Alaska Endeavour

The Williston Northampton School

Expedition to Port Chalmers, Prince William Sound, Alaska
August 1 – August 12, 2024

Curriculum

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1 – The Mission

Our Mission

Congratulations! You are going on a 12-day research expedition to Alaska on board the historic 72-foot research vessel, the *Endeavour*.

We (Alaska Endeavour) are a science and education non-profit organization that runs natural history research expeditions for high school students like you – six at a time with a faculty member from their school.

We pick a well-defined, remote wilderness site – an island, a lagoon, a glacier, or a river mouth – go there, and conduct a type of census we call a benchmark study. A benchmark study is a snapshot of the location at a certain point in time. It tells other researchers what animals and plants are there now, and it gives future researchers a way to measure the effects over time of logging, fishing, mining, pollution, and global warming.

Your study site is described in an appendix at the end of this document.

For the study, each student focuses on one of six aspects of natural history – marine and riparian mammals, land mammals and bats, fish and marine invertebrates, birds and terrestrial invertebrates, geology and paleontology, or botany and mycology.

After the expedition, each of you will write a section of the paper describing your observations at the site. We'll then publish the paper, and each of you will earn an author credit, which can be a good addition to a college application.

The science is real. So is your contribution to conservation.

While on board, you and a teammate will be responsible for specific tasks: galley duty (cooking and cleanup), deck duty (fenders, lines, maintenance), and watch duty (weather and tide check, helm watch, and logbook). The teams rotate through the different duties every three days.

You are going to see and do astonishing things. This expedition is likely to change your perspective of life on Earth. You'll become a more scientifically literate advocate for conservation. You may even become a scientist.

The expedition is led by Bill Urschel, a US Coast Guard licensed captain and founder of Alaska Endeavour. The *Endeavour* is a US Coast Guard-designated research vessel. We'll have a second crew member and your teacher on board, and the support of our expedition manager on shore. The backgrounds of our captain and crew, as well as details of the ship, are on the Alaska Endeavour website.

The rest of this curriculum describes the study, life on board, and how to prepare.

We are delighted to introduce you to the Alaskan wilderness.

2 – Preparation

Getting Ready

There are a few things you need to do to get the most out of your expedition to Alaska, to come back safely, and to support your fellow members of the expedition.

Read this Curriculum

Read all the chapters in this curriculum. Jot down any questions and ask them in the Orientation Meeting.

Familiarize yourself with your Study Site. It is described in the *Mission* chapter. Look up the site online. Visit it on Google Earth (you can cut and paste the latitude and longitude from the site description). Try to internalize the geography.

Consider what aspects of natural history you may want to study (land mammals, marine mammals, birds, botany, fish, etc.). You and your fellow expedition members will decide who studies what in the Initial Meeting (described below).

Before the Initial Meeting, we'll give you a questionnaire to find out more about your interests, concerns, and likely contributions, as well as any dietary or medial restrictions you may have.

First Meeting

You will meet with your fellow expedition members, including the Expedition Manger and your Faculty Member. At this meeting you will:

- ✓ Decide between you what specialty you will study.
- ✓ Who is in which team of two.
- ✓ The duty roster for the teams (galley, deck, watch).

Personal Gear

Start assembling your personal gear. We provide a checklist at the end of this chapter.

If you have any questions, ask them in the orientation meeting, or email or call the Expedition Manager listed in the *Contacts and Travel* chapter.

If you wish to bring any research equipment beyond the basics (which Alaska Endeavour provides, as described in the *Study* chapter), start assembling it now.

Orientation Meeting

About a month before departure, the Captain and the Expedition Manager from Alaska Endeavour will meet with the students and faculty member by video call or other means. Interested parents are welcome to attend. At this meeting, the Expedition Manager will:

- ✓ Go over each chapter in this curriculum, answering any questions.
- ✓ Discuss airline travel to and from the start port and end port.
- ✓ Explain the Expedition Mindset (described in the *Safety Protocols* chapter).

Departure

Three days before you leave home to join the *Endeavour* the Expedition Manager will be in touch with an update on the weather and any other news.

The travel details are listed in the *Contact and Travel* chapter.

Personal Gear Checklist

No suitcases. Storage space on board is limited and hard-sided suitcases are impractical on board.

You need to pack everything in one soft-sided pack or duffle bag (plus a day pack). The largest duffle most airlines will accept as carry-on luggage is 22" x 14" x 9" which is about 35 liters in volume. If you want to bring a larger duffle that's fine by the captain, but you may have to check a larger bag with the airline.

Required

- ☐ 2 pairs of long pants of a quick-dry material. No cotton, including jeans.
- ☐ 3 long-sleeved shirts. Flannel is acceptable but wool or a quick-dry material is better.
- ☐ 1 undershirt of Merino wool or similar, for warmth and wicking.
- ☐ 6 pairs of underwear and socks. No cotton socks. Wool or a wool blend is good.
- ☐ 1 pair of tennis/running/boat shoes. These are for wearing on the boat only (you will be pulling off your boots as soon as you board).
- ☐ 1 pair of 15" high rubber boots. Xtratuf or Grunden's are both excellent, but you can find good and less expensive alternatives online. Always pull-on, no laces. Don't bring shorter than 15" or your feet will be wet all day. Mark your boots, since so many look the same.
- ☐ Rain jacket with a hood (or a broad brimmed hat) and rain pants (Gore-Tex or similar waterproof material). Ski jackets and paints usually aren't sufficiently waterproof. As with your boots, mark your rain gear for easy identification.
- ☐ Fleece vest or under-jacket. Avoid down, since once wet it's useless.
- ☐ Pajamas, if that's what you sleep in or want to lounge in.
- ☐ Sunglasses (polarized recommended for seeing below the water's surface).
- ☐ Nalgene or stainless-steel water bottle (on board you can mark it with your bunk number).
- ☐ A day pack, waterproof or with a rain cover (915 cubic inches is about right).
- ☐ Toiletries (we provide soap and shampoo, but you are welcome to bring your own) and any medications you require. If you are prone to sea sickness, bring Dramamine or similar and take it early.

If necessary, we run loads of laundry on board, but this uses up large amounts of fresh water, so we only run the machines when necessary.

Optional

- ☐ Gloves and a watch cap.
- ☐ Headlamp or LED flashlight.

- ☐ Laptop, Chromebook, tablet, phone with chargers and cords (you may want to mark them with your name or initials). There will be little or no connectivity away from the port, so download the music, books, and other files you need before departure.
- ☐ Small musical instrument that can fit in your duffle (there is a guitar already on board).
- ☐ A personal journal.
- ☐ Art supplies.
- ☐ Noise-canceling headphones or earplugs (people snore).

Electronic games are specifically discouraged.

Provided by Alaska Endeavour

We will have for you:

- ✓ Bedding, pillow
- ✓ Towels, soap, and shampoo.
- ✓ Sunscreen.
- ✓ The Basic Research Gear, as described in The Study chapter.

3 – The Study

Definition and Purpose

The purpose of your upcoming 12-day expedition to Alaska is to conduct a benchmark study.

A benchmark study is a census of a certain piece of wilderness – the study site – at a certain moment in time. As researchers, you and your teammates will observe the animals, birds, fish, plants, insects, and geology at the site and record your observations in a scientific paper, which we (Alaska Endeavour) will publish and make available to researchers worldwide.

A benchmark study is relatively simple – it's mostly just being observant and accurate – but it is real, valuable science.

- It gives other contemporary researchers data on the site.
- It gives future researchers a starting point (a benchmark) against which to measure change over time and the impacts of logging, fishing, mining, pollution, and global warming.
- It gives conservation advocates a way to decide what parts of the wilderness most need protection: people have to know about a location before they will protect it.

We also think this study is going to teach you observational skills that will change the way you look at the world and give you an appreciation of wilderness and nature that will last the rest of your life.

And the author credit on a research paper will look good on your college application.

Methodology

There will be six of you students on the expedition, plus a faculty member (and the ship's captain and a crewperson).

Between you, you will each choose an aspect of natural history to focus on:

- Marine and Riparian Mammals
- Land Mammals and Bats

- Fish and Marine Invertebrates
- Birds and Terrestrial Invertebrates
- Geology and Paleontology
- Botany and Mycology

Whatever your specialty, you'll be expected to observe and record everything you see, whether it's in your specialty or not. If you can't identify a bird, a plant, or a rock, you can take a photo or write a description and give it to the student specialist later, back on the boat.

For the research paper, you'll each write a short chapter describing everyone's observations in your specialty. More on the paper later.

Study Site Characteristics

We have chosen the study site with input from our science and conservation advisors and your faculty member.

Any study site needs to be a well-defined wilderness location – an island, a lagoon, a glacier, a watershed, a river mouth – and be of interest to the science and conservation community. In other words, we want the site to be interesting and important.

A study site also needs to have a good anchorage, not require long open-water passages, and be within two or three days of a commercial airport. In other words, the site has to be safe and not too uncomfortable to get to.

In some cases, we'll need to get permits from the federal, state, or tribal authorities to visit the site or conduct the study. We (Alaska Endeavour) will secure those ahead of time.

Basic Research Gear We Provide

We will provide you with your basic research gear. This includes:

- a pair of waterproof 10x40 binoculars
- a waterproof field notebook and pen
- bear spray
- access to the ship's media computer for satellite imagery, maps, charts, and other resources.

We will also provide you or your teammate with:

- a waterproof GPS receiver (which also tells time and temperature)
- a waterproof radio
- a map (digital or paper)

Research Gear You May Want to Bring

Polarized sunglasses are extremely helpful, cutting glare when looking at creatures in the water, but you'll need to provide your own.

A field guide and checklist for your slice of natural history are essential items. A field guide is a compact book that you can carry with you outdoors. It tells you what you're looking at, with photos, descriptions, and maps. A checklist is just a list of the birds, animals, fish, and other creatures and plants known to be in the area. Some field guides include checklists. We have at least one field guide for each of the six aspects of natural history on board the *Endeavour*, but if you can, bring your own copy. We have a list of recommended field guides at the end of this chapter.

If you have a smartphone, there are apps that can help you identify specimens in the field. We mentioned several of them at the end of this chapter.

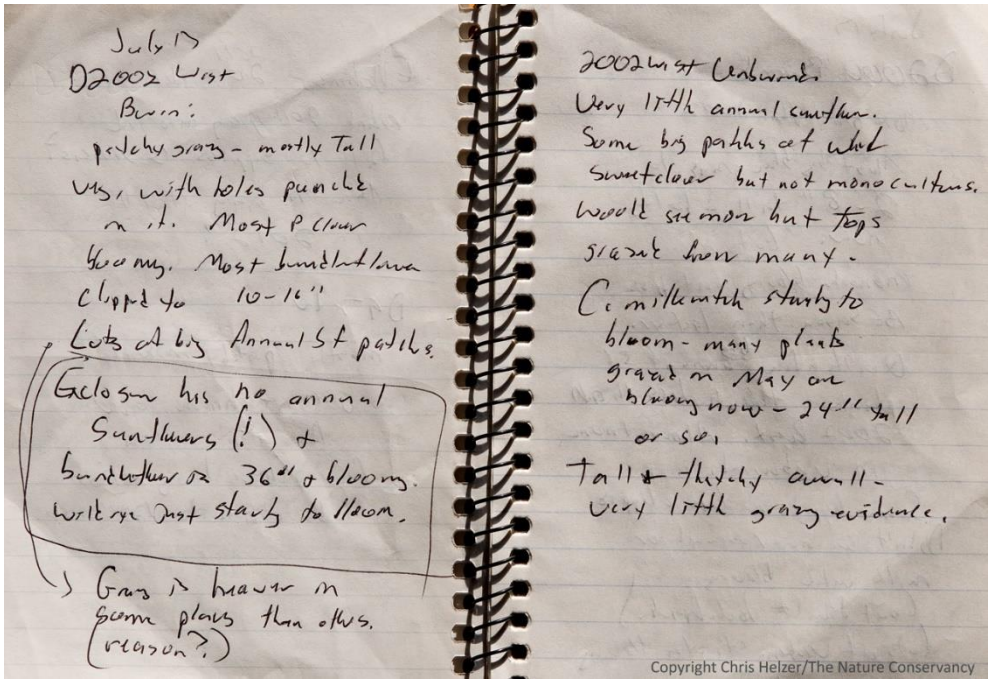
We mention some specialized gear in the relevant sections, below, which you will need to secure yourself.

You'll need to carry all our research gear in a day pack.

Field Notebooks

As mentioned above, we'll give you a field notebook when you board. Field notebooks are where researchers – like you – jot down your observations as you make them. They provide the data you will need for your portion of the research paper.

It's important that you write down your observations (or draw your sketches) at the time because memory fades and distorts so quickly. We can almost guarantee that you'll forget important details inside of an hour.



The field notebooks we will give you are waterproof. You can literally write in the rain. And you probably will.

By the way, these notes are only for your eyes. No one else needs to see them.

What Happens When

Before the Expedition

Sometime before the expedition, you and your fellow researchers and your faculty member will meet to decide which of you takes which aspect of natural history for the study – the six topics described above – and then, with the help of the faculty member, you will each develop your study plan based on what you expect to find at the site.

A study plan is a description of how you are going to conduct your portion of the census. It could be as simple as just walking through the forest with binoculars, a checklist, and a notebook, making observations and writing them down, or it could involve photography and sketching, or drones, robotics, trail cameras, and so on. It's important, though, that you don't let technology interfere with basic observation.

See below for some ideas for study plans. Feel free to invent your own.

Two things to keep in mind at this point:

- The plan will feel a bit amorphous until you arrive at the site and get the lay of the land. We'll spend the first field day reconnoitering, getting oriented, and refining the plan.
- You are collecting data in a survey and it's not incumbent on you to interpret it. Your job is to observe and accurately record. Do that, and there are no wrong answers.

Before the expedition, you should spend a little time becoming familiar with the more common species and specimens of your specialty: know the half dozen birds you are most likely to see, the four most common trees, the general geology of the area, the five common whales, the six most common land mammals, and so on. An hour or two spent doing this basic preparation will give you a knowledge framework you can build on and increase your confidence.

On the Expedition

Depending on the weather, we'll spend the first three days getting to the study site (doing a little exploring and probably some fishing along the way), then spend the next six days at the site, and spend the last three days getting back – 12 days total.

At the study site, you will work with a partner as you execute your study plans. (You'll also be doing boat tasks with your partner, which we describe elsewhere in this Curriculum).

Every evening, after the fieldwork and back on board the *Endeavour*, you'll give everyone else a brief summary of your day's findings, any issues you had, and ideas for the following day.

In the evenings you'll also upload your photos and videos to the ships' computer, to be shared by everyone.

On the last days of the expedition, on the way back to port (or if we have to stay hunkered down because of extreme weather), you and your fellow researchers will start concentrating your data and start writing your chapters for the report. The aim is to have a first rough draft by the time we get back to port.

After the Expedition

After the expedition, back home or at school, you'll polish your part of the report.

There is no minimum length for the paper, but you will need to write a short narrative and include any tables, graphs, or photographs you think best shows your data. If you kept good notes in the field, the writing should be painless. Your faculty member will help you.

The research paper should generally follow the outline shown on the right. If your study doesn't include all of the topics in its results sections, that's fine. If you want to organize the results some other way, that's fine too.

In addition to your own section, you may be asked to write other portions of the paper that describe the site, the overall study, or give the summary.

We (Alaska Endeavour) will do a final edit of the paper, then publish it on Research Gate (a repository for research papers) and elsewhere, and then broadcast it to our 3,300 or so blog subscribers.

Outline of the Paper

Title Page
- Title of the paper, with site and dates.
- Author credits, in alphabetical order.
- Sponsors acknowledgments.

Abstract
- A one-paragraph summary of the study

Site Definition
- Name of the site, location, how defined, why chosen.
- The dates the team was there.
- A physical description of the site.
- Climate (winds, tides, currents, rainfall, snowfall).
- Weather during the study.

Results: Marine and Riparian Mammals
- The study plan
- The data

Results: Land Mammals and Bats
- The study plan
- The data

Results: Fish and Marine Invertebrates
- The study plan
- The data

Results: Birds and Terrestrial Invertebrates
- The study plan
- The data

Results: Geology and Paleontology
- The study plan
- The data

Results: Botany and Mycology
- The study plan
- The data

Summary
- A summary of the study and ideas for further study

Study Plans

The Plan

As mentioned above, a study plan is a description of how you are going to conduct your portion of the census. How are you going to find and count land mammals and bats? How are you going to understand the rocks and fossils? It's important to think through your plan carefully. You'll need to do some research on the study site to get an idea of what's there and what equipment you'll need beyond the basics we provide.

Whatever plan you develop, you don't want to get out there and wander aimlessly. The most valuable observational data has context, meaning it came from a specific place at a specific time. Time context is easy with a calendar, a watch,

and maybe a tide table. For place context, think in terms of point, transect, and gird observations.

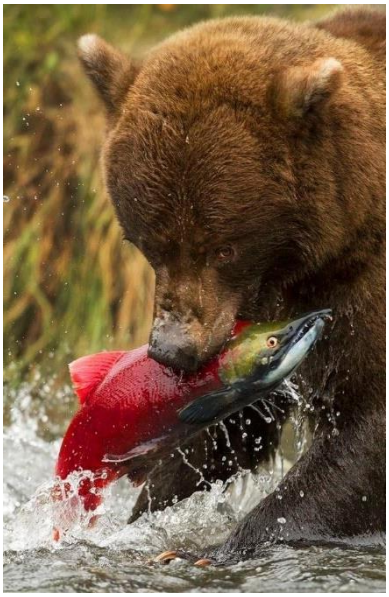
- For point observations, you go to a spot, note the GPS coordinates, stay there (or within a defined radius), and observe over some period of time. A point observation could be used to monitor sea otters in a bay, birds at a pond, trees and shrubs in a plot, or bears feeding at a salmon stream.
- For transect observations, you pick a line – from the water's edge and up into the woods (for example), noting the GPS coordinates of the starting spot, the heading of your line, and the distance, and walk the line, making your observations. A transect would be used to observe the trees and shrubs reclaiming land exposed by a receding glacier, geological features along a fault line, or a bird and mammal survey along a beach.
- For grid observations, you pick a square patch of land (a meter square or larger) and note the GPS location at one corner, and then mark it off with stakes and line (in 20 cm or larger square segments) and count what you find in each segment. When you're done, remove all of the line and stakes except the stake that marks the GPS corner.

The GPS coordinates allow future researchers to revisit your exact points or walk your exact transects years, decades, or centuries after you make your observations.

What follows are some ideas for study plans. Pick and choose which approach seems most appropriate, or invent your own. But write the plan down and bring it with you.

Finally, do remember that a pair of binoculars, a field guide, and a notebook are often all you need. Cameras, robotics, drones, and electronic devices can be useful, but don't let gadgets get in the way of basic observation, or appreciating the magnificence of where you are. Use all five of your senses – sight, touch, smell, hearing, and even taste – and above all, take your time.

Land Mammals & Bats



Land mammals are difficult to see when you are walking a transect. You're moving, and the animals often hear, see, or smell you before you ever see them. Most study plans for animals will therefore be point observations. The key is picking the right point. You can do it with satellite imagery, a topographic map, and – most importantly – an exploratory hike. You want a spot where animals are likely to be and be able to be seen. This can be the outlet of a river, which often has a beach or mudflat with grass behind it, or it can be a meadow upriver, or a saddle between two valleys or bays.

Binoculars are essential. It's not so much because the animal will be far away, but because only a part of it – an ear, a leg – may be visible through the brush. Take your time.

If your point is some distance away, you might consider bringing a spotting scope (a type of 60x telescope). Better yet, consider a

high-magnification camera (like the Nikon Coolpix P950 with its 83x zoom lens) not only lets you see the creature but also record it. A tripod can be useful in low-light situations.

A small aerial drone (like the Mavic Mini 2 with its 4k video camera) can be a great tool for spotting and photographing animals and birds. One drone for the expedition is enough. Be careful using a drone, however. Drones create a buzzing noise that can irritate or frighten even the largest brown bears. Perhaps thinking they are being attacked by a swarm of bees. If you use a drone to spot bears, pull it back if it seems to be disturbing the animals.

Some amount of stealth is usually required. If the animals are at a distance, it is usually sufficient to use the existing brush or rocks as cover. Camouflage clothing can help. But if the animals are close, you might set up a camouflaged blind.

One of the best viewing spots for watching bears feeding at the mouths of streams is from a small boat (camouflaged, if possible) anchored offshore.

Realistically, you won't see most of the land mammals in the area, even big ones, either because they're nocturnal or because they're very shy. Consider using trail cams and looking for tracks and scat.

A trail camera is affixed to a tree and takes a photo when it senses the movement or body heat of an animal, any time of the day or night. The camera will record the time, telling you when the animals are on the move. To capture images of small animals like rabbits, squirrels, and mice, place the trail cam close to the ground. (We don't physically trap animals, for practical and ethical reasons). Choose the camera location(s) based on pre-expedition research (maps and satellite imagery) and on game trails you find at the site. Three cams per expedition is plenty.

Tracks and scat (animal poop) tell you who has been there recently. Look for tracks in muddy patches and scat on game trails. Tracks and scat on a game trail give you clues as to who uses it. There are other signs, too, including bark scratches, antler rubs, chew marks, hair tuffs, and bones of the prey or the predator. Photograph what you find with a ruler or tape measure next to the evidence.

Good spots for observing bats are near their roosts when they emerge or return, or in open areas where they feed on insects. You won't need camouflage and you won't need to worry about scent and noise, but low light and the bats' erratic flight can make identification difficult. A low-light camera with a medium-length lens can help. You can take photos (with flash or without) and identify the species later. You'll need a way to estimate the number of bats in the air that doesn't involve counting each bat.

Marine & Riparian Mammals

Observing marine mammals that are close to shore or onshore can be much like with land mammals: a point observation is often best, using the same logic to find the point and the same optics for the observations. (Imagine counting otters in a bay or sea lions in a haulout). The differences are that it's usually easier to get an unobstructed view of the animal (fewer trees if any in the way) and the animals are less skittish, allowing you to get closer. Observation points can be on land or on a boat, including a skiff, a canoe, or a kayak.

If you are observing by boat, you need to be careful to remain a legal and safe distance from the animal.

It's also easy to use a transect approach, just walking a measured stretch of beach or cliffs slowly, or paddling along a shoreline, or circumnavigating an island or bay, stopping often to listen and look.

Photographs are important, especially for whales because individuals can often be identified by their markings. For example, the website www.HappyWhale.com allows you to upload your photos of humpbacked whales, tells you where they have been seen before (if they have), and then notifies you when "your" whale is seen again and where. Collectively, this data is extremely valuable to whale researchers.

Haulouts and rookeries, which are onshore (usually in rocks) and otter slides and kelp patties, are places you could use a remote-controlled camera. You set it up when the animals are absent, then control it by radio. The camera could be fixed on one spot and only the shutter is triggered by remote control, or it could be aimed, focused, and triggered remotely. If necessary, the camera could be disguised as a log or a rock.

Underwater cameras, controlled from a boat, can be simple pole-cameras (a GoPro type camera on a stick) or tether-controlled underwater drones.

Hydrophones are underwater microphones that listen in on whales and other sea creatures. A simple hydrophone can be lowered into the water from a boat and play the sounds over speakers, recording them on a phone or a computer. The SETI Institute (Search for Extraterrestrial Intelligence) is using recordings of humpback whales made this way to train its

computers how to decode alien speech, should such capability ever be needed. A hydrophone can help identify marine mammals you can't see, but interpreting the sounds is beyond most students.

Be aware of tides. Low tides are feeding opportunities for animals and birds, but don't get trapped on the wrong side of the rocks by a rising tide. We do a tide briefing every morning.

Birds and Terrestrial Invertebrates

Most of the basic point and transect observation techniques for land mammals and bats apply to birds and insects: pick a point or a transect and go out with your binoculars, field guide, notebook, and camera, and observe.

For birds, a blind (especially near a nesting or feeding site) can be useful.

The number of eagle nests along a river or a beach is an indicator of the size of the local population. Changes over time will be important to future researchers. A transect along a beach noting the shorebird nests and any occupants is just as valuable.

Birds have calls that can be used to identify them and what they're doing. An inexpensive disk microphone plugged into your smartphone will give you a digital recording (you'll want earbuds or a headset to monitor the sounds in real-time). A dish or parabolic microphone can record bird and animals sounds though the air at great distances but have limited utility in a census.

You can create an account with eBird to register your sightings: https://ebird.org/ak/home

A high-magnification camera is especially useful in identifying birds, which often don't hold still long enough for you to find them in a field guide. One of these cameras for the expedition is sufficient. It takes the place of a spotting scope (a small telescope with 60x magnification but not binoculars.

Looking for insects will require turning over rocks and logs (and putting them back in place). A lightweight tool like a filed-down golf club makes this easier and cleaner. You might also hang a gauzy net in front of a light at night and see what you catch, or bury a wide-mouthed plastic bottle with its open mouth at the surface as a trap.

For photographing insects, you'll need a shallow pan with a ruler affixed to the bottom for holding the insects while you photograph them. Instead of the telephoto lens used for birds, you'll need a macro lens, which lets you take very close-up photos. There are inexpensive macro lenses that attach to smartphones. We prefer not to keep specimens.

Fish & Marine Invertebrates

Most observations of fish and marine invertebrates are point observations.

In marine environments, you can locate a sea mount or other structure and catch and release rockfish. You can also lower an underwater camera.

On beaches at low tides, you can dig and sift for clams, sand fleas, worms, and other invertebrates, and you can walk the beach counting creature remains.

On salmon streams, you can sit on the bank with polarized sunglasses and count the fish heading upstream and coming down (clicking them off with a hand counter), but that's very hard to do and very inaccurate. You could place underwater video cameras in the stream and then count and identify the species later. For salmon runs, note the timing with the tides, the temperature of the water, and the numbers and types of predators and scavengers.

You can use recording thermometers (which retain temperature sampling for over a year) to measure the temperature over several tide cycles and determine how far upstream the saltwater invades and for how long. If you can take the temperature of more than one salmon stream, you might look for a correlation between temperature and the number and species of fish, which may suggest which stream is more important to the fish, at least at the time you are there.

Botany and Mycology

Most observations for botany (grass, moss, shrubs, trees, ferns, muskeg) and mycology (mushrooms and other fungi) are done with transects. The line in our study sites is usually from the low tide line of the beach some distance inland, including maybe a 50-foot swatch, 25 feet on either side of the line. Take the GPS coordinate of your starting point, choose a heading, and continue in as straight a line as possible, observing and measuring as you go, taking the GPS coordinates of your ending point.

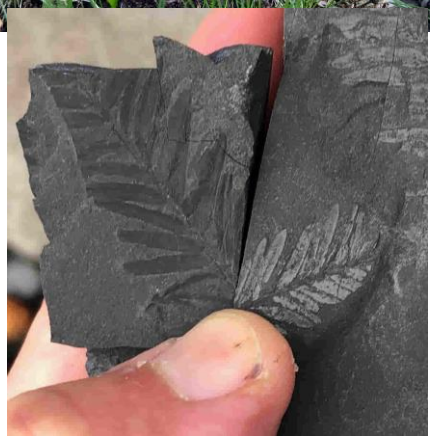
For trees, you count the species, the density within the plot, the thickness or the trunks, and the height. Thickness is measured with a tape measure around the trunk 4 feet off the ground. Height is measured with the same tape placed on the ground, and a protractor with a plumb bob that measures 45 degrees. Move back from the tree until the top of the tree meets that 45-

degree angle, then measure the distance back to the middle of the trunk and apply basic geometry.

On a smaller scale, notice what fungi grow where, and what the conditions are.

If your transect runs through land that was once under a glacier, you can observe which plants reclaimed the exposed land, in what order, and how quickly. Future researchers using your data will be able to build on it.

If your transect runs through a forest that has been logged, your data will help show where the forest is in its recovery. If you know when the forest was logged, you can begin to estimate how long recovery takes at that study site.



If your transect runs across a stream, look for changes in vegetation closer to the water. Do trees grow bigger when fertilized by otter poop and salmon carcasses dropped by bears and eagles?

Geology and Paleontology

Rocks, fossils, and glaciers are usually studied from point observations. Outcroppings and glaciers are where they are, and looking for them where they obviously are not is pointless. Some can be spotted on satellite imagery (Google Earth, Gaia GPS, and others) and you can lay a course right to them. Others you can infer from the topology like cut banks of rivers or marine shorelines. Most fossil hunting in Alaska happens on the beach at low tide.

Transect observations make sense when surveying a beach for residual oil from a past spill (like the Exxon Valdez in Prince William Sound) or gauging the effects of a past earthquake (like the 1964 Good Friday earthquake that raised parts of Montague Island 33 feet in a few seconds).

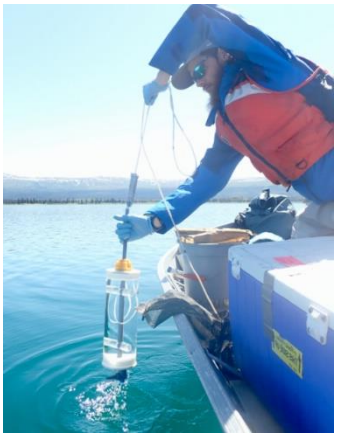
Fossils are invaluable data points, helping to date rocks and document changes to the Earth since the Paleozoic Era, about 550 million years ago. Fossils tell us there used to be palm trees in the Arctic and alga mats covering the North Pole. Alaska has an unbroken fossil record, but so much of it is still unread.

Glaciers in Alaska are one of the most visible indicators of climate change. Most glaciers are receding (those that aren't are thinning). How far and how quickly they are receding tells us a lot about how the Earth is changing. One way to measure and document the change is to go to a glacier with an old photograph, find the exact spot where it was taken, and take a new photograph, recording the GPS coordinates and the date.

The specialized tools you'll need for geology and paleontology include a rock pick, pry bar, sledgehammer, and chisel (we carry these on board). You may also want to bring a loupe (a jeweler's magnifying glass), a ceramic streak plate (the color of the rock's mark on the plate is a clue to its composition) and collecting bags.

A geologic map, showing the rock types and distributions spotted by earlier researchers (but not always accurate) is useful. Geologic maps are free online at https://macrostrat.org/. Definitely look at this map as part of your pre-expedition preparation.

Water Sampling



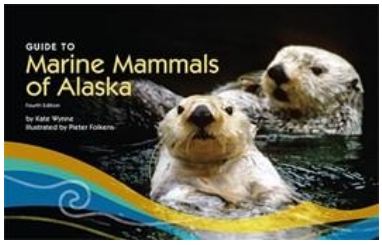
Whatever else you'll be observing for your portion of the benchmark study, you'll also be helping with water sampling. As benchmark data, what's in the water is extremely important: pollution is suspected in the decline of many species, including salmon and beluga whales. Unfortunately, the government agencies tasked with taking and logging water samples are understaffed and sampling in the Alaska wilderness isn't being done adequately.

We will be taking samples wherever we go. We will do some limited analysis on board, but we'll send off most of the samples to a laboratory for analysis. The data will be interpreted for us by one of our conservation partners and added to the state database. You can use the data and analysis in your paper.

Final Thought

Something happens when you begin to observe nature deliberately. You begin to understand how things work in nature and how they are interconnected, and the more you start to understand that, the more you realize how little any and all of us actually know. Only when deep water is clear can you begin to see the depths. For a curious mind, thoughtful observation leads to wonder and appreciation.

Field Guides, Checklists, Apps, and Sites



The field guides listed here are all recommended by one or more of our science advisors. You need to have at least one for your specialty. We keep some of these books on the *Endeavour* (ask us about a specific book you are interested in), but you'll probably want to find a copy long before you board. Check your library or visit the *books* page on the Alaska Endeavour website for affiliate links to Amazon. All the checklists are free to download from the *books* page of our website. Apps for your phone are available in your app store. Make certain it will work without internet access.

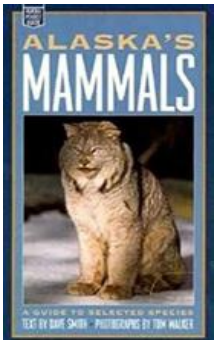
Marine and Riparian Mammals

Guide to Marine Mammals of Alaska 4th Edition - Kate Wynne; Pieter Folkens, illustrator (2013)

NOAA Checklist of Marine Mammals of Alaska

www.HappyWhale.com is currently tracking 40,000 humpback whales based on AI recognition of their flukes.

Land Mammals and Bats



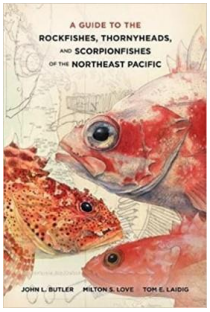
Alaska's Mammals: A Guide to Selected Specie - Dave Smith and Tom Walker (1995)

Recent Mammals of Alaska - Joseph A. Cook and Stephen O. MacDonald (2010)

Mammals of North America: Temperate and Arctic Regions - Adrian Forsyth (2006)

Checklist of Bat Species in Alaska

Fish and Marine Invertebrates



Guide to Northeast Pacific Rockfishes Genera Sebastes and Sebastolobus - Donald E. Kramer; Victoria M. O' Connell (1988)

A Guide to the Rockfishes, Thornyheads, and Scorpionfishes of the Northeast Pacific - John L. Butler, Milton S. Love, et al. (2012)

Field Guide to Common Marine Fishes and Invertebrates of Alaska - Susan C. Byersdorfer and Leslie J. Watson (2011)

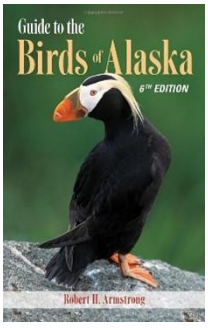
NOAA Checklist of Fish and Invertebrates

Birds and Terrestrial Invertebrates

Guide to the Birds of Alaska, 6th edition - Robert H. Armstrong and Nils Warnock (2015)

Sibley Birds West: Field Guide to Birds of Western North America - David Allen Sibley (2016)

The Sibley Guide to Bird Life & Behavior - David Allen Sibley (2001)



Birds of the North Gulf Coast - Prince William Sound Region, Alaska (Biological Papers of the University of Alaska, No. 14) - M. E. "Pete" Isleib and Brina Kessel (1989)

Common Marine Birds of Southeast Alaska, by ADF&G (2015)

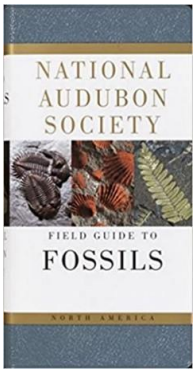
Insects of South-Central Alaska - Dominique M. Collet (2008)

Checklist of Alaska Birds, 29th edition – Alaska Checklist Committee (2023)

Alaska Department of Fish and Game Birding Website

Merlin Bird ID on the Apple app store, from Cornell Labs

Geology and Paleontology



The Field Guide to Alaska Rocks and Minerals - Dennis R. Garrett (2011)

National Audubon Society Field Guide to North American Fossils – NAS (1994)

Satellite Image Atlas of Glaciers of the World, Alaska - Molnia (2008)

Rockd on the Apple app store, from Macrostrat Lab, the Department of Geoscience, University of Wisconsin at Madison.

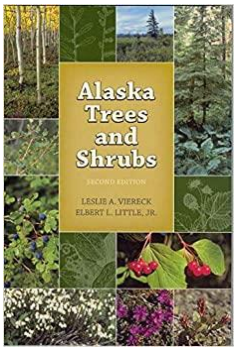
https://macrostrat.org/ are free online geologic maps, also from Macrostrat Lab, the Department of Geoscience, University of Wisconsin at Madison.

myFossil on the Apple and Android app stores and at https://www.myfossil.org/, from the University of Florida.

Rock Identifier on the Apple and Android app stores from Next Vision Service.

Botany and Mycology

Wildflowers and other Plant Life of the Kodiak Archipelago - Studebaker, Stacy (2010)



A Field Guide to Alaska Grasses, Skinner, et al (2012)

Alaska Trees and Shrubs, 2nd Edition - Viereck, Little (2007)

Plants of Coastal British Columbia: Including Washington, Oregon and Alaska - Pojar, MacKinnon, et al. (2016)

The Alaska-Yukon Wild Flowers Guide - White, Williams, et al. (1974)

Alaska's Mushrooms: A Practical Guide (Alaska Pocket Guide) – Parker (1994)

Alaska Trees and Shrubs – Viereck (2007)

Field Guide to Seaweeds of Alaska – Lindeberg, Lindstrom (2012)

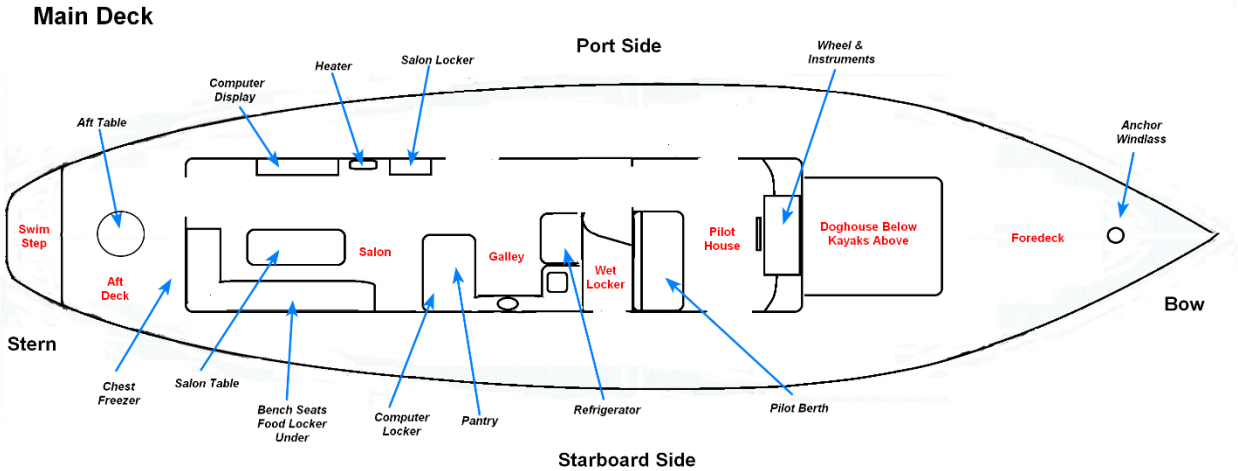
General

iNaturalist, available on the Apple app and Android stores and at https://www.inaturalist.org/, is a broad-spectrum app, covering most aspects of natural history.

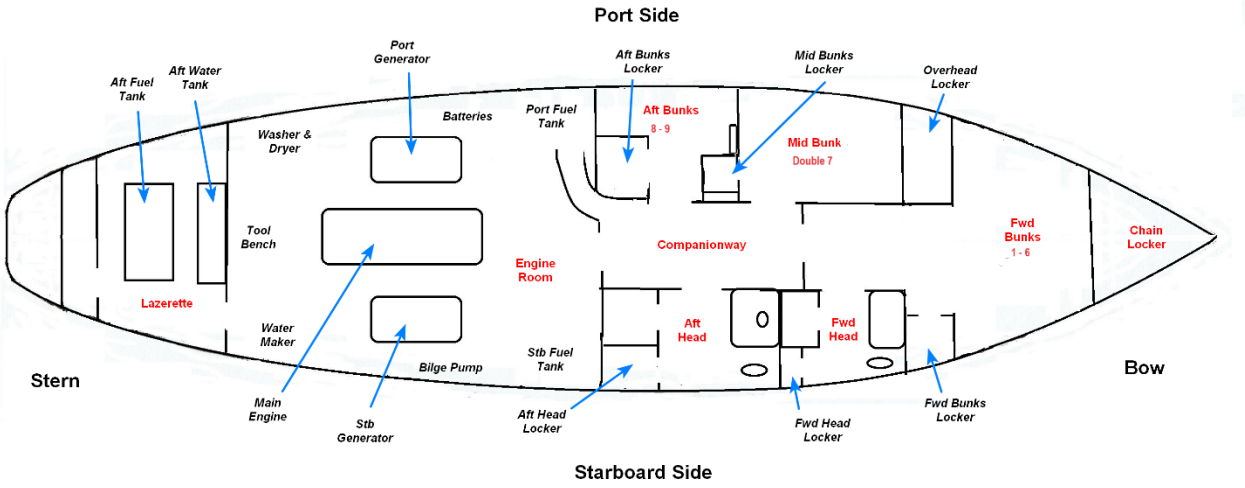
4 – Life Onboard

The Endeavour

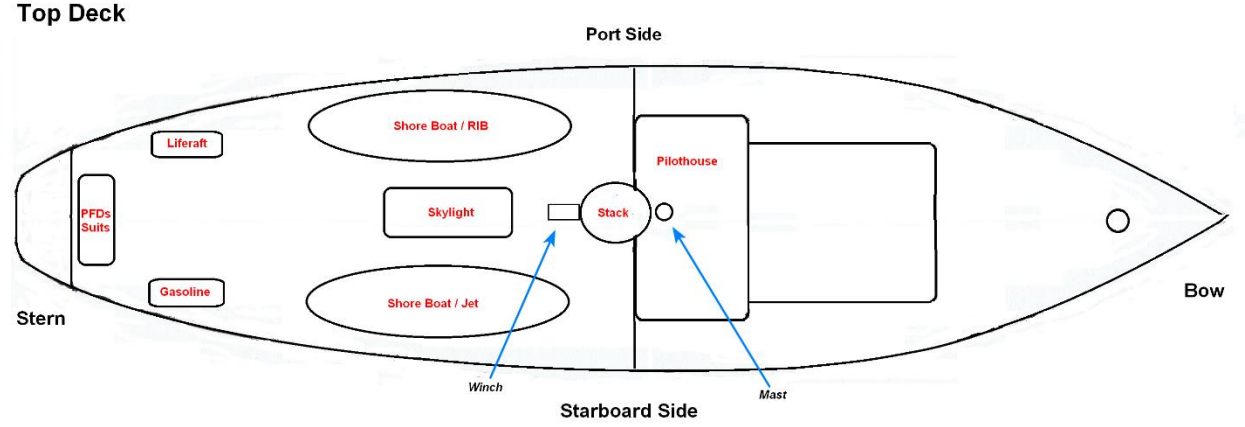
The *Endeavour* is a 72-foot-long former US Army T Boat, built in 1954 and later rebuilt and certified as a research vessel by the US Coast Guard. She sleeps ten comfortably and has two heads with showers, a washer-dryer, and a freshwater maker. She has all the required safety equipment and more. See our website for details on the ship and its equipment.



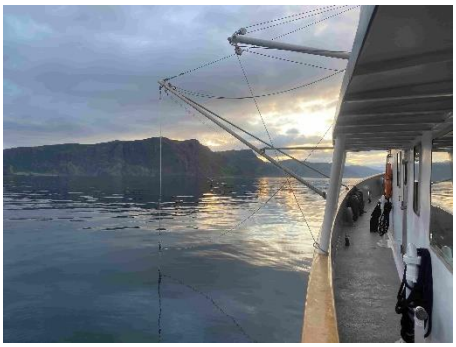
Lower Deck



Top Deck



Expected Weather



We expect the weather to be between 55 and 60 degrees during the day and 40 to 55 at night. Rain is always likely in maritime Alaska. We won't limit our shore operations on account of rain alone.

Wave and wind conditions can't be predicted with any reliability more than a week before, but we stay in port or at anchor in dangerous weather. Sea sickness is rarely a significant problem, but you are welcome to bring a sea sickness countermeasure, if you wish.

Boat Tasks

Students take on boat tasks in their teams of two, rotating tasks every three days. Sometime before the expedition, you will collectively decide which team will do which tasks on which days and fill out a duty roster.

Galley Team

Two students for meal preparation, cooking, dishwashing, and dish stowage. We have picked a meal plan from the *Endeavour Cookbook* and will have secured provisions before your arrival.

Deck Team

Two students for fenders, lines, help with shore boat handling (we teach basic knots) and policing the deck (we have a dog on board who poops on deck). The deck team will also be assigned maintenance tasks, depending on what needs to be done, which could include window cleaning and fresh water washdown when back in port.

Watch

Two students for weather, tide, and sunrise/sunset reports in the morning, standing watch in the pilot house (with the captain) while underway, clearing the salon of gear every evening, cleaning and restocking the heads, vacuuming, and writing the day's activities in the logbook. On the last day, the watch team is also responsible for getting written comments from everyone in the logbook and taking a final group photo. When back in port, the watch team also collects and clears all research gear.

On the first day the captain or crew will teach you how to do the tasks, and then you will teach your replacements on the next team rotation.

Cohabitating

Bunks and Stowage

There are three bunk rooms with nine bunks total. Each bunk has stowage underneath or nearby.

It is very important that you keep your personal and research gear stowed when not in use. Stow it on your bunk or in your drawer. Do not leave it in the common areas: not only is it in other people's way, but it's likely to get damaged and could become a hazard in an emergency.

Every bunk is numbered, 1 through 9. This number will identify your water bottle, towel, and any other item you wish to label. The faculty member will assign the bunks upon boarding.

Heads

There are two bathrooms (called *heads* on ships) with showers, both are gender-neutral.

Use fresh water sparingly. Two-minute showers, please. Never let the water run unused. This goes for the galley, also.

Marine toilets are delicate creatures. Do not put anything in them other than toilet paper and whatever organic matter came out of you. Absolutely nothing else or the unit will jam, and the captain will have to take it apart and clean it by hand, which he really doesn't like to do. If you are especially productive, flush halfway through. Be miserly with toilet paper.

You'll be able to shower every third day and do one load of laundry.

Boots and Wet Clothes

Rubber boots need to be kept outside. They can be stuck upside down in a rack under the aft deck table.

Wet clothes can be dried on a clothesline in the engine room: but stay out of the engine room when the main engine is running. If the engine is running, ask the crewperson to hang them up for you. If necessary, we can also run the clothes dryer.

The Galley

The galley team will keep snacks available. Otherwise, the refrigerator and pantries are not to be raided. The galley team is counting on certain ingredients being there. If you want something, ask the galley team.

Fishing

You are welcome to fish in your off-hours on the expedition but check with the captain first. We have all the fishing gear you will need on board. The captain or crew can show you how to troll for salmon or bottom fish for halibut and lingcod. You will need an Alaska fishing license, which are available online before you arrive.

You will be expected to clean whatever fish you catch. The captain or crew will show you how. We will probably eat your fish at one of our meals. It is impractical for you to take your catch home with you.

Downtime

There will likely be plenty of downtime while underway or at anchor in bad weather. Bring books, or make use of our onboard library (we have paper books and ebooks).

Ship Operations

You are welcome to shadow the captain on pre-startup inspection, start-up process, navigation, anchor deployment and retrieval, shut-down process, night inspection, and any other boat operations, if you are interested.

5 – Safety Protocols

The Expedition Mindset

The Expedition Mindset is a way of thinking that keeps you safe and effective outside of the protections of your normal life. Every explorer we know – in the forests, deserts, on the sea, under the sea, in the air, or in space – survives by these principles.

1. Understand the safety protocols. These are covered in the *Safety* chapter in this curriculum. You need to understand not only what they are, but why they are in place. You need to understand the potentially harmful or fatal consequences to yourself and others if you fail to heed safety protocols when in a remote area without immediate rescue services or nearby hospitals.
2. Understand your own limitations. You may be fit, quick, and smart, but over-confidence is the biggest risk in the wilderness. Anticipate trouble. This can mean stepping over a mossy rock and not on it to reduce the chance of slipping, wearing a life jacket even if you can swim, and bringing extra layers in your daypack that will keep you warm and dry when the weather changes.
3. Look out for the team. You need to look out for others as well as yourself. You don't have to be the one hurt or lost to ruin the expedition. Where are the others? What are they doing? What could go wrong? How are they (and you) doing in the close confines of the boat, and if friction or fear develops, what can you do to reduce it?

We will talk about the expedition mindset in the Orientation Meeting and more than once on the ship.

Boat Safety

Unsafe Areas and Times

When the boat is underway, do not go on the top deck, on the swim step, or in the engine room.

Fire

The risk of fire on the *Endeavour* is extremely low, given that it has a steel hull and runs on diesel, which does not give off flammable vapors as gasoline does and is almost impossible to light with a flame. All the same, we keep fire extinguishers throughout the boat, and we'll show you where they are and how to use them.

Lifejackets

Lifejackets keep you afloat if you fall in the water. Even if you are a good swimmer, you need the jacket; you could hit your head or be otherwise injured on the way in, and in any case, you don't want to be treading water until rescued.

We need to routinely wear lifejackets when we're using either of the shore boats (most dunkings happen when getting into and out of small boats) and when we're kayaking, or on the top deck or the swim step of the *Endeavour*. You do not need to wear a lifejacket on the main deck or inside the boat, unless told to do so by the captain. You will be shown where the lifejackets are when you first board. You'll try several one and the one that fits best will be yours for the rest of the expedition.

Shore Boats

The two shore boats are driven by outboard motors. Only the crew drives the shore boats. When getting in or out of a shore boat on shore, be prepared to stand in the water (which is why we wear tall rubber boots). Step carefully. Never jump into or out of a shore boat.

Kayaks and Canoes

When we are at anchor in protected water, you are welcome to use the *Endeavour's* kayaks and canoes, subject to clearance from the captain We will have one of the shore boats in the water to help you if you need it. A crew person will show you how to get in and out of the kayaks and canoe and how to paddle. Always wear your lifejacket and carry one of our waterproof walkie-talkies. Do not leave sight of the *Endeavour* without a crew person in a shore boat with you.

Survival Suits and the Life Raft

In the incredibly rare chance that the boat starts to sink, everyone will put on a survival suit – a big, loose, rubber suit with a hood with a light and a whistle attached. A survival suit can keep you alive for many hours in cold water that would otherwise kill you in fifteen minutes. These suits are buoyant, and you do not need to wear a life jacket when in a survival suit. If we don the survival suits, we will also launch the self-inflating life raft.

Shore Safety

Teams

When on shore we always travel with partners, either in twos or threes, as directed by the captain.

Communication

In any emergency, communication is essential. All student teams carry walkie talkies, as do the faculty member and both crew members. Calls are received and the nearest or most appropriate crew member or faculty will respond. When you board, we'll show you how to use the walkie talkies and how to keep them charged when on board.

Injuries

Walk thoughtfully! The most common injuries BY FAR are simple falls when stepping on logs and slippery rocks. Step over logs and rocks if you can, not on them. A fall can break your leg, arm, or ribs. A moment's carelessness can abort the expedition for you and the rest of the team. Don't be that person.

Wildlife

Respect the locals! Depending on where we are, there could be black bears, brown bears, moose, and wolves. Always travel with your partner(s) and carry the bear spray we issue to you when you board. Always check that one of your team has the walkie talkie. If there is fresh brown bear sign, an armed crewmember will accompany you. We will go into more detail on wildlife protocol when you are on board.

Emergencies

Definition

An emergency is when someone on board urgently needs help.

Lifesaving

When you board, we will teach you person-overboard procedures, which include using a 50-foot throwline and the locations of life rings (and another reminder of when you need to wear your life jacket).

First Aid

We carry an extensive first aid kit on board and both the captain and the crew member are first aid and CPR certified.

Physician Access

We have an account with an onshore medical team, which gives us access 24/7 to a doctor on our satellite text system.

Medivac

In dire emergencies, we can call in a medical helicopter or float plane to evacuate the patient from nearly anywhere to a hospital. We maintain medivac insurance to cover the cost of true emergencies.

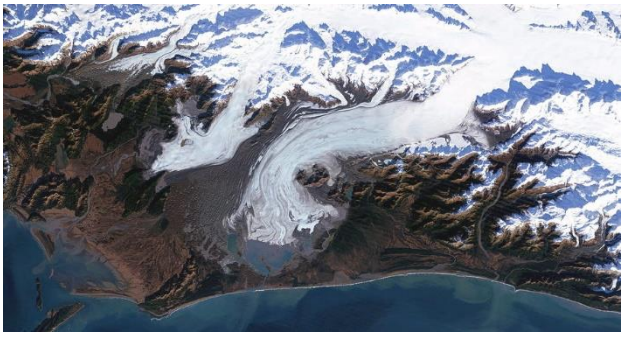
6 –Topic Briefs

Over the course of the expedition, we will cover a range of topics on natural history, human history, conservation, and things maritime. Based on what we are doing or seeing, the captain or crew will choose a topic and present it briefly (usually at lunch and dinner), and then invite discussion.

The topics include:

Natural History

- Geology
- Paleontology
- Glaciers
- Landforms
- Botany
- Birds
- Humpbacks
- Orcas
- Porpoises
- Sea Otters
- Salmon
- Bottom Fish
- Sharks
- Wolves
- Bears
- River Mammals
- Ungulates
- Pinnipeds



Human History

- Native Alaska History, from First Arrivals to Today
- Colonial Alaska History, from Russian, English, French, and Spanish, to American

Conservation

- Biodiversity
- Fishing

- Forestry
- Mining
- Eco-Tourism
- Conservation Successes in Alaska
- Conservation Failures in Alaska
- Conservation Challenges Today
- Engagement for Conservation
- The Importance of Wilderness

Maritime

- The *Endeavour*
- Tides and Currents
- Marine Weather
- Basic Knots

7 – Daily Schedule

Arrival Day

TBD	Students and Faculty arrive and board the *Endeavour*.
Next	Intros: captain, crew, students, faculty Bunk assignments and gear stowage (Crew and Faculty) Safety Briefing #1 (Captain & Crew) Itinerary discussion, w/chart (Captain)
Next	Get underway (time and weather permitting, else we wait until the next morning)
Next	While underway… Life On Board Briefing (Crew) Safety Briefing #2 (Crew) Boat Task Assignments – Galley, Deck, Watch (Crew) Boat Task Instruction (Captain & Crew) Watch Tasks (tides and weather) Deck Tasks (assist with departure) Galley Tasks (start preparing dinner)
1900	While underway … Dinner Discussion Topic (Captain & Crew) Galley clean-up (Galley Team)
2000	While underway… Evening Activity (Students and Faculty) Snack prep (Galley Team)
2100	Anchor (we prefer to anchor before dark) Anchor assist and deck patrol (Deck Team)
2200	In Bunks (all Students)

Travel Day Outbound

There may be one or two travel days, depending on the arrival time at the departure port, weather conditions, and the distance to the study site.

0600	Everyone Up Breakfast Prep (Galley Team) Collect Weather & Tide Data (Watch Team) Deck patrol (Deck Team)
0700	Breakfast
0730	Weather & Tide Report (Watch Team) Safety Quiz (Crew) Travel Plans (Captain)
0800	Anchor assist (Deck Team) Get Underway, stopping from time to time at places of interest
1200	Lunch, while underway (Galley Team) Discussion Topic (Captain or Crew)
1800	Dinner Prep (Galley Team)
1900	Dinner Discussion Topic (Captain or Crew)
2000	Evening Activity (Students and Faculty)
2100	Anchor: we prefer to anchor before dark Anchor assist and deck patrol (Deck Team)
2200	In Bunks (all Students)

Research Days at the Study Site

0600	Everyone Up Breakfast Prep (Galley Team) Collect Weather & Tide Data (Watch Team) Deck patrol (Deck Team)
0700	Breakfast
0730	Weather & Tide Report (Watch Team) Safety Quiz (Captain or Crew) Deployment Plans (Students, reviewed by Captain and Faculty)
0800	Go research
1200	Lunch (on board or on land, depending on conditions) Discussion Topic (Captain or Crew)
1300	Go research
1800	Return to Ship Dinner Prep (Galley Team)
1900	Dinner Discussion Topic (Captain or Crew)
1930	Day Reports (Students describe what they saw and did)
2000	Evening Activity (Students and Faculty)
2200	In Bunks (all Students)

Travel Day Inbound

Same as the travel day(s) at the start.

We typically arrive at the departure port in the evening of the day before departure unless the outgoing flight is very late in the day.

8 – Contacts

Contacts

Captain

Bill Urschel, Bill@AlaskaEndeavour.org, (907) 650-7149 (voice or text).

Expedition Manager

Stephanie Hayes, Expeditions@AlaskaEndeavour.org, (907) 202-1033

> *Email, voice, and text work on board during an expedition, but the crew may not receive or see a message until they return to the ship.*

A – The Study Site

Black Bay, Alaska

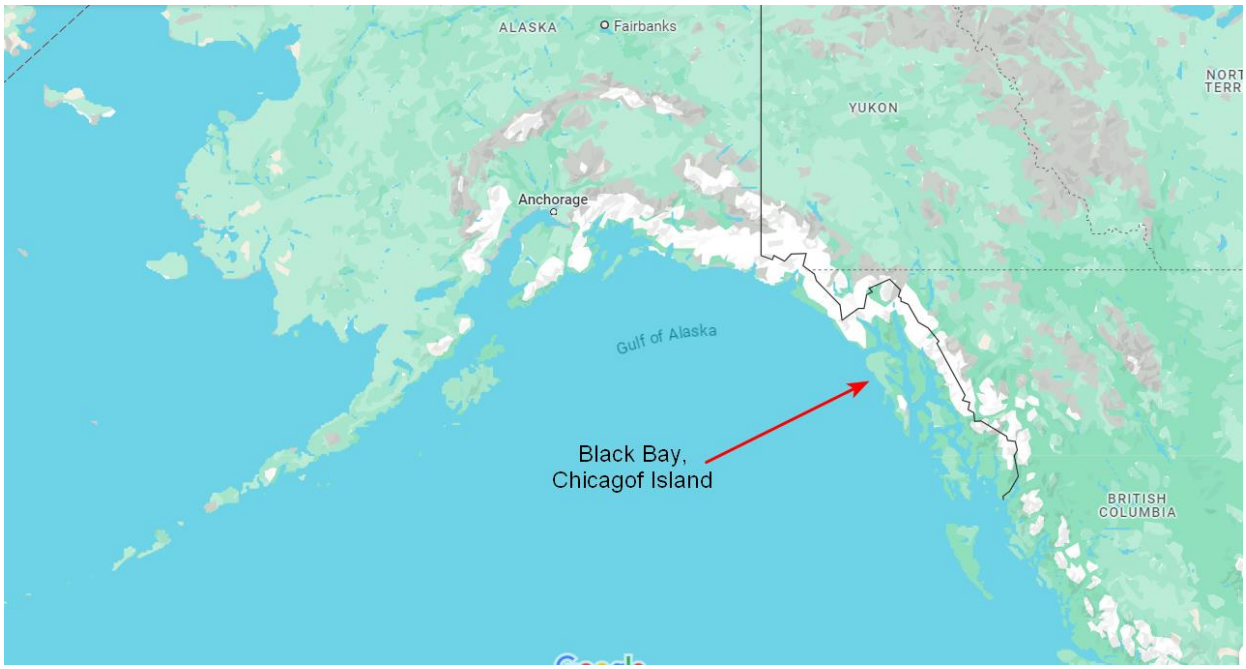
Description

For this expedition, we have chosen Black Bay as the study site.

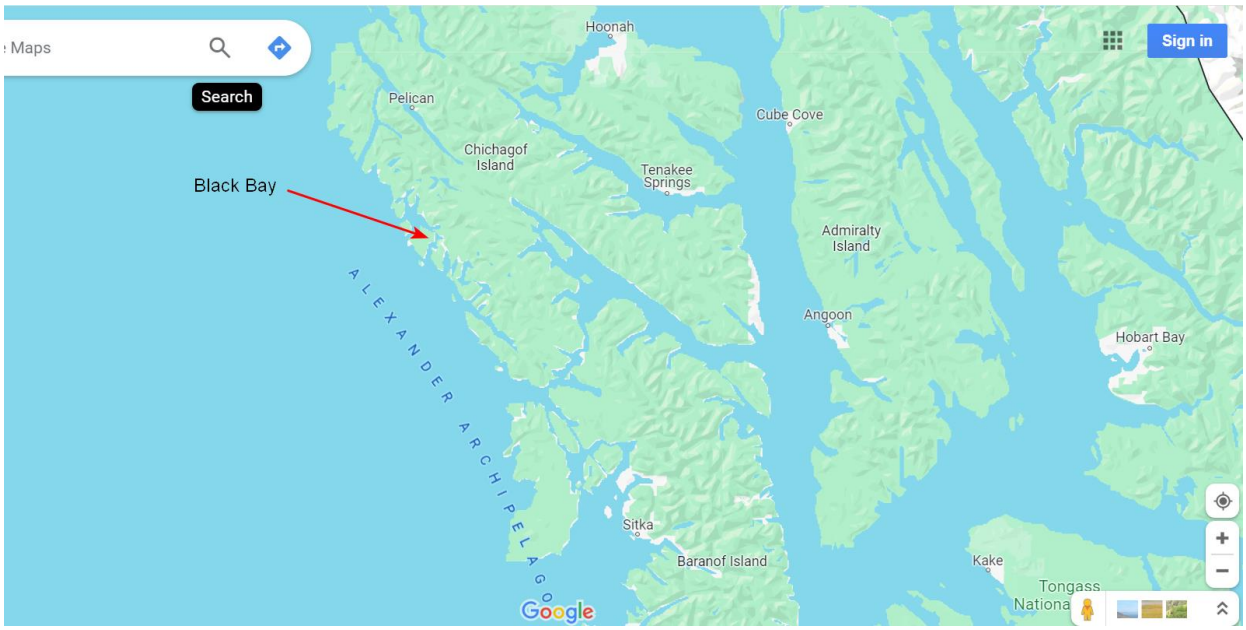
Black Bay is on Chichagof Island, in Southeast Alaska, at the coordinates 57.7101 -136.1328 (you can cut and paste these coordinates into Google Earth).

This land-locked and rarely visited bay has an astonishing array of wildlife – brown bears, Sitka blacktail deer, Steller sea lions, harbor seals, bald eagles, sand hill cranes, and salmon and rockfish.

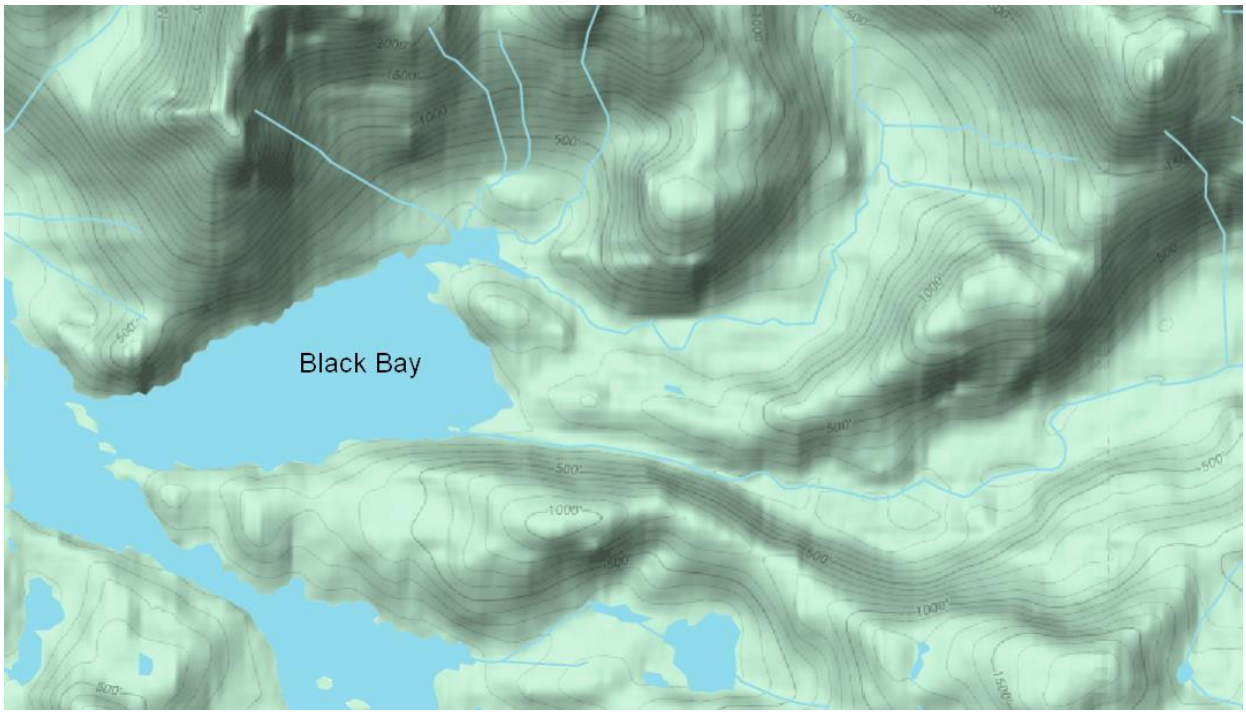
The entrance to the bay is just wide enough for the *Endeavour*. There is a mountain on the north side and a tidal flat with open grassland on the south side (which attracts deer and bear). Two creeks flow into the bay. The larger of the two is a salmon stream, meaning that at some point in the summer a large school of salmon congregate at the mouth and make their way upstream to spawn. In July of 2021 the *Endeavour* crew saw a large quantity of some sort of gas bubbling up from the bottom at the mouth of the stream: we have no explanation.



Black Bay on Chichagof Island is in Southeast Alaska.

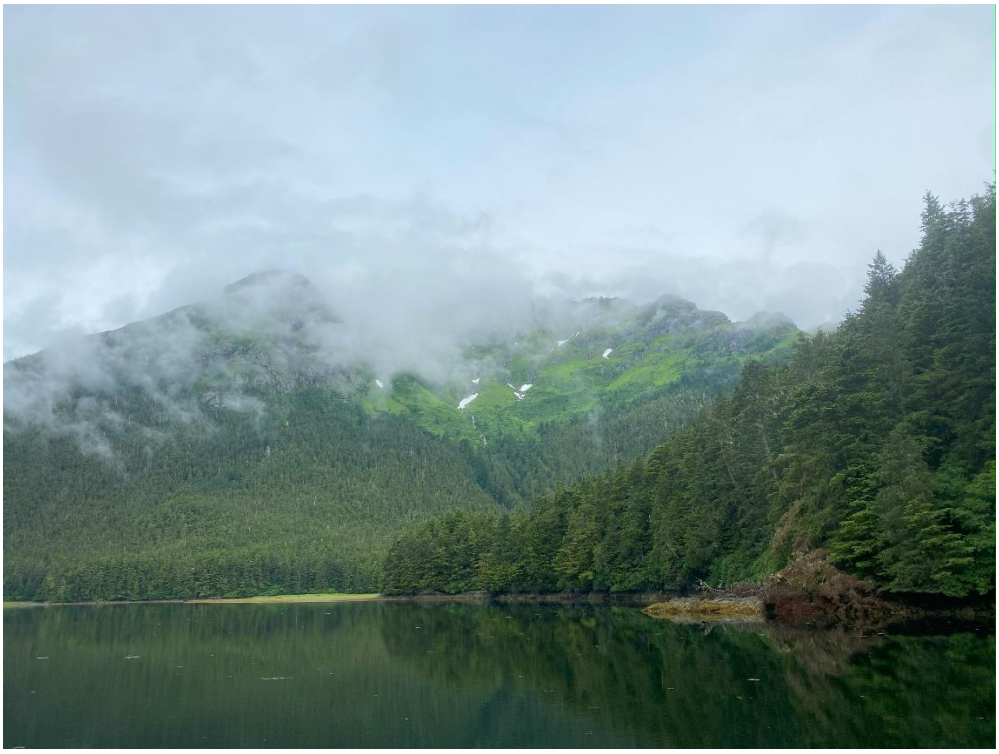


Black Bay is two easy days travel north from Sitka.



A mountain dominates the north side. Two large creeks enter from the east.

This satellite image shows the creeks and their grassy deltas.



View from the anchorage in Black Bay, looking north.

The grassy delta on the south side of Black Bay.

The *Endeavour* crew kayaking up the larger creek in July 2021.

Travel

The team will fly in and out of Sitka on Alaska Airlines.

It is a two-day cruise to Black Bay. The route north is very protected: north through Krestof Sound, Neva Strait, and Salsbury Sound, with stops in Ford Arm, Klag Bay (and its ghost town), and Kimsham Cove (with its gold mine) to Black Bay.

The route back south is on the outside of Kruzof Island (conditions permitting) where we may see humpback whales and orcas.

A – The Study Site

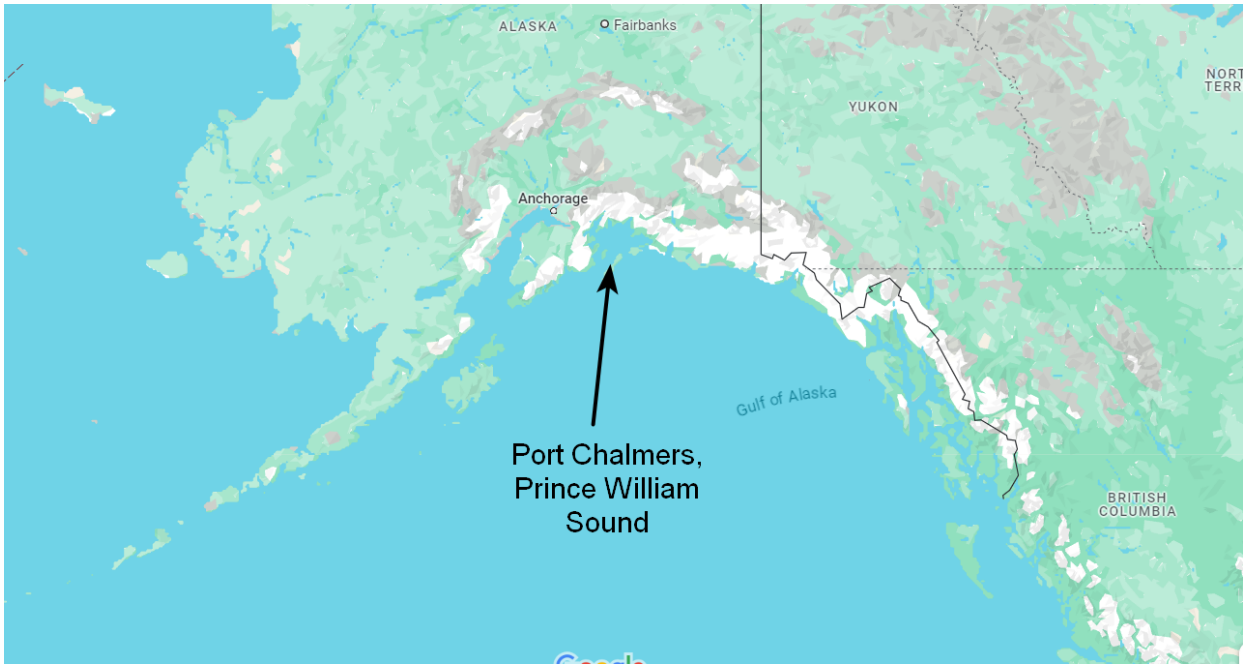
The Study Site

For this expedition, we have chosen Port Chalmers on Montague Island in Prince William Sound as the study site.

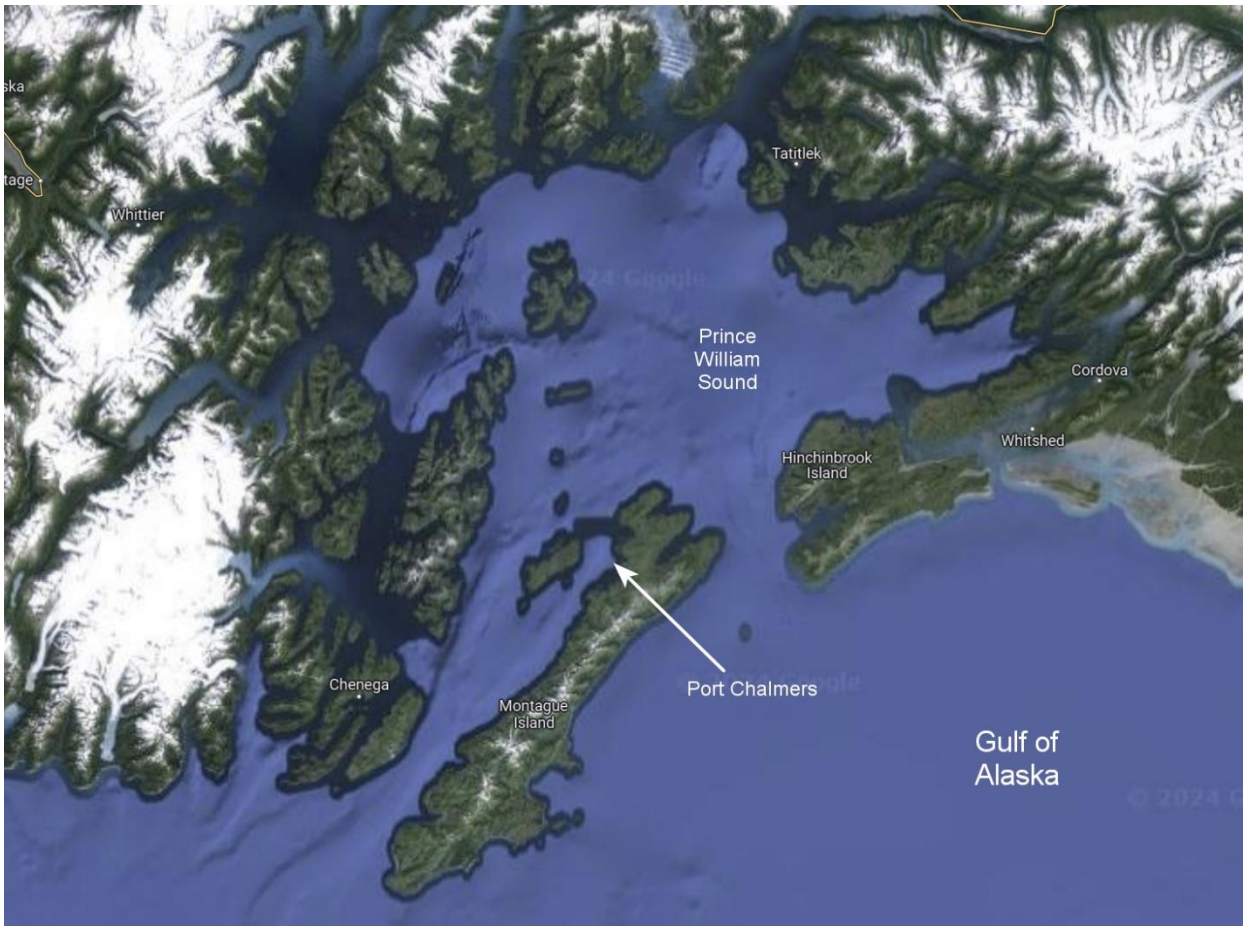
In Alaska, the terms "ports" and "harbors" do not imply any human presence. Port Chalmers is one of those. This well-protected anchorage is at the mouth of Chalmers River (really, a large creek) that leads back to a lake and then meanders up into the hills. It has runs of chum and pink salmon during the late summer. The land around the river is rolling hills, intermittently forested with spruce and hemlock, interspersed with grasslands and muskeg, easily walkable. Students can portage a canoe or kayak over the low hills and paddle down through the lake to the bay. The coast, generally, is shallow and rocky with some healthy kelp forests. The north side of Green Island, nearby, is a popular feeding area for humpbacks. The halibut and lingcod fishing is good. There are brown bears in the area, and moose.

Students will fly into and out of Cordova, on the east side of Prince William Sound.

For satellite imagery of Port Chalmers, type or cut and paste these coordinates into Google Earth: 60.2539 -147.1922



Port Chalmers is in Prince William Sound.



Port Chalmers is on the northwest shore of Montague Island in protected waters.

Travel To and From the Study Site

The flight details are being arranged by your faculty member.

The students and their faculty member will fly into Cordova and board the *Endeavour* in the harbor.

On our way to or from the study site, we will spend a few hours with the researchers at the Prince William Sound Science Center in Cordova, stop at Bligh Reef where the Exxon Valdez hit the rocks, and visit either Meares or Columbia glaciers.

Prince William Sound in general is generally calm, protected from the open ocean by a wall of islands. We anticipate good conditions.