006 Integrated Water Quality Monitoring and Assessment Report states:

"This waterbody has been on the Section 303(d) list for non-attainment of the Sediment, Petroleum Hydrocarbons, Oil & Grease, and Residues standards for sediment, petroleum products and debris since 1994. Numerous water quality violations have been reported. These violations are a result of debris dumped into the slough. Urban run-off is also a problem. Snow dumps from the removal of snow from city streets and parking lots located adjacent to the slough contain oil, grease, litter, anti-freeze, and salts. Melting snow carries these pollutants into the waterbody."

The pollutant source identified on the section 303(d) list is urban runoff. This document presents the TMDL to address the debris impairment in Noyes Slough. The sediment, petroleum hydrocarbons, and oil and grease impairments will either be established in a separate TMDL document or will be delisted in the future based on data available.

The following sections provide general background information on the Noyes Slough watershed.

1.2. Location

Noyes Slough is a 5.5 mile long slough located in the City of Fairbanks and is a tributary to the Chena River (Figure 1-1). Noyes Slough branches off to the north from the Chena River and returns to the north bank of the Chena River upstream of the confluence of the Chena River with the larger Tanana River. The slough is stagnant and is used mostly during the winter months for dog mushing, skiing, and dog walking. Noyes Slough and its adjacent wetlands provide habitat for beavers, muskrat, and waterfowl and spawning grounds for grayling and other fish (Kennedy et al. 2004). Noyes Slough is also a popular canoeing area and serves as a "living laboratory" where local elementary students observe local wildlife and learn about the value of clean waterways and the effects of urban pollution (Kennedy et al. 2004).

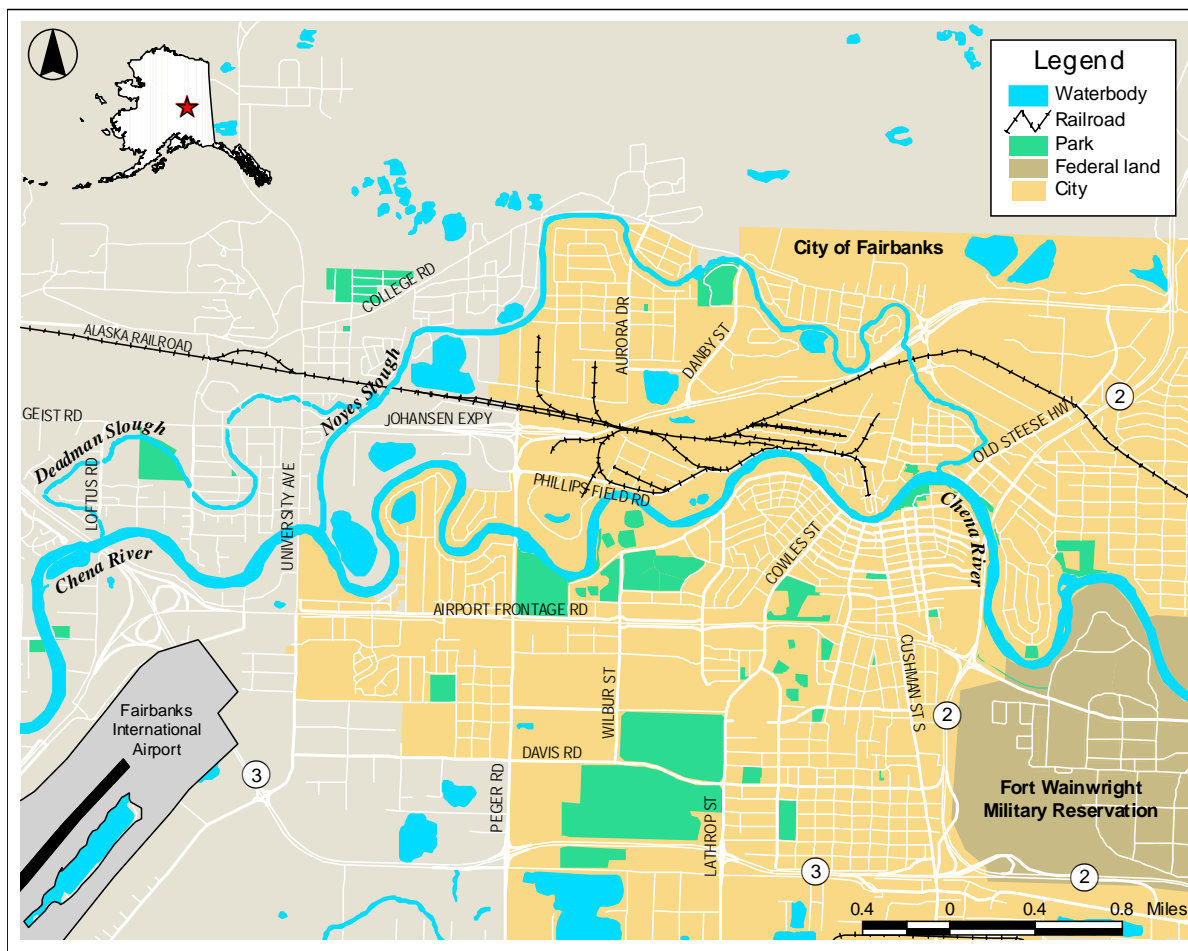


Figure 1-1. Noyes Slough and surrounding areas.

1.3. Population

The population for Fairbanks North Star Borough recorded in the 2000 Census is 82,840, with more than 30,000 people in the city of Fairbanks and approximately 6,500 people residing in the area immediately surrounding Noyes Slough.

1.4. Topography

The topography of the Noyes Slough immediate drainage area has very little variation. The area of the slough is located at 430 feet above sea level while Chena River at the inlet and outlet of the slough is located at 420 feet.

1.5. Land Use

Land between Noyes Slough and the Chena River is a mix of residential, commercial and industrial uses (Figure 1-2). The upper reaches pass through industrial and commercial areas, and lower reaches pass through residential and recreational areas. Land north of the slough is dominated by rural and agricultural uses.

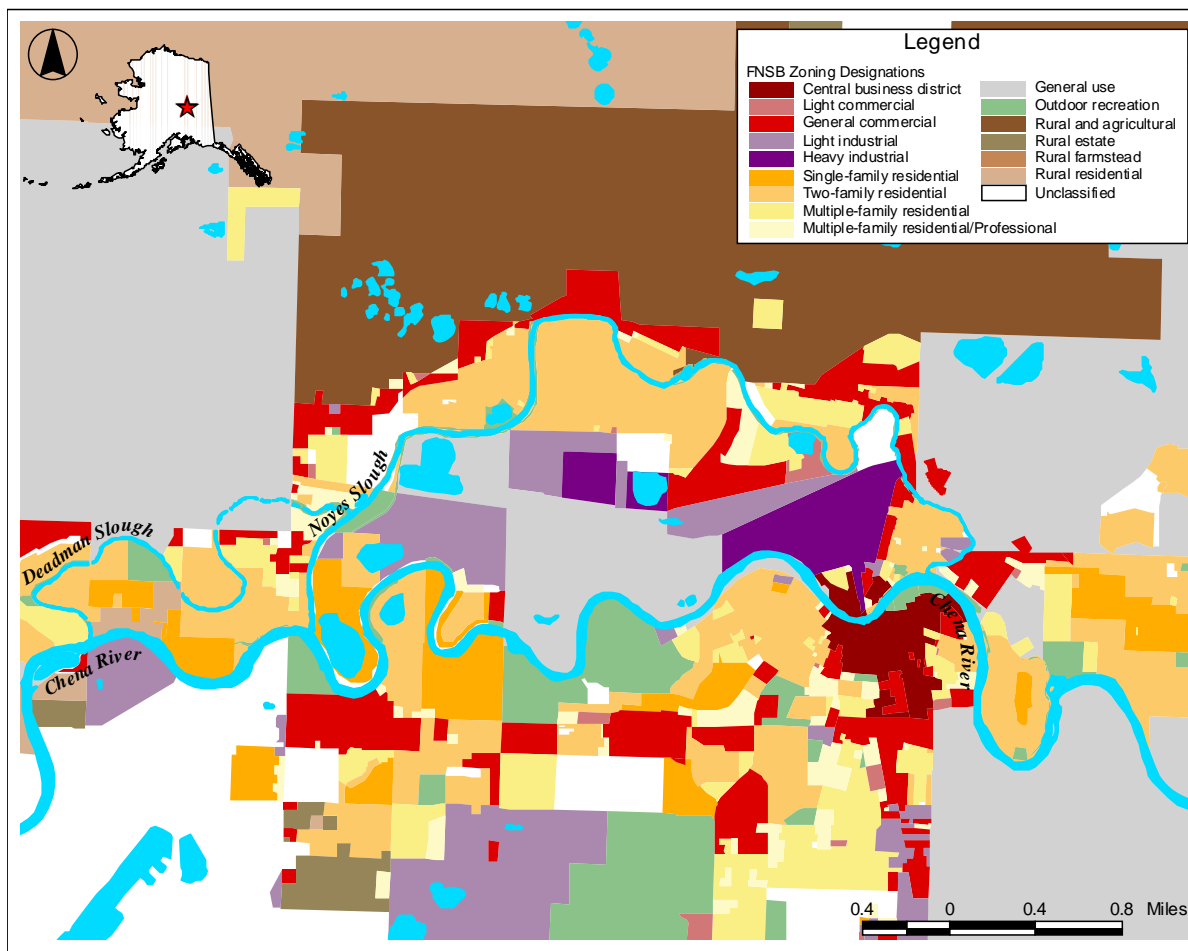


Figure 1-2. Land use surrounding Noyes Slough.

1.6. Climate

Fairbanks has a continental climate typified by warm, moist summers and cold, dry winters. Mean minimum January temperature is -19°F, and mean maximum July temperature is 72°F (Burrows et al. 2000). On average, Fairbanks receives about 70 inches of snowfall annually. Mean annual precipitation at Fairbanks International Airport is 11 inches (Burrows et al. 2000).

1.7. Hydrology¹

Prior to 1945, both the Chena River and the Tanana River contributed water to Chena Slough, which is now the lower Chena River through Fairbanks. Noyes Slough acts as an overflow channel during high flows on the lower Chena River. Flow in Noyes Slough has declined over the past 50 years because of flood-control structures on the Chena and Tanana Rivers. Moose Creek Dike was built across Chena Slough in 1945, blocking flow from the Tanana River. The 1967 flood on the Chena River resulted in the construction of a diversion dam (Moose Creek Dam), a floodway leading to the Tanana River, and a levee along the north bank of the Tanana River to avoid potentially severe flooding in Fairbanks. Peak flows in the Chena River were reduced further in 1980 after the completion of the Chena River Lakes Flood Control Project, which was designed to limit Chena River flow through Fairbanks to 12,000 cubic feet per

¹ Information in this section is taken from Burrows et al. (2000) and Kennedy et al. (2004).

second (cfs). The reduction in peak flows in the Chena River likely resulted in reduced flows in Noyes Slough. These flow-reduction measures have also caused down-cutting (lowering) of the Chena River channel bed at the entrance to Noyes Slough, reducing the magnitude and duration of surface water flow from Chena River to the slough. Consequently, Noyes Slough is slowly drying up and flows will likely continue to decline without intervention to reverse the process.

Typically, Noyes Slough is navigable except during low flows. During very dry periods there is still standing water in the slough, but there is little to no flow. Many reaches of the slough are stagnant and unsightly due to the debris. At times of no surface water flow from the Chena River into Noyes Slough, pools of water in the deeper parts of the slough correspond to local groundwater levels, indicating input from groundwater. In winter, no water flows in the slough, and the channel is filled with ice and snow.

When Noyes Slough does not receive much flow, debris (trash and brush) may accumulate, changing the entrance conditions to the slough. When the slough receives significant flow, the debris is washed out and flow conditions improve. This alternating debris pattern at the slough entrance and the groundwater inflow and outflow likely account for the variation in discharge measurements at lower flows.

1.8. Fish Populations

Kennedy et al. (2004) documents data collected by the U.S. Geological Survey (USGS) in 2001 to assess fish habitat in Noyes Slough. The data collection included the number and type of fish found in the slough. Alaska blackfish (*Dallia pectoralis*) were found in much greater numbers than any other species of fish captured or observed in Noyes Slough. Northern pike (*Esox lucius*) was the second most widely distributed fish and were found mostly in the downstream half of the slough. Other fish captured included Arctic grayling (*Thymallus arcticus*), Arctic lamprey (*Lampetra japonica*), burbot (*Lota lota*), humpback whitefish (*Coregonus pidschian*), lake chub (*Couesius plumbeus*), longnose sucker (*Catostomus catostomus*), and slimy sculpin (*Cottus cognatus*). Most of these species were found within a mile of the Chena River.

The large number of Alaska blackfish throughout most of the slough was indicative of the environmental conditions in the slough. Alaska blackfish are highly tolerant of degraded stream conditions. They are capable of breathing atmospheric oxygen and can live in water that is uninhabitable to other species.

Noyes Slough has the potential to provide high quality habitat for fish and wildlife resources. The Alaska Department of Fish and Game has indicated that Noyes Slough could provide important rearing habitat for chinook salmon and arctic grayling (USACOE 1997) if the slough was readily accessible to fish from the Chena River.

2. Water Quality Standards and TMDL Target

Water quality standards designate the “uses” to be protected (e.g., water supply, recreation, aquatic life) and the “criteria” for their protection (e.g., how much of a pollutant can be present in a waterbody without impairing its designated uses). TMDLs are developed to meet applicable water quality standards, which may be expressed as numeric water quality criteria or narrative criteria for the support of designated uses. The TMDL target identifies the numeric goals or endpoints for the TMDL that equate to attainment of the water quality standards. The TMDL target may be equivalent to a numeric water quality standard where one exists, or it may represent a quantitative interpretation of a narrative standard. This section reviews the applicable water quality standards and identifies an appropriate TMDL target for calculation of the debris TMDL for Noyes Slough.

2.1. Applicable Water Quality Standards

Title 18, Chapter 70 of the Alaska Administrative Code (ACC) establishes water quality standards for the waters of Alaska, including the designated uses to be protected and the water quality criteria necessary to protect the uses. Designated uses established in the State of Alaska Water Quality Standards (18 AAC 70.020) for fresh waters of the state include (1) water supply, (2) water recreation, and (3) growth and propagation of fish, shellfish, other aquatic life, and wildlife, and are applicable to all fresh waters, unless specifically exempted. Residue water quality standards for all uses are applicable to Noyes Slough. These standards are presented in Table 2-1. The TMDL for residue in Noyes Slough will be developed to meet all applicable criteria, the most stringent of which is the criteria for water supply and water recreation.

Table 2-1. Alaska Water Quality Standards for Residues in Fresh Waters

Designated use	Description of criteria
(A) Water supply	
(i) Drinking, culinary, and food processing	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines, cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.
(ii) Agriculture, including irrigation and stock watering	May not be present <i>in quantities to cause soil</i> plugging or reduced crop yield, or to make the water unfit or unsafe for the use.
(iii) Aquaculture	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use.
(iv) industrial	Same as (1)(A)(iii).
(B) Water recreation	
(i) contact recreation	Same as (1)(A)(i).
(ii) secondary recreation	Same as (1)(A)(i).

(C) Growth and propagation of fish, shellfish, other aquatic life, and wildlife	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. May not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines, or cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.
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Source: 18 AAC 70.020

2.2. Designated Use Impacts

Designated uses for Alaska's waters are established by regulation and are specified in the State of Alaska Water Quality Standards (18 AAC 70). For fresh waters of the state, these designated uses include (1) water supply, (2) water recreation, and (3) growth and propagation of fish, shellfish, other aquatic life, and wildlife. Noyes Slough does not fully support its designated uses because of elevated in-stream debris levels. Although Noyes Slough is not currently used for drinking water, the designated use of water supply must also be protected per Alaska water quality standards.

The presence of debris detracts from recreation and can introduce contaminants to the water column. Debris from household garbage can attract undesirable wildlife. Debris deposited in the stream can block culverts and fish passage, which inhibits the designated use of growth and propagation of fish.

2.3. TMDL Target

The TMDL target is the numeric endpoint used to evaluate the loading capacity and necessary load reductions and represents attainment of applicable water quality standards. In the case of debris in Noyes Slough, the TMDL target is zero, consistent with applicable water quality standards allowing no debris in the stream.

3. Data Summary

Unlike most numeric TMDLs where specific loadings are calculated, the data available regarding debris in Noyes Slough are largely qualitative. According to the guidelines used by the Alaska Department of Environmental Conservation (ADEC), the best professional judgment of a resource agency professional or other credible source can be used to determine whether a waterbody persistently exceeds water quality standards or designated uses (e.g., fish habitat, recreational areas are adversely affected) are not supported because of residues. Direct monitoring data, photographs and videos, and written reports within the last 5 years are additional sources of information that ADEC uses to determine whether a waterbody is impaired or water quality limited due to residues for section 303(d) listing purposes.

3.1. Data Inventory

Water quality data have been collected in Noyes Slough over the past few years, but there is no consistent measure of debris that allows a comparison over time. Clean-up activities that have taken place in the Noyes Slough watershed are described below.

The Noyes Slough Action Committee was responsible for several clean-up events along Noyes Slough beginning in September 1999. Clean-up days continued to occur in the fall and spring of 2000, 2001, and 2002. The cleanup days were typically attended by 50-80 volunteers including committee members, students and parents, and Noyes Slough residents. The volunteers removed log jams and trash to help restore flow to the slough and enhance habitat potential.

The Fairbanks Stormwater Advisory Committee (FSWAC) hosted a clean-up day for Noyes Slough on September 17, 2005, to complete one of the measurable goals for public involvement / participation activities specified in the stormwater management plan (SWMP) associated with the City of Fairbanks's stormwater permit (USKH, Inc. 2006). More than 30 volunteers collected trash from Noyes Slough in more than 50 30-gallon trash bags as well as an assortment of large trash items including car bumpers, shopping carts, Styrofoam boxes, and animal carcasses.

There was a June 2007 Noyes Slough clean-up conducted by the Tanana Valley Watershed Association (TVWA) with help from the City of Fairbanks. Examples of trash removed from the slough and banks of the slough during this clean-up include shopping carts, tools, a bike frame, shoes, bottles, picnic benches, a car tire, and a bicycle tire (Eshleman 2007).

During a water quality assessment in May 2007 photos were taken of the large amounts of trash in Noyes Slough to try to persuade the FSWAC to consider Noyes Slough as the main focus for the permit-required stream-clean-up event scheduled for August 25, 2007. This was successful and the FSWAC changed the focus stream from the Chena River to Noyes Slough. The stream clean-up was sponsored by the FSWAC in partnership with the TVWA and Fairbanks Soil and Water Conservation District. Volunteers cleared debris, working on the stream banks and from canoes. The clean-up yielded 2.38 tons (4,760 pounds) of garbage from the Noyes Slough watershed. Photographs of the August 2007 clean-up show a variety of trash including shopping carts, bikes, doors, propane tanks, barrels, and tires. Photos of the August 2007 clean-up activities are presented in Appendix A.

A debris assessment was also conducted by ADEC on August 3, 2007. The assessment led to the discovery of 11 beaver dams along Noyes Slough. These dams trap trash and debris as it flows through the slough. Typical large debris on Noyes Slough includes shopping carts, tires, and barrels. Specific items found during the August 3rd debris assessment include shopping carts, a TV, a freezer, pieces of cars, metal, concrete, tires, barrels, bikes, and chairs among other items. The largest pieces of debris were

photographed and a GPS location was taken for future removal activities. The area located near the Bently Mall behind the Granger Building is a debris-prone area. During a water quality assessment in May 2007, this area had the largest amount of debris in the water including carts and trash bags. Photos of the debris assessment in June 2007 are provided in Appendix B.

4. Pollutant Sources

The types of residue observed along Noyes Slough include appliances, scrap building materials, concrete, and asphalt (Burrows et al. 2000) as well as shopping carts, tires, paper products, cans and empty barrels. The reduced flows combined with the abuse of the waterway as a refuse site have depleted the slough's value as aquatic and wildlife habitat (Burrows et al. 2000). The slough has been a dumping ground for refuse and a catchment for storm runoff that introduces point and nonpoint source pollution.

The identification of pollutant sources is important to the successful implementation of a TMDL and the control of pollutant loading to a stream. Characterizing watershed sources can provide information on the relative magnitude and influence of each source and its impact on in-stream water quality conditions. This section discusses the potential sources of debris to Noyes Slough, including point and nonpoint sources.

4.1. Point Sources

Discharge of debris into surface waters is prohibited in the State of Alaska, so no permits have been issued for this activity in the Noyes Slough watershed. Although not permitted to discharge debris into Noyes Slough, Phase I and II stormwater systems are possible point source contributors to the slough. Stormwater discharges are generated by runoff from urban land and impervious areas such as paved streets, parking lots, and rooftops during precipitation events. These discharges often contain high concentrations of pollutants that can eventually enter nearby waterbodies. Many stormwater discharges are considered point sources and require coverage by a National Pollutant Discharge Elimination System (NPDES) permit.

Under the NPDES stormwater program, operators of large, medium, and regulated small municipal separate storm sewer systems (MS4s) must obtain authorization to discharge pollutants. The Stormwater Phase I Rule (55 *Federal Register* 47990, November 16, 1990) requires all operators of medium and large MS4s to obtain an NPDES permit and develop a stormwater management program. Medium and large MS4s are defined by the size of the population within the MS4 area, not including the population served by combined sewer systems. A medium MS4 has a population of between 100,000 and 249,999. A large MS4 has a population of 250,000 or more.

Phase II requires a select subset of small MS4s to obtain an NPDES stormwater permit. A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers all small MS4s in urban areas, as defined by the Bureau of the Census. It also includes small MS4s outside an urban area that are so designated by NPDES permitting authorities, case by case (USEPA 2000).

There are no Phase I MS4 permits in the Noyes Slough watershed; however, there are two Phase II MS4 permits (AKS-053406 and AKS-053414). MS4 permit AKS-053406 includes the City of Fairbanks, the City of North Pole, the University of Alaska - Fairbanks, and the Alaska Department of Transportation and Public Facilities - Northern Regional Office. MS4 permit AKS-053414 includes the Fairbanks North Star Borough. The urban area included in the MS4 permits is shown in Figure 4-1. All of Noyes Slough is included in the urban area.

Most debris in Noyes Slough appears to be a product of direct input from residential, commercial, and industrial areas and transient populations or indirect inputs brought into the creek through urban runoff. In some areas, snow removal activities on streets and parking lots adjacent to the slough cause debris to be placed in the flood plain and on the banks of the creek where it enters the creek upon snowmelt. All of the debris deposited into the slough and carried through runoff from the "urban" area is covered under the

MS4 permits. In addition, some debris may originate in areas north of the slough that are not included within the urban area boundary.

Some specific expected sources of debris in the MS4 areas are a construction company located along the slough and winter recreational users. There is a large amount of industrial debris (e.g., concrete blocks and rebar) in the slough adjacent to the construction company property. There is also a tire embankment along the slough where the tires are being used as riprap; however, the tires are falling into the water. The U.S. Army Corps of Engineers has been working with the construction company to find a better way to stabilize the land, but a new stabilizer has not been put in place yet, and the tires have not been removed.

It is suspected that the cut vegetation blocking the slough is from winter recreational users that cut the vegetation to gain better passage and let the vegetation fall into the slough to form a better base for winter recreational activities. The slough is a multi-use designated recreation trail for the Fairbanks North Star Borough (Ordinance No. 2006-24). The slough is also used as a route for the Open North American Sled Dog Race.

4.2. Nonpoint and Natural Sources

The debris impairment discussed in this document refers only to human-caused residues and does not include naturally occurring woody debris that is important to maintain in-stream habitat. Therefore, there is no background or natural source of residue in the watershed. As mentioned in the previous section, some portion of the debris carried to the slough through surface runoff might originate in areas outside of the MS4 areas. However, it is impossible to determine which portion of the debris content is delivered from the MS4 and non-MS4 areas.

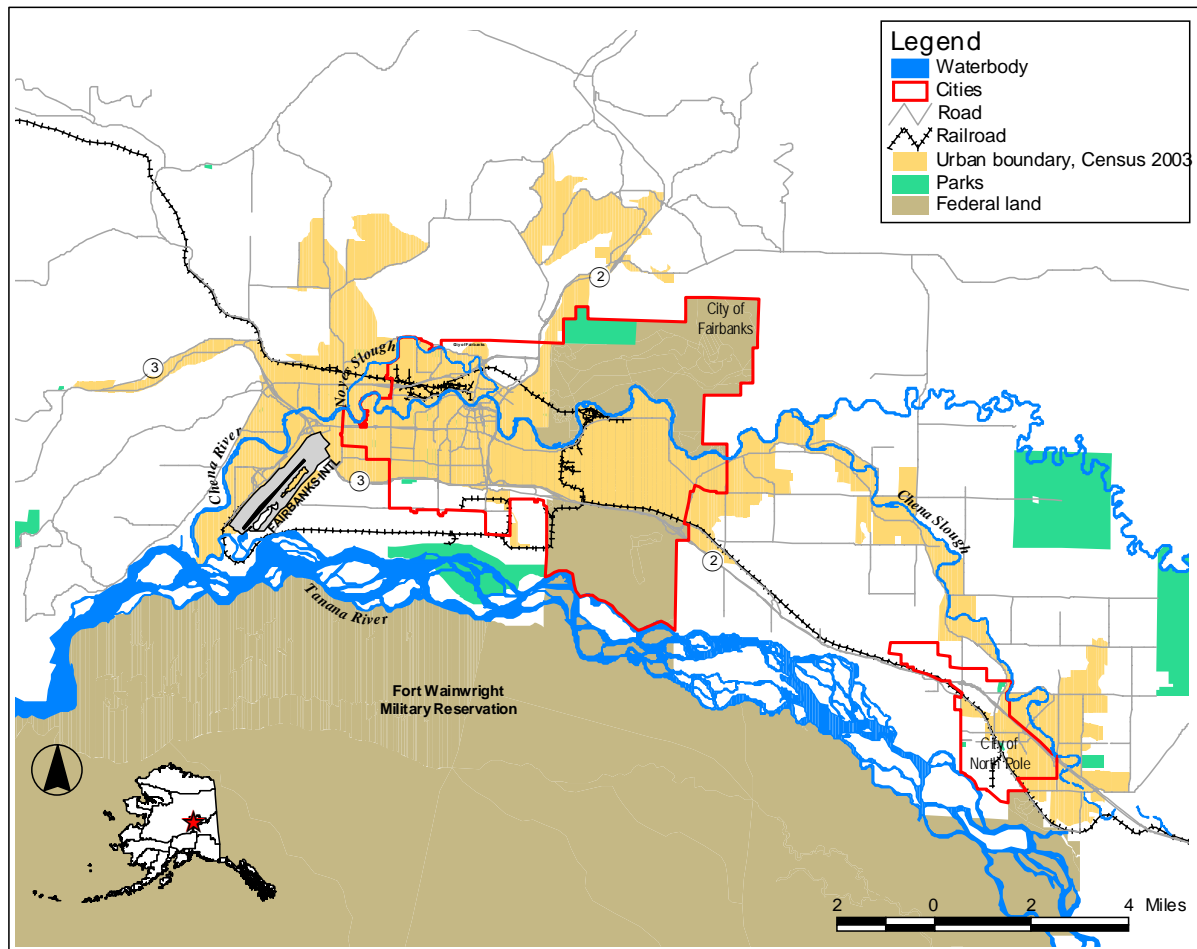


Figure 4-1. Urban area covered by Phase II MS4 stormwater permits.

5. Technical Approach

The impairment to Noyes Slough does not fit the model for the typical loading capacity determination because the nature of debris does not lend well to quantitative analysis. However, because Alaska water quality standards do not allow for any debris delivered to a stream, no loading calculation is necessary. Therefore, the TMDL will be set to zero, and the TMDL document will focus on implementation of strategies that will help keep debris out of the slough and allow it to meet the applicable water quality standards.

5.1. Loading Capacity

Loading capacity is the ability of the receiving waters to assimilate a given pollutant. For Noyes Slough, the pollutant is residue in the form of debris. The debris loading capacity for Noyes Slough is derived directly from the water quality standards, which require no unpermitted, human-caused debris to be deposited within the stream. As such, the loading capacity of Noyes Slough for debris is zero.

5.2. Wasteload Allocation

The wasteload allocation is the portion of the TMDL that is allocated to point sources. Discharge of debris into surface waters is prohibited in the State of Alaska, so the wasteload allocation for debris in Noyes Slough is zero.

5.3. Load Allocation

The load allocation is the portion of the TMDL that is allocated to nonpoint sources and background levels. Since there are no background sources of debris and water quality standards do not allow for any debris inputs, the load allocation for debris in Noyes Slough is zero.

5.4. Margin of Safety

Clean Water Act section 303(d) requires that a TMDL incorporate a margin of safety (MOS) to account for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS can be implicit (e.g., incorporated into the TMDL analysis through conservative assumptions) or explicit (e.g., expressed in the TMDL as a portion of the loadings) or a combination of both. Because the loading capacity determined from water quality standards allows no debris in the stream, there is neither a load nor wasteload of debris allocated for Noyes Slough, and, the explicit MOS is set to zero.

5.5. Seasonal Variation

There is some seasonal variation in the debris loading into Noyes Slough. Debris input is generally lower in the winter since snow and ice reduce runoff that can carry debris from the surrounding watershed into the slough. Spring snowmelt brings higher loading to the slough, as increased runoff transports debris accumulated throughout the winter from the streambank into the slough. Warmer weather also increases pedestrian and vehicle traffic in the residential and commercial areas where littering is common. The warm-weather debris input is mostly from illegal dumping by local residents and from the transient population.

Debris input, however, still occurs during the winter since Noyes Slough is a heavily used waterway for winter recreation such as dog mushing, snowmachining, biking, and cross country skiing. Most debris input during the winter season is from brush cutting to create a clear and safe pathway for the winter recreational users. Seasonal variation is considered by timing education, enforcement, and clean-up activities with key times of usage and seasonal target audiences.

6. Implementation

There are a number of local groups that are concerned with the health of Noyes Slough and are already working toward the goal of reducing debris and other pollutants in the stream, including the TVWA, the co-permittees of the Fairbanks MS4 permit, Fairbanks North Star Borough, and the 6th grade class of the Anne Wien Elementary School.

6.1. Watershed Groups

The TVWA is a local non-profit organization that seeks to ensure the recreational and economic benefits of the Tanana River and its tributaries, including Noyes Slough (TVWA 2007). The goal of the TVWA is to promote and improve the health of the Tanana Valley watershed through education, restoration, collaborative research, and community involvement. TVWA is currently organizing an adopt-a-stream program, which is a volunteer-based effort. The goal of the program is to get residents and local businesses involved in monitoring the water quality and fish and wildlife habitat of local streams. One of the activities associated with the adopt-a-stream program is litter pick-up. Volunteers are asked to clean up their section of stream at least two times per year.

The TVWA has received funding and technical support from the U.S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS) to develop a riparian management plan. The TVWA is partnering with the Fairbanks Northstar Borough's Planning Department to develop the riparian management plan to address riparian set-back and low impact development BMPs.

6.2. MS4 Permits

6.2.1. Permit for the City of Fairbanks, City of North Pole, University of Alaska – Fairbanks, Alaska Department of Transportation and Public Facilities – Northern Regional Office

The MS4 permit for the co-permittees of the City of Fairbanks, the City of North Pole, the University of Alaska - Fairbanks, and the Alaska Department of Transportation and Public Facilities - Northern Regional Office (AKS-053406) requires a SWMP. The SWMP must include "BMPs, control techniques, system design, engineering methods, and other provisions the co-permittees or EPA determines appropriate for the control of pollutants in discharges from the MS4" (USEPA 2005a).

The SWMP includes the following six minimum control measures:

1. Public education and outreach
2. Public involvement/participation
3. Illicit discharge detection and elimination
4. Construction site storm water runoff control
5. Post-construction storm water management in new development and redevelopment
6. Pollution prevention and good housekeeping for municipal operations

The minimum measures that are most relevant to controlling debris in Noyes Slough are public education/outreach, public involvement/participation, illicit discharge detection and elimination, and pollution prevention and good housekeeping from municipal operations.

The public involvement and participation measure of the SWMP requires the co-permittees to host an annual clean-up day (Shannon & Wilson, Inc. 2003). Clean-up days focus on removing trash and debris

from small streams in the area, including Noyes Slough. Local residents canoe through the slough, and pick up and haul trash and debris that has accumulated in the waterbody and along its banks. The co-permittees are also required to organize an ongoing volunteer monitoring program and an Adopt-A-Stream program. Currently the co-permittees are working with the TVWA to coordinate efforts on this Adopt-A-Stream program and the volunteer monitoring program permit requirements.

Education is another tool that can be used to help reduce sources of debris to Noyes Slough. The SWMP requires stormwater education materials to be distributed annually. Educational items might include fliers, posters, magnets, and other items to promote interest. The SWMP also requires public service announcements (PSAs) to run annually in April. Newspaper, radio, and television can be used to show the public the impacts of stormwater pollution. Local newspapers can and are being used to highlight pollution issues in Noyes Slough including articles on local individuals working to prevent pollution, articles highlighting pollution along the slough, and articles showing sources of the pollution/debris. Stormwater issues can also be discussed on local radio talk shows in addition to radio PSAs.

The 2005 clean-up day sponsored by FSWAC also presented an educational opportunity to reach residents who live and work along Noyes Slough. Information pamphlets that detailed the cleanup activities were mailed to residents who live along the slough and reminded them not to dump yard clippings and waste into the slough. PSAs were broadcast that addressed the cleanup efforts. In addition, the cleanup efforts were documented in a September 18, 2005, article in the Fairbanks News-Miner (USKH, Inc. 2006).

Education about Noyes Slough can also occur in local classrooms. The 6th grade class from Anne Wien Elementary School, which is adjacent to Noyes Slough, has been involved with conservation efforts along Noyes Slough for several years. The students are working on restoring the Noyes Slough area. The students also built and maintain the Noyes Nature Trail in Lion's Park. The restoration effort is ongoing and building momentum (Anne Wien School 2007). The students have been picking up litter, clearing the nature trail along the slough, and keeping the waterway free of obstructions (Duffy 2006). The class uses the nature trail along Noyes Slough as a living laboratory for science lessons. The children learn about the life cycles of plants and animals that live along the slough. Students collect samples from water and sediments.

The MS4 co-permittees also host an educational event each year called "Stormwater is Cool" in which a presentation is given in local elementary schools to deliver the message of how storm water can carry pollutants into surface waters and how those pollutants adversely affect the flora and fauna in our local water bodies (City of Fairbanks 2007). It is estimated that in the spring of 2007, more than 400 students at nine elementary schools attended the presentation of "Stormwater is Cool."

The SWMP outlines a plan for the co-permittees to adopt an ordinance or other control measure to prohibit any non-stormwater discharges to the stormwater system and implement appropriate enforcement procedures and actions (Shannon & Wilson, Inc. 2003). The SWMP also outlines a plan to detect and address non-stormwater discharges, including illegal dumping. The plan includes informing public employees, businesses, and the general public of the hazards associated with illegal discharges and improper waste disposal (Shannon & Wilson, Inc. 2003).

The purpose of pollution prevention and good housekeeping is to develop and implement an operation and maintenance program (Shannon & Wilson, Inc. 2003). The SWMP suggests evaluating the effectiveness of street cleaning, storm drain cleaning, and waste disposal practices within the co-permittee jurisdictions.

6.2.2. FNSB Permit

The general requirements of the Fairbanks North Star Borough (FNSB) MS4 permit (AKS-053414) indicate that the FNSB must submit to EPA a written description of how SWMP activities control the discharge of sediment, petroleum products, and debris to waters of the United States from MS4s.

As with the City of Fairbanks, City of North Pole, University of Alaska - Fairbanks, and Alaska Department of Transportation and Public Facilities - Northern Regional Office MS4 permit (AKS-053406) described above, FNSB's permit requires the six minimum control measures (public education and outreach; public involvement/participation; illicit discharge detection and elimination; construction site storm water runoff control; post-construction storm water management in new development and redevelopment; and pollution prevention and good housekeeping for municipal operations).

The public education and participation requirements of the permit include

- Planning and implementing a public education program for local audiences
- Distributing stormwater education materials to target audiences
- Preparing and distributing outreach material to local print and broadcast media
- Organizing and hosting an annual "Stream Clean-up day"
- Developing an appropriate and ongoing means of providing stormwater information to the public and for receiving information from the public such as a website or staffed telephone hotline
- Convening and participating in a volunteer citizen committee to guide and advise the Borough on its stormwater activities.

The FNSB is working with the City of Fairbanks, City of North Pole, Alaska Department of Environmental Conservation and Alaska Department of Transportation and Public Safety Northern Region (i.e., co-permittees of the other MS4 permit in the watershed) to meet the public education and outreach requirements of their permit (FNSB 2007). The public education program was described in section 6.2.1.

The FNSB MS4 permit requires the adoption of an ordinance or other control measure to prohibit any non-stormwater discharges to the stormwater system and implement appropriate enforcement procedures and actions. The permit also outlines a plan to detect and address non-stormwater discharges, including illegal dumping. The plan includes informing public employees, businesses, and the general public of the hazards associated with illegal discharges and improper waste disposal. The FNSB has not established an ordinance or other control measure to prohibit illicit discharges in the MS4 to date, but the FNSB is planning on developing an implementation plan for illicit discharge detection and elimination ordinances to meet the permit requirements in 2008 (FNSB 2007).

Each annual report required by the MS4 permit must include a description of the FNSB's efforts to prevent or reduce pollutant runoff from the municipal operations through the operation and maintenance program, including a description of the activities to reduce floatables and other pollutants to the MS4; and a description of the controls for reducing or eliminating the discharge of pollutants from areas owned or operated by the FNSB, including streets, roads, and highways; municipal parking lots; maintenance and storage yards; waste transfer stations; fleet or maintenance shops with outdoor storage areas; salt/sand storage locations; and snow disposal sites (USEPA 2005b). According to the 2007 Annual Report (FNSB 2007), the FNSB does not currently have a "formal schedule for activities, maintenance, or long term inspection procedures for controls to reduce floatables and other pollutants to the MS4." The development of a formal schedule and description of maintenance, inspection, and control activities is planned to be included in the 2008 Annual Report.

6.3. Local Ordinances

In addition to the requirements of the MS4 permits, the City of Fairbanks and the Fairbanks North Star Borough have ordinances regarding garbage and litter. The City of Fairbanks has five ordinances that relate to garbage and littering: 1) post-construction storm water management; 2) illicit discharge detection and elimination; 3) public streets; 4) general; and 5) offenses regarding nuisances.

The purpose of the post-construction storm water management ordinance is to establish minimum stormwater management requirements and controls to reduce storm water runoff rates and volumes, soil erosion, and nonpoint source pollution at all new subdivisions or development sites disturbing 10,000 square feet of land or more. The illicit discharge ordinance prohibits the deposition of any solid waste, garbage, rubbish, junk, fill, dirt, snow or other material in such a manner as to obstruct, impound, pollute, or cause siltation of any waterbody unless allowed by federal, state, or local permit. If either of these ordinances is violated, the violator must remediate or restore the affected property within an established deadline or the work will be done by a designated government agency or contractor at the violator's expense.

The City of Fairbanks requires the owners or occupants of any property bordering a city street, alley, or sidewalk to remove any debris transported from their property onto the city streets, alleys, or sidewalks. There is a minimum fine of \$50 for any violation of this ordinance. General ordinances for the City of Fairbanks also require the disposal of all trash through the regular services of the city. Property owners are prohibited from keeping any trash on their property. Property owners must maintain the premises in a clean and sanitary condition, including any alleys bordering the property. The City of Fairbanks's offenses regarding nuisances indicate that a person commits the offense of littering if he or she places litter any place other than a public or authorized private trash receptacle.

Fairbanks Northstar Borough (FNSB) has one ordinance relevant to garbage and littering. The FNSB General Prohibition ordinance prohibits the disposal of solid wastes or sludge in any unauthorized locations and prohibits the discarding of any litter into water or land within the borough. The penalty for violation of this ordinance is \$100.00 for the first offense, \$200.00 for the 2nd offense, and \$300.00 for each subsequent offense within a 5-year period.

Increased enforcement of the City of Fairbanks's and FNSB's ordinances is important to reducing debris in Noyes Slough. Measures such as reducing a garbage-related fine if the violator agrees to pick up litter should be considered. Placing more garbage receptacles that are easily visible within the commercially and residentially developed portion of Noyes Slough may help to cut down on littering. Centralized recycling containers, placed in convenient locations such as outside of grocery stores and in shopping centers, may help to encourage recycling and reduce the amount of garbage that accumulates between pickups.

6.4. Stormwater Attitude Survey

While the quantifiable goal of this TMDL is "zero" trash in Noyes Slough, an additional measure of success of the various implementation activities is the "stormwater attitude survey" required by the City of Fairbanks's MS4 permit. The permit requires the co-permittees to develop a stormwater attitude survey that may be able to address why residents dump debris into the slough. The survey will assess public knowledge and attitudes related to stormwater management in the Fairbanks urban area and help to identify whether or not residents understand the effect they have on the nonpoint sources of pollutants entering nearby waterbodies.

The survey is available in the 2007 Annual Report for permit AKS-053406 (City of Fairbanks 2007). The survey is currently undergoing revisions and should be distributed to Fairbanks area residents in 2008;

although, the survey is not required to be developed until 2009 and the results are due to EPA and ADEC in November 2009. The survey will be distributed by mass mailing, website, and at community events. The survey may be very helpful in assessing Fairbanks area residents' current views on stormwater, while stormwater education is just getting started in the area, versus later when stormwater education has been ongoing for several years. A second survey should be required as part of the next MS4 permit, as the current permit expires in May 2010. A comparison between the two surveys will help to evaluate the success of the stormwater education program.

7. Monitoring

There is currently no MS4 permit requirement to monitor for litter and there is no measureable goal for the litter pick-up program. As part of the monitoring strategy in Noyes Slough, agencies and volunteers should be encouraged to actively observe and note the presence of trash in and around water quality sampling locations. The type and amount of debris collected during clean-up events should also be recorded (in addition to photographs). In addition to general monitoring, specific monitoring of sites where strategies have been implemented to reduce debris input into the slough should be monitored to evaluate effectiveness.

Benchmarks to assess the effectiveness of the various implementation strategies in their progress toward the TMDL target can be useful. According to EPA's fact sheet on best management practices (BMPs) for trash management (USEPA 2008), "a successful trash management program depends on citizen awareness." Programs to promote citizen awareness of the trash/debris problem in Noyes Slough are already underway (see Section 6). Benchmarks to assess the effectiveness of these education programs could include an increase in the number of volunteers involved in the TVWA's adopt-a-stream program as well as an increase in the number of volunteers present on the stream clean-up days required by the MS4 permits. An increase in volunteers in association with a reduction in the amount of trash collected over several clean up events and over several years will provide insight into whether or not the implementation programs currently in place are helping to achieve the TMDL target of zero trash in Noyes Slough.

8. Public Comments

This proposed TMDL is open for public comment from March 23rd, 2008 to April 22nd, 2008. People wishing to comment on the proposed TMDL should do so in writing by the close of the public comment period. Written comments must be postmarked by the close of the comment period and sent to Michelle (Missy) Corrigan, Alaska Department of Environmental Conservation, 610 University Ave. Fairbanks, AK 99709. Comments may be faxed to ADEC at (907) 451-2187 or e-mailed to michelle.corrigan@alaska.gov by the close of the public comment period. All comments should include the name, address, and telephone number of the commenter and a concise statement of the comment and the relevant facts upon which it is based.

Appendix A: Photographs, August 2007 Noyes Slough Clean-up

(Source of photos: Alaska Department of Transportation)





Appendix B: Photographs, June 2007 Noyes Slough Debris Assessment

(Source of photos: Alaska Department of Environmental Conservation)



Tire in Noyes Slough



Shopping cart in Noyes Slough



Tires on the banks of Noyes Slough



Barrel in Noyes Slough



Typical large debris



Trash and cuttings in Noyes Slough

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