Prepared For:
The Municipality of Anchorage
Watershed Management Services

Campbell Creek Watershed Plan

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Watershed Management Services
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1. Introduction

A watershed is an area of land that channels water by gravity and collects into a surface water system, such as a lake, river, or ocean. Anchorage has many different watersheds, comprising various terrain features, vegetation, wildlife habitat, land uses and levels of development, all of which contribute value and complexity to the Anchorage community. One of the most well know and prized watersheds in Anchorage is the Campbell Creek Watershed. Campbell Creek is a highly valuable, vibrant creek that flows from its headwaters in the Chugach Mountains through the heart of Anchorage's midtown and eventually into Turnagain Arm.

The Campbell Creek Watershed is approximately 69 square miles and includes several tributaries (shown in Figure 1). The watershed encompasses a diverse range of land uses. Approximately 70% of the watershed area consists of undeveloped land, open spaces, and parks, offering a variety of opportunities for outdoor recreation. The urbanized portions of the watershed are home to many residents, businesses, schools, recreation areas, and an airstrip. As of the 2020 Census, the Campbell Creek Watershed has 83,543 residents, accounting for approximately 29% of Anchorage's total population. Unfortunately, the Campbell Creek Watershed also has areas of concern for the natural environment that limit recreational and economic opportunities and impair its aesthetic qualities. These issues include water quality degradation and development along the creek-side or riparian habitat.

This document is developed as a resource for planners, scientists, community members, and others to make decisions that will minimize additional impacts to the watershed and enhance and protect features that are key to this watershed's health and longevity. This plan outlines the resources and addresses environmental, ecological, and socioeconomic concerns.

1.1 Importance of Watershed Planning

Watershed planning can be helpful to the health of a watershed ecosystem. Within each watershed, unique living and nonliving components interact, with one element responding to the action or change of another. Watershed planning can help protect the water and the plants and animals that live in it, and can also help protect a watershed's physical, chemical, and biological components. It can also help restore watersheds that have already been degraded. An effective plan will:

- Supply guidance for balancing the environmental, ecological, and socioeconomic needs of the watershed
- Provide implementation strategies that will optimize future projects
- Facilitate compliance with federal, state, and local regulations
- Guide funding strategies for watershed projects
- Save time and money by identifying priority projects

1.2 Regulations and Related Plans

Several existing plans support the development of this watershed plan, as well as relevant regulatory documents that help guide and regulate ongoing development in this watershed and others across Anchorage.

- *2007 Little Campbell Creek Watershed Management Plan*[1]. This document outlines watershed characteristics and identifies activities to improve watershed health in the Little Campbell Creek watershed. Much of the plan is still relevant today.

- *2018 Anchorage Stormwater Manual (ASM)*[2]*.* The ASM, also known as Chapter 2 of the MOA's Design Criteria Manual (DCM), describes stormwater management requirements associated with development projects in Anchorage. It identifies stormwater management strategies and requirements intended to reduce pollutants in stormwater runoff prior to discharge to local water bodies, including Campbell Creek. These practices are currently implemented, but additional opportunities exist to enhance stormwater quality through stormwater management.

- *Municipality of Anchorage (MOA) and Alaska Department of Transportation and Public Facilities (DOT&PF), Alaska Pollutant Discharge Elimination System (APDES), Municipal Separate Storm Sewer System (MS4) Permit*[3]. This permit, issued by the Alaska Department of Environmental Conservation (DEC) and renewed every 5 years, regulates the MS4 stormwater collection systems, including design, management, and operation. The 2020-2025 permit requires the development of watershed management plans for a specific water body.

- *Campbell Creek Watershed Stormwater Master Plan*[4]. The stormwater master plan identifies and characterizes the expected condition and associated risk of failure of the stormwater collection system in the Campbell Creek Watershed. It will also provide a hydrologic and hydraulic performance evaluation of the existing system to identify deficiencies and help focus stormwater-related improvement projects on high-priority areas.

- *2017 Anchorage 2040 Land Use Plan*[5]. The 2040 Land Use Plan updated the Anchorage 2020 Anchorage Bowl Comprehensive Plan. The 2040 Land Use Plan updates population and economic forecasts for city growth and land needs through 2040 and includes a Land Use Plan Map. The Land Use Plan Map serves as a visual guide for future land uses and development patterns across the Anchorage Bowl. This map provides the blueprint for how Anchorage will accommodate economic growth and meet the forecast housing needs of our city's residents. The plan also includes updated goals, policies, and strategies to achieve expected growth while meeting today's challenges.

- *Alaska Administrative Code Title 18, Chapter 70*[6] provides standards for water quality that must be maintained in Alaska.
- *Anchorage Municipal Code*, especially Title 21[7], outlines regulations related to land use, including setback areas for stream protection, water quality protection, pollution, and construction requirements.

2. Creation of this Plan

The MOA Watershed Management Services developed the Campbell Creek Watershed Plan. The plan development included an existing literature review, compilation of available data, GIS mapping and analysis, and evaluation of potential future conditions and development scenarios.

2.1 Vision, Mission, and Goals

Our Vision - The Campbell Creek Watershed Plan's vision is to provide guidance and identify opportunities to improve and protect watershed health, benefiting aquatic organisms, wildlife habitat conservation, community recreation, economic benefits, area aesthetics, and overall resident quality of life.

Our Mission - The mission of this Plan is to provide recommendations for realizing its vision by guiding community decisions within the Campbell Creek Watershed to improve and protect the environmental, ecological, and socioeconomic functions and values of the land and watercourse.

Table 1: Goals and Objectives for the Campbell Creek Watershed Plan

ISSUE	GOAL	OBJECTIVE
Water Quality	*Meet water quality standards and prevent further degradation.*	*Monitor and reduce pollution from point and non-point sources.*
Water Quantity	*Reduce the potential impacts of stormwater and flood events, while maintaining and improving creek function.*	*Eliminate flood hazards, maintain flows for habitat, and preserve and/or widen non-development stream setbacks or buffer zones where necessary.*
Vegetation	*Protect and maintain lands that support healthy watershed functions.*	*Plan revegetation and invasive species removal projects.*
Terrestrial Wildlife	*Provide habitat for a diversity of wildlife within the Campbell Creek watershed.*	*Maintain and enhance existing wildlife corridors, riparian habitats, greenbelts, and parks.*
Aquatic Wildlife	*Provide a healthy habitat for fish and other aquatic organisms in Campbell Creek.*	*Improve and maintain aquatic organism passages, stream habitats, and water quality to support all life cycles of aquatic organisms.*
Socioeconomics	*Foster a high degree of social and economic opportunities.*	*Promote compatible development, recreation, and economic opportunities throughout the watershed.*

3. Watershed Characteristics

Campbell Creek is the largest watershed in the Anchorage Bowl. It spans 69 square miles and encompasses a diverse range of land uses, terrain features, natural characteristics, vegetation, and wildlife. The watershed's upper reaches are primarily undeveloped portions of the Chugach Mountains. Since Anchorage's establishment over 100 years ago, the lower reaches of the watershed have undergone significant development. As Anchorage developed from a small tent community to an urban city, portions of the creek were straightened, relocated, or altered to make room for new residential, commercial, and industrial areas.

This section of the Plan depicts the Campbell Creek Watershed, including a summary of geographical information, physical characteristics, land uses, and ecological quality.

3.1 Location and Watershed Features

The Campbell Creek Watershed extends approximately 16 miles from the Chugach Mountains to the creek's mouth on Turnagain Arm, just downstream of Campbell Lake. The watershed location is provided in Figure 1.

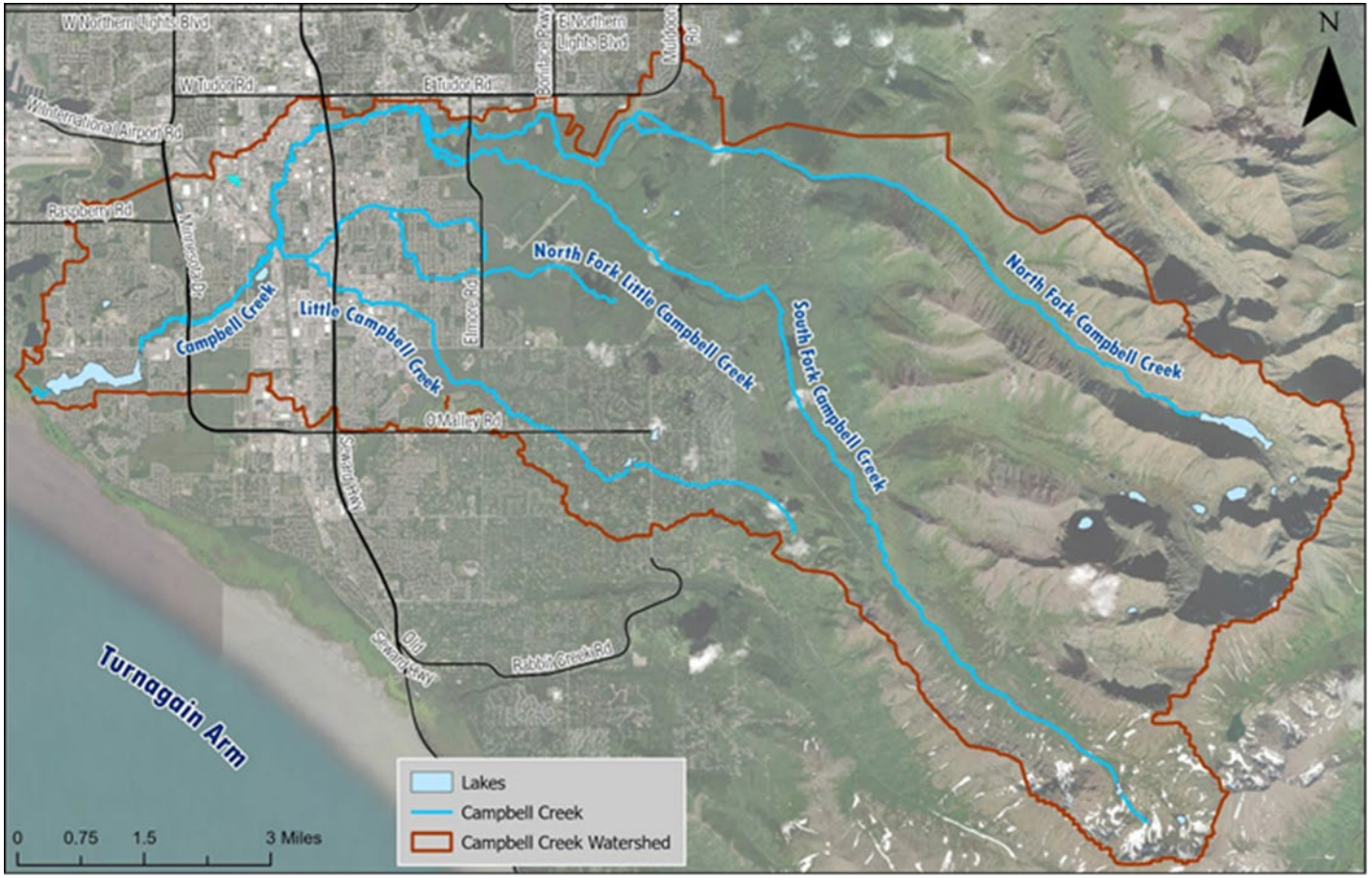

Figure 1: Campbell Creek Watershed

3.2 Sub-watersheds

The Campbell Creek Watershed contains five primary sub-watersheds, which are discussed below. A map of the sub-watersheds is provided in Figure 2.

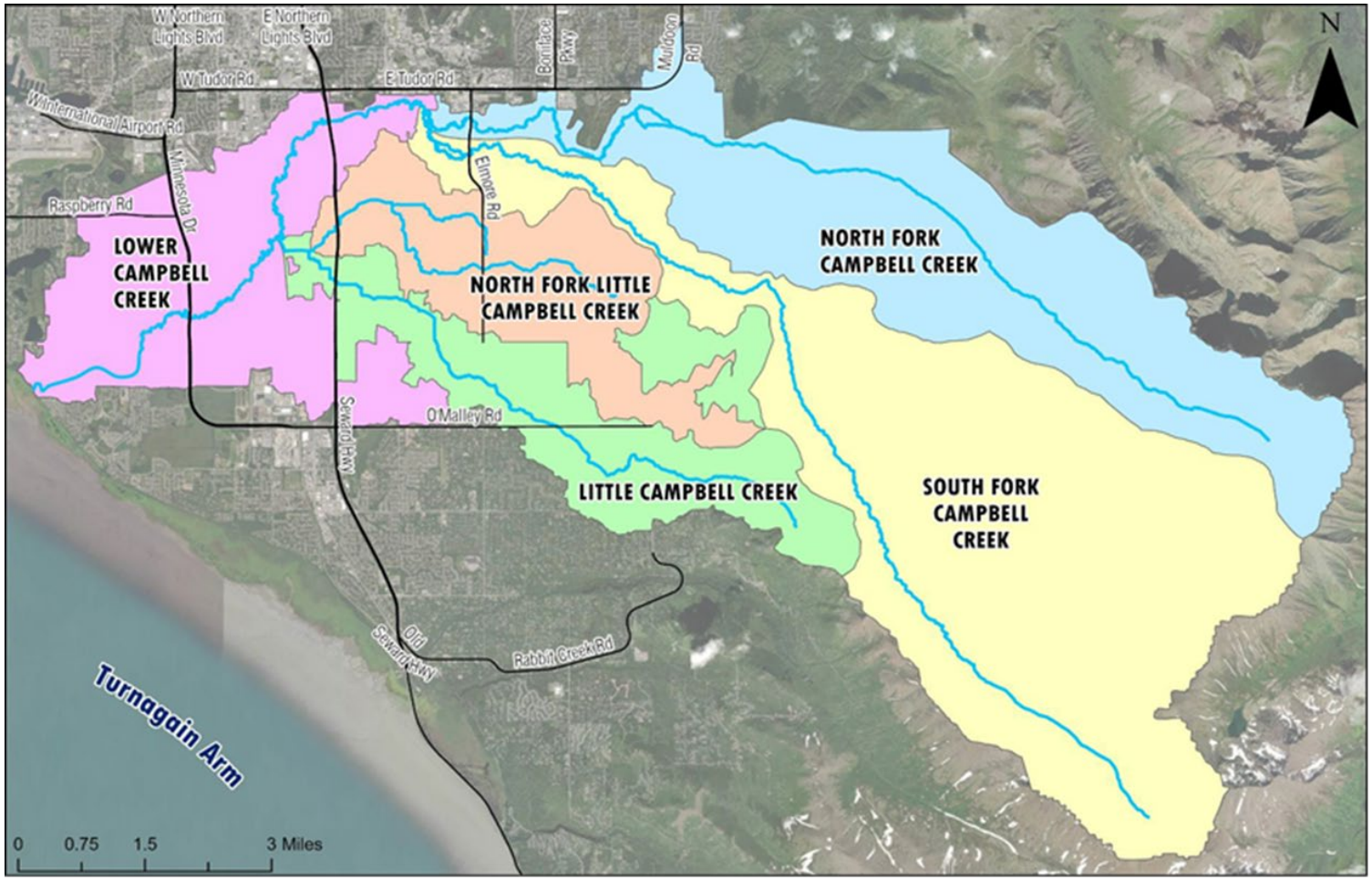

Figure 2: Campbell Creek Sub-Watersheds

3.2.1 South Fork Campbell Creek

The South Fork Campbell Creek sub-watershed contains what most consider the start of the main branch of Campbell Creek. This sub-watershed is almost entirely undeveloped and contains 15.5 river miles of the main creek with numerous smaller tributaries. This fork of Campbell Creek enters the developed portion of Anchorage by crossing under Elmore Road just north of the Elmore Road - Dowling Road intersection. The South Fork converges with the North Fork shortly downstream of that road crossing, forming the creek's main branch. The South Fork creek alignment is almost entirely unaltered from its natural form. As a result, the creek is quite sinuous, with intact riparian areas, a healthy and functioning floodplain, and abundant supporting wetland areas.

3.2.2 North Fork Campbell Creek

The North Fork Campbell Creek sub-watershed encompasses 14.7 river miles of the main creek, along with numerous additional smaller tributaries. The North Fork is the second-longest section of the creek, and it originates at a small lake in the Chugach Mountains. This sub-watershed is primarily undeveloped, with small pockets of developed areas at the lower reaches. A residential area is located at the end of Campbell Airstrip Road, though the airstrip itself is not within this sub-watershed. The North Fork crosses Campbell Airstrip Road approximately one mile south of Tudor Road, flows through Far North Bicentennial Park, and crosses Elmore Road before converging with the South Fork downstream of Elmore Road and forming the creek's main branch. T he North Fork, like the South Fork sub-watershed, is mostly in its unaltered form. The creek has a sinuous alignment, intact riparian areas, and a healthy floodplain with abundant supporting wetlands.

3.2.3 Little Campbell Creek

Little Campbell Creek is a significant tributary to Campbell Creek and includes 16 river miles. The associated sub-watershed is approximately 75% developed, primarily with residential land cover, some businesses, and an airstrip.

The main branch of Little Campbell Creek originates in the eastern foothills of the watershed in the Chugach Mountains. It then flows as a relatively small channel through the Anchorage Hillside subdivision, the Alaska Zoo, and the O'Malley golf course.

A watershed plan for Little Campbell Creek was completed in 2007, providing valuable information on watershed characteristics, features, issues, and potential improvements. This current watershed plan primarily focuses on other portions of the larger Campbell Creek Watershed, as the Little Campbell Creek Watershed was previously studied.

3.2.4 North Fork Little Campbell Creek

The North Fork Little Campbell Creek originates in the Chugach Mountains just south of the Campbell Airstrip and contains approximately 8 river miles. The sub-watershed is mainly developed, with a small portion of underdeveloped areas on the hillside.

North Fork Little Campbell Creek flows from the Anchorage "hillside" area, a neighborhood in the east Anchorage foothills, crosses Elmore Road, and then splits into a north and south branch. These branches flow separately until converging again at Lake Otis Parkway and E. 66th Ave. The North Fork Little Campbell flows through channels and merges with Little Campbell Creek near Old Seward Highway and E. 74th Ave.

3.2.5 Lower Campbell Creek

Lower Campbell Creek starts where the previous sub-watersheds converge. This creek flows for almost eight river miles until it enters Campbell Lake and then flows into Turnagain Arm.

The North and South Fork Campbell Creek merge east of Lake Otis Parkway and E. 48th Ave. The Lower Campbell Creek then flows south and converges with Little Campbell Creek just east of where North Fork Little Campbell and Little Campbell merged.

3.3 Lakes in the Watershed

The Campbell Creek Watershed contains numerous lakes of varying sizes, land uses surrounding them, and their origins. The named lakes in the watershed are listed in Table 2 below and shown in Figure 3.

Table 2: Watershed Lakes

Name	Sub-watershed	Size (acres)	Surrounding Land Use	Origin
Birch Lake	Lower Campbell Creek	4.67	Residential, School	Natural
Black Lake	South Fork Campbell Creek	12.2	Undeveloped	Natural
Blueberry Lake	Lower Campbell Creek	3.21	Industrial	Natural
Campbell Lake	Lower Campbell Creek	125.79	Residential	Manmade (dam)
Green Lake	South Fork Campbell Creek	5.38	Undeveloped	Natural
Hidden Lake	South Fork Campbell Creek	4.3	Undeveloped	Natural
Hideaway Lake	Little Campbell Creek	6.95	Residential	Natural
Lake O' The Hills	Little Campbell Creek	6.9	Residential	Manmade (dam)
Long Lake	North Fork Campbell Creek	70.77	Undeveloped	Natural
Strawberry Lake	Lower Campbell Creek	0.48	Open Space	Natural
Taku Lake	Lower Campbell Creek	11.61	Open Space, Residential, Commercial	Manmade (gravel pit)
Tina Lake	Lower Campbell Creek	2.3	Industrial	Natural
Williwaw Lakes (7)	North and South Fork Campbell Creek	54.33	Undeveloped	Natural

The largest lake in the watershed is Campbell Lake, located near the lower reaches of the watershed, just upstream of where Campbell Creek flows into Cook Inlet. Campbell Lake is approximately 126 acres and is surrounded by residential development. Campbell Lake is used for various recreational activities, including canoeing, kayaking, fishing, and paddleboarding. It is also an FAA seaplane base, and many local residents have float planes on the lake.

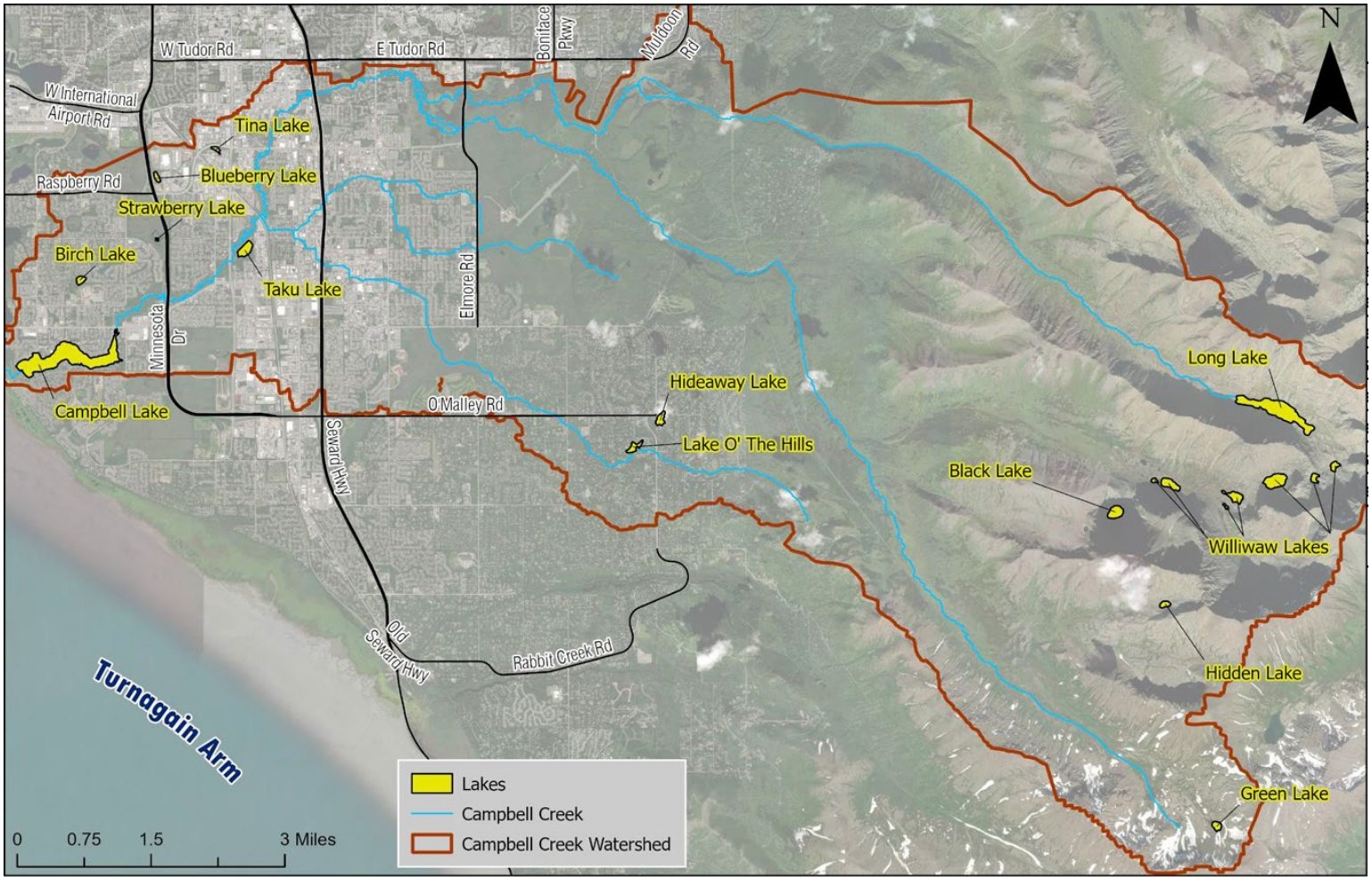

Figure 3: Named Lakes in Watershed

3.4 Climate

The watershed is characterized by a subarctic climate typical of south-central Alaska, with short, relatively cool summers. The rainiest months typically occur from July to October, and snow is prevalent from October to April. There is significant variation in quantities of rain and snow from the lower portions near Cook Inlet to the upper reaches of the Chugach Mountains. The Anchorage Stormwater Manual (DCM Ch. 2) identifies an increase of 2.0 inches in rainfall quantities from the watershed's east to west portions. This is generally from the Raspberry Road area to Hillside Drive and Campbell Airstrip Road. Additionally, increases are expected in the watershed's upper reaches but have not been specifically quantified.

3.5 Soils and Wetlands

Soils in the Campbell Creek Watershed are highly diverse. Geologic forces, especially glaciation, created a highly variable pattern of soils where large gravel deposits exist in places and other areas are scoured and composed of silty soils (compact). This process results in an area that essentially acts like a bathtub, except for scattered locations of well-draining soils. Some of the variation in soil types is likely attributable to the historical land cover in the watershed. A significant portion of the Campbell Creek Watershed was historically wetlands before the region was developed. Soils in developed wetland areas are more likely to be poorly draining, as they would have been holding and storing water before the area's development. As development occurred, much of the wetlands were filled. Figure 4 shows the watershed's historical versus current wetland coverage. Wetlands provide a natural system for attenuation of rainfall runoff, buffer zones for floodplains, and natural cleaning and filtration of water. The loss of wetlands to urban development has resulted in increased runoff quantity in the watershed, transport of pollutants from developed areas to the creek, increased runoff velocity, and channel erosion and incision.

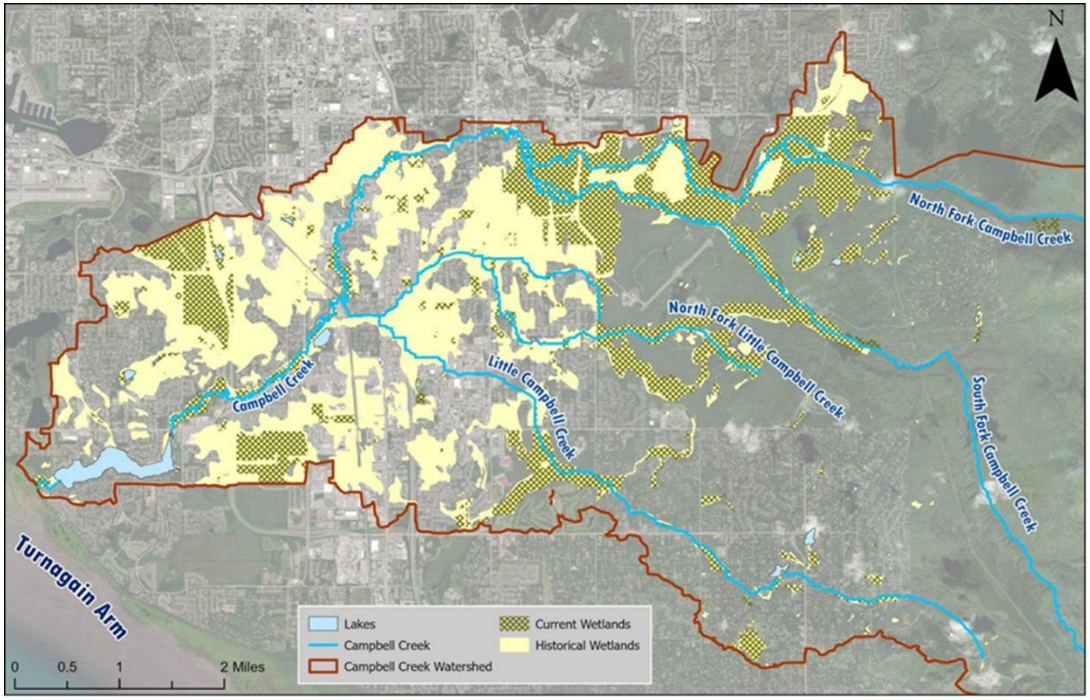

Figure 4: Current & Historical Wetland in the Campbell Creek Watershed

3.6 Land Use and Population Density

Today's Campbell Creek Watershed encompasses a range of land uses, from undeveloped open spaces to dense urban development. Figure 5 shows the primary land uses across the mid and lower portions of the watershed. Land use mapping for the upper portion of the watershed does not exist, but the upper area is comprised nearly entirely of undeveloped open space and mountainous areas.

In the developed portions of the watershed, population density ranges from less than 1,000 to greater than 7,500 inhabitants per square mile. The dense portions of the watershed are concentrated in pockets across the watershed, primarily in west Anchorage, west of C Street, and in southeast Anchorage, east of the Seward Highway and north of Abbott Road.

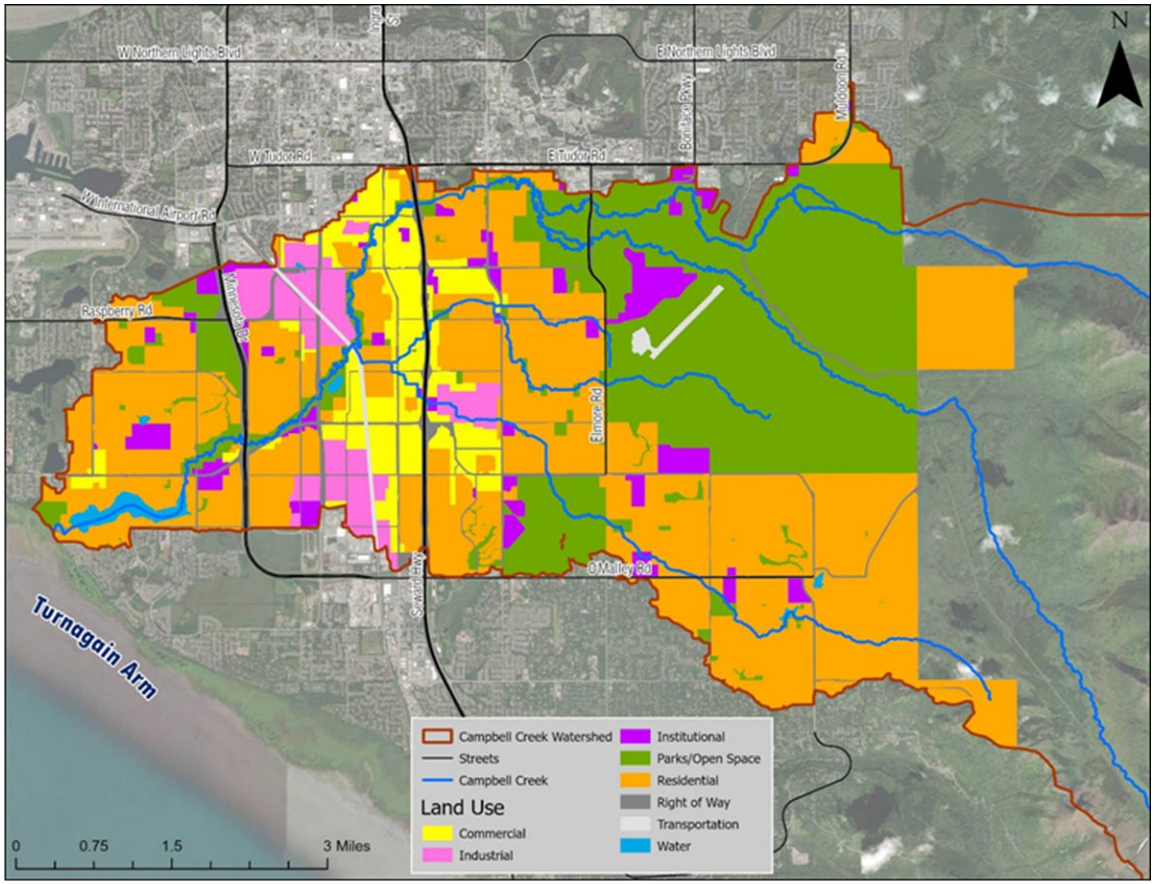

Figure 5: Land Use Categories in the Campbell Creek Watershed

3.7 Impervious Surfaces and Stormwater

When land is developed, the natural hydrologic cycle is disrupted and permanently altered. Clearing and grubbing removes the vegetation that intercepts, slows, and returns rainfall to the air (through evaporation and transpiration). Grading flattens hilly terrain and fills in natural depressions that slow and provide temporary storage for water. The topsoil is scraped and removed, and the remaining subsoil is compacted. Rainfall that once seeped into the ground now runs off the surface. Impervious surfaces (buildings, roadways, parking lots, etc.) reduce natural infiltration and increase runoff. These surfaces reduce the amount of water that infiltrates into the soil and recharges groundwater aquifers. More water runs off the land surface and into receiving creeks, thus increasing the water flow velocity and discharge quantity. This may result in increased flooding, bank erosion, and channel incision.

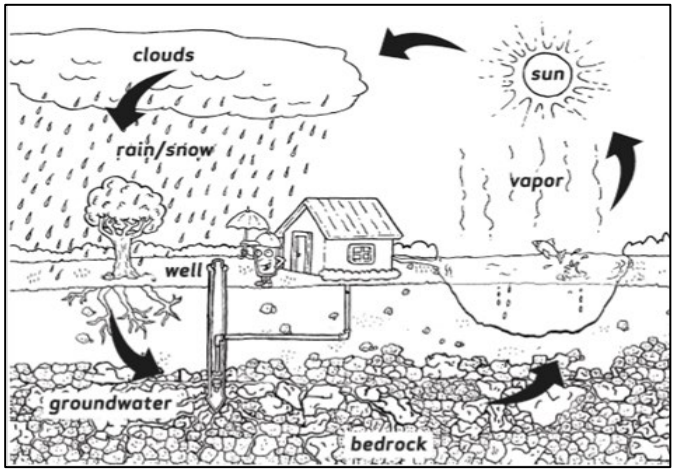

Figure 6: Hydrologic Cycle (US EPA)

Urbanization affects not only the quantity of stormwater runoff but also its quality. Development increases both the concentration and the pollutants carried by runoff. As stormwater runoff flows over rooftops, lawns, roadways, and other surfaces, it picks up and transports contaminants and pollutants to water bodies. Losing the original topsoil and vegetation removes a valuable filtering mechanism for stormwater

Figure 7: Urban Stormwater Runoff (US EPA)

runoff that can help treat and remove contaminants.

The overall Campbell Creek Watershed is estimated to contain only 9% impervious surfaces, as the vast upper reaches of the watershed are undeveloped. However, in the lower, developed portion of the watershed, approximately 50% area is impervious surfaces, as shown in Figure 8.

The impervious surfaces are primarily roads, parking lots, and buildings. In 2018, the MOA implemented new development requirements for stormwater management. These requirements are intended to mitigate additional degradation of watershed quality due to the development of impervious surfaces. Specifically, the requirements include using Low Impact Development techniques and Green Infrastructure facilities to slow runoff and allow pollutants to filter through vegetation before entering the receiving water system. The requirements also encourage the preservation of natural vegetation as a stormwater management technique.

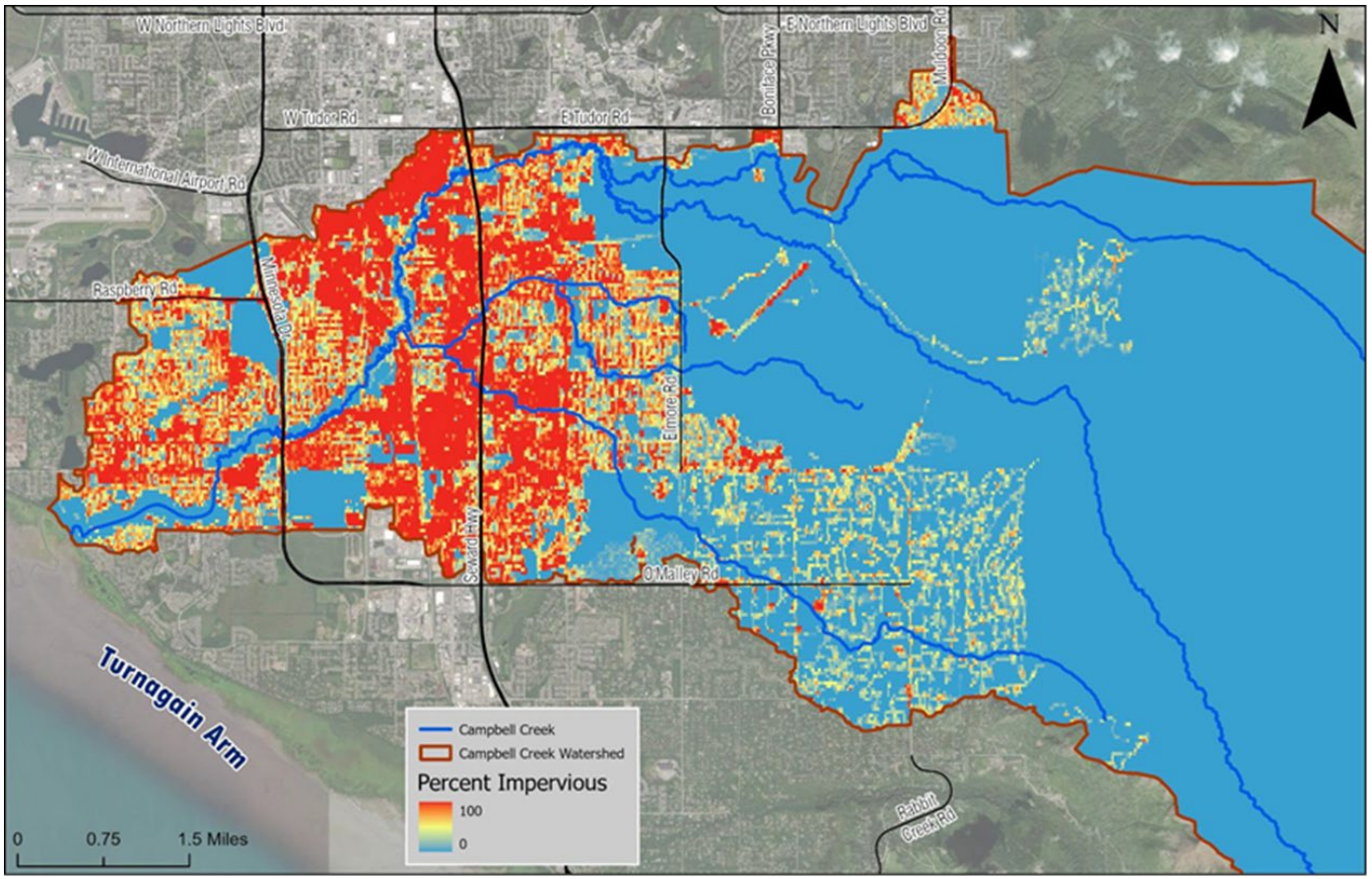

Figure 8: Percent Impervious Cover of the Campbell Creek Watershed

3.8 Channel Habitat

In an undeveloped state, stream channels are bordered by natural vegetation and can meander or straighten across their floodplain. An example of this is an oxbow shown in Figure 9, located northeast of Minnesota Drive and W. Dimond Boulevard. Natural channels can include a diversity of depths and configurations. As a city becomes more developed, natural channels are often modified (moved, straightened, piped, dammed, etc.) to accommodate more room for development. It's essential to understand the impact of channel modification on an ecosystem and future infrastructure planning.

It is estimated that approximately 20% of Campbell Creek channels have been modified by human activity. This was estimated by reviewing historical imagery from the 1950s and 1960s, historical topographic maps from the USGS, and conducting a visual desktop reconnaissance to identify locations where urbanization has caused unnatural stream alignments. The modified areas resulting from this process are shown in Figure 10.

Figure 9: Oxbow in Campbell Creek northeast of Minnesota Dr. & W Dimond Blvd.

Channel modification includes straightening, piping, or realigning the channel from its natural, historic course. Channel modifications have typically occurred to accommodate area development and/or control or alleviate flooding, but over time, significantly altering a watercourse from its natural state is usually detrimental. It disrupts the sediment transport balance of the system, often leading to either degradation (erosion and channel incising) or aggradation (deposits of material in the channel). It also harms wildlife by removing and/or damaging riparian buffer areas, which are crucial to terrestrial animal movement and survival, as well as restricting the movement of aquatic organisms by creating barriers to passage.

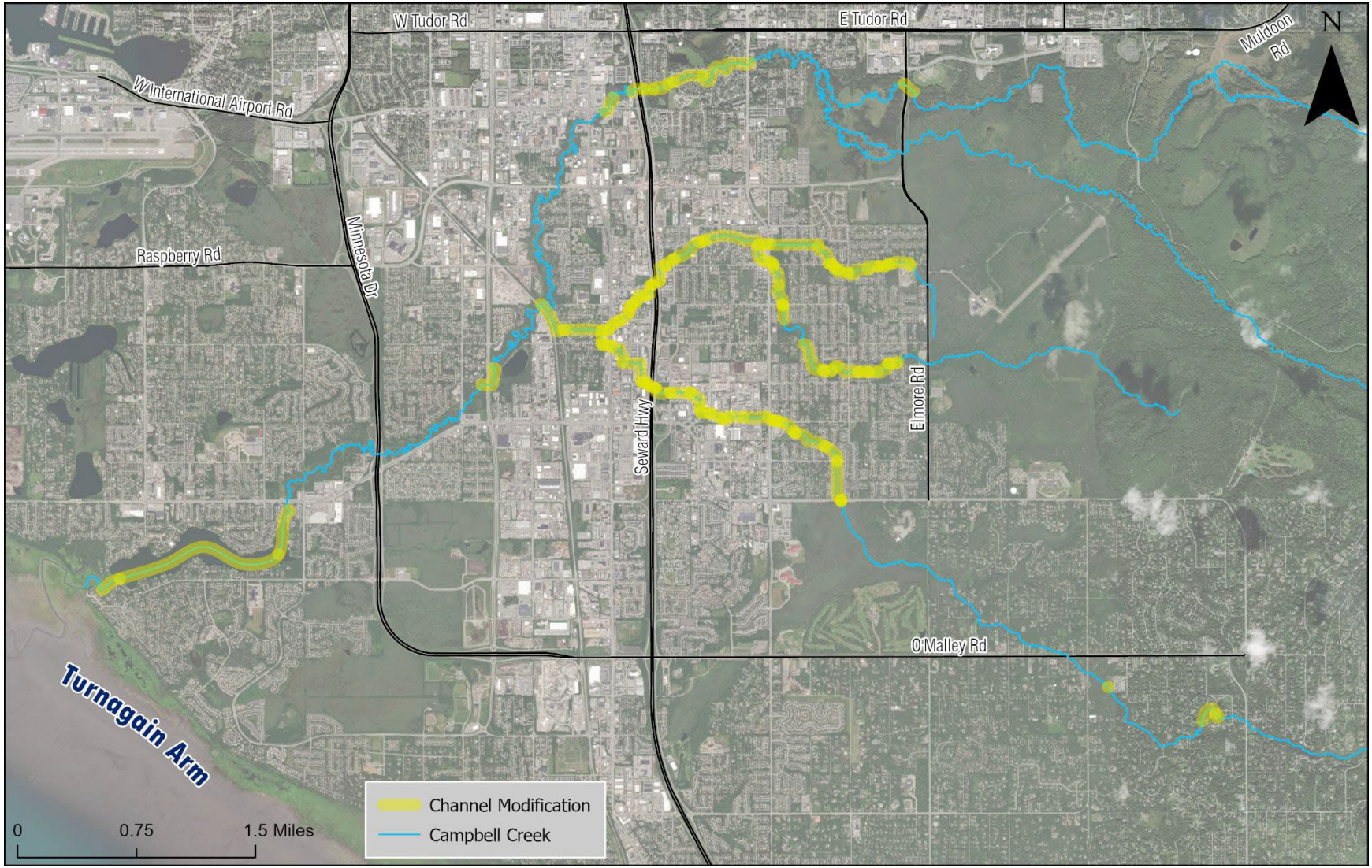

Figure 10: Areas of Channel Modification on Campbell Creek

4. Watershed Issues

Important watershed issues have been identified through past investigations and studies, discussions with stakeholders, and review of existing data. The existing issues generally fell into one of the following categories:

- Water Quality
- Water Quantity
- Vegetation
- Wildlife Habitat
- Fish Habitat
- Socioeconomic Issues

4.1 Water Quality Concerns

Campbell Creek offers a diverse wildlife habitat and aquatic recreational opportunities within the community, and maintaining clean water is a priority. The ADEC regulation 18 AAC 70 establishes Water Quality Standards (WQS) for various activities and uses. These water quality standards establish the degree of degradation that may not be exceeded in a water body due to human activity, also referred to as a threshold. These standards aim to maintain waterways and support beneficial uses, such as fish and wildlife habitat, recreation, and water supply, while complying with federal water quality standards.

Campbell Creek is listed on the ADEC Integrated Water Quality Report[9] as Category 4a, meaning it is considered impaired with a recovery plan for fecal coliform bacteria. Water quality testing consistently reports fecal coliform levels in the creek that exceed the threshold levels set by the ADEC WQS. Additionally, there is significant public interest in minimizing other types of pollutants in the creek. Some contaminants of concern are bacteria, hydrocarbons, PFAS, and a recently discovered contaminant, 6PPD-quinone. Various pollutants can originate from both natural and anthropogenic sources, including wildlife, pet waste, vehicle emissions, exposed sediment from construction activities, pesticides, herbicides, and de-icing products. Stormwater management and minimizing water quality degradation in the creek are high priorities for the community.

4.1.1 Illicit Discharges

Illicit discharges are any discharge to a storm drain not entirely composed of stormwater. These discharges are defined by measurable flows during dry weather and may contain pollutants and/or pathogens. These pollutants then travel through the storm drains and empty into Campbell Creek. With the variety of land uses and population densities throughout the watershed, several contaminants have the opportunity to enter the creek waters. The Campbell Creek Watershed requires ongoing monitoring, prevention, and cleanup efforts to prevent these contaminants from entering the watershed.

4.1.2 Chemical Concerns

A recent discovery has been made of a contaminant called 6PPD-quinone. The organic chemical called 6PPD is widely used as a stabilizing compound in rubbers. It is commonly used in vehicle tires to prevent breaking down due to reactions with ozone and other reactive oxygen compounds in the air. When 6PPD reacts with ozone, it produces 6PPD-quinone. As tires break down over time, the 6PPD-quinone is released into the environment, and stormwater can carry this pollutant to creeks, lakes, and rivers. Recent research indicates that 6PPD-quinone is toxic to fish, and particular species, such as coho salmon, are particularly sensitive to this pollutant. In 2021, the *Science*[10] journal published an article discussing the death of coho salmon in the Pacific Northwest following exposure to 6PPD-quinone in stormwater runoff.

Another manufactured chemical group of concern is PFAS (*per- and polyfluoroalkyl substances*). These have been widely used in residential, commercial, and industrial products since the 1940s. There are thousands of different PFAS compounds in use today. PFAS tend to break down extremely slowly and can accumulate in soil, air, and water over time, resulting in harmful health effects for humans, fish, and animals.

4.1.3 Homeless Camp Impacts

Anchorage is currently experiencing a high amount of homelessness across the municipality. Homeless camps have appeared along Campbell Creek in several locations, raising concerns about the quality of the stream water. Large amounts of trash, human feces, and inorganics have entered the creek, polluting and altering the ecosystem. Campbell Creek is listed as an impaired water by DEC for fecal coliform, and many residents have health concerns with these high levels of fecal coliform.

4.2 Water Quantity Concerns

As discussed in Section 3.7, development in a watershed can significantly alter the watershed hydrology. Urbanization in the Campbell Creek Watershed comprises much of the backbone infrastructure of our vibrant city, but at the expense of altered creek hydrology. Anchorage wetlands have been filled, natural vegetation removed, and absorbent soils were replaced with pavement, lawns, and roofs. Rainwater runs off the ground instead of soaking in and does so significantly faster than it would in a natural environment. The result is higher peak flows, increased flooding, increased erosion, and reduced groundwater recharge. Pollutants on the ground surface are more readily transported to the creek, instead of being filtered through vegetation or soil as they would in a natural environment.

Management of water quantity, improvement of areas of impaired hydraulic function, and minimization of additional increases in water quantity are priorities for this watershed. Additionally, the MOA is developing a stormwater master plan for this watershed, which will evaluate the hydraulic performance and risk of failure for stormwater infrastructure. This is expected to be available in late 2025.

4.2.1 Urban Development

Urban development also necessitates more locations where the creek crosses roadways and trails. Creek crossings alter natural hydraulics by restricting the flow width of the channel and confining it to the opening size of a culvert or a bridge. This can cause flooding upstream, bank erosion upstream and downstream, and significantly impair wildlife passage, both for fish and animals that commonly travel through the creek beds and riparian areas.

4.2.2 Hydrology

The Campbell Creek Watershed is the largest in the Anchorage Bowl area. The creek is generally quite steep in the upper, mountainous reaches, with slopes generally around 10%. The creek is much flatter near Cook Inlet, with slopes mostly around 1%.

The United States Geological Survey (USGS) maintains a stream gage on Campbell Creek north of Dimond Boulevard, just upstream of Campbell Lake. The gauge period of record is from 1965 to the present. The gauge data show that the average annual discharge ranges from a low of 38 cubic feet per second (CFS) in 1969 to a high of 111 CFS in 2022. Similarly, average daily discharge ranges from a low of 14 CFS in 1971 to a high of 102 CFS in 2009. A graph of the average monthly flow is provided in Figure 11.

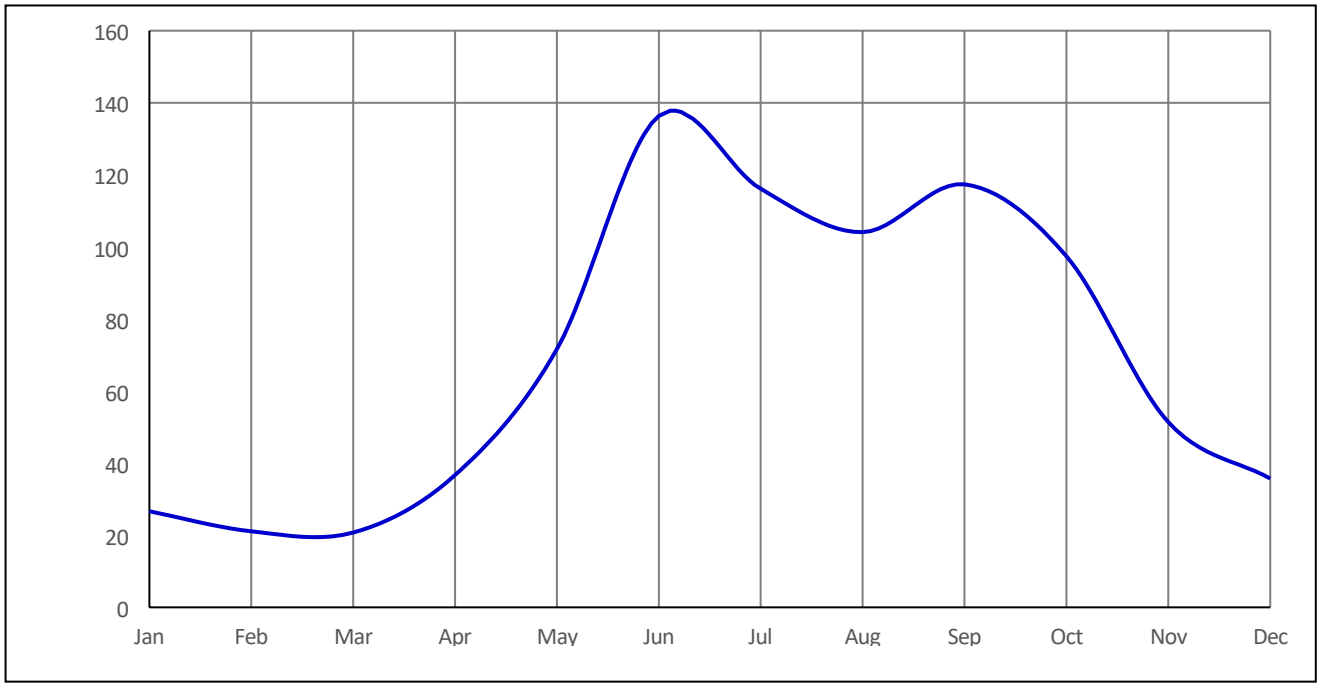

Figure 11: Average Monthly Stream Flow (1965 - 2024)

According to a 2007 Federal Emergency Management Agency (FEMA) report, "[w]hen rain falls in a natural setting, as much as ninety percent of it will infiltrate the ground; in an urbanized area, as much as ninety percent of it will run off"[14]. With the expansion of impervious surfaces, more water drains into Campbell Creek, which can lead to high-water events, such as flooding and bank erosion. The Federal Emergency Management Agency (FEMA) has mapped Special Flood Hazard Areas (SFHA) for the developed portions of the watershed. These are shown in Figure 12. However, the reader is encouraged to check with FEMA for any updates to flood maps after the date of this document.

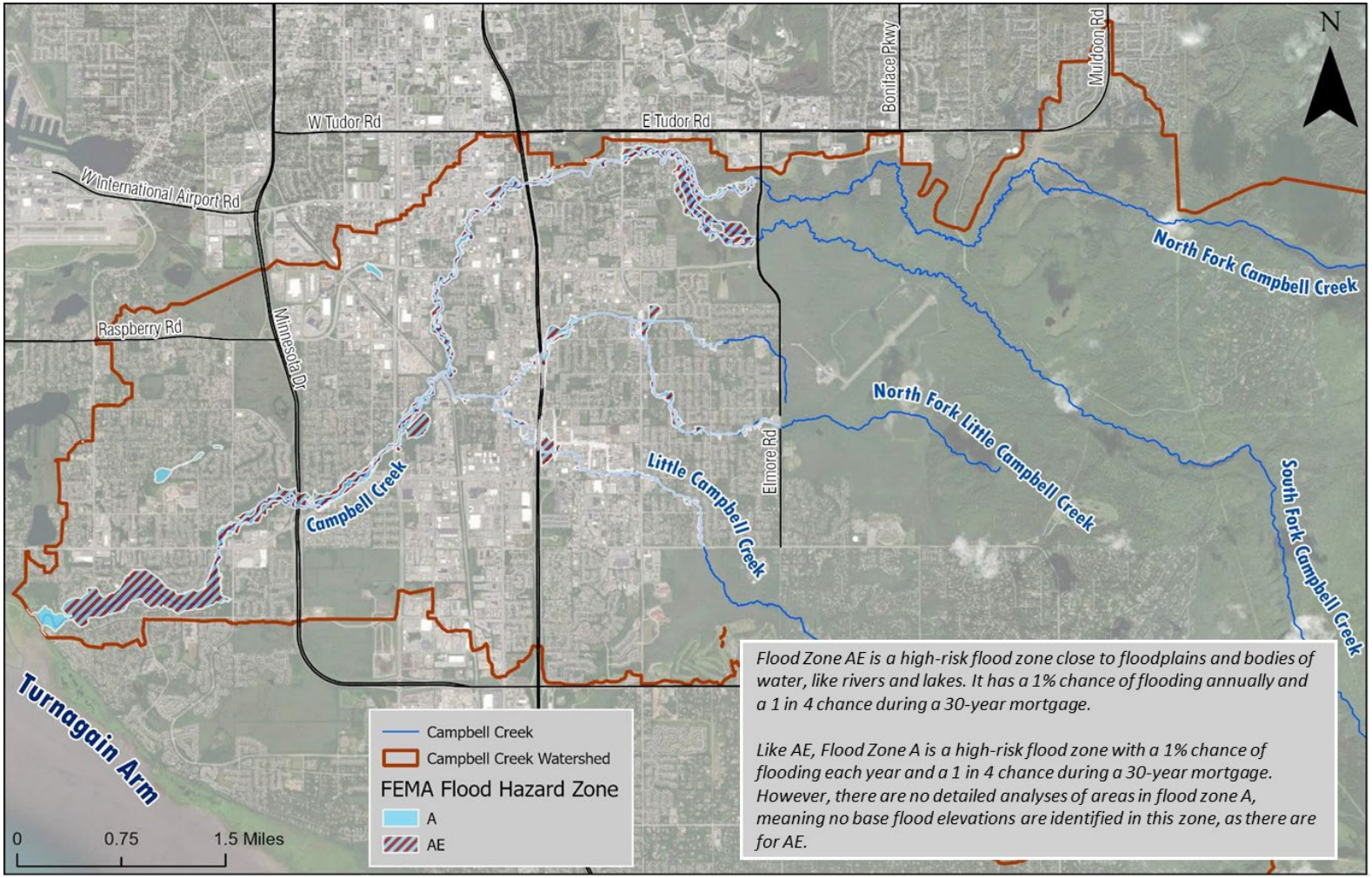

Figure 12: FEMA Mapped SFHAs in the Campbell Creek Watershed

4.3 Vegetation

Undeveloped areas in the watershed comprise a mix of wetlands, forested areas, and shrub/scrub areas at higher elevations. In developed areas, vegetation ranges from manmade lawns to pockets of naturally occurring trees and shrubs.

4.3.1. Riparian Zone

A riparian zone is land immediately adjacent to a creek, lake, or river and often encompasses the floodplain for the water body. A healthy and functioning riparian zone is essential for the overall health of a water body, as it provides natural filtration of pollutants, attenuates flood flows and rainfall runoff, serves as a habitat for wildlife, and offers opportunities for water to seep into the ground and recharge groundwater reserves. In a natural state, the riparian area allows the creek to naturally meander, as most creeks do if not confined by development. In a natural system, the riparian buffer area is typically seven to ten times the width of the creek or river.

The quality of the riparian areas in the Campbell Creek Watershed ranges from excellent to poor. The current Anchorage Municipal Code (AMC) provides setbacks on either side of the creek, where development activities are regulated or restricted (see Section 4.3.2 of the *AMC).* However, in some areas, riparian areas are much broader, offering the full benefits of this valuable zone. This includes all undeveloped areas of the upper watershed sections, as well as pockets of wetlands and parks throughout the watershed. Conservation measures have been implemented to protect the riparian area in certain sections of the creek. For example, the Great Land Trust, a local non-profit, has established the beautiful Campbell Creek Estuary Natural Area on the coast just downstream of Campbell Lake. The estuary is a 60-acre open coastal space with a meadow, wooded areas, and wetlands, and offers visitors walking trails, overlook viewing platforms, and educational signage.

4.3.2 Stream Setbacks

Anchorage Municipal Code of Ordinances (AMC) provides protections and regulations for all watercourses, waterbodies, and wetlands in Anchorage. These ordinances are intended to promote, preserve, and enhance the hydrological, ecological, and aesthetic functions provided by watercourses, water bodies, and wetlands. Natural setbacks protect water quality and quantity, and maintaining natural vegetation prevents erosion, flooding, pollution, and the spread of invasive plants.

Stream setbacks are established for all streams in the municipality and reflect the characteristics and size of the water body. Larger streams required larger buffers than small, channelized streams. Stream setback widths are measured horizontally from the ordinary high-water mark and can be found in *AMC Table 21.07-1*. In some instances, there are some exceptions to stream setbacks, which can be found in *AMC 21.07.020.B.9.c*. In 2014 AMC 21.07 was rewritten to provide larger development setback from streams in order to maintain and promote better water quality, wildlife habitat, and overall watershed health.

4.3.3 Invasive Species

Evidence of several invasive plant species has been observed within Anchorage's watersheds for several decades. The Campbell Creek Watershed now has an established population of *Prunus padus* and *Prunus virginiana*, commonly known as chokecherry, mayday, and European bird cherry, which have widely disrupted the natural vegetation along the channel habitats. An example of chokecherry is shown in Figure 13. These plant species grow quickly, have no pests or diseases in Alaska, and generally, wildlife will not forage on these plants. These species outcompete native vegetation, destroying habitats for wildlife and other organisms that rely on the native vegetation. A list of invasive species found in Anchorage can be found at the Anchorage Cooperative Invasive Species Management Area website.

Figure 13: Chokecherry bush

4.4 Wildlife Habitat Concerns

Campbell Creek and the associated riparian areas provide habitat for a diverse range of Alaska wildlife, including moose, bears, foxes, rabbits, beavers, lynx, ermine, porcupines, small rodents, insects, fish, and many species of birds, including birds of prey. Preserving the rich wildlife habitat provided by the creek and the associated riparian areas is a priority for this watershed. This includes protecting riparian areas and valuable wildlife habitats, as well as maintaining good water quality to support a healthy and vibrant ecosystem.

A key component in promoting and protecting wildlife habitat is ensuring that wildlife can move freely through the creek corridor and maintaining the corridor's connectivity for safe movement. Both road crossings and non-continuous riparian areas can impair wildlife movement. Campbell Creek and its tributaries cross many roads in Anchorage, where culverts and bridges may not be sufficient to allow wildlife to pass. This forces wildlife onto the road and into areas where they may be unsafe. Additionally, some sections of Campbell Creek have no defined riparian area for safe wildlife movement in and around the creek. These areas are more prevalent east of the Seward Highway and west of Lake Otis Parkway, as the creek flows through developed commercial and residential areas.

Another impact on wildlife habitats is the introduction of invasive species, which can displace the native plants essential for wildlife survival. This includes aquatic and terrestrial invasive species, which are further discussed in Section 4.3.3.

The Anchorage 2040 Land Use Plan acknowledges that natural and open spaces, as well as wildlife, are important to Anchorage residents. One of the Plan's goals is to "*preserve and enhance the network of natural open spaces that provide Anchorage's scenery, ecological functions such as water drainage and recharge, diversity of fish and wildlife habitats, and recreational opportunities*." The plan also states that maintaining harmony with our natural settings is another goal: "*Develop in harmony with the natural setting and capitalize on retaining Anchorage's advantage as an attractive place to live and work, which is mindful of critical environmental lands, its northern climate, and natural hazards*."

4.5 Fish Habitat Concerns

Maintaining a healthy fish habitat is a priority for this watershed, and achieving it involves addressing many of the other issues discussed in this document. Fish are adversely impacted by poor water quality, flooding, erosion, road crossing barriers, loss of riparian vegetation, and other factors. Responsible stormwater management, protection of riparian areas, minimization of invasive species, controlling runoff quantities, and ensuring clean water are all critical for the health and vitality of the fish that make Campbell Creek their home.

4.5.1 Roadway Crossing Issues

There are over 100 roadway crossings on Campbell Creek and its tributaries, comprised of culverts and bridges. If not properly designed and constructed, roadway crossings can become barriers to fish, limiting their movement through the creek corridor. Poorly designed and installed road crossings can also cause erosion and channel instability. The Alaska Department of Fish and Game (ADF&G) maintains an inventory of roadway crossings and their ability to safely pass fish, using juvenile salmon and generally weak swimming fish as a benchmark for passage. Summaries of the existing roadway crossings in the watershed and their current ADF&G fish passage ratings are in Table 3 and displayed in Figure 14. Culverts rated red and gray are concerning for fish passage, and replacement/upgrading of these crossings would be beneficial.

Table 3: Red & Gray Rated Crossings Along Anadromous Sections of Campbell Creek

Creek Branch	Road	Size	ADF&G Rating
North Fork Campbell Creek	Unnamed Rd	40-inch diameter w/ four 18-inch diameter overflow pipes	Red
	Campbell Airstrip Rd	Two 72-inch x 48-inch pipe arches	Red
North Fork Little Campbell Creek	Spring Pl	Two 36-inch diameter pipes	Red
	Briarwood St	60-inch x 48-inch pipe arch	Red
	Meadow St	Two 48-inch x 36-inch pipe arches	Red
	Askeland Dr	72-inch x 42inch pipe arch	Gray
	Lake Otis Pkwy	Creek in storm drain pipe	Red
	East 68th Ave	36-inch x 24-inch pipe arch	Red
	Snow View Dr	Two 54-inch x 36-inch pipe arches	Gray
Little Campbell Creek	East Dimond Dr	Two 36-inch diameter pipes	Red
	Near East 84th Ct	Creek in storm drain pipe	N/A
	Golden Spring Cir	Two 24-inch diameter pipes	Gray
	Spring Hill Dr	Two 24-inch diameter pipes	Red
	Our Rd	72-inch x 36-inch	Red
	Driveway off of Our Rd	24-inch diameter pipe	Red
Lower Campbell Creek	Campbell Lake Outlet	Two 132-inch x 72-inch pipe arches	Gray

The ADF&G ratings are defined as follows:

Red: the crossing is assumed to be inadequate for juvenile salmonid/ weak swimming fish passage
Gray: the crossing may be insufficient for juvenile salmonid/ weak swimming fish passage
Green: crossing assumed to be adequate for juvenile salmonid/ weak swimming fish passage
Black: unable to rate or culvert has been replaced and not reassessed

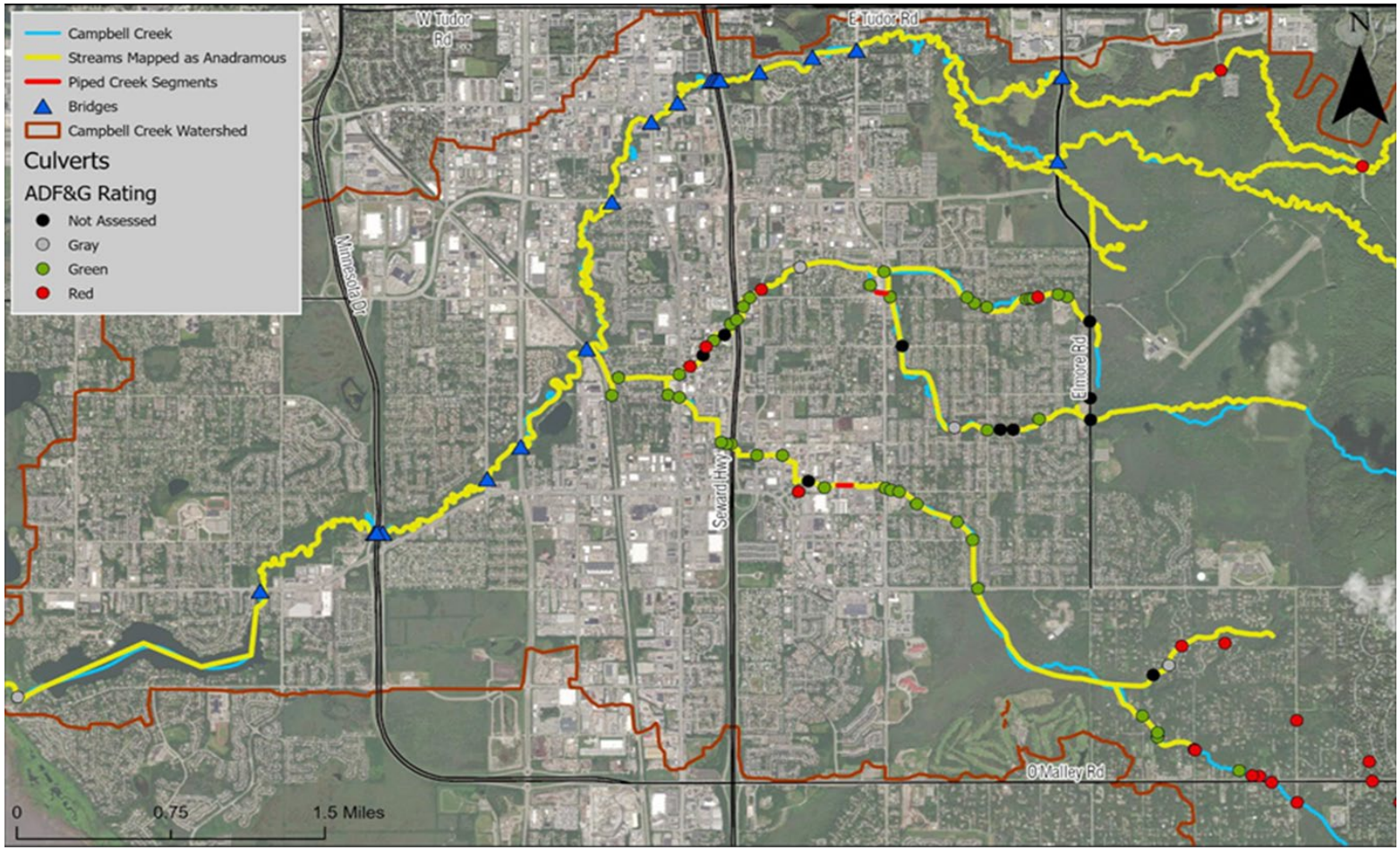

Figure 14: Road Crossings and Fish Passage along Campbell Creek

4.5.2 Water Quality & 6PPD

Fish habitat is also impacted by water quality. One issue of concern for fish habitat is the recently discovered contaminant 6PPD-quinone. Unfortunately, there is still limited information about the toxicity and long-term impacts of 6PPD in the environment. The EPA has noted that research is currently being conducted regarding the effectiveness of 6PPD removal through stormwater treatment practices such as Green Infrastructure. In 2023, the American Chemical Society published research findings from the University of British Columbia regarding the effectiveness of bioretention facilities in removing 6PPD from stormwater. The study found that the tested stormwater bioretention facilities could effectively mitigate more than 90% of the 6PPD loading to the stream for typical storm events, generally less than the 2-year return period. The study recommended that "stormwater managers and other environmental stewards redirect stormwater away from receiving waters and into engineered green infrastructure systems such as bioretention cells." These results strongly support the continued use and prioritization of Green Infrastructure for new and redevelopment projects in the Campbell Creek Watershed.

4.6 Socioeconomic Concerns

The Campbell Creek Watershed offers various recreational activities, including wildlife viewing and fishing opportunities. The creek provides access to Alaskan wildlife and offers unique experiences in the heart of Anchorage, making it a valuable asset to the community. The creek and its associated lakes are widely used for activities such as rafting, tubing, kayaking, swimming, wading, and paddleboarding. These water-contact recreational activities introduce opportunities for inhalation or accidental water ingestion, further emphasizing the importance of maintaining clean water in the creeks and lakes.

Another popular feature of the creek corridor is the Campbell Creek trail, which generally follows the creek alignment from Tudor Road to Dimond Boulevard. This paved trail is widely used for non-motorized sports such as walking, biking, jogging, skating, dog walking, skiing, and skijoring. The trail also provides easy access to the creek itself for anglers, tubers, and swimmers.

The Campbell Tract Special Recreation Management Area, as shown in Figure 15, is a jewel for Anchorage residents

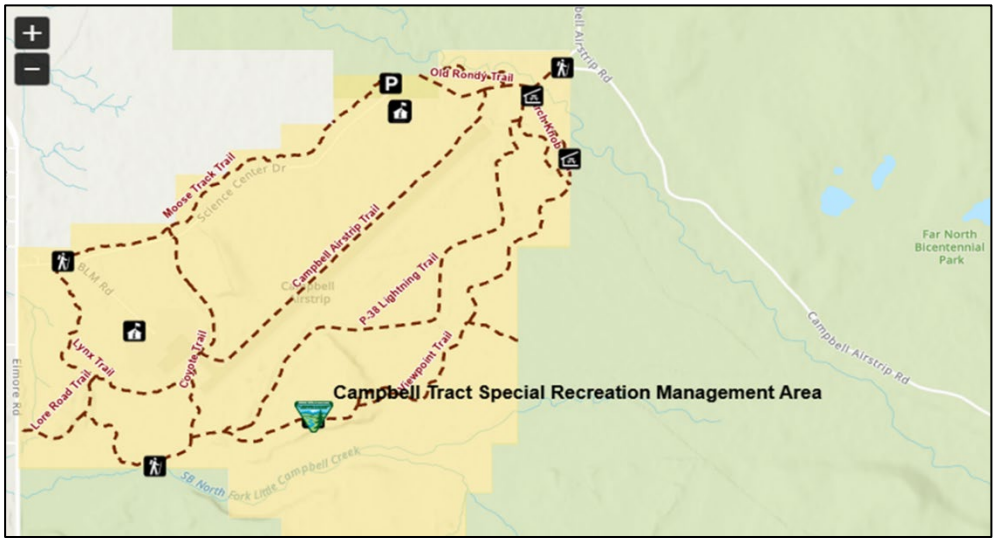

Figure 15: Campbell Tract Special Recreation Management Area.

seeking to recreate in the Campbell Creek watershed. The trail systems offer fantastic biking and skiing opportunities for people of all ages. It is an excellent location to connect with friends for healthy outings, and it is a great spot to explore a relatively pristine area of Campbell Creek, observe a variety of wildlife, and witness the spawning activities of a wild king salmon run. The BLM placed a 99-year lock on the Campbell Tract around the year 2000 to ensure residents could enjoy this open space treasure for the next century, and Anchorage is lucky to have it without having to defend its existence for years to come.

While the trail is a tremendous asset, it also presents several challenges. Heavy foot traffic in some areas has caused bank erosion and damage to bank vegetation. Litter and unmanaged pet waste can also introduce additional pollutants into the creek. The Anchorage Waterways Council (AWC) promotes clean creeks through annual stream clean-up days, where volunteers gather to pick up trash along the creek. AWC also has an ongoing “Scoop the Poop” campaign to educate pet owners about the harmful effects of unmanaged pet waste and to provide pet waste disposal stations throughout Anchorage, making it easier for trail users to pick up after their pets.

In recent years, Anchorage has experienced increasing issues with homelessness and homeless camps. This issue is both complex and has far-reaching impacts. One impact is the increased presence of homeless camps along the creek corridor, accompanied by the presence of trash and feces, which concerns both water quality and the safety of humans and wildlife. This issue is discussed further in Section 5.4.

5. Actions

The strategies outlined in this section have been developed to address the issues presented in Section 4 and to achieve the highest priorities of the Campbell Creek Watershed Plan's vision, mission, and goals. The strategies are organized into the same categories, individual or combined, as the issues presented in Section 4 of this plan. They include Water Quality and Quantity, Vegetation, Wildlife Habitat, Fish Habitat, and Social and Economic strategies. For each category of issues, the plan provides a goal, an actionable objective, and specific actions that can be taken to activate the goals and objectives. This list is not all-inclusive. Instead, it is a compilation of actions that the project stakeholders deemed high priorities for the watershed.

5.1 Water Quality and Water Quantity

Water quality and water quantity have essential and inseparable connections in watershed management. Where flows in streams or drainage systems and storm pipes are unattenuated, they can scour the lands they travel across, picking up debris and acting as conduits for solid waste and dissolved pollutants into receiving systems. Land use is a major factor contributing to the types of pollutants we see. In the Campbell Creek Watershed, a combination of residential, commercial, and light industrial activities is present.

5.1.1 Green Infrastructure

Green infrastructure has emerged as the most suitable approach to address these impacts. Anchorage has developed design criteria in its stormwater guidance, emphasizing green infrastructure as the required method for managing drainage associated with development. Beyond the new development area, where end-of-pipe controls have traditionally been applied in the form of sediment basins and oil and grit separators, Anchorage has developed a goal to use green infrastructure where it can reasonably be included. Green infrastructure is a runoff management approach that uses, enhances, and mimics the natural hydrologic cycle processes of infiltration, evapotranspiration, and reuse.

To this end, WMS is currently developing a Campbell Creek Green Infrastructure Opportunities report to guide the implementation of the goal. The project identified potential sites in the watershed that could benefit from disconnecting outfalls, adding bioretention facilities, utilizing porous pavers, and other techniques. This effort helps lessen the impacts of impervious surfaces and urban runoff.

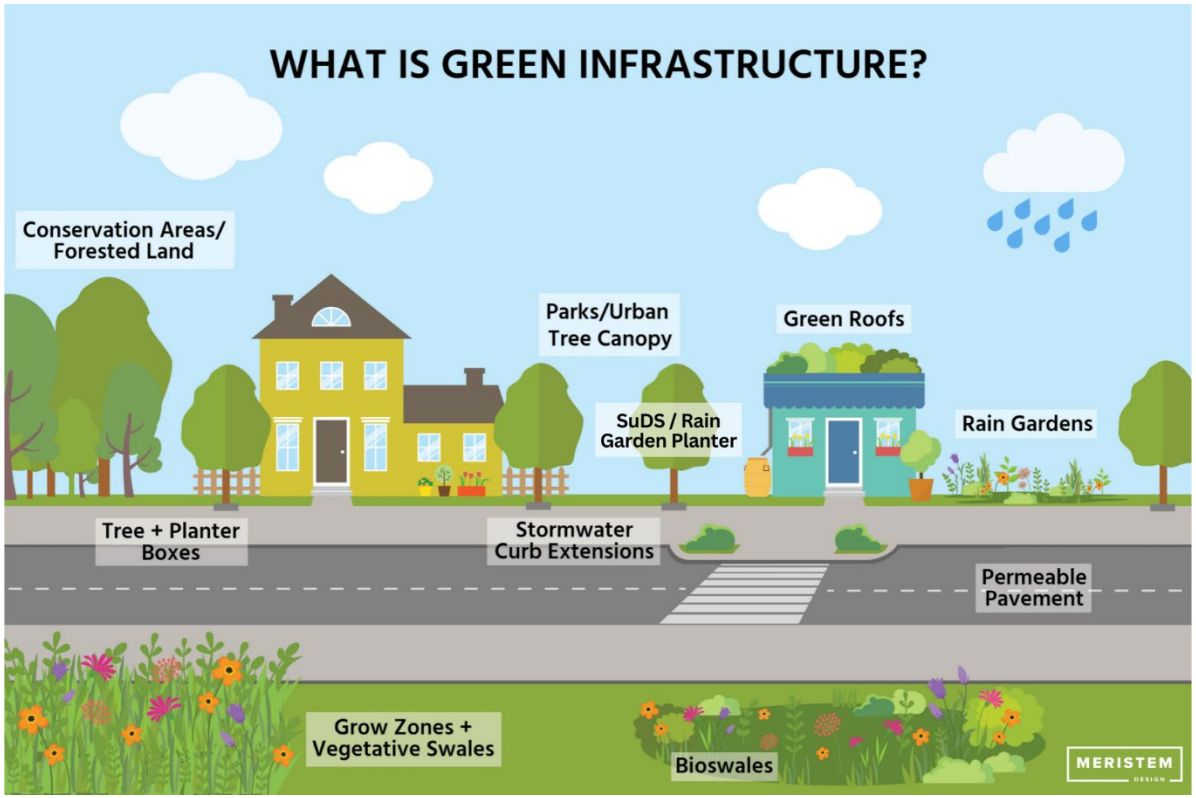

Figure 16: Green Infrastructure Examples

5.1.2 Water Quality Monitoring

Water quality monitoring on Campbell Creek and its tributaries is currently performed as part of the Municipal Separate Storm Sewer System (MS4) program. Two types of monitoring are performed: Dry weather screening and stormwater outfall monitoring. Additional volunteer water quality monitoring has also been conducted on Campbell Creek through volunteer groups such as the Anchorage Waterways Council (AWC).

Dry weather screening is conducted during periods of no rain to detect potential illicit discharges that may be entering the creek. An illicit discharge is defined as any discharge to the MS4 that is not entirely composed of stormwater (*some exceptions are described in Part 1.4 of the MS4 Permit*). In Anchorage, flow from outfalls during dry weather is frequently an indicator of groundwater infiltrating the storm pipe rather than illicit discharges or illegal connections to the MS4. Field screening techniques gather baseline information and identify highly suspected outfalls or obvious discharges.

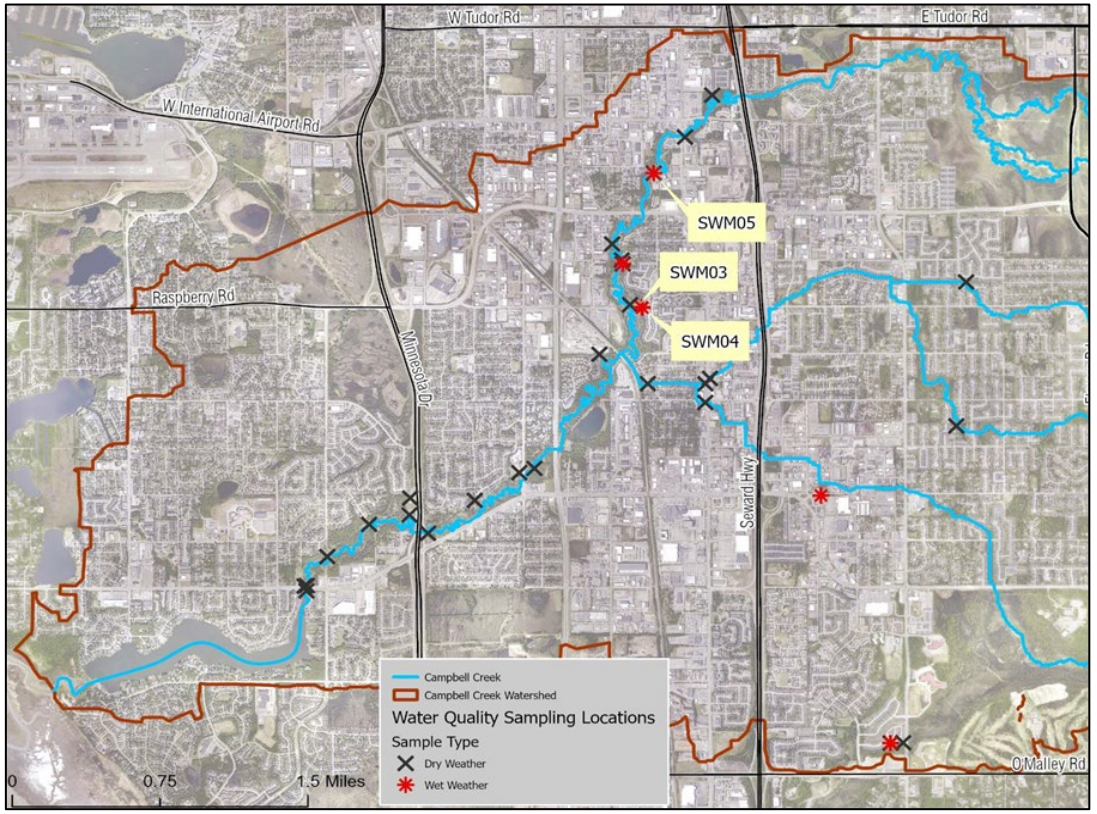

Figure 17: Water Quality Sampling Locations in the Campbell Creek Watershed

Stormwater outfall monitoring is conducted during periods of active rainfall to characterize the quality of stormwater discharged into U.S. waters. Storm drains that discharge to the MS4 can introduce pollutants, such as fecal coliform and petroleum products, in runoff from commercial and industrial facilities, residential areas, and even parks. This monitoring is designed to characterize the quality of the stormwater discharging to the MS4. A map of the sample locations is provided in Figure 17. Table 4 provides a list of parameters tested at each location. Sampling occurs during measurable rainfall events when pollutants from contributing areas should be mobilized.

Table 4: Wet Weather Monitoring Parameters in Campbell Creek

Outfall ID	Parameter											
	Flow	Conductivity	pH	Temp.	Dissolved Oxygen	BOD*	Fecal Coliform	Total Suspended Solids	Hardness	Dissolved Copper	TAH*	PAH*
SWM03	X	X	X	X	X	X	X	X	X	X		
SWM04	X	X	X	X	X	X	X	X	X	X		
SWM05	X	X	X	X	X	X	X	X	X	X	X	X

**BOD: Biochemical Oxygen Demand, TAH: Total Aromatic Hydrocarbons, PAH: Polycyclic Aromatic Hydrocarbons*

Water quality results from stormwater outfall monitoring vary from year to year and from storm to storm. Water quality in Campbell Creek typically meets the ADEC water quality standards for pH, temperature, turbidity, dissolved oxygen, biochemical oxygen demand (BOD), total dissolved solids, total suspended solids, and dissolved copper. Fecal coliform concentrations generally exceed water quality standards, and Campbell Creek is listed as an impaired water body by ADEC with a TMDL for fecal coliform.

Fecal coliform is a type of bacteria found in the intestinal tracts of humans and other warm-blooded animals. Fecal coliform may be entering the creek from various anthropogenic and natural sources. Examples include unmanaged pet waste, leaking or faulty septic systems, sewer overflows, illegal camping, improper waste disposal, and urban wildlife. When stormwater encounters these wastes on urban impervious surfaces, such as roads and sidewalks, bacteria are washed away and can enter the receiving creek. Large quantities of fecal coliform in waterways increase the risk of other waterborne pathogens negatively impacting human and wildlife health, as well as the environment.

Fecal coliform has been a historic issue in Campbell Creek. In 1981, ADEC reported that “Campbell Creek, below its confluence with Little Campbell Creek, and Campbell Lake at its outlet, experienced chronic levels of fecal coliform contamination. These levels violated Alaska Water Quality Standards (AWQS) for all use purposes at the Campbell Lake outlet and for contact recreation below the confluence with Little Campbell Creek[12].” This resulted in the cancellation of the 16-year summer tradition of the Campbell Creek Classic in 1985 because untreated sewage in the creek seriously compromised water quality. This classic event was a raft, canoe, and kayak race down Campbell Creek, drawing large crowds into the creek each summer. The race cancellation prompted attention to the issues of polluted creeks from local, state, and federal agencies. Water quality sampling began regularly by the Alaska Department of Health and Human Services (DHHS), ADEC, and the U.S. Geological Survey (USGS).

A 2003 study by WMS, entitled "Fecal Coliform in Anchorage Streams: Sources and Transport Processes," found that the primary source of elevated fecal coliform bacteria concentrations in Anchorage streams is of animal (non-human) origin. Since then, WMS has worked with the Anchorage Waterways Council to educate the public on fecal coliform issues. An annual event called Scoop the Poop is promoted to clean up animal waste along trails, within parks, and other areas with the municipality. This cleanup effort has helped manage fecal coliform Total Maximum Daily Loads (TMDLs) for streams and creeks.

5.1.3 Low Impact Development

Water quantity management, which involves minimizing additional increases in water quantity, is a priority for this watershed. One way this can be accomplished is by creating Low Impact Development (LID) projects, with the goal of mimicking the natural water cycle that existed at the site before it was developed. LID is an innovative stormwater management approach with a fundamental principle modeled in nature: managing rainfall at the source through uniformly distributed, decentralized, small-scale controls. In essence, it works to establish a more natural water cycle. The MOA continues to review new and retrofit development projects to advise on LID during the design and construction phases.

5.2 Vegetation

Watershed Management has collaborated with the MOA Parks & Recreation and Anchorage Soil and Water Conservation District (ASWCD) programs in an aggressive management program for invasive species in stream corridors and their watersheds. Discussions leading to this work moving forward centered on methodologies of herbicide application and the need to prevent chemicals from entering the water. We arrived at a workable process that excludes aerial herbicide spraying, and the ADEC has approved the selected methods through their General Permit program.

ASWCD's work primarily focuses on the highly invasive bird cherry but is expanding to address other species as resources are available. Their work plan for control efforts involves the removal of invasive species by hand-pulling, mechanical wrenching, cutting while leaving roots in place, or otherwise killing individual trees and shrubs with herbicides, provided that sufficient native plants remain to prevent soil erosion and promote recolonization by native species. The herbicide is an EPA-registered aquatic formulation labeled for use at such a site. It is applied by an ADEC-Certified Pesticide Applicator to individual stems or trunks of *Prunus padus* or *Prunus virginiana* using frill-and-squirt, cut-stump-treatment, or stem injection methods. All other federal, state, and municipal rules regarding herbicide use are strictly followed, including compliance with the herbicide label, permitting requirements, record-keeping, and notifications.

Much of Campbell Creek winds through a wide vegetative buffer of open space, and wildfires and nuisance fires are a danger to the community and the integrity of the creek greenbelts. Two entities primarily provide land use management in the Campbell Creek watershed: the Anchorage Fire Department (AFD) and the Bureau of Land Management (BLM).

The AFD has found that 96% of fires in Anchorage are human-caused, including those in the Campbell Creek greenbelt. The vegetated buffer hosts a large group of unhoused and transient individuals. City officials clear the wooded areas of people living in them, but fires are periodically started and can quickly get out of hand. The AFD responds quickly; only a few acres have burned. Weather plays a strong role in the frequency and severity of wildfires. Winds can exceed 80mph on the hillside where the South Fork originates, and a spark could ignite and burn hundreds of acres. A Community Wildfire Protection Plan lays out a strategy for reducing hazardous fuels. It examined species composition, horizontal and vertical density of vegetation, and soil characteristics to model areas for predictive fire behavior. Wildfire mitigation officers then use the results to perform selective thinning and maintenance. Figure 18 identifies maintenance areas within the Campbell Creek Watershed.

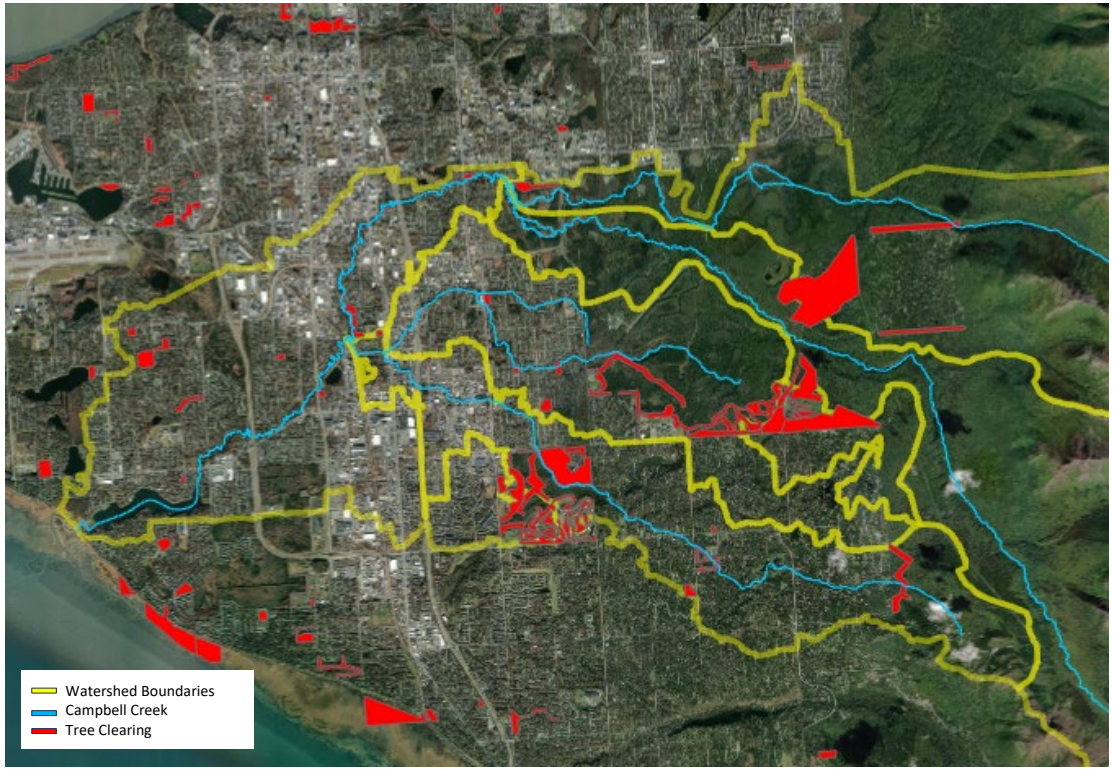

Figure 18: AFD Wildlife Fuel Breaks

The BLM's current policy for fire risk management on public lands, including Anchorage, is to manage vegetation around rights-of-way, particularly electric transmission lines. The BLM Campbell Tract Special Recreation Management Area has a strict policy prohibiting camping or building fires within the area's boundaries.

5.3 Fish and Wildlife Habitat

Preserving the rich fish and wildlife habitat provided by the creek and the associated riparian areas is a priority for this watershed. This includes protecting valuable riparian areas and habitats, as well as maintaining good water quality to support a healthy and vibrant ecosystem. WMS works closely with habitat biologists from ADF&G to control excessive erosion and sediment inputs into the creek. Watershed Management will continue to participate in bank rehabilitation projects to increase riparian vegetation and provide stable corridors for wildlife movement. Watershed Management will recommend upgrading culverts to maintain adequate fish passage and incorporating animal passages in new or retrofit projects at road crossings.

5.4 Socioeconomic Opportunities

The Campbell Creek Watershed has an extensive trail and park system that has already been established. Campbell Creek is a valuable asset to the community; therefore, WMS partners with the Anchorage Waterways Council (AWC) to promote public education and involvement in maintaining a clean and healthy creek. WMS and AWC promote public education on stormwater by focusing on various topics that affect water quality. The primary issues have been, and continue to be, pet waste, waterfowl feeding, invasive species, yard treatments, disposal of green waste, snowmelt products, vehicle repair, car washing, plastics, monofilament fishing line, trash, litter, and illegal dumping into storm drains. Annual events, such as Scoop the Poop and Creek Cleanup, are highly successful in maintaining a healthy creek for various recreational uses, wildlife viewing, and fishing opportunities. For more information on the AWC & WMS partnership, refer to the 2024 Stormwater Outreach, Public Education, and Involvement report on the Watershed Management website.

While the trail system is a tremendous asset, some challenges occur. Heavy foot traffic has caused erosion and damage to the bank vegetation in several areas. WMS works closely with MOA Parks & Recreation and ADF&G to reestablish damaged vegetation along these corridors. The Youth Employment in Parks (YEP) program within Park & Recreation teaches teens valuable skills in natural resource management and recreation by building trails, restoring stream banks, and conducting other park improvements. WMS will continue to work with Parks & Recreation and target areas for improvement within the Campbell Creek Watershed.

The Municipality promotes compatible development within the watershed. Ordinances have been established to protect stream setbacks to at least 25 feet and 50 feet in some areas when development occurs near Campbell Creek. WMS collaborates with developers during the planning phase to ensure the protection of the stream setback and that proper stormwater controls are implemented. During development, the MOA also has regulations that all run-offs must be contained onsite and treated before they are allowed to leave the site. With these ordinances in place, minimal impacts occur to the watershed.

In recent years, Anchorage has experienced increasing issues with homelessness and encampments. This issue is highly complex and goes beyond the capabilities of WMS. There has been an increased presence of homeless camps along the Campbell Creek corridor, which produce a lot of trash along with human feces, which are a concern in water quality and human safety. The MOA is expanding the cleanup of parks and trails and increasing abatement efforts to the maximum extent allowed by law. Public parks, trails, and spaces must be safe and accessible. The MOA has dismantled 23 camps and will enforce the law to address public safety and health threats in our community. Enforcement of crimes like theft, trespassing, and drug use is an action item the MOA is pursuing to mitigate the impact of the homeless encampments. WMS is committed to supporting these efforts when possible.

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