

APPENDIX F
BIOLOGICAL INVENTORY MEMORANDUM

Biological Inventory Memorandum Ross-Adams Site Tongass National Forest, Prince of Wales Island, Alaska

1.0 INTRODUCTION

Tetra Tech conducted a qualitative biological survey of the Ross-Adams site (Site) to identify the main habitat types and associated aquatic and terrestrial species for use in the exposure pathways analyses of the ecological and human health risk assessments (ERA and HHRA). During the biological survey, an emphasis was placed on characterizing food chain exposure pathways to wildlife and humans as this information will be used in the refinement of the Conceptual Site Models (CSMs) that will be prepared for the ERA and HHRA. The objectives of the survey were to 1) identify terrestrial, freshwater and marine habitat types present in the project area, 2) record any observed animal species or evidence of wildlife (visual, auditory, tracks, scat, trails, nests, prey remains, etc.), and 3) record observed plant species, particularly those comprising habitat or potential diet items.

Biologists from the Tetra Tech team conducted a pedestrian survey July 22-24, 2009. Prevalent weather conditions were moderate temperatures in the 60s °F with low clouds and intermittent rain showers. On July 22, the intertidal zone and marine environment in Kendrick Bay were surveyed during low tide, which was approximately -4.2 feet (MLLW) at its lowest point. On July 23 and 24, further intertidal area surveys were performed as well as surveys of three streams (Kendrick Creek, Mine Fork Creek, and Cabin Creek) and the upland terrestrial habitats from the intertidal zone to the Ross-Adams Mine 900 Level. The low tides recorded for July 22-24 were among the lowest recorded for the year, with only January and March having lower tides (per NOAA's station at Ketchikan, AK, NOAA 2009). In addition to the biological survey performed on July 22-24, incidental species observations were reported from field notes and personal communications from Tetra Tech field sampling events conducted in June, July, and September 2009.

This technical memorandum includes the following sections: 2.0 Site Survey and Habitat Types, 3.0 Species Observed, 4.0 Wildlife Functional Groups, and 5.0 Subsistence Use and Hunting.

2.0 SITE SURVEY AND HABITAT TYPES

The Alaska Department of Environmental Conservation's guidance for conducting ecological risk assessments (ERA's) (ADEC 1999a, b, 2009) divides the environments of Alaska into 8 broad ecoregions (based on watersheds) and 29 ecological subregions to provide general descriptions of ecology pertinent to the development of ERAs. The Ross-Adams site falls within the "Southeast Ecoregion" as defined by ADEC. This ecoregion includes the entire Alaska Panhandle and extends from approximately Redwood, Alaska south to the southern tip of Prince of Wales Island. It is bordered on the east by Canada, and on the west by the Pacific Ocean. The main ADEC ecological subregions characterizing the Ross-Adams site are the Southeast Coastline/Estuary and Coastal Western Hemlock-Sitka Spruce Forest. The Pacific Ocean subregion characterizes the open waters of Kendrick Bay.

The biological survey identified the following four main habitat types, which are considered consistent with the ADEC subregions described above. Their locations are roughly depicted in Figure 1.

Subalpine Zone. This area is found at the 900 Level and is characterized by barren rock and plants adapted to the colder and windier environment at this higher elevation (such as the dwarf form of the shore pine). This zone includes the open pit, mine rock, and other mine workings at the 900 Level.

Western Hemlock-Sitka Spruce Forest. This habitat type consists of old growth forest extending from sea level to approximately 900 feet ASL (900 Level) and dominated by Western Hemlock and Sitka-Spruce. Kendrick Creek drains through the forested area and is joined by its tributaries Mine Fork Creek and Cabin Creek. This zone also includes the portals and mine workings at the 300 and 700 Levels, the disturbed areas along the gravel haul roads, several small dwellings and structures, and the former ore staging area.

Intertidal Zone. This habitat type is bounded by the low and high tides of Kendrick Bay, as shown in Figure 2. The area between low and high tides is approximately 27 acres. The Intertidal Zone receives freshwater input from Kendrick Creek and runoff from the surrounding uplands, and is connected to the open waters of the northwest end of Kendrick Bay.

Marine Zone. This habitat type is contiguous with the Intertidal Zone and includes the waters of the northwest end of Kendrick Bay that border the low tide line (see Figure 2).

Attachment A presents a synopsis of the site survey, including descriptions and photographs of the various habitats and species encountered during the survey, travelling from the intertidal zone up to the subalpine zone. The species observed are further discussed in Section 3.

3.0 SPECIES OBSERVED

A list of species observed at the Site is included in Table 1. The species are grouped by the major habitat areas at the Site: Intertidal and Marine Zones, Western Hemlock-Sitka Spruce Forest and Subalpine Zone, and Freshwater Habitats within the forest and subalpine areas. The table also includes notes on relative abundance, location/elevation observed, and other pertinent information. Species (or genera) observed in the intertidal zone and the nearshore subtidal portion of Kendrick Bay included: 16 aquatic and wetland plants and algae, 24 aquatic invertebrates, 2 fish, 6 mammals, and 8 birds. Species (or genera) observed in terrestrial habitats included 56 plants, 2 invertebrates, 3 mammals, and 4 birds. Very few species (or genera) were observed in the freshwater environments, including 1 aquatic invertebrate, 2 fish, and 1 amphibian. It is important to note that the survey was conducted over a short time span and most likely did not record all of the aquatic and terrestrial wildlife species that may utilize the area, and this is particularly likely for species that are nocturnal or are present at other times of the year.

Bats. Bat species are nocturnal and thus it is not surprising that they were not observed during the survey. They are of special interest since they could potentially occupy mine workings or other areas that could be affected during reclamation activities. As such, a review was conducted to evaluate the likelihood of bat species occurring at the Site. Many of the bat species in North America are special status species (e.g., threatened or endangered) and thus can be of management concern if identified in the project area. Limited information is available on the distribution of bats in Alaska, however, a paper by Parker et al. (1997) evaluated the northwestern extent of bats in North America and found that there are six bat species that occur in Alaska. Five bat species were reported from southeast Alaska and could occur in the vicinity of the Ross-Adams site, these include: little brown bat (*Myotis lucifugus*), long-legged bat (*M. volans*), California bat (*M. californicus*), Keen's long-eared bat (*M. keenii*), and silver-haired bat

(*Lasionycteris noctivagans*). *M. volans*, *M. californicus*, *M. keenii*, and *L. noctivagans* appear to be at the northern limits of their range in southeast Alaska, whereas *M. lucifugus* is widely distributed in much of Alaska. All four of the *Myotis* species exhibit the potential to roost in caves and/or mine workings (WBWG 2009). Therefore, it is possible that the *Myotis* species could use similar areas of the Site. *L. noctivagans* roosts in trees, and could occur in forested areas, but is not reported to use caves or mines for roosting (WBWG 2009).

Salmonids. Salmonids are also considered species of special interest since they can be an important link in aquatic food chains and potential exposure pathways to both humans and wildlife. Thus it is important to understand the ecological pathway of salmon being exposed to potential contaminants at the Site. As described below, based on field observations and review of the literature, it is expected that the lower portions of Kendrick Creek could be used by some salmonid species, but the upper portion of Kendrick Creek and other streams in the upper portions of the Site are not likely useable by salmonids due to steep gradients and physical barriers. A run of spawning pink salmon was observed in lower Kendrick Creek during the September 2009 sampling event. They were observed up to a sampling station just above the confluence with Cabin Creek (“CONF-SW-01-K”). This observation is consistent with stream classification information from the Tongass National Forest (USFS 2008b). USFS classified the streams in TNF using a system by Paustian et al. (1992) that includes a description of the stream channel type as well as a rating of the stream type’s capacity to support anadromous salmon species. The lower portion of Kendrick Creek is classified as AF-1, “Moderate Gradient Alluvial Fan Channel”, having moderate available spawning area (ASA) for most salmonids, and moderate available rearing area (ARA) for some species (see Figure 3). Farther upstream on lower Kendrick Creek, the channel is classified as MC-2 (Moderate Width and Incision, Contained Channel), having low to negligible ASA and some moderate ARA for salmonids. Between 150 and 200 ft ASL the stream turns northwest and becomes much steeper. From this point to approximately the confluence with Mine Fork Creek it is classified as HC-2 (Shallowly to Moderately Incised Footslope Channel) with moderate ASA and ARA for Dolly Varden and low to negligible ASA and ARA for all other salmonids. Above the Mine Fork Creek confluence, Kendrick Creek is classified as HC-6 (Deeply Incised Mountainslope Channel) and is considered negligible spawning and rearing habitat for all salmonids (see Figure 3). Mine Fork Creek, just above its confluence with Kendrick Creek and the 300 Level Portal, is characterized by a large waterfall (Attachment A – Photo #12). Over a horizontal distance of only 285 feet, Mine Fork Creek drops 185 vertical feet, from 510 ft ASL to 325 ft ASL, a slope of approximately 65%. Due to the waterfall and the extremely steep gradient, it is very unlikely that salmonids would be able to pass above this point on Mine Fork Creek. The inaccessible upper portion of Mine Fork Creek is classified as HC-5, “Shallowly Incised Very High Gradient Channel”. Cabin Creek is classified as HC-6, indicating it is negligible habitat for all salmonids. This is consistent with field observations which noted that Cabin Fork Creek becomes much steeper just above the bridge on the haul road (Attachment A – Photo #14).

4.0 WILDLIFE FUNCTIONAL GROUPS

As previously mentioned, information from the biota survey will be used in evaluating potential food chain exposure pathways. Essential to this evaluation is an understanding of the feeding strategies and diets of the main wildlife species at the Site. ADEC’s risk assessment guidance (ADEC 1999a,b) provides a compilation of the feeding guilds or “functional groups” of Alaska’s wildlife species. Functional groups are based on a species’ taxonomic group (i.e., avian, mammalian), primary foraging habitat (i.e., marine, freshwater, terrestrial) and feeding strategy based on the composition of the bulk of the species’ diet (i.e., herbivore, carnivore, piscivore, invertivore). We have used ADEC’s functional groups to characterize the species of birds and

mammals observed at the Site and these are presented in Table 2, along with additional information on diet composition. As an example, the bald eagle is classified in the “marine/freshwater avian piscivore” functional group, indicating that it is a fish-eating bird that forages in both marine and freshwater environments.

The information in Table 2 will be used to refine the exposure pathways in the CSM and select potential indicator species and assessment endpoints for evaluation in the ERA. Note that six of the species in Table 2 are also ADEC “Default Primary Indicator Species”: belted kingfisher, mallard, dark-eyed junco, harbor seal, sea otter, and mink. Selection of indicator species for evaluation in the ERA includes an assessment of the species’ occurrence or likelihood of occurrence at the site, the presence of complete exposure pathways (based on feeding guilds and potentially affected exposure media), and the potential significance of the exposure pathways.

5.0 SUBSISTENCE USE AND HUNTING

Information on subsistence use and hunting in the vicinity of the Site is presented in this section and will be used in the evaluation of exposure pathways for the HHRA.

A number of the animals and plants observed at the Site are used for subsistence in other areas of Alaska, for example: berries, blue mussels (*Mytilus edulis*), bull kelp, clams, crabs, deer, fish, and sea cucumber (ADFG 2000). However, no subsistence permits for finfish or shellfish have been issued for Kendrick Bay, and thus subsistence fishing is not allowed in this area under Alaska regulations (Mike Turek, ADFG, personal communication, September 2009).

Subsistence use of black bear, deer, and wolves is allowed in this area, but a state hunting license and harvest tickets are required rather than a subsistence use permit (Mike Turek, ADFG, personal communication, September 2009). The Ross-Adams site falls within ADFG’s Wildlife Analysis Area (WAA) #1209, which is one of 31 WAAs within Prince of Wales Island and the surrounding islands (ADFG’s Game Management Unit 2). Based on information from ADFG’s WinfoNet database (ADFG 2008), 35 black bear, 94 river otter, and 12 marten were harvested in WAA #1209 from 2000 to 2006. As per the ADFG WinfoNet database, no deer were harvested in WAA #1209 from 2005 to 2007, and no wolves have been harvested in WAA #1209 since 2000.

6.0 REFERENCES

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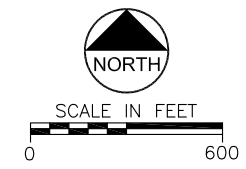
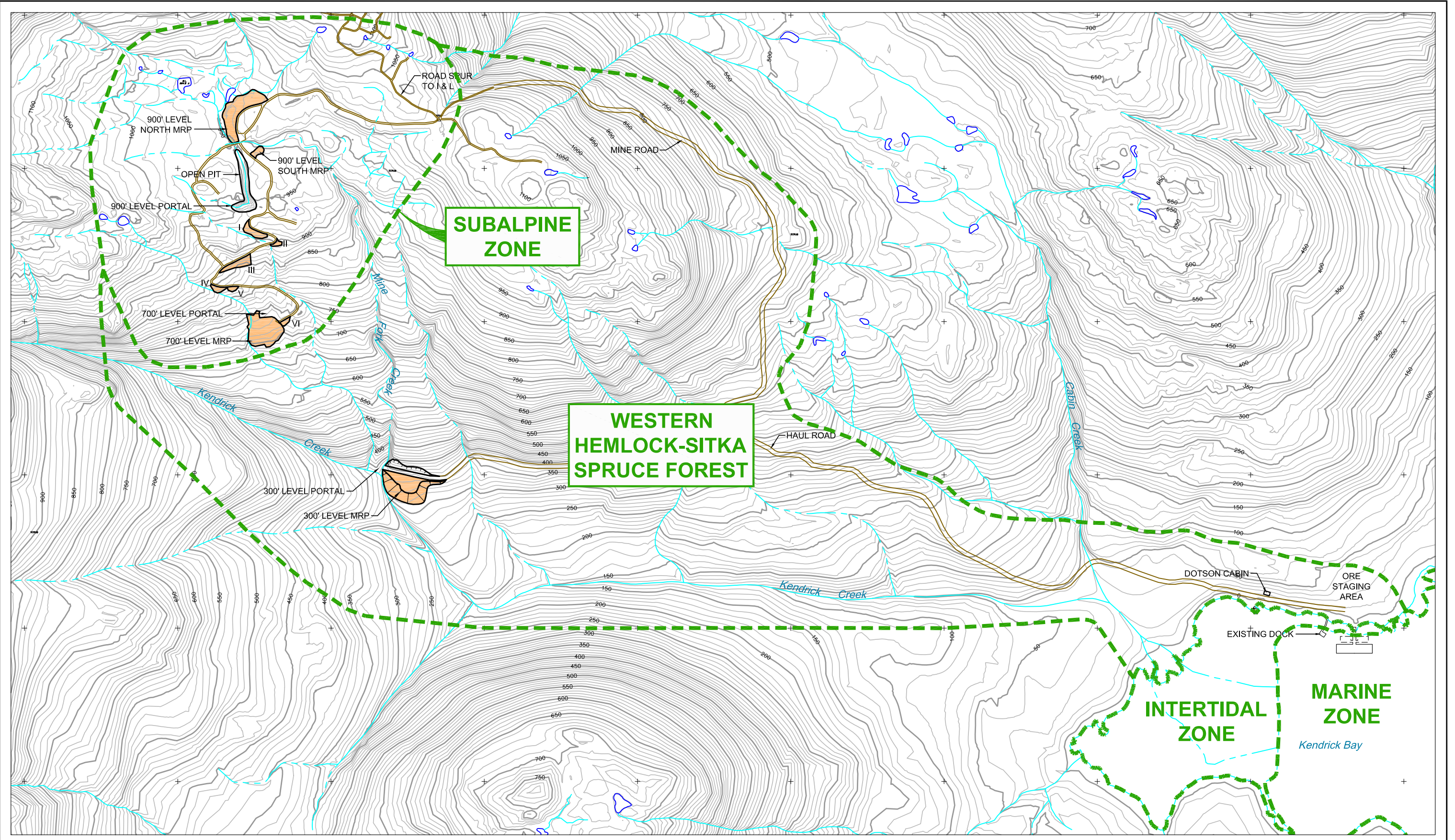


Figure 1
Ross-Adams Site
Ecological Habitats

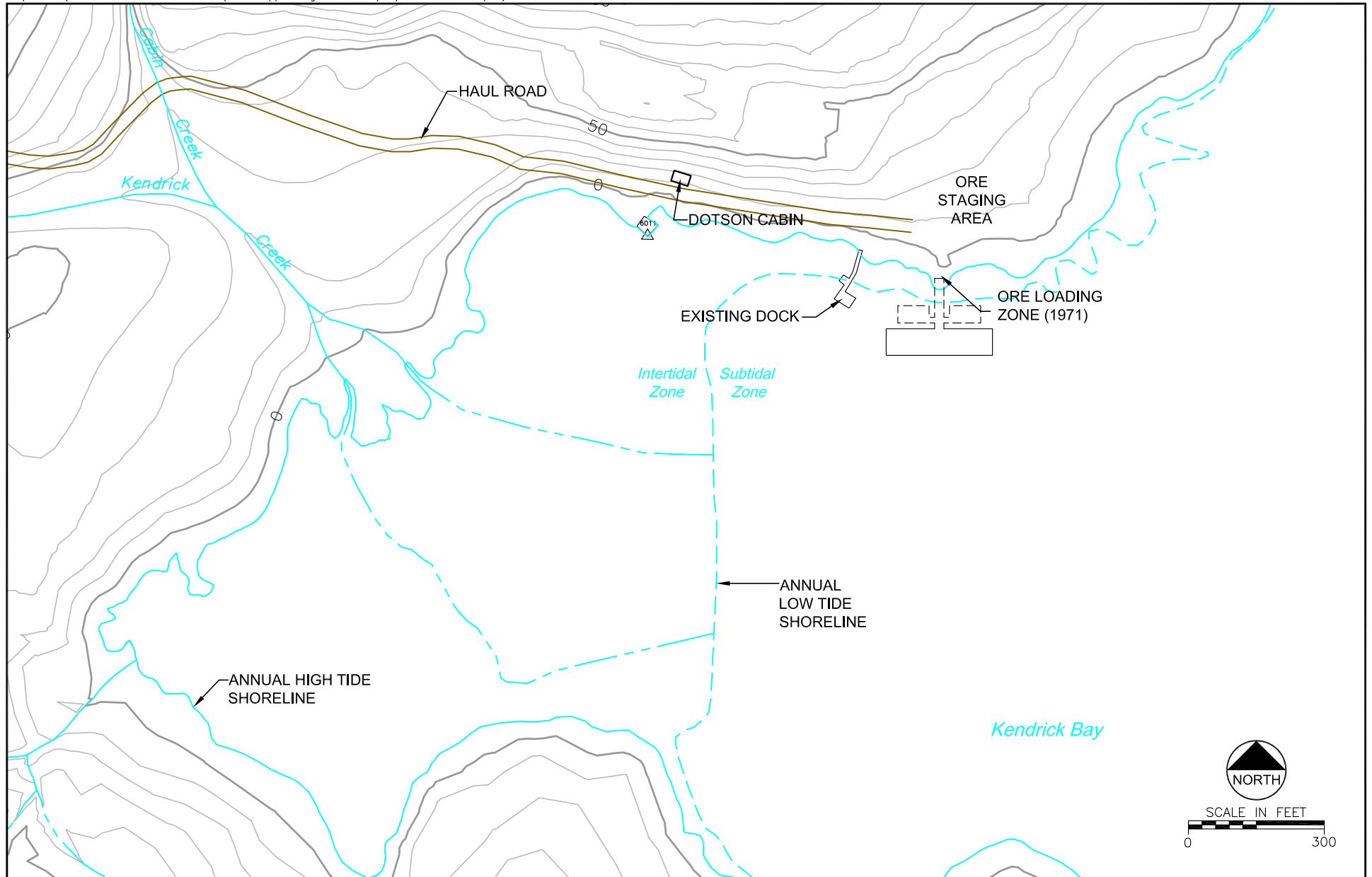
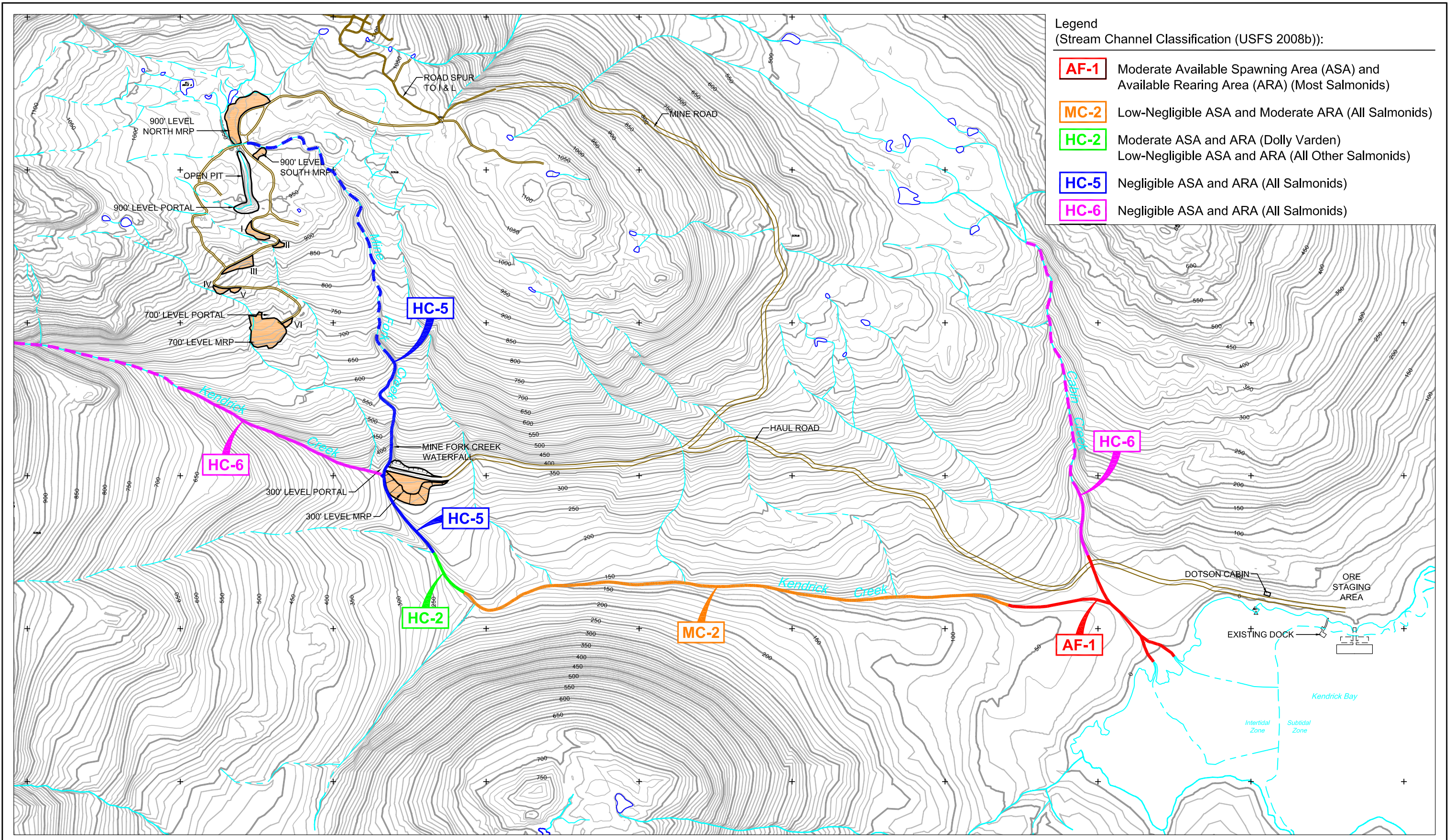


Figure 2
Ross-Adams Site
Kendrick Bay Area

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Legend
(Stream Channel Classification (USFS 2008b)):

AF-1	Moderate Available Spawning Area (ASA) and Available Rearing Area (ARA) (Most Salmonids)
MC-2	Low-Negligible ASA and Moderate ARA (All Salmonids)
HC-2	Moderate ASA and ARA (Dolly Varden) Low-Negligible ASA and ARA (All Other Salmonids)
HC-5	Negligible ASA and ARA (All Salmonids)
HC-6	Negligible ASA and ARA (All Salmonids)

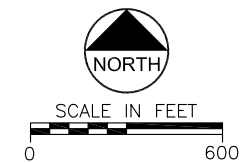


Figure 3
Ross-Adams Site
Kendrick Creek Fish Habitat Zones

**Table 1. Plant and Animal Species Observed during Biota Inventory at Ross-Adams Site
Tongass National Forest, Prince of Wales Island, Alaska (1)**

Common Name	Scientific Name	Notes (2)
Intertidal and Marine Zones		
Aquatic and Wetland Plants		
Eelgrass	<i>Zostera sp.</i>	low intertidal
Sugar Kelp	<i>Laminaria saccharina</i>	low intertidal
Bull Kelp	<i>Nereocystis luetkeana</i>	low intertidal area; found frequently
Giant Kelp	<i>Macrocystis integrifolia</i>	low intertidal
Green Excelsior	<i>Chaetomorpha sp.</i>	mid-intertidal
Cornrow Sea Lettuce	<i>Ulva intestinalis</i>	mid-intertidal
Sea Sacs	<i>Halosaccion glandiforme</i>	mid-intertidal; uncommon
Black Pine	<i>Neorhodomela larix</i>	within creek channel in mid-intertidal; a red alga
Rockweed	<i>Fucus gardneri</i>	Dominant in intertidal area; high to mid-intertidal
Sea Asparagus	<i>Salicornia depressa</i>	high intertidal
Sea Arrow-grass	<i>Triglochin maritimum</i>	high intertidal
Brown Tuft	<i>Ectocarpus sp.</i>	high intertidal
Alaska Plantain	<i>Plantago macrocarpa</i>	high intertidal
Lynghy's Sedge	<i>Carex lynghyeyi</i>	high intertidal
Yarrow	<i>Achillea millefolium</i>	high intertidal and perimeter above intertidal
Vetch	<i>Vicia sp.</i>	high intertidal and perimeter above intertidal
Marine Invertebrates		
Sea cucumber	<i>Holothuroidea sp.</i>	Observed in eelgrass beds near existing dock and ore loading dock; some individuals greater than 1 ft in length; low intertidal
Blue mussel	<i>Mytilus edulis</i>	low to mid-intertidal; common, associated with rockweed
Acorn barnacle	<i>Balanus glandula</i>	low to mid-intertidal
Clams (unidentified species)	NA	low intertidal
Cockle	<i>Clinocardium sp.</i>	low intertidal
Northern Striped Dogwinkle	<i>Nucella osterina</i>	low intertidal
Periwinkle	<i>Littorina sp.</i>	low intertidal
Limpet (unidentified species)	NA	low intertidal
Tusk coneworm	<i>Pectinaria granulata</i>	low intertidal
Polychaete (unidentified species)	NA	low intertidal
Oligochaete (unidentified species)	NA	low intertidal
Chiton	<i>Tonicella sp.</i>	low intertidal
Amphipod (unidentified species)	NA	low intertidal
Isopod	<i>Gnorimosphaeroma oregonensis</i>	low intertidal; observed on undersides of cobble near shoreline
Crabs (unidentified species)	NA	low intertidal
Green shore crab	<i>Hemigrapsus oregonensis</i>	low intertidal; common
Hermit crab (unidentified species)	NA	low intertidal
Shrimp (unidentified species)	NA	low intertidal
Mottled star	<i>Evasterias troschellii</i>	low intertidal
Purple sea star	<i>Pisaster ochraceus</i>	low intertidal; common
Sunflower star	<i>Pycnopodia helianthoides</i>	low intertidal
Leather star	<i>Dermasterias imbricate</i>	low intertidal
Water jellyfish	<i>Aequorea sp.</i>	low intertidal
Cross jellyfish	<i>Mitrocoma cellularia</i>	Observed in bay adjacent to existing dock
Marine Fish		
Black prickelback	<i>Xiphister atropurpureus</i>	low intertidal; in beach sediments & gravel
Flounder (unidentified species)	NA	observed underwater at several marine sediment sampling locations
Mammals		
Sitka Black-Tailed Deer (3)	<i>Odocoileus hemionus sitkensis</i>	Observed in rocky area on east side of bay and tracks found in drainage in upper Intertidal Zone
Black Bear (3)	<i>Ursus americanus</i>	Grassy area at north end of intertidal zone
Harbor Seal	<i>Phoca vitulina</i>	Observed in site vicinity in Kendrick Bay
Sea Otter	<i>Enhydra lutris</i>	Observed near existing dock
Mink	<i>Mustela vison</i>	Observed near existing dock and intertidal zone during first sampling event, June 2009
Humpback Whale (4)	<i>Megaptera novaeangliae</i>	Observed in northwest end of Kendrick Bay, several hundred meters south of the existing dock; observed during June 2009 sampling event
Birds		
Bald Eagle (3)	<i>Haliaeetus leucocephalus</i>	In large trees on southwest side of bay
Belted Kingfisher	<i>Megasceryle alcyon</i>	Fairly common around bay
Loon	<i>Gavia sp.</i>	Kendrick Bay
Greater Yellowlegs	<i>Tringa melanoleuca</i>	Kendrick Bay shoreline
Mallard	<i>Anas platyrhynchos</i>	Kendrick Bay shoreline
Northwestern Crow	<i>Corvus caurinus</i>	Kendrick Bay shoreline
Mew Gull	<i>Larus canus</i>	Common - observed on beach near shoreline and mouth of Kendrick Creek, and on Kendrick Bay
Steller's Jay	<i>Cyanocitta stelleri</i>	Intertidal zone
Western Hemlock-Sitka Spruce Forest and Subalpine Zone		
Trees, Shrubs, & Other Plants		
Western Hemlock	<i>Tsuga heterophylla</i>	Dominant in old growth forest up to 700L
Sitka Spruce	<i>Picea sitcchensis</i>	Common to 700L
Red Alder	<i>Alnus rubra</i>	Common to 700L
Western Red Cedar	<i>Thuja plicata</i>	Up to 700L
Salmonberry	<i>Rubus spectabilis</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Devil's Club	<i>Oplopanax horridus</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Silverweed	<i>Potentilla sp.</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Skunk Cabbage	<i>Lysichiton americanum</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
False Lily-of-the-valley	<i>Maianthemum dilatatum</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Western Rattlesnake Root	<i>Prenanthes alata</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Marsh-marigold	<i>Caltha biflora</i>	Adjacent to lower Kendrick Creek; in forest just above intertidal zone
Fireweed	<i>Epilobium angustifolium</i>	Above tidal zone, disturbed area near crib and fire ring north of dock
Alaska Blueberry	<i>Vaccinium alaskaensis</i>	Up to 700L
Oval-leafed Blueberry	<i>Vaccinium ovalifolium</i>	Up to 700L

**Table 1. Plant and Animal Species Observed during Biota Inventory at Ross-Adams Site
Tongass National Forest, Prince of Wales Island, Alaska (1)**

Common Name	Scientific Name	Notes (2)
Red Elderberry	<i>Sambucus racemosa</i>	Up to 700L
False Azalea	<i>Menziesia ferruginea</i>	Up to 700L
Dwarf Dogwood	<i>Cornus canadensis</i>	Up to 700L
Twistedstalk	<i>Streptopus amplexifolius</i>	Up to 700L
Foamflower	<i>Tiarella trifoliata</i>	Up to 700L
Five-leafed Bramble	<i>Rubus pedatus</i>	Up to 700L
Fern-leaved Goldthread	<i>Coptis asplenifolia</i>	Up to 700L
Deer Fern	<i>Blechnum spicant</i>	Up to 700L
Oak Fern	<i>Gymnocarpium dryopteris</i>	Up to 700L
Shield Fern	<i>Dryopteris expansa</i>	Up to 700L
Lady Fern	<i>Athyrium filixfemina</i>	Up to 700L
Red Huckleberry	<i>Vaccinium parvifolium</i>	700L
Alpine Azalea	<i>Loiseleuria procumbens</i>	700L
Common Harebell	<i>Campanula rotundifolia</i>	700L
Labrador Tea	<i>Ledum groenlandicum</i>	700L
Running Clubmoss	<i>Lycopodium clavatum</i>	700L
Salal	<i>Gaultheria shallon</i>	700L to 900L sub-alpine
Subalpine Daisy	<i>Erigeron peregrinus</i>	700L to 900L sub-alpine
Deer Cabbage	<i>Fauxia crista-galli</i>	700L to 900L sub-alpine
Variable Willow	<i>Salix commutata</i>	700L to 900L sub-alpine
Mountain Hemlock	<i>Tsuga mertensiana</i>	700L to 900L sub-alpine
Yellow Cedar	<i>Chamaecyparis nootkatensis</i>	700L to 900L sub-alpine
Bog Blueberry	<i>Vaccinium uliginosum</i>	700L to 900L sub-alpine
Burnett	<i>Sanguisorba sp.</i>	700L to 900L sub-alpine
Reindeer Lichen	<i>Cladonia sp.</i>	700L to 900L sub-alpine
Cotton Grass	<i>Eriophus sp.</i>	700L to 900L sub-alpine
Bog Rosemary	<i>Andromeda polifolia</i>	900L, wetter sites
Round-leaved Sundew	<i>Drosera rotundifolia</i>	900L, wetter sites
Bog Orchid	<i>Habenaria saccata</i>	900L
Aparigidium	<i>Micoseris borealis</i>	900L
Swamp Gentian	<i>Gentiana douglasiana</i>	900L
Bog Cranberry	<i>Oxycoccus oxycoccus</i>	900L
Mountain Cranberry	<i>Vaccinium vitis-idaea</i>	900L
Shore Pine	<i>Pinus contorta</i> var. <i>contorta</i>	At 900L sub-alpine area; dwarf form
Club Moss	<i>Lycopodium sp.</i>	Observed at 900L near road and waste dump area.
White Clover	<i>Trifolium repens</i>	roadside
Creeping Buttercup	<i>Ranunculus repens</i>	roadside
Oxeye Daisy	<i>Leucanthemum vulgare</i>	roadside
Dandelion	<i>Taraxacum</i>	roadside
Stink Current	<i>Ribes bracteosum</i>	roadside
Maiden Hair Fern	<i>Adiantum pedatum</i>	roadside: 300L to 700L
Indian Hellebore	<i>Veratrum viride</i>	roadside: 300L to 700L
Terrestrial Invertebrates		
Pacific Banana Slug	<i>Ariolimax columbianus</i>	Observed in old growth forest adjacent to Kendrick Creek and along haul road; yellow, white, and olive color variants
Dragonfly (unidentified species)	NA	Observed at all levels up to 900L
Mammals		
Sitka Black-Tailed Deer (3)	<i>Odocoileus hemionus sitkensis</i>	Observed at 900L
Black Bear (3)	<i>Ursus americanus</i>	scat at 900L
Gray Wolf	<i>Canis lupus</i>	Unconfirmed observation during first sampling event, June 2009
Birds		
Ptarmigan	<i>Lagopus sp.</i>	Adults observed with young along the main road near I&L spur, during June 2009 sampling event. Also observed at 900L during September 2009 sampling event.
Rufous Hummingbird	<i>Selasphorus rufus</i>	In trees between haul road and intertidal area
Hermit or Swainson's Thrush	<i>Catharus sp.</i>	At 900L
Dark-eyed Junco	<i>Junco hyemalis</i>	Along road to 900L
Freshwater Habitats		
Freshwater Invertebrates		
Stonefly (unidentified species)	NA	Uncommon; observed in Kendrick Creek near 700L
Freshwater Fish		
Pink Salmon	<i>Oncorhynchus gorbuscha</i>	Run of pink salmon observed on lower Kendrick Creek up to sampling location "CONF-SW-01-K"; observed during September 2009 sampling event.
unidentified fish species	NA	Small or juvenile fish in pool in Kendrick Creek, just above intertidal zone
Amphibians		
Rough-skinned Newt	<i>Taricha granulosa</i>	One specimen found at pond at I&L area

(1) Identification primarily based on Lamb and Hanby 2005, Armstrong 2008, Alaska Geographic Society 1996, and Pojar and MacKinnon 1994.

(2) 300L = 300-foot level; 700L = 700-foot level; 900L = 900-foot level

(3) Management Indicator Species (MIS) for Tongass National Forest (USFS 2008c).

(4) A Federal and Alaska endangered species (ANHP 2009).

Table 2. Functional Groups of Birds and Mammals Observed at the Ross-Adams Site, Tongass National Forest, Prince of Wales Island, Alaska

Taxonomic Group/Species	Functional Group (1,2)	Diet Composition (3)
Birds		
Bald Eagle	Marine/Freshwater avian piscivore	Fish is main diet item (including herring, flounder, pollock, salmon); also sea urchins, crabs, clams, waterfowl, small mammals, and carrion
Belted Kingfisher (4)	Freshwater avian piscivore	Diet is primarily fish, also may include crustaceans, insects, and amphibians (EPA 1993)
Loon	Freshwater avian piscivore	Fish, also aquatic vegetation, molluscs, insects, and frogs
Greater Yellowlegs	Freshwater semi-aquatic avian invertivore	Fish (e.g., sculpins, sticklebacks), aquatic insects, sand fleas, intertidal amphipods; also terrestrial invertebrates (e.g., ants, grasshoppers, snails, spiders, and worms)
Mallard (4)	Freshwater semi-aquatic avian herbivore	Plants (including seeds, tubers, stems), insects, snails, worms, and crustaceans (EPA 1993)
Northwestern Crow	Terrestrial avian carnivore	Feeds heavily on blue mussel (Armstrong 2008)
Mew Gull	Marine/Freshwater avian invertivore	Primarily scavengers, diet includes insects, earthworms, molluscs, crustaceans, sea urchins, fish, young birds, mice (USFWS 2006)
Steller's Jay	Terrestrial avian herbivore	Diet consists of approximately 57 to 88% plant matter depending on the season, including berries, seeds, and nuts. The balance of the diet is comprised of insects such as wasps, beetles, and grasshoppers (Martin et al. 1961).
Ptarmigan	Terrestrial avian herbivore	Buds, twigs, and vegetation of willow, birch, and alder; berries, seeds, and insects (e.g., caterpillars and beetles)
Rufous Hummingbird	Terrestrial avian herbivore	Nectar from plants such as blueberries, salmonberries, and rusty menziesia; also eat insects (O'Clair et al. 2007).
Hermit or Swainson's Thrush	Terrestrial avian invertivore	Thrush diets are primarily insectivorous (e.g., beetles, ants, caterpillars), and may also include fleshy fruits such as berries, cherries, and grapes (Martin et al. 1961).
Dark-eyed Junco (4)	Terrestrial avian herbivore	Primarily plants (approximately 50 to 95% depending on the season), the balance of the diet is insects (such as beetles, ants, caterpillars, grasshoppers) (Martin et al. 1961).
Mammals		
Sitka Black-Tailed Deer	Terrestrial mammalian herbivore	Vegetation, evergreen forbs (e.g., bunchberry, trailing bramble), woody browse (e.g., yellow cedar, hemlock)
Black Bear	Terrestrial mammalian herbivore	Opportunistic and widely varied: berries, vegetation, ants, grubs, and other insects, fish, carrion
Harbor Seal (4)	Marine mammal piscivore	Fish, octopus, and squid
Sea Otter (4)	Marine mammal invertivore	Sea urchins, crabs, clams, mussels, octopus, other marine invertebrates, and fish
Mink (4)	Freshwater semi-aquatic mammalian carnivore	Fish, crabs, clams, birds, bird eggs, small mammals, insects; prefer streams, ponds, beaches, or marshes
Humpback Whale	Marine mammalian piscivore	Fish, krill
Gray Wolf	Terrestrial mammalian carnivore	Sitka black-tailed deer, mountain goats, and beaver are main diet items; summer diet also may include small mammals and occasionally birds and fish

(1) Based on "Default Assessment Endpoints and Primary Indicator Species" for the "Southeast" Ecoregion, which includes Prince of Wales Island; per ADEC's "User's Guide for Selection and Application of Default Assessment Endpoints and Indicator Species in Alaska Ecoregions" (ADEC 1999a,b)

(2) Piscivore - feeds primarily on fish; Invertivore - feeds primarily on invertebrates; Herbivore - feeds primarily on plant matter; Carnivore - feeds primarily on meat.

(3) Diet information, unless otherwise indicated, is from ADFG Wildlife Notebook Series <http://www.adfg.state.ak.us/pubs/notebook/notehome.php>.

(4) A "Default Primary Indicator Species" as per ADEC guidance (ADEC 1999a,b).

**ATTACHMENT A
SYNOPSIS OF THE SITE SURVEY**



Photo #1 – Intertidal Zone. Facing west. July 22, 2009.

The survey of the intertidal zone began east of the Former Ore Loading Dock. The area is dominated with large to small boulders and cobbles with some woody debris and sporadic rockweed (*Fucus gardneri*) (Photo #1). Acorn barnacles cover the boulders/cobbles and various size crabs (including green shore crabs *Hemigrapsus oregonensis*), hermit crabs, and mussels are found under the rocks.



Photo #2 – Intertidal Zone. Former Ore Loading Dock - Facing east. July 22, 2009.

Walking west from the location in Photo #1, an obvious high spot in this area represents the Former Ore Loading Dock location as evidenced by weathered cable wire and large logs/timber used for supporting the dock (Photo #2). As at previous location, acorn barnacles cover the boulders/cobbles and various size crabs (green shore crabs), hermit crabs, and mussels are found under the rocks.



Photo #3 – Intertidal Zone. West of Former Ore Loading Dock and current boat dock - Facing west. July 22, 2009.

Walking west of the Former Ore Loading Dock the area is dominated with large to small boulders and cobbles with some woody debris and sporadic Rockweed as shown in Photo #3. Acorn barnacles cover the boulders/cobbles and various size crabs (green shore crabs), hermit crabs, and mussels are found under the rocks. Several large sea cucumbers (*Holothuroidea* sp.) are observed in this area.



Photo #4 – Intertidal Zone – Northwest area. Facing east. July 22, 2009.

Walking further west the intertidal area begins to wrap around to the south. This area contains medium to small sized boulders/cobbles and has an undulating landscape. Pools are formed as the tide moves in and out of this area (Photo #4). Rockweed dominates areas that are not inundated or ponded. Sea asparagus (*Salicornia depressa*) is observed in the highest intertidal area and eelgrass (*Zostera* sp.) is observed in the pooled area. Acorn barnacles cover the boulders/cobbles and various size crabs (green shore crabs), Hermit crabs, and mussels are found under the rocks.



Photo #5 – Kendrick Creek flowing into intertidal area. Facing southeast. July 22, 2009.

Walking south from the location in Photo #4 the intertidal area begins to flatten and is dominated by medium to small sized boulders/cobbles with sand. Rockweed and sugar kelp (*Laminaria saccharina*) are observed in this area. Unattached bull kelp (*Nereocystis luetkeana*) is dispersed throughout the entire intertidal zone. Other species observed in this area include: Cornrow sea lettuce (*Ulva intestinalis*), brown tuft (*Ectocarpus*), limpets, mussels, isopods, black prickelback (*Xiphister atropurpureus*), purple sea star (*Pisaster ochraceus*), sunflower stars (*Pycnopodia helianthoides*), leather stars (*Dermasterias imbricate*), oligochaetes, amphipods, and polychaetes.

Kendrick Creek drains into the intertidal area as shown in Photo #5. The creek bed in the intertidal area is dominated by medium to small sized cobbles with some sand. At low tide the flow of Kendrick Creek varied based on precipitation in the area. On July 22 (no precipitation observed on the evening of the July 21) the creek was flowing approximately 1-2 cfs. On July 23 (after an evening of steady precipitation), the creek was flowing approximately 3-4 cfs.

Near the mouth of Kendrick Creek the following were observed: rockweed, barnacles, mussels, limpets, northern striped dogwinkle (*Nucella osterina*), periwinkle (*Littorina* sp.), unidentified clam, hermit crab, isopods, amphipods, green shore crab, tusk coneworm (*Pectinaria granulata*), green excelsior (*Chaetomorpha* sp.), leather sea stars, black prickleback, eelgrass, sunflower stars, oligochaetes, and polychaetes.



Photo #6 – Kendrick Creek flowing into intertidal area. Facing northeast. July 22, 2009.

Photo #6 presents Kendrick Creek and a bank cut into the intertidal zone. This is evidence that during high flow events the creek can distribute particles (sand and silt) and rocks downstream.



Photo #7 – Intertidal Zone – southwestern area, facing north.

The southwestern portion is the lowest area in the intertidal zone. During July 22 and 23, this area was observed to become inundated by the rising tide before the other areas. The area is relatively flat, but has some ponding areas. Rockweed and kelp (*Laminaria* sp.) were observed in this area. The lower subtidal portion of this area is dominated by medium to small cobbles with sand and the upper intertidal area is mixed with medium to small cobbles with sand and silt. There are two unidentified streams that drain into this southwestern area. One stream is located to the south (Photo #7) and the other is to the west (Photo #8).

During the survey in the intertidal zone northwestern crow, bald eagle, belted kingfisher, greater yellowlegs, Steller's jay, mallard, mew gull, Sitka black-tailed deer, black bear, sea otter, and harbor seals were observed.



Photo #8 – Intertidal Zone – southwestern area. Facing east.



Photo #9 – Small pool in side channel of Kendrick Creek above intertidal zone, at edge of forest.

A side channel to the Kendrick Creek probably formed during a high flow event is observed (Photo #9). Within this side channel the substrate is predominantly sandy, silt with woody debris. A small school of an unidentified fish species was observed in this pool. Deer tracks were observed in this area.



Photo #10 – Lower Kendrick Creek, just above the intertidal zone.

Above the intertidal zone, lower Kendrick Creek runs through the Western Hemlock – Sitka Spruce forest. Tree canopy cover is about 70 to 75% (Photo #10). The creek channel is approximately 20-25 feet wide with water occupying approximately 12-15 feet of the channel. Trees and plants in this area include: western hemlock, Sitka spruce, red alder, western red cedar, red elderberry, salmonberry, devil's club, blueberry, huckleberry, marsh-marigold, deer fern, lady fern, oak fern, shield fern, twistedstalk, and foamflower.



Photo #11 – Kendrick Creek above confluence of Cabin Creek.

Further upstream on Kendrick Creek approximately 50 yards upstream of the confluence of Cabin Creek the creek is dominated with large to small boulders and cobbles (Photo #11). Stream flow was approximately 1 to 2 cfs (July 22, 2009). The water depth was approximately 4 to 6 inches. The creek is approximately 10-15 feet wide with water occupying approximately 5 feet of the channel. Tree canopy cover is about 50%. Snags and large woody debris are observed and the stream bank on the north side is very steep. No aquatic invertebrates were observed in the stream. The forest is classified as old growth. Tree and plant species include: western hemlock, Sitka spruce, red alder, western red cedar, red elderberry, salmonberry, devil's club, blueberry, huckleberry, marsh-marigold, deer fern, lady fern, oak fern, shield fern, twistedstalk, and foamflower.



Photo #12 - Mine Fork Creek Waterfall

Just above the portal at the 300 Level, Mine Fork Creek is characterized by a large waterfall (Photo #12).



Photo #13 – Kendrick Creek downstream of the confluence of Mine Fork Creek.

The upper reaches of Kendrick Creek were surveyed downstream of the confluence of Mine Fork Creek. This portion of Kendrick Creek is dominated with large to small boulders and cobbles (Photo #13). Stream flow was approximately 4 to 6 cfs (July 23, 2009). The stream gradient is steep with multiple falls and pools. Snags and large woody debris are observed. Tree canopy cover is approximately 60%. No aquatic invertebrates were observed in this portion of the stream. Trees and plants in this area include: western hemlock, red alder, western red cedar, red elderberry, salmonberry, devil's club, blueberry, huckleberry, deer fern, oak fern, shield fern, salal, twistedstalk, five-leafed bramble, dwarf dogwood, and foamflower.



Photo #14 – Cabin Creek upstream of Haul Road bridge.

A stream survey for Cabin Creek was performed upstream and downstream of the haul road bridge. The portion of Cabin Creek located upstream of the bridge is dominated with large to small boulders and cobbles (Photo #14). Stream flow was approximately 3 to 4 cfs (July 22, 2009). The stream gradient is steep with multiple falls and pools. The creek is approximately 8-10 feet wide with water occupying approximately 3 feet of the channel. Snags and large woody debris were observed and the stream bank on the west side is very steep. Tree canopy cover is approximately 50%. No aquatic invertebrates were observed in Cabin Creek in this area.



Photo #15 – Cabin Creek downstream of Haul Road bridge.

The portion of Cabin Creek located downstream of the road bridge is dominated with large to small boulders and cobbles (Photo #15). Stream flow is approximately 1 to 2 cfs (July 22, 2009). The stream gradient is approximately 30-40%. The creek is approximately 10-15 feet wide with water occupying approximately 5-7 feet of the channel. Snags and large woody debris are observed. Tree canopy cover is approximately 70%. The forest is classified as old growth. An unidentified invertebrate on the underside of a cobble was observed.



Photo #16 – Subalpine zone at 900 Level.



Photo #17 – Black-tailed Sitka deer in subalpine zone at 900 Level.