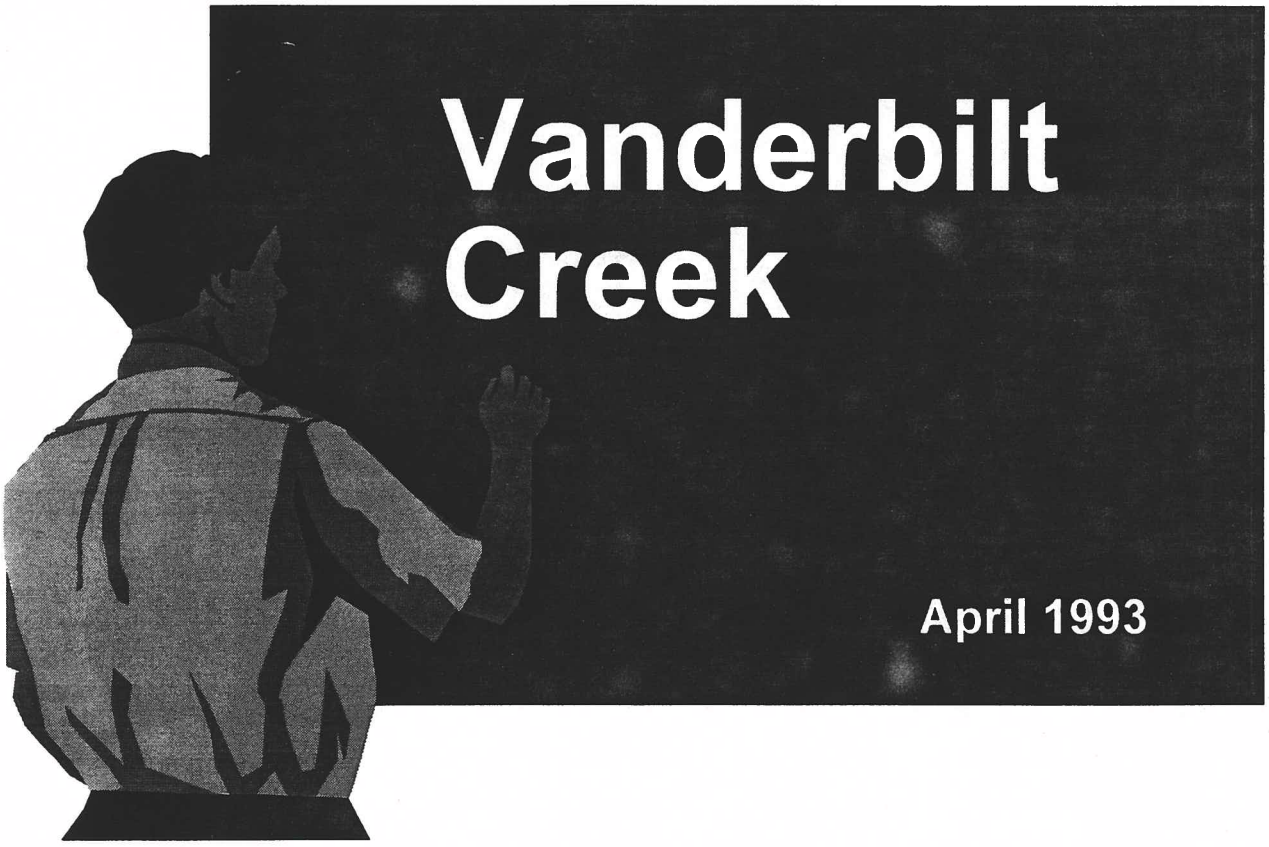
Alaska TMDL waterbody assessments

Alaska Department of Environmental Conservation
Environmental Protection Agency, Region 10

ADEC

Water Quality Assessment



Vanderbilt Creek

April 1993

Waterbody Assessment
Alaska Department of Environmental Conservation

VANDERBILT CREEK

Background Information

Geography

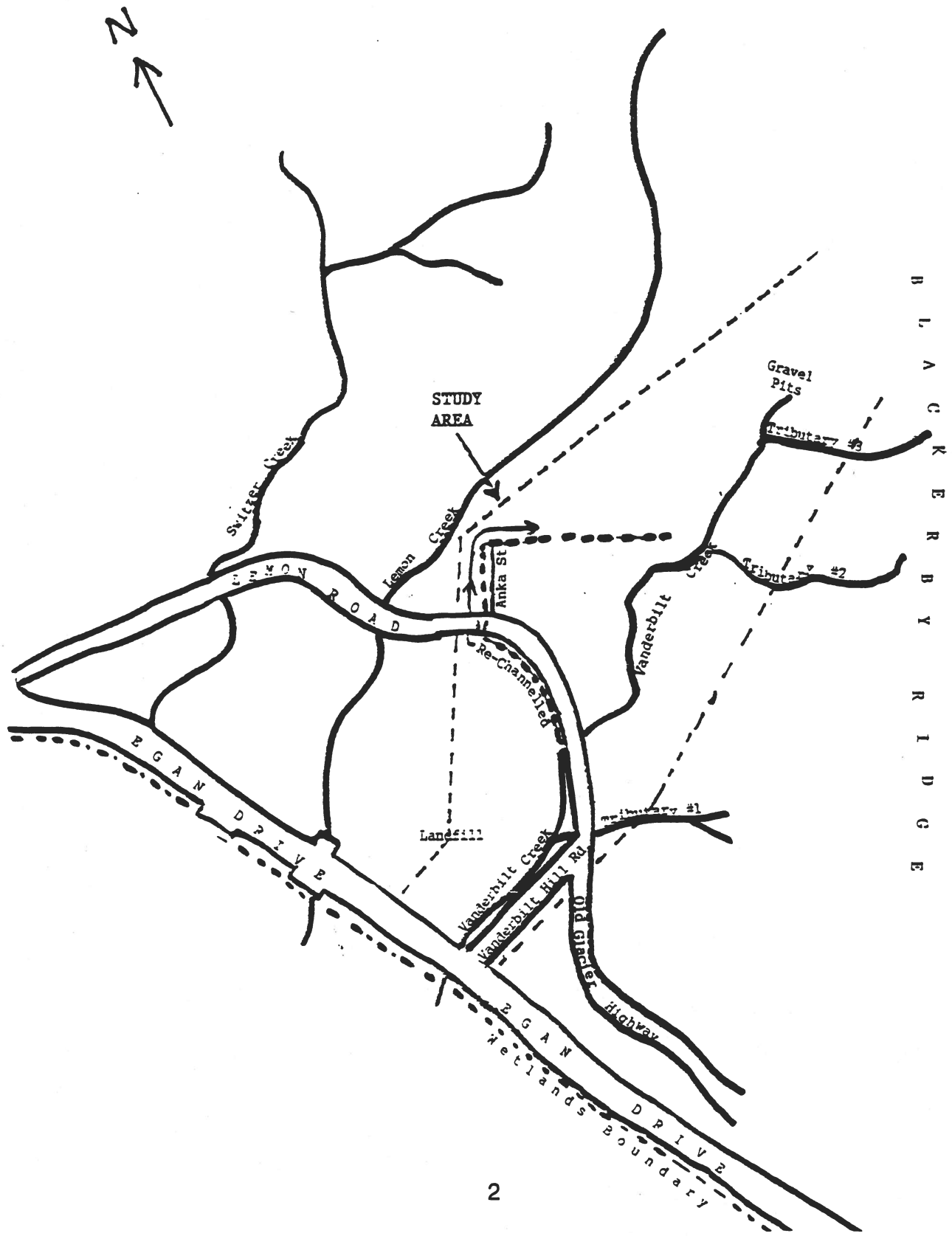
The area of concern is located in Lemon Creek Valley, about 5 miles northwest of downtown Juneau. The Lemon Creek Valley watershed is drained by three streams, Lemon Creek, Switzer Creek and Vanderbilt Creek. The drainage of Vanderbilt Creek includes the eastern side of Lemon Creek Valley and Blackerby Ridge. The study area comprises all of Vanderbilt Creek, from it's headwaters to the east to the wetlands adjacent to Egan Expressway in the southwest. Located at the northern boundaries of the study area are the Channel Landfill and a residential and commercial area ending at Anka Street. The creek's southern boundaries are Glacier Highway and areas immediately adjacent to the highway. The north-eastern boundary includes the foot of Blackerby ridge and the city and commercial gravel pits. The geographical location of Lemon Creek Valley, Vanderbilt Creek and the boundaries of the study area are shown in Figure 1.

Vanderbilt Creek is more than 1 mile long; the stream enters saltwater in the Mendenhall Wetlands State Game refuge near the intersection of Egan Drive and Vanderbilt Hill Road. Vanderbilt Creek has several tributaries, one of which drains into a pond system. The upper reaches of the tributaries have a steep gradient, while the gradient of the main stream is low. Vanderbilt Creek has an intertidal section of 1/4 to 1/2 mile. The width of the main stream is between 4 and 8 ft, with a depth of 6 inches to 6 feet (Adamus 1987, and ADFG 1993).

Climate

The study area has a temperate maritime climate, with relatively mild winter temperatures in the range of 10 - 40 °F, and cool summers with temperatures generally staying in the range of 50 to 70 °F. The area studied receives considerable precipitation throughout the year, with about 70 inches annually. Streamflow is lowest during the winter months and during several weeks in the summer.

Figure 1 - Map of Lemon Creek Valley and Vanderbilt Creek



Description of Environmental Conditions

The headwaters of Vanderbilt Creek are on U.S. Forest Service land. The stream then flows through State and private lands. The tributaries of Vanderbilt Creek flow through re-routed channels near the gravel pits to the east. Vanderbilt Creek is listed as an impaired waterbody by ADEC because of significant deposition of sediment into the stream bed. The major sources for sedimentation appear to be the gravel operations at the headwaters of the stream, runoff from various construction activities along the mid-section of the stream, relocation of the stream bed and filling of wetlands adjacent to the stream.

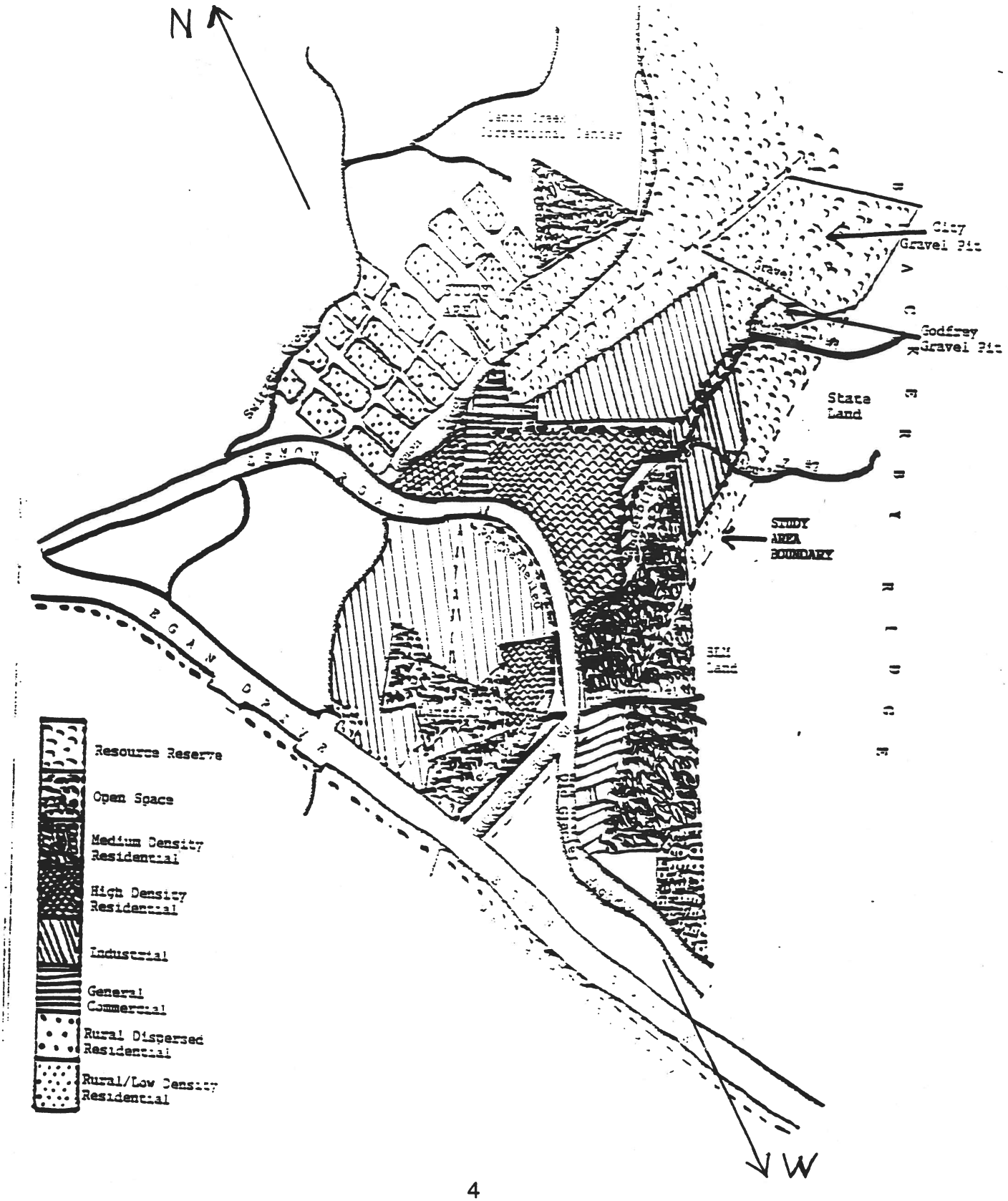
A general reconnaissance survey in January 1993 confirmed an extensive drainage ditch system throughout the developed commercial area surrounding Vanderbilt Creek. Essentially all runoff from commercial and construction activities drains into Vanderbilt Creek. During heavy rainfall, which is frequent in the area, this could result in episodes of significant discharges of various pollutants and sediments into Vanderbilt Creek. However, with the exception of verbal reports, no data or recorded observations are available on high turbidity episodes during rain storms.

Surface waters flowing from the landfill drain into a small tributary ditch of Vanderbilt Creek. The tidal wetlands bordering the lower Vanderbilt Creek are part of the Mendenhall Wetlands State Game Refuge and seasonally accommodate high concentrations of eagles, shore birds and waterfowl . Vanderbilt Creek is used by Dolly Varden char and Pink, Chum and Coho salmon as spawning and rearing habitat. A study was conducted in 1992 by ADEC to determine the potential impact from leachate of chemicals on the water quality of the streams adjacent to the landfill. The results did not indicate the presence of organic and inorganic chemicals at significant levels.

Land-use

Most of the Lemon Creek Valley, including the areas immediately adjacent to Vanderbilt Creek, is zoned residential/commercial or light industrial. Public use of the area is limited and consists of hiking or wildlife watching along the Lemon Creek trail, which parallels the stream in its mid-section and the intertidal area near Egan Expressway. Figure 2 shows a map of the stream flow and indicates the land uses along the different segments of the stream. The middle stream section includes residential developments and some commercial developments, either directly adjacent to Vanderbilt Creek or connected to the stream through drainage ditches. Essentially all development is either directly adjacent to Vanderbilt Creek or indirectly drains into the stream and ditch system.

Figure 2 - Map of Vanderbilt Creek - Land Use.



Between early 1900 and about 1950 principal uses of the area included logging, homesteading and fishing. Extensive commercial development from about 1950 to the present has included gravel extraction, construction of residences, light industrial and commercial operations. Construction activities, stream relocation, wetland fills and gravel extractions have resulted in impacts to the habitat quality of the stream. Because development spanned over several decades with little documentation of activities, the degree of alteration to the stream bed, diversion of stream flows, severity of sediment deposition and impacts on adjacent wetlands are difficult to quantify. No data are available on fish habitat or fish populations prior to 1978. While the City and Borough of Juneau has specific requirements to control sediment discharges in its subdivision and conditional use permits, there is limited documentation which indicates that permit requirements were verified and enforced.

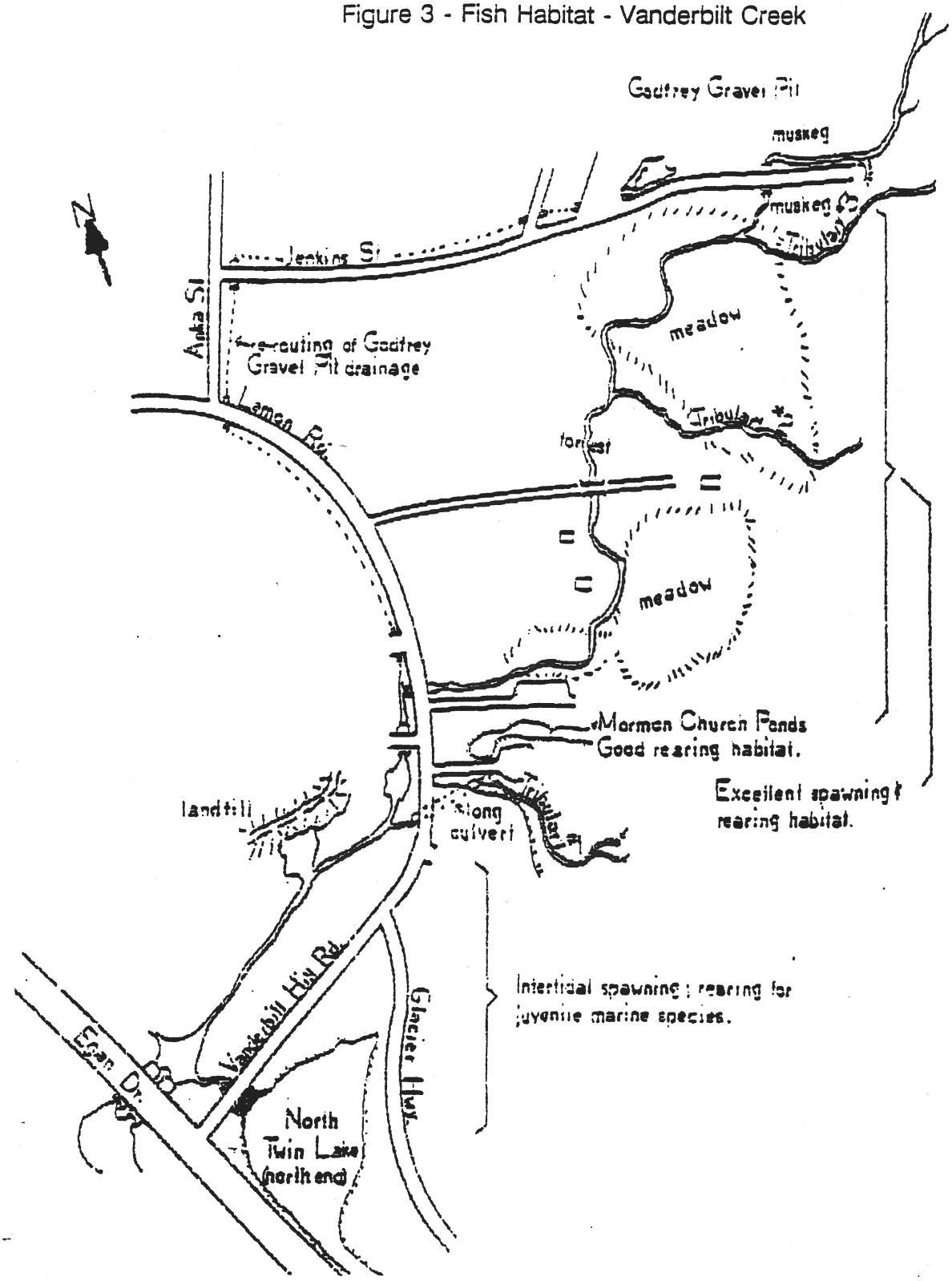
Fish Habitat

Vanderbilt Creek provides excellent fish rearing habitat. Winter surveys of one of the lower channels indicate the highest overwintering salmon population densities of any of the Juneau streams (Adamus, 1987). Vanderbilt Creek provides critical wintering habitat that is often a limiting factor to sustaining healthy fish populations. Fish populations in Vanderbilt Creek consist primarily of wild stock, unlike several other streams in the area. Figure 3 identifies habitat areas in relation to existing facilities and commercial activities. Only the larger tributaries to Vanderbilt Creek are identified on Figure 3. The upper sections of the stream provide good rearing, spawning and overwintering habitat for Coho and Dolly Varden. Both species were identified in the stream section between Glacier Highway and the Godfrey gravel pit and the ponds below the Mormon church. Pink and Chum salmon utilize the culvert across from the Grants Plaza below the landfill.

Coho are sensitive to changes in water temperatures and have specific requirements for spawning gravel containing very little fine sediments. Coho predominantly use the upper reaches of Vanderbilt Creek which have been impacted by sedimentation and other disturbances of the stream bed from gravel extraction and construction activities. Dolly Varden, Chum salmon and Pink salmon use the lower and intertidal stream area and have less stringent requirements for pristine spawning and rearing habitats.

The impact of habitat degradation on fish populations cannot be verified through existing data. Available ADFG peak fish counts from 1978 to 1991 (Table 1) do not indicate a decrease in the number of escapements during the years measured. However, because peak counts do not provide an accurate measure of all the fish present throughout the year and no fish count data are available for the years prior to commercial development in the seventies and eighties, no conclusion can be drawn on impacts spanning this time period.

Figure 3 - Fish Habitat - Vanderbilt Creek



Source: Bethers, et al., 1993.

Table 1: Vanderbilt Creek
Juvenile Salmon Escapements 1978-1992

Species	Year	No. of Surveys	Peak Count	Date
Chum	1984	3	1	08/06
Coho	1976	2	4	11/08
	1981	2	4	10/23
	1982	2	33	10/21
	1983	4	11	11/15
	1984	6	50	10/27
	1985	3	12	10/24
	1986	2	7	10/28
	1988	2	6	10/10
	1989	1	11	10/26
	1991	1	19	10/07
	1992	1	4	10/18
Pink	1983	2	2	10/16
	1990	1	941	08/28

Source: Bethers et al., 1993.

Runoff from the gravel pits in the headwaters originally drained directly into the creek. To protect salmon habitat from sediment deposition, the drainage was diverted through a drainage ditch along Jenkins Street to bypass the most productive section of the stream. The lower stream sections receive substantial runoff from multiple commercial activities via stream diversions and a series of drainage ditches. These discharges may act as channels for directing waters containing fine sediments and other pollutants into the lower portion of the Vanderbilt Creek.

Water Quality Concerns

The specific water quality concerns for Vanderbilt Creek are turbidity and suspended solids. In addition, metals, petroleum-derived organics and other chemical pollutants may also contribute to long-term impacts and habitat degradation. Sources of these pollutants are parking lot runoff, landfill leachate or other commercial activities. The effects of development on water quality and habitat values have not been studied in detail. The limited data and written information that are available, do not allow a complete assessment of water quality or a determination that significant impacts have occurred.

Extensive commercial and residential development has occurred along Vanderbilt Creek in the past few decades. Further commercial and residential development is proposed for the whole Lemon Creek Valley, including Vanderbilt Creek. Continuing, unrestricted development will result in additional wetland loss and habitat degradation. Continued degradation of the stream's water quality from additional sediment deposition throughout the stream has the potential of resulting in a significant decline of fish populations.

Beneficial Uses Affected:

a) Fish Habitat

The most important beneficial use of Vanderbilt Creek is the abundance of high quality fish habitat. Vanderbilt Creek provides good salmon spawning and rearing habitat and serves as one of Juneau's major salmon wintering streams. The fish habitat values of the stream, especially the upper reaches, have been significantly degraded by stream re-channeling, stream bank destruction and destruction of spawning gravel beds through deposition of fine sediments. The high sediment levels found in Vanderbilt Creek (Adamus 1987) suggest that sediment deposits in excess of 5% over natural levels have occurred and state water quality have been exceeded. While there are no data to substantiate that this has resulted in a significant reduction in numbers and species of fish, there is sufficient evidence to be concerned about additional wetland fills, stream diversions and runoff from construction sites and commercial operations.

b) Wetlands functions:

Destruction of wetlands and their regenerative functions also constitute a loss of beneficial uses. Wetlands influence fish habitat quality and aquatic invertebrates in stream areas and estuaries. Wetlands also serve an important function in regulating the quantity and chemical composition of runoff. Maintenance of natural water temperatures and release of decaying plant material are important riparian support functions of wetlands (Adamus, 1987). The release of decayed plant material and dissolved organic carbon may also play an important part in supporting offshore salmon fisheries and other deep water biological resources (Adamus, 1987). Table 2 shows that 35% of development in the Lemon Creek area has occurred in wetlands between 1948 and 1984. A large proportion of wetlands along Vanderbilt Creek has also been lost to development (Figure 4). Additional wetlands have been lost or altered since 1984. With respect to the study area, there is concern over reduced availability of wetlands for filtering pollutants from commercial activities and land fill operations at the lower reaches and the mid sections of Vanderbilt Creek.

c) Recreational and residential uses:

Other beneficial uses of the area which are impacted are recreational uses and residential uses, either through visual impacts or reduced uses for fishing, hiking and wildlife watching. Recreational and residential uses have already been impacted by past commercial development and will be further reduced by additional development.

d) Commercial uses and economic development:

Commercial developments are not directly impacted by the degradation of the water quality of the stream. However, further commercial developments and construction activities requiring wetland fills or re-channelling of the stream bed will be economically impacted by more stringent requirements for obtaining permits. The Department of Environmental Conservation has established a policy stating that future permits will include provisions to prevent discharges of pollutants and further destruction of fish habitat (Menge, ADEC Memo 1993).

Table 2:

Juneau Wetland Losses
1948-1984

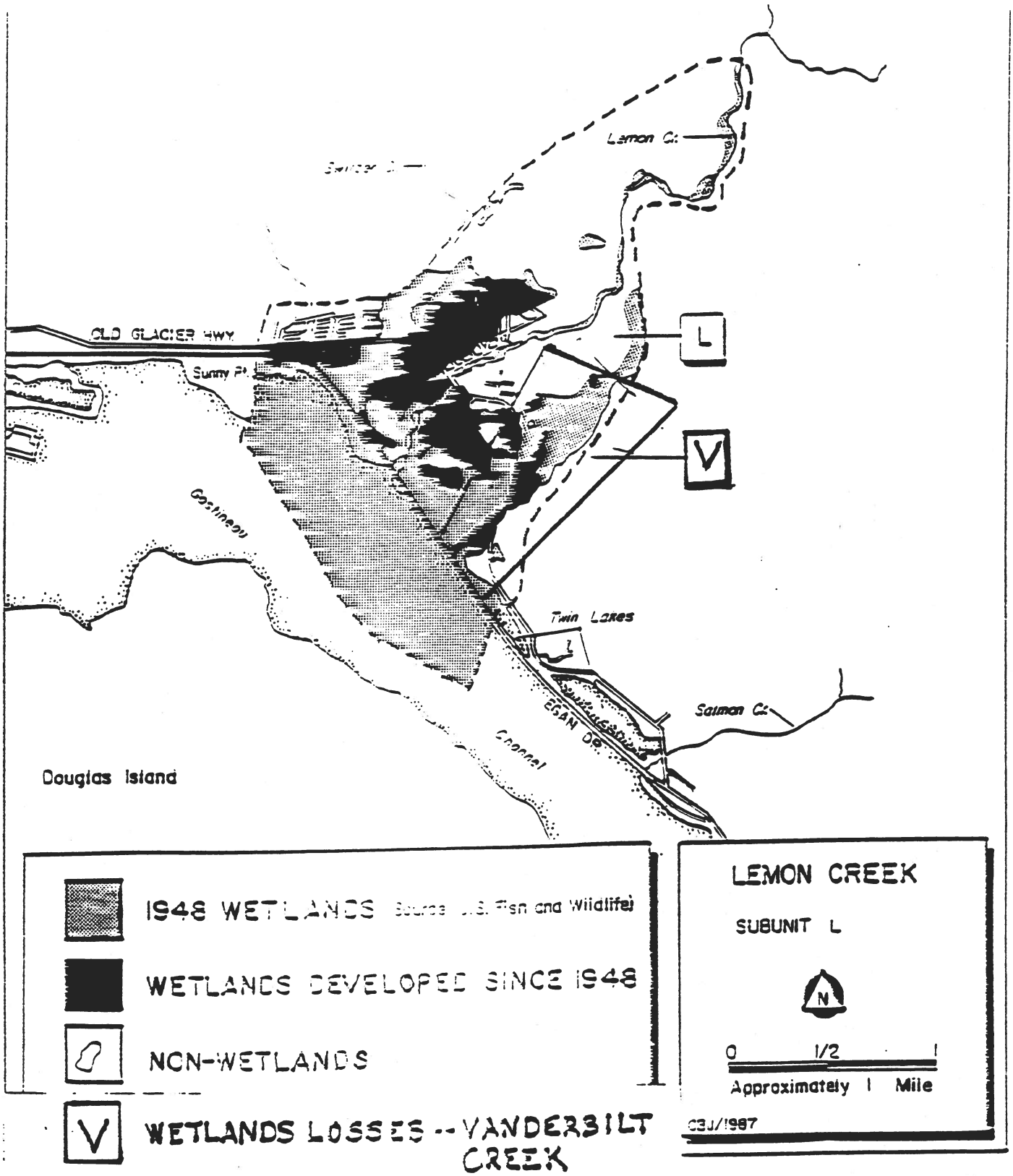
Subunit	Duck	Jordan	Lower Montana	Upper Montana	Auke Bay	West Mendenhall	East Mendenhall	Lemon
Subunit Size	1,690	484	1,019	1,207	1,208	1,901	2,712	2,049
Wetlands Filled since 1948								
Acres	320.6	4.3	6.3	6.5	30.2	119.6	309.2	309.9
Acres/Yr	8.9	0.1	0.2	1.8	0.8	3.3	8.6	8.6
Location and % of Development since 1948								
% in Wetlands	28.0	9.5	6.6	7.8	43.8	73.0	66.6	35.1
%in Upland	71.7	90.5	93.0	92.0	56.0	26.8	33.3	64.9
Wetlands as % of Study Area (1948)	27	32	56	37	42	58	81	58
Remaining Undeveloped Areas								
Total	508	484	918	1,101	1,115	1,710	1,997	1,146
Upland[1]	379	332	346	656	642	728	126	258
Palustrine[2]	95	152	496	444	307	524	84	226
Developable Upland[3]	51	0	45	110	202	137	126	134

[1]Much of this upland acreage may be unbuildable due to ownership, geotechnical limitations, and other factors.
[2]Palustrine wetlands basically are freshwater wetlands that are not lakes or rivers.
[3]See text for criteria and explanation.

Source: Adamus, 1987.

Figure 4:

Juneau Area Wetland Losses
Lemon Creek Valley



Applicable Water Quality Standards

The Alaska Department of Environmental Conservation (ADEC) has designated Vanderbilt Creek as water quality impaired. The primary pollutants of concern are turbidity and sediments from non-point sources. The water quality standards that apply to Vanderbilt Creek are the State of Alaska's Water Quality Standards, as revised in 1989 (18 AAC 70). The stream is classified for multiple uses and the most stringent criteria apply. Protected water uses under 18 AAC 70.020 include water supply, water recreation, and growth and propagation of fish and shellfish, other aquatic life and wildlife. For most of Vanderbilt Creek fresh water quality standards apply. For the intertidal zone of the stream, criteria for estuarine waters apply.

Vanderbilt Creek is presently not used for drinking water supply, aquaculture, agriculture, contact recreational purposes, or for industrial water use. While all uses need to be protected unless the waterbody is exempted from a particular use, the water quality criteria for the use of fish and shellfish propagation are of principal concern. These criteria are summarized in Table 3.

The concern is that water quality standards have been and continue to be exceeded intermittently or for extended periods of time for turbidity, suspended solids and sediment deposition. While no actual data exist that document violations of state water quality criteria, there is evidence on impacts on existing uses in the form of fish habitat destruction.

Chemical Monitoring Data

Available chemical data consist of monitoring data collected by ADEC in 1991 and 1992. In 1991, three sets of surface water data were collected from the lower section of Vanderbilt Creek, as part of the Juneau Streams Monitoring project. Sampling was conducted during February, May and September. The parameters analyzed included heavy metals, inorganic non-metals and volatile organics. Metals concentrations in streambed sediments or sediment deposition have not been measured. Copper was not included in the study. Suspended solids and dissolved solids concentrations were low. No significant variations exist in the results from the three different sampling episodes. The study does not indicate any measurable water quality impact from organic and inorganic chemicals in the water column which could be attributed to runoff from the Grants Plaza parking area, road runoff or other activities at the lower portion of Vanderbilt Creek.

Table 3: 1989 Alaska Water Quality Standards for Propagation of Fish and Shellfish - Freshwater

pH	Shall not be less than 6.5 or greater than 9.0. Shall not vary more than 0.5 pH unit from natural conditions.
Temperature	Shall not exceed 20°C at any time. The following maximum temperature shall not be exceeded, where applicable: Migration routes: 15°C Spawning areas: 13°C Rearing areas: 15°C Egg & Fry incubation: 13°C
Dissolved Oxygen	D.O. shall be greater than 7 mg/l in waters used by anadromous and resident fish. In no case shall D.O. be less than 5 mg/l to a depth of 20 cm in the interstitial waters of gravel used by anadromous or resident fish for spawning (See Note 2). For waters not used by anadromous or resident fish, D.O. shall be greater than or equal to 5 mg/l. In no case shall D.O. above 17 mg/l be permitted. The concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection. D.O. concentrations in estuaries and tidal tributaries shall not be less than 5.0 mg/l except where natural conditions cause this value to be depressed. In no case shall D.O. levels above 17 mg/l be permitted. The concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.
Coliform	Not applicable to fish and shellfish propagation.
Turbidity	Shall not exceed 25 NTU above natural condition level. For all lake waters, shall not exceed 5 NTU over natural conditions.
Total Suspended Solids	No criteria in 1989. Adoption of criteria is planned.
Total Dissolved Solids	Total dissolved solids shall not exceed a maximum of 1,500 mg/l, including natural conditions. Increase in TDS shall not exceed one-third of the concentration of the natural condition of the body of water.
Sediment	The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased more than 5% by weight over natural conditions (as shown from grain size accumulation graph). In no case may the 0.1 mm to 4.0 mm fine sediment range in the gravel bed of waters used by anadromous or resident fish for spawning exceed a maximum of 30% by weight (as shown from grain size accumulation graph). (See Notes 3 and 4). In all other surface waters no sediment loads (suspended or deposited) shall be present which can cause adverse effects on aquatic animal or plant life, their reproduction or habitat.
Residue	Shall not alone or in combination with other substances or wastes cause the water to be unfit or unsafe, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. Shall 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.

Source: 18 AAC 70.020

In 1992, chemical data were collected by ADEC for the purpose of identifying impacts from landfill leachate to wetlands and the lower portions of Lemon and Vanderbilt Creek (ADEC Channel Landfill Study 1992). Four sampling sites relevant to Vanderbilt Creek were studied, these included one site in Vanderbilt Creek (Site 12), one from a ditch draining into Vanderbilt Creek (Site 11) and two sites in the estuary below the landfill (Sites 13 and 14). Figure 5 identifies the sampling sites. Site 12 is the same location as in the 1991 sampling effort.

Data include measurements for inorganic non-metals, physical measurements, metals and volatile organics. No turbidity and suspended solids data were collected in this study. The 1992 results are summarized in Table 4. Sites 11 and 13 show high conductivities, high dissolved solids and high magnesium concentrations which are possibly due to tidal saltwater influences. Coliform counts of 1600FC/100ml were obtained for sites 13 and 14. The source for these high levels has not been determined. Iron was found above drinking water standards at all four sampling sites. High iron in surface and groundwater is not uncommon in the Juneau area. Other metals were below freshwater criteria for aquatic life or below detectable levels. Copper, silver nickel and zinc detection limits were 100 μg/L, corresponding freshwater criteria are 6.5 - 21 μg/L (Cu), 0.12 μg/L (Ag), 56 - 160 μg/L (Ni), and 47 μg/L (Zn).

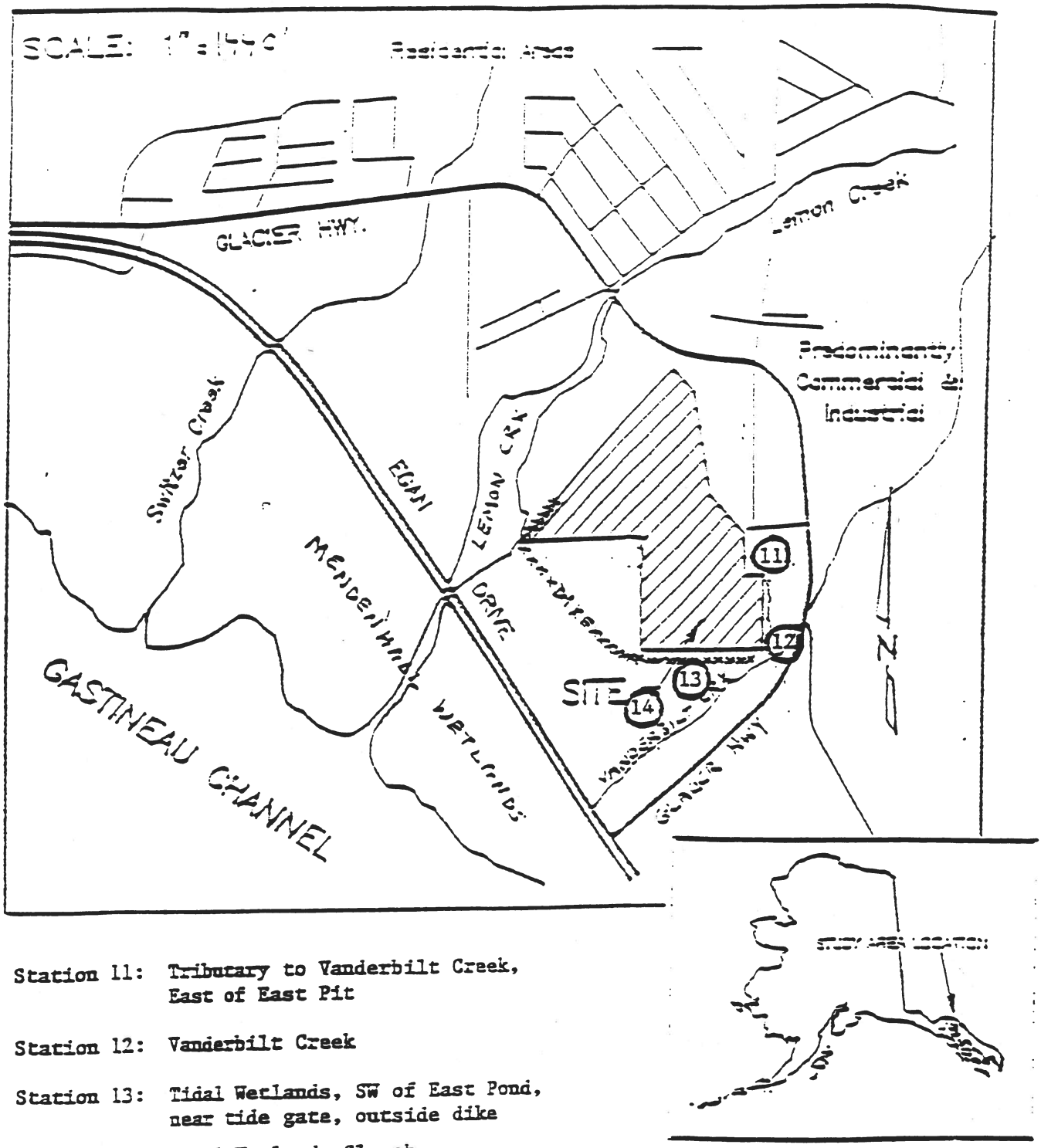
No records are available on visual surveillance data for indicators of water quality impacts, such as color, turbidity and floating debris after heavy rainfall. Quantitative data on turbidity levels, settleable solids and percent sedimentation increase over natural conditions are also not available.

b) Biological data:

Biological monitoring data consist of data on nutrients, fish habitat, species identification and fish counts and are reported in the Juneau Wetlands study (Adamus, 1987). Data on fish habitat characteristics for Vanderbilt Creek (Table 5) show a high percentage of overhanging and aquatic vegetation, which are critical to good fish habitat. The high levels of fine sediments and the high percentage of stream bank undercuts shown in Table 5 indicate negative impacts on fish habitat. Sediment deposition is also favored by the relatively low depth and the low velocity of Vanderbilt Creek.

Data for wintering juvenile Coho in Juneau streams (Table 6) demonstrate the high fish productivity of Vanderbilt Creek. Dolly Varden also use Vanderbilt Creek as wintering habitat. Table 7 shows wintering densities for Coho and Dolly Varden.

Figure 5: Chemical Sampling Sites - Vanderbilt CreekFigure 5 - Sampling Sites



Station 11: Tributary to Vanderbilt Creek, East of East Pit

Station 12: Vanderbilt Creek

Station 13: Tidal Wetlands, SW of East Pond, near tide gate, outside dike

Station 14: Tidal Wetlands Slough

Source: ADEC, 1992.

Table 4:

ADEC 1992 Surface Water Data for Vanderbilt Creek

Parameter	Station 11 Tributary to Vanderbilt Creek, East of East Pit	Station 12 Vanderbilt Creek	Station 13 Tidal Wetlands, SW of East Pond, near tide gate, outside dike	Station 14 Tidal Wetlands Slough
pH	6.66	7.98	7.63	7.93
Temperature	4.00	2.30	3.60	3.50
Salinity	20	0.5	1	0.5
Conductivity (µmhos)	32329	205	1485	280
Alkalinity (mg/L)	61	12	53	29
Hardness (mg/L)	3078	51	171	68
TDS (mg/L)	21085	102	751	151
Nitrate (mg/L)	<0.05	<0.05	<0.05	<0.05
Dissolved Oxygen (mg/L)	13.3	12.4	10.4	11.2
BOD (mg/L)	<2.0	<2.0	<2.0	<2.0
Coliform (FC/100ml)	11	170	1600	1600
Arsenic (µg/L)	<2.10	<2.10	<2.10	<2.10
Barium (mg/L)	<0.10	.20	.30	.30
Cadmium (µg/L)	<0.19	<0.19	<0.20	<0.20
Chromium (µg/L)	<1.70	<1.70	<1.70	6.20
Copper (mg/l	<0.10	<0.10	<0.10	<0.10
Iron (mg/L)	1.82	1.53	4.63	5.90
Lead (µg/L)	<1.00	2.20	3.20	12.00
Magnesium (mg/L)	540.00	4.00	30.00	7.00
Manganese (mg/L)	<0.01	0.05	0.22	0.16
Mercury (µg/L)	<0.11	<0.11	<0.11	<0.11
Nickel (mg/L)	<0.10	<0.10	<0.10	<0.10
Selenium (µg/L)	<1.30	<1.30	<1.30	<1.30
Silver (µg/L)	<0.31	<0.31	<0.31	<0.31
Zinc (mg/L)	<0.10	<0.10	<0.10	<0.10

Source: Adamus, 1987.

Table 5: Summary Averages for Fish Habitat Characteristics in Vanderbilt Creek

Vanderbilt Creek	
Area/reach (sq. ft.)	213.81
Overhanging Vegetation (%/reach)	72.78
Aquatic Vegetation (%/reach)	2.64
Undercut (%/reach)	52.89
Depth (x max)	1.04
Velocity (x max)	1.40
Gravel (2=most)	0.67
Fines (2=most)	1.62
Soft Sediment Depth	0.33
Shade (4=most)	3.13
Maximum Depth (ft)	2.3+
Maximum Velocity (ft/s)	3.4+

Source: Adamus, 1987.

Table 6:

Juvenile Coho Wintering Densities and Habitat in Most Productive Reaches of Juneau Area Streams

STREAM REACH	# of Fish	Std. Dev.	#/ft
Vanderbilt (lower)	214	17.1	4.28
Jordan (Amalga St.)	154	8.6	1.54
Switzer (mud trib.)	56	11.4	1.12
Jordan (mid-beaver U)	220	29.4	1.10
Montana (slough)	157	28.7	.78
Switzer (gravel meadow)	79	15.5	.79
Jordan (Nancy)	148	13.7	.74
Jordan (Egan)	75	8.8	.75
Vanderbilt (upper meadows)	97	3.6	.49
Montana (DR channel)	118	16.6	.59
Jordan (Sand Bar - L)	99	15.9	.49
Switzer (below pond - U)	84	4.9	.42
Little Auke Cr. (Windfall)	41	8.5	.41
Jordan (Sand Bar - U)	75	13.8	.38
Jordan (Nugget Dr.)	62	6.5	.31
Jordan (Airport)	58	5.4	.29
Montana (by mouth)	111	23.3	.18
Engineers Cutoff (WT13)	27	3.6	.13
Johnson Creek (upper)	24*	1.4	.12*

Source: Adamus, 1987.

Table 7: Wintering Densities in Productive Reaches of Juvenile Coho and Dolly Varden

	Vanderbilt (lower)		Vanderbilt (upper meadow)	
Species	**Coho**	**Dolly Varden**	**Coho**	**Dolly Varden**
# of fish	214	35	97	26
Std. Dev.	17.1	15.8	3.6	23.5
#/ft	4.28	.70	.49	.19
#/m^2	8.89	1.453	4.97	0.194

Source: Adamus, 1987.

Pollutant Sources

Water quality impacts to Vanderbilt Creek occur from sedimentation resulting from non-point site runoff, wetland fills, and stream bank disturbances. The main sources of sediment runoff are the gravel pits at the headwaters of Vanderbilt Creek and construction activities in the mid to upper section of the stream below the gravel pits. While individual commercial activities in the mid to lower segment of the stream probably contribute little to water quality impacts, all activities combined could add to the overall degradation of the water quality of Vanderbilt Creek. Runoff from the subdivision at the mid-section of the stream and the commercial/industrial area along Glacier Highway drains towards Vanderbilt Creek and combines with discharges from the culvert below the Mormon Church. A suitable location to monitor overall pollutant accumulations would be where the combined drainage enters Vanderbilt Creek.

Gravel Pits

Three gravel extractions have been operating near the headwaters of Vanderbilt Creek since the seventies. City records contain documentation on concerns about drainage from the pits causing large quantities of sediments being washed into the stream bed. During early operations disturbance of the stream bed occurred. Most runoff from the gravel extractions and groundwater seepage has now been diverted via culverts or ditches towards Lemon Creek. No documentation exists to indicate that these systems perform properly. Runoff from the south end of the pits may still enter the Vanderbilt Creek during heavy rainstorms. Information identified in the City and ADEC permit files do not allow a comprehensive assessment of past and present permit activities. Additional effort is required to compile a complete list of activities, permit decisions and permit conditions.

A new gravel extraction activity (Lemon Creek 9) will take place in the tidelands, between the landfill and Egan Expressway. The gravel extractions will affect an estimated 5 to 10 acres of wetlands, with 20,000 cubic feet of gravel extracted over the next 3 years. The applicant proposed temporary removal of the upper vegetation layer of the tideflats and replacment after completion of the gravel extractions. There is concern that the proposed reclamation will not adequately restore the beneficial uses of these wetlands.

Construction

Construction fills, road construction, storage of construction materials and runoff from unpaved roads occur at the subdivision below the gravel pits with potential sediment discharges into Vanderbilt Creek. City and Borough of Juneau (CBJ) records indicate a wetlands violation in 1991 (SSG III Red Samm Construction). The owner was required to restore the area but documentation on the completion of the restoration was not available. The same area is also being proposed for a possible large commercial development.

Commercial/industrial/residential activities

Various businesses are located along the mid section of the stream. Runoff from roads, parking lots and service and commercial operations is into ditches that eventually drain into Vanderbilt Creek. Of concern are organic and inorganic pollutants and sedimentation. Main commercial operations are a shopping center, gas station, heavy equipment and body shops, car wreckage yard, and an old generator storage.

About 30 residences are located east of Glacier highway at the lower and the mid section of Vanderbilt Creek. This area also includes a church, a motel and a restaurant. Parking lot runoff, inappropriately constructed driveways or septic systems could contribute to water quality impacts.

Landfill

Channel Landfill is located upgradient from the inter-tidal section of Vanderbilt Creek. The concern is that leachate from the landfill could enter into the stream. The data collected by ADEC in 1991 and 1992 have not shown the presence of contaminants in the stream. However, only a limited number of samples were collected and no sediment samples were included.

Actions to Date

City and Borough of Juneau

To date actions aimed at addressing water quality problems at Vanderbilt Creek have focused on controlling sediment discharges and minimizing wetlands destruction. A review of CBJ's current files showed that requirements for conditional use permits and subdivision applications include specific conditions regarding site preparation and construction, containment of sediment runoff, as well as requirements for restoration and reclamation. However, city records do not contain documentation on follow-up actions and procedures that verify if permit requirements are being met or if they are effective. There are no requirements to the permit applicant to monitor discharges and stream impacts.

In 1984 drainage from the CBJ gravel pit was rerouted through a culvert into Lemon Creek. CBJ records also showed a violation which involved an unauthorized (accidental) wetland fill (Permit No. CU-10-85, Gastineau Sand and Gravel). No written information is available on state or city actions on gravel extraction and construction activities prior to 1979.

State Actions

The majority of the construction activities that have occurred adjacent to Vanderbilt Creek have been permitted by the Alaska Army Corp of Engineers and have undergone review for consistency with the Alaska Coastal Management Program and the Alaska State Water Quality Standards. Although many of the projects have been conditioned to address possible water quality impacts, the cumulative effects of multiple projects impacts have not been studied.

The privately owned wetlands in the area are in constant threat of development as land owners attempt to obtain economical returns from their properties. One owner with wetlands adjacent to Vanderbilt Creek has attempted but thus far failed to develop his land by offering it for the development of an approximate 12 acre middle school site (another site was eventually chosen) and then requesting to develop a one-acre concrete block plant on the same parcel (this project was denied because of a zoning restriction).

In 1979, a relocation of Vanderbilt Creek along Glacier highway was approved by the Department of Fish and Game. The purpose was to control sedimentation runoff during the construction and use of the Grants Plaza parking lot. By placing coarse gravel into the new stream bed, suitable spawning habitat conditions were created (Correspondence Rick Reed, 1979).

Other State regulatory actions affecting the Vanderbilt Creek area are the solid waste permit issued to channel landfill by ADEC (Permit No. 8511-BA016), which was renewed in 1991. Permit conditions require quarterly water quality monitoring which include two surface water sites for Vanderbilt Creek.

Conclusions and Recommendations

Information reviewed in this assessment indicates that fish habitat, especially in the upper reaches of the stream has been impacted by fine sediment deposition. Based on the presently available data, the extent of the impact cannot be quantified in terms of numerical water quality standard violations. It is apparent that major sediment contributions result from gravel operations and construction activities, which continue to pose a future threat to water quality. The relative contribution from each of the various sources along the stream is not known.

A major information gap is the inaccessibility and incompleteness of documentation on permit actions and other information relating to gravel operations and construction activities during the past ten to twenty years. Because all discharges into Vanderbilt Creek originate from nonpoint sources, and quantitative water quality data on contributions from individual sources are not available, the control of existing water quality impacts via

discharge allocations is not possible at present. As an alternative, the following actions are proposed for meeting water quality standards with existing controls:

1.) Development and implementation of a Watershed Management Plan, including an evaluation of the restoration of fish habitat.
2.) Additional site surveys and water quality monitoring.
3.) Verification of compliance and enforcement of existing permit conditions and stormwater permit requirements.
4.) Implementation of ADEC's policy on adding more stringent requirements to state permits and during permit certification for activities affecting impaired waterbodies.
5.) Cooperation between ADEC, and possibly other State resource agencies and the City and Borough of Juneau during the review of new permits and on permit compliance.

Proposed actions are discussed below. Specific goals and a timetable for achieving the goals will be worked out by designated ADEC staff and will be specified in the Watershed Management Plan.

1.) Watershed Management Plan

In order to address water quality problems in a more comprehensive fashion, the development of a water quality management plan for the whole Lemon Creek Watershed is needed. This plan will include implementation of a management strategies for controlling water quality degradation, plans for the restoration of fish habitat and indicators that monitor the status and improvement of water quality and fish habitat. The collection of additional water quality and habitat data may be necessary. To provide a basis for the above proposed strategies, comprehensive information on all existing permits in the area is required, including evaluation of the adequacy of permit conditions and verification of the existence and effectiveness of sediment controls. Strategies for restoration of fish habitat will be included in the management plan.

The Watershed Management Plan will address coordination of public and private interests and education of the public and permit applicants. The watershed management plan will describe available control strategies and procedures for verification of the effectiveness of controls, site inspections and enforcement of permit requirements. Because most construction activities involve conditional use permits, permit conditions, control strategies and inspection and enforcement procedures need to be developed in coordination with the City and Borough of Juneau.

The feasibility of restoring fish habitat will be explored with input from the Alaska Department of Fish and Game. Potential strategies include removal of sediments, restoring stream flow where it is restricted, and additional sediment containment through dikes or ponds. The Watershed Management Plan will weigh the benefits of restoration strategies against their potential for causing additional habitat disturbances.

2.) Collection of additional data

In order to obtain a more accurate picture of the magnitude of water quality impacts and identification of the major sources, additional water quality and biological data need to be collected. Requirements for monitoring discharges will be added as Department permit stipulations to new 404 permits. Additional data will also be collected through discharge monitoring requirements under the new NPDES stormwater permits. Discharge monitoring and pollution control strategies will be addressed in the Best Management Practices Plans (BMPs) also required by the stormwater permits for the gravel operations at the upper portion of Vanderbilt Creek. In addition, monitoring during or after rain storms in combination with site inspections will be performed by ADEC to identify major sources and the occurrence and magnitude of water quality violations. To confirm that no impacts have occurred from landfill operations and other activities, some sediment and macroinvertebrate samples will be analyzed for heavy metals and organics. Additional sampling may be appropriate to monitor impacts to Vanderbilt Creek and Lemon Creek as a result of proposed wetlands disturbances between the landfill and Egan Expressway and other development activities along Vanderbilt Creek.

The data will be used to quantify water quality impacts, to identify major sources, and to determine if existing controls are adequate or if alternate control strategies are needed. In addition, the data will aid in the development of the Watershed Management Plan.

3. Compliance with permit conditions and NPDES stormwater permit requirements

ADEC will assure compliance with permit requirements and water quality criteria through routine site inspections, review of monitoring data, and technical assistance with the implementation of appropriate pollution controls. ADEC is in the process of developing a ranking system for setting inspection priorities based on facility size, the severity of anticipated environmental impacts and past inspection and compliance histories. This will assure that facilities are reviewed on a routine basis at a frequency that is achievable with existing staff. ADEC will also develop inspection procedures and criteria.

4. Implementation of ADEC policy to restrict discharges to impaired waterbodies

ADEC will assure implementation of its policy of certifying new permits with the addition of permit stipulations which assure that "the project will not cause water quality degradations with respect to TMDL pollutants or cause violations of standards of other pollutants". Construction activities involving less than 5 acres or requiring no wetlands fills are not subject to ADEC review. In these cases, prevention of water quality impacts can be achieved through cooperation between ADEC and the City during planning and permit review phase of commercial development projects.

5.) Cooperative effort between ADEC and the City and Borough of Juneau

An effective means to protect water quality is the cooperation between the City and Borough of Juneau and ADEC during the review of subdivision plans and conditional use permits. This will involve determining permit conditions that control and contain sediment discharges and devising routine procedures for verifying permit conditions, Follow-up and enforcement in the event of permit or water quality standard violations need to be agreed upon. It would be most useful to define cooperative agreements, procedures and responsibilities in the form of a Memorandum of Agreement between ADEC and the City.