Kensington Gold Project
2007 Annual Report

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2. Kensington Terrestrial Wildlife Monitoring Annual Report Slate Lakes Basin, November 2007, Kate Savage, Juneau, AK

3. 2007 Northern Goshawk Survey – Kensington Mine Site, September 2007, Kate Savage, Juneau, AK

4. TSF Ecological Monitoring: Upper Slate Lake Dolly Varden Survey, January 2008, Liz Flory, Juneau, AK

5. Berners Bay Herring Research – 2007 Research Report (Draft), November 2007, ADFG, Juneau, AK

References

1. Coeur Alaska, Inc., 2007, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2007.
2. Coeur Alaska, Inc., 2007, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2007 Volume 2: Water Quality Data.

Introduction

The Kensington Gold Project is owned and operated by Coeur Alaska, Inc. (Coeur) a wholly owned subsidiary of Coeur d'Alene Mines, Inc. The project is located on the western and southern flanks of Lions Head Mountain; between Berners Bay and Lynn Canal; and in the drainages of Johnson, Sherman, and Slate Creeks (Attachment 1). Coeur Alaska has prepared this annual report to comply with requirements of the U.S. Forest Service (USFS) Plan of Operations (POO) for the Kensington Gold Project.

The Kensington Gold Project received authorization under the POO on June 13, 2005. The Final Supplemental Environmental Impact Statement, U.S. Forest Service Record of Decision and all necessary major permits were issued prior to year end 2005. Coeur Alaska issued construction contracts and ground breaking was initiated during July 2005.

Section 1.0 contains a synopsis of the activities conducted at the Kensington Gold Project during calendar year 2007, and Section 2.0 contains projections of activities planned for calendar year 2008.

During 2007 construction concentrated on surface access and facilities at Slate Creek Cove, the Johnson Creek facilities site, the Jualin Access Road and the Jualin drift. In August, 2006 an injunction against further development of the Lower Slate Lake tailings facility was received and all work on that facility was suspended with the exception of minor sediment control measures that were necessary to stabilize the area from potential erosion.

Project personnel on site are a mix of Coeur Alaska employees and contractors. As of December 2007, Coeur Alaska employed 80 personnel between the Juneau office, Johnson Creek camp and Comet Beach facilities.

Construction activities and operations have been consistent with the approved POO. No gold production occurred during calendar year 2007.

1.-1 Summary of 2007 Activities

1.1 Public Safety

Public access to the project site is managed as defined in the established Public Access Control Plan. Public access to the site must be controlled to ensure the safety of the public. During the construction and operational phases of the Project, hazards such as truck traffic, blasting, barge and tug operations, clearing operations, and earthwork could result in physical harm to unauthorized visitors.

During 2007, personnel accessed the site via rotary wing aircraft and to a lesser extent by fixed wing float plane. Agency inspections and other public like personnel generally access the site by fixed winged aircraft.

Supplies and equipment for the facility are delivered by barge to the Slate Creek Cove Marine Terminal.

1.2 Construction Activities

Site construction continued into 2007 with the exception of the work on the tailings treatment facility. An injunction was received in August 2006 which led to the suspension of construction activities associated with the continued development of the tails facility. Ongoing surface work in this area is limited to measures taken to stabilize and protect water quality from potential erosion of exposed areas that were under construction.

The majority of surface disturbance associated with construction was completed in 2005 and 2006 as outlined in the project disturbance summary Table 1(Figures 2-5). During 2007 construction activities focused primarily on completing the mill and support facilities.

Approximately 80 individuals were employed at the site during 2007. The demographics of the employees were defined as:

- 27.4% Alaska Natives;
- 60.7% Local (Juneau) Hire; and
- 86.3% Alaska Hire.

In addition to Coeur employees at years end 38 contractors were employed in various positions at the site.

Topsoil and growth media salvaged during construction included slash, stumps, duff, A-horizon soil, organic illuviated soils, and other suitable mineral soil. Throughout construction approximately 350,000 cubic yards of salvaged soil were placed in stockpiles.

1.2.1 Storm Water Controls

Construction operations on both the Jualin and Comet sides of the Kensington Gold Project were conducted in compliance with storm water pollution prevention plan requirements. Both temporary construction Best Management Practices (BMPs) and sediment pond BMPs were utilized to control excess sediment production from disturbed areas that otherwise might enter waters of the state. These practices included interim reclamation of 53 acres. A full accounting of storm water controls can be found in

Appendix 4F of the USFS POO, entitled: Storm Water Pollution Prevention Plan (SWPPP) for the Kensington Gold Project.

Sediment ponds and silt fences were maintained, existing check dams were maintained, new check dams were constructed in road ditches, and diversion channels were cut as necessary to redirect flow to treatment BMPs. Designs for these construction BMPs are discussed in the SWPPP. Most operational (long-term) sediment ponds were constructed during 2005, and all were constructed as designed in the SWPPP Addendum B, entitled Sediment Pond Design Kensington Gold Mine – Jualin Area Borough of Juneau, Alaska, January 26, 2006. Minor pre-settling sumps were installed in 2006 to aid in the removal of the coarse fraction of sediment entrained in stormwater flow.
The nature of construction BMPs is transitory; i.e., they change in response to site conditions and the rapidly evolving ground conditions encountered during construction. Therefore, designs are dependent on site conditions, which may change day by day. However, as construction elements are completed, operational BMP sediment ponds can be developed or eliminated, which discretely demonstrate compliance with the SWPPP as amended.

In addition to SWPPP monitoring and inspections, site receiving water monitoring was also conducted in compliance with the current site NPDES permit to help document compliance with state water quality standards. Receiving water sampling data are discussed below under NPDES monitoring (section 1.9.1).

1.2.2 Corps of Engineers Wetland Disturbance

An annual summary of wetland areas impacted and reclaimed is a requirement of the Corps of Engineers (COE) 404 fill permit. Wetland areas impacted are tallied in Table 2 (Figures 2-5). Overall, total wetland disturbance as of year end 2007, including soil excavation or fill placement was 62.4 acres.

1.2.3 Access Corridors

Road improvements during 2007 were an ongoing priority of project construction. Road surfacing, guard rail installation and interim reclamation seeding were major improvements to road projects in 2007. The maintenance of stormwater BMPs along the Jualin and Kensington access corridors was a major ongoing task for 2007.

1.3 Mine Operations

1.3.1 Ore Production

Mill operations had not commenced during the reporting period, and no ore was milled.

1.3.2 Development Rock Production

Mine development continued underground from the 850 Level portal and produced 66,100 bank cubic yards of development rock and 11800 bank cubic yards of ore, which were hauled outside and stored on the Kensington Development Rock Storage Facility (Parcel #4). Breakthrough of the New Jualin Drift was completed on July 9th 2007 as a result of that activity approximately 26,131 cubic yards of development rock was placed on the Jualin Development Rock Storage Facility. These numbers assume 10% overbreak and 50% swell factor.

1.3.3 Dust Suppression Activities

During this period the project's climate was exceptionally wet and very limited road watering via water wagon was required.

1.4 Mill Operations

Activities continued on the mill bench and included the construction of surface buildings and facilities for the eventual milling of ore from the underground.

1.4.1 Gold Production

No gold or gold equivalent was produced during the reporting period.

1.4.2 Tailing Production

An injunction was received in August 2006 which led to the suspension of construction activities associated with the continued development of the tails facility. As the tailings portion of the mill complex was not completed, the project was not operational during 2007 therefore, no tailing was produced.

1.5 Solid/Hazardous Waste Generation and Transport

Solid waste was generated from the Comet and Jualin sides of the Kensington Gold Project, including: incinerator ash, construction debris, worn cable, tires and broken equipment. This material was managed in accordance with the approved ADEC Solid Waste Management Permit. Coeur Alaska generated approximately 500,000 pounds of solid waste, including 13,000 pounds of incinerator ash, 21,000 lbs of tires and 117,000 lbs of scrap metal. These materials were shipped to Juneau, then transported to disposal facilities or otherwise managed according to controlling regulations and permits (Table 3).

Camp and construction operations on the Jualin side of the Kensington project are managed by contractors in the same general manner as those from Comet. That is, domestic wastes were incinerated and the ash and other solid waste was containerized and returned to Juneau for proper management.

TCLP aqueous solution metals extraction results for the incinerator ash sample collected on March 27, 2007 showed metals non-detect except for a barium concentration of 0.73

mg/L. This value is two orders of magnitude below the levels established by EPA for hazardous waste (barium = 100mg/L).

Hazardous waste, including Universal waste, generated at the site could include:

- Lead/acid batteries
- Light Bulbs
- Lamps
- Paint and paint related waste
- Computer backup power supplies

Universal wastes (batteries, lamps, mercury switches) need not be manifested. In no month was more than 100 kg of hazardous waste generated, accumulated, or transported to Juneau for disposal.

1.6 Tailings Storage Facility

During 2007 work was suspended due to an injunction being issued in 2006, which resulted in the ACOE suspending their approval to proceed with the development of this facility.

1.7 Compliance

For the year 2007, there were no Notice of Violations issued to Coeur Alaska. All reporting was completed as required. One component of this document is the reporting of hydrocarbon spills. Each spill that occurred during 2007 was taken very seriously and all site resources were utilized, as appropriate for each occurrence. A total of twenty-four incidents were reportable during 2007 with the majority of the spills being minor in nature (Table 4).

1.8 Reclamation

No permanent concurrent reclamation was performed in 2007; however, interim seeding stabilization of 53 acres associate primarily with topsoil stockpiles and road ditches was performed as a BMP under the approved SWPPP plan.

1.8.1 Revegetation Test Plots

Revegetation test plots were to be installed at the Tailings Storage Facility (TSF) following construction of the Phase I dam and flooding of the reservoir. As construction of the dam and TSF was not initiated in 2007 these test plots were not installed during the reporting period.

1.9 Monitoring

1.9.1 NPDES

Results of the extensive monitoring program contained in the Kensington Gold Project NPDES permit AK-005057-1 is compiled in the NPDES Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2007, and Volume 2: Water Quality Data (Coeur, 2007). This report will be submitted to the US Forest Service, Juneau under separate cover.

1.9.2 Fresh Water

Fresh water monitoring requirements are contained within the USFS POO. Monitoring performed for the NPDES permit and summarized in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2007 Volume 2. Water Quality Data are inclusive of requirements under the USFS POO. This report will be submitted to the US Forest Service, Juneau and EPA, Seattle under separate cover, as the NPDES 2007 Annual Report.

1.9.3 Water Usage

Under requirements of the ADNR water rights, certain water usage and stream flow submittals are prepared. Some of these filings are made monthly while others are submitted quarterly. These reports are available at ADNR's offices, Juneau.

1.9.4 Aquatic Resource Surveys

The USFS POO references aquatic resource surveys, which are to include:

- Annual photographs of stream habitat types.
- Fish surveys and minnow trapping in Upper Slate Lake.
- Salmon escapement surveys in Sherman, Slate, and Johnson Creeks.

Annual photographs of stream habitat types are included in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2007.

Salmon escapement surveys were performed in 2007 on Sherman, Slate, and Johnson Creeks. Tabulations of these data are presented in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2007.

1.9.5 Marine

The U.S. Forest Service Plan of Operations Appendix 4.d. contains a marine monitoring program for Berners Bay. Requirements of this monitoring plan have been contracted to various agencies that are responsible to implement and report on portions of the plan.

Monitoring of mammals within the Bay was completed during 2007 by select flight personnel traveling to and from the mine site over Berners Bay. Flight co-pilots are observing and recording marine mammal sightings on maps and submitting those observations to the Juneau Coeur office for compilation. Field data sheets were faxed to Aleria Jensen at NMFS, Juneau in the spring of 2007.

1.9.6 Air

During the period, bi-annual Facility Operating Reports, including fuel use summaries, were submitted to the Fairbanks office of ADEC Air Permits Program (610 University Avenue) in compliance with ADEC air quality permits. These reports are not reproduced here, but can be provided upon request.

1.9.7 Archeology

Surface disturbance activities within historic areas were completed during 2005. No additional surface disturbance was created in 2007.

1.9.8 Tailing Storage Facility Ecological Monitoring Plan

Dolly Varden spawning activities were documented as a planning exercise for ultimate closure of the tailing storage facility. This study is included in Attachment 4.

1.9.9 Berners Bay Transportation Plan

Marine vessel transport was between Juneau or Adlersheim Lodge and Slate Cove or Comet Beach. Heavy equipment and supplies were transported via barge or landing craft and were received at Slate Cove or Comet Beach. Marine waters around all marine facilities discussed above were open to public access.

It is a requirement of the Berners Bay Transportation Policy, Mitigation, and BMP Plan to collect information on company marine vessel encounters with special fish, marine mammals, and important bird species during the eulachon spawning season in Berners Bay. During 2007, no ferry service occurred in Berners Bay.

Monitoring in Berners Bay included herring and hydrocarbon studies conducted by ADFG and NOAA respectively. The ADFG herring draft report is included as Attachment 5. Coeur Alaska has not been issued a report concerning the hydrocarbon studies from NOAA staff.

1.9.10 Development Rock, Borrow Source, and Tails Material

Development rock and tailing sampling for acid base accounting (ABA) is a requirement of the POO. Development rock sampling results are submitted to the US Forest Service, Juneau under a separate cover, on a quarterly basis.

No tails were generated during 2007. Future quarterly sampling of tailing for acid base accounting will commence following project commissioning and commercial production.

1.9.11 Construction/Excavation Dewatering (Non-Stormwater)

Groundwater intercepted during excavation and construction of the New Jualin Tunnel was captured, treated, and discharged to either a land application area or through site sedimentation ponds – as appropriate. Discharge is authorized and managed under ADEC general permit 2004DB0101 and the stormwater Construction General Permit AKR10000.

- During 2007 the Jualin Tunnel excavation was completed and the land application area was decommissioned.

1.9.12 Tailing Storage Facility Monitoring

During 2007 work was suspended on the tailing storage facility due to an injunction being issued, therefore no water balance measurements are available.

1.9.13 Wildlife

1.9.13.1 ADFG Goat Monitoring

Mountain goat monitoring in the Lions Head Mountain area associated with the Kensington Gold Project has been conducted intermittently since the late 1980's, in part to help determine potential future mine impacts on this population. An updated ADFG goat study is included with this report as Attachment 1.

1.9.13.2 Goshawk and Wildlife Observations

A condition of the USFS POO is to collect information on the wildlife present observations of raptors are made in the Kensington Gold Project area. Observations made during 2007 are captured in two separate reports issued by Kate Savage. These reports are included as Attachments 2 and 3 in this annual report.

1.10 Avalanche Safety Plan

Coeur Alaska implemented an avalanche hazard awareness and mitigation safety plan, during the 2006/07 winter season. A qualified professional firm was retained to:

- Identify and quantify the snow avalanche safety hazard
- Prepare recommendations on managing that hazard
- Train employees and contractors in pertinent requirements of the resulting safety plan
- Prepare daily hazard forecasts and perform potential avalanche control activities

Because of the nature of construction, risk avoidance cannot be accomplished in all cases. Therefore, an active avalanche risk mitigation program was initiated. This involves use of explosives to initiate controlled release of smaller avalanches so as to reduce the risk of naturally triggered larger and more destructive avalanches.

During 2007, active control work was required and performed. During the 2007 reporting period,

- Areas of avalanche risk were placarded
- Crews were informed of avalanche hazards and the appropriate responses to those hazards
- Daily risk forecasts were prepared and communicated to crews, based on site weather and snow condition data
- Avalanche rescue equipment was procured and located on-site
- Crews were trained in their roll in avalanche rescue operations and the use of the rescue equipment – as appropriate
- Avalanche control was utilized on several occasions through the use of an avalauncher and explosives.

During the 2007/08 winter season Coeur Alaska hired an onsite Avalanche Program Director to continue the avalanche program.
During the reporting period, site activities were not curtailed as a result of identified avalanche hazards. No personnel were caught or injured in avalanches, nor were any facilities or material negatively impacted.

1.11 Dam Safety Oversight Status

The dam safety approval to construct was issued in March 2006, and construction was initiated and continued until August when an injunction against further development of the tailings facility was issued. Work at Lower Slate Lake was restricted to erosion control measures for the remainder of the year. No embankment has been constructed.

Projected Activities for 2008

2.-1 Key Issues and Permitting Activities

The Kensington Gold Project continues to work on the site infrastructure and will continue in this status during much if not all of 2008. The timetable for completion is uncertain at this time due to permits required for a new tailing disposal site or resolution of the pending litigation. It is likely that modifications to approved permits, plans, leases, and other authorizations may be requested. These modifications cannot be anticipated prior to actually encountering changed conditions in the field.

Coeur Alaska submitted a proposed Modified Plan of Operations (MPO) for the Kensington Mine to the U.S. Forest Service (USFS) on January 25, 2008. The MPO proposes the use of the Comet site on the Kensington side of the mine area for tailings storage, using “paste” technology. Paste is a variation of "dry stack" tailings storage, which was approved at the same site in 1998, following an extensive Supplemental Environmental Impact Statement process.

2.1 Public Safety

No changes to the Public Access Control Plan are contemplated for 2008.

2.2 Mine Operations

Continued underground mine construction and development will be the primary focus of 2008 activities. Mine development and exploration activities will require ore excavation, in which case the ore will be stockpiled on surface or underground as future mill feed.

2.3 Mill Operations

Mill start-up is uncertain at this time due to the permits required for a new tailing disposal site or resolution of the pending litigation.

2.4 Tailings Storage Facility

Alternate tailings management options and permitting will be the primary focus of 2008 activities

2.5 Access Corridors

Most access road and corridor upgrades were completed in 2006.

2.6 Reclamation

Reclamation activities at lower Slate Lake are anticipated to occur in 2008. Temporary stabilization activities and other activities will occur in 2008.

2.7 Proposed Modifications to Monitoring Plans for 2008

Modifications to the anadromous fish population inventories in Sherman, Slate, and Johnson Creek will likely be formulated and proposed to the appropriate agencies. No specific modifications of this plan are proposed in this annual report.

2.8 Bonding

The Kensington Gold Project is currently bonded, including the tailings storage facility, as described in the 2005 FSEIS and USFS Record of Decision. Bonding activities have been coordinated with US Forest Service as needed with each revision.

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Table 1
Project Surface Disturbance

		Permitted Disturbance Acreage	Actual Disturbance Acreage
Parcel #	**Description**	**Total**	**Total**
1	Kensington Comet Beach Camp	3.2	3.2
2	Kensington Road	8.1	8.1
3	Kensington Borrow Source	1.5	1.5
4	Kensington Development Rock Storage	14.3	14.3
5	Kensington Water Treatment Plant/Ponds	4.3	4.3
6	Kensington Topsoil Stockpile Area	2.1	0
7	Kensington 2050 Level Portal Waste Rock Dump	1.5	1.5
8	Jualin Process Area	12.9	16
9	Jualin Development Rock Storage Area	4.3	8.1
10	Jualin Process Area Treatment Pond	1.5	1.7
11	Jualin Process Topsoil Stockpile Area	0.3	0.5
12	Jualin Pumphouse Area	0.1	0.1
13	Jualin Access Road	33.8	31.2
14	Jualin Laydown Area #1	0.4	0.7
15	Jualin Laydown Area #2 (Batch Plant)	3.5	3.7
16	Jualin Laydown Area #3	0.8	0.5
17	Jualin Administration Area (Camp & Admin)	2.5	5.7
18	Jualin Borrow Source #1	2	3.5
19	Jualin Borrow Source #2	1.3	1.3
20	Jualin Borrow Source #3	12.3	12.1
21	Jualin Borrow Source #4 -- Eliminated	0.7	0
22	Tailings Facility Access Road & Pipeline	7.4	5.2
23	Taliings Facility Access Road	9.2	9.2
24	Tailings Lake (tailings as fill)	39.9	19.9
25	Tailings Lake Margin Working Area	17.9	18.6
25a	Tailings Lake Water Treatment Plant	0	0.1
25b	Tailings Lake Diversion Pipe Intake Dam	0.01	0.01
26	Tailings Dam Borrow Source	4.6	4.9
27	Tailings Pipeline & Access Road	10.1	7.2
28	Taliings Dam and Plunge Pool Area	6.8	7.1
29A	Slate Creek Cove Marine Terminal - USFS	1.4	4
29B	Slate Creek Cove Marine Terminal - State	0.5	0.5
30	Slate Creek Cove Topsoil Stockpile Area-Eliminated	0.2	0
31	Jualin Topsoil Stockpile Area	0	0
32	Jualin Facility Access Road Borrow Source #6	0	3
33	Jualin Land Application Area	0	0
34	Jualin Reclamation Material Area	0	1.6
35	Western Interception Ditch - Eliminated	0	0
36	Tailings Area Topsoil Stockpile	0	0
	TOTALS	**209.4**	**194.7**
***	These were rolled up into the row above		

Table 2
Wetlands Disturbance

		Permitted Disturbance Acreage	Actual Disturbance Acreage	COE Fill Volume (cu.yd)	COE Fill Volume (cu.yd)	Acreage of Water of the U.S. as of December 31,2007					Reclaimed Wetland Acres
Parcel #	Description	Total	Total	Permitted	Actual	Permitted	2005 Actual	2006 Actual	2007 Actual	TOTAL	Permitted
1	Kensington Comet Beach Camp	3.2	3.2	0	0	0	0	0	0	0	0
2	Kensington Road	8.1	8.1	0	0	0.9	0.9	0	0	0.9	7.6
3	Kensington Borrow Source	1.5	1.5	0	0	0.3	0.3	0	0	0.3	1.5
4	Kensington Development Rock Storage	14.3	14.3	500,000	263,155	5.1	5.1	0	0	5.1	0
5	Kensington Water Treatment Plant/Ponds	4.3	4.3	20,000	3,000	2.6	2.6	0	0	2.6	4.3
6	Kensington Topsoil Stockpile Area	2.1	0	30,000	0	2.1	2.1	0	0	2.1	2.1
7	Kensington 2050 Level Portal Waste Rock Dump	1.5	1.5	0	0	0	0	0	0	0	0
8	Jualin Process Area	12.9	16	21,000	0	1.1	1.1	1.5	0	2.6	0
9	Jualin Development Rock Storage Area	4.3	8.1	100,000	35,213	4.3	0	0.8	0	0.8	0
10	Jualin Process Area Treatment Pond	1.5	1.7	20,000	0	0	0	0	0	0	0
11	Jualin Process Topsoil Stockpile Area	0.3	0.5	10,000	1,367	0	0	0	0	0	0
12	Jualin Pumphouse Area	0.1	0.1	0	757	0.1	0	0	0.1	0.1	0
13	Jualin Access Road	33.8	31.2	26,000	19,756	8.2	7.1	0.6	0	7.7	0
14	Jualin Laydown Area #1	0.4	0.7	4,800	4,800	0.4	0.3	0.4	0	0.7	0.4
15	Jualin Laydown Area #2 (Batch Plant)	3.5	3.7	0	22,553	3.5	2.6	0	0	2.6	0
16	Jualin Laydown Area #3	0.8	0.5	0	0	0.8	0.5	0	0	0.5	0
17	Jualin Administration Area (Camp & Admin)	2.5	5.7	32,000	14,709	2.5	3.1	0	0	3.1	0
18	Jualin Borrow Source #1	2	3.5	0	0	0	0	0	0	0	0
19	Jualin Borrow Source #2	1.3	1.3	0	0	0.1	0.1	0	0	0.1	0
20	Jualin Borrow Source #3	12.3	12.1	0	13,843	2.4	1.8	0	0	1.8	3.6
21	Jualin Borrow Source #4 -- Eliminated	0.7	0	0	0	0	0	0	0	0	0
22	Tailings Facility Access Road & Pipeline	7.4	5.2	20,000	19,740	4.7	0	4.8	0	4.8	0
23	Taliings Facility Access Road	9.2	9.2	2,000	2,590	0.3	0	0.6	0	0.6	0
24	Tailings Lake (tailings as fill)	39.9	19.9	3,168,000	116,726	23.5	0	4.7	0	4.7	61.8
25	Tailings Lake Margin Working Area	17.9	18.6	450	7,990	8.5	0	1.7	0	1.7	8.5
25a	Tailings Lake Water Treatment Plant	0	0.1	1,000	81	0.2	0	0.1	0	0.1	***
25b	Tailings Lake Diversion Pipe Intake Dam	0.01	0.01	25	0	0.01	0	0.01	0	0.01	***
26	Tailings Dam Borrow Source	4.6	4.9	0	0	0.3	0	0	0	0	0.5
27	Tailings Pipeline & Access Road	10.1	7.2	15,000	19,645	3	0	3.1	0	3.1	2.8
28	Taliings Dam and Plunge Pool Area	6.8	7.1	120,000	0	5.9	0	6.2	0	6.2	5.9
29A	Slate Creek Cove Marine Terminal - USFS	1.4	4	10,475	6,700	1.9	1.9	1.3	0	3.2	1.9
29B	Slate Creek Cove Marine Terminal - State	0.5	0.5	***	***	***		***	***	***	***
30	Slate Creek Cove Topsoil Stockpile Area-Eliminated	0.2	0	4,000	0	0.2	0	0	0	0	0.2
31	Jualin Topsoil Stockpile Area	0	0	0	298,825	0	7	0	0	7	0
32	Jualin Facility Access Road Borrow Source #6	0	3	0	0	0	0	0	0	0	0
33	Jualin Land Application Area	0	0	0	0	0	0	0	0	0	0
34	Jualin Reclamation Material Area	0	1.6	0	0	0	0	0	0	0	0
35	Western Interception Ditch - Eliminated	0	0	0	0	0	0	0	0	0	0
36	Tailings Area Topsoil Stockpile	0	0	0	0	0	0	0	0	0	0
	TOTALS	**209.4**	**194.7**	**4,104,750**	**851,450**	**83**	**36.5**	**25.81**	**0.1**	**62.4**	**101.1**
***	These were rolled up into the row above										

Table 3
Kensington Waste Shipments

Date	Quantity	UOM	Description	Total Weight	
1/29/2007	1	Pallet	Scrap Hydraulic Hose	1220	lbs
2/16/2007	8	Drums	Ash Drums for Disposal	3000	lbs
3/7/2007	6	Pallet	Tires	6625	lbs
3/7/2007	1	Dumpster	Scrap Metal	7000	lbs
3/15/2007	2	Pallet	Tires	2892	lbs
4/7/2007	5	Each	Tires	3670	lbs
4/13/2007	7	Drums	Ash Drums for Disposal	1400	lbs
4/28/2007	1	Pallet	Tires	497	lbs
5/1/2007	1	Pallet	Tires	220	lbs
5/4/2007	1	Dumpster	Scrap Metal	10000	lbs
5/8/2007	3	Dumpster	Household Garbage	27600	lbs
5/20/2007	1	Pallet	Ash Drums for Disposal	1000	lbs
5/30/2007	3	Dumpster	Household Garbage	36000	lbs
6/11/2007	2	Pallet	Tires	515	lbs
6/13/2007	4	Dumpster	Household Garbage	20000	lbs
6/13/2007	1	Each	Tire	37	lbs
7/6/2007	1	Dumpster	Household Garbage	25240	lbs
7/6/2007	1	Dumpster	Scrap Metal	11000	lbs
7/6/2007	1	Pallet	Ash Drums for Disposal	1330	lbs
7/19/2007	4	Dumpster	Household Garbage	38370	lbs
7/24/2007	3	Dumpster	Household Garbage	23620	lbs
8/2/2007	1	Dumpster	Household Garbage	10020	lbs
8/7/2007	1	Each	Tire	150	lbs
8/8/2007	3	Dumpster	Household Garbage	27320	lbs
8/8/2007	4	Dumpster	Scrap Metal	29530	lbs
8/15/2007	1	Dumpster	Ash for Disposal	1500	lbs
8/15/2007	3	Dumpster	Household Garbage	17680	lbs
8/19/2007	1	Dumpster	Scrap Metal	27770	lbs
8/19/2007	4	Dumpster	Ash Drums for Disposal	1272	lbs
8/19/2007	5	Pallet	Tires	1956	lbs
8/28/2007	4	Dumpster	Household Garbage	27360	lbs
9/4/2007	3	Dumpster	Household Garbage	24603	lbs

Table 3 (cont)
Kensington Waste Shipments

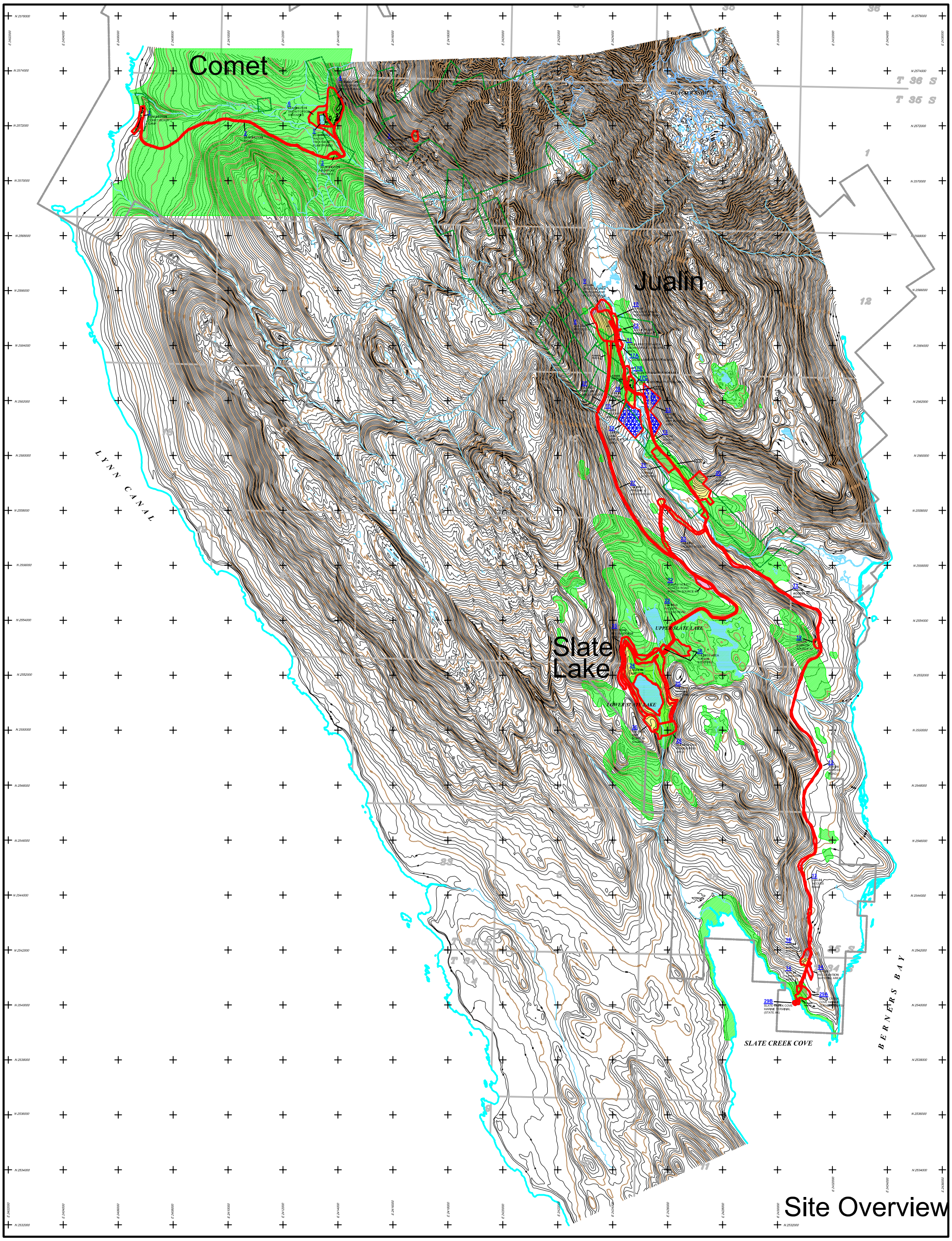
Date	Quantity	UOM	Description	Total Weight	
9/18/2007	4	Dumpster	Household Garbage	24020	lbs
9/18/2007	3	Dumpster	Scrap Metal	15880	lbs
9/18/2007	2	Pallet	Tires	1200	lbs
9/18/2007	4	Drums	Ash Drums for Disposal	420	lbs
9/25/2007	2	Dumpster	Household Garbage	15540	lbs
10/2/2007	1	Dumpster	Household Garbage	6000	lbs
10/9/2007	3	Pallet	Tires	800	lbs
10/12/2007	1	Pallet	Ash Drums for Disposal	1281	lbs
10/16/2007	2	Dumpster	Scrap Material for disposal	10000	lbs
10/19/2007	1	Dumpster	Household Garbage	5970	lbs
10/30/2007	2	Pallet	Tires	736	lbs
11/6/2007	1	Pallet	Tires	391	lbs
11/13/2007	2	Pallet	Ash Drums for Disposal	1892	lbs
11/13/2007	2	Pallet	Tires	1024	lbs
11/20/2007	1	Dumpster	Scrap Material for disposal	7330	lbs
11/20/2007	1	Dumpster	Scrap Metal	8120	lbs
11/26/2007	1	Pallet	Tires	434	lbs
12/2/2007	1	Flat	Scrap Metal	3000	lbs
12/18/2007	1	Dumpster	Scrap Metal	5000	lbs
12/18/2007	1	Pallet	Tires	228	lbs
			Total	499,663	lbs

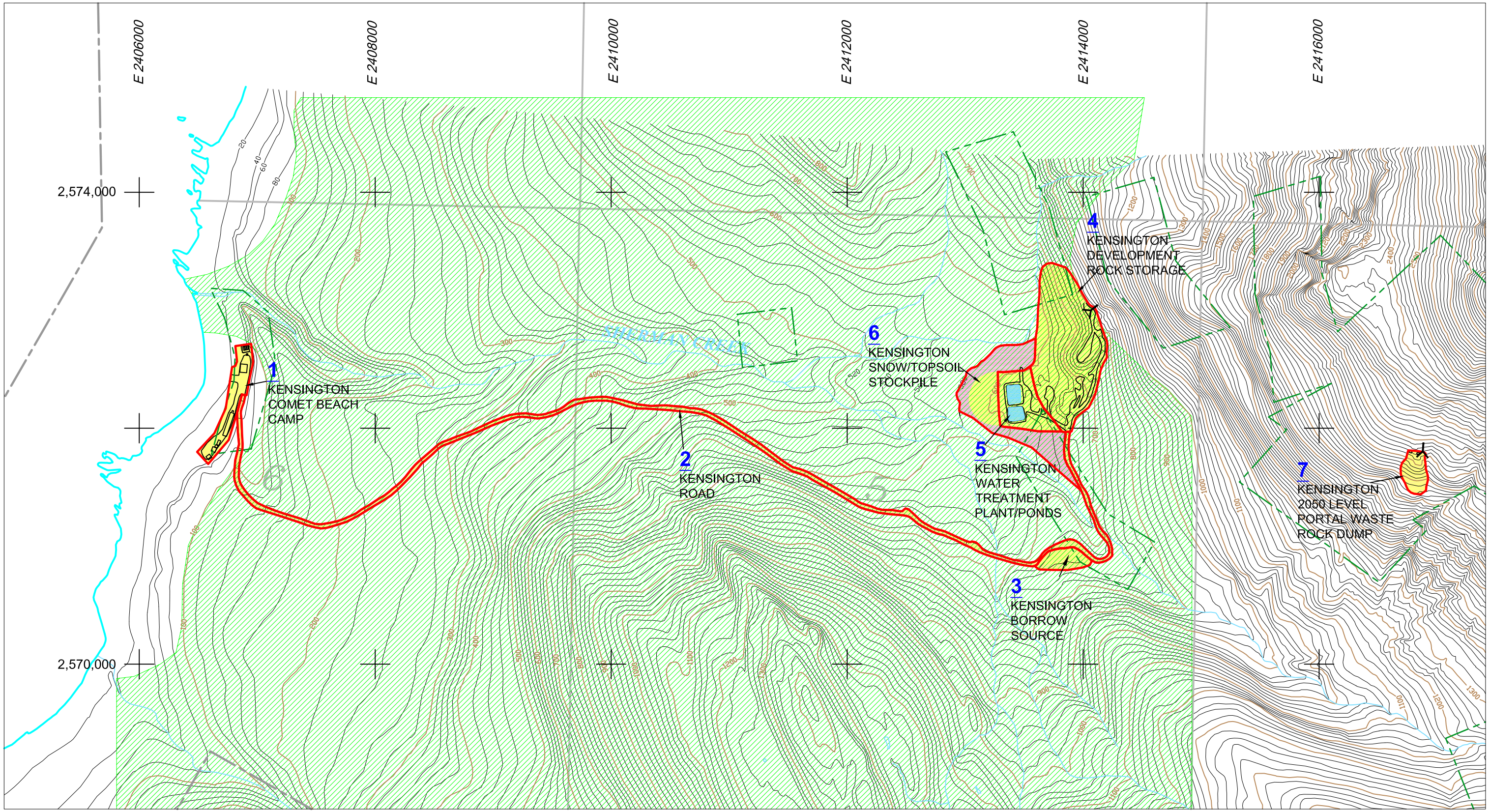
Table 4

Coeur Alaska - Kensington Gold Mine

2007 Spill Log

Date of Spill	Time of Spill	Product Spilled	Quantity Spilled	Location of Spill	Cause of Spill or additional information	Area(s) Affected	Clean Up (Y/N)	Reported to State
02/02/07	13:30	Hydraulic Fluid	7.5 to 10 gallons	Southwest corner by mill - Jualin	discharging hydraulic fluid.	Land	Y	NA
02/05/07	9:30	Diesel Fuel	<1 Gallon	Comet Beach Shop fuel tank	walked away to do somehting else while the fuel	Land	Y	NA
02/20/07	14:00	Hydraulic Fuel	~ 25 Gallons	Mine Portal - Jualin	Broken hydraulic line on Eight Yard Mucker	Land	Y	Y - 02/21/07
3/1/07	11:00	Hydraulic Fluid	1.5 to 2.0 gallons	Jualin - top of road from camp to Mill Bench	Ruptured hydraulic hose of Manlift	Land	Y	NA
3/22/07	2:00	Hydraulic oil	3 Gallons	Comet - 850 Underground Shop	Rock feell off bed of truck hitting the tranny line.	Land	Y	NA
4/20/07	20:30	Diesel Fuel	30 Gallons	Comet - 850 Generator Tank Pad	operator left the nozzle unattended and the tank	Land	Y	Y - 04/22/07
4/21/07	9:15	Diesel Fuel	3 Gallons	Comet - WTP	overflowed approx 3 gallons of diesel fuel onto	Land	Y	NA
5/7/07	15:45	Engine Oil	1 Gallon	Jualin - South of Ore Bin	spilled on the ground. Operator immediately turned	Land	Y	NA
5/19/07	11:00	Hydraulic Oil	4 Gallons	Jualin - TIC Warehouse, mill bench	Hydraulic hose broke on Ingersoll Rand Forklift.	Land	Y	NA
5/19/07	15:00	Diesel Fuel	2 Cups	Comet - Container Laydown	fuel leaking.	Land	Y	NA
6/12/07	14:00	Hydraulic oil	18 Gallons	Comet - WTP	Hydraulic hose broke on 55 Ton Crane	Land	Y	Y - 06/13/07
6/13/07	13:00	Hydraulic oil	< 1 Quart	Comet - Development rock pile	Hydraulic hose leak on Mucker	Land	Y	NA
6/13/07	17:55	Diesel Fuel	< 1/2 Gallon	Jualin - AIC Office Area	drip out through fuel cap	Land	Y	NA
7/2/07	16:30	Hydraulic Fluid	1.5 Gallons	Jualin - TIC Warehouse on Mill Bench	Hydraulic Hose burst on Hydraulic Manlift (ATB-60)	Land	Y	NA
7/6/07	12:45	Hydraulic Fluid	4 Gallons	Jualin - U/G at grade break	Hydraulic Hose burst on U/G Loader - R1700	Land	Y	NA
7/10/07	16:45	Sediment Release	< 5 Cubic Yds	Comet - Ophir Creek to Sherman Creek below Outfall 001	water treatment plant influent pond as part of routine maintenance, a sediment collection bladder failed	Land	Y	Y - EPA & ADEC
7/11/07	16:00	Diesel Fuel	<1 cup	Jualin - 30,000 gal. fuel tank on mill bench	ISO container and the discharge was the residual	Land	Y	NA
7/13/07	7:00	Motor Oil	6 ounces	Jualin - East side of mill at the eastern most edge of the road.	Tyler rental man lift leaked oil over night while it was parked.	Land	Y	NA
7/13/07	15:00	Diesel Fuel	<1 ounce	Jualin - 30,000 gal. fuel tank on mill bench	out onto the ground.	Land	Y	NA
7/15/07	5:30	Diesel Fuel	Max. 296 Gallons	40' North of Jualin Portal	generator. The generator was filled to capacity at 7 pm the night of 7/14/07. At 12 midnight a Redpath	Land	Y - Ongoing	07/15/07 - 10:52 am
7/26/07	15:15	Hydraulic Fluid	2 Ounces	Mill Building, Inside east door	was spotted, clean up was done and bucket was	Land	Y	NA
9/21/07	13:30	Diesel Fuel	~ 1 Cup	Comet Maintenance Shop	Faulty Fuel Line	Land	Y	NA
10/26/07	10:15	Diesel Fuel	30 gallon	Underground - 850 Drift	fuel on drift rib toward sump at 0900 ramp	Land	Y	Y - 11:55
10/29/07	15:00	Hydraulic oil	3-5 gallons	North End of Warehouse	inch hydraulic pipe nipple	Land	Y	NA


Comet
Jualin
Slate Lake
LYNN CANAL
BERNERS BAY
SLATE CREEK COVE
UPPER SLATE LAKE
LOWER SLATE LAKE
T 36 S
T 35 S
T 34 S
Site Overview



LEGEND OF FEATURES

- BUILDING OR STRUCTURE
- MINE ADIT WITHIN DISTURBANCE BOUNDARIES
- CLAIM BLOCK OUTLINE
- PATENTED CLAIMS
- WETLANDS
- FACILITY DISTURBANCE AREA OUTLINE
- PERMITTED DISTURBANCE

Figure 2 - Comet Facilities	
FILENAME: Kensington_3_Disturb_07.dwg	SCALE: 1"=800 FT
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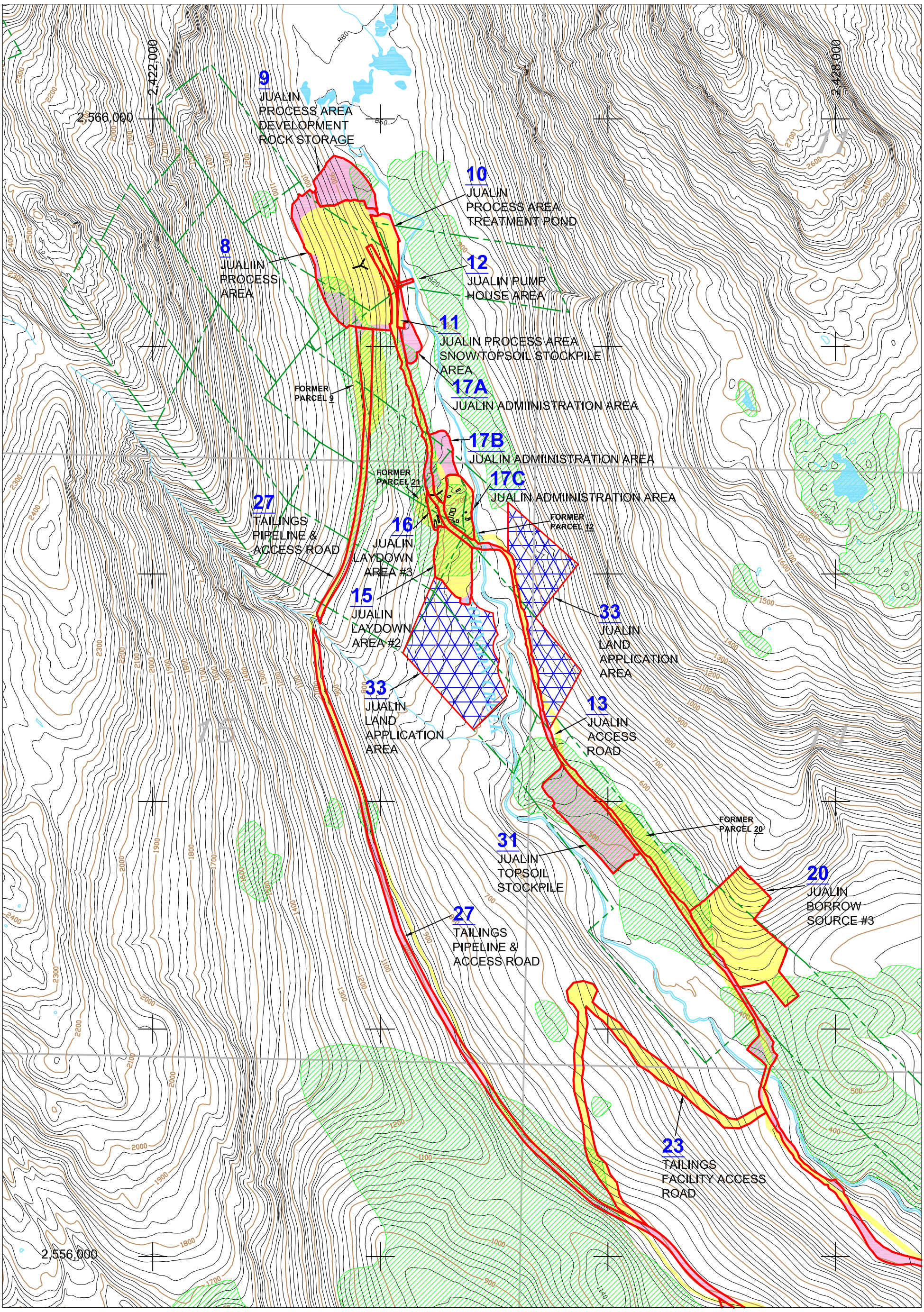
KENSINGTON GOLD PROJECT AREA

DISTURBANCE BOUNDARIES

BERNERS BAY, ALASKA



LEGEND OF FEATURES

- BUILDING OR STRUCTURE
- MINE ADIT WITHIN DISTURBANCE BOUNDARIES
- CLAIM BLOCK OUTLINE
- PATENTED CLAIMS
- WETLANDS
- FACILITY DISTURBANCE AREA OUTLINE
- PROPOSED LAND APPLICATION AREA
- PERMITTED DISTURBANCE

Figure 3 - Jualin Area

FILENAME: Kensington_3_Disturb_07.dwg | SCALE: 1"=800 FT

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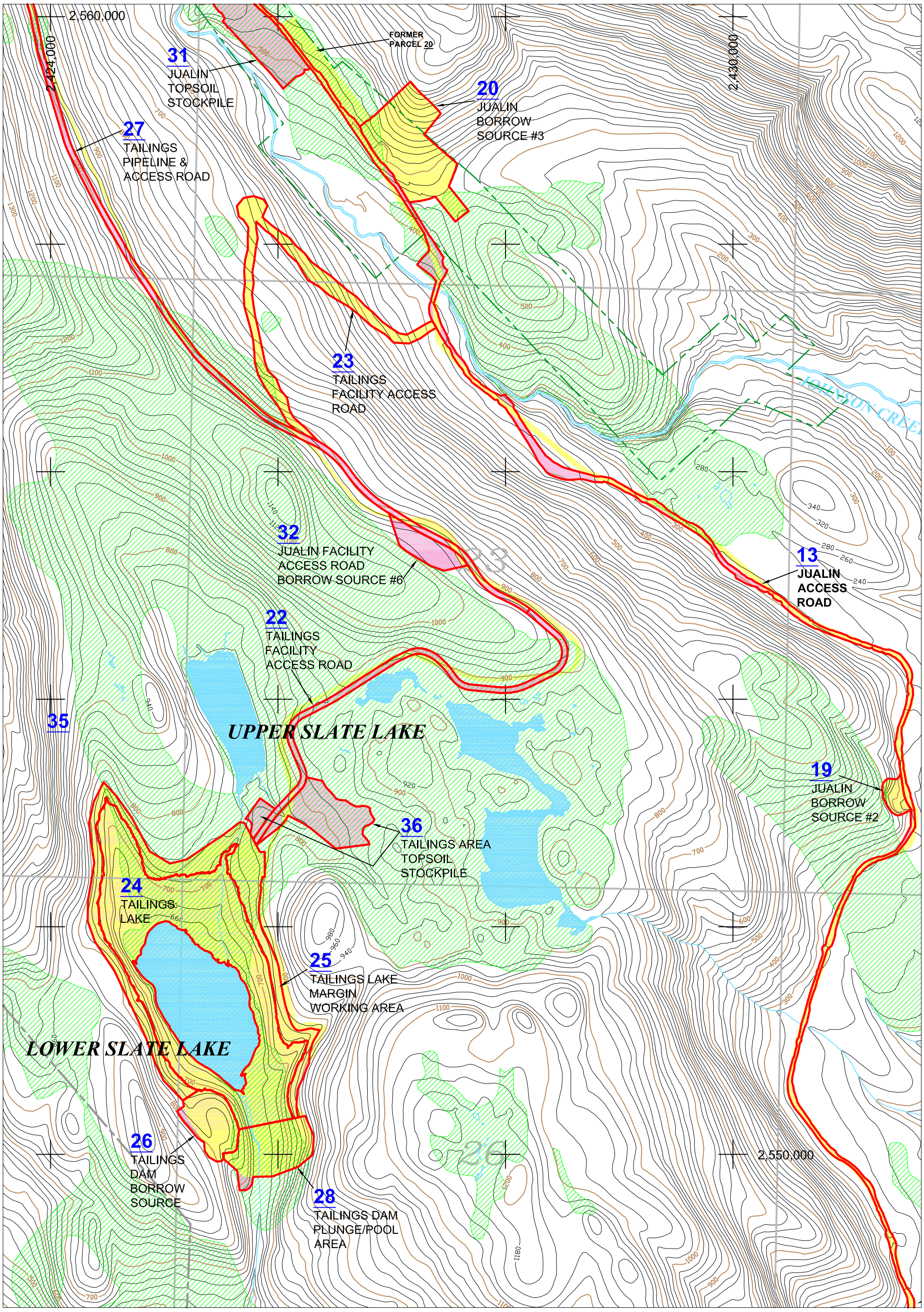
KENSINGTON GOLD PROJECT AREA

DISTURBANCE BOUNDARIES

BERNERS BAY, ALASKA



LEGEND OF FEATURES

- BUILDING OR STRUCTURE
- MINE ADIT WITHIN DISTURBANCE BOUNDARIES
- CLAIM BLOCK OUTLINE
- PATENTED CLAIMS
- WETLANDS
- FACILITY DISTURBANCE AREA OUTLINE
- PERMITTED DISTURBANCE

Figure 4 - Tailings Area

FILENAME: Kensington_3_Disturb_07.dwg | SCALE: 1"=800 FT

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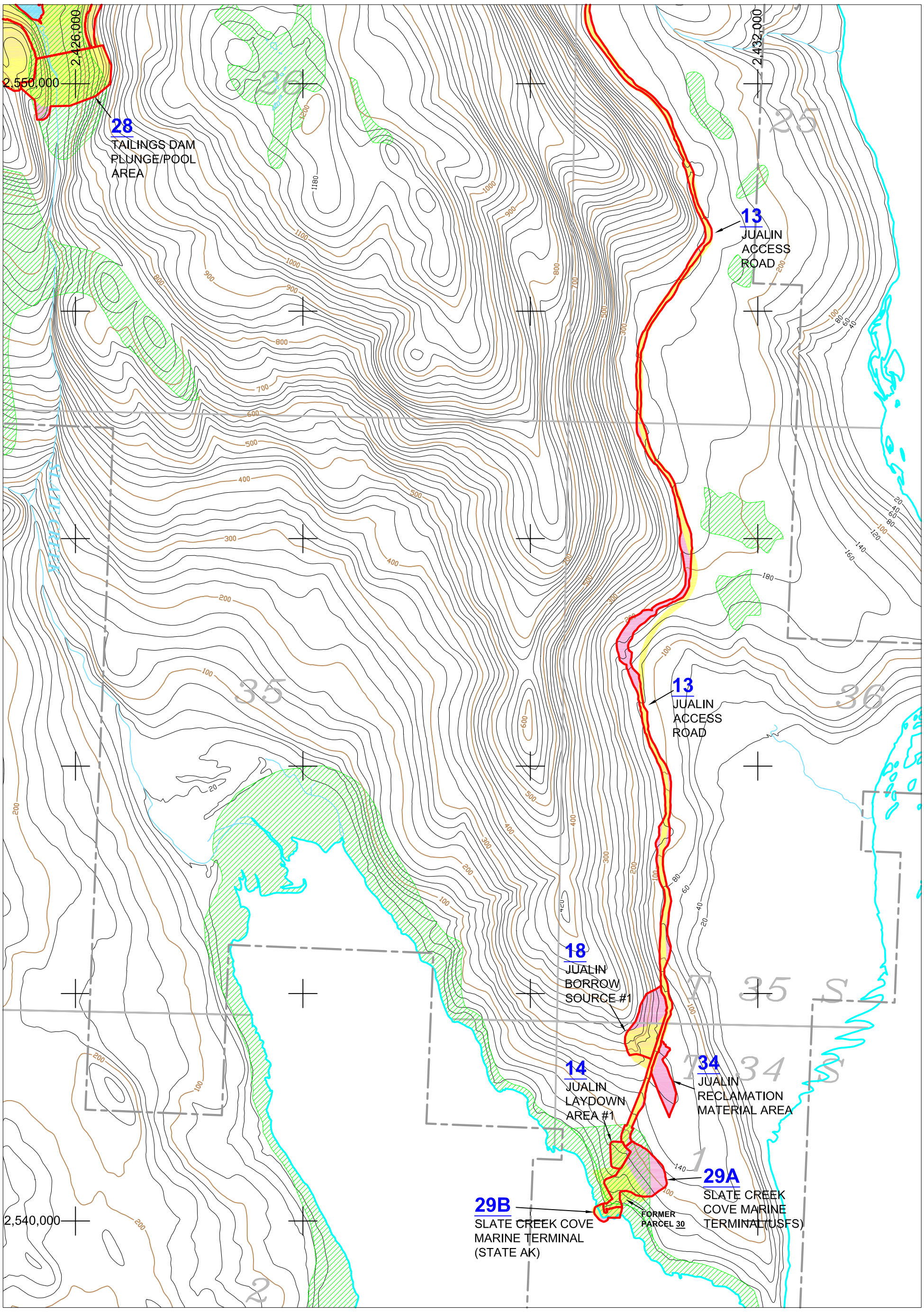
KENSINGTON GOLD PROJECT AREA

DISTURBANCE BOUNDARIES

BERNERS BAY, ALASKA



LEGEND OF FEATURES

- BUILDING OR STRUCTURE
- MINE ADIT WITHIN DISTURBANCE BOUNDARIES
- CLAIM BLOCK OUTLINE
- PATENTED CLAIMS
- WETLANDS
- FACILITY DISTURBANCE AREA OUTLINE
- PERMITTED DISTURBANCE

Figure 5 - MARINE TERMINAL AREA

FILENAME: Kensington_3_Disturb_07.dwg | SCALE: 1"=800 FT

REV.DATE: 1/30/2008 | DRAWN: Env

KENSINGTON GOLD PROJECT AREA

DISTURBANCE BOUNDARIES

BERNERS BAY, ALASKA

Attachment 1

Mountain Goat Assessment - ADFG

Wildlife Research Annual Progress Report

Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine, Southeast Alaska.

Kevin S. White, Neil L. Barten, and Doug Larsen

Alaska Department of Fish and Game
Division of Wildlife Conservation

September 2007

Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine, Southeast Alaska.

Kevin S. White, Neil L. Barten, and Doug Larsen

Alaska Department of Fish and Game
Division of Wildlife Conservation
P. O. Box 110024, Douglas, AK 998211
Tel: 907-465-4353

Annual Progress Report

September 2007

This report contains preliminary data and should not be cited without permission of the authors.

ACKNOWLEDGEMENTS

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Cover photo: Mountain goat #LG-71 leaping across a small alpine stream in the upper Katzehin river valley, August 2007. (Kevin White)

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INTRODUCTION

This annual progress report was prepared to meet the reporting requirements for State of Alaska Department of Transportation and Public Facilities and Coeur Alaska. Funding for this project was made available in September 2005 and this report summarizes activities completed by July 31, 2007.

Background

Coeur Alaska has recently re-initiated development activities at the Kensington mine site, located a short distance northwest of Berners Bay. In addition, the Department of Transportation and Public Facilities is planning to construct an all-season highway between Echo Cove and the Katzehin River (ca. 51 miles in length). Among the wildlife species potentially affected by mine development and road construction activities are mountain goats (*Oreamnos americanus*). A small-scale study of mountain goats conducted in the vicinity of the Kensington mine by Robus and Carney (1995) showed that goats moved seasonally from high alpine elevations in the summer and fall to low, timbered elevations during winter months. One of the main objectives of the Robus and Carney (1995) study was to assess the impacts of the mine development activities on habitat use, movement patterns and, ultimately, productivity of mountain goats. However, since the mine never became operational these objectives could not be achieved, and by 1995 goat monitoring in the area wound down and eventually ended. Now, however, the mine is in the process of re-opening and the Alaska Department of Fish and Game maintains that many of the same concerns that prompted the Robus and Carney (1995) study are still valid and need to be addressed. In addition, large-scale plans for development of the Juneau Access road raise new, potentially more substantial, concerns regarding not just the enlarged "footprint" of industrial development activities in eastern Lynn Canal, but also the cumulative impacts of both development projects.

The affects of mining and road development activities on local mountain goat populations in the vicinity of the Kensington mine and eastern Lynn Canal are not well known or understood at this time. However, studies conducted elsewhere indicate that mountain goats can be negatively impacted by industrial development activities. Such effects include temporary range abandonment, alteration of foraging behavior and population decline (Chadwick 1973, Foster and Rahs 1983, Joslin 1986, Cote and Festa-Bianchet 2003). Consequently, information about the distribution of mountain goats proximate to the mine and road development corridor is needed to determine the extent to which populations may be affected by associated industrial activities. Information collected by Robus and Carney (1995), in the vicinity of Kensington mine, as well as Schoen and Kirchhoff (1982), near Echo Cove, suggest that spatial overlap between mountain goats and the proposed industrial activity will be most pronounced when goats are over-wintering in low-elevation habitats. In addition, it is not clear where goats spend non-winter months and, by extension, the spatial extent to which development activities are thereby translated across the landscape.

In response to the above concerns, the Alaska Department of Fish and Game, with funding provided by the Department of Transportation and Public Facilities and Coeur Alaska, has initiated monitoring and assessment activities to determine possible impacts of road construction and mine development on mountain goats and identify potential mitigation measures, to the extent needed. Assessment and monitoring work includes collection of vital rate, habitat use and movement data from a sample of radio-marked mountain goats in addition to conducting annual aerial population abundance and productivity surveys. These efforts are aimed at providing the Alaska Department of Fish and Game with information necessary to appropriately manage mountain goats in the proposed areas of development.

STUDY OBJECTIVES

This research is designed to investigate the spatial relationships, vital rates and abundance of mountain goats in the Berners Bay and upper Lynn Canal area. The specific objectives are as follows:

1) Determine seasonal movement patterns of

mountain goats in areas near the Kensington mine and Juneau Access road corridor;

2) Characterize mountain goat habitat selection patterns and the extent of spatial overlap with areas impacted by Kensington mine and Juneau Access road corridor development activities;

3) Estimate reproductive success and survival of mountain goats in areas near the Kensington mine and Juneau Access road corridor; and

4) Estimate mountain goat population abundance and composition in areas near the Kensington mine and Juneau Access road corridor.

STUDY AREA

Mountain goats were studied in a ca. 600 km^2 area located in a mainland coastal mountain range east of Lynn Canal, a post-glacial fiord located near Haines in southeastern Alaska (Figure 1). The study area is oriented along a north-south axis and bordered in the south by Berners Bay (58.76N, 135.00W) and by Dayebas Creek (59.29N, 135. 35W) in the north. Within this area, three separate study sites were delineated based on the actual or expected extent of industrial activity occurring in or near each locality (Figure 1).

An additional study area located east of Berners Bay was established in spring 2006. This area was not originally included in the study design however recent information about road construction timelines resulted in a re-evaluation of the efficacy of conducting research activities in this area. Research efforts in this area will be limited in scope and low intensity sampling in this area is intended to provide managers with baseline information needed to assist future management efforts in light of the road construction, gravel crushing and/or stock-piling that is likely to occur in this area. Additional ADFG funding was allocated to partially offset costs associated with research activities in this area.

Elevation within the study areas range from 6300 feet to sea level. This area is an active glacial terrain underlain by late cretaceous-paleocene granodiorite and tonalite geologic formations (Gehrels 2000).

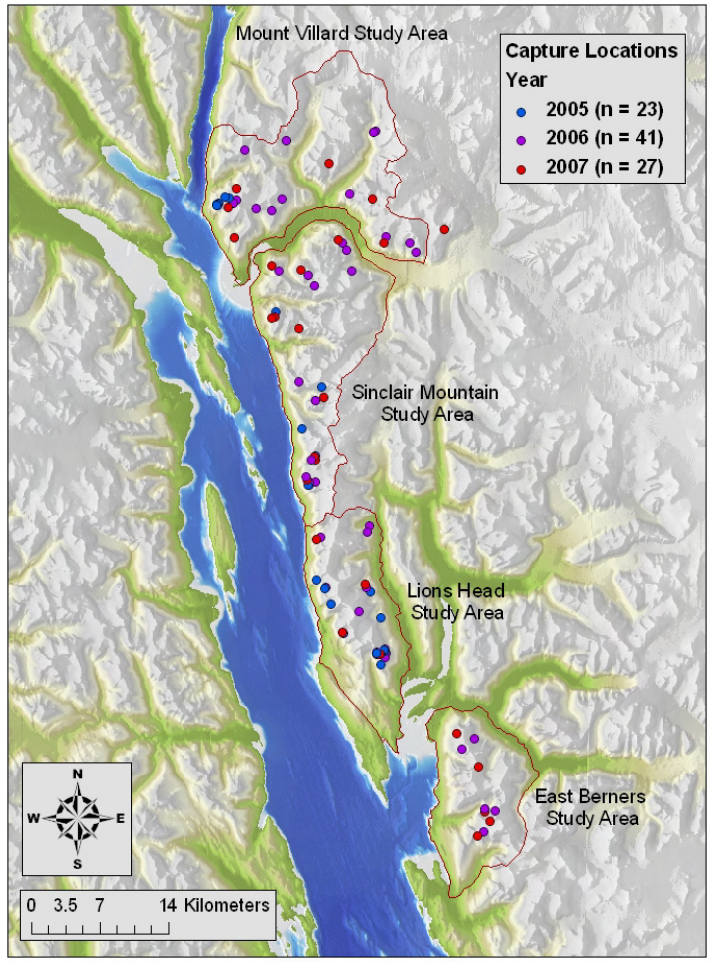

Figure 1. Mountain goat capture locations, Lynn Canal, 2005-2007. Study areas are labeled and delineated in red.

Specifically, it is a geologically young, dynamic and unstable landscape that harbors a matrix of perennial snowfields and small glaciers at high elevations (i.e. above 4000 feet) and rugged, broken terrain that descends to a rocky, tidewater coastline. The northern part of the area is bisected by the Katzehin river, a moderate volume (ca. 1500 cfs; USGS, unpublished data) glacial river system that is fed by a tributary of the Juneau Icefield.

The maritime climate in this area is characterized by cool, wet summers and relatively warm snowy winters. Annual precipitation at sea-level averages 55 inches and winter temperatures are rarely less than 5º F and average 30º F (Haines, AK; National Weather Service, Juneau, AK, unpublished data). Elevations at 2600' typically receive ca. 250 inches of snowfall, annually (Eaglecrest Ski Area, Juneau, AK, unpublished data). Predominant vegetative communities occurring at low-moderate elevations (<1500') include Sitka spruce (*Picea sitchensis*)-

western hemlock (*Tsuga heterophylla*) coniferous forest, mixed-conifer muskeg and deciduous riparian forests. Mountain hemlock (*Tsuga mertensiana*) dominated 'krummholtz" forest comprises a subalpine, timberline band occupying elevations between 1500-2500 feet. Alpine plant communities are composed of a mosaic of relatively dry ericaceous heathlands, moist meadows dominated by grasses and forbs and wet fens. Avalanche chutes are common in the study area, bisect all plant community types and often terminate at sea-level.

METHODS

Mountain Goat Capture

Mountain goats were captured using standard helicopter darting techniques and immobilized by injecting 3.0-2.55mg of carfentanil citrate, depending on sex and time of year (Taylor 2000), via projectile syringe fired from a Palmer dart gun (Cap-Chur, Douglasville, GA). During handling, all animals were carefully examined and monitored following standard veterinary procedures (Taylor 2000) and routine biological samples and morphological data collected. Following handling procedures, the effects of the immobilizing agent was reversed with 100mg of naltrexone hydrochloride per 1mg of carfentanil citrate (Taylor 2000). All capture procedures were approved by the State of Alaska Animal Care and Use Committee.

GPS Location Data

Telonics TGW-3590 GPS radio-collars (Telonics, Inc., Mesa, AZ) were deployed on most animals captured (seven Telonics MOD-500 VHF radio-collars were deployed on an experimental basis). GPS radio-collars were programmed to collect location data at 6-hour intervals (collar lifetime: 2 years). During each location attempt, ancillary data about collar activity (i.e. percent of 1-second switch transitions calculated over a 15 minute period following each GPS fix attempt) and temperature (degrees C) were simultaneously collected. Complete data-sets for each individual were remotely downloaded (via fixed-wing aircraft) at 8-week intervals. Location data were post-processed and filtered for "impossible" points and 2D locations with PDOP (i.e. position dilution of precision) values greater than 10, following D'Eon et al. (2002) and D'Eon and Delparte (2005).

Habitat Selection and Movement Patterns

Altitudinal Distribution.—Annual variation in mountain goat altitudinal distribution was characterized by estimating daily average altitude for 18 mountain goats for which multi-year data were available. In addition, duration of time spent on winter ranges was calculated, for both male and female mountain goats, during the winters of 2005-2006 and 2006-2007.

In general, comprehensive analyses of mountain goat habitat use and movement patterns will not be conducted until all GPS location information is collected (i.e. 2009). Nevertheless, preliminary analyses focused on describing sex specific variation in terrain use, and movement patterns were conducted using a subset of the data (White, in press) during the previous reporting period (White et al. 2006).

Winter Severity and Snow Modeling Data Collection

Winter distribution of mountain goats is strongly influenced by snow depth and distribution. Since patterns of snow accumulation vary at both small and large spatial scales it is often necessary to collect site-specific field data in order to accurately characterize these relationships within focal areas. Unfortunately, standardized snow depth monitoring information is extremely limited within the study area and additional information is needed in order to properly characterize spatial patterns of snow accumulation and, ultimately, mountain goat winter distribution. Consequently, we initiated field efforts designed to create a snow depth database in order to generate spatially explicit snow depth models within the study area.

Standardized field surveys were conducted in order to estimate patterns of snow depth as it related to habitat type (i.e. forested/non-forested), altitude, and slope aspect. These preliminary efforts focused on four sites located in different mountain goat winter ranges. During surveys snow depth was measured at geo-referenced locations along an altitudinal gradient (beginning at sea level). Snow measurements were replicated at each sampling location (n = 5) and associated covariate

information was collected. Sampling locations were spaced at regular (100-200m) intervals, depending upon terrain complexity. Steep (>35 degrees), exposed slopes were, generally, not sampled due to safety considerations. In addition, daily climate information for reference weather stations was acquired from the National Weather Service (Haines and the Mendenhall Valley) and Coeur Alaska (Jualin Camp).

Reproduction and Survival

Kidding rates and mountain goat survival were determined by monitoring individual study animals during monthly surveys using fixed-wing aircraft (Heliocourier, Cessna 210) equipped for radio-telemetry tracking. During surveys, radio-collared adult female mountain goats were monitored to determine whether they gave birth to kids and, if so, how long they survived. Monitoring kid production and survival was only possible during the non-winter months when animals could be reliably observed in open habitats. We assumed that kids did not survive winter if they were not seen with their mothers the following spring. Cases in which kid status assessments were equivocal were filtered from the data set and not used for subsequent estimates of kid survival. Mortality of individual mountain goats was determined by detecting radio-frequency pulse rate changes during monthly monitoring surveys. In cases where mortality pulse rates were detected, efforts were made to investigate sites as soon as possible via helicopter or boat. To the extent possible, all mortalities were thoroughly investigated to ascertain the cause of death and relevant biological samples collected.

Population Abundance and Composition Estimation

Aerial Surveys.—Population abundance and composition surveys were conducted using fixed-wing aircraft (i.e. Heliocourier) and helicopter (Hughes 500) during August-October 2006. Original project planning required flying 3 replicate surveys in the Lions Head, Sinclair and Villard study areas. Additional funding provided by the Alaska Department of Fish and Game provided the opportunity to fly surveys in the East Berners area and additional replicate surveys in the three focal study areas.

Aerial surveys were typically conducted when conditions met the following requirements: 1) flight ceiling above 5000 feet ASL, 2) wind speed less than 20 knots, 3) sea-level temperature less than 65 degrees F. Surveys were typically flown along established flight paths between 2500-3500 feet ASL and followed geographic contours. Flight speeds varied between 60-70 knots. During surveys, the pilot and two experienced observers enumerated and classified all mountain goats seen as either adults (includes adults and sub-adults) or kids. In addition, each mountain group observed was checked (via 8X binoculars) to determine whether GPS-collared animals were present. Flight conditions, terrain complexity and animal behavior often complicated efforts to determine whether observed mountain goats were collared or not. As a result, the number of adults for which collar presence could be ascertained with a high degree of confidence was also recorded for each group observed.

Estimating the probability of observing mountain goats on a given survey (i.e. sightability) is critical for deriving population size estimates for focal areas. This is typically achieved by comparing the number of marked animals in an area to the number of marked animals actually seen (or re-sighted) during a survey. This fairly simple procedure can be complicated when its not always possible to assess whether observed animals are marked or not. This situation occurs on mountain goat surveys and requires additional refinement of standard mark-resight population estimators. New analytical methods appropriate for estimating mountain goat population size in this study are currently being developed. As a result, mountain goat survey data were summarized in this report to include estimates of population composition and the minimum number of mountain goats seen on surveys (i.e. the number observed) but not the estimated actual number of mountain goats in focal areas.

Ground Surveys.—Evaluation of ground-based techniques for estimating mountain goat population size and composition were conducted in a small portion of the Lions Head study area (i.e. 13.2 km^2) in June 2006 and in the Mt. Villard area during June 2007. Previous research has concluded that aerial

surveys are often inadequate for providing accurate estimates of the proportion of adult males and females, as well as sub-adults during aerial surveys (Cote and Festa-Bianchet 2003); only the proportion of adults and kids in a population can be reliably estimated. As a result, ground-based survey techniques were tested to evaluate whether this method might serve as a reliable tool for classifying individuals of separate sex and age classes during survey efforts.

Additional field efforts involved collection of GPS-collar activity sensor validation data. In these cases, individual study animals were observed during pre-programmed activity sensor evaluation periods (i.e. 15 minute intervals following fix initiation events). During observation periods, detailed behavioral data were collected using focal animal sampling procedures (Altman 1974).

RESULTS AND DISCUSSION

Mountain Goat Capture and Handling

Capture Activities.—Mountain goats were captured over 5 days between July 29-August 11, 2007. Overall, 27 animals were captured using standard helicopter darting methods. Nineteen animals were deployed with Telonics TGW-3590 GPS radio-collars and seven were deployed with Telonics MOD-500 VHF radio-collars. We deployed VHF radio-collars on a subset of captured mountain goats because battery life-span is significantly longer (radio-collar battery life span: VHF = 8 years, GPS = 2 years). The extended life span of VHF radio-collars will enable collection of supplementary mountain goat survival and reproduction data and reduce the frequency in which mountain goats must be captured.

Helicopter captures were attempted during periods when mountain goats were distributed at high elevations and weather conditions were favorable (i.e. high flight ceiling and moderate wind speed). Additionally, captures were scheduled to avoid periods within 8 weeks of parturition in order to avoid unnecessary disturbance of adult females and associated neonates. Captures were attempted in areas where mountain goat access to dangerously steep terrain was limited. As a result of these constraints, opportunities to capture mountain goats were fairly limited. Nevertheless, given the fairly large area of study and decent summer weather conditions, it was typically possible to capture approximately six mountain goats per day of effort.

Biological Sample Collection.—During handling procedures, standard biological specimens were collected and morphological measures recorded. Specific biological samples collected from study animals included: whole blood (4 mL), blood serum (8 mL), ear tissue, hair and fecal pellets. Whole blood, serum and fecal pellet sub-samples were sent to Dr. Kimberlee Beckmen (ADFG, Fairbanks, AK) for disease screening. In addition, tissue sub-samples were sent Dr. Steeve Cote (University of Laval, Quebec) for inclusion in a broad-scale mountain goat population genetics analysis. Fecal sub-samples were sent to the Wildlife Habitat Nutrition Lab (Washington State University, Pullman, WA) for microhistological analysis to determine diet composition of mountain goats. All remaining samples have been archived at Alaska Department of Fish and Game facilities in Douglas, AK.

Mountain Goat Body Mass.—Data relating to morphological characteristics of mountain goats were collected for all animals, when practicable. Preliminary analysis of age- and sex-specific body mass were conducted. Body mass data were standardized following Cote et al. (1998) to control for the effects of capture date on body mass and allow for comparisons with other studies. Overall, adult (i.e. 4+ years of age) male mountain goats were heavier and appeared to sustain a longer

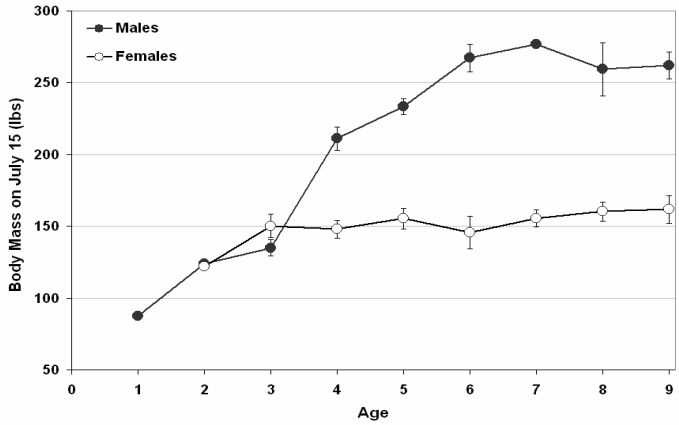

Figure 2. Sex and age specific body mass of mountain goats, 2005-2007 (females, n = 34; males, n = 46).

Table 1. Average body of mass adult (<5 years old) male and female mountain goats. Weight estimates are standardized and represent predicted weights in mid-summer (i.e. July 15). Regression equations used to standardize weights to July 15 for Lynn Canal mountain goats were: males, $y = 0.62x + 242.91$, $r^2 = 0.27$; females, $y = 0.39x + 149.28$, $r^2 = 0.35$.

	Adult Males			Adult Females			
Area	Mean (lbs.)	SD	n	Mean (lbs.)	SD	n	Source
Lynn Canal, AK	259	31.91	33	156	17.81	25	This Study
Caw Ridge, AB	216	18.35	36	156	--	--	Festa-Bianchet and Cote 2007
Olympic Mountains, WA	246	--	9	136	--	40	Houston et al. 1989

period of mass gain than females (Figure 2). In comparison to other studies, mountain goats in Lynn Canal were within the normal range of values reported. While adult males tended to be heavier, the degree of sexual dimorphism tended to be intermediate and adult females were of similar body mass as compared to other populations (Table 1). Statistical analyses of population comparisons is limited due to incomplete data in the literature.

GPS Location Data

GPS System Performance.—The performance of GPS radio-collars (as of 8/21/07) has been evaluated for 79 collars deployed since the beginning of the study. In general, the remote GPS data collection system used in this study worked as expected. We did not encounter any problems with GPS collar performance, nor did significant problems occur with remote data download attempts. This high level of success was achieved despite occasionally poor weather conditions and, in some cases, substantial download distances between aircraft and mountain goats (i.e. up to 3 miles). However, several pre-programmed bi-monthly GPS data download periods were missed due to weather conditions. Nevertheless, it was always possibly to download missed GPS data on subsequent surveys.

Collar Retrieval.—Of the 24 animals that died, nearly all (n = 23) collars were retrieved from the field and GPS data downloaded from the collar. One collar was not located in the field due to an unknown VHF transmitter failure, however, all GPS data collected had been previously downloaded by this time. Fifteen GPS collars deployed in fall 2005 had been pre-programmed to automatically release on August 15, 2007. Twelve of these collars were

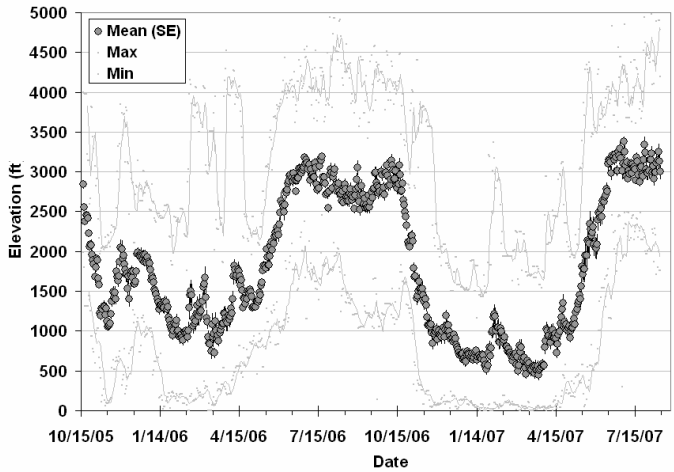

Figure 3. Altitudinal distribution of mountain goats, Lynn Canal, AK, 2005-2007. Data were summarized only for mountain goats for which data were available during 2005-

retrieved from the field on August 23, 2007 and subsequently downloaded. These data revealed every collar released on the exact day they were programmed to do so. This differs with results obtained in brown bear studies where collars can take up to a few weeks to release (Rod Flynn, Alaska Department of Fish and Game, personal communication).

Habitat Use and Movement Patterns

Altitudinal Distribution.—During the high snow winter of 2006-2007, mountain goats, on average, wintered at lower elevations (females, mean = 840 ft; males, mean = 782 ft) than during the moderate winter of 2005-2006 (females, mean = 1493 ft; males = 1303 ft; Figure 3). Nonetheless, the duration of time mountain goats spent in wintering areas was similar between years (2005-2006, mean = 193 days; 2006-2007, mean = 179 days), though tended to be longer for males (mean duration = 197 days) than females (mean duration = 175 days).

Winter Severity and Snow Modeling

Snow Surveys.—Four field-based snow surveys were conducted during April 3-20, 2007 in the Echo Cove (n = 1) and northern Lynn Canal (n = 3) areas. Preliminary analyses of these data quantified the degree to which snow depth differs with increasing elevation between forested and non-forested sites (Figure 4). Specifically, we determined that snow depth increased about 1 foot for every 400 feet in elevation gain. Further, snow depth was, on

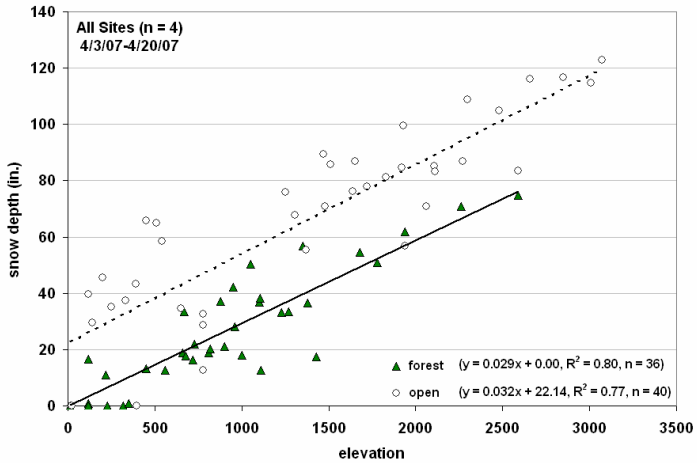

Figure 4. Relationship between snow depth, elevation and forest cover. Based on data collected at four sites in upper Lynn Canal, AK during April 3-21, 2007.

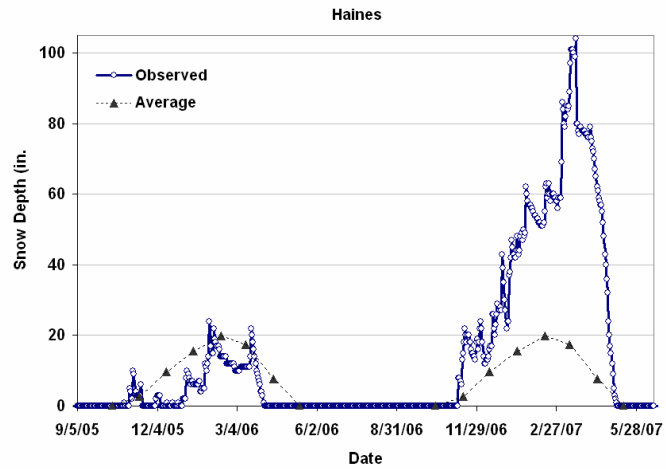

Figure 5. Daily snow depth (inches) recorded at the NWS weather station in Haines, AK, 2005-2007. Average daily snow depth is depicted by the black dashed line.

average, about 22 inches deeper in open sites as compared to forested sites.

Climate Data.—Daily climate data were archived from the National Weather Service and Coeur Alaska databases to characterize broader scale climate patterns. Mean daily snow depth and snowfall data were summarized from data collected at the Juneau Forecast Office (Mendenhall Valley), Haines and Jualin Camp (snowfall data only). Mean snow depth during the winter of 2006/2007 in Haines and the Mendenhall Valley was the highest on record. In Haines, snow depth during late-winter was as much as five times higher than the long-term average, however, the overall winter mean snow depth was not as extreme (Figure 5). Snow depth in the Mendenhall Valley was substantially lower than in Haines, though still up to 2-3 times higher than normal during extended periods (Figure 6). In general, snowfall patterns exhibited a bi-modal distribution when compared across time. Specifically, these data indicated that snowfall peaked during November-January and March; only moderate amounts of snowfall were recorded during February (Figure 7). Snow depth data collected in the Mendenhall Valley documented an approximate 6 week period of minimal or negative snow accumulation during January-February 2007, a period during which snow depth approximated average. However, in Haines snow depth consistently increased during the entire winter and a significant melting event was not evident in mid-winter. These data corroborate long-term climate

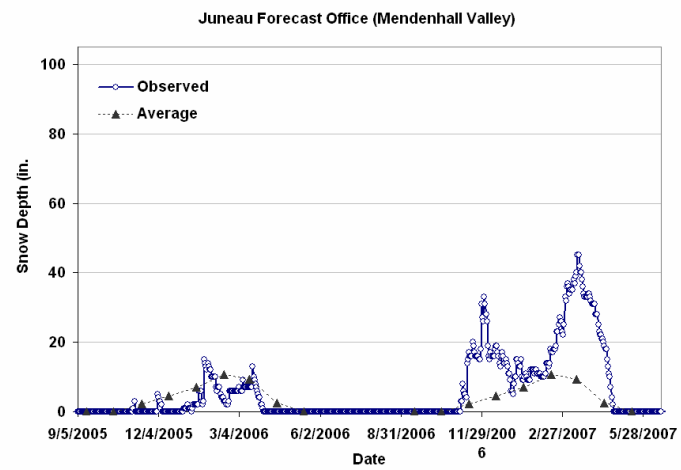

Figure 6. Daily snow depth (inches) recorded at the NWS weather station in Mendenhall Valley, AK, 2005-2007. Average daily snow depth is depicted by the black dashed line.

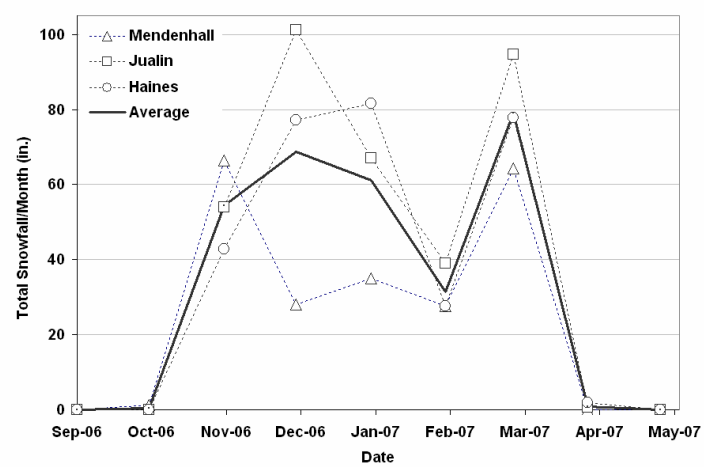

Figure 7. Daily snowfall/month inches) recorded in Mendenhall Valley, Jualin Camp and Haines AK, 2006-2007. Average daily snowfall depth is depicted by the solid black line.

Table 2. Estimates of annual survival for adult male and female mountain goats, 2005-2007, Lynn Canal, AK. Estimates independent of gender and year are also provided.

	Males				Females				Total			
Year	At Risk	Died	Survival	SE	At Risk	Died	Survival	SE	At Risk	Died	Survival	SE
2005/2006	11	2	0.82	0.12	11	1	0.91	0.09	22	3	0.86	0.07
2006/2007	33	11	0.67	0.08	25	4	0.84	0.07	58	15	0.74	0.06
Both years	44	13	0.70	0.07	36	5	0.86	0.06	80	18	0.78	0.05

trends which indicate that Haines is typically colder in winter than the Juneau area where winter precipitation is less likely to fall as snow than in Haines.

Survival and Reproduction

Survival.—Mountain goats were monitored monthly during fixed-wing aerial telemetry flights. Of the 58 animals monitored during 2006/2007 (i.e. 5/20/2006– 5/19/2007), 15 animals died of various causes. Overall, preliminary survival estimates were 12% lower in 2006/2007 than in 2005/2006 (Table 2). In general, survival of females was higher than males (Table 2) and older animals were more likely to die than younger animals (Table 3). Most mortality occurred during late winter (February-May), however, two adult males died during October-November, a period coinciding with the rut (Figure 8). The preliminary estimates of survival reported for 2006/2007 are lower than has been documented elsewhere (Smith 1986, Festa-Bianchet and Cote 2007), however, survival estimates for 2005/2006 are similar to previous studies (Table 3). Given that winter snowfall accumulation during

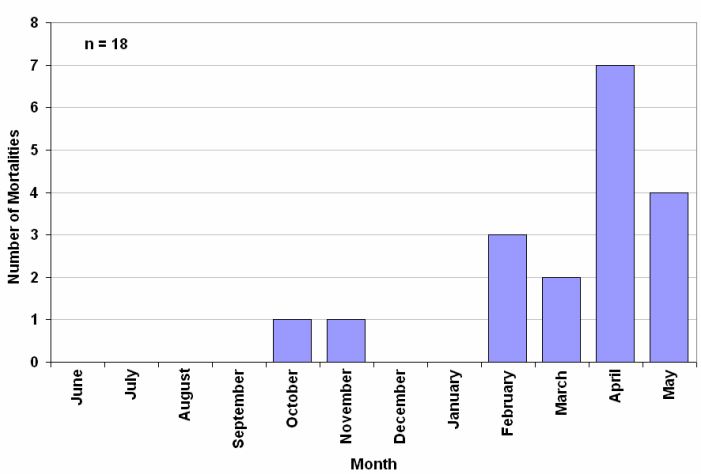

Figure 8. Season distribution of mountain goat mortality, 2005-2007, Lynn Canal, AK.

Table 3. Comparison of mountain goat sex- and age-specific annual survival among three populations, for which data exist, in North America.

	Females		Males		Both Sexes		
Population	2-8 Years	9+ Years	2-8 Years	9+ Years	2-8 Years	9+ Years	Source
Lynn Canal, AK	0.90 (30)	0.60 (5)	0.83 (30)	0.43 (14)	0.87 (60)	0.47 (19)	This Study
Ketchikan, AK	--	--	--	--	0.95 (152)	0.68 (25)	Smith 1986
Caw Ridge, AB	0.94 (303)	0.84 (85)	0.78 (161)	0.71 (17)	0.89 (464)	0.81 (102)	Cote and Festa-Bianchet 2003

2006/2007 was the highest on record, severe winter conditions likely played a key role on increased mortality of mountain goats during this period.

Kid Recruitment.—Kid recruitment of radio-marked female mountain goats was estimated by determining the percentage of radio-marked females seen with kids during May-June aerial telemetry surveys (n = 3). Since each radio-marked female was not observed daily during the kidding period, it was not possible to determine if kids were born and subsequently died prior to, or between, surveys. As such, estimates of kid recruitment reported here are presumably lower than the actual percentage of females that gave birth. Nevertheless, our estimates of kid recruitment in summer (57-64%; Table 4) were similar to estimates of kidding rates reported elsewhere (Festa-Bianchet and Cote 2007). Past studies have documented late age at first reproduction for mountain goats, as compared to other ungulates (Festa-Bianchet and Cote 2007, Galliard et al. 2000). Consistent with these findings, we did not document any cases where females less

Table 4. Proportion of radio-marked adult female mountain goats associated with kids during summer, 2005-2007, Lynn Canal, AK. These data represent an early season measure of kid recruitment rather than and estimate of the actual proportion of kids born.

	Proportion of Females with Kids		
Year	Mean	SE	n
2005/2006	0.60	0.15	10
2006/2007	0.64	0.10	25
2007/2008	0.57	0.11	21
All Years	0.61	0.07	56

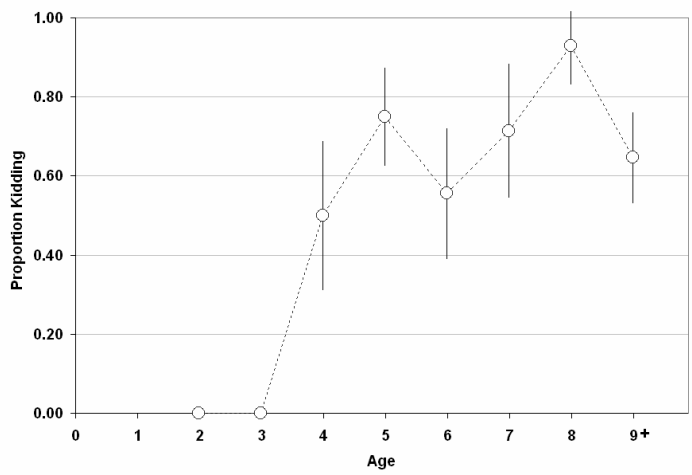

Figure 9. Age-specific mountain goat kid recruitment (as of June 15), 2005-2007, Lynn Canal, AK.

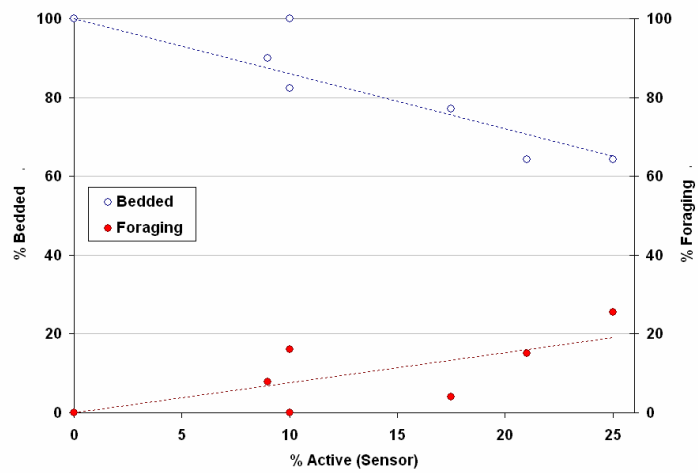

Figure 10. Relationship between radio-collar activity sensor output and actual mountain goat foraging and bedding activity summarize over 15 minute periods. Data were collected from three adult female mountain goats, April 21-24, 2007, Lynn Canal, AK.

than four years of age were associated with kids in summer. Overall, kid recruitment varied with female age (range = 50-93%) such that younger and older females were generally less likely to have a kid at heel than prime-aged females (i.e. 5-8 years old; Figure 9). We did not observe cases of kid abandonment when females with kids were captured, as determined via post-capture aerial telemetry surveys.

Population Abundance and Composition

Aerial Surveys.—Overall, 13 fixed-wing and 3 helicopter surveys were conducted in August-October 2006 (Lions Head, n = 4, Sinclair Mountain, n = 4, Mount Villard, n = 5, East Berners, n = 3; Appendix 1). Five surveys were attempted but not completed in entirety. Incomplete surveys provide meaningful data but are not, at this point, directly comparable to other surveys. Of the complete surveys flown (n = 8), substantial variation was observed in the minimum number of mountain goats observed and the proportion of kids (Appendix 1). These findings underscore the value of conducting replicate surveys in each area.

The proportion of mountain goats for which the presence or absence of a collar could be ascertained was highly variable and primarily depended upon weather conditions and aircraft type. In general, collar status assessments varied between 79-92% during helicopter surveys, and 16-63% during fixed-wing surveys (considering only complete surveys in the three focal study areas). Estimates of mountain goat sightability will be performed following development of additional analytical methodology.

Ground-based Surveys.—Ground based surveys were conducted in the Mount Villard and upper Dayebas Creek area during June 21-25, 2007 in order to estimate age and sex composition of mountain goats in this area. Overall, 54 individual mountain goats were classified, of which 1 was an adult male, 16 adult females, 12 subadults, 16 kids and 9 adults of unknown sex. In some cases, it was not possible to identify sex status for all animals due to large distances (i.e. <3 kilometers) between observers and animals. Of the animals observed, 5 were radio-collared (females, n = 4; males, n = 1). Of the 14 adult female-kid dyads, 2 were accompanied by twins.

Detailed behavioral data was collected for three GPS radio-collared adult females in order to validate data collected by activity sensors imbedded in radio-collars. The activity sensor data calculates the percent of mercury tip-switch transitions over a 15 minute period commencing at pre-programmed times linked to GPS location acquisition attempts. Seven data collection trials were conducted in which actual animal behavior over a continuous 15 minute period was collected and later compared to activity sensor data (downloaded remotely from GPS collars). While sample sizes are limited, preliminary analyses suggest the percent of activity tip-switch transitions negatively correlated with percent of time animals are bedded and positively

correlated with the percent of time foraging (Figure 10). Continued data collection is necessary before reliable conclusions can be made regarding these data, however, preliminary results are encouraging.

FUTURE WORK

Study animals will continue to be monitored monthly to assess reproductive status and survival. Additionally, at 8-week intervals GPS data will be downloaded from each animal during aerial surveys. These data will be post-processed and integrated with the existing GPS location database. Three replicate aerial surveys will be conducted in early-fall 2007, weather permitting, in order to estimate mountain goat sightability, population abundance and composition. Results of these efforts will be summarized and submitted as an annual research progress report on September 1, 2008.

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Appendix 1. Summary of mountain goat population abundance and composition survey data, 2006, Lynn Canal, AK.

Study Area	Date	AST	Survey Time (min)	Area Surveyed (km^2)	Adults	Kids	Total	% Kids	Goats/ min	Goats/ km^2	km^2/ min	Temp	Weather	Wind (knots)	Aircraft	# of Observers
East Berners[b]	8/28/2006	1244-1326	42	49.3	86	42	128	32.8	3.05	2.60	1.17	40-50	Mostly Clear	0-10	Heliocourier	3
East Berners[a]	9/3/2006	1550-1637	47	66.8	83	21	104	20.2	2.21	1.56	1.42	51	Partly Cloudy	0-10	Heliocourier	2
East Berners	10/3/2006	1325-1406	41	67.5	70	22	92	23.9	2.24	1.36	1.65	35-40	High Overcast	5-15	Heliocourier	3
Lions Head	8/28/2006	1339-1426	47	65.2	49	9	58	15.5	1.23	0.89	1.39	40-50	Mostly Clear	0-10	Heliocourier	3
Lions Head[a]	9/3/2006	1652-1739	47	65.2	54	11	65	16.9	1.38	1.00	1.39	51	Partly Cloudy	0-10	Heliocourier	2
Lions Head[a]	10/2/2006	1133-1213, 1424-1440	57	65.1	92	13	105	12.4	1.84	1.61	1.14	26-31	Mostly Cloudy	5-15	Heliocourier	3
Lions Head	10/16/2006	1123-1235	62	64.9	91	23	114	20.2	1.84	1.76	1.05	35-42	Mostly Clear	10-25	Hughes 500	3
Sinclair Mtn.[b2]	8/28/2006	1426-1530	64	97.6	86	21	107	19.6	1.67	1.10	1.53	40-50	Mostly Clear	0-10	Heliocourier	3
Sinclair Mtn.[a]	9/2/2006	1605-1739	94	119.7	128	31	159	19.5	1.69	1.33	1.27	50-56	High Overcast	0-10	Heliocourier	4
Sinclair Mtn.	9/23/2006	1526-1717	111	131.6	153	22	182	12.1	1.64	1.38	1.19	40-42	High Overcast	0-10	Heliocourier	3
Sinclair Mtn.	10/16/2006	1235-1311, 1402-1415, 1506-1638	141	124.1	227	41	268	15.3	1.90	2.16	0.88	35-42	Mostly Clear	10-25	Hughes 500	3
Mt. Villard	9/2/2006	1741-1912	91	137.8	102	23	125	18.4	1.37	0.91	1.51	50-56	High Overcast	0-10	Heliocourier	4
Mt. Villard[b3]	9/23/2006	1723-1831	68	96.4	90	12	102	11.8	1.50	1.06	1.42	40-42	High Overcast	0-10	Heliocourier	3
Mt. Villard[b4]	10/1/2006	1222-1240	18	21.5	41	12	53	22.6	2.94	2.46	1.20	31	Mostly Cloudy	5-15	Heliocourier	3
Mt. Villard	10/2/2006	1230-1355	85	130.7	165	28	193	14.5	2.27	1.48	1.54	26-31	Mostly Cloudy	5-15	Heliocourier	3
Mt. Villard[b5]	10/17/2006	1012-1117	65	83.7	145	29	174	16.7	2.68	2.08	1.29	35-31	High Overcast	0-10	Hughes 500	3

[a] poor GPS reception during portions of survey, estimated part or all of survey route
[b1] not complete survey: Davies Ck.-Antler Lk. only
[b2] not complete survey: to Katz lk. only
[b3] not complete survey: Meade Gl.-Katz Flats only
[b4] not complete survey: Dayebas Ck. only
[b5] not complete survey: N Meade Gl to NW fork Katzehin

Attachment 2

Wildlife Monitoring Report - 2007

Kensington Terrestrial Wildlife Monitoring
Annual Report
Slate Lakes Basin, 2007

Coeur Alaska
3031 Clinton Drive
Suite 202
Juneau, Alaska 99801

Prepared for Coeur by K. Savage
Submitted November 6, 2007

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1 Introduction

Coeur Alaska's Kensington Project is an underground gold mine, located approximately 45 air miles north of Juneau, Alaska. The Jualin site of the project is located in a valley east of Comet and includes the Slate Lakes basin, an area approximately 1 mile north of Berner's Bay. Within the Slate Lakes basin are Lower and Upper Slate Lakes and the Spectacle Lake complex, which encompasses the upper and lower sections of Spectacle Lake and Fat Rat Lake, as well as associated environs. When the mine begins production, the Jualin site will include a camp, mill, tailings storage facility (TSF) and associated infrastructure. Tailings will be processed at the mill and subsequently conveyed as slurry through a pipeline to the Lower Slate Lake TSF in the Slate Lakes basin. A dam built at the southern end of Lower Slate Lake will eventually increase the area of Lower Slate Lake from 20 acres to 56 acres. The project also involves the construction of both roads and limited facilities through and within the Slate Lakes basin. Because activities associated with construction and operation of the project may possibly effect wildlife and habitats within the area, a terrestrial wildlife monitoring plan has been incorporated into the *Kensington Gold Project Final Plan of Operations*, dated May 6, 2005, the *Kensington Project Lower Slate Lake Tailings Storage Facility Ecological Monitoring Plan*, dated May 6, 2005, and the *Kensington Gold Mine Berners Bay Transportation Mitigation and Best Management Practices Plan*, dated August 2005, in accordance with federal, state and local agency permit requirements. This plan, as described in *The Kensington Project Terrestrial Wildlife Monitoring Plan*, dated June 19, 2006, was designed to ensure that environmental impacts to wildlife resources in the project area are mitigated during both construction and operation and that the reclamation process includes a plan to support and encourage use by local wildlife species.

The goals of the 2007 Terrestrial Wildlife Monitoring Plan include the following:

- Collect data and other information that can be used to shape a standardized protocol for subsequent year's studies and long-term monitoring. The survey techniques as defined in the *The Kensington Project Terrestrial Wildlife Monitoring Plan* (2006) would be used as preliminary guidelines and modified accordingly. This would ultimately include:

  1. Gathering information on specific wildlife species and habitats that could be affected by increased activity at the project site, with specific attention to sensitive species.

  2. Identifying specific locations where concentrations of wildlife would be expected to be observed because of specific resources present (e.g., stream mouth marshes, wetlands, bird nesting/feeding areas, large mammal crossing areas, etc.).

  3. Determining and instituting mitigative measures to support wildlife species during construction and operations.

- Determine the optimum frequency of monitoring relative to season and the intensity of wildlife activity.

- Supplement the regional resource knowledge available with site-specific data for the study area of interest.

2 2007 Survey

2.1 Survey Area

2.1.1. Topography and Vegetation

The survey area covered by the wildlife monitoring project lies within the confines of the Slate Lake basin, an area of approximately 2 sq. km, ranging in elevation from 200 m at the mouth of Lower Slate Lake to 300 m atop the ridge to the west of Lower Slate Lake. Water bodies within the basin include Lower and Upper Slate Lakes to the west and the Spectacle Lakes complex to the east. Though both Lower and Upper Slate Lake have steep western slopes, each lake has a specific topography. Lower Slate Lake has a moderately inclined slope leading to a ridge to the east and the upper and lower drainages are only mildly sloping. The area around Upper Slate Lake is fairly flat in the northern and southern sections with a mild slope to the east. Spectacle Lake is also a fairly flat region with mildly elevated patches throughout.

Prior to construction, terrestrial vegetation types around Upper and Lower Slate Lake were fairly similar and included mixed spruce and predominantly hemlock forest to the west of both lakes and to the southeast of Lower Slate Lake, some lake shore wetland, grass/sedge meadow and patchy bog/ muskeg to the north and east. As of August 2006, the periphery of Lower Slate Lake had been clear-cut and a road system constructed from the Spur road, along the north of Spectacle Lakes and around the eastern, southern and northern aspects of Lower Slate Lake. The immediate vicinity of Upper Slate Lake has not been impacted by the project. The vegetation structure around the Spectacle Lake complex mainly includes sphagnum bogs and sedge fens with brushy, scrub forest in elevated areas. All of the lakes contained various species of aquatic vegetation, though not in high volume. Spectacle Lake contains the greatest concentration of aquatic vegetation, mainly in the three sloughs and also in Fat Rat Lake.

2.2 Methods

The primary goal for the 2007 wildlife monitoring was to continue establishing a long-term workable protocol to assess the wildlife species present in the target area as well as working towards assessing the reason for their presence. The initial survey methodology was based upon *The Kensington Project Terrestrial Wildlife Monitoring Plan*, dated June 19, 2006, which included:

1. A standardized schedule for fixed scan wildlife observations conducted from a field camp set in an elevated location as well as along an established route, which also included specific sites for dawn and dusk surveys. Observations would be made on a regular basis from spring through fall, and intermittently through the remainder of the year. Results from the first year of monitoring would be used to determine the frequency of monitoring in following years relative to seasonal intensity of wildlife activity.
2. The collection of data including field records of all observed wildlife species and indices, with photographs/video footage/sample collection at times as an adjunct to recorded data. Data collection would also include information concerning human activities in the area.
3. Particular animal species would be of special interest if they are located at any area of the project site, including herons, waterfowl such as Vancouver Canada Geese, and raptors such as eagles and goshawks. Regarding the presence of goshawks, a survey would be conducted by trained personnel using standard broadcast calling protocols.
4. Cross-training of associated personnel by the field biologist as necessary.

Based on monitoring data collected in the fall of 2006, *The Kensington Project Terrestrial Wildlife Monitoring Plan* was modified as follows:

1. Modifications to the proposed field camp and dawn and dusk surveys.

The dawn and dusk surveys were incorporated into the plan to allow for monitoring, mainly for the presence of waterfowl and crepuscular species, during periods of no human activity. The field camp was proposed as a means to access the area for the dawn and dusk surveys prior to the construction of a Slate Lakes basin road system. By August of 2006, the road system around the lakes was in place and a field camp was unnecessary. The fall 2006 monitoring showed no increase in wildlife activity during the dawn and dusk surveys, which were discontinued in November of 2006.

2. Modifications and additions to suggested techniques for wildlife observations and data collection.

The original plan called for fixed scans along an established route. Scans were included on all routes of the 2007 survey. At Lower Slate Lake, the entire lake up to the edge of the clear-cut was easily visible from almost any aspect. At Upper Slate Lake, scans for waterfowl in particular were made from both the southern meadow and the edge of the eastern muskeg. Viewing locations were optimum in the Spectacle Lakes area from the western edge on Lower Spectacle Lake, the southern tip of lower Spectacle Lake, which also afforded a good view of the adjacent southern slough, and the northern tip of upper Spectacle Lake. Both primary and secondary routes were established to cover the greatest area, with the presence and location of wildlife and/or indices noted along each route. The primary routes were standard in the survey and secondary routes incorporated if time allowed. In order to more systematically document and quantify the presence, location and change in frequency of observed indices, a series of transects and grids, put into place in the fall of 2006, were

regularly checked. These consisted of 21 50 x 2 m strip transects placed in a stratified, nonrandomized pattern in open bogs/ muskeg around the lakes and two 20 m^2 grids set on the north and south ends of Spectacle Lake in areas with suspected high wildlife activity. A series of trail monitors (Bushnell Trail Sentry, Model 11-9300) were also placed in strategic locations at each of the lakes in areas where species' utilization or travel appeared especially high.

Data collected included weather conditions and visibility, noise levels as well as any source of potential man-made disturbance, route, any noted environmental changes and observations of wildlife species and/or indices. When mammalian species were present, data included time of day, GPS location, approximate morphometrics and behavior (e.g. browsing, traversing etc.). Indices included perennial sign such as game trails, presence of dens or middens, scratching posts and stripped bark as well as ephemeral sign such as tracks, scat, browsing or digs, bedding activity. Data on location, direction of tracks (followed when possible), and scat composition were recorded, samples collected when necessary and photographs taken to document observations. Data also included anecdotal information. Introductions were made to Coeur personnel associated with work in Slate Lake basin, who were informed of the project intent, including species of particular interest, and regularly questioned on sightings of any wildlife species that may have occurred throughout the week.

3. Monitoring of avian species

Avian species of particular interest included herons, waterfowl and raptors such as eagles and goshawks. Surveys for the presence of the Queen Charlotte Northern Goshawk were conducted between March and June. Sightings and/or songs/calls of any avian species that occurred during the surveys were recorded, including information on location, number, gender (when possible) and behavior. Because Spectacle Lake in particular showed substantial sign of goose activity, seven 1 m circular grids were set in areas with greatest concentration of feathers and scat.

4. On going training of field personnel

Each survey was conducted by the field biologist as well as one of four technicians, who were trained on site to ensure that observations and data collection was as standardized and unbiased as possible.

3 Survey Results

3.1 Wildlife Species Present in the Slate Lakes Basin, 2007

Species richness and location of sightings are summarized below. The presence of wildlife within the Slate Lakes basin was determined either through the identification of indices, such as scat, tracks or "digs", or through actual sightings and trail monitor photography.

3.1.1. Large Mammals

Black Bear (*Ursus americanus*), Brown Bear (*Ursus arctos*)

Snowpack was present along the primary route, transects and grids through May. Initial indications of bear activity in the form of tracks and "digs" was noted on June 14, the first snow-free survey. The presence of bear indices then increased through the summer, especially from mid-July until the final survey on September 5. The total number of scat samples located along all transects increased from 0 on June 14 to 3 on July 10 to twelve on September 5. Composition of bear scat varied between what appeared to be roots and blueberry leaves/ fruit. Bear indices were found around all of the lakes, with the highest density around both upper and lower Spectacle lakes.

Six bear sightings were made between June 21 and September 5; three (B1, B2, B3) from trail monitors and three from personnel in the field (B4, B5, B6). B1, a black bear photographed on June 21 and B2, a bi-colored bear with a dark rump and lighter torso and head photographed on June 28, were both located crossing the lower Spectacle Lake outlet. B3, possibly the same bi-colored bear as B2, was photographed on June 21 moving up the game trail on the western side of Lower Slate Lake. B4, another bi-colored bear with a dark head and lighter colored body, was noted on July 6 feeding on grasses on the north edge of lower Spectacle Lake. B5, another bi-colored bear, was seen eating berries along the road northeast of Lower Slate Lake. B6, a black bear, was observed running along the western peninsula between upper and lower Spectacle Lakes. Based on these observations, at least 3 individual bears forage or traverse through the Slate Lakes basin.

Moose (*Alces alces*)

Moose indices in the form of tracks, scat, browse and bedding sites were present at all the lakes, with the greatest concentration focused around Upper Slate Lake and Spectacle Lake. In Lower Slate Lake, moose tracks were noted on more than one occasion moving along the dirt track west of the lake to and from the major game trail. In Upper Slate Lake, most indices were found at the southern tip of the lake and in the eastern muskeg. At Spectacle Lake, moose sign was most concentrated around lower Spectacle Lake. Moose indices were first noted on May 24 when the snow was almost gone. The presence of new indices remained fairly consistent through the summer, from 9 noted along the transects between May 24 – June 14, 12 between June 14 and July 10 and 10 noted between July 10 and September 5.

No sightings of moose by field personnel were made in the Slate Lakes Basin in 2007; however, 6 moose were recorded by trail monitors. M1, a cow, was photographed on June 21 standing to the east of the lower Spectacle Lake outlet. M2, also a cow, was recorded on June 28 heading east of Upper Slate Lake. M3, a cow wearing a collar, was photographed moving from east to west across the lower Spectacle Lake outlet. M4, a paddle bull, was recorded on July 3, 4 and 5 along the slough south of lower Spectacle Lake. M5, a cow, was noted on July 3 moving west towards the lower Spectacle outlet and M6, a paddle bull, was photographed on July 16 moving from west to east across the

lower Spectacle outlet. Based on the information collected through the trail monitors, at least 3 moose utilize the area around the Slate Lakes basin, most probably as passage to areas with more abundant forage.

Lynx (*Lynx canadensis*)

On February 12, a set of lynx tracks was followed from the southern slough of lower Spectacle Lake to the road north of upper Spectacle Lake. A urine marking site was also identified. As the tracks were not detected on subsequent surveys, it is probable the lynx was a transient in the area.

Other:

Coyote (*Canis latrans*) - Sighted October, 2006. Refer to the *Kensington Terrestrial Wildlife Monitoring Report, Slate Lakes Basin*, dated January 24, 2007.

Mountain Goat (*Oreamnos americanus*) - No mountain goats have been observed within the Slate Lakes basin. Refer to *Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine,* ADF&G, Wildlife Research Annual Progress Report, August 2006.

3.1.2. Small Mammals

Porcupine (*Erithizon dorsatum*)
River Otter (*Lontra canadensis*)
Pine Marten (*Martes americana*)
Short-tailed Weasel (*Mustela erminea*)
Mink (*Mustela vison*)
Red Squirrel (*Sciuris vulgaris*)
Deer Mouse (*Peromyscus maniculatus*)

Small mammal indices were plentiful around all of the lakes. Perennial sign such as den sites, gnawed branches and stripped bark were mainly found in the forested areas around Upper and Lower Slate Lake. Ephemeral sign in the form of tracks was both very apparent and plentiful throughout the area while snow cover remained. Porcupine, marten and short-tailed weasel tracks were frequently found both in the woods and crossing open space around Spectacle Lake and Lower Slate Lake. However, the vast majority of tracks were found in the forests surrounding Lower and Upper Slate Lake as well as in and around the brush of Spectacle Lake and included porcupine, squirrel, short-tailed weasel, marten and deer mice. Marten and weasel tracks were frequently followed to and around tree wells, indicating active foraging. River otter tracks and “slides” were first noted on April 27 leading from the thawed, open water of Upper Slate Lake, through Fat Rat Lake to Spectacle Lake. Tracks continued to be found until June 28, mainly around lower Spectacle Lake, which may signify active, rather than transient, use of the area.

The only small mammal sightings by field personnel were of red squirrels, which are fairly ubiquitous in the wooded areas, and porcupines. In March, trail monitor photos of porcupine were taken on a distinct trail in the snow leading from a den into the woods

north of Spectacle Lake. A porcupine was also sighted in a spruce tree west of Spectacle Lake on June 22.

3.1.3. Avian Species

The avian species identified through direct sightings or indirectly through songs or calls included both resident and migratory wading birds, nonpasserine land birds, passerines and species of special interest, which include waterfowl, raptors and herons.

3.1.3.1 Waterfowl

Waterfowl were noted only on Spectacle Lake and Fat Rat Lake. A pair of red-throated loons on lower Spectacle Lake and a common goldeneye on Fat Rat Lake nested in the area and chicks were seen later in the season. Other, less consistent species included hooded mergansers and mallards. Because of evidence of significant historical goose activity, primarily along the shore of Spectacle Lake, a series of seven 1 m circular grids was put into place in areas of high activity around Spectacle Lake on Oct. 26, 2006. No change was noted in any of the grids until June 28, 2007. At this time, a flock of 29 adult Canada geese were noted along the shore of lower Spectacle Lake. Behavioral clues as well as multiple dropped feathers indicated the birds were probably in a moulting phase and a “no fly” zone was instituted through Coastal Helicopters in early July to minimize disturbance. The birds were last seen on August 9 and were no longer on the lake by September 5.

3.1.3.2 Raptors, Herons

Bald Eagles

Bald eagles continued to be the most frequently observed raptor with in the study area. A trail monitor in place at the outlet of lower Spectacle Lake showed eagles, up to 3 at one time, present in this area on 11 different days between May 24 and August 3.

Northern Goshawk

Annual goshawk surveys have been incorporated into the Kensington Plan of Operations in accordance with the US Forest Service (USFS) and the US Fish and Wildlife Service (USFWS). The 2007 survey was carried out between April 14 and June 29, with survey techniques timed to follow goshawk breeding biology.

Three sets of two day dawn acoustical surveys were performed on April 14 and 15, April 21 and 22 and April 28 and 30, with each day encompassing one of two sites. The first site included the length of the Spur Road, the second site covered one half mile along the road in each direction from Pit 2, the location closest to the 2000 nest site. The dawn acoustical surveys entailed arriving at each site approximately 1/2 hour before dawn, then moving to listening stations at approximately 150 m intervals along the road followed by 5 - 10 minutes of listening at each station. A search for nests or signs of nesting activity was done continuously along the route.

A valley watch was also conducted on April 30. The location for the valley watch was above Pit 4, which overlooks the Spur Road and affords an excellent view of the forest canopy.

A broadcast survey, per Kennedy and Stahlecker (1993), was conducted on June 29. A total of 26 call stations, set 250 m apart, were set starting from the top of the Spur Road to the 1 mile marker above Slate Creek Cove. Playback recordings of adult female alarm calls were broadcast at maximum volume. Broadcasts were started facing the direction of travel, with 10 seconds of recorded calls followed by 30 seconds of listening and observing. This procedure was then repeated at 60° and 180° from the direction of travel and conducted twice at each station.

The weather was good for all surveys.

Goshawk presence was not detected with any of the survey techniques employed. All bird calls heard in the acoustical surveys were identifiable by species, no goshawks were noted during the valley watch surveys and no goshawk response was detected during the follow up broadcast survey.

Other Raptor Species, Herons

Other raptor species found within the Slate Lakes Basin include both red-tailed and sharp-shinned hawks, which were heard on separate occasions. No herons were noted at any time in the area.

4 Optimum frequency of monitoring relative to season and wildlife activity

One of the goals of the 2007 survey was to determine the optimum frequency of monitoring relative to season and wildlife activity levels. In 2007, snow on the ground as well as ice on the lakes remained substantially later than usual. Although this enhanced the ability to detect the presence of certain species, small mammals in particular, it is likely the snow load also hampered use by the larger mammals, either for foraging or transient use. Similarly, the lakes were not open to waterfowl use until late May/early June. Based on information collected in the spring and summer of 2007, biweekly monitoring in the winter and early spring is likely sufficient. Depending upon the snow and ice conditions, monitoring on a weekly basis from mid spring into summer would be optimal to catch the bulk of wildlife activity.

5 Wildlife activity and movement

Observations of wildlife and indices in 2007 provided additions to the list of animals present in the Slate Lakes Basin as well as further tentative insight into how these animals are using the area.

Regarding large mammal activity, it was apparent through the presence of digs and scat, especially around Spectacle Lake, that bears use the area extensively for forage. Moose, on the other hand, mainly seem to transit through the Slate Lakes Basin. One principal route appeared to start from the lower eastern reaches of Spectacle Lake, including the outlet of lower Spectacle Lake, and then either cross over the eastern ridge of Lower Slate Lake heading south or moving north, crossing the road and passing through the eastern meadow of Upper Slate Lake. A major game trail along the northwestern portion of Lower Slate Lake, as well as a bench dominated by skunk cabbage immediately below the trail, received use by both moose and bear. Both bear and moose scat were present along the bench, moose tracks were followed to the bench and up the trail on multiple occasions and a trail monitor of a bear (B3) moving up the trail was also taken. Abundant evidence of both moose and bear was also noted along the eastern muskeg of Upper Slate Lake.

Small mammal presence was abundant around all of the lakes, primarily where there was sufficient cover as in forested or brushy areas.

6 Summary

Either through direct observation or indirectly through the use of indices, the presence of 12 species of mammals and 38 avian species have been documented in the Slate Lakes basin since August of 2006. Three species of mammals and 18 avian species were added to this comprehensive list in 2007. Though most animal sightings and evidence were detected around the Spectacle Lake complex, indices of wildlife species were observed throughout the area. Most of the large mammal sightings as well as water fowl sightings started towards the end of May and continued through the summer, though this may have been influenced by the unusually large snow/ice load which remained on the ground and on the lakes until early summer.

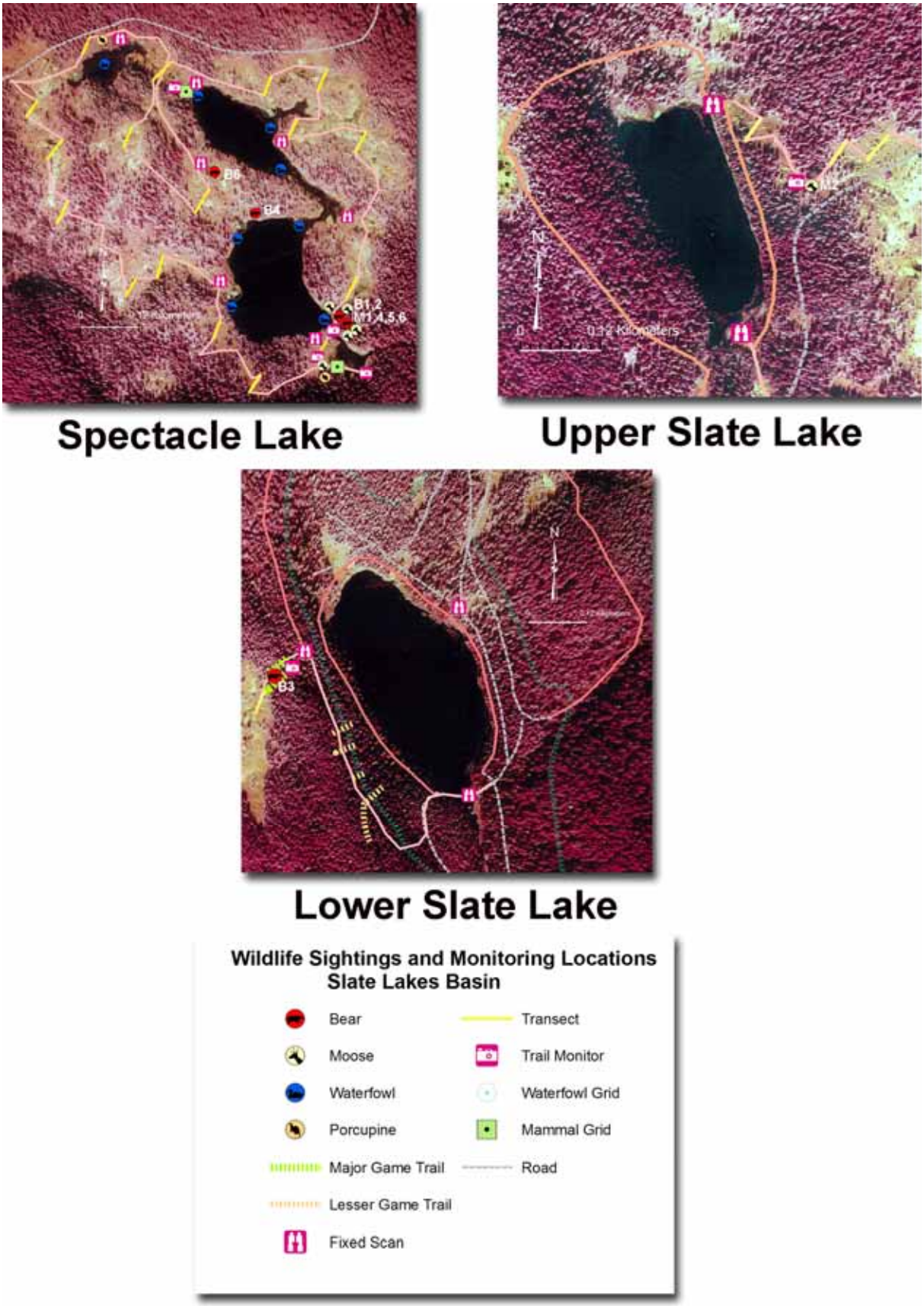

Figure 1. 2007 Wildlife Sighting and Monitoring Locations, Slate Lake Basin

Brown Bear (B4),
Lower Spectacle Lake, 7/6/2007

Bull Moose (M3,Trail Monitor),
Lower Spectacle Lake slough, 7/3/2007

Brown Bear (B3, Trail Monitor)
Lower Slate Lake, 6/24/2007

Porcupine (P1, Trail Monitor)
Upper Spectacle Lake, 3/1/2007

Cow Moose (M2, Trail Monitor),
Upper Slate Lake, 6/28/2007

Black Bear (B1,Trail Monitor),
Lower Spectacle Lake, 6/21/2007

Cow Moose with collar (M4, Trail Monitor)
Lower Spectacle Lake, 6/29/2007)

Figure 2. Examples of Wildlife Sightings at Slate Lakes Basin

Pine Grosbeak,
Lower Slate Lake, 1/11/2007

Bald Eagles (Trail Monitor)
Lower Spectacle Lake, 5/22/2007

White-crowned Sparrow,
Lower Slate Lake, 5/2/2007

Red-throated Loons,
Lower Spectacle Lake, 7/6/2007

Canada Geese,
Lower Spectacle Lake, 6/28/2007

Blue Grouse,
Lower Slate Lake, 5/31/2007

Figure 3. Examples of Avian Species Found in Slate Lakes Basin

River Otter tracks,
Upper Slate Lake 5/24/2007

Bear scat,
Spectacle Lake, 6/28/2007

Pine Marten tracks,
Lower Slate Lake 2/28/2007

Tree Swallow nest,
Upper Slate Lake 6/14/2007

Moose scat,
Spectacle Lakes, 5/24/2007

Short-tailed Weasel tracks,
Spectacle Lake, 2/1/2007

Lynx tracks,
Spectacle Lake, 2/12/2007

Figure 4. Examples of Indices Found in Slate Lakes Basin

Table 1. 2007 Wildlife Sightings, Avian Species and Selected Mammals, Slate Lake Basin

DATE	MISC. BIRD SIGHTINGS/CALLS	LOCATION	PHOTO?	#	S/C/B	BEHAVIOR
1/11/2007	Pine grosbeak	Between LSL and USL, E of old meadow in forest	Y	807	S	3 birds, male and female, eating high bush cranberries
1/12/2007	Bald eagle, raven, chickadee	SP	N		S	
2/1/2007	Common raven	SP	N		S	In flight
	C.B. chickadee	SMiddleSP	N		B	In trees
3/29/2007	Blue grouse	W of USL	N		C	
	dark-eyed junco	S LSL	Y	4907		
	Red-breasted sapsucker	W of LSL	N		S	Working on tree next to game trail
4/12/2007	Red-breasted sapsucker		N		B	
4/27/2007	Dark-eyed junco	SP	N		C	
	Lesser yellowlegs	SP penninsula	N		B	A pair flew SW
	Ruby-crowned kinglet	E LSL	N		B	In trees right next to upper E road
5/2/2007	White-crowned sparrow	E LSL	Y	5007	S	Group picking in dirt next to road, E LSL, upper road
	Rufous hummingbird	W LSP	N		B	
	Tree swallows	N LSP	N		S	
5/31/2007	Blue grouse	WLSL	Y	6007	S	Flew from ground to tree
	Wilson's warbler	SW LSP	N		B	
6/14/2007	Olive-sided flycatcher	W SP to SE USL	Y	6107	B	
	Tree swallows	E USL	Y		S	Multiple active nests in dead tree
6/22/2007	Orange-crowned warbler	W LSL	Y	6907	B	
	Solitary sandpipers	MidSP slough	Y	7407	B	Pair, nesting, trying to lead us away, perturbed, chasing Stellars
	Fox sparrow	N USP	Y	7107	S	
	Song sparrow	N USP	Y	7207	S	
	Varied thrush	N USP	Y	7307	S	
	Hermit thrush	Next to TR5	Y	8307	S	
6/28/2007	Song sparrow?	W LSP	Y	8607	S	
	Solitary sandpipers	LSP S Slough	Y	9007	S	
	Cedar waxwing	E midSP slough	Y	9107	S	
7/6/2007	Orange-crowned warbler	E LSL	N		B	
	Song sparrow	S LSL	Y	9707	S	
	Solitary sandpipers	E midSP slough	N		B	
	Olive-sided flycatcher	E USL	Y	10107	B	Pair
	Varied thrush	W LSL	Y	10607	S	
7/10/2007	Fledgeling - song sparrow?	WLSP	Y	11107		
	Red-breasted sapsucker	NW Tr7, LSP	N		C	Nestlings in dead tree

DATE	RAPTOR SIGHTINGS/CALLS	LOCATION	PHOTO	#	S/C/B	BEHAVIOR
1/31/2007	Bald eagle	W LSL	Y	1807	S	Flying over S LSL
3/29/2007	Bald eagle	Standing near outflow of USL	Y	4207	B	Two together
4/12/2007	Northern pygmy owl	SP	N		C	
5/2/2007	Red-tailed hawk	W LSL	N		C	In trees W of LSL muskeg
5/24/2007	Bald eagle	LSP Dam crossing	TM	5507	S	2-3 adults, 1 immature. 5/10, 5/11, 5/12, 5/13, 5/15
6/14/2007	Bald eagle	LSP Dam crossing	TM	6707	S	6/03, 6/09
6/22/2007	Bald eagle	LSP Dam crossing	TM	8107	S	Most action around noon
	Sharp-shinned hawk	To the N of SP	N		C	
	Bald eagle	LSP	N		S	Flying after mallards on lake
6/28/2007	Bald eagle	LSP Dam crossing	TM	9207	S	24-Jun
7/10/2007	Bald eagle	LSP Dam crossing	TM	12007-120073		8/3 @ 13:36, 13:38, 13:39 x 2

DATE	WATERFOWL SIGHTINGS	LOCATION	PHOTO		S/C/B	Behavior
6/14/2007	Red-throated loon	LSP on water, then in grasses E LSP	Y	6307		
	Common goldeneye	S USP	Y	6507	S	1 female
	Mallards	S of USP Eastern slough	N		S	1 male, 1 female
6/22/2007	Mallards	LSP Eastern slough	Y	7507	S	4 males, 1 female
	Hooded mergansers	LSP on water, then in grasses E LSP	Y	7607	S	Pair
	Red-throated loon	LSP	Y	7807	S	Pair
	Common goldeneye	Fat Rat then USP	Y	7907	B	Single female
6/28/2007	Common goldeneye	Fat Rat	Y	8407	S	Single female
	Canada geese	USP and LSP	Y	8507	S	29
	Canada geese	USP and LSP	TM	9307		6/26, 6/27
	Red-throated loon	LSP	Y		S	Pair
	Mallard	LSP	N		S	1 male
7/6/2007	Red-throated loon	USP	Y	10407	B	Pair
	Canada geese	LSP	N		S	29, went into bushes, lots of feathers at dam site
	Canada geese	LSP	TM	11007	B	7/5/07, 15:41
	Common goldeneye	FRL	Y	9607	S	
7/10/2007	Canada geese	Eastern slough LSP	N		B	Too foggy to count
	Mallards	Fat Rat	N		S	
7/31/2007	Mergansers(sp?)	LSL	N		S	4 flying around lake
	Red-throated loon	LSP	N		S	Female and single chick
	Canada geese	USP, near road	N		B	29
	Common goldeneye	Fat Rat	N		S	Female and two chicks

	Canada geese	LSP Dam	TM	11307-4	B	7/25 @ 17:07, 17:10, 17:11, 19:54, 20:27
	Canada geese	LSP Dam	TM	11407-5	B	7/27 @ 15:05, 16:03, 16:57, 17:00 x2, 17:04
	Canada geese	LSP Dam	TM	11507-3	B	7/29 @ 13:39, 13:53, 13:56, 13:58
8/9/2007	Red-throated loon	LSP	N		S	Single chick
	Canada geese	LSP Dam	TM	11607	B	7/31 @ 7/31@16:31
	Canada geese	LSP Dam	TM	1170 -1	B	8/1 @ 18:53, 18:54
	Canada geese	N USP	TM	11807-1	B	8/2 @ 2:19, 2:20
	Canada geese	LSP Dam	TM	11907	B	8/2 @ 16:14
	Canada geese	LSP Dam	TM	12107	B	8/3 @ 14:00
	Canada geese	SP	N		S	29
9/5/2007	Mallard	USP to FR	N		S	

DATE	SIGHTINGS - BEARS	LOCATION	PHOTO	#	S/C/B	Behavior
6/22/2007	Black bear (B1)	LSP dam	TM	8107		6/21/2007, 13:12
6/28/2007	Bi-colored bear (B2)	LSP dam	TM	9407		6/28/2007, 5:22, dark rump, lighter torso and head
7/5/2007	Bi-colored brown bear (B3)	W LSL	TM	9907		6/24/2007, 13:54, dark rump, lighter torso and head
7/6/2007	Brown bear (B4)	Along N edge of LSP	Y	10507		11:30, Browsing grasses, black head, light body
8/9/2007	Brownish black bear (B5)	East of cones on LSL road	N			Eating berries, bi-colored
9/5/2007	Black bear (B6)	Between USP and LSP, western penninsula	N			11:00, Running

DATE	SIGHTINGS - MOOSE	LOCATION	PHOTO	#	S/C/B	Behavior etc.
6/14/2007	Moose (M1)	LSP dam	TM	6807		Cow, 6/10/2007, 22:56
7/6/2007	Moose (M2)	USL	TM	10207		Cow, 6/28/2007, 23:30
7/6/2007	Moose (M3)	LSP slough	TM	10707-073		Paddle bull, 23:25(7/3), 3:55(7/4), 1:50(7/5),5:15(7/5)
7/6/2007	Moose (M4)	LSP dam	TM	10807-1		Cow with collar, 6/29/2007, :03
7/6/2007	Moose (M5)	LSP dam	TM	10907		Cow, 7/3/2007, 23:24
7/31/2007	Moose (M6)	LSP dam	TM	11207 - 2		Paddle bull, 7/16 @ 22:16 - 22:17

Appendix 1. Avian Species Identified in Slate Lakes Basin

Waterfowl

1. White-winged Scoter (*Melanitta fusca*)
2. Greater Scaup (*Aytha marila*)
3. Mallard (An*as platyrhynchos*)
4. Canada Goose (*Branta canadensis*)
5. Ring-necked Duck (*Aythya collaris*)
6. Red-throated Loon (*Gavia stellata*)
7. Hooded Merganser (*Lophodytes cucullatus*)
8. Common Goldeneye (*Bucephala clangula*)

Raptors

1. Bald Eagle (*Haliaeetus leucocephalus*) – Common, B
2. Red-tailed Hawk (*Buteo jamaicensis*)
3. Sharp-shinned Hawk (*Accipiter striatus*)
4. Northern Pygmy Owl (*Glaucidium gnoma*) – C/S

Other

1. Belted Kingfisher (*Ceryle alcyon*) – Common, B
2. Steller's Jay (*Cyanocitta stelleri*) – Common, B
3. Common Raven (*Corvus corax*) – Common, B
4. Chestnut-backed Chickadee (*Poecile rufescens*) – Common, B
5. Dark-eyed Junco (*Junco hyemalis*) – Common, B
6. Winter Wren (*Troglodytes troglodytes*) – Common C/S
7. Savannah Sparrow (*Passerculus sandwichesis*) - B
8. Varied Thrush (*Ixoreus naevius*) - B
9. Pine Grosbeak (*Pinicola enucleator*) - S
10. Northwestern Crow (*Corvus caurinus*) - B
11. Red-breasted Sapsucker (*Sphyrapicus rubber*) –Common, B
12. Bohemian Waxwing (*Bombycilla garrulous*) - B
13. Least Sandpiper (*Calidris minutilla*) – S
14. Blue Grouse (*Dendragapus obscurus*)
15. Lesser Yellowlegs (*Tringa flavipes*)
16. Ruby-crowned Kinglet (*Regulus calendula*)
17. Wilson's Warbler (*Wilsonia canadensis*)
18. White-crowned Sparrow (*Zonotrichia albicollis*)
19. Rufous Hummingbird (*Selasphorus rufus*)
20. Tree Swallow (*Tachycineta bicolor*)
21. Orange-crowned Warbler (*Vermivora celata*)
22. Hermit Thrush (*Catharus guttatus*)
23. Cedar Waxwing (*Bombycilla cedrorum*)
24. Olive-sided Flycatcher (*Contopus borea*lis)
25. Solitary Sandpiper (*Tringa solitaria*)
27. Song Sparrow *(Melospiza melodia*)

Common = multiple sightings through season
S = identified through sighting
C/S = identified through call or song

Appendix 2. 2007 Indices and Sightings by Month, Slate Lakes Basin

January		February		March		April		
11	31	12	28	13	29	12	19	27

Pine marten, ermine, small rodent tracks (SLB)

Porcupine sightings and tracks (SLB)

Lynx tracks (SP)

River otter tracks (SP)

May			June				July			Aug/Sept	
2	24	31	4	14	22	28	6	10	31	9	5

River otter tracks (SP)

Bear (LSL,SP)

Moose (SLB)

Common goldeneye (SP)

Canada geese, Red-throated loon (SP)

SLB = Slate Lakes basin
LSL = Lower Slate Lake
SP = Spectacle Lake

Table 2. 2006 – 2007 Transect Results

LOC.	GRID #	M.	2006 INDICES					2007 INDICES									
			8/22	10/12	11/1	11/9	11/28	1/12	1/31	2/1	5/24	6/14	6/22	6/28	7/6	7/10	9/5
SP	**1**	0.1			S	FS	S	DS	DS	DS	S		DNC		DNC		ED
SP	**1**	4.7			S	FS	S	DS	DS	DS	S		DNC		DNC		WD
SP	**1**	5.4											DNC		DNC		WD
SP	**1**	7.1											DNC		DNC		ED
SP	**1**	34.1	WD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**1**	37.5		ED(T?)	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**1**	45.6											DNC		DNC	WD	x
SP	**1**	46.0	WD	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**1**	41.8		WMoT	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**1**	48.2	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**2**	1.5	BSc	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**2**	1.5	2WD	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**2**	1.5	3ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**2**	2.1											DNC		DNC	MMoT	x
SP	**2**	2.2	WD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**2**	4.6	WD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**2**	11.6											DNC		DNC		EBSc
SP	**2**	11.6									S		DNC		DNC		ED
SP	**2**	16.2	2ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**2**	16.3											DNC		DNC		MMoT
SP	**2**	17.2										ED	DNC	x	DNC		
SP	**2**	29.0		EMT	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**2**	37.0			S	FS	**PM Tr, E to W**	DS	DS	DS	S		DNC		DNC		
SP	**2**	40.0											DNC		DNC		EBS
SP	**2**	46.6	MoSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**3**	14.6	2BSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**3**	12.5 - 17										MoT	DNC	x	DNC		
SP	**3**	15.2	WMoT	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**3**	21.1											DNC		DNC		EBSc
SP	**3**	21.6	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**3**	22.7										ED	DNC	x	DNC	x	x
SP	**3**	22.9	2ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**3**	24.1	MoT	x	S	FS	S	DS	DS	DS	S		DNC		DNC		

SP	**3**	41.1										MoT	DNC	vague	DNC		
SP	**4**	0.1			S	FS	S	DS	DS	DS	S		DNC		DNC		EBSc
SP	**4**	10.3			S	FS	S	DS	DS	DS	S		DNC	WMT	DNC	x	x
SP	**4**	15.2	WD	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**4**	15.2										MMoT	DNC	vague	DNC		
SP	**4**	23.5	WD	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**4**	29.3	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**4**	23.2										WD	DNC	x	DNC	x	x
SP	**4**	29.4											DNC	ED	DNC	x	x
SP	**4**	33.2	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**4**	35.9											DNC		DNC		EBSc
SP	**4**	37.0	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**4**	37.1											DNC		DNC		ED
SP	**4**	37.2	2ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**4**	37.5											DNC		DNC		EBSc
SP	**5**	1.5	MD	x	S	FS	S	DS	DS	DS	S	DNC	x	x	DNC	x	x
SP	**5**	1.5	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	2.7	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	3.6										DNC			DNC		ED
SP	**5**	4.3	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	6.1	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	6.1	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	12.5		ED	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	13.4		2WD	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	14.6	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	14.6	MD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	24.7	MD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	24.7	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	30.8										DNC			DNC		ED
SP	**5**	34.1	EMoT	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	35										DNC	2WD	x	DNC	x	x
SP	**5**	36		2WD	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	37.5		D?	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	38.7	MD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	38.7	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	39.6	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	40.2			S	FS	S	DS	DS	DS	S	DNC	**E-W,MoT**	x	DNC	x	x
SP	**5**	41										DNC			DNC		WD

SP	**5**	45.7	2WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	46.9		3WD	S	FS	S	DS	DS	DS	S	DNC			DNC		7WD
SP	**5**	47.2	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**5**	48.5	EBSc	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	2.7	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	9.1	T?	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	9.1	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	9.3										DNC			DNC	MoT	x
SP	**6**	11.9										DNC			DNC		ED
SP	**6**	12.2	WD	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	12.2	T?	x	S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	25.0										DNC		MD	DNC	x	x
SP	**6**	27.9										DNC			DNC		MoT
SP	**6**	32.3	WT		S	FS	S	DS	DS	DS	S	DNC			DNC		
SP	**6**	34.0										DNC			DNC		WD
SP	**6**	35.9										DNC			DNC		WD
SP	**7**	1.8	MBSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**7**	2.6											DNC		DNC		BSc
SP	**7**	8.8		WBS	S	FS	MoT	DS	DS	DS	S		DNC		DNC		
SP	**7**	9.0											DNC		DNC		EBSc
SP	**7**	9.4	MD	x	**MoT**	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**7**	10.8			**MoT**	FS	S	DS	DS	DS	S	MD	DNC	x	DNC	x	x
SP	**7**	14.1											DNC		DNC	MT	x
SP	**7**	19.2	MoT		**MoT**	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**7**	22.9											DNC		DNC		MT
SP	**7**	23.5-25.7			**MoT**	FS	S	DS	DS	DS	S	MT	DNC	vague	DNC		
SP	**7**	26.6										BT	DNC	vague	DNC		
SP	**7**	27.1	WMT	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**7**	32.9	WBSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**7**	34.5											DNC		DNC		MBSc
SP	**8**	0.0			**MT**	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**8**	1.5			**MT**	FS	S	DS	DS	DS	S		DNC		DNC	WMSc	x
SP	**8**	4.4	ED	x	**MT**	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**8**	9.7											DNC		DNC		EBSc
SP	**8**	11.0	WD	x	**MT**	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**8**	16.8	WD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**8**	22.7										WMoT	DNC	x	DNC	vague	
SP	**8**	24.4	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x

SP	**8**	26.0				FS	S	DS	DS	DS	S	ED	DNC	x	DNC	x	x
SP	**8**	29.9	T?		**MT**	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**8**	36.0	WMoT										DNC		DNC		
SP	**8**												DNC		DNC		
SP	**8**	47.8		ED	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**8**	48.2	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**9**	0.5	BSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**9**	4.9			S	FS	S	DS	DS	DS	S	MT	DNC	x	DNC	vague	
SP	**9**	8.3											DNC		DNC		EMoT
SP	**9**	12.1											DNC	ED?	DNC		
SP	**9**	13.3										ED	DNC		DNC		
SP	**9**	14.3	ED	x	S	FS	S	DS	DS	DS	S	WMoT	DNC	x	DNC	x	x
SP	**9**	20.4	MD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**9**	27.1	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**9**	27.2											DNC		DNC		EMoT
SP	**9**	33.2	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**9**	42.9											DNC		DNC		EBSc
SP	**9**	50.0			**E - W,Mo**	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**10**	3.9											DNC		DNC		WD
SP	**10**	5.9											DNC		DNC		WD
SP	**10**	7.2											DNC		DNC		WD
SP	**10**	13.7	E2T	x	S	FS	S	DS	DS	DS	S	DNC	DNC		DNC		
SP	**10**	14.4											DNC	**E - W,MoT**	DNC	x	x
SP	**10**	19.4											DNC	ED	DNC	x	x
SP	**10**	37.3											DNC		DNC		ED
SP	**10**	37.5	WBSc	x	S	FS	S	DS	DS	DS	S	DNC	DNC		DNC		
SP	**10**	48											DNC		DNC		WBSc
SP	**11**	0.9											DNC		DNC		WD
SP	**11**	2.9											DNC	EMT	DNC	x	
SP	**11**	3.1										ED	DNC	x	DNC		
SP	**11**	6.5											DNC		DNC	MoT	x
SP	**11**	10.7	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**12**	7.9	BSc	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**12**	11.3	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**12**	13.3										EMoT	DNC	x	DNC	x	x
SP	**12**	24.4	ED	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**12**	27.4	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**12**	46.9	WD	x	S	FS	S	DS	DS	DS	S		DNC		DNC		

SP	**12**	47.8											DNC		DNC		WD
SP	**12**	48.8											DNC		DNC		ED
SP	**13**	26.5	WD	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x2	x2
SP	**13**	30.7										ED	DNC	x	DNC	x	x
SP	**13**	30.8	MD	x	S	FS	S	DS	DS	DS	S	x	DNC		DNC		
SP	**13**	31.1	ED	x	S	FS	S	DS	DS	DS	**ROT**		DNC		DNC		
SP	**13**	38.1										WD	DNC	x	DNC	x2	x2
SP	**13**	38.4	WT	x	S	FS	S	DS	DS	DS	S		DNC		DNC		
SP	**13**	39.3	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**13**	43.3	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**14**	1.7											DNC		DNC		ED
SP	**14**	5.6											DNC		DNC		ED
SP	**14**	6.7	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**14**	8.5	ED	x	S	FS	S	DS	DS	DS	S	x	DNC	x	DNC	x	x
SP	**14**	21.2											DNC		DNC		ED
SP	**15**	6.7	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC	DNC	
SP	**15**	8.5	ED	x	S	FS	S	DS	DS	DS	S	DNC			DNC	DNC	
SP	**15**	23.3										DNC			DNC	DNC	WD
SP	**15**	29.5 - 35.2										DNC	EMoT	x	DNC	DNC	x
SP	**15**	36.5										DNC	WD	x	DNC	DNC	x
SP	**15**	43.3										DNC	2ED	x	DNC	DNC	x
SP	**15**	43.5										DNC	ED	x	DNC	DNC	x
SP	**16**	5.9			SET										DNC		ED
SP	**16**	8.5			SET										DNC		WD
SP	**16**	10.3			SET										DNC		ED
SP	**16**	10.5			SET								DNC	WBS	DNC	x	x
SP	**16**	12.6			SET							WD	DNC	x	DNC		
SP	**16**	13.2			SET							WD	DNC	x	DNC	x	x
SP	**16**	15.3			SET							ED	DNC	x	DNC	x	x
SP	**16**	18.3			SET										DNC	EBSc	x
SP	**16**	19.9			SET										DNC		ED
SP	**16**	25-43			SET							EMT	DNC	vague	DNC		
SP	**17**	11.8			SET							DNC	DNC		DNC		WD
SP	**17**	14.9			SET							DNC	DNC		DNC		ED
SP	**17**	29.3			SET							DNC	DNC	WD	DNC	x	x
SP	**17**	31.7			SET							DNC	DNC		DNC	WD	x
SP	**17**	32.6			SET							DNC	DNC	ED	DNC	x	x

SP	**17**	33.6	SET						DNC	DNC	WD	DNC	x	x
SP	**17**	34.8	SET						DNC	DNC		DNC		WMoT
SP	**17**	48.7	SET						DNC	DNC		DNC		WD
USL	**18**	20.1	SET						DNC	EMoT	vague	DNC	x	x
USL	**18**	25	SET						DNC	WD	x	DNC	x	x
USL	**18**	26.1	SET						DNC	WD	x	DNC	x	x
USL	**18**	28.3	SET						DNC	WD	x	DNC	x	x
USL	**18**	36.9	SET						DNC	WD	x	DNC	x	x
USL	**18**	40.6 - 50	SET											**E-W, MoT**
USL	**19**	4.2	SET						DNC	WD	x	DNC	x	x
USL	**19**	21.7	SET						DNC	ED	x	DNC	x	x
USL	**19**	26.8	SET						DNC		WD	DNC	x	x
USL	**19**	36.1	SET						DNC	WD	x	DNC	x	x
USL	**19**	37.4	SET						DNC			DNC		ED
USL	**19**	43	SET						DNC			DNC		WD
USL	**20**	11.5	SET						DNC			DNC		**E-W, MT**
USL	**20**	17.5	SET						DNC			DNC		WBSc
USL	**20**	21.4	SET						DNC		WMT	DNC	x	x
USL	**20**	25	SET	**MoT**	DS	DS	DS	S	DNC					
USL	**20**	25.3	SET						DNC			DNC		MD
USL	**20**	26.9	SET						DNC			DNC		WD
USL	**20**	28.5	SET						DNC			DNC		WD
USL	**20**	30.5	SET						DNC			DNC		3WD
USL	**20**	35.6	SET						DNC	BSc		DNC	x	x
USL	**20**	37.1	SET						DNC			DNC	ED	x
LSL	**21**	0.9	SET								DNC	WBSc	DNC	x
LSL	**21**	1.2	SET								DNC		DNC	EMoT
LSL	**21**	10.8	SET								DNC	WD	DNC	x
LSL	**21**	10.9	SET								DNC		DNC	MMoT
LSL	**21**	12.2	SET							MMoT	DNC		DNC	
LSL	**21**	13.7	SET								DNC		DNC	ED
LSL	**21**	16.8	SET								DNC	WMoT	DNC	x
LSL	**21**	18.1	SET								DNC	WD	DNC	x
LSL	**21**	20.8	SET							WD	DNC	x	DNC	x
LSL	**21**	27.7	SET							T?	DNC		DNC	
LSL	**21**	28.6	SET							2ED	DNC	x	DNC	x
LSL	**21**	18-26	SET						MoT	x	DNC	vague	DNC	

LSL	**21**	26.9	SET				DNC	MT	DNC	
LSL	**21**	30.5	SET		WD	ED	DNC	x	DNC	x
LSL	**21**	48	SET		2WD	x	DNC	x	DNC	x

KEY

W = west	D = dig	B = bear	DNC = did not check	S = snow
E = east	T = track	Mo = moose	SP = Spectacle Lake	FS = fresh snow
M = mid	Sc = scat	RO = river otter	USL = Upper Slate Lake	DS = deep snow
		PM = pine marten	LSL = Lower Slate Lake	

Table 3. 2006 - 2007 Waterfowl Grid Results, Slate Lakes Basin

WF Grid Site #1 - SW LSP

WF Grid Site #2 - N LSP

WF Grid Site #3 - N USP Eastern slough

WF Grid Site #4 - N Fat Rat

	#1W		#1E		#2W		#2E	
	Feathers	**Scat**	**Feathers**	**Scat**	**Feathers**	**Scat**	**Feathers**	**Scat**
10/26/2006	23	78	42	81	9	22	9	18
11/1/2006	Snow	Snow	Snow	Snow	Snow	Snow	Snow	Snow
11/9/2006	Snow	Snow	Snow	Snow	Snow	Snow	Snow	Snow
5/24/2007	Snow	Snow	Snow	Snow	Snow	Snow	Snow	Snow
6/15/2007	0	0	0	0	0	0	0	0
6/22/2007	0	0	0	0	0	0	0	0
6/28/2007	0	4	0	5	0	0	0	0
7/10/2007	0	7	0	6	0	2	0	5
9/5/2007	9	14	9	14	0	4	0	4

	#3		#4W		#4E	
	Feathers	**Scat**	**Feathers**	**Scat**	**Feathers**	**Scat**
10/26/2006	2	20	5	10	6	7
11/1/2006	Snow	Snow	Snow	Snow	Snow	Snow
11/9/2006	Snow	Snow	Snow	Snow	Snow	Snow
5/24/2007	Snow	Snow	Snow	Snow	Snow	Snow
6/15/2007	0	0	0	0	0	0
6/22/2007	0	0	0	0	0	0
6/28/2007	0	0	0	0	0	0
7/10/2007	1	3	0	0	2	4
9/5/2007	7	4	2	5	2	1

Attachment 3

Goshawk Monitoring Report – 2007

2007 NORTHERN GOSHAWK SURVEY
JUALIN MINE SITE

Photo: K. Savage

Coeur Alaska
3031 Clinton Drive
Suite 202
Juneau, Alaska 99801

Prepared for Coeur by K. Savage
September 4, 2007

2007 Northern Goshawk Survey
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Introduction

Coeur Alaska's Kensington Gold Mine Project is located approximately 45 air miles north of Juneau, Alaska, with the Jualin site of the mine project immediately north of Berner's Bay. Phases of the construction plan have included limited timber clearing within the Tongass National Forest for the establishment of roads and structures. As timber harvesting has proved to be a principal threat to nesting habitat of the Northern Goshawk (*Accipiter gentilis*) (Squires and Reynolds 1997), annual goshawk surveys have been incorporated into the Kensington Plan of Operations in accordance with the US Forest Service (USFS) and the US Fish and Wildlife Service (USFWS).

The goal of the 2007 Northern Goshawk Survey at the Jualin mine site was to continue observations for the presence of breeding and/or nesting Queen Charlotte Northern Goshawks (*Accipiter gentilis laingi*) within the survey area using established and reproducible protocols.

Background

An initial survey for Northern Goshawks was conducted on July 8 -11, 2000 by ABR, Inc. The survey area encompassed the Jualin mine site, the Slate Lakes basin and followed the existing road system from the mine site to the eastern point of Slate Creek Cove. Sampling station design and broadcast protocol were conducted in accordance with Kennedy and Stahlecker (1993) and included broadcasting "wailing" calls at 300m intervals to elicit potential goshawk response and determine nesting sites. On July 9, an active nest with two 3 to 4 week old young was identified approximately 150 m west of the road leading from Slate Creek Cove to the Jualin mine site (Fig 2). On July 10, an adult goshawk was observed flying over the forest near the camp. The bird did not respond to broadcast calls and it was speculated that it may have been one of the nesting pair.

On June 8, 2004, personnel from USFS, USFWS, ADF&G, and Tetra Tech FW, Inc. attempted to relocate the 2000 nest site using GPS coordinates provided by ABR. No sign of the nest or nesting material was found, though a large downed Sitka spruce tree was noted within 100 feet of the GPS coordinates. The team also conducted a broadcast survey in the vicinity of the nest site as well as along the first 3.5 miles of the existing road from Slate Creek Cove to the Jualin camp, which encompassed the nest site. Standard "wailing" broadcast protocols were followed, with calling stations approximately 250 m apart. No response was detected. It was surmised that the goshawks were not using the immediate area around the nest site, though additional surveying was recommended.

On April 19, 20 and 25-27 of 2006, Coeur field biologists and USFS personnel conducted dawn acoustical, valley watch and limited search surveys on the Spur Road prior to construction. On June 27, 2006, standard broadcast surveys, with 250 m calling stations, were conducted along the Spur Road, along the pipeline access route from the southern edge of Snowslide Gulch, along the upper mill road adjacent to Snowslide Gulch and around the area of the nest found in 2000 by ABR, Inc. No goshawk presence was detected at any of the sites surveyed.

Survey Area and Methods

The 2007 Northern Goshawk Survey protocol followed guidelines from Woodbridge and Hargis (2005) with techniques timed to follow goshawk breeding biology, and included dawn acoustical, valley watch and broadcast surveys.

Three sets of two day dawn acoustical surveys were performed on April 14 and 15, April 21 and 22 and April 28 and 30, with each day encompassing one of two sites. The first site included the length of the Spur Road, the second site covered one half mile along the road in each direction from Pit 2, the location closest to the 2000 nest site (Fig. 1). The dawn acoustical surveys entailed arriving at each site approximately 1/2 hour before dawn, then moving to listening stations at approximately 150 m intervals along the road followed by 5 - 10 minutes of listening at each station. A search for nests or signs of nesting activity was done continuously along the route.

A valley watch was also conducted on April 30. The location for the valley watch was above Pit 4, which overlooks the Spur Road and affords an excellent view of the forest canopy.

A broadcast survey, per Kennedy and Stahlecker (1993), was conducted on June 29. A total of 26 call stations, set 250 m apart, were set starting from the top of the Spur Road to the 1 mile marker above Slate Creek Cove. Playback recordings of adult female alarm calls were broadcast at maximum volume. Broadcasts were started facing the direction of travel, with 10 seconds of recorded calls followed by 30 seconds of listening and observing. This procedure was then repeated at 60° and 180° from the direction of travel and conducted twice at each station.

The weather was good for all surveys.

Survey Results

Goshawk presence was not detected with any of the survey techniques employed. All bird calls heard in the acoustical surveys were identifiable by species, no goshawks were noted during the valley watch surveys and no goshawk response was detected during the follow up broadcast survey.

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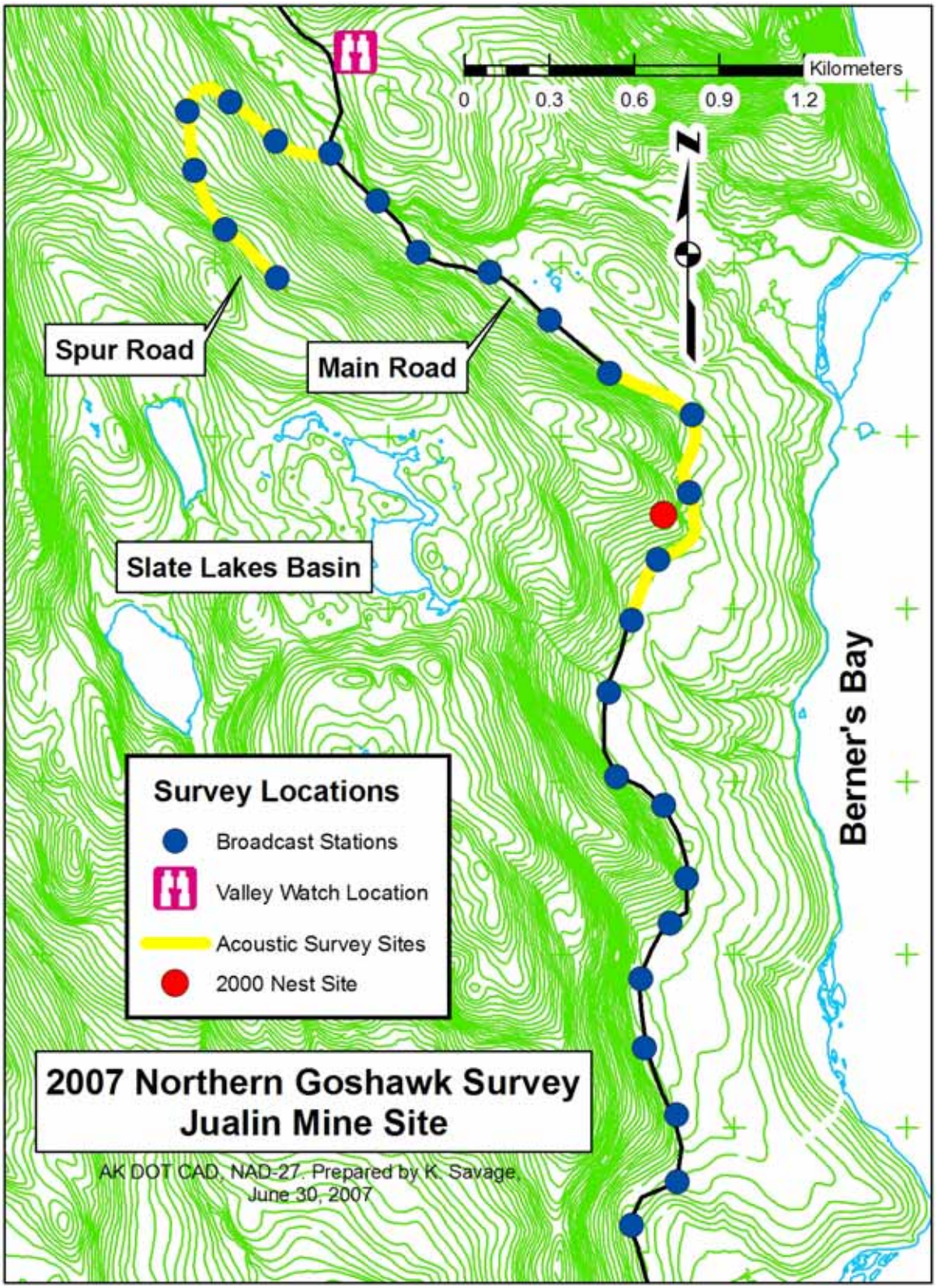


Figure 1 2007 Northern Goshawk Survey Locations

2007 NORTHERN GOSHAWK SURVEY - JUALIN MINE SITE

Date	Personnel	Survey Site	Start & End Time	Weather	Survey Type
4/14/2007	KS, CF	Old nest site, Pit 3 1/2 mile up and down road	0515 - 0700	High overcast, calm, quiet	Dawn Acoustic*
4/15/2007	KS, CF	Spur Road	0515 - 0700	High overcast, calm, moderate noise	Dawn Acoustic*
4/21/2007	KS, CF	Old nest site, Pit 3 1/2 mile up and down road	0430 - 0630	Clear, calm, quiet	Dawn Acoustic*
4/22/2007	KS, CF	Spur Road	0430 - 0630	Clear, calm, quiet	Dawn Acoustic*
4/28/2007	KS,RP	Old nest site, Pit 3 1/2 mile up and down road	0400 - 0600	High overcast, calm, quiet	Dawn Acoustic*
4/30/2007	KS,RP	Above Pit 4	0400 - 0600	Low overcast, light drizzle, calm	Valley Watch
6/29/2007	KS, LS	From top of Spur Rd to Mile 1	0800 - 1530	High overcast, calm	Broadcast

1. Field Biologist: Kate Savage (KS), Environmental Technicians: Chris Frank (CF), Ray Pohl (RP), LeAnn Scheel (LS)

2. * Bird calls noted include: red-breasted sapsucker, winter wren, dark-eyed junco, American robin, bald eagle, blue grouse, common raven, Northern pygmy owl, Stellar's jay, varied thrush, chestnut-backed chickadee, marbled murrelets, hermit thrush, belted kingfisher, rufous hummingbird, orange-crowned warbler.

Table 1. 2007 Northern Goshawk Survey Field Data

Attachment 4

Upper Slate Lake Dolly Varden Survey – 2007

COEUR ALASKA KENSINGTON PROJECT

USFS Annual Report 2007

TSF Ecological Monitoring:
Upper Slate Dolly Varden

January 2008

1.0 Introduction

This report summarizes monitoring conducted in 2007 in accordance with the Ecological Monitoring Plan for the TSF (Tailings Storage Facility). Dolly Varden surveys were conducted in Mid-Lake Slate Creek in August and September with a portion of the captured fish being relocated below the TSF. Dolly Varden spawner surveys were also conducted in October and November in Upper Slate Lake.

2.0 Mid-Lake Slate Creek Dolly Varden

The Ecological Monitoring Plan for the TSF states that "*Dolly Varden in Mid-Lake Slate Creek will be captured and released below the TSF dam from the beginning of construction of the TSF until confirmation that suitable conditions for Dolly Varden are present in the TSF. These Dolly Varden will be measured for length, weighed, searched for abnormalities, and scanned for tags from baseline studies. By relocating migrants, subtleties of timing and life stage relating to downstream movement will be preserved. The information that will be gained on numbers, seasonality, and sizes of Dolly Varden migrants will be directly applicable to the final plan for reintroduction of Dolly Varden to the TSF.*"

2.1 Methods

During the summer of 2006, preparation of the TSF involved diversion of part of Mid-Lake Slate Creek around Lower Slate Lake to East Fork Slate Creek (Figure 1). On August 31, and September 27, 2007, five minnow traps, baited with disinfected salmon eggs were set in the remaining section of Mid-Lake Slate Creek near Upper Slate Lake and allowed to soak for 30 minutes. Fish captured were anesthetized with a solution of MS222 (Tricane-methane sulphonate), measured to the nearest 1mm and weighed to the nearest 0.1g. Fish were examined for any abnormalities and tags from baseline studies. After being allowed to recover from the anesthetic, fish were released at the site of capture. A sample of fish was held in a container of stream water equipped with an aerator and transported to East Fork Slate Creek where they were released.

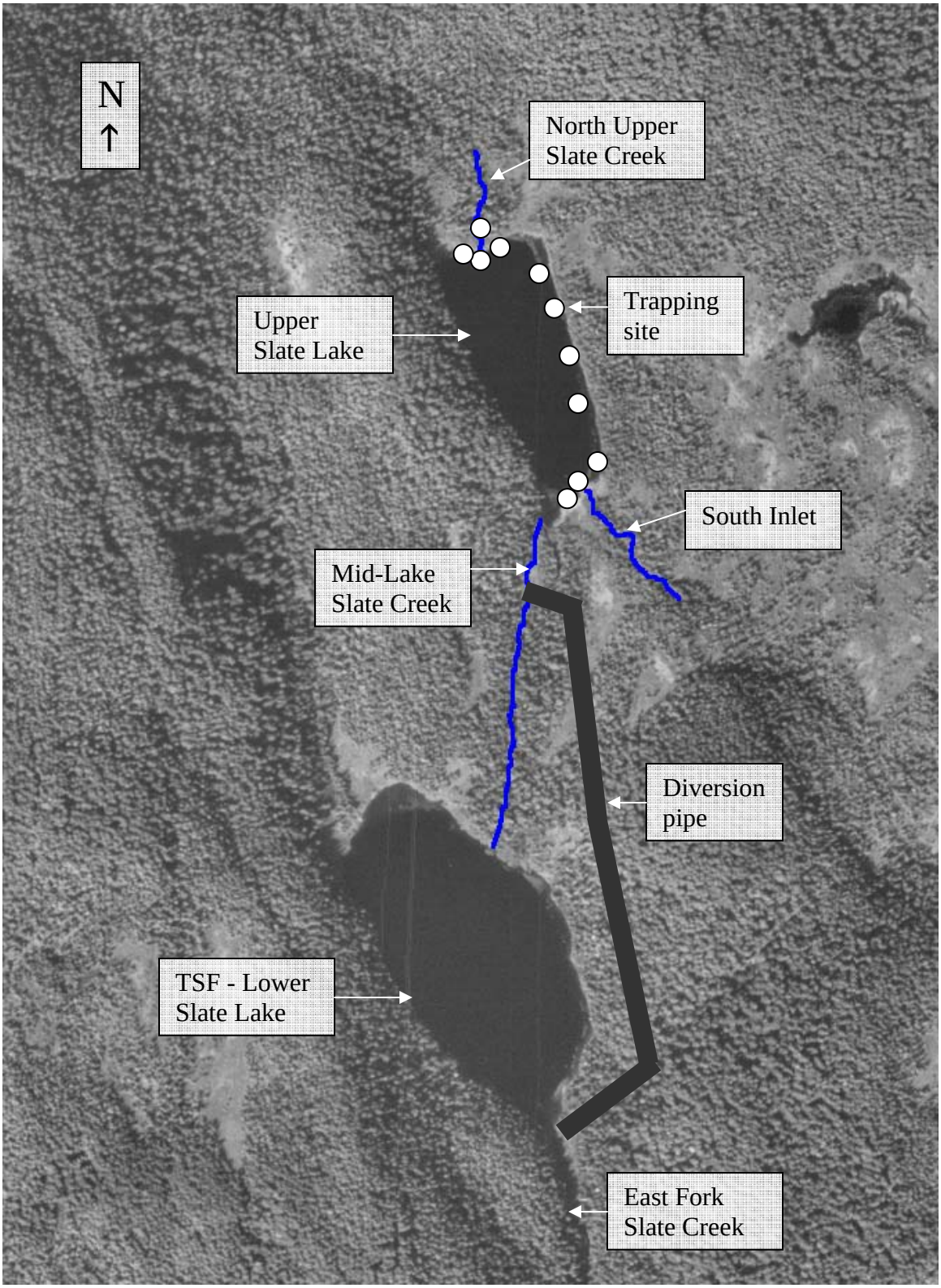
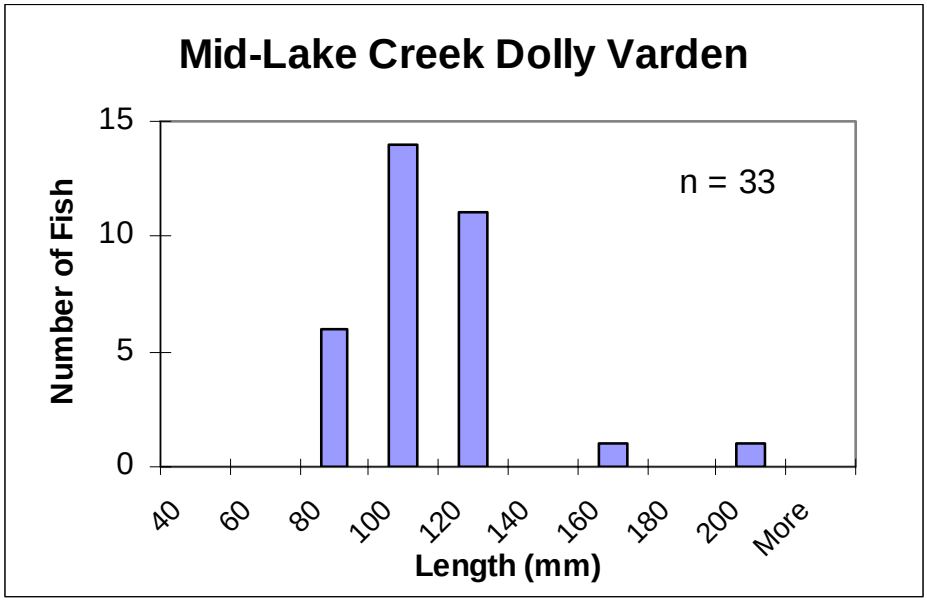


Figure 1: Upper Slate Aerial View. Mid-Lake Slate Creek is now diverted around the TSF through a pipe. Trapping sites for spawner surveys are shown by white circles.



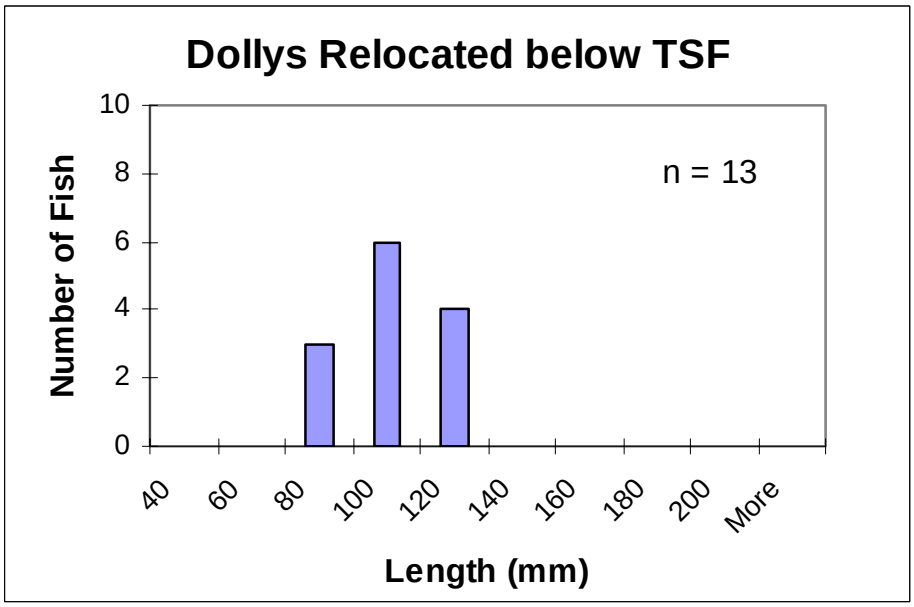


Figure 2: Length-Frequency Histograms of Dolly Varden captured in Mid-Lake Slate Creek in August 2007. A portion of the total fish captured was transported to below the TSF (lower graph).

2.2 Results

The lengths and weights of Dolly Varden captured in Mid-Lake Slate Creek are presented in Appendix 1. Lengths and weights were used to calculate Fulton's condition factor (K) using the equation given in Anderson & Neumann (1996):

$$K = W/L^3 \times 10{,}000$$

W = weight in g; L = total length in mm

Table 1 summarizes the mean length, weights and condition factor of all the Dolly Varden captured while Table 2 summarizes statistics for those fish relocated to East Fork Slate Creek. Size distribution histograms for both sets of fish are shown in Figure 2. Only 3 Dolly Varden and 22 sticklebacks were captured on August 31. A total of 30 fish were captured on September 27 and a sample of 13 of these fish were transported to East Fork Slate Creek, downstream of the proposed TSF, and released. All other fish were released at the site of capture. There is little evidence that large numbers of Dolly Varden migrate from Upper Slate Lake to lower Slate Creek annually (Earthworks Technology 2002), therefore only 13 fish were relocated.

The minnow trap surveys provide data on sizes of fish available for final reclamation. The mean length and weight of fish relocated was slightly smaller than the total capture, but mean condition factor was slightly higher. The largest and smallest fish captured were not relocated (Tables 1, 2).

Table 1: Summary statistics of all fish captured in Mid-Lake Slate Creek

n = 33	**length**	**weight**	**k**
mean	98.9	9.1	0.801
min	69.0	2.3	0.686
max	194.0	55.8	0.905

Table 2: Fish relocated from Mid-Lake Slate Creek to East Fork Slate Creek

n = 13	**length**	**weight**	**k**
mean	94.8	7.538	0.822
min	70.0	2.7	0.781
max	118.0	14.3	0.873

3.0 Dolly Varden Spawner Surveys

Potential Dolly Varden spawning habitat occurs mostly in North Upper Slate Creek and along the eastern shore of Upper Slate Lake (Figures 1, 3). Suitably sized gravel with flow from inlet streams exists in these areas. Spawner surveys were conducted in October and November 2007 to gain an understanding of the variability in recruitment of Dolly Varden to the Slate Creek basin from the Upper Slate area in accordance with the Ecological Monitoring Plan for the TSF. The plan states that surveys will be conducted from July through September, however, Dolly Varden in South-East Alaska are known to spawn in late Fall (Armstrong 1965, Armstrong & Morrow 1980, Blackett 1973, Heiser 1966) therefore surveys were adapted accordingly.

Figure 3: Gravel in North Upper Slate Creek.

3.1 Methods

Dark-colored tannins in the water in the fall prevent direct observation of the lake bed along the shore, therefore minnow trapping was used to capture and examine fish for signs of spawning. Surveys were conducted by setting minnow traps near likely spawning areas, namely gravel beds at the mouth of small streams running into Upper Slate Lake and the North Inlet Creek (Figure 1). Minnow traps were modified by enlarging entrance holes to 2 inches in diameter, allowing larger fish to enter the traps, since they are more likely to be spawning. Traps were set on October 12 and 24 and on November 15, and left to soak overnight. Trapping was repeated during daylight hours to increase fishing effort. Eight traps were set on October 12 for a total of 16 fishing hours. A total of 130 hours were fished over October 23-24 and 15 hours were fished on November 15. Captured fish were anesthetized, length and weight measurements taken and notes made of any spawning coloration or milt production (Figures 4, 5). The surveys ceased after November 15 owing to the diminishing number of spawners found and ice and snow cover on the lake.

3.2 Results

Lengths, weights and condition factor of fish are presented in Appendix 2. The size distribution of fish captured is displayed in histograms in Figure 6. Spawning signs included bright orange belly, bright red to orange spots on the sides and milt production. Figures 4 and 5 show Dolly Varden with and without spawning coloration. Only 5 fish out of a total catch of 41 showed signs of spawning and only one of these showed milt production. On October 12, three of the twelve fish captured showed signs of spawning and their lengths ranged from 195 to 239mm. On October 23-24, only two of the twenty-one fish captured showed spawning sign and their size ranged from 227 to 240mm. The 240mm fish was the only one found with fresh milt. Three other fish over 200mm were captured, but showed no spawning signs. These fish had lower condition factors than the fish with spawning coloration. In November only eight fish were captured, the largest being only 131mm and none showed spawning colors. Failure to catch larger fish may partly account for the lack of spawners found in November.

Figure 4: Dolly Varden lacking spawning coloration.

Figure 5: Dolly Varden with spawning colors, orange belly, red spots.

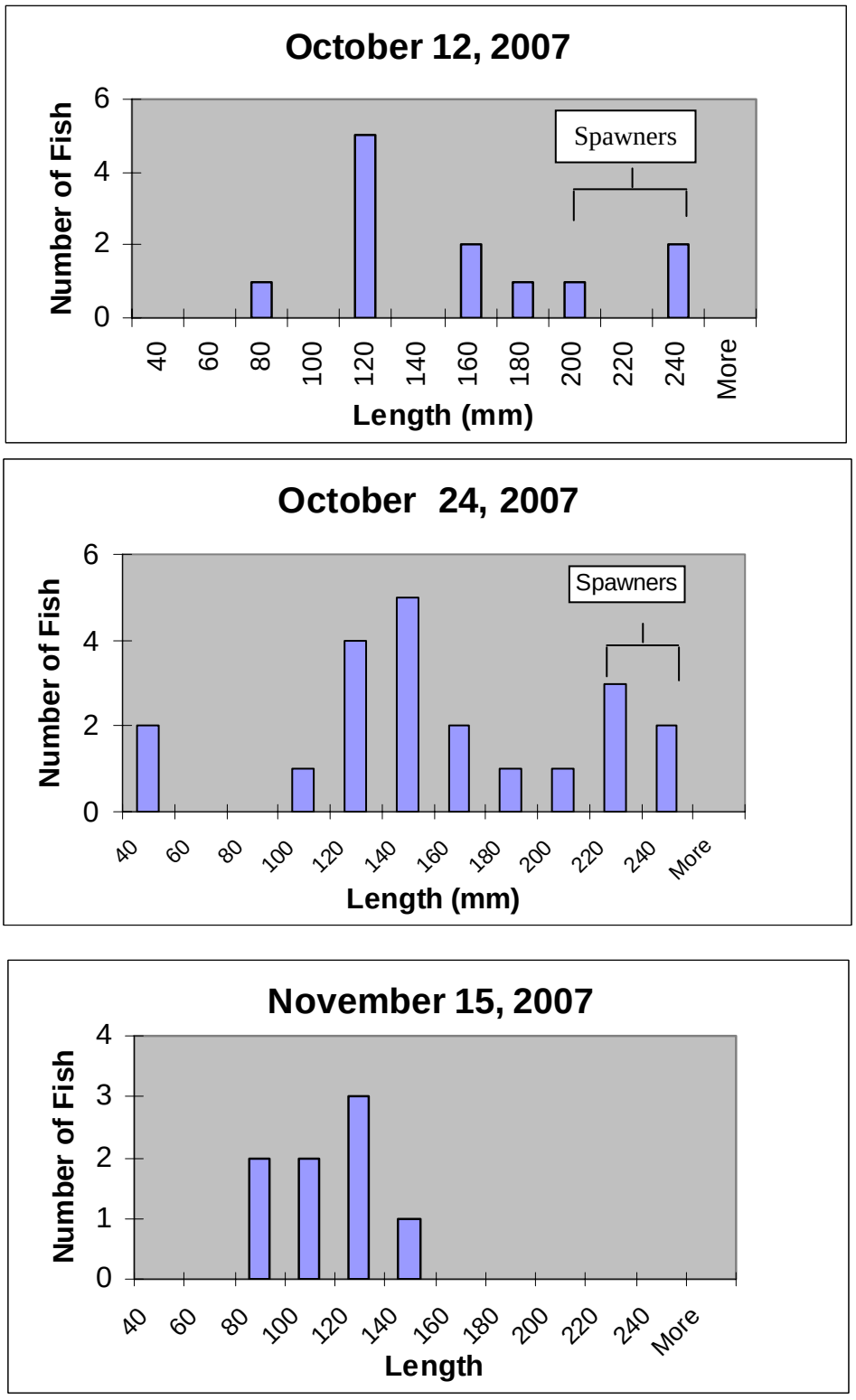


Figure 6: Length-Frequency Histograms of fish captured during spawning surveys.

3.3 Discussion

Fewer spawning fish were found in 2007 than 2006 despite capturing fish in the same size range. Van Alen (1983) found evidence from the Indian Lake system in Southeast Alaska that Dolly Varden females spawn every year, but males apparently only spawned every 2 years. This might partly explain the lower number of spawners found in 2007. In 2006, Dolly Varden were found in spawning colors in late October at a wider size range of 140-240mm; in 2007 the size range of spawners was narrower with smallest spawner being 195mm.

The condition of spawning fish appeared to be higher than fish of the same size that did not show spawning colors (Appendix 2). It is likely that fish that have not gained enough weight or have lost weight will not spawn that year. This is in agreement with the theory that some fish do not spawn every year. Reproduction consumes energy and some fish may not reach a condition suitable for spawning every year. Some fish may have already spawned prior to the first survey, but the first fish found with ready milt was on October 24, suggesting the timing was similar to the previous year. It will be interesting to see if numbers of spawning males found are higher in 2008 supporting the theory that they may not spawn every year. A larger sample size would also help to test this theory.

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Appendix 1: Dolly Varden Captured in Mid-Lake Slate Creek, 2007.

Date	Fish #	Length (mm)	Weight (g)	Condition
30-Aug-07	1	101	8.4	0.815
	2	95	7.1	0.828
	3	110	9.5	0.714
27-Sep-07	4	142	22.5	0.786
	5	95	6.7	0.781
	6	102	9.6	0.905
	7	92	5.8	0.745
	8	83	4.3	0.752
	9	73	3.1	0.797
	10	69	2.3	0.700
	11	94	5.7	0.686
	12	77	3.9	0.854
	13	110	10.7	0.804
	14	92	6.7	0.860
	15	194	55.8	0.764
	16	105	9.6	0.829
	17	96	7	0.791
	18	106	9.9	0.831
	19	90	5.6	0.768
	20	106	8.6	0.722
Moved below TSF	21	102	8.5	0.801
	22	96	7.1	0.802
	23	91	5.9	0.783
	24	115	12.4	0.815
	25	95	6.7	0.781
	26	118	14.3	0.870
	27	111	10.9	0.797
	28	70	2.7	0.787
	29	99	8.3	0.855
	30	92	6.8	0.873
	31	99	8.1	0.835
	32	73	3.2	0.823
	33	71	3.1	0.866

Appendix 2: Length, weight, condition and spawning sign of Dolly Varden captured during spawner surveys in 2007.

	10/12/07			
	Length	**Weight**	**Condition**	**Spawning sign**
Trap 1	239	109.7	0.804	No milt, orange belly
North shore				red spots
Trap 2	104	8.2	0.729	
North shore	141	20.4	0.728	
	195	50.6	0.682	no milt, orange spots
Trap 3	73	3	0.771	
North creek	104	7.9	0.702	
	111	10.1	0.739	
	111	12.2	0.892	
	102	10.1	0.952	
Trap 4	173	38.7	0.747	no milt
in creek				
at 50m				
Trap 5	158	30.3	0.768	
East shore	229	90.9	0.757	no orange belly
				a few orange spots
Traps 6,7,8	no dollys, 2 stickleback			
East shore				
total fish	**12**			

Appendix 2 cont.

10/24/07

	Length	Weight	Condition	Spawning sign
Trap 1	111	14	1.024	
South end	227	99.1	0.847	no milt, orange belly
Upper Lake				
Trap 2	141	20.2	0.721	
South end				
Trap 3	94	7.1	0.855	
South end				
Traps 4-7	0			
Trap 1	220	72.3	0.679	
South end	103	9.4	0.860	
Trap 2	166	40.4	0.883	
South end	190	49.5	0.722	
Traps 3-7	0			
Trap 1				
North end	121	12.7	0.717	
	124	14.2	0.745	
	136	22.3	0.887	
	160	31.3	0.764	
	204	63.7	0.750	
Trap 2	106	9	0.756	
North end	115	12.7	0.835	
	210	71.4	0.771	
Trap 3	133	17.5	0.744	
North end	131	17.6	0.783	
	240	123.5	0.893	Milt, strong orange belly
Traps 4,5	0			
Total fish	**22**			

11/15/07

	Length	Weight	Condition	Spawning Sign
Trap 1	81	4.1	0.771	
North Creek	77	3.5	0.767	
	74	3.2	0.790	
	101	8.7	0.844	
Trap 2	102	9.2	0.867	
North Creek	115	12.5	0.822	
Trap 3	83	4.1	0.717	
North Shore	131	17.4	0.774	
Traps 4-7				
North Shore	Empty			
total fish	**8**			

Attachment 5

Berners Bay Herring Research – 2007

Regional Information Report No. #RYY-XX

Berners Bay Herring Research

2007 Research Report

by

Marc Pritchett

Kevin Monagle

and

Dave Harris

November 2007

Alaska Department of Fish and Game **Division of Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, Special Publications and the Division of Commercial Fisheries Regional Reports. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL INFORMANTION REPORT NO. #RYY-XX

BERNERS BAY HERRING RESEARCH

2007 RESEARCH REPORT

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ABSTRACT

Lynn Canal aerial and skiff surveys were used to document herring spawn locations in 2007. Spawn deposition dive surveys were used to estimate spawning biomass. Results of these surveys indicate the Lynn Canal herring spawning population remains below threshold. As a result, Lynn Canal herring will not be opened to commercial harvest in 2008.

Key words: Lynn Canal, Berners Bay, herring, Southeast Alaska, stock assessment

INTRODUCTION

Prior to 1983 the Lynn Canal herring stock was one of the larger stocks in Southeast Alaska supporting several commercial fisheries including a sac roe fishery, bait pound fishery, and a winter food and bait fishery. This stock declined through the 1970's and since 1982 and has remained at low levels. The reason for the decline is not clear, however potential contributing factors include: over fishing, habitat degradation or disturbance in Auke Bay, water pollution, geographic shifting of spawning aggregations, and population growth of major predators such as sea lions. If the long-term decline was solely the result of over fishing, it is expected that this stock should have recovered during the 20-year period since commercial exploitation has ceased. In other areas in Southeast Alaska, such as Hoonah Sound, herring stocks have grown from low levels to relatively high levels over a span of a few years. Historically, the Lynn Canal or Juneau herring spawning aggregation is defined as that area of southern Lynn Canal (the Berners Bay area) south, and northern Stephens Passage (i.e. from Taku Harbor north).

The established spawning biomass threshold level for this stock is 5,000 tons. This means that before a herring fishery may be considered for the Lynn Canal spawning stock, a spawning biomass forecast must meet or exceed 5,000 tons. No commercial harvest has occurred in the Juneau area since the 1981-82 season.

Available records indicate that from 1953 to 1982 Lynn Canal herring primarily spawned from Auke Bay to Point Sherman including Berners Bay. The documented spawn for the Lynn Canal herring stock during this period ranged from 2.5 to 28.1 nmi, averaging approximately 11.6 nmi (Table 1). While significant spawning occurred in the vicinity of Auke Bay prior to 1981, there has been very limited spawning in Auke Bay in recent years. Recent spawning activity for the Lynn Canal herring stock is primarily centered between Bridget Cove and Berners Bay. From 1983 through 2006 the documented spawn has ranged from 2.0 to 8.8 nmi, averaging only 5.0 nmi. ADF&G records since 1972 document herring spawn between Echo Cove and the Berners Bay flats in most years, with few exceptions. The consistent herring spawn along this shoreline for the last 20 years suggests its importance to this stock. Pacific herring have been documented to spawn at Cascade Point as early as April 18 and as late as May 29.

The Alaska Department of Fish and game conducts aerial, skiff, and scuba dive surveys to monitor the Lynn Canal spawning stock. Aerial and skiff surveys have been conduced since 1970 to identify the dates and extent (miles of spawn along shoreline) of herring spawn. A 2004 dive survey provided the first estimate of spawning biomass escapement by the department for

the Lynn Canal area since a 1984 dive survey and a 1992 hydroacoustic estimate. Using dive surveys, the department estimates the total number of herring eggs in the Lynn Canal spawning grounds and converts this to an estimate of spawning population biomass through use of a fecundity relationship and weight-at-age data. Monitoring of the Lynn Canal spawning stock through aerial, skiff, and spawn deposition scuba dive surveys continued in 2007 as reported here.

MATERIALS AND METHODS

A series of aerial and skiff surveys are used to record spawning activities during the spring spawning period to document spawn timing and estimate the nautical miles of beach that received herring spawn. During the spring of 2007, all aerial surveys were flown in a Cubcrafters Supercub aircraft on floats with a department contracted pilot. In 2007 there were 16 aerial surveys conducted for the Lynn Canal area between April 16 and May 23 (Appendix A).

As in 2004, 2005, and 2006 scuba surveys were used in 2007 to estimate the total number of herring eggs in the Lynn Canal spawning grounds. Actual survey methods in 2007 were the same as those used in recent years (Pritchett et al. 2007). Dive surveys have occurred only on spawn in the Berners Bay area (i.e. dive surveys have not been completed in areas such as Taku Harbor or Oliver Inlet) and therefore biomass estimates are only for the Berners Bay area in southern Lynn Canal.

RESULTS AND DISCUSSION

Aerial surveys documented a total of 7.4 nmi of spawn in the Berners Bay area of Lynn Canal in 2007 (Figure 1, Appendix A). For comparison, Table 1 also lists documented herring spawn for the Juneau area including the Berners Bay area. Additional areas where spawn may have been documented include Taku Harbor, Oliver Inlet, Auke Bay, or Tee Harbor.

A spawn deposition survey was conducted on May 25, 2007 with the completion of eight randomly selected transects. The average transect length was 31 m with an average density of 287,712 eggs per square meter. The estimated 2007 spawning biomass was 1,461 tons.

The Lynn Canal spawning stock is currently below the 5,000 ton threshold and will likely remain closed to commercial harvest in the foreseeable future. In the future as resources permit, the department intends to document herring spawning locations in the Juneau area with aerial and skiff surveys and to conduct dive assessment surveys in southern Lynn Canal and Berners Bay.

REFERENCES CITED

Pritchett, M., S. Dressel, K. Monagle. 2007. Berners Bay Herring Research, 2005 and 2006 Research Report. Alaska Department of Fish and Game, Regional Report Series No. #R07-01, Douglas Alaska.

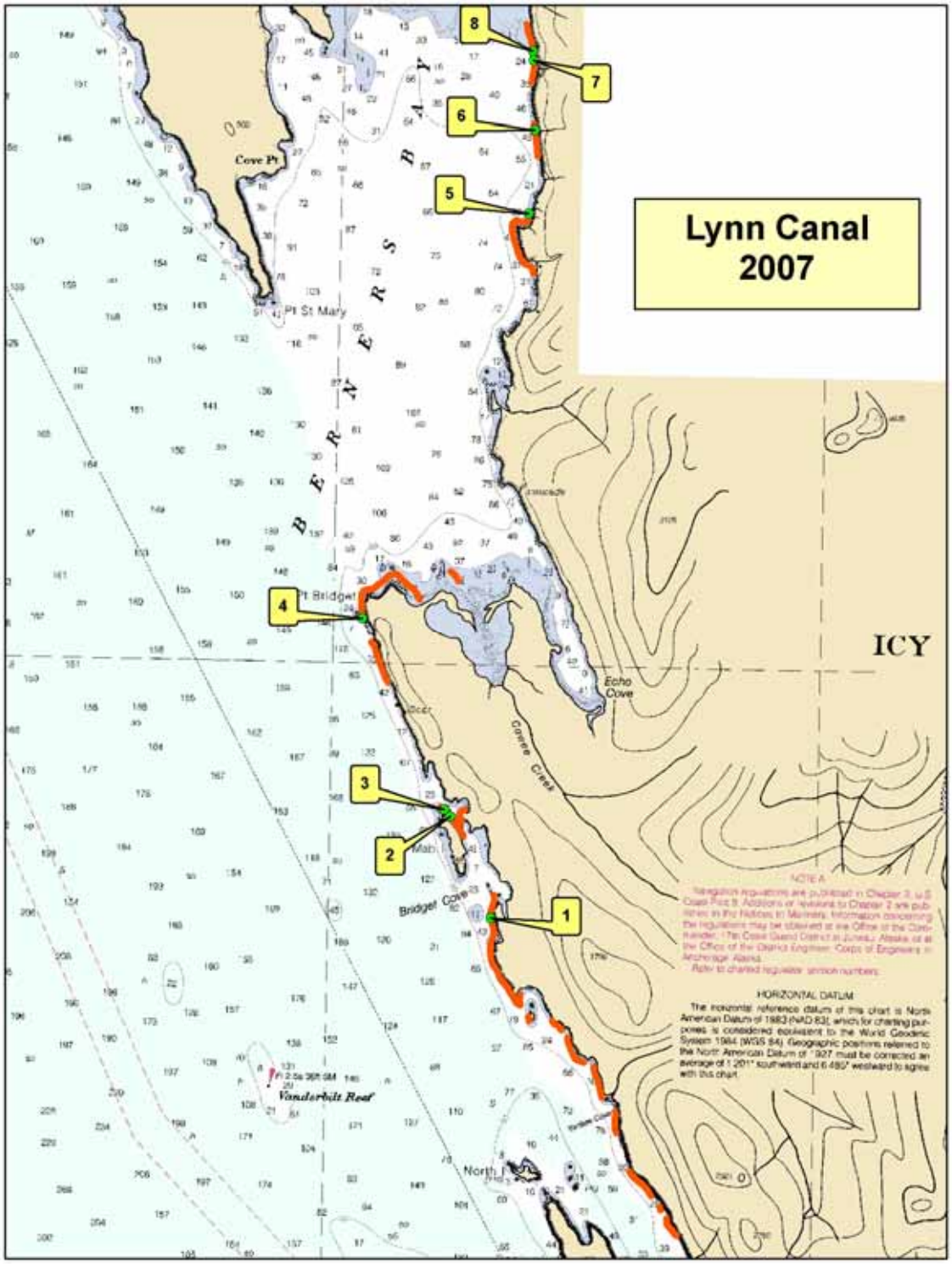

Figure 1.–Berners Bay 2007 herring spawn shoreline (broad, dark line parallel to shore) and transect locations (numbers 1 – 8).

Table 1.–Historic Lynn Canal commercial harvest and nautical miles of spawn.

Season	Total quota (tons)	Total Harvest (tons)	Pound catch (tons)	Seine catch (tons)	Gillnet catch (tons)	Date of first spawn	Major spawning dates	Nautical miles of spawn - Juneau Area	Nautical miles of spawn - Berners Bay Area	Spawning escapement - Berners Bay Area
1952-53								8.2		
1953-54								9.4		
1954-55								12.2		
1955-56								10.0		
1956-57								28.1		
1957-58								24.1		
1958-59								10.8		
1959-60		156	156			1-May	5/1-5/15	12.9		
1960-61		22	22							
1961-62		354	354							
1962-63		101	101							
1963-64		195	195							
1964-65		200	200							
1965-66		109	109							
1966-67		100	100							
1967-68		475	475							
1968-69		600	0	600						
1969-70	750	240	240				5/2-5/4	11.5		
1970-71	750	654	654							
1971-72	950	524	431	93		2-May	6-May	8.5		
1972-73	950	350	49	301			25-Apr	10.6		
1973-74	620	396	73	319	4		27-Apr	13.2		
1974-75	620	644	88	556	2		5-May	10.9		
1975-76	870	631	74	433	124		27-Apr	15.9		
1976-77	995	926	0	709	217		3-May	9.7		
1977-78	820	966	0	603	363		24-Apr	8.0		
1978-79	120	7	11	0			18-Apr	5.7		
1979-80	720	976	0	976			8-May	9.8		
1980-81	845	777	2	775			30-Apr	9.2		
1981-82	400	551	0	551				2.5		

- continued -

Table 1 page 2 of 2.

Season	Total quota (tons)	Total Harvest (tons)	Pound catch (tons)	Seine catch (tons)	Gillnet catch (tons)	Date of first spawn	Major spawning dates	Nautical miles of spawn - Juneau Area	Nautical miles of spawn - Berners Bay Area	Spawning escapement - Berners Bay Area
1982-83							1-May	6.0		
1983-84							24-Apr	2.6		
1984-85							29-Apr	5.1		
1985-86							2-May	5.0		
1986-87							4-May	2.5		
1987-88							4/30-5/3	7.3		
1988-89							24-Apr	5.8	4.3	
1989-90							26-Apr	3.3	3.3	
1990-91							4/30-5/4	5.6	1.7	
1991-92							27-Apr	7.5	4.2	
1992-93							5/4-5/6	5.1	3.5	
1993-94							4/27-5/8	6.2	4.5	
1994-95							5/10-5/24	2.1	1.0	
1995-96						29-Apr	1-May	8.5	3.7	
1996-97						1-May	5-May	5.6	3.0	
1997-98						13-May		2.0	0.6	
1998-99								5.5	4.7	
1999-00						4-May	5/10-5/10	5.6	3.6	
2000-01						5-May	5/5-5/6	6.9	3.8	
2001-02						29-May	29-May	4.0	3.0	
2002-03						30-Apr	4/30 - 5/2	3.0	2.2	
2003-04						4-May	5/4 – 5/9	8.8	5.1	719
2004-05						10-May	5/11 – 5/12	2.8	1.4	318
2005-06						12-May	5/13 - 5/14	4.5	3.9	712
2006-07						11-May	5/11-5/16	8.2	7.4	1,461

APPENDIX A

Appendix A.– Lynn Canal and Berners Bay 2007 Herring Survey Flight Log.

Total miles of spawn:	7.4 nmi
Spawning dates:	5/11-5/22
Peak spawning:	5/11-5/16

4/16	1st aerial survey. 20 sea lion, 60 harbor seal at mouth of Berners. No herring activity.
4/20	40 sea lion in Berners Bay, 40 harbor seal at mouth of Berners. No herring activity.
4/25	62 sealion, one whale. No herring activity.
4/30	1 whale 4 sea lions. No herring activity
5/4	328 sea lions 6 whale in Berners Bay, none S of Pt Bridget
5/7	18 sealions
5/11	50 sealions, 6 whales, many schools, 1 mile active spawn.
5/12	27 sealions, 3 whales, 16 schools of herring, .5 miles active spawn
5/13	45 sealions, 1 whale. 1 mi spawn
5/14	9 sealions 1 whale, several small schools, ¾ mile active spawn
5/15	10 sealions and 2 whales, ≈3nm active spawn
5/16	.5 nm intense spawn, 15 sealions
5/17	spot spawn, 0 whales, sealions at Benjamin Is
5/18	2 spot spawns, no herring or predators
5/22	¾ mile spawn, many schools observed
5/23	few predators, no new spawn