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SCIENTIFIC INVESTIGATIONS MAP 3272
Bathymetry, Morphology, and Lakebed Geologic Characteristics
Barton, G.J., and Dux, A.M., 2013, Bathymetry, Morphology, and Lakebed Geologic Characteristics of Potential Kokanee Salmon Spawning Habitat in Lake Pend Oreille, Bayview and Lakeview Quadrangles, Idaho

Abstract

Kokanee salmon (*Oncorhynchus nerka*) are a keystone species in Lake Pend Oreille in northern Idaho, historically supporting a high-yield recreational fishery and serving as the primary prey for the threatened native bull trout (*Salvelinus confluentus*) and the Gerrard-strain rainbow trout (*Oncorhynchus mykiss*). After 1965, the kokanee population rapidly declined and has remained at a low level of abundance. Lake Pend Oreille is one of the deepest lakes in the United States, the largest lake in Idaho, and home to the U.S. Navy Acoustic Research Detachment Base. The U.S. Geological Survey and Idaho Department of Fish and Game are mapping the bathymetry, morphology, and the lakebed geologic units and embeddedness of potential kokanee salmon spawning habitat in Lake Pend Oreille. Relations between lake morphology, lakebed geologic units, and substrate embeddedness are characterized for the shore zone, rise zone, and open water in bays and the main stem of the lake. This detailed knowledge of physical habitat along the shoreline of Lake Pend Oreille is necessary to better evaluate and develop kokanee recovery actions.

Introduction

Fishery recovery efforts by the Idaho Department of Fish and Game at Lake Pend Oreille in northern Idaho (fig. 1) have included efforts to increase the population of kokanee salmon (*Oncorhynchus nerka*; fig. 2). Kokanee salmon are a keystone species in the lake, historically supporting a high-yield recreational fishery and serving as the primary prey for the threatened native bull trout (*Salvelinus confluentus*) and the Gerrard-strain rainbow trout (*Oncorhynchus mykiss*). Kokanee were introduced in the 1930s by downstream dispersal from Flathead Lake, Montana. They quickly became established and provided an important fishery from the 1940s to the early 1970s (Simpson and Wallace, 1982; Bowles and others, 1991). Annual kokanee harvests averaged more than 1 million fish from 1951 to 1965 (Simpson and Wallace, 1982; Paragamian and Bowles, 1995). After 1965, however, the kokanee population rapidly declined and has remained at a low level of abundance. Since 2000, the Lake Pend Oreille kokanee fishery has been closed to harvest.

The primary factor believed to be responsible for the initial kokanee population decline was the altered lake level regime created by the construction and operation of the Albeni Falls Dam (Maiolie and Elam, 1993). The dam was constructed on the Pend Oreille River in 1952. Prior to dam operation, natural lake-level fluctuations allowed wave action to redistribute gravels and to remove fine sediment from gravels above the minimum pool elevation, which varied annually. These gravels provided spawning habitat for kokanee, which spawn along the lakeshore during November and December. The lake level has been monitored since 1929 at the U.S. Geological Survey stage gage at Hope, Idaho (12392500). The pre-dam-era maximum lake-level elevation was 2,071.62 feet (ft) above National Geodetic Vertical Datum of 1929 (NGVD 29) on June 9, 1948, and minimum lake-level elevation was 2,046.27 ft on February 17, 1936 (fig. 3). Since the construction of the Albeni Falls Dam, a maximum lake level of 2,062.5 ft above NGVD 1929 (figs. 4–6) has been maintained during the summer (normal maximum summer full pool), with drawdowns in autumn to reach a minimum winter level. Before 1966, the winter lake level was variable, and an exceptional fishery continued with the Albeni Falls Dam in operation. After 1966, however, consistent deeper drawdowns to an elevation of 2,051.0 ft above NGVD 1929 reduced the quantity and quality of spawning substrate (normal minimum winter low pool). Wave action continued to create suitable spawning habitat when the lake level was greater than 2,051.0 ft elevation; this habitat was above the waterline during kokanee spawning. The kokanee were forced to spawn in depths that were never exposed to wave action and that contained a high amount of fine sediment (Fredericks and others, 1995). Concurrent with the operational change at the Albeni Falls Dam, the kokanee population began to decline rapidly. The area between the normal maximum summer pool and the normal minimum winter pool is referred to as the variable zone (figs. 5 and 6).

A lake-level experiment began in 1996 to improve spawning habitat and to increase kokanee recruitment. With few exceptions, the winter lake level was set either at an elevation of 2,051 ft , the normal minimum winter low pool level, or at 2,055 ft, a higher level at which to submerge higher-quality spawning substrates. This strategy is still being evaluated, and questions remain regarding the specific habitat conditions required for successful spawning and the amount of suitable spawning habitat needed to provide sufficient recruitment to meet recovery goals. Additionally, augmenting the amount of suitable kokanee spawning habitat through means other than winter pool management, such as adding substrates, is being considered.

The U.S. Geological Survey and Idaho Department of Fish and Game are cooperatively investigating the bathymetry, morphology, and lakebed geologic characteristics of potential kokanee salmon spawning habitat in Lake Pend Oreille because detailed knowledge of physical habitat along the shoreline of Lake Pend Oreille is necessary to better evaluate and develop kokanee recovery actions. Previous habitat evaluations were limited to shallow depths and were completed prior to recent technological advances in underwater mapping and videography techniques. The purpose of this study was to collect and analyze physical habitat data from several areas at the southern end of Lake Pend Oreille. Three study units were selected because they support most kokanee spawning activity and collectively represent a diversity of habitat conditions that are used by kokanee during spawning (fig. 1). The objectives of this study were to: (1) develop a high-resolution bathymetric map for each study unit, (2) develop a high-resolution lakebed slope map for each study unit that can be used to describe morphological characteristics, and (3) develop a map of lakebed geologic characteristics for each study unit.

Setting

Lake Pend Oreille in northern Idaho is 65 miles (mi) long, has a surface area of about 148 square miles (mi^2), and reaches a maximum depth of more than 1,150 ft. It is one of the deepest lakes in the United States (The Columbia Electronic Encyclopedia, 2012). The lake is fed by the Clark Fork and Pack Rivers, and it drains into the Pend Oreille River. The study area was in the southernmost part of the lake in three study units (fig. 1), each representing a different landscape. The largest study unit, in Scenic Bay, includes 254 acres and 2.8 mi of shoreline bordered by a gentle-to-moderate-sloping landscape and steep mountains. A second study unit, along the north shore of Idlewild Bay, includes 220 acres and 2.2 mi of shoreline bordered by a gentle-to-moderate-sloping landscape. Scenic Bay and Idlewild Bay are separated by a low-lying peninsula that juts into the lake; both bays are within the Bayview 7.5-minute quadrangle. The smallest study unit, in Echo Bay, includes 48 acres and 0.7 mi of shoreline bordered by steep mountains; the study unit is within the Bayview and Lakeview 7.5-minute quadrangles.

The local geologic history and formation of Lake Pend Oreille is summarized briefly here as background information about the evolving morphology and substrate geological characteristics of the lake. The most recent research suggests that the location of the lake is related to an older river valley controlled by faults (Breckenridge and Sprenke, 1997). The lake substrate consists mainly of silt, sand, gravel, cobble, bedrock debris, some boulders, and some bedrock outcrops. Unconsolidated sediments in the substrate originate mainly from glaciation, megaflood, lacustrine, and terrestrial and subaqueous landslide processes, and from tributary inflows. The Idaho Panhandle is widely known as a region of Precambrian Belt Supergroup sedimentary formations (Savage, 1965). The Wallace Formation, consisting mainly of siltite and argillite, borders the Echo Bay study unit. Cambrian-age formations, such as the Lakeview limestone that was mined at Bayview, are present along the north shore of the Scenic Bay study unit and, in some areas, form a small part of the lakebed (Lewis and others, 2002). Both the Precambrian- and Cambrian-age formations form steep slopes that frequently develop rockslides that plunge into the lake. The slide material in the lake includes large boulders that, over time, weather into smaller fragments. Pleistocene glaciation played a significant role in modifying the preexisting landscape (Week and Thorson, 1983; Smyers and Breckenridge, 2003). The eastern lobe of the Cordilleran Ice Sheet advanced from Canada into the Purcell Trench and dammed the Clark Fork River many times to form glacial Lake Missoula (Booth and others, 2003). The south end of Lake Pend Oreille at Farragut State Park marks the location of the breakout of the Missoula floods. Lake Pend Oreille was carved repeatedly by this lobe of Pleistocene ice, scoured by ice-age floods, and filled with glacial outwash and flood deposits. The lake is now dammed at the south end by thick glacial and flood deposits that underlie Farragut State Park. Wait (1985) interpreted carbon-14 evidence to show that Glacial Lake Missoula existed only between 17,200 and 11,000 years ago. After the last flood, a glacier again occupied the lake, but this glacial advance did not result in catastrophic lake drainage. Quaternary-age glacial deposits border the lake and form large swaths of the lakebed. Outwash—deposits from glacial meltwater composed of layers of gravel, sand, and clay—covers the lower elevations at Bayview, is mapped as geologic unit Qgtow, and extends into the lake some undetermined distance. Bouldery till and outwash deposits are mapped as Qgtow on the small peninsula, Jökulhlaup Point, between Scenic Bay and Idlewild Bay. These deposits form an undisturbed end moraine at the south end of the lake and constitute an undetermined amount beneath the lake itself (Breckenridge and Sprenke, 1997).

Methods

Data collection methods included mapping of the lake bathymetry using an echo-sounder and collecting video imagery of the lakebed (fig. 7).

Shoreline and Lakebed Topographic Elevation and Morphology

Lake bathymetry was mapped using a multibeam echosounder (MBES). Results from the MBES then were used to plan stationing for the video survey. The MBES system included a flat-array transducer that sent a 240-kilohertz pulse over a 120-degree swath width. The MBES was set to receive 240 beams, each with a width of 0.75 degrees. In most areas, the MBES survey had about 50-percent swath overlap, which resulted in several soundings per square foot of lakebed. A contiguous, 3.28-ft digital elevation model (DEM) was generated from the MBES bathymetric data for each study unit. During 2010, the U.S. Army Corps of Engineers oversaw a LiDAR (light detecting and ranging) survey along the lake edge. The MBES and LiDAR DEMs generally overlapped because the LiDAR was flown at normal minimum winter pool and the MBES data were collected during the normal maximum summer full pool. These DEMs were combined to form a larger, seamless DEM; where the two datasets overlapped, the MBES data were selected solely for generating maps of the shoreline and lakebed topographic elevation (figs. 5 and 6). The slope of the shoreline and lakebed, shown in figures 5 and 6, was computed in degrees based on the topographic elevation DEM.

Video Imagery of Lakebed

During August 2011, video imagery of the lakebed was recorded continuously along 30 mi of lake transects (fig. 6). Transects typically were oriented about perpendicular to the shoreline, and video data were collected to a maximum depth of about 240 ft. More than 200 video clips were recorded using an underwater color video camera suspended vertically in the water column. Two underwater laser pointers were mounted outside the camera housing and pointed downward to illuminate a reference scale of 4 inches (in.) on the lakebed (fig. 7). The camera was lowered through the water column until it was near the lakebed and the substrate could be identified. The signal from a mapping-grade Global Positioning System (GPS) receiver was output to a video titler to add date, time, and geospatial coordinates to the recordings. Video processing included de-interlacing, image filtering, and automatic still (photograph) extraction. About 20,000 photographs were extracted from the video and viewed briefly. Basic information about each photograph was entered into a spreadsheet: photograph file name, study area unit name, and date. These groupings of photographs were subsampled to reduce the number of photographs to a reasonable size that represents how substrate conditions vary within each study unit: 2,100 photographs were subsampled for Scenic Bay, 1,710 photographs were subsampled for Idlewild Bay, and 245 photographs were subsampled for Echo Bay. These photographs were reviewed, and additional information was added to the spreadsheet, including geospatial coordinates, embeddedness of lakebed, particle size classification, woody debris, macrophytes, and general comments.

Lakebed Geologic Characteristics

Kokanee spawning substrate preferences were considered during the development of geologic units and maps of substrate geologic characteristics. The two primary characteristics considered important to successful spawning and egg incubation were embeddedness and riverbed geology. Embeddedness is the degree to which fine sediments such as sand, silt, and clay fill the interstitial spaces between rocks on a substrate. A 0-percent embeddedness means that there are no fine sediments on a substrate. A 100-percent embeddedness means rocks are completely surrounded and covered by sediment. The sediments and rock on the lakebed are mapped as geologic units. The designation of lakebed geologic units that are composed of unconsolidated sediments is based on particle size using the Wentworth scale (Wentworth, 1922; table 1).The habitat conditions kokanee prefer for spawning in Lake Pend Oreille are not fully understood, but the Idaho Department of Fish and Game was investigating kokanee spawning habitat preference during 2012. However, it is generally accepted that kokanee spawn over clean gravel, and kokanee likely will spawn over smaller-diameter gravel than will larger species of salmonids. For the purposes of this study, fine substrates (silt and sand) were combined in a single category because neither silt nor sand is considered a preferred kokanee spawning substrate.

Based on these general spawning substrate preferences, areas of lakebed with embeddedness of greater than 15 percent were classified as the geologic unit Qsltsd, "embedded lakebed." Substrate characteristics assumed to be most preferred by spawning kokanee may be found in the geologic unit Qfmg, "fine-medium gravel lakebed," where very-fine-to-medium gravel composes more than 50 percent of the lakebed with or without lesser amounts of coarse gravel and cobble. Kokanee also may find suitable spawning substrate in the geologic unit Qcg, "coarse-gravel lakebed," where coarse and very coarse gravel compose the largest percentage of clasts in this unit. Substrate characteristics that spawning kokanee may avoid are in the geologic unit Qc, "cobble lakebed," where cobble and coarse gravel compose the largest percentage of the clast size. Lakebed with significant amounts of both fine-medium gravel and coarse gravel and cobble are mapped as the undifferentiated, geologic unit Qgcu.

The terrestrial geologic units on the geology maps are from previously published maps (Lewis and others, 2002) as well as those developed specifically for this project; they are considered informal, local geologic units. ESRI ArcGIS™ was used to create lakebed embeddedness maps and lakebed geologic characteristics maps based on the analysis of photographs extracted from the video recordings (figs. 5–7). Lakebed bathymetry and slope are shown on these maps to help clarify the relation between lake morphology, lakebed geologic units, and substrate embeddedness. Descriptions of the morphology, lakebed geology, and embeddedness in the shore zone, rise zone, and open water in bays and the main stem of the lake are provided in figures 5–6. Lakebed geologic units and embeddedness are subject to change in shallow parts of the lake, especially the shore zone, where wave action can suspend and remove fines from clasts and transport them to other areas, and can also transport and sort clasts.

Acknowledgments

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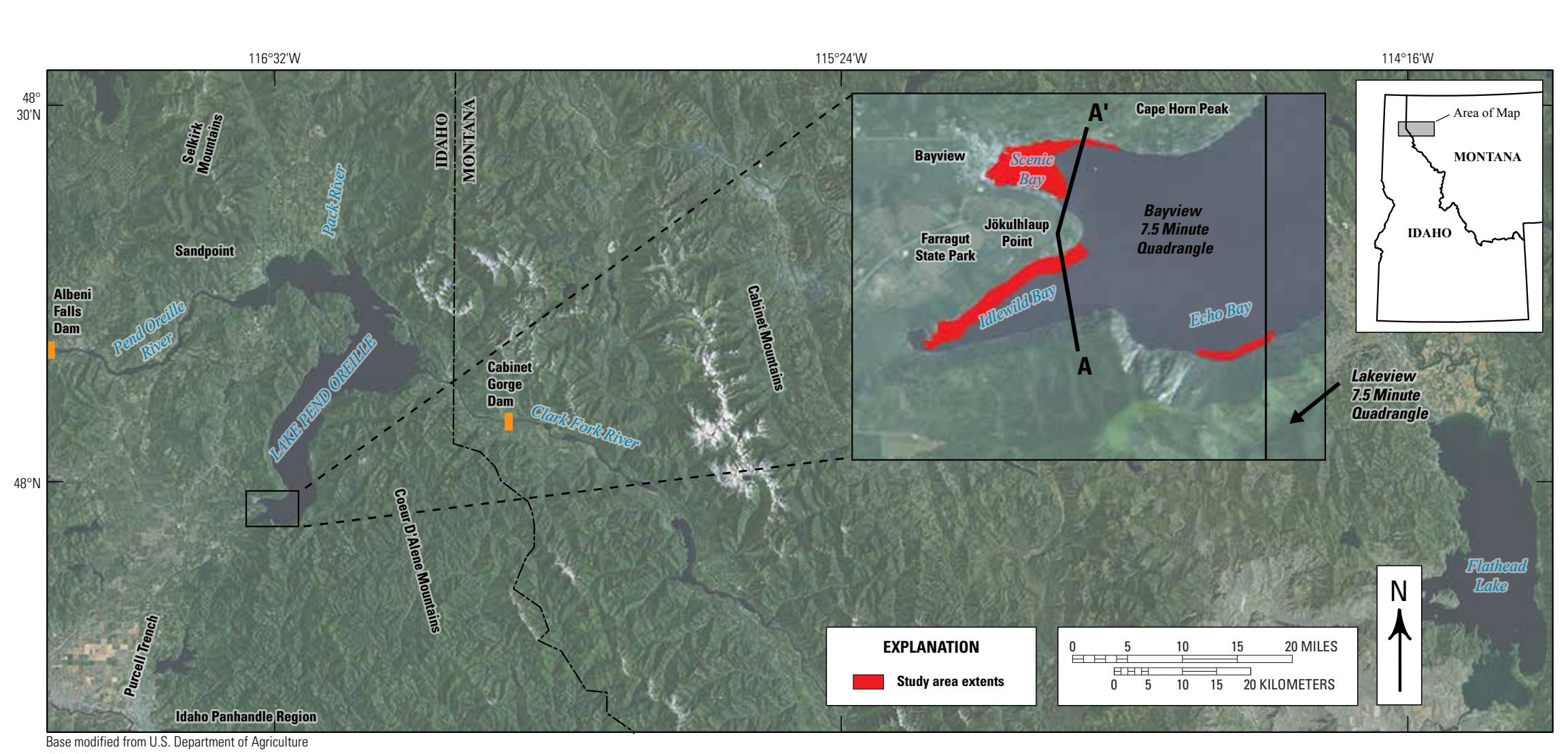


Base modified from U.S. Department of Agriculture digital data 2011.

Figure 1. Study area and surrounding rivers, lakes, and dams at Lake Pend Oreille, Idaho. See figure 4 for geologic cross section *A–A′*.

Figure 2. Kokanee salmon (*Oncorhynchus nerka*), a keystone species in Lake Pend Oreille, Idaho.

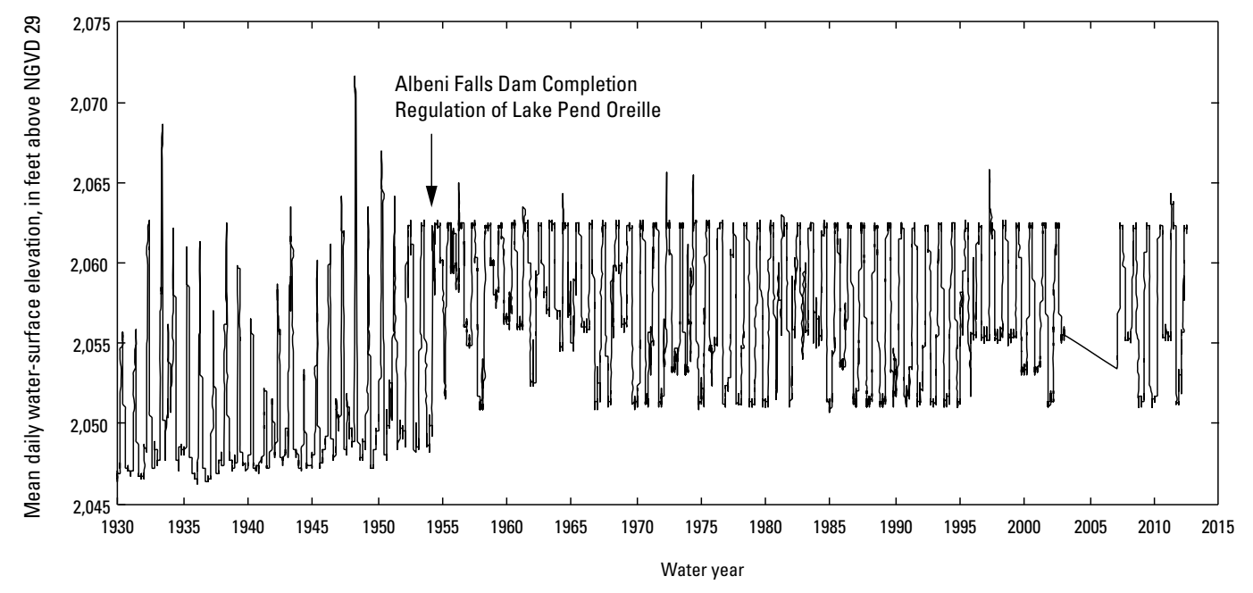


Figure 3. Mean daily water-surface elevation at Lake Pend Oreille at Hope, Idaho, U.S. Geological Survey stage gage 12392500, water years 1930–2012.

A. **Qllb, mass of angular shaped, gravel-to-boulder size rock material found below a recent terrestrial landslide.**

B. **Qfmg, fine to medium gravel is dominant substrate.**

C. **Qcg, course to very coarse gravel is dominant substrate.**

D. **Qgcu, undifferentiated gravel and cobble.**

E. **Qc, cobble and very coarse gravel is dominant substrate.**

F. **Bu, bedrock substrate.**

Figure 7. Underwater photographs showing types of bedrock and glaciofluvial geology that form the bed of Lake Pend Oreille, Bayview and Lakeview quadrangles, Idaho, 2011. Laser scale is 4 inches.

Description of the Morphology, Lakebed Facies, and Embeddedness in the Shore Zone, Rise Zone, and Open Water in Bays and Mainstem of Lake

Lakebed with a gentle, moderate, steep, and very steep defined as 0–20, 20–40, 40–60, and greater than 60 degrees, respectively.

Clean substrate defined as less than 4 percent embeddedness, slightly embedded substrate defined as 4–15 percent embeddedness, and heavily embedded substrate defined as 15–100 percent embeddedness.

Shore zone morphology is subdivided into the variable zone and subvariable zone. Variable zone is where lakebed elevations are between normal maximum summer full pool and normal minimum winter low pool; this zone has a gentle to moderate sloping lakebed and is steep and narrow along most bedrock shorelines. Subvariable zone is where lakebed elevations are lower than the lake's normal minimum winter low pool elevation, and has a moderate to steep slope. This zone forms a transition to open water, rising somewhat abruptly from the open water. The variable zone is subdivided: the inner variable zone is the area near the shoreline, the middle variable zone is the area near the zone's midpoint, and the outer variable zone is the area adjacent to the subvariable zone.

Labels ***A–I*** identify characteristics in the shore zone, rise zone, and open water in figure 5.

A Open water with a gentle-steep sloping lakebed, forms a lake-wide patch of heavily embedded substrate.

B Variable and subvariable zones located deep within a bay with large patches of heavily embedded substrate. Zone is shielded from heavier winds on main stem of the lake, and therefore, is subject to less wave action.

C Variable zone in bays with patches of clean, slightly embedded gravel and cobble substrate, and the adjacent subvariable zone is embedded. Sometimes a patch is limited to the upper variable zone where wave effect is greatest, likely to occur in areas of a bay where it is sheltered from winds.

D Variable and subvariable zones in bays have patches of clean, slightly embedded gravel and cobble substrate. Zone is likely to occur in areas of a bay that are less shielded from winds and wave action.

E Subvariable zone in bays with patches of clean, slightly embedded gravel-cobble substrate. Patches parallel the shoreline, length ranges from a few hundred feet to one-half mile, and water depth can be greater than 75 feet deep during normal maximum summer full pool. Either (1) the adjacent variable zone has a highly embedded substrate, or (2) the inner variable zone has narrow patches of clean, slightly embedded gravel-cobble substrate and highly embedded substrate in the middle and outer variable zones. Zone is more likely to occur in areas of a bay that are less shielded from winds and wave action.

F Shore zone on main stem of lake has (1) a variable zone with a contiguous patch of clean gravel-cobble substrate, and (2) a subvariable zone with a contiguous patch of clean-slightly embedded cobble substrate with a few patches of gravel and cobble. Generally, the main stem of the lake has stronger winds and greater wave action than bays; the wave action suspends and removes fines from clasts and transports clasts.

G Rise zone, where lake morphology forms an irregular, pod-like shaped rise that extends from the outer variable zone toward open water. This rise has a glacialfluvial gravel and cobble substrate of variable embeddedness and is surrounded by deep water. The rise is of glacial origin and not related to any post-glaciation or recent activity.

H Very narrow shore, steep sloping lakebed composed of bedrock. The shoreline often has a narrow patch of gravel-to-boulder size clasts, and embeddedness generally is less than 4 percent.

I Very narrow shore, steep terrain bordering the lake. Recent landslides have sent rock debris plunging into the lake. Clasts on lake bottom are angular and range in size from gravel to boulders.

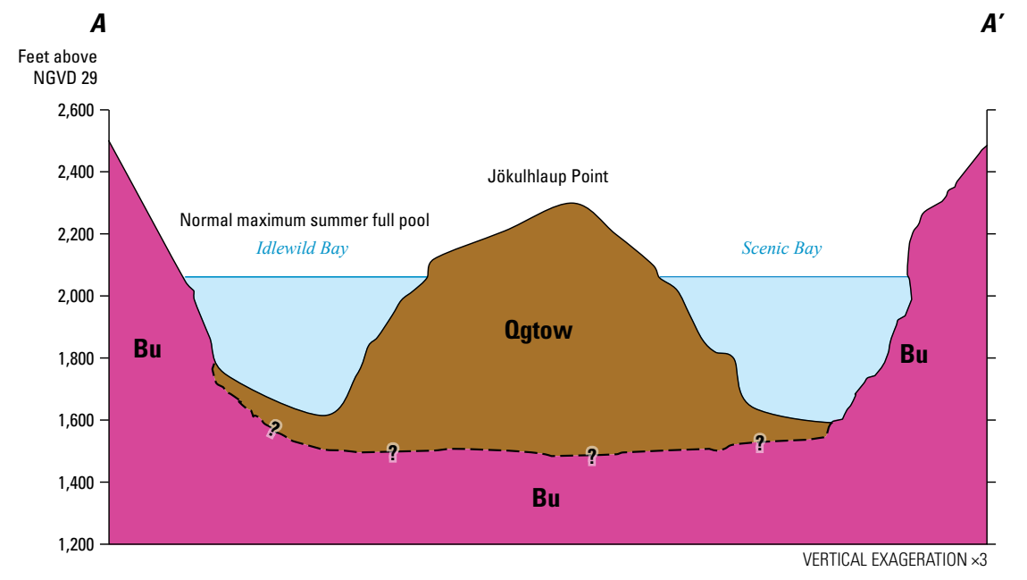


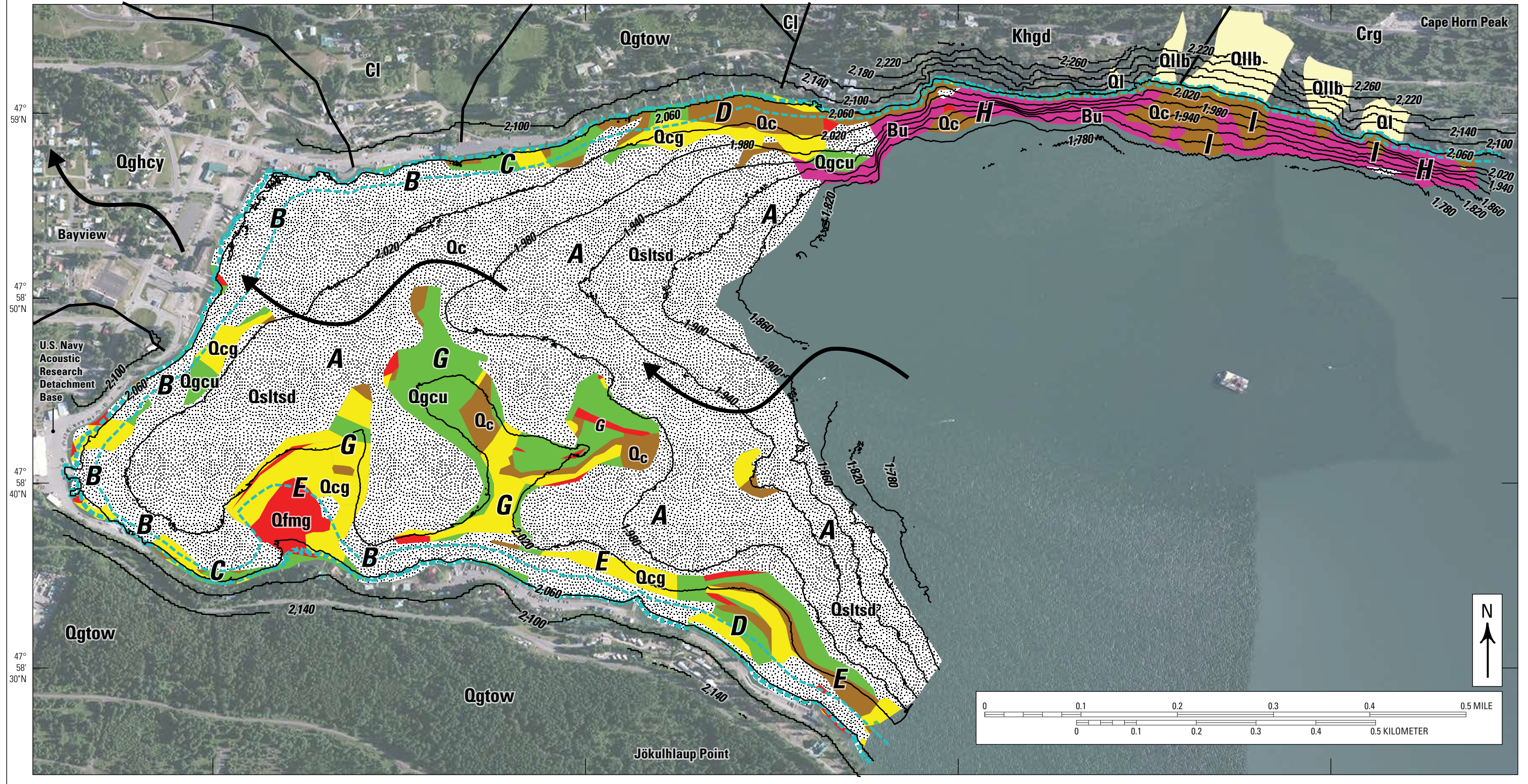
Figure 4. Generalized geologic cross section *A–A′* of Lake Pend Oreille study area and surrounding areas near Bayview Idaho. See figure 1 for cross section location.

Table 1. Sediment particle-size classification.

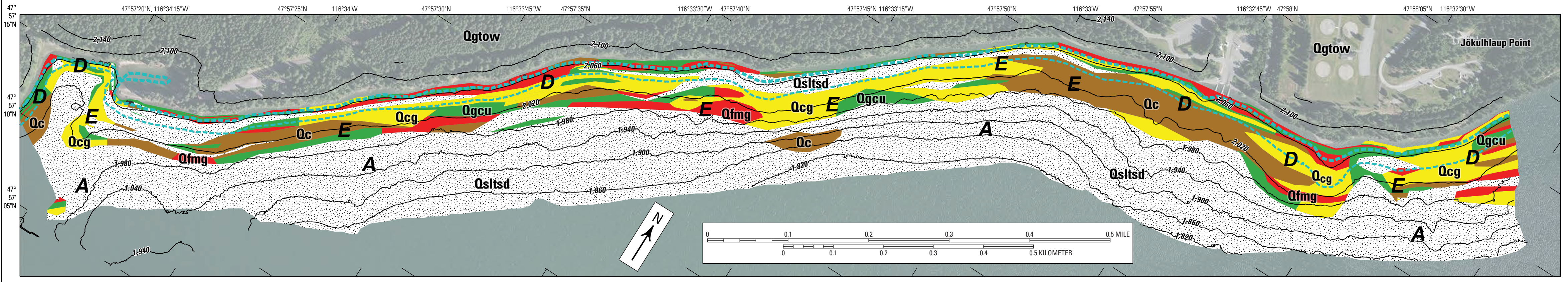
[**Size terms:** after Wentworth, 1922]

Size terms	Size range (inch)
Boulder	Greater than 10.1
Cobble	2.5–10.1
Very course gravel	1.26–2.5
Course gravel	0.63–1.26
Medium gravel	0.31–0.63
Fine gravel	0.16–0.31
Very fine gravel	0.08–0.16
Sand, silt, and clay	Less than 0.08

A. **Scenic Bay**



B. **Idlewild Bay**



C. **Echo Bay**

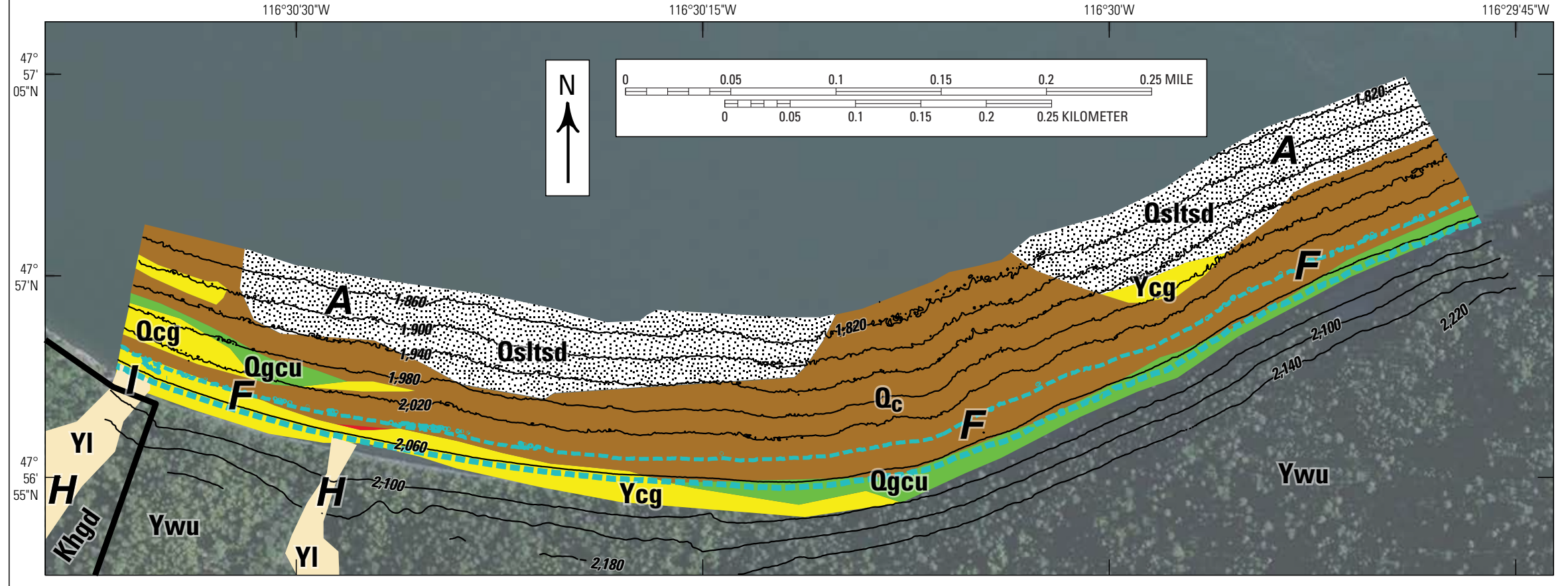
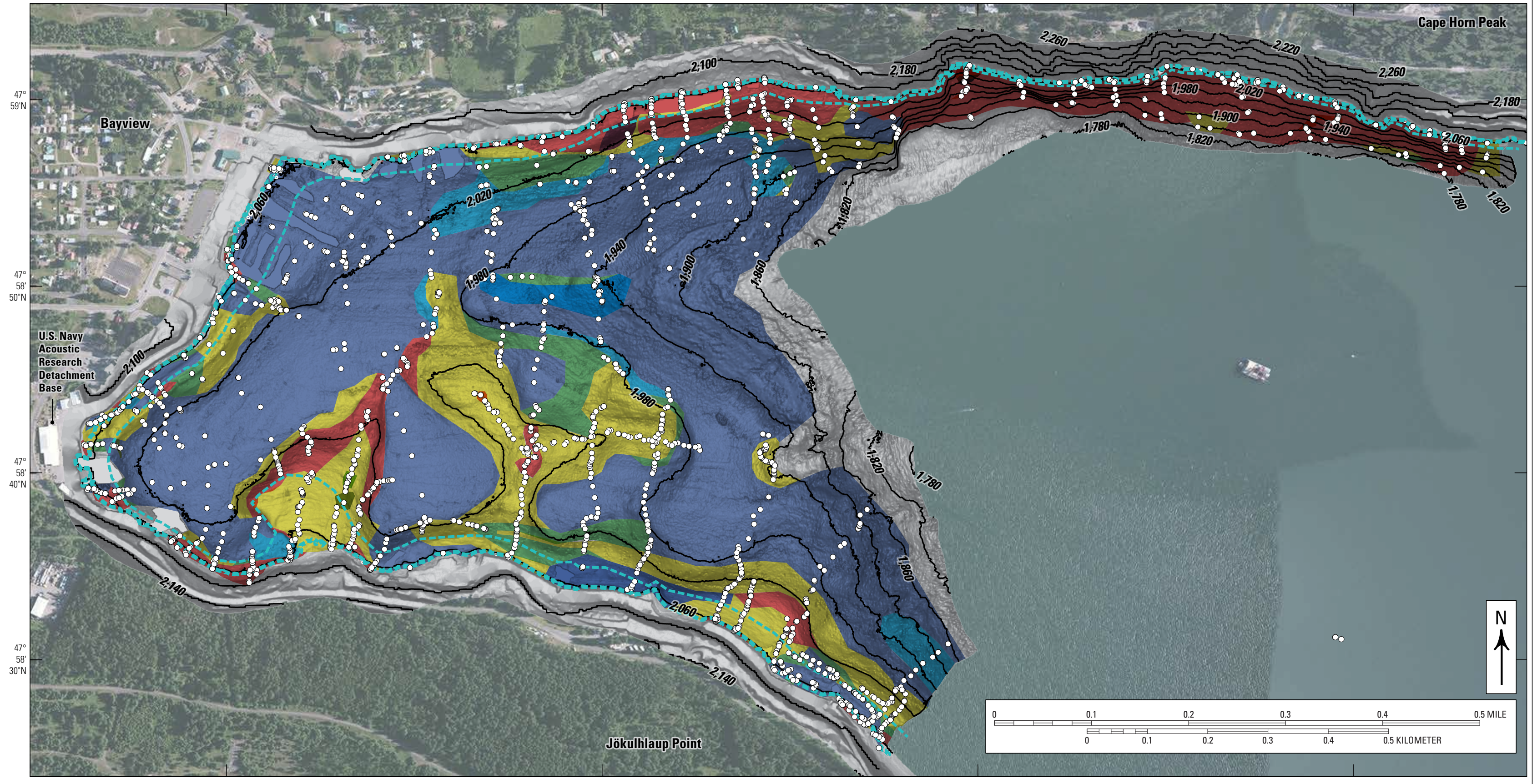
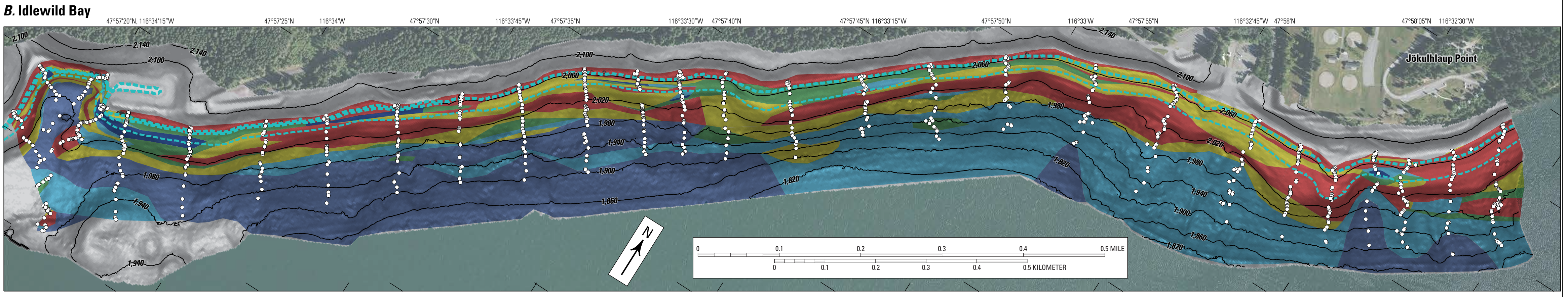


Figure 5. Shoreline and lakebed topographic elevation and terrestrial and lakebed geology at (*A*) Scenic Bay, (*B*) Idlewild Bay, and (*C*) Echo Bay, Lake Pend Oreille, Bayview and Lakeview quadrangles, Idaho.

A. **Scenic Bay**



B. **Idlewild Bay**



C. **Echo Bay**

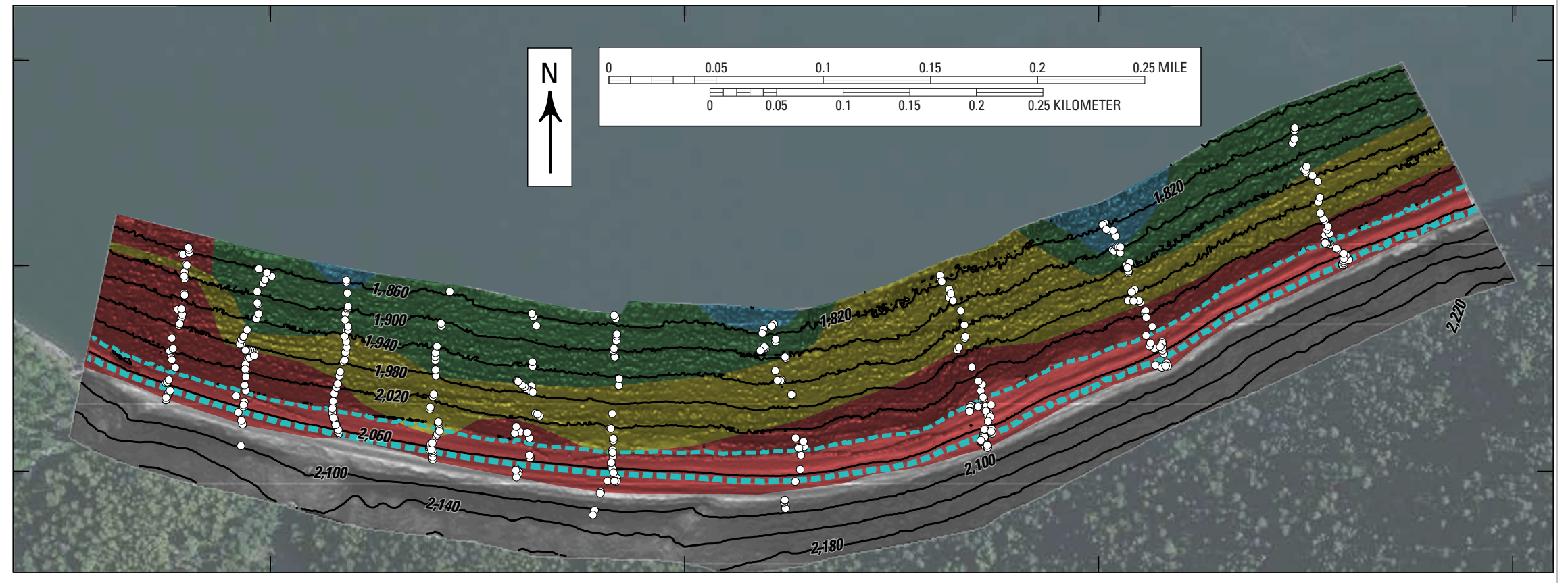


Figure 6. Shoreline and lakebed topographic elevation, bed slope, and embeddedness of lakebed sediments at (*A*) Scenic Bay, (*B*) Idlewild Bay, and (*C*) Echo Bay, Lake Pend Oreille, Bayview and Lakeview quadrangles, Idaho.

EXPLANATION

Lakebed geology (figs. 4 and 5)

[f., fine; m., medium; c., coarse; v, very; ft, foot; (1) Unit is mapped where gravels and cobbles on the lakebed are embedded with 0–15 percent silt.]

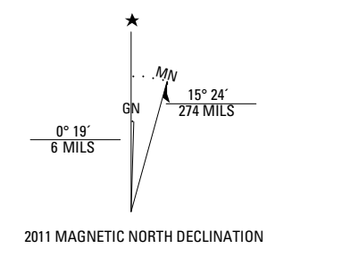
Pleistocene	Qllb	Landslide deposit on lakebed, terrestrial slope failure send rock plunging into Lake Pend Oreille
	Qsltsd	Embedded lakebed – areas of the lakebed where 15–100 percent of the interstitial space between gravel and cobbles is embedded with silt and sand. Gravel, cobble, or boulders may be exposed on lakebed.
	Qfmg	Fine-medium gravel lakebed – well to poorly sorted, vf to m gravel forms more than 50 percent of this unit, may or may not include c-vc gravel, cobble, boulders, or traces of sand and silt.
	Qcg	Course-gravel lakebed – well to poorly sorted, c to vc gravel represents the largest percentage of clast in unit, may or may not include f-vf gravel, cobble, boulders, or traces of sand and silt.
	Qgcu	Undifferentiated gravel and cobble lakebed – moderate to poorly sorted, undifferentiated, vf-m gravel sediment and c gravel-cobble sediment comprise this unit. Boulders may be present.
	Qc	Cobble lakebed with some f-vc gravel – moderate to poorly sorted, cobble and c-vc gravel represents the largest percentage of clast in unit, and may include some vf-m gravel. Boulders may be present.
Undifferentiated	Bu	Bedrock

Terrestrial geology (figs. 4 and 5)

Holocene	Ql	Landslide deposits, slope failure sent rock debris plunging into Lake Pend Oreille (this study).
Pleistocene	Qghcy	Outwash deposits – poorly sorted, coarse boulder outwash gravel that records the melt water flow to the Pend Oreille River. Graded to the outlet of Pend Oreille Lake at Bayview at an elevation of 2,200 feet above NGVD 29.
	Qgtow	Bouldery till and outwash deposits – non-sorted, bouldery clay till and boulder outwash deposits that form a modified end moraine at the south end of Lake Pend Oreille at Bayview, Idaho.
Cretaceous	Khgd	Hornblende-biotite granodiorite – gray, medium-grained, hornblende-biotitegranodiorite. Mafic mineral content varies, and unit probably is composed of multiple plutons or plutonic phases (Lewis and others, 2002).
Cambrian	Crg	Rennie Shale and Gold Creek Quartzite – shale is a fissile olive-colored fossiliferous shale. Underlying the shale is white to pale pink, vitreous coarse-grained quartzite (Lewis and others, 2002).
	Cl	Lakeview Limestone – light to dark gray, thin- to thick-bedded, blocky limestone (Lewis and others, 2002). Unit was mined for lime at Bayview (Savage, 1965).
Precambrian, Belt supergroup	Ywu	Wallace Formation, upper member, undivided – predominantly dark gray siltite and argillite, but locally contains unmapped carbonate intervals (Lewis and others, 2002).

Substrate embeddedness, percent (fig. 6)

🟥	0 - 4
🟨	5 - 15
🟩	16 - 35
🟦	36 - 65
🟦	66-100



2011 MAGNETIC NORTH DECLINATION

Other symbols

—1,900—	Elevation of landsurface and lakebed, National Geodetic Vertical Datum of 1929, interval 40 ft (figs. 5 and 6)
▬ ▬ ▬	Lake stage elevation, 2,062.5 ft, normal maximum summer pool (figs. 5 and 6)
- - -	Lake stage elevation, 2,051.0 ft, normal minimum winter pool (figs. 5 and 6)
▨	Lakebed slope represented by a gradational gray scale, in degrees, shallow slope is light gray and a steep slope is dark grey. (fig. 6)
↖	Direction of glacial Missoula flood outbursts (fig. 5)
○	Location of photograph extracted from underwater video of the lakebed: provides basic data about substrate embeddedness and geologic characteristics. The series of white dots follow transects of continuous video of lakebed (fig. 6)
A	Letters *A–E* are example areas used to describe the relation between lake morphology and lakebed geologic characteristics including embeddedness (fig. 5)

Base maps from http://services.arcgisonline.com/arcgis/services unless otherwise noted.
Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83) State Plane Coordinate System.
Elevation is referenced to National Geodetic Vertical Datum of 1929 (NGVD 29).

Bathymetry, Morphology, and Lakebed Geologic Characteristics of Potential Kokanee Salmon Spawning Habitat in Lake Pend Oreille, Bayview and Lakeview Quadrangles, Idaho

By

Gary J. Barton, U.S. Geological Survey, and Andrew M. Dux, Idaho Department of Fish and Game

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