Module 3: Training Curriculum for Instructors

Part A: Curriculum for Module 1: Mapping and Surveying Intertidal Habitats

Shorekeepers' Guide for Monitoring Intertidal Habitats of Canada's Pacific Waters

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

Module 3: Training Curriculum for Instructors

Part A: Curriculum for Module 1: Mapping and Surveying Intertidal Habitats

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Developed by:

Glen S. Jamieson[1]
Colin D. Levings[2]
Brian D. Smiley[3]

Written by:

James W. Baxter[4]
Linda M. Nichol[5]

[1]Fisheries and Oceans Canada, Science Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6
[2]Fisheries and Oceans Canada, Science, Branch, West Vancouver Laboratory, 4160 Marine Drive, Vancouver, B.C. V7V 1N6
[3]Fisheries and Oceans Canada, Science Branch, Institute of Ocean Sciences, Sidney, B.C. V8L 4B2
[4]BME Consulting, Box 181, Coal Harbour, B.C. V0N 1K0
[5]L. Nichol Ecological Consulting, 317 Irving Road, Victoria, B.C. V8S 4A1

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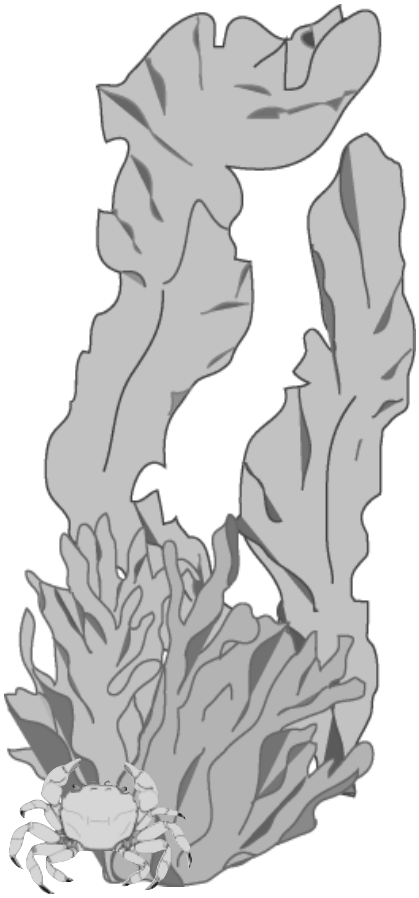
ABOUT SHOREKEEPER TRAINING

Part A of this Module of the Shorekeepers' Guide is intended as a curriculum for the Shorekeeper Surveying and Mapping course to train non-professional people to become fully-recognized Shorekeepers. A fully recognized Shorekeeper is defined as an individual who has successfully demonstrated mastery of the Learning Outcomes as detailed in this training Module. This criterion is established to ensure that the data collected by Shorekeepers are valid, reliable, and reproducible. The data will not only tell us about the shoreline of our coast but they will also form the basis of a great many scientific studies to come.

The training course also provides an opportunity for education. We train the Shorekeepers to be good technicians. We tell them why we are doing this data collection (i.e. we give them a context within which to work). But we also use the training to provide the trainees with a better understanding of their physical and biological environment. They become better observers, they grow in their appreciation of all the aspects of life, and they gain more knowledge upon which to make judgements and decisions regarding our environment.

Part A of this module is a companion document to Module 1: Mapping and Surveying Intertidal Habitats. It serves as a guidebook and provides a curriculum for instructors who are training Shorekeepers largely for the field work. It is a practical, hands-on training program, the majority of which will take place on the beach. There is, however, the requirement for a certain amount of theory and background knowledge.

The learning outcomes are geared to approximately the grade 10 level in regard to mathematic and scientific ability. The reading level of the materials, except for several technical terms, is at the grade 9 - 10 level. Participants are expected to be shoreline-wise regarding hazards, weather, tides, clothing, and safety. They are also expected to be able to take initiative on their own, to work unsupervised, to be able to read maps and reports, and to be reliable. They should also be prepared to purchase the equipment they need.



In terms of the approach to the training taken here, all concepts are taught from "common sense" perspective, and all techniques and requirements must include a "why" component. Participants are to be encouraged to question and engage in discussion. A thorough understanding of what they are doing and why they are doing it will maintain high interest on the part of the trainees and it will also lead to the quality of data collection required for success of the Shorekeepers' program.

Part A is divided into two sections. The first lists the expected Learning Outcomes. The second is a Course Outline and describes various approaches to achieving the expected Outcomes.

SECTION 1- LEARNING OUTCOMES

This section contains the curriculum. The outcomes are intended to be observable indicators of student learning and should act as a guide as to the intended scope of the course. All stated outcomes are examinable and the evaluation criteria for the outcomes are provided. The outcomes are not necessarily listed in the order in which they should be taught. Suggested teaching strategies and activities are given in the second part of this guide.

1. VOCABULARY

Define the following terms:

1.1	Alive
1.2	Animal
1.3	Attached plants and animals
1.4	Backshore Zone
1.5	Biodiversity
1.6	Chart Datum
1.7	Dead
1.8	Ecology
1.9	Elevation
1.10	Environmental Indicator
1.11	Exposure
1.12	Mobility category
1.13	Habitat
1.14	Habitat Type
1.15	Intertidal Zone
1.16	Inventory
1.17	Monitor
1.18	Motile
1.19	Organism
1.20	Plant
1.21	Quadrat
1.22	Shading
1.23	Slope
1.24	Species
1.25	Stabilization
1.26	Substrate
1.27	Survey
1.28	Transect
1.29	Water Retention
1.30	Zero Tide

Evaluation Criteria

- Correct definitions of 90% of the items.

2. INTRODUCTION

✓

Evaluation Criteria

- Correct responses to the items.

2.1 Define the role of *Fisheries and Oceans Canada* and the *Marine Environment and Habitat Science Division (MEHSD).*

2.2 Explain the role of a *Shorekeeper.*

2.3 Explain the purpose of collecting information about the plants and animals of the intertidal zone and the backshore.

2.4 Explain why it is important to have detailed and accurate data.

2.5 Describe briefly the seven tasks of doing a survey (see Module 1).

3. BEACH SAFETY AND ETIQUETTE

3.1 Describe and Demonstrate Compliance With the Rules of Common Beach Etiquette

✓

Evaluation Criteria

- Correctly states and complies with the items.

- Where to park.
- Don't drive on the beach.
- Get permission to cross private property.
- Get permission to be on beaches which are part of First Nation reserves.
- Leave your dog at home.
- Leave no trace behind except the permanent marker.
- If you lift something to look underneath it put it back.
- Fill in any holes you dig.
- Handle all animals gently and put them back where you got them.

3.2 Explain and Demonstrate Compliance With the Rules of Beach Safety

- Read tide tables and know the tides (times and heights).
- Never work alone.
- If your group is widely dispersed check in and out with the group leader.
- Avoid sunstroke and keep an eye on the water so as not to be swept away.
- Don't get lost.
- If you do get lost know what to do.
- Be bear and dog aware.

4. BIOLOGY

4.1 Define the major classifications of living organisms; differentiate among the major groups of living organisms; develop operational criteria for classifying organisms into these categories.

4.2 Define biodiversity; describe a shoreline in terms of its biodiversity; develop operational criteria for differentiating among various types of shorelines in terms of their biodiversity.

4.3 Define the term ecology; describe the ecology of the shoreline in terms of food webs and pyramids and plant and animal succession; compare the ecosystem of one type of shoreline with the ecosystem of another type; develop operational criteria for defining various types of shoreline ecosystems.

4.4 Identify local shoreline plants and animals in the field; use keys for identification of species.

✓

Evaluation Criteria

- Written responses indicate a working knowledge of the above items sufficient to understand the context in which the shorekeeper works.
- In the field correctly identify a minimum of 10 plant and 10 animal species using common knowledge and appropriate keys (See Suggested Reading List, Module 1).

5. FIELD TECHNIQUES

5.1 Use metric units of measurement in measuring lengths and area.

5.2 Measure distance by using a tape and a range finder.

5.3 Calculate the averages of several lengths.

5.4 Use a hand level, or the horizon to measure elevation change.

5.5 Use a clinometer, hand level, or horizon to measure slope.

5.6 Use tide tables and time of day to determine low tide height.

5.7 Use a compass to measure direction on a map and in the field.

5.8 Measure a compass bearing.

✓

Evaluation Criteria

- Measure 5% accuracy; calculate areas and averages correctly.
- Measure true direction and bearing within 5% accuracy.
- Transect data are recorded; measurement and calculated data is accurate to 5%; microclimate and substrate descriptions (does not require classification) are sufficient for understanding; species identification and count are sufficiently comprehensive, accurate and reliable to meet database requirements.

5.9 Use triangulation to determine location.

5.10 Conduct a transect from water level to the top of a backshore area, identifying the common plant and animal species, the substrate, and general micro-environment of each portion of the transect.

6. CHOOSE A STUDY AREA

✓

Evaluation Criteria

- Successfully completed.
- Demonstrates reasonable comprehension of issues and previous work.

6.1 Identify a site for study.

6.2 Demonstrate ability to contact the nearest DFO office and register the study.

6.3 Install permanent baseline triangulation markers.

6.4 Identify other studies that have been done in the area of the site.

6.5 Summarize reports of other studies and research done in the area of the site.

6.6 Identify current environmental issues, if any, affecting the study area.

7. MAPPING THE STUDY AREA

✓

Evaluation Criteria

- Obtain correct maps, charts, and photos (if available) of the study area; 100% accuracy in identifying chart and map names and codes; 90% accuracy in identifying features and symbols on maps and charts.

7.1 Obtain Maps, Charts, and Aerial Photographs

7.1.1 Identify the NTS Code and the Map Name for the area being studied.

7.1.2 Identify the Hydrographic Chart Code and Chart Name for the area being studied.

7.1.3 Interpret the information and symbols on the Topographic Map and on the Hydrographic Chart for the study.

7.1.4 From the Maps and Chart describe the study area.

7.2 Locate Study Area on Topographic Map and Hydrographic Chart

7.2.1 Identify and mark the borders of the study area on the topographic map and the hydrographic chart.

7.2.2 Establish the baseline reference points for the study area.

7.2.3 Use triangulation or compass bearing and range finder to determine the geographic location of the baseline reference points.

7.2.4 On the topographic map, determine and record the Easting values, Northing values, and UTM coordinates for the study area baseline reference points.

7.2.5 On the hydrographic chart determine and record the longitude and latitude of the study area baseline reference points.

✓ Evaluation Criteria

- Accurately marks reference point of study area on map and chart; 90% accuracy in determining Easting and Northing values, longitudes, latitudes, and UTM coordinates.

7.3 Map Study Area Using Global Positioning System (GPS) (optional)

7.3.1 Describe the principles of GPS operation and how it is used to determine position.

7.3.2 Describe the principles of Differential GPS and how differential corrections are determined.

7.3.3 Determine and record the GPS coordinates (including date and time) of the study area baseline point.

7.3.4 Store and save the GPS information.

✓ Evaluation Criteria

- Determine the GPS coordinates of the study area with 95% accuracy.

✔

Evaluation Criteria

- Creates an accurate and suitable sketch map of the study area and successfully completes **Form 1: Study Area Description.**

7.4 Create a Sketch Map of the Study Area and Describe the Area

7.4.1 Calculate the scale of the sketch map.

7.4.2 If appropriate, record prominent features in the study area on the sketch map and reference the features to the topographic map or chart with longitude/latitude, or UTM or GPS.

7.4.3 Complete a **Form 1: Study Area Description**.

8. IDENTIFY AND DOCUMENT HABITATS

8.1 Identify the backshore and intertidal zone boundaries of the study area.

8.2 Identify the separate habitat types in the backshore zone and the intertidal zone; assign each habitat unit a unique alpha-numeric identifier code.

8.3 Record the location and identification code of each habitat unit on the sketch map. Record the identification code of each habitat unit on **Form 3: Habitat Description.**

8.4 Determine and record the area of each habitat unit.

8.5 Determine and record the slope of each habitat unit.

8.6 Determine and record the elevation of each habitat unit.

✔

Evaluation Criteria

- 90% accuracy on each item.

9. SURVEY STUDY AREA FOR PLANTS AND ANIMALS

9.1 Identify and record the substrates (up to 3 substrate levels) for each quadrat.

9.2 Identify and record the plant and animal **mobility** categories for each substrate level in each quadrat.

9.3 Identify and record the plant and animal **species** for each substrate level in each quadrat.

9.4 Determine and record the plant and animal **abundance** for each substrate level in each quadrat.

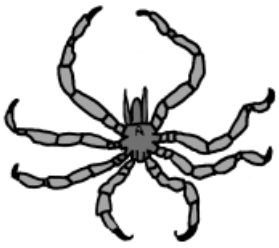
9.5 Describe the purpose and the correct way to make **notes** during the survey.

9.6 Demonstrate ability to make appropriate notes during a survey.

✓

Evaluation Criteria

- 90% accuracy on each item



SECTION 2 - COURSE OUTLINE

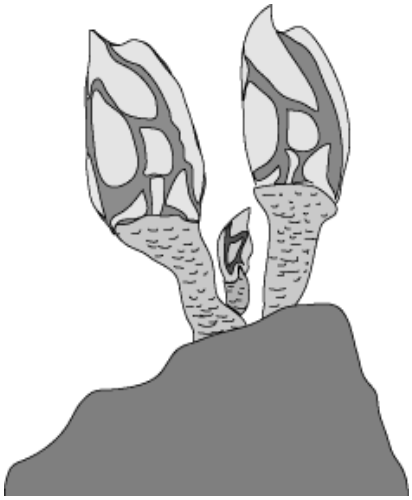
1. ABOUT THE COURSE OUTLINE

This is a GUIDE. Use it as you wish. It is simply one approach from one individual, but it does include comments from a variety of others.

The notes and suggested activities are listed in chronological order for the ideal teaching situation. However, weather and tides often have a tendency to over rule an instructor's sense of the ideal and scheduling will undoubtedly have to be improvised. Bad weather days present an excellent opportunity to do the classroom work.

Each section has a suggested time period required to achieve the outcomes. The times suggested here are estimates and are based on the assumption that there are no overall time limits. In fact, if you add up all the time suggestions they come to 27 hours: 4 to 5 full-time days. It is not likely that many groups will have that much training time available. You may have to cram the training into a couple days in some circumstances. This will of course necessitate the elimination of some of the learning outcomes and it is up to the instructor to determine what is disposable, depending on the group of trainees.

The suggested activities include a list of materials required and are referenced to the **Learning Outcomes** in Section 1. The same learning outcome may show up more than once. This is intended as the students perfect techniques and build new skills on top of old ones.



ABOUT THE TRAINING AREA

The training may occur on a demonstration beach that is convenient for the group. In this case the training is stand-alone and the trained Shorekeepers will then go off and survey some different area of interest to them. These notes are written with that case in mind. Alternatively the training may occur in an area which is to be studied anyway and the actual survey may be conducted through data collected in the course of the training program. In such cases the instructor will have to modify the directions somewhat.

"IN THE PARKING LOT"

Brief training sessions are indicated to occur "in the parking lot". This means a brief oral explanation given by the instructor before setting out onto the beach, usually held where the vehicles are parked or on the beach itself, if it is quiet and sheltered.

2. INTRODUCTION

Time Required
15 minutes maximum

Learning Outcomes
2.1-2.5

It is assumed that the participants have been advised beforehand what to wear and what to bring to the beach.

Start of Day 1, regardless of the weather, in the parking lot

Review the mandate of the DFO and of MEHSD within Fisheries and Oceans Canada. Refer to other agencies such as B.C. Ministry of Fisheries, Ministry of Environment, Lands and Parks, and the map people (i.e. how and where maps are made). Define what a Shorekeeper is and why the Shorekeepers' Guide was developed. Explain what data collection is, what the 7 tasks of the survey are and what happens to the data once they are submitted.

3. BEACH SAFETY AND ETIQUETTE

Time Required
15 minutes maximum

Learning Outcomes
3.1-3.2

Continuation of Day 1, on the beach

Explain the rules of Beach Etiquette- where to park; don't drive on the beach; get permission to cross private property; notify DFO Fisheries Office of sampling plan; get permission to be on beaches which are part of First Nation reserves; leave your dog at home; leave no trace behind except the permanent marker; if you lift something to look underneath it put it back; fill in any holes you dig; handle all animals gently and put them back where you got them.

Explain the rules of Beach Safety- know the tides (times and heights); never work alone; if your group is widely dispersed, check in and out with the group leader; avoid sunstroke and exercise caution around water; don't get lost; if you do get lost know what to do; be bear aware; keep track of the time.

Time Required
2 hours

Equipment & Supplies
- identiflcation keys
- note pads

Learning Outcomes
2.1-2.5; 4.5

4. SHORELINE PLANTS AND ANIMALS - PART I

Continuation of Day 1, on the beach

Conduct a tour of the intertidal and backshore zones to identify the major animal and plant species. This is a show and tell session. Have the participants write the common and proper names of the organisms in their note books. Give a brief life history of each species. Most likely the range of knowledge within the group about each animal and plant will vary from total ignorance to expert. Use the "experts" to teach the novices. Have everyone in the group share their knowledge, encourage them to ask questions, encourage them to ask about the relationships among the animals and plants, for example, what animals eat what. Slip in the terms *biodiversity* and *ecology.* Introduce the trainees to the use of keys for identification.

Time Required
1 hours

Learning Outcomes
2.1-2.5; 3.1-3.2;
6.1, 6.2

5. REVIEW OF POINTS 2 AND 3

First meeting in the classroom - Bad weather or after completing Point 3

Review the information in the first two activities at a more leisurely pace and in somewhat greater depth, to reinforce what they are doing. Show the video "Bear Aware" if available. Describe how to decide what to study, how to choose a study area, and why to register the study with DFO.

Time Required
3 hours

Equipment & Supplies
- assorted specimens
- diagram of the classification system

Learning Outcomes
4.1-4.4

6. BIOLOGY

This is a classroom-based unit intended as background for the Shorekeepers. It should be taught with awe and wonder. The learning outcomes emphasize "operational" definitions of the various concepts. These should be developed through group discussions. The introduction of "correct" or "scientific" or commonly accepted definitions must be done as a derivative from the group's definitions. Settle on definitions which are suitable to the purposes of the course.

NOTE: This unit is certainly not required for any trainees who have had Grade 12 Biology or above.

Classification of living organisms: The group may examine some specimens of various types of organisms and attempt to develop a classification system. As with the definition of "Life", a classification system will prove to be difficult because of the always present apparent exceptions. How does one come up with an operational classification of plant and animal when you consider the sponge and the proverbial Venus fly trap? Encourage debate and discussion but this exercise need not be belaboured before delving in to the accepted classification system from Kingdom to Species. The criteria for classification at each level can be explained as a matter of interest.

Biodiversity: This is a commonly heard term which often has more politics than substance. Discuss with the group what is meant by the term Biodiversity. Give some examples of areas having large biodiversity and areas having low biodiversity. Discuss the importance of having complex food webs with all trophic levels present. Discuss clear-cut forestry, agriculture, and aquaculture impacts in terms of biodiversity.

Ecology: Give a brief lecture on Ecology, comparing, for instance, one type of intertidal ecosystem with another. This is not an academic first year biology credit course so the material must remain as fairly general background information. It is suggested that this topic be revisited after completion of the transect (see 8. Conduct a Transect). At that time the participants will be more familiar with intertidal plants and animals. The adaptations of plants and animals to their micro-environment and their interaction with each other will have a bit more meaning.

Time Required
2 hours

Equipment & Supplies
- identification keys
- note pads

Learning Outcomes
4.5; 9.5

7. SHORELINE PLANTS AND ANIMALS - PART II

On the beach - Plant and animal identification

See 3. Shoreline Plants and Animals above. Emphasize the use of keys for identification. Have the participants work in pairs and identify the organisms on a stretch of beach. Have the pairs of participants compare their results with another pair and resolve the differences.

8. CONDUCT A TRANSECT

Time Required
3 hours

Equipment & Supplies
- string or rope
- short measuring tape
- identification keys
- quadrat

Learning Outcomes
5.10, 5.11

Have the participants in small groups of 2-4, conduct their first survey. Participants will string a line from the low tide level to the upper boundary of the backshore zone. They will follow the line and at equal intervals, say 5 metres, record the substrate and identify the animals and plants present within a *quadrat* of 1-metre diameter (the size of the quadrat doesn't have to be all that accurate- hula hoops used to be great for this sort of thing). They should attempt also to describe the organisms' physical characteristics in terms of the environment in the immediate vicinity. This will emphasize the organisms' adaption to their surroundings.

In the parking lot

Describe the transect technique to be used. Review what and how data are to be recorded. Introduce the substrate classifications. This part proves to be difficult when dealing with a sand-pebble-cobble mix. This mixture tends to be quite variable and patchy. It would be good to walk some of this beach and discuss how to handle it.

On the beach: Conduct the transect.

At home: Complete the Transect Report. You may choose **Form 3** in **Module 1,** or create your own data sheet for this exercise.

NOTE: The Shorekeepers' training is a certification process and the certification standards must be met. The ability to survey a transect acts as a screening device. If the participants demonstrate that they can reliably identify organisms, can code, can adequately describe physical characteristics of organisms, can record substrate and can draw reasonable conclusions about organism adaption to environment, and the trainees demonstrate a suitable level of literacy, then they can be trained as Shorekeepers. If at this point, however, they cannot demonstrate these skills, they will likely not be certifiable as Shorekeepers and should not continue the training.

9. FIELD TECHNIQUES - MEASUREMENT

Time Required
30 minutes

It is assumed that the participants can use the metric system to measure distance. However, the degree of accuracy or the mathematical ability of the participants may vary widely within a group. It is therefore important to review this material and ensure that everyone can, in fact, work comfortably with this measurement system.

In the parking lot - Use of Tapes

Review the markings on long and short tapes; demonstrate how to measure and record short lengths and long distances in the metric system (with particular attention to the use of decimal places); describe how to get a sense of the accuracy of the measurement -- this is an informal way of dealing with the very important concepts of uncertainty and significant figures. The data collection will not include the $\pm$ values but the appropriate number of significant figures for all measurements will be incorporated into the data fields.

Time Required
2 hours

In the parking lot - Use of Range Finder

Demonstrate how to use a range finder. The participants must be able to determine the accuracy of the device and to record the correct number of significant figures.

Equipment & Supplies
- rulers
- tapes
- range finders
- note pads
- calculators

On the beach - Measurement of Length and Distance

The participants, working in pairs, can use a ruler to measure short lengths such as the diameter of a sanddollar, the length of a stick, etc. They can also measure distances, such as the distance between two features using a long tape. In all cases they should estimate the degree of accuracy and record their measurements using the correct number of significant figures. Each member of the pair can record their own measurements and then compare with their partner. They should work out their differences on the spot.

Have every pair independently measure the same distance. These data will be used back in the classroom.

Learning Outcomes
5.1-5.2

Have every pair independently measure the "length" of a log (which has at least one irregular shaped end). Each pair of participants will have to define what they mean by the length for the purposes of their measurements. Again, these data will be used later in the class.

On the beach - Use of Range Finder (if available)

Give the participants practice using a range finder. Participants should compare their readings with each other, maybe in groups of four, and train themselves independently as a group to come up with reliable measurements with the correct degree of accuracy (try for 1%) and reliability.

In the classroom

Time Required
1.5 hours

Learning Outcomes
5.1-5.3

Review millimetres, centimetres, metres, and kilometres. Review uncertainty (or accuracy), and significant figures. Display the results each group got when they measured the same distance or length of log. Use these data to calculate averages. Review the concept of averages and when and how to calculate them. Emphasize that when using a calculator or doing arithmetic the participants should check that their answers are reasonable. Continuously reinforce the need for reliability in data collection.

An optional exercise

Later on, when the participants are familiar with the use of topographic maps and hydrographic charts, they can measure the distance between two features on the map or chart (even better, compare a map and chart of the same area in regard to the same feature). After determining the distance, they can go and measure the distance in actuality and compare the map (chart) value with the actual value. This can lead to insight into the actual accuracy of the maps and charts.

10. FIELD TECHNIQUES - ELEVATION AND SLOPE

It is necessary to know the elevation and slope of the various habitats. This section uses the terms **elevation, elevation change,** and **slope**. It is important to ensure the participants distinguish among the terms and realize that they can also use some of them to calculate others. It might be advisable to have a bit of classroom time on this prior to the field work. But if that is not possible the essentials can be covered in the wind and rain in the parking lot.

In the parking lot - Use of clinometer, hand level, and the Horizon Method

Time Required
30 minutes

Demonstrate how a clinometer is useful to estimate slope. Demonstrate the Horizon Method and the hand level method to determine elevation and to calculate slope. The participants must be able to determine the accuracy of the device and to record the correct number of significant figures.

Also briefly review the use of tide tables to calculate absolute elevation.

On the beach - Use clinometer, hand level, and the Horizon Method

Time Required
1 hour

Equipment & Supplies

- clinometers
- hand level
- 3- to 4-m surveying stake
- tapes or range finders
- notepads

Learning Outcomes
5.4, 5.5

Give the participants practice using a hand level and the Horizon Method to measure elevation and to calculate slope. Participants should compare their readings with each other, maybe in groups of four, and train themselves independently as a group to come up with reliable measurements with the correct degree of accuracy (try for 1%) and reliability. Actual calculations of slope will be done in the classroom. Similarly, give them practice using the clinometer to measure slope.

If the water is fairly calm, have the participants establish a reference point near the high tide mark if possible, and measure the elevation change between the water level at low tide and the reference point. If they cannot do this exactly at the time of low tide then they should record the time as they will have to do some further calculations back in the class.

Time Required
1-1.5 hours

Equipment & Supplies
- tan tables
- tide tables
- calculators
- notepad

Learning Outcomes
5.5, 5.6

In the Classroom

Briefly explain the theory of Tan tables and demonstrate how to use the tables to calculate elevation above chart datum from the data collected using the hand level or the Horizon Method.

11. FIELD TECHNIQUES - DIRECTION

As with length and distance measurement, the ability of the trainees to do compass work will vary widely within a group. It is important to cover this material thoroughly and ensure that the participants can work comfortably with direction.

In the parking lot - Use of Compasses

Time Required
20-30 minutes

Review the markings on a compass; demonstrate how to take a bearing (with normal precautions against errors due to close-by magnetic interference) and how to correct for declination (use the **"T" and "M" Method**, see below); describe how to determine the accuracy of the measurement and how to record bearings with the correct number of significant figures. Demonstrate how to sight along a bearing (given a true bearing). Explain how to determine position from triangulation. Four bearings are better than three. Never use just two.

"T" and "M" Method: If you take a bearing off a landmark with a compass that is not corrected for declination, you are measuring Magnetic north. When you go to plot this bearing on your map or chart, the grid lines on your map run True north to south. On Canada's Pacific coast, you have to add the declination. A trick to remembering whether to add or subtract the declination, is that you are going forward in the alphabet from M to T.

But, if you take a bearing off a map then this is in relation to True north. Now when you try to set your course in the real world with this bearing you must first convert to Magnetic north. On Canada's Pacific coast, you must subtract the declination. To help remember to substract, remember you are going backwards in the alphabet from T to M.

On the beach - Use of Compasses

The participants will work in groups of four and measure several bearings from a fixed point. Each member of the group should record their measurements independently, convert to true readings and, after everyone is done, compare their results with each other. Differences should be resolved on the spot. Encourage the group members to help each other.

Each group can then establish a fixed reference point. The participants will geo-reference this point through triangulation. From the point take bearings of at least three different prominent features that will be displayed on a chart or map of the area (navigation markers are good). Two groups can exchange points and triangulate the second point. They can then compare their readings. Emphasize the importance of accuracy. These data will be used in the classroom.

Time Required
2 hours

Equipment & Supplies
- tapes
- compasses
- calculators
- notepads
- flagging tape

Learning Outcomes
5.7-5.9

12. CHARTS AND MAPS

In the classroom

Review compass use and magnetic versus true readings. Review uncertainty (or accuracy), and significant figures in compass measurement.

Introduce hydrographic charts and topographic maps of the area where the students have been working. Review the NTS Codes and how to determine the correct code of an area. Similarly, review the Hydrographic Chart Code system. Review the symbols. Explain map direction and the compensation for declination; explain the scale and have the participants convert various lengths on the maps to actual distances. Have the participants determine the bearings of various points on the map or chart from a fixed point. From a fixed point have the trainees locate another point when given the distance and bearing.

From the triangulation data each group collected, have them locate their reference point.

Have the participants sketch a large-scale map of the area they worked at, drawing from the topographical map or chart (alternatively, use a copier to blow up the part of the map that covers where they worked). The sketch need not have any detail, the important thing is for the trainees to be able to develop a useable scale, locate North, and locate their reference point.

Time Required
2 hours

Equipment & Supplies
- charts and topographic maps- enough for every pair of trainees
- rulers
- dividers
- calculators

Learning Outcomes
7.1.1-7.1.4, 5.4, 5.5, 7.2.3

13. USE OF DIFFERENTIAL GLOBAL POSITIONING SYSTEM (OPTIONAL)

The use of DGPS is optional but it will become much more common in the upcoming years. It is recommended that GPS be reviewed, if access to a DGPS is available. This is not a GPS course, however, and the trainer will have to use discretion in determining how much to go into this topic.

Time Required
20-30 minutes

In the classroom or in the parking lot

Describe the principles of GPS and how it is used. Explain how differential corrections are made. Demonstrate how to set up a GPS device and how to measure the GPS coordinates of a spot and how to record the time of day, date, and GPS readings. Proper maintenance and set up procedures cannot be over emphasized.

Time Required
1 hour

On the beach

Have the participants determine and record the GPS coordinates of several spots on a beach (or in a field, for that matter). Participants can work in pairs if enough devices are available. Groups that measured from the same spots can compare their data and try to resolve differences.

Equipment & Supplies
- portable DGPS
- note pads

Learning Outcomes
7.3

14. CHOOSING A STUDY AREA

In the classroom

Review individual reasons for doing a beach survey; review how to choose an appropriate study site; review how to register a study with DFO. Describe how to obtain information about other studies which have been done on the area and how to identify current environmental issues, if any, which affect the study area. Provide some newspaper clippings on a beach area which discuss environmental issues or provide some previous studies for an area and help the participants identify how this information impacts what they may do in their own study.

Time Required
1 hours

Learning Outcomes
6.1-6.6, 7.1-7.2

15. LAYOUT OF STUDY AREA, QUADRATS, AND SKETCH MAP

The sketch map forms part of the data base for the study area. The sketch will be scanned into the data base as a visual image and will be linked through the baseline reference point to the topographic map and/or hydrographic chart of the area.

The sketch must use as accurate a scale as possible and include the main reference features of the area. (e.g., buildings, roads, large rocks, creeks, etc.).

The method for recording the layout of the study area uses distance measures along two coordinates. A baseline is established with one end being the "baseline reference point." Any point is referenced by its *x* and *y* coordinates relative to the baseline. Shorekeepers must take care in measuring perpendicularly from the baseline.

In an actual survey, most of the data will be entered onto the forms on site, and will not be re-copied later. But, in the case of the sketch map, most Shorekeepers will want to re-do it at home as it will be scanned into the data base.

In the parking lot

Time Required
30 hours

Cover the essentials in laying out the study area and in creating a sketch map. Emphasize the importance of identifying north, of locating the baseline reference point on the map, and of noting the coordinates of the major reference features relative to the baseline.

Note: It is important to identify in the field notes where exactly on a major feature the coordinate distances are measured to. If the participants are to be working in non-inhabited areas, it may be important that they establish a fixed marker on their site for future reference. Demonstrate installation of a permanent marker.

Review the identification of habitat units and their boundaries. Review the layout of the transect lines in the habitat units, and of the quadrats on the transect lines.

Review the essentials of measurement accuracy. Measurements should be recorded only to the nearest 10 cm. Explain why we don't record these measurements to the nearest millimetre, i.e., it is too precise for the scale in which we are working.

Time Required
2 hours

Equipment & Supplies
- rulers
- tapes
- range finders
- calculators
- note pads
- flagging tape or flags
- sketch map forms
- baseline rope marked in 2 m intervals

Learning Outcomes
7.4.1-7.4.3

On the beach

The participants can work in pairs. Give each pair 2 or 3 copies of the sketch map grid. They should establish a base-line reference point and from that establish a baseline and the boundaries of their "study area." The baseline reference point should be located from a chart or map if an appropriate feature is marked.

They should then plot the main features on the sketch by measuring the coordinates relative to the baseline. (The "grid" method described in Module 1 is easy and accurate.) This should include the edges of the intertidal and backshore zones, water's edge, and coordinates for the various habitat units in their study area. This will include the boundaries of the units, their shapes and dimensions, choosing several points on the periphery of the unit and measuring their *x y* coordinates. Next, they should determine the dimensions of the study area and set an appropriate scale for the sketch.

At home: Re-do the sketch map to a standard suitable for scanning.

16. IDENTIFY HABITAT UNITS

The whole shorekeeper survey revolves around the habitat unit. It is necessary that the participants have a good grasp of identifying the various habitat units in a study area. However, this is not an exact science and a fair bit of the process is a subjective judgement call.

The first step is to identify the backshore zone. This zone is clearly defined in the Module 1. The second step is to identify the habitat units. This identification is based on the substrate and plant species abundant. The important point here is to have the group collectively define these units on the beach and to agree on the boundaries of each unit.

In the parking lot - Review the 19 Habitat Types and the 13 different substrate classifications

Go over the photographs showing the different habitat types.

Time Required
15 minutes

On the beach - Identify habitat units

Pick a beach with a variety of habitat types. The cobble-sandy-muddy type of mixture is a difficult distinction and must be included. With the whole group identify 2-3 separate units and get agreement on their individual boundaries. Note that a habitat unit must have an minimum area of 25 square metres. Go into some detail on defining the boundary of a unit by choosing several points around the outside of the unit. These points will be located relative to the baseline in the next section. You might put some painted rocks or flags at the several points around the unit to mark it. Also discuss the area of the unit and how it might be measured.

Time Required
2 hours

Equipment & Supplies
- flagging tape
- small traffic cones or brightly painted rocks

Learning Outcomes
8.1, 8.2, 8.3, 8.4

Have the participants break into groups and identify several other habitat units and mark them. Units will have to be identified. Have participants code each habitat unit, using the codes and definitions given in Module 1.

17. CONDUCT A SURVEY

By this stage of the training, the participants should have mastered all the skills required for a comprehensive survey; they will have, in fact, carried out most of the tasks but not all at once. Here it is put together. The instructor will have to use discretion in determining whether or not the partiticpants need a lot more step-by-step instruction or are able to carry on with a lot of independence.

The participants should conduct an actual survey as part of this training.

In the classroom

Time Required
2 hours

Introduce the participants to the **Form 1: Study Area Description,** and **Form 2: Survey Description**, and go over each data field, explaining what is required.

Introduce the participants to **Form 3: Habitat Description**, and go over each data field, explaining what is required. Emphasize the need for a new form for each habitat unit. Explain all codes and how to fill in the form suitably for data entry.

Review how to establish locations for quadrats and how to survey the animals and plants.

Time Required
4-6 hours

Equipment & Supplies

- rulers
- tapes
- range finders
- calculators
- note pads
- flagging tape or flags
- sketch map forms
- baseline rope marked in 2-m intervals
- quadrats
- sieves
- buckets
- trowels
- slope measuring devices
- elevation measuring devices

(Refer to Module 1)

Learning Outcomes
8.1-8.6, 9.1-9.6

In the parking lot

Go over the step-by-step procedures below.

- Layout a baseline.
- Locate the baseline end point by triangulation, GPS or other method.
- Record essential data for **Form 1: Study Area Description**, and **Form 2: Survey Description**.
- Identify the backshore and intertidal boundary.
- Identify the habitat units.
- Collect data for the sketch map.
- Collect the data required to determine elevation of each habitat unit above chart datum.
- Measure the slope of each habitat unit.
- Lay out the quadrats and give each quadrat a unique identifier.
- Identify the substrate level in quadrats.
- Identify the plants and animals and estimate their abundance.

On the beach

Conduct a survey