NEWFOUNDLAND AND LABRADOR SEARCH AND RESCUE ASSOCIATION

SEARCHER II
LESSON PLANS

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GENERAL

This classification shall apply to all members of a search team who have successfully completed Searcher I and who desire to upgrade their skill level to that of a regular searcher. Successful candidates will be trained to work under a search manager or a senior searcher and will be capable of carrying out the duties and responsibilities of a regular searcher with a high degree of accuracy and confidence. The candidate will perform these duties without endangering themselves or other members of their team.

PREREQUISITES

Successful completion of Searcher I.

TRAINING MATERIALS REQUIRED

1:50000 Topographic Maps
Compass (Preferably Silva Ranger)
Douglas Protractor – Combined Parallel Rule (Template in BLM)
Pencil and Notepad
GPS (Lowrance)

Obj. 1

MAP READING AND CHARTING

Map skills are not optional for searchers. All searchers <u>MUST</u> be able to use maps easily and effectively.

Obj 1.1

TOPOGRAPHIC MAPS

- A MAP is a pictorial representation of a portion of the earth's surface.
- Many types of maps exist but for our purposes, they can be divided into two main categories:
  1. Those that, record to scale, natural and man-made features, such as;
     - **<u>Atlas Maps</u>** – very small scale maps showing whole countries, continents or even the whole world on one sheet. Hey may show major geographical or political boundaries but cannot be used for map reading due to their small scale.
     - **<u>Topographical Maps</u>** – used primarily for map reading. They show as much detail as their scale allows, the physical features of the land. Their purpose is to present a complete and accurate picture of the ground as it exists.
     - **<u>Plans</u>** – very large scale maps drawn in great detail. A plan covers so small an area that they are of little use except for special operations.
  2. Those that record and display other types of information in various ways, such as;
     - **<u>Relief Map</u>** – solid maps built as an actual model of the ground. They may be of any scale, are bulky and expensive. May be used in the planning and preparation of special operations.
     - **<u>Road Maps</u>** – intended only for use in road connection. Roads are printed to stand out clearly but they contain very little topographic detail.
     - **<u>Photo Maps</u>** – produced by making a mosaic of vertical airphotos so as to completely cover an area to be mapped. They will show everything that is on the ground, however, they require experience in airphoto interpretation. They are also expensive and time consuming to construct.

- The most useful and commonly used map by the searcher is the ***TOPOGRAPHIC MAP,*** which can be defined as:
  - *A two dimensional representation of the three dimensional configuration of a land surface.*

Obj. 1.2

- **Advantages Of A Topographic Map:**
  - Represent physical features of the earth's surface without distortion.
  - Made to scale which means there is a ratio of a distance on the map to the actual distance on the ground.
  - Provide a base of all SAR activities.
  - Have grids which allow the searcher to describe a point on a map with great accuracy.
  - Provide a wealth of information about a particular location.

- **Disadvantages Of A Topographic Map:**
  - The most commonly available topographic map is the 1:50,000 scale. This means that 2 cm on the map equals 1km on the ground. Most ground searches would correspond to a very small section of a map.
  - Difficult to chart manoeuvres accurately.
  - They are only updated every 10 years or more, so cultural features may change or be incomplete.

Obj. 1.3

MAP CONVENTIONS

- Topographic maps have a wide variety of applications, but all follow the same general conventions. Maps are made with north at the top. A black margin frames the ground area represented. The Title, Scale, Contour Interval, Reference Systems, Legend and other information are shown outside and are usually displayed along the bottom or right margin (BLM 1). Topographic map symbols are usually displayed on the back of the map.

Obj. 1.4

- TITLE
  - In Canada, there is a National Topographic System (NTS) of indexing maps.
  - Each Topographic map is named after some prominent community or place within the area and this name or *Title* is displayed in the lower centre of the map sheet. The title of our working map, for example, is **ST. JOHN'S**.

- The map number is usually displayed prominently in the upper right corner of the map. The map number of our working map, for example, is **1N/10**.
- The map number and index to adjoining maps are usually displayed in the lower right corner.

Obj. 1.5

- SCALE
  - The scale of a map is a ratio between a unit of length on the map and the actual distance represented on the ground, and can be stated in three ways:
    1. **Verbal -** a statement of the scale in the form of an equation. For example; one centimetre to one kilometre, meaning that one cm on the map represents one kilometre on the ground.
    2. **Ratio or Fractional Scale –** the scale is indicated by either a ratio or a fraction. For example, 1:50,000 or 1/50,000. This means that one unit (centimetre, inches, etc.) on the map is equivalent to 50,000 like units on the ground.
       Map Distance/Ground Distance = 1cm/50,000cm = 1cm/500m = 1cm/0.5km
    3. **Graphic Scale** – a bar scale marked off to show scale distance in kilometres, miles, or any other unit. View the ST. JOHN'S map to see the two included graphic scales for distance measurement in kilometres and miles.
  - The 1/50,000 map scale is the most commonly used by SAR workers. This scale simply states that 1cm on the map equals 0.5 km on the ground.

Exercise

SCALE EXERCISE

Convert the following Fractional scales into verbal scales:

Fractional Scale	Verbal Scale
1/20,000	One cm represents _____ km
1/50,000	One cm represents _____ km
1/250,000	One cm represents _____ km
1/1,000,000	One cm represents _____ km

Convert the following verbal scales into fractional scales:

Verbal Scale	Fractional Scale
One inch equals ten feet	_____
One cm equals ten km	_____
One inch equals one mile	_____
One cm equals 200 km	_____

Obj. 1.6

- MEASURING DISTANCE
  - There are several methods for measuring distance between two points on a map.
    - The simplest involves using the Graphic scale at the bottom of the map. Simply measure between the two points with a ruler and then measure the same distance along the scale. If you don't have a ruler, the two points may simply be marked on the edge of a piece of paper which can be then laid along the scale. (BLM 2). You will need to measure the distance in sections if it is longer than the graphic scale.
    - Another quick method for rough estimates is to measure the map distance with a piece of string and transfer it to the scale.
    - Distance can be measured through the use of a ***"romer"***, which is essentially a ruler which reads in km or miles on the map rather than cm or inches. A different romer is required for each map scale.
    - Distance can also be measured with a map wheel or digital map measurer. These instruments are rolled along a line on a map and will display the distance either on the dial or LED screen.
    - Finally, distance can be measured on the map, and by using the scale and simple mathematics, this distance can be converted to actual ground distance.

Exercise

MEASURING DISTANCE EXERCISE

Using the St. John's Map, determine the following:

a. The approximate length of Quidi Vidi Lake
_____ km and _____ miles

b. The distance between Bell Island Front and Broad Cove (*dotted line*)
_____ km and _____ miles

c. The perimeter of St. John's International Airport
_____ km and _____ miles

d. The Distance between Cape Spear National Historic Site and Cabot Tower
_____ km and _____ miles

Obj. 1.7

- <u>GRID REFERENCE SYSTEMS</u>
  - Topographic Maps have two types of grid reference systems:
    - Geographic (Latitude and Longitude)
    - Universal Transverse Mercator (UTM)

  - **Geographic Grid Reference System**
    - Locations on a map may be indicated through the use of Latitude and Longitude coordinates.
    - **Latitude** is measured in degrees and denotes the angular distance north or south of the equator. It varies from 0^o – 90^o north or south. Lines of Latitude encircle the Earth parallel to the equator and are termed ***Parallels*** (BLM 3).
    - **Longitude** is an angular distance measured east or west from the prime meridian which runs through Greenwich, England. It ranges from 0^o – 180^o east or west. Lines of Longitude are termed ***Meridians*** and encircle the earth in a direction perpendicular to the equator (BLM 3).
    - Latitude and Longitude coordinates are expressed in units of degrees, minutes, and seconds.

- Each degree is subdivided into 60 minutes (') and each minute is subdivided into 60 seconds (")
- By convention, the Latitude is stated first, followed by the Longitude.
- To read Latitude and Longitude of a map, start at the lower right corner and remember the following; **FIRST GO UP AND THEN GO LEFT**.
- *It is critical that all ground searchers understand the use of the geographic grid since they may have to communicate their position to an aircraft/helicopter, and virtually all of their navigational equipment is designed to use the geographic grid system only.*

Exercise

LATITUDE AND LONGITUDE EXERCISE

Using the St. John's Map, determine the location for the following:

a. Bell Island Hospital
_____ Latitude _____ Longitude

b. North Head in St. John's Harbour
_____ Latitude _____ Longitude

c. Com 99 on Kenmount Hill
_____ Latitude _____ Longitude

d. Chimney 37 at MUN
_____ Latitude _____ Longitude

e. Big Hill in Bauline
_____ Latitude _____ Longitude

- **Universal Transverse Mercator (UTM) Grid Reference System**
  - The UTM grid is more "user friendly" for the ground searcher.
  - The grid consists of a system of blue lines forming 2cm squares over the entire map.
  - Each grid square represents 1 square kilometre.

- The entire UTM grid system is comprised of 100 x 100 kilometre blocks. The grid lines are numbered, every kilometre, 0-99 eastward and northward within each block. These numbers are printed along the borders of the map and at intervals on the map area.
- Using the UTM system, any point can be designated to an increment of 1 metre.
- The UTM system is commonly called the ***Military Grid Reference System***.
- A grid map reference is given in six figures and is unique to a particular map.
- A six figure grid reference will locate any point on a map to within 100 metres, which is usually accurate enough for SAR purposes.
- Since grid numbers are repeated every 100 kilometres, the map name/number must be stated along with the grid map reference.
- BLM 4 illustrates the method used to determine a 6-figure grid reference.

Obj 1.8
Exercise

UTM GRID REFERENCE EXERCISE

Using the St. John's Map, determine the 6-figure grid reference for the following:

a. Bell Island Hospital

_____

b. North Head in St. John's Harbour

_____

c. Com 99 on Kenmount Hill

_____

d. Chimney 37 at MUN

_____

e. Big Hill in Bauline

_____

Obj. 1.9

- DATUMS
  - Map grids are based on a series of accurately surveyed points called ***datums*,** to ensure that the grids are consistent on all maps.
  - The two datums currently used are the North America Datum 1927 (NAD 27) and the North America Datum 1983 (NAD 83). Newer map editions use NAD 83.
  - This results in a several hundred metre difference between grids depending upon which datum a map is based.
  - This is very important if you are using a GPS. The user must check on which datum the map is based, and ensure it coincides with the datum programmed into their GPS.
  - Map datums are located on the bottom margin of the map.
  - The datum for our working map is NAD 83.

Obj. 1.10

- MAP SYMBOLS
  - Symbols are used on maps to represent features on the ground. The key to these symbols is either on the reverse side of the map or in the margin (BLM 5 and 6).
  - All map symbols on Canadian topographic maps conform to the following colour code:
    - Black: human-made features
    - Blue: water
    - Green: forest or vegetation
    - Brown: elevation (contours)
    - White: open areas, field or snowfield
    - Red: highways
    - Orange: secondary or dirt roads
    - Pink: high population density areas
    - Purple: updated data

Obj 1.11

- TOPOGRAPHIC CONTOURS
  - A map is prepared on flat (2-D) paper but the surface it represents has three dimensions. On topographic maps the third dimension or elevation can be indicated with ***Contour Lines***.
  - A ***contour line*** on a map is a line that connects points of equal elevation above sea level.

- The vertical distance between two contour lines is the ***Contour Interval (C.I.)***.
- The contour interval is located on the bottom margin of the map.
- The contour interval for our working map is 20 metres.
- Contour lines are drawn with reference to a datum plane or zero contour, usually mean sea level.
- There are three kinds of contour lines:
    1. Elevation contours — brown lines
    2. Depression contours — hachured brown lines
    3. Water depth contours — blue lines
- On most topographic maps, every fifth contour line is printed darker for easy recognition and is locally labelled with its elevation. These are called ***Index Contours***.

Obj. 1.12

- The following 10 rules apply to all contour lines:
    1. All points on the same line are at the same elevation.
    2. All contour lines close somewhere, although it may be outside the map at hand.
    3. Contour lines never cross, except when they are representing an overhanging cliff in which case those beneath the overhang are dotted. On a vertical cliff several contour lines may become superimposed.
    4. Contour lines never divide.
    5. Contours are far apart on a gentle slope.
    6. Contours are close together on a steep slope.
    7. Contours bend upstream in valleys and cross streams at right angles.
    8. On level ground there are no contours.
    9. An isolated closed contour has the same elevation as the next adjacent contour.
    10. All points inside a depression contour are lower than the line.

Obj. 1.13

MAP CARE

- In the field, maps can be subjected to a considerable amount of abuse. Maps are fragile, expensive and often in short supply, so they must be ***handled with care***.
- Avoid opening a map full out in the open air especially if there is even the slightest wind. The wind will cause small tears to start and quickly spread.

- Avoid refolding the map any more than you must. Refolding causes the paper to weaken and results in tears and loss of detail.
- A map should be folded using the following procedure (BLM 7):
  - Fold the map in half down its longest length with the map showing outwards.
  - Next fold the map three times the other way in an accordion fashion.
  - The idea is to fold the map to a suitable carrying size while ensuring that there is a reasonable size area to study when two folds are open.
- Try to keep maps dry at all times. This can be accomplished by placing it in a clear, sealable plastic bag or map case.
- If a map becomes wet, open then as soon as possible and allow them to dry. Wet maps will tear and stain easily.
- Laminating maps or covering them with a clear adhesive plastic film will increase their durability but will make them cumbersome to carry in the field.

Obj. 1.14

MAP ORIENTATION

- A map is ***"orientated"*** when it is turned by the map reader to correspond with the ground it represents.
- The following describes four methods for orientating a map:

1. Compass

- Set compass to North
- Place orientating lines on compass parallel to North on the map.
- Rotate map until ***"red goes in the bed"***.

2. Distant Objects

- Find two objects/natural landmarks that are also distinct on the map.
- Stand between the two objects.
- Orientate the map to line up with the objects.

3. Watch and Sun

- Orientate your watch by pointing the hour hand directly at the sun.
- Then bisect the angle between the hour hand and 12 o'clock.
- You will have an imaginary line running north and south.
- The direction reverses from morning to evening.

4. Stars

- Locate the Pole Star.
- Face it and you are facing north.
- You can locate the pole star by using the big dipper.

Obj. 1.15

DIRECTIONS AND TRENDS

- Directions are angular measurements with respect to the position of the observer, north, and the position of a distant object or intended destination course.
- Directions may be expressed in terms of:
  - Points on a compass
  - Bearings
  - Azimuths
- Features that lack a particular direction are said to "trend" (ie. a lake may have a SW-NE trend).

Obj. 1.16

- <u>CARDINAL AND INTERCARDINAL POINTS OF A COMPASS</u>
  - A compass rose may be broken down into a series of 16 cardinal and intercardinal points (BLM 8).
  - All 16 cardinal and intercardinal points are separated by 22.5°.

Exercise

TREND EXERCISE

Using the St. John's Map, determine the trend of the following:

a. Southside Hills

_____

b. The rivers north of St. John's

_____

c. The longest runway at St. John's International Airport

_____

Obj. 1.17

- <u>BEARINGS</u>
  - Bearings are always measured within the four quadrants of the directional circle (BLM 9).
  - Bearings are always measured as the angle from the North or South Pole towards either the East or West.
  - Bearings cannot exceed 90°.

Exercise

BEARINGS EXERCISE

Using BLM 9, determine the bearings for the following eight courses:

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____
g. _____
h. _____

- AZIMUTHS
  - Azimuths are directions, expressed as angles, measured clockwise from north throughout the full range of the directional circle (BLM 10).
  - Azimuths range from 0^o – 360^o.
  - BLM 10 illustrates how southwest would be expressed as 225^o.

Exercise

AZIMUTHS EXERCISE

Using BLM 10, plot the following bearings as azimuths

a. S20°E
b. N75°W
c. S35°W
d. N45°E
e. N10°W

Obj. 1.18

MAGNETIC DECLINATION

- Direction can be defined as the position of one point in relation to another.
- On a map, there are three primary references that are used to measure direction:
  - **True North (TN)** – the direction to the earth's north geographic pole. All lines of longitude meet there.
  - **Magnetic North (MN)** – the direction to the earth's north magnetic pole. This is where all compass needles point. The position of north magnetic pole is not stable and varies from year to year. It currently lies just south of Ellef Ringnes Island in the Canadian Arctic.

- **Grid North (GN)** – the direction indicated by the N-S lines on the grid which overlies the map. Grid north is slightly different than true north. Since this difference is so little, ***for GSAR purposes, grid north and true north are the same***.

Obj. 1.19

- The angular difference between true north and magnetic north is called ***Magnetic Declination***.
- All topographic maps display a declination diagram either on the right hand margin or to the left on the bottom margin *(only on newer topo maps).*
- Depending on your location, declination will be either east or west (BLM 11). In Newfoundland, all declinations are westerly.
- A line passing through both the magnetic and true north poles has no declination and is referred to as an ***Agonic Line***.
- In Canada, the agonic line currently passes through Saskatchewan.

- CALCULATING CURRENT DECLINATION
  - All searchers responsible for navigation should check the map each time they use it, and calculate the current declination if required.
  - The following sample calculation of current declination is based on the information displayed in BLM 12.
  - The diagram indicates the declination was 23°17' in 1976 and was decreasing 5.4' annually.
    - Calculate the number of years since the declination was established: 2004 – 1976 = 28 years.
    - Multiply the annual change by the number of years, to obtain the total declination change: 28 x 5.4' = 151.2'. This can be rounded to 151'. Remember, 1 degree equals 60 minute, therefore 151' = 2 ° 31'.
    - Since declination is decreasing, the angle between grid north and magnetic north is decreasing. Therefore, the total amount of change is subtracted from the original figure: 23°17' - 2°31' = 20°46'. It is virtually impossible to measure fractions of degrees with a hand-held compass, so round off the result to the nearest degree: 21°.
    - Note on which side of the grid north arrow the magnetic north arrow is located. If it is to the right, the declination is east. Conversely, if it is the left, the declination is west. In this case, declination is 21° E.

- Each year make a pencil note of the new declination beside the declination diagram on the map.

Exercise

CURRENT DECLNATION EXERCISE
Using the St. John's Map, determine the current magnetic declination.

Obj. 1.20

CONVERTING BEARINGS AND AZIMUTHS

- Whether the declination is east or west is critical, when it comes to map and compass work.
- Whenever you take a grid direction from a map and want to follow it with a compass, you must take into account the magnetic declination. Conversely, the same holds true when you want to plot field data taken from your compass, onto a map.
- All searchers responsible for navigation should remember the following rhyme:
  - ***Declination West – Magnetic Best***
  - ***Declination East – Magnetic Least***
- This rhyme can be broken down into the following rules:
  - <u>With a Westerly Declination</u>
    - To go from a grid bearing to a magnetic bearing **Add Declination**
    - To go from a magnetic bearing to a grid bearing **Subtract Declination**
  - <u>With a Easterly Declination</u>
    - To go from a grid bearing to a magnetic bearing **Subtract Declination**
    - To go from a magnetic bearing to a grid bearing **Add Declination**

Exercise

CONVERTING BEARINGS EXERCISE
Complete the following:

Mag. Dec. 17°E
Azimuth (Mag) 264°
Azimuth (True)_____

Mag. Dec. 24°W
Azimuth (True) 167°
Azimuth (Mag)_____

Mag. Dec. 16°W	Mag. Dec. 17°E
Azimuth (Mag) 094°	Bearing (True) N86°E
Azimuth (True)_____	Bearing (Mag)_____
Mag. Dec. 13°E	Mag. Dec. 7°E
Bearing (Mag) S24°E	Azimuth (True) 088°
Bearing (True)_____	Bearing (Mag)_____
Mag. Dec. ____	Mag. Dec. 11°W
Azimuth (True) 347°	Bearing (True) S15°W
Bearing (Mag) N4°E	Bearing (Mag)_____
Mag. Dec. _____	Mag. Dec. _____
Azimuth (Mag) 244°	Bearing (True) S79°W
Azimuth (True) 221°	Bearing (Mag) N81°W

Obj. 2 COMPASS AND NAVIGATION

Obj. 2.1

MAGNETIC COMPASS

- The magnetic compass is an important aid for taking bearings, map orientation, running transects, position location, triangulation, route finding and map making.
- The magnetic compass works on the principle that the pivoting magnetized needle, will always point to the magnetic north.
- There are a variety of compasses available, ranging in price from a few dollars to hundreds of dollars, however, the Silva Ranger (or Sunnto) is the most practical for SAR related activities.
- There is two advantages of using the Silva Ranger:
  1. Bearings do not have to be remembered, because they can be set using the adjustable dial.
  2. The transparent base plate and orientating lines marked on the adjustable dial housing means that it can be used as a protractor for measuring grid bearings on a map.
- BLM 13 identifies all the part of a Silva Ranger compass.

Obj. 2.2

THE SILVA RANGER COMPASS

- The Silva Ranger compass consists of three main parts:
  1. MAGNETIC NEEDLE – points consistently towards the north magnetic pole. All measurements with the compass are therefore made relative to the magnetic north direction.
  2. COMPASS HOUSING AND GRADUATED DIAL – the compass housing is a sealed capsule which contains the magnetic needle. It is filled with a light oil liquid so that the needle quickly comes to rest. The outer ring of the housing is graduated in degrees from 0^o to 360^o in steps of 2^o degrees. The north direction is indicated by the set of parallel (meridian) lines on the transparent base plate. The large black arrow which is also on the base plate can be rotated independently by means of a small screw in the graduated metal dial. If the meridian lines indicate the true north direction, the black orientating arrow can be adjusted for declination so that it is pointing in the magnetic north direction.
  3. BASE PLATE AND SIGHTING MIRROR – are used in the bush to obtain or point out bearings, and on the map, to measure or plot bearings and traverses.

Obj. 2.3

PROBLEMS AFFECTING COMPASS OPERATION

- The compass needle is magnetic and will be attracted toward any large iron or steel object or it will respond to local magnetic fields.
- If you are near a car, snowmobile, ATV, or outboard motor, especially if they are running, the needle may be way off.
- Radios, GPS units, knives, axes, clipboards and even metal belt buckles will affect the operation of the compass.
- If you are unsure of how far the local magnetic attraction of an object extends, simply move away from the object while watching the compass needle. When it no longer wavers towards the object, the compass is set for operation.

Obj. 2.4

SETTING DECLINATION

- Simple compasses require the addition or subtraction of declination to determine true north, however, in compasses such as the Silva Ranger, the declination can be set for each corresponding map sheet, and all reading will then be relative to true north.
- A **Declination Scale** that runs from **90 º W. decl.** to **90 º E. decl**. can be seen inside of the compass housing.

- The declination can be adjusted by using the brass set screw in the NE position of the compass housing. The set screw can be turned using the attached screwdriver (metal tab on the carrying cord). As the screw is turned, the orientating arrow will move against the declination scale.
- To correctly set the declination, the screw should be turned until the tiny centre mark in the base of the orientating arrow points to the known declination.
- The divisions of the declination scale are in 2^{o} increments, so single degrees lay between the marks.

Exercise

SETTING DECLNATION EXERCISE

Set the magnetic compass to the current declination for the local search area.

Obj. 2.5

MEASURING DIRECTION ON A MAP

- To follow a route in the field between two points on a map, the direction between these points must be determined first.
- This can be accomplished by using the compass as a protractor to determine the bearing. It can also be accomplished by using a Douglas protractor (BLM 14).
- The following outlines the procedure for determining a bearing with a compass:
    - With a sharp pencil, lightly draw a line between the departure and destination points.
    - Align the long edge of the compass along the line with the direction of travel arrow point towards the destination point.
    - Holding the compass in this position, rotate the compass housing until the meridian lines on the base are aligned with the north-south grid lines on the map, with the orientating arrow pointing north.
    - Read the bearing on the compass housing at the index pointer.
    - *If the compass is not set for declination, add the declination to the grid bearing to determine the magnetic bearing.*

Exercise

MEASURING DIRECTION AND DISTANCE EXERCISE

Using the St. John's Map, determine the direction and distance for the following:

a. Com99 on Kenmount Hill to Com86 on Firewood Hill
b. North Head in St. John's Harbour to Com38 at Cape Spear
c. Chimney 37 at MUN to Com76 at Mount Scio
d. Bell Island Hospital to Bell Island Hotel
e. Big Hill in Bauline to the Tolt near Birch Hill

Obj. 2.6

PLOTTING A DIRECTION ON A MAP

- Bearings and distances collected in the field are commonly plotted onto base maps.
- The following outlines the procedure for plotting a line on a map:
  - Locate your starting point on the map.
  - *If the compass is not set for declination, subtract the declination from the magnetic bearing to determine the grid bearing.*
  - Rotate the compass housing to the desired bearing.
  - Place the compass on the map with the long edge just touching the known point.
  - Rotate the entire compass (not just the dial) around the point until the meridian lines inside the compass housing are parallel to the north-south grid lines on the map, with the orientating arrow pointing north.
  - Draw a line along the edge of the compass.
  - This line represents the bearing from the field.

Exercise

PLOTTING DIRECTION AND DISTANCE EXERCISE

Using the St. John's Map, plot the route followed by searchers based on the following field notes:

Starting Point: 666671
Declination: **Declination 21ºW**

Record #	Magnetic Azimuth	Distance
1	330º	4.5km
2	031 º	10.25km
3	182 º	4.75km
4	290 º	6km
5	027 º	2.75km

Obj. 2.7

TRIANGULATION

- Triangulation can be used to find your position or to find the position of a particular land feature if a series of bearings are given from different points.
- To determine your position using triangulation:
  1. Open your topographic map and orient it by using a compass.
  2. Identify two (preferably three) prominent features that you can see from your current position and then find them on the map.
  3. Use your compass to find the bearings of those features in relation to your position.
  4. Record these bearing in your field notebook.
  5. If the declination is not set on the compass, change the magnetic bearings to grid bearings.
  6. On the map, find the first object that was sighted, set the compass so that the back (reciprocal) bearing is read on the index pointer, and place the compass on the object.
  7. Orient the compass so that north on the compass points to grid north.
  8. Draw a line back along the edge of the compass.
  9. Repeat steps 6-8 for each of the other points.
  10. Where the lines intersect is your position. (BLM 15)

Obj. 2.8

HOW TO TAKE A BEARING WITH A COMPASS

- To determine the bearing of a particular object or direction in the field, perform the following steps:
  1. Hold the compass steady and level at chest height, and point the direction of travel arrow in the direction of an object or in the direction that you want to travel. This can also be done using the sighting mirror.
  2. Rotate the compass housing until the orienting arrow is under and parallel to the coloured end of the magnetic needle (***Put the Red in the Bed***).
  3. The bearing is now set on the compass and may be read at the index pointer.

Obj. 2.9

HOW TO FOLLOW A BEARING WITH A COMPASS

- To follow a given bearing in the field, perform the following steps:
  1. Rotate the compass housing so that the desired bearing corresponds to the index pointer.
  2. Hold the compass steady and level, and turn your entire body until the orienting arrow is under and parallel to the coloured end of the magnetic needle (***Put the Red in the Bed***).
  3. The direction of travel arrow now points in the desired direction.
  4. To travel on the bearing, sight a distant object on the route, put the compass away and walk towards it. When this is reached, sight another landmark along the route and continue to your destination.

Exercise

TAKING AND FOLLOWING BEARINGS EXERCISE

Now that you are familiar with taking and following bearings, go outside and practice taking and following bearings on objects in all directions. Continue this process until it becomes automatic and second nature.

Obj. 2.10

BASIC COMPASS NAVIGATIONAL TECHNIQUES

1. Open Bush Navigation
   - In open country where visibility extends to 50m or more, accurate navigation is best achieved by sighting on an object (ie. tree, boulder, etc.) in the correct direction and as far away as possible.
   - Keep an eye on this object and walk towards it. The more distinctive the object, the easier it will be to identify especially if you lose sight of it for a while.
   - Once you have reached the object, stand close to it and sight on another, further along the line of travel (BLM 16).
   - In this manner you can walk comfortably in between checkpoints without constantly referring to the compass.

2. Thick Bush Navigation
   - If bushes and trees are close together, it is not possible to travel as in open bush.
   - With a minimum of two people traveling together, person "A" goes out ahead as far as possible, but still visible to person "B".
   - "B" then sights on "A" with the compass and moves that person left or right so that they move on to the desired line of travel.
   - "B" then walks to "A" and the cycle is repeated as long as thick bush obscures the path ahead (BLM 17).
   - This method is also useful for night navigation or navigation during conditions of low visibility (ie. snow and fog)

3. Navigation Around Small Obstacles
   - If an obstacle such as a small pond or bog is encountered, sight with the compass on an object on the opposite side which is close to your direction of travel.
   - Walk around to that object and proceed as before.

4. Navigation Around Large Obstacles
   - When a large obstacle is encountered that can not be sighted across, it may be necessary to divert the traverse to avoid the obstacle.
   - Walk at a right angle to the traverse direction far enough to avoid the obstacle, counting paces.

- Turn back to the traverse direction and walk past the obstacle.
- Turn a right angle in the opposite direction and walk back towards the original line of travel, counting the same number of paces as before.
- You should now be on the original traverse line and ready to proceed forward (BLM 18).

Obj. 2.11

DISTANCE MEASUREMENT IN THE FIELD

1. Dead Reckoning
   - During the early stages of a search, accurate distance measurement is rarely needed.
   - "Dead Reckoning" or knowing your speed and elapsed time is usually adequate enough to tell how far you traveled.
   - For example, if you estimate that you are moving 1km every 15 minutes and you then walk for 1.5 hours, you may reasonably assume that you have traveled about 6km.
   - This method is imprecise and travel time will vary based on the nature of the terrain and the thickness of the bush.
   - Practice will improve accuracy.

2. Pacing
   - When accurate measurement is necessary, as in grid searches or plotting trails, and no GPS is available, pacing is the most practical method available.
   - Measuring distance accurately by pacing requires experience.
   - Every person has a different pace length and the size of their step will vary depending on speed and the type of ground they are traveling on.
   - To obtain pace information, it is desirable to travel previously measured distances and count the number of paces required to travel these distances.
   - The effect of varying speed, terrain conditions, and slope should also be investigated.
   - The figure that should be obtained in each case is the number of paces that are required to travel 100m.
   - In order to measure distance with reasonable accuracy by pacing, you must find the number of paces required to travel 100m over the type of country that you will be measuring. This is outlined by the following procedure:

- Measure a course of 100m over ground typical of what you will be walking. Ensure that you chose an area that represents all aspects of the terrain and not just the easiest place to walk.
- Walk the course counting the number of paces. Always maintain a normal walking pace and continue walking the course over and over until the number of paces becomes consistent.

- For example, if you require 120 paces to travel 100m and you are told that you must follow a compass bearing for 500m, you simply multiply 120 by 5 to determine the number of paces to complete this distance.
- Experienced pacers usually have a degree of error in measurement of 1m in 100m.

3. Hip Chain
   - Hip chains are most commonly used by forestry professionals to measure distances and to lay out cruising lines. However, their use in SAR activities is greatly increasing.
   - A hip chain is a plastic belt case containing a spool of thin string and a measuring device which registers as the string is let out.
   - The user simply ties the string at the starting point and can then read the counter at any time to determine how far they have traveled.
   - This method is more exact than pacing if a reasonably straight line can be maintained.

Obj. 2.12
Exercise

PRACTICAL FIELD EXERCISES

1. Pace Length Determination

- Measure a course of 100m over ground typical of what you will be walking. Ensure that you choose an area that represents all aspects of the terrain and not just the easiest place to walk
- Have participants walk the course counting the number of paces. Ensure that participants maintain a normal walking pace and continue walking the course over and over until their number of paces becomes consistent.

2. Following Bearings and Pacing

- This exercise will help you to follow compass bearings and estimate distances. Mark a starting point. Use lightly forested country if available. Be sure to have plenty of room, about 100 m in all directions with no obstructions. From the starting point, follow the given courses of bearings and distances. If you do all four courses, you will become quite comfortable with distance and bearing. If you do everything precisely right, your third leg will take you right through your starting point and you will come out at the end of each course exactly 5 paces from your starting point, in the opposite direction from which you started. See how close you can come!

Course 1	**Course 2**
360º for 30 paces	270º for 30 paces
90º for 30 paces	360º for 30 paces
225º for 85 paces	135º for 85 paces
90º for 30 paces	360º for 30 paces
360º for 25 paces	270º for 25 paces

Course 3	**Course 4**
180º for 30 paces	90º for 30 paces
270º for 30 paces	180º for 30 paces
45º for 85 paces	315º for 85 paces
270º for 30 paces	180º for 30 paces
180º for 25 paces	90º for 25 paces

3. Orienteering: Following a Map

- This exercise will help you to follow compass bearings and distances using basic orienteering skills. From the starting point, teams of two will follow to completion the field notes detailed below. As an aid to navigation, flagging tapes/paint marks have been laid out in select locations. Please note that not all locations have been marked. It is also recommended that teams do not work together to complete this exercise.
- ***PLEASE NOTE:*** *Field notes have not been created for this exercise since they are team dependent. Training officers should create a route through varying terrain conditions and should include a minimum of 20 legs. Field notes should contain the bearing and number of paces for each leg.*

4. **Orienteering: Map Making**
   - In this exercise, teams of two will create their own map and will carefully record their bearings and paces in their field notes. A team labelled flag will be place at the end of the last leg.
   - Upon completion of their map, teams will return to the staging area where they will exchange their maps with other groups and will follow their map to completion, retrieving that team's flag.

Obj. 3 SAFETY IN THE FIELD

Obj 3.1 RESPONSIBILITY FOR SAFETY

- Health and safety on the job is everyone's responsibility.

- *NEGLIGENCE* - means the failure to take reasonable precautions to avoid injury to persons or damage to property.

SAR TEAMS:

- They have the primary responsibility for health and safety.
- They must establish policies on safety and training.
- They must utilize competent supervisors.

Specific Responsibilities of the SAR Team:

- Ensure that the equipment, material and protective devices are provided, maintained and used.
- Ensure that all prescribed measures and procedures are followed.
- Must provide information, instruction and competent supervision to searchers to protect their health and safety.
- Take every reasonable precaution for the protection of their searchers.

TEAM LEADERS:

- Responsible for establishing safe work practices for tasks preformed and supervising searchers to ensure they follow these practices and do not take short-cuts.
- Must ensure that the crew is competent and have been trained to perform their assigned tasks in a safe manner.
- Any additional training needs.
- Must provide crew with all possible protective equipment.
- Advise searchers of any potential or actual dangers to their health and safety of which they are aware of.

SEARCHERS:

- Must perform assigned tasks in a manner that is consistent with approved safe practices, procedures and regulations.
- Work in co-operation with others, use common sense and be alert at all times.

Obj. 3.2

PERSONAL SAFETY

EYES:

- Wear safety glasses or goggles when working above eye level, traversing through the bush, handling heavy equipment or handling corrosive materials.

EARS:

- Regular exposure to noise levels above 85dB can result in permanent hearing loss.
- If you are standing 3 feet from someone and feel the need to shout, the noise level is probably above 85db.
- Sources of dangerous noise; aircrafts, chainsaws, blasting operations.
- Hearing protection is not as simple as wearing a pair or earmuffs. Muffs and ear plugs must be properly fitted and maintained in order to be effective.

HEAD:

- Working in any situation where there may be falling or flying debris requires the wearing of a CSA approved hardhat.
- Hats should fit comfortably, not being too tight or too loose.

HANDS:

- Gloves should be worn when performing heavy manual labour and insulated gloves worn as a protection against cold.

FEET:

- Any long distance hiking requires durable boots with non-slip soles and proper ankle support.
- Use gaiters with lower cut boots.
- Heavy insulated waterproof boots (with felt liners) should be worn in cold weather.

BACK:

- Improper lifting techniques accounts for 30% of all back injuries.
- To avoid back injury, it is important to keep back muscles strong and flexible.

Obj. 3.3

TRIP PREPARATION

- Careful planning is the most important part of a successful search.
- Factors to consider include: destination, the season, mode of transportation, number of people and duration of the search.

PHYSICAL CONDITIONING

- Before leaving on any strenuous trip; undergo a physical examination and/or physical training.

Obj 3.4

BACK PACK

- Whether it's for an afternoon or several weeks, there are certain items that no one should be without when entering the woods. These include:
  1. Wooden matches in a sealed pill bottle or a film canister to keep them dry, and a candle.
  2. Compass and a topographic map or aerial photos.
  3. Small First-Aid kit.
  4. Pocket Knife.
  5. Insect repellent.
  6. Roll of electric tape/duct tape.
  7. Safety pins.
  8. A whistle and a pocket mirror.
  9. A couple of large orange garbage bags (highly visible, used as a tarp, rain gear or signals)

- All of these items should fit into your pockets or your backpack.

- When entering a remote area or if you are going to be away for more than one day, you should also include the following:
  1. Additional Food - especially high energy food. (ie. chocolate, granola bars, trail mix, raisins, dehydrated soup, bouillon cubes, salt, etc.)
  2. Extra clothing and a waterproof poncho.
  3. 12m (40ft) of heavy test fishing line, hooks, 6m (20ft) snare wire.
  4. Small flashlight.
  5. Water decontamination tablets.
  6. 6m (20ft) thin nylon rope.
  7. Small sharpening stone.
  8. Nylon tarp, bungee cords.
  9. Metal cup and pan.
  10. Small axe.

  (BLM 19 and BLM 20)

Obj. 3.5

FIRST-AID KIT

- The following is the minimum requirements for any field first-aid kit:
  1. Triangular Bandages
  2. Sterile gauze bandage (4x4)
  3. Several rolls of 1 inch and 2 inch gauze bandage
  4. Adhesive tape, self-adhesive bandage
  5. Antiseptic
  6. Painkillers
  7. More than the necessary amount of any prescribed medication in case of a prolonged stay.
  8. First-Aid manual

MODES OF TRANSPORTATION

Obj. 3.6

<u>FOOT TRAVEL</u>

- Stay alert and watch for unforeseen hazards.
- Make sure equipment is in good condition, check laces, soles, eyes, and hooks of boots, carry First-Aid kit and emergency survival kit in backpack.

General Travel Precautions:

- Travel in pairs
- Use extra caution when travelling alone.
- Travel at the speed of the slowest party member.
- Inform others where you are going.
- Do not panic if you become lost or injured.

Obj 3.7

TRAVERSING IN WINTER

- Dress in layers, it provides better insulation. You can pull off layers if you get hot.
- Inner wicking layer, a middle wool layer and an outer weatherproof nylon/polyester/gortex layer.
- Wear a hat or facemask.
- Wear good gripping warm boots (extra liners is a good idea).
- Take snow shoes.

Obj 3.8

ICE SAFETY

- Beware of slushy areas and ice over upwelling springs (black ice)
- Stay on clear ice if you can. Snow acts as an insulator and prevents the ice from freezing solid.
- Avoid areas where rocks are protruding the ice.
- On unfamiliar ice, carry a pole, to check the ice ahead of you and to use for support if you should fall through the ice.
- If you fall through the ice and don't have a pole, extend your arms in front of you and kick your feet to the surface, then on your belly, wiggle out of the water like a seal.
- When you reach solid footing, roll in powder snow. It will absorb moisture and give some insulation while a fire is being lit.
- Make and carry a set of ice claws. (BLM 21)

Obj. 3.9

SNOWMOBILES

- Avoid racing, chasing wildlife and other fun activities while on the job.
- Ensure machines are in good operating condition. Carry a tool kit, spare parts and emergency equipment.
- Wear a CSA approved Helmet, face mask and goggles.
- Machines should be used in pairs for long trips.
- Should be able to troubleshoot and perform emergency repairs.
- Wear blaze orange.

ATV's

- When going up, down or across a slope, always shift your weight towards the top of the slope.
- When turning, slow down to avoid overturning.
- Slow down when riding in shallow water.
- Do not park on a slope with soft ground.

Obj 3.10

TRUCKS AND CARS

- When driving on gravel and bush roads:
  - Keep your sights high and wide.
  - Keep well back from other vehicles.
  - Drive according to existing conditions.
  - Know your vehicle's and your own capabilities.
  - See and be seen.

Obj. 3.11

FIXED-WING AIRCRAFT

- Follow the instructions of the pilot.

Obj. 3.12

HELICOPTERS

- Approach or leave the helicopter in a crouched manner always on the downslope side.
- Exercise extreme caution when jumping from the skids.
- Ensure that there is no loose object near the helicopter landing site.
- Never throw or drop objects while the rotors are turning.
- Always approach or leave the helicopter in the view of the pilot. Never to the rear. (BLM 22 and BLM 23)

Obj. 3.13

BOATS AND CANOES

- Always wear a CSA approved life jacket or PFD.
- Each craft should have 2 oars, oar locks, an anchor, rope, buoyant heaving line, whistle/horn, and a bailing jug.

Obj. 3.14

SETTING UP CAMP

- Camp sites should be located away from potential hazards.
- Store flammable and hazardous material properly.
- Open fires are to be kept small and located in a safe site.
- Ensure appropriate First-Aid equipment is available.
- Ensure food and water is properly prepared and stored.

CAMP LOCATION

- In an open area select a site close to safe drinking water.
- Avoid areas that have the potential for landslides, rockslides and windfalls.
- Avoid tall and/or dead trees which could fall or drop branches in windstorms.

Obj. 3.15

CAMP LAYOUT

- Tents/lean-to's should be placed a sufficient distance apart to prevent the spread of fire.
- Cooking areas should be well separated from sleeping areas (~50m)
- Food should be elevated to reduce the attractiveness to nuisance animals.

Obj. 3.16

FIRE HAZARDS

- Be on the lookout for potential causes of a forest fire, such as a bush fire, a fire from wood or propane stoves and lanterns, careless smoking or signal fires.
- No open fires should be left unattended.

Obj. 3.17

LIGHTNING

- During a lightning storm, the first thing you should do is disconnect all radio antennas and then ground them.
- Avoid tall trees and open spaces, particularly on high ground.
- If anyone is hit by lightning and suffers respiratory failure, AR must be provided immediately.

NUISANCE ANIMALS

- Reduce the possibility of unwanted animals with proper camp layout and garbage disposal.
- Destroy any animal you suspect of having RABIES.

Obj. 3.18

COMMUNICATIONS

- Dependable communications are absolutely essential for relaying information back to the command post, or in the event of a severe storm, an accident, or a member of the crew becoming lost or sick.

Obj. 3.19

EQUIPMENT SAFETY

AXES

- Be careful with dull axes.
- Sharpen an axe at least twice a day if in constant use.
- Keep axe in sheath when not in use.
- If you don't have a sheath, wrap the axe blade in newspaper.
- When carrying an unsheathed axe, hold it by the handle as close to the head as possible with the blade pointing away from you.
- Never carry an axe over your shoulder.

CHAINSAWS

- Wear safety boots, cutter pants, gloves, hard hat, and eyes and ears protection.
- Keep chain filed regularly, this reduces the likelihood of "kick-back" or having the blade become imbedded in the tree.
- The saw should have a chain brake which immediately stops the chain if the saw bucks up.
- Do not use the tip of the blade for cutting.
- Ensure that all parts are tight and the chain is properly tensioned.
- Adjust the idle so that when your finger leaves the trigger, the chain stops.
- Do not use a chain saw for cutting bush or stripping bark.
- Do not walk with the saw running. Carry it with the blade pointed to the rear.
- Start the saw on the ground or a stump, never on your knee.
- Do not smoke when refuelling and do not refuel a hot machine.
- Always keep a First-Aid kit nearby. (BLM 24, BLM 25 and BLM 26)

Obj. 3.20

LIGHTING AND HEATING

LANTERNS

- Propane or battery operated lanterns are recommended.
- If a lantern runs on flammable fluids, it may get knocked over, which can result in a fire which spreads rapidly.
- Lanterns should be hung from the ceiling.
- Light lanterns outside.
- Keep away from flammable material.
- Be careful taking down hanging lanterns, handles may be hot.
- Let lanterns cool down before refuelling.

STOVE HEATING IN TENTS

- Make sure that walls nearest stove have heat resistant or aluminium foil which reflects heat around the tent.

Obj. 4 BASIC SURVIVAL AND FIRST AID

Obj. 4.1 **SURVIVAL PROCEDURE PREPARATIONS**

1. Tell someone where and when you are going and when you plan to return. If you change your plans or move from one place to another, let someone know.
2. Choose clothing which is suitable for the expected weather, but also be comfortable and protect yourself should the weather change.
3. Take a compass and detailed map of the area you are going to. Make sure you know how to use them.
4. Carry a personal survival kit and a basic First-Aid kit.
5. Practice sound basic survival techniques.

Obj. 4.2 **EIGHT BASIC RULES FOR SURVIVAL**

1. Tell someone where you are going and when you plan to return. Advise someone of any changes.
2. Never go in the bush by yourself.
3. Take enough food for several days in case of an emergency.
4. Take a map and compass of the area.
5. Wear proper clothing and equipment.
6. Plan your work schedule so that you return to camp before dark.
7. Know how to build a fire.
8. Carry a personal survival kit at all times.

Obj. 4.3 **LOST AND FOUND**

- Being lost can be uncomfortable, frustrating, embarrassing and scary.
- The biggest fear of getting lost is ***BUSH PANIC*** and wildly crashing through the bush in all directions, using precious energy which you will need later.
- If you become lost, stay calm and do not panic.
- Improvise a shelter; you can survive for 30 days without food and 3 days without water. Conserve as much energy as possible.

- Orientate yourself with a map and compass, look for familiar landmarks.
- Start a fire (heat, cooking, signal, mosquito repellent, calming effect)

FACTORS AFFECTING SURVIVAL:

1. Hunger
   - Not a serious threat to survival.
   - Your body fat will supply enough energy for ***30 days*** or more if your health is normal.

2. Thirst
   - A person can survive several days without water if they are in normal health.
   - Try not to think about it and keep your mind active and busy.

3. Cold
   - A serious threat to survival.
   - Cold affects an individual's ability to function.
   - Exposure to cold, wetness and wind can result in hypothermia.
   - Maintain body temperature by staying dry, building a fire and constructing shelter.

4. Loneliness and Boredom
   - Occurs when nothing is happening and nobody comes to the rescue.
   - Can have a greater effect on survival than thirst, hunger, cold or pain.
   - Loneliness and Boredom can be overcome by:
     - Making decisions and acting on them.
     - Adapting to your situation and improvising solution.
     - Tolerating solitude.
     - Avoid panic and remain calm.
     - Positive thinking and planning ways to overcome problems.
     - Being patient.
     - Keeping your hands busy.

5. Fatigue
   - When tired, you don't think clearly and become careless.
   - Overexertion, lack of sleep and boredom causes fatigue.
   - Rest as much as possible and avoid overexertion.

6. Pain
   - Attend to any injuries immediately.
   - Keeping busy lessens the effects of pain.
   - Do not give in to the pain.

7. Fear
   - Fear is a normal reaction.
   - Fear can be the greatest obstacle to survival.
   - Types of fear include:
     - Death
     - Unknown
     - Animals
     - Being alone
     - Darkness
     - Weakness
     - Punishment
     - Ridicule
     - Discomfort
     - Personal guilt

   - The best way to deal with these fears is to:
     - Identify which fears you are feeling, and;
     - Understand why you are afraid and use common sense to deal with and overcome each fear.

Obj. 4.4

BUSH NAVIGATION

- If it is an easy traverse, plenty of daylight, moderate weather and if you are 100% sure of the direction, then and only then, should you come out of the woods.
- Know how to use a map and compass.
- Keep your compass away from metal or iron.
- Stay alert and look for landmarks.

Obj. 4.5

ASSISTING THE SEARCH

- If you are even the slightest bit uncertain of the direction, stay put and do what you can to assist searchers.
- Do not retrace your steps. The searchers will be retracing your route, either by ground or air, looking for signals.
- If you are in thick bush, make your way to a conspicuous spot such as a ridge, meadow or lake.
- Prepare your distress signals.

Obj. 4.6, 4.7

TYPES OF EFFECTIVE DISTRESS SIGNALS

- Three of anything is the universally accepted code for persons in distress.

1. Smoke By Day – Fire By Night
   - One of the most effective signals.
   - Build 3 fires about 30m apart in a triangular manner.
   - Light them when you hear an aircraft. (BLM 27)

2. Sound Signals
   - Sound signals could include three shots from a firearm about 15 seconds apart or three blasts on a whistle.

3. International Ground To Air Signals
   - Use any available materials that may be visible to anyone overhead.
   - You may trample it in the snow, stomp down the grass in a meadow, set pieces of material or clothing in a visible spot, or cut brush and stand it on end. (BLM 28 – 33)

4. Hand-Held Mirror
   - Upon spotting an aircraft, stand so the sun hits the full surface of the mirror.
   - Straighten your arm and form a "V" with two fingers.
   - Cast the reflection of the mirror through the "V" aimed toward the aircraft.
   - It can be seen for miles. (BLM 34)

Obj. 4.8

PRIORITIES IN A SURVIVAL SITUATION

1. The main enemy to survival is ***PANIC***.
2. Remain calm and assess your resources, both in your pack and those provided by nature.
3. Assess your plan to see if it conserves, adds to, or uses up your energy.

Priorities for a survival situation, in the appropriate order, include:

1. Attend to any injuries.
2. Construct a shelter.
3. Conserve and create warmth.
4. Find water.
5. Rest and conserve energy.
6. Find food.

Obj. 4.9

BUILDING A SHELTER

- A shelter will keep you warm and dry and will aid in keeping up your moral.
- Shelters can be built with materials provided by nature - trees, boughs and stumps - or from materials in your pack.
- Do not use too much energy building your shelter.
- Situate your shelter near water, if possible.
- Build your shelter on high ground (drainage and visibility).

TYPES OF SHELTER:

1. Fallen-Tree Shelter
2. Lean-To
3. Wigwam
4. Snow Cave Shelter
5. Natural Shelters (caves)

Fallen-Tree Shelter

- Under the log shelter.
- Find a log with a small pit under it.
- Enlarge the pit and cover the log with boughs.
- Keep the living area small. (BLM 35)

Lean-To

- This is a pole shelter covered with boughs, raingear or plastic.
- Find two trees about 3m apart and lash a pole to them 1 or 2m off of the ground.
- Lean a series of vertical poles (45^{o}) against your horizontal pole.
- Heap spruce or fir branches over the poles until you have a solid overhang.
- Boughs should be about 6 inches thick. (BLM 36 and BLM 37)

Wigwam

- Primarily used in wooded areas.
- Constructed around 3 upright poles about 3m long, making a tripod.
- Wrap plastic around the poles or heap boughs on the poles until a sturdy covering is made.
- Advantage – a small fire can be made in the middle of the floor, spreading even heat and keeping out flies.

Snow Cave

- Used primarily in treeless terrain.
- Makes use of a large, solid snowdrift or overhang to form a tunnel with a small cavern inside.
- Use snowshoes as a shovel and dig a tunnel about 1m into the bank, just wide enough to crawl through.
- Dig away at the end of the tunnel under the bank until you have enlarged an area comfortable for you.
- Poke a small air hole from the inside out.
- Line the cave with boughs. (BLM 38)

Obj. 4.10

BUILDING A FIRE

- It is difficult to stay warm, cook or have drinkable water without a fire.
- Exercise caution when making even the smallest fire.
- Build a fire near the water's edge, if possible.
- Always keep a good supply of dry wood and kindling on hand.
- To keep a fire burning all night, place some green logs on top of the fire. The logs will burn slowly as they continue to dry.
- You'll need tinder and a spark.

FIVE WAYS TO MAKE A FLAME

1. Safety matches should be carried at all times and be of the "strike anywhere" variety.
2. Lighter. Be sure it has a good flint and plenty of fluid.
3. Flint and steel. One of the safest and most reliable fire starters. (BLM 39)
4. Battery (9 volt) – touch the battery on steel wool (ooo or finer)
5. Magnifying glass – focus sunrays on good tinder.

Obj. 4.11

BUILDING A HEAT REFLECTOR

- Stack some green logs (or build a wall of logs) at the back of the fire.
- A reflector is not effective unless the logs are ambering but not burning.

TYPES OF TINDER

- Tinder should be dry, fine and highly flammable.
    1. Old man's beard
    2. Paper
    3. Birch bark
    4. Gasoline soaked rags
    5. Cotton fuzz
    6. Absorbent cotton
    7. Steel wool
    8. Sugar
    9. Bird's nests
    10. Dead, dry grass
    11. Dryer lint

FUEL

- Large fuel material requires greater heat to ignite.
- Always use some sort of kindling to nurture the fire until it is hot enough to ignite larger fuel.
- A good supply of fuel should be gathered before you light your tinder.
- All wood burns better when dry.
- The finer the wood, the less smoky the fire will be.
- The denser the wood the hotter the fire and the slower it will burn.
- Green wood requires a hot fire to ignite.

TYPES OF KINDLING

1. Birch bark, shavings, woodchips
2. Dry, dead twigs (BLM 40)
3. Splits
4. Feathered stick
5. Gas or oil-impregnated wood

FIRE LAYOUT

- An ideal fire is built on mineral soil or bedrock.
- If the ground is dry, scrape down to the black earth.
- In winter, dig to solid soil, trample the snow or dig out an area around your shelter or fire site.
- If the snow is deep, a small fire can be maintained by building on top of several layers of green logs.
- Do not build a fire directly under a tree. It may result in a brush fire or snow slide. (BLM 41)

Obj. 4.12

WATER

- A person can go without food for an extended period but you cannot go without water for more than 2-3 days.
- The average body uses 2-3 litres of water per day.
- If water is accessible, do not ration it.
- During the summer, fast water or spring water is preferred.
- Water from marshy ground or muskeg should be boiled and use water decontamination tablets.
- Water from moist earth: dig hole in the mud until water seeps in and settles.

In Winter:

- Open water is preferred, but melted snow or ice can be substituted.
- Ice yields the most amount of water for the amount of fuel used.
- Fluffy snow yields the least amount of water.
- Pack the snow and mix it with water as it melts.
- Avoid eating snow. It can cause hypothermia by lowering body's core temperature.

Obj. 4.13

FOOD

- Before using emergency rations, locate easily obtainable natural food.
- If properly equipped, fish or snare small game (rabbits and squirrels).
- Most healthy adults, with plenty of rest and water, can go about 2-3 weeks without food.
- Stress can rob the body of important vitamins and minerals.

General Rules when Foraging:

1. When short on water, eat as many carbohydrates as possible. They require less energy to digest than proteins.
2. All fur-bearing animals are edible.
3. All grass seeds are edible.
4. More food value in the roots of plants than in the "greens".
5. All birds and their eggs are edible.
6. Skin frogs before cooking or boiling.
7. Grubs and insect larvae are edible.
8. Inside bark of many trees are edible (maple, birch and poplar).
9. Most black and blue berries are edible. Avoid red and white berries unless you know what they are, and anything resembling a cucumber or parsnip because some are poisonous.
10. All seaweed is edible.
11. Avoid mushrooms. No nutritional value.
12. Boiling food kills most bacteria.

Some edible plants include:

- Cat-tails (root)
- Bearberry
- Burreed
- Chickweed
- Rock Tripe
- Juniper berries
- Dandelion
- Maple (seeds and sap)
- Pine

Obj. 4.14

HUNTING AND FISHING

- Do not stray far from camp in search of food as it consumes energy.
- Search immediate vicinity.

General Hunting Techniques:

1. Walk softly
2. Stop frequently
3. Watch carefully for: rabbit runs, dens, holes, droppings, tracks and feeding grounds.

Snares:

- Primarily used for rabbits and squirrels, but can be used for big game. (BS BLM 42-45)

Obj. 4.15

INJURY AND FIRST-AID

- Attend to all injuries immediately.
- First-Aid: Saves life, reduces suffering until services of a doctor can be obtained.

PRIORITIES

***First Priority*:**

- Severe bleeding
- Airway obstructions or breathing difficulties
- Unconsciousness
- Other life-threatening emergencies: hypothermia and hyperthermia.

Second Priority: *(severe injuries but not immediately life-threatening)*

- Back or neck injuries
- Fractures
- Burns

Third Priority: *(less severe injuries which can benefit from First-Aid)*

- Sprains and minor fractures
- Minor bleeding
- Sickness, frostbite, etc.

Obj. 4.16

EXAMINATION

- Diagnosis is the key to successful First-Aid
- Check pulse, breathing, bleeding, swelling and pallor of skin.
- If victim is conscious, talk to the person to find out what happened.

Obj. 4.17

PRIMARY EXAMINATION - CRITICAL INJURIES:

1. Breathing
2. Heartbeat
3. Bleeding
4. Unconsciousness

Obj. 4.18

SECONDARY EXAMINATION - NON-CRITICAL INJURIES:

1. Head
2. Neck
3. Spine
4. Chest and Shoulders
5. Abdomen
6. Pelvis
7. Arms and Legs

Obj. 4.19

TREATMENT:

1. **AR** *(mouth to mouth resuscitation)*
2. **CPR**
3. **Bleeding**
   - Stop bleeding by applying direct pressure
   - Place victim into a position of rest
   - Cleanse the area with alcohol
   - Cleanse area around wound with without touching it with your fingers
   - Affix dressing with tape or bandage.
4. **Shock** *(can be fatal)*
   - Symptoms:
     - Bluing of lips and fingertips
     - Changes in level of consciousness
     - Weak or rapid pulse
     - Shallow breathing
     - Cold, bleeding and pain can intensify shock
   - To prevent and control shock:
     - Treat all injuries
     - Place conscious person on their back and elevate feet
     - Place unconscious person in recovery position
     - Reassure a conscious person
     - Loosen clothing
     - Keep person warm and sheltered

5. **Fractures and Sprains**
   - Two types of fractures:
     1. Bone breaks but skin intact
     2. Bones breaks but protrudes from the skin

   - Stabilize fractures with splints using tree branches, boards, ski poles, etc.
   - Before fastening splint, make sure limb is in natural position.
   - Put a pad between splint and limb.
   - Use rope, bandages, strips of cloth, etc. to fasten splint.

6. **Burns**
   - Immerse in cool water - relives pain and reduces swelling.
   - Remove restrictive clothing and jewellery before swelling starts.
   - Cover burn with clean sterile cloth.
   - Do not apply any antiseptic, oil, iodine or butter to burn.

- Do not break any blisters.
- Do not remove any clothing stuck to burns.

7. **Frostbite** *(freezing of skin tissue)*
   - Symptoms
     - White skin firm to the touch.
   - Advance Frostbite
     - Skin becomes waxy and hard.
   - Mild Frostbite
     - Treated by gradually rewarming the area. Do not rub snow on frostbite.
   - Severe Frostbite
     - Some of the tissue has to be removed.

8. **Blisters**
   - Apply a large strip of gauze or tape over reddened area.

9. **Hypothermia**
   - Occurs when the temperature of the body falls to a level where the internal organs cease to function.
   - Usually caused by cold, wet, chilling weather.
   - Body loses heat faster than it can produce it.

   Symptoms:
   - Violent shivering. Shivering stops in advance stages.
   - Bluing of lips and fingertips.
   - Slurred speech and irrational behaviour.
   - Weak, slow pulse.
   - Final phase - unconsciousness and death.

   To Avoid Hypothermia:
   - Dress appropriately (wool layer, waterproof layer).
   - Rest frequently, carry matches and high energy food.
   - Be on the lookout for symptoms and weather.

   If you encounter someone with Hypothermia:
   - Get them out of the elements.
   - Get person out of wet clothes, into a sleeping bag near a heat source or use body heat.
   - Give the conscious warm drinks with no alcohol.
   - Handle person gently, do not rub them or make them exercise.

10. Hyperthermia

- Three types:
  1. Heat Cramps
     - Caused by dehydration and salt depletion.
  2. Heat Exhaustion
     - Caused by dehydration and salt depletion.
  3. Heat Stroke
     - Caused when body temperature rises above 41°C.

Ways to Reduce Heat Stress:

1. Drink plenty of fluids.
2. Increase salt intake slightly.
3. Wear light coloured loose fitting clothes.
4. Listen to your body. Do not overexert yourself.

Treatment of hyperthermia is the exact opposite treatment of hypothermia

11. Diarrhea

- Can rob the body of nutrients and fluids.
- Prevention - boil water and use decontamination pills.

12. Giardia

- *"BEAVER FEVER"*
- Caused by parasite from animal or human feces.

Symptoms:

- May take a week or more to show up, include severe diarrhea, vomiting, nausea, cramps, headaches, chills and severe gas.

Precautions:

- Boil water for ***FIVE*** minutes.
- Wash hands thoroughly after using toilet.
- Never swim in a beaver pond.

13. Tularemia

- Caused by bacteria from human or animal feces.

Caused by:

- Drinking infected water.

- Direct contact with fur or internal parts.
- Eating meat that has not been cooked long enough.

Symptoms:

- Resemble flu, including fever, chills, sweating, headaches, nausea diarrhea and general malaise.

Precautions:

- Boil water.
- Wear rubber gloves when handling fur of dead meat.
- Wash hands and tools carefully.
- Cook any game thoroughly.

Obj. 4.20

PRACTICAL EXERCISE

One day practical field exercise involving the construction of a lean-to and reflector fire, the construction of a signal fire, setting survival traps and snares, and participation in a mock accident.

Obj. 5 GLOBAL POSITIONING SYSTEM

NOTE:

The Newfoundland and Labrador Search and Rescue Association has adopted the Lowrance GlobalMap 100 as the official GPS unit. As a result, the following training section is based on Lowrance GlobalMap 100 specifications. The Association recognizes that many teams and individual members may have different types of GPS units however, it would be impossible to develop a training package for each individual GPS unit type. Therefore, the Association recommends that individuals using different type of GPS units be able to follow similar procedures as outlined for the Lowrance GlobalMap 100.

Obj. 5.1

DEFINE GPS

- The Global Positioning System or GPS was originally developed by the US Department of Defense as a 24 hr a day, 365 days a year global navigation system for the military. The system utilizes 24 satellites that orbit the Earth in a configuration that virtually

guarantees that at least four satellites are in view of any place on Earth at any time.

Obj. 5.2

BASIC REQUIREMENT OF A GPS

- The system requires a minimum of 3 satellites to calculate a position (2D Fix).
- 4 satellites are required to calculate both position and elevation (3D Fix)
- In order to receive signals, the unit must have an unobstructed view of the satellites.
- Signals can be blocked by trees, buildings and even your body, however, they can travel through glass/plastic.
- ***Always ensure that the antennae has a clear view.***

Obj. 5.3

GPS: A NAVIGATIONAL AID

- GPS is the most accurate method of electronic navigation available to the general public.
- ***However, the GPS is only a navigational aid and is not meant to replace traditional navigation methods such as map and compass.***
- You should always carry a map and compass and spare batteries.

Obj. 5.4

DISPLAY SCREENS: LOWRANCE GLOBALMAP 100

- The Lowrance GlobalMap 100 has four display modes: **Status, Map, Navigation and Groups** (BLM 46)**.**
- The various screens can be accessed using the **PAGES** button and arrow keys.

STATUS SCREEN

- Appears when unit is turned on.
- Graphical display of satellites in view.
- *Expected Error* is shown in upper left.
- The unit has ***NOT*** acquired a ***Position Fix*** if the expected error is ***flashing***.
- The *Fix Indicator* (2D or 3D) is located in the left centre.
- The *Battery Level Indicator* is located in the lower right.
- (BLM 47)

NAVIGATION SCREENS

- There are two different types of Navigation Screens.

Navigation Screen #1

- Displays a graphical view of the trip.
- The screen is comprised of a compass rose which displays both direction of travel and direction to a recalled waypoint.
- Current position is shown by an arrow in the centre of the screen.
- The arrow pointing down at the top of the compass rose indicates current track. (BLM 48)

Navigation Screen #2

- Displays all navigation information in large digital numbers.
- Composed of eight digital boxes.
- Track (TRK) and ground speed (GS) are all that show if you are not navigating to a waypoint.
- If navigating to a waypoint, Bearing (BRG), Distance to Waypoint (DIS), Estimated Time en Route (ETE), Cross Track Error (XTK), Course Deviation Indicator (CDI) and Destination Arrow also operate. (BLM 49)

MAP SCREENS

- The Lowrance GlobalMap 100 has a built-in ground map of the world**.**
- The map screens show your course and track from an aerial view.
- The flashing arrow in the centre of the screen shows your present position and points in the direction of travel.
- The solid line extending from the arrow is your plot trail.
- The plotter range is shown in the lower left corner of the screen (BLM 50).
- There are three different mapping screens.
- MAP-1 is a simple map screen. MAP-2 and MAP-3 display the map but also have different navigation data added to the bottom of their screens.
- The **Z-IN** and **Z-OUT** keys zoom-in and out all maps (BLM 51).

GROUP SCREENS

- The group windows provide ten different screens chosen for their broad range of navigation information.
- Many group windows have navigation data that require navigation to a waypoint in order to show data.
- The ***GROUP F*** window is the most important for NLSARA work since it displays current position information in two formats (BLM 52)

Obj. 5.5

NLSARA STANDARD GPS SETUP

- The Lowrance GlobalMap 100 has many customization options.
- These options affect the basic operation of the GPS.
- To change any of these options, press the **MENU** key and use the arrow keys to select the appropriate option that requires adjustment.
- The following is the recommended standard GPS setup according to the NLSARA.

SYSTEM SETUP

- Press the **MENU** key and select ***"System Setup"*** to make the following changes:

AUDIO/SCREEN (BLM 53)

○ Sound	On
○ Contrast	50 – 60%
○ Backlight	Max
○ Light Dly	Continuous

SET LOCAL TIME (BLM 54)

- ○ Set local time using the 12hr clock

CHANGE UNITS (BLM 55)

○ Units	Metric
○ Bearing	True or Magnetic* **(depending on compass setup)*
○ Clock	12hr

RESET GROUPS

○ Do Not Touch	Returns unit to factory defaults

RESET OPTIONS

○ Do Not Touch	Returns unit to factory defaults

COM PORT SETUP (BLM 56)
- Baud Rate 9600
- Parity None
- Data Bits 8

DELETE ALL WPTS
- Do Not Touch — Deletes all waypoints from memory

SYSTEM INFO
- No Settings — Pressing the down arrow 5X will show how long the unit has operated.

NMEA/DGPS CONFIG
- Do Not Touch

GPS SETUP

- Press the **MENU** key and select ***"GPS Setup"*** to make the following changes:

INITIALIZE GPS (BLM 57)
- Do Not Touch — Use only to reset

POWER SAVE
- Off — Allows maximum signal

POSITION FORMAT (BLM 58)
- UTM

ALTERNATE FORMAT
- DM — Used to communicate position to helicopters.

SELECT DATUM (BLM 59)
- WGS-84 or NAD27 Mean Canada*

**(Depending upon datum used to create topo maps for a given area)*

MAP FIX SETUP
- Do Not Touch — Advanced user feature

SET PCF OFFSET (BLM 60)

- Do Not Touch Advanced user feature*

(A method used to make the display match a map or chart. Also known as **Position Correction Factor)*

PINNING

- ON Used when traveling in a vehicle
- OFF Used when traveling on foot

(*The position pinning feature locks the present position indicator on the GPS plotter until you have either moved a certain distance or exceeded a minimum speed.)*

GPS AUTO SEARCH

- Do Not Touch Reinitializes GPS receiver

(This feature should only be used when the GPS receiver is turned on for the first time or if you have moved more than 100 miles from the last location in which the GPS was used.)

ADDITIONAL SETUPS

SIMULATOR (BLM 61)

- Do Not Touch Used for training or trip planning

SUN/MOON CALC (BLM 62)

- The GPS unit has a sunrise/sunset and moonrise/moonset calculator that shows this information anywhere or anytime in the world. The information is displayed based on your present position. Information for other areas can be displayed by moving the plotters cursor to the desired area.

ROUTE PLANNING

- Used to create a route by connecting several user waypoints. Illustrated in detail in later.

ALARMS/CDI (BLM 63)

- Arrival On
- Arrival Dis 0.1 km
- CDI Alarm Off
- CDI Dis 0.2 km
- Anchor Off
- Anchor Dis 0.1 km
- DGPS MSG Off

MAP SETUP

- The three GPS maps have many customization options.
- In order to make any changes, the display must be in the **MAP** mode. *(ie. either Map 1, 2, or 3)*
- To change any map options, press the **MENU** key while a map is showing on the screen.
- The ***Map Setup*** screen is highlighted.
- Press the right arrow key.
- A screen similar to (BLM 64) appears.

MAP OPTIONS (BLM 65)

- Rotate — North-up, Track-up, or Course-up*
  **(North-up always shows north at the top of the screens similar to printed maps. Track-up always keeps the direction of travel towards the top of the screen. Course-up is used for navigating to waypoints and locks on to the original bearing)*
- Auto Zoom — Off
- Rng Rings — Off
- Grid — Off

EARTH MAP OPTIONS (BLM 66)

- Earth Map — On
- Grey Fill — Water
- Map Text — On
- Symbols — On
- Locations — Off
- Railroads — On
- Navionics — Off
- Contours 1 — On
- Contours 2 — Off
- Map Details — High
- Map Bounds — On

WAYPOINT OPTIONS (BLM 67)

- Waypoints — On
- Symbols — On or Off*
  **(If you have too many waypoints, the symbols may clutter the screen)*
- Names — On
- Numbers — Off

` ICON OPTIONS (BLM 68)

- Icons — On
- Del All Icons — Do Not Touch
- Del Icon Type — Do Not Touch
- Del Icons From Map — Do Not Touch

CHANGE (BLM 69)

- This Map — Limits map option changes to the current map

TRAIL OPTIONS (BLM 70)

- Clear Trail — Clears current trail from screen
- Flash Trail — Off
- Update By — Time
- Update Rate — 3-5 sec*

  **(use a shorter update rate for vehicles and a longer update rate for foot travel. A plot trail can only have a maximum of 3000 points)*
- Update Dis — 0.10 km
- Save Trail — Select Trail 1 or Trail 2
- Trails Shown — Display up to three trails on the plotter

GROUP SETUP

- All of the window groups can be customized.
- All changes will remain in permanent memory.
- The **RESET GROUPS** option in the system **SETUP MENU** will return the groups to the factory settings.
- To customize a group, make that group active.
- Press **MENU**, and Select **REPROGRAM GROUP**.

REPROGRAM GROUP

- Do Not Touch — Advanced User Feature

Exercise

PRACTICAL EXERCISE 1

1. All participants should setup up the GPS unit based on the previous recommended setup options.

2. Upon completion of setup, participants should be instructed to proceed to a specified location and obtain a position fix with the GPS unit.

3. All position fixes should be compared to determine accuracy and to ensure proper GPS setup.

Obj. 5.6

DEFINE WAYPOINT

- The GPS receiver has the ability to create a database of locations called ***WAYPOINTS***.
- The Lowrance GlobalMap 100 can save a maximum of 750 waypoints.
- Waypoints can be saved as either a current position, a cursor location or an entered coordinate.
- Use the ***WAYPOINT MENU*** to either save, modify or recall a waypoint.
- The Waypoint Menu can be accessed by pressing the **WPT/GO TO** key.
- All of the details about a waypoint are shown on the Waypoint Menu screen (BLM 71).

Obj. 5.7

SAVING A WAYPOINT

- There are several methods for saving waypoint:

QUICK SAVE METHOD (BLM 72)

- Saves the current position as a waypoint.
- Simply press the **WPT** key twice.
- The current position is saved in the first available waypoint number on the list.
- A message appears on the display stating the waypoint number it saved the position in.
- Anytime the Waypoint Menu is showing, simply pressing the **WPT** key once, will store the current position on the waypoint list.

SAVING THE CURSOR POSITION (BLM 73)

- When the cursor is showing on the map and the **WPT** key is pressed twice, the cursor's position is placed into the first available waypoint number in the list.
- A message appears on the display stating the waypoint number it saved the position in.
- The menu will clear automatically in a few seconds.
- Press the EXIT key to erase the cursor.

SELECT NUMBER METHOD (BLM 74)

- The previous methods do not allow a choice in the waypoint number.
- However, a waypoint number can be selected and the current or cursor position can be saved to that number.
- To save the current position, press the **WPT** key once. The waypoint menu screen will appear.
- Highlight the ***"WPT"*** label at the top of the screen.
- Use the arrow keys to select the desired waypoint number.
- Next, select the **CREATE WPT** option.
- Finally, highlight the **CURRENT WPT** option and press the right arrow key.

  NOTE: ***A position can be saved on any waypoint number even if a position is already stored on that number.***

SAVING A NEW POSITION (BLM 75)

- To save a position other than the current or cursor position, press the **WPT** key once. The waypoint menu screen will appear.
- Highlight the ***"WPT"*** label at the top of the screen.
- Use the arrow keys to select the desired waypoint number.
- Next, select the **CREATE WPT** option.
- Highlight the **ENTER POS** option and press the right arrow key.
- Using the arrow keys, enter the coordinates (UTM or Lat/Long) of the position to be saved.

Obj. 5.8

SELECTING A WAYPOINT

- In order to edit or navigate to a waypoint, it must be first selected. There are three methods of selecting waypoints:

WAYPOINT NUMBER (BLM 76)

- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Highlight the ***"WPT"*** label at the top of the screen.
- Use the arrow keys to select the desired waypoint number.

WAYPOINT LIST (BLM 77)

- The waypoint number method forces you to scroll through all waypoint numbers whether there is a saved location in them or not.
- The waypoint list is composed only of saved waypoints.
- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Select the ***"WPT LIST"*** label.
- The list shows the names of all stored waypoints.
- Highlight the desired waypoint and press the right arrow key to select it.

WAYPOINT NAME (BLM 78)

- The waypoint name method allows you to scroll through all waypoint names whether they are user or GPS generated.
- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Select the ***"NAME-WPT"*** label.
- Use the arrow keys to select the desired waypoint name.

Obj. 5.9

EDITING A WAYPOINT

- Waypoints can be customized by changing it's position, name or icon.

EDIT POSITION (BLM 79)

- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Highlight the ***"WPT"*** label at the top of the screen and use the arrow keys to select the desired waypoint number that you want to save a position under.

- Highlight the ***"EDIT POSITION"*** label and press the right arrow key.
- Using the arrow keys, enter the coordinates (UTM or Lat/Long) of the position.
- Press the **ENT** key to save this position.

EDIT NAME (BLM 80)

- A name can be assigned to each waypoint.
- The name can have up to eight characters.
- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Highlight the ***"WPT"*** label at the top of the screen and use the arrow keys to select the desired waypoint number that you want to name.
- Highlight the ***"EDIT NAME"*** label and press the right arrow key.
- Use the arrow keys to enter the characters of the name.
- Press the **ENT** key to save the name, the **WPT** key to erase all the characters in the name or the **EXIT** key to cancel without saving any changes.

EDIT ICON (BLM 81)

- Changes the icon assigned to a waypoint.
- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Highlight the ***"WPT"*** label at the top of the screen and use the arrow keys to select the desired waypoint number for which you want to change the icon.
- Highlight the ***"EDIT SYMBOL"*** label and press the right arrow key.
- Use the arrow keys to select the icon to be assigned to the waypoint.
- Press the **ENT** key to save the new icon to the waypoint.

Obj. 5.10

WAYPOINT NAVIGATION

- Waypoint navigation with the GlobalMap 100 is a simple task.

NAVIGATING TO A WAYPOINT (BLM 82)

- Press the **WPT/GO TO** key to make the Waypoint Menu active.
- Highlight the ***"WPT"*** label at the top of the screen and use the arrow keys to select the desired waypoint number that you want to navigate to.
- Highlight the ***"GO TO WPT"*** label and press the right arrow key.
- The GPS immediately shows navigation information to the waypoint on all display screens.

NAVIGATING TO A CURSOR LOCATION (BLM 83)

- Make the **MAP SCREEN** active by using the **PAGES** key
- Move the cursor to the location to be navigated to.
- Press the **MENU** key.
- Highlight the ***"GO TO CURSOR"*** label and press the right arrow key.
- The GPS immediately shows navigation data to the cursor location (shown as a ***"D"*** on the map).

Obj. 5.11

MOVING A WAYPOINT

- All information can be moved from one waypoint number to another to help better organize waypoints (BLM 84).
  - Press the **WPT/GO TO** key to make the Waypoint Menu active.
  - Highlight the ***"MOVE WPT"*** label and press the right arrow key.
  - The ***"FROM"*** label is highlighted at the top of the screen. Press the right arrow key until the waypoint number that you want to move appears.
  - Press the down arrow once to highlight the ***"TO"*** label. Press the arrow keys until the number that you want to move the waypoint to appears.
  - Press the **ENT** key to move the waypoint.

Obj. 5.12

DELETING A WAYPOINT

- To erase all of the information in a waypoint (BLM 85):
  - Press the **WPT/GO TO** key to make the Waypoint Menu active.
  - Highlight the ***"WPT"*** label at the top of the screen and use the arrow keys to select the desired waypoint number that you want to erase.
  - Highlight the ***"DELETE WPT"*** label and press the right arrow key.
  - A message appears to confirm the deletion of the waypoint.
  - Press the right arrow key to delete it or the left arrow key to exit without deleting the waypoint.

Obj. 5.13

ICONS

- The plotter has 28 symbols or "ICONS" that cab be placed anywhere on the screen to mark significant features.

PLACE ICON – PRESENT POSITION (BLM 86)

- Press the ENT key while the MAP SCREEN is active.
- Use the arrow keys to highlight the desired icon.
- Press the ENT key again.

PLACE ICON – CURSOR POSITION (BLM 87)

- Use the arrow keys to move the cursor to the location that you wish to place the icon.
- Press the **ENT** key while the **MAP SCREEN** is active.
- Use the arrow keys to highlight the desired icon.
- Press the **ENT** key again.

Exercise

PRACTICAL EXERCISE 2

2a. All participants should be instructed to proceed to a specified location and obtain a position fix with the GPS unit. The position should be saved as a waypoint and called **BASE1**.

2b. All participants should be given a piece of labeled flagging tape and should be instructed to proceed from **BASE1** to any desired location. The flagging tape should be placed at that location and the position should be saved as a waypoint using the name on the tape. Once all participants have returned to

BASE1, they will exchange GPS units and navigate to the waypoint, collect the flagging tape and return to **BASE1**.

2c. All participants should be given a radio and should be instructed to proceed from **BASE1** in different directions. A small object should be placed in an inconspicuous location. All participants should be instructed over the radio to copy the coordinates, create a waypoint and navigate to the location of the object and return it to **BASE1.**

Obj. 5.14

DEFINE TRAIL

- A TRAIL is a line that is plotted on the display which depicts the path that you have taken.
- The Lowrance GlobalMap 100 has the ability to save and display a maximum of **3** plot trails.
- Each plot trail can consist of a maximum of **3000** plot trail points.
- For example, a plot trail created with an update rate of 3 sec will last for 2.5 hours. If you exceed this time limit, the plot trail will remove points from the beginning of trail and place them at the end. *Use extreme caution when creating a plot trail over an extended period of time*.

Obj. 5.15

PLOTTING A TRAIL

- The following procedures will create plot trail from your current position *(with the map screen active)*:
  - Press the **MENU** key.
  - Highlight the ***"MAP 1 SETUP"*** label and press the right arrow key.
  - Highlight the ***"TRAIL OPTIONS"*** label and press the right arrow key.
  - Highlight the ***"CLEAR TRAIL"*** label and press the right arrow key. A message appears to confirm the clearing of the plot trail.
  - Press the right arrow key to select ***"YES".*** A message is displayed confirming that the plot trail was cleared.
  - Press the **MENU** key.
  - Highlight the ***"MAP 1 SETUP"*** label and press the right arrow key.
  - Highlight the ***"TRAIL OPTIONS"*** label and press the right arrow key.

- Highlight the ***"TRAILS SHOWN"*** label and press the right arrow key and select the following options.
  - ► CUR TRAIL ON
  - ► TRAIL 1 OFF
  - ► TRAIL 2 OFF

Obj. 5.16

SAVING A TRAIL

- The following procedures will save a current plot trail *(with the map screen active)* (BLM 88):
  - Press the **MENU** key.
  - Highlight the ***"MAP 1 SETUP"*** label and press the right arrow key.
  - Highlight the ***"TRAIL OPTIONS"*** label and press the right arrow key.
  - Highlight the ***"SAVE TRAIL"*** label and press the right arrow key.
  - Highlight the desired number that you want to save the current trail under, either ***"SAVE AS TRAIL 1"*** or ***"SAVE AS TRAIL 2"*** and press the right arrow key.
  - A message is displayed confirming that the plot trail was saved.

Obj. 5.17

DISPLAYING A TRAIL

- The following procedures will display a previously saved plot trail *(with the map screen active)* (BLM 89):
  - Press the **MENU** key.
  - Highlight the ***"MAP 1 SETUP"*** label and press the right arrow key.
  - Highlight the ***"TRAIL OPTIONS"*** label and press the right arrow key.
  - Highlight the ***"TRAILS SHOWN"*** label and press the right arrow key and select the following options.
    - ► CUR TRAIL OFF
    - ► TRAIL 1 ON or OFF*
    - ► TRAIL 2 ON or OFF*

      (depending on which trail was saved)

Exercise

PRACTICAL EXERCISE 3

All participants should be given a piece of labeled flagging tape and should be instructed to proceed from **BASE1** and create a plot trail in any desired direction. The flagging tape should be used to mark the end of the trail and a waypoint should be created with the name on the flagging tape. At this point, the current trail should be turned off and the plot trail should be saved as **TRAIL 1**. Once all participants have returned to **BASE1**, they will exchange GPS units and navigate **TRAIL 1**, collect the flagging tape and return to **BASE1**.

Obj. 5.18

DEFINE ROUTE

- A **ROUTE** is formed when several user waypoints are connected together.
- When a route is recalled, the GPS shows navigation information to the first waypoint in the route, when that waypoint is reached, it switches to the next waypoint, and so on until the last waypoint in the route is reached.
- The Lowrance GlobalMap 100 has the ability to save and display a maximum of **99** routes.
- Each route can consist of a maximum of **99** waypoints.
- A maximum of **1500** total waypoints can be used in all routes combined.

Obj. 5.19

CREATING A ROUTE

- The following procedures will create a route (BLM 90):
  - Press the **MENU** key.
  - Highlight the ***"ROUTE PLANNING"*** label and press the right arrow key.
  - Highlight the ***"ROUTE #"*** label at the top of the screen and use the arrow keys to select the desired route number that you want to create.
  - To name the route, highlight the ***"EDIT NAME"*** label and press the right arrow key. Use the arrow keys to create a name up to 8 characters. Press the **ENT** key when you have finished.
  - The gray boxes in the lower half of the screen comprise the list of waypoints that form the route.
  - To add waypoints to the route, highlight the first gray box and press the right arrow key.

- Highlight the ***"ADD WPT"*** label and press the right arrow key.
- Select a waypoint either by using the waypoint number, name or waypoint list. After selecting the waypoint, highlight the "***ADD TO ROUTE***" label and press the right arrow key.
- The unit returns to the route planning screen with the first waypoint at the top of the screen.
- To add another waypoint, highlight the next gray box and repeat the process described above. Continue until all desired waypoints have been added to the route. When completed, press the **EXIT** key twice.

Obj. 5.20

FOLLOWING A ROUTE

DIRECT-TO METHOD (BLM 91)

- Press the **MENU** key.
- Highlight the ***"ROUTE PLANNING"*** label and press the right arrow key.
- Highlight the ***"ROUTE #"*** label at the top of the screen and use the arrow keys to select the desired route number that you want to follow.
- Decide if you want to travel this route either forward or reverse.
- Highlight the first waypoint in the route that you want to start with and press the right arrow key.
- Highlight the ***"DIRECT TO"*** label and press the right arrow key.
- The unit returns to the last used display screen.
- A dotted line shows from your starting position to the waypoint. A dashed line extends from this waypoint to each of the other waypoints in the route. Follow these lines to get to each of the waypoints.

AUTO START METHOD (BLM 92)

- You do not have to choose the starting waypoint in a route. The ***"AUTO START"*** function will start navigation along the leg of the route that is closest to your present position
- Press the **MENU** key.
- Highlight the ***"ROUTE PLANNING"*** label and press the right arrow key.
- Highlight the ***"ROUTE #"*** label at the top of the screen and select the desired route number.

- Decide if you want to travel this route either forward or reverse.
- Highlight the ***"AUTO START"*** label and press the right arrow key.
- The unit returns to the last used display screen.
- The unit shows navigation data to the closest waypoint. Once you arrive at this waypoint, route navigation resumes normally.

Obj. 5.21

DELETING A ROUTE

- To erase a route, highlight the ***"ROUTE #"*** label at the top of the route planning screen and select the route number that you want to erase.
- Highlight the "***DELETE ROUTE"*** label and press the right arrow key. A message appears asking if you really want to erase the route.
- Select ***"YES"*** by pressing the right arrow key. A message then asks if you want to erase the waypoints used in the route from memory. Press the right arrow key to erase them or the left arrow key to leave the waypoints in memory. (BLM 93)

Obj. 5.22

CANCEL NAVIGATION

- To stop navigation, press the **MENU** key, highlight the "***CANCEL NAV***" label and press the right arrow key. The unit stops showing navigation information. (BLM 94)

Exercise

PRACTICAL EXERCISE 4

A minimum of five well spaced waypoints should be created and marked. All participants should be given their coordinates and names and should be asked to create these waypoints. Once all of the waypoints have been created, the participants should then create a route utilizing these waypoints and the route should be named **TRAIN1**. The route should run forward and the participants should follow the **DIRECT TO** method of navigation. The participants should make field notes of all the points within the route.

Obj. 6

RADIO COMMUNICATIONS

Obj. 6.1

STANDARD RADIO PROCEDURES FOR SAR TEAMS

- It is imperative that all members of a search team be familiar with proper radio use since many operations require that searchers carry and use a radio.
- Search team members should practice and follow proper radio protocols until they become second nature.

Standard Terminology

- Since SAR radio communications in Newfoundland and Labrador are carried mostly on EMO, EPC and local policing channels, searchers should attempt to follow standard radio procedures and terminology as closely as possible.
- If exact terminology is forgotten, urgent communications should be transmitted in the most appropriate form possible.
- Idle chat, non-emergency communications, profanity, personal references and the transmission of confidential material must be avoided.

Protocols

- Different jurisdictions may have different communication protocols however, the station serving the Search Manager is considered ***"Command"*** and all communications from the field must be directed through the search manager.

Intra-Team Communications

- Individual SAR teams that may need to communicate between each other may be instructed by command to operate on a separate frequency.
- Due to topography, some teams may not be able to communicate with command, and as a result, may have to rely on intra-team communications to relay information back to command.

Message Content

- It is essential that only important information be broadcasted.
- Messages should be short, exact and easily understood.
- Compose your message before you communicate to ensure

there will be no misunderstanding.

- To confirm that a message has been understood, ask for a "***Read Back***".
- Radio reception is variable and your full message should be transmitted during your first contact. Sometimes, you may not be able to make contact again.

Radio Logs

- Command must maintain a detailed log of all radio communications during a SAR mission.
- This log will allow the overhead team to review what has been done and it may also become a legal document for court.
- For legal purposes, the communications log must be recorded in a fully bound notebook from which pages cannot be removed without leaving a trace.

Obj. 6.2

GENERAL RADIO CHARACTERISTICS

- Many different types of radios with different features and characteristics are available for SAR use in the province, however, most have the following features in common:

On/Off/Volume Switch

- This is usually a single knob, and volume increases as it is clicked on and turned clockwise.
- Most radios will beep when they are initially turned on to indicate that they are powered up.
- Some radios will beep twice quickly to indicate that they are low on battery power.
- Set the radio volume at a level in which it can be easily heard and understood, but not to loud as it may result in distortion.

Squelch

- Most radios have automatic squelch control, however some have a knob which enables the user to reduce the static when no transmission is coming in.
- To set a radio for the most sensitivity but no static noise, turn the squelch knob until you hear static, and then back it off until the static just disappears.

Channel Switch

- Some radios are capable of using just one frequency however, most are capable of using more than one.
- Searchers must be absolutely sure which channels are being used and their purposes before leaving on a task.

Push to Talk (PTT) Switch

- This is a button located on the side of a portable or on the microphone.
- When depressed, the radio is in "*transmitter mode*" and you can talk.
- When released, the radio reverts to "*receiver mode*" and you can listen.
- Always wait 1-2 sec after you have depressed the PTT button before you begin to transmit your message.
- Do not try to transmit a message when the radio is receiving communications from another station.

Antenna

- Ensure that the antenna is properly attached before trying to transmit a message.
- Telescoping antennae should be fully extended before receiving communications.

Obj. 6.3

BASIC RADIO OPERATING PROCEDURES

- The principles of operation are generally similar and fairly simple for most makes of hand-held radios.

To Activate

- Turn on the on/off/volume switch and adjust the volume.
- Adjust squelch until static noise just disappears.
- Adjust the channel switch to the desired channel.

To Transmit

- Do NOT interrupt any other radio traffic.
- Hold the microphone several inches from your mouth.
- Press the PTT button, wait a couple of seconds and then transmit message in a normal voice.

To Speak

- Do not raise your voice, mumble, shout, speak to fast or run your words together.
- Avoid meaningless pauses between words.
- Keep the rate of speech constant, keeping in mind that an operator may have to write it down.
- Always use the phonetic alphabet when spelling or giving letters and use the 24-hour clock when stating time.

Obj. 6.4

PHONETIC ALPHABET

- The phonetic alphabet is an internationally recognized alphabet and should be used to avoid confusion when transmitting difficult or unusual words.

Letter	Word	Pronunciation
A	Alfa	**Al** FAH
B	Bravo	**BRAH** VOH
C	Charlie	**CHAR** LEE
D	Delta	**DELL** TAH
E	Echo	**ECK** OH
F	Foxtrot	**FOKS** TROT
G	Golf	GOLF
H	Hotel	HOH **TELL**
I	India	**IN** DEE AH
J	Juliett	**JEW** LEE ETT
K	Kilo	**KEY** LOH
L	Lima	**LEE** MAH
M	Mike	MIKE
N	November	NO **VEM** BER
O	Oscar	**OSS** CAH
P	Papa	PAH **PAH**
Q	Quebec	KEH **BECK**
R	Romeo	**ROW** ME OH
S	Sierra	SEE **AIR** RAH
T	Tango	**TANG** GO
U	Uniform	**YOU** NEE FORM
V	Victor	**VIK** TAH
W	Whiskey	**WISS** KEY
X	X-ray	**ECKS** RAY
Y	Yankee	**YANG** KEY
Z	Zulu	**ZOO** LOO

Obj. 6.5

TRANSMITTING NUMBERS

- Numbers should be pronounced as follows:

  0 = ZE-RO
  1 = WUN
  2 = TOO
  3 = TREE
  4 = FOH-er
  5 = FIVE
  6 = SIX
  7 = SEV-en
  8 = AIT
  9 = NYN-er

- All numbers except whole thousands should be transmitted by pronouncing each digit separately.
- Whole thousands should be transmitted by pronouncing each digit followed by the word "thousand".
- The following are examples of how to transmit numbers:
  - 10 one zero
  - 50 five zero
  - 200 two zero zero
  - 3500 three five zero zero
  - 15000 one five thousand

Obj. 6.6

STATING TIME

- All time should be stated using the 24-hour clock.
- Time should be expressed using four figures; the first two represents the hour past midnight and the second two represents the minutes past the hour.
- The following are examples of how to transmit time:
  - 12:45 am 0045
  - 12:00 noon 1200
  - 12:00 midnight 2400 or 0000
  - 3:15 pm 1515
  - 10:30 pm 2230
  - 6:25 am 0625

Obj. 6.7

STANDARD RADIO CODES

- Using standard radio codes will enable radio transmissions to be more easily understood especially when transmission is difficult.
- Avoid using police "10" codes. The only 10 code that should be transmitted is 10-45 which is used to indicate that a subject has been found dead. Many SAR teams used "Situation Delta" for a death code.
- Avoid slang and CB expressions such as "breaker-breaker", "ten-four", "over and out" and "okay".

Code	Meaning
ACKNOWLEDGE	Confirm that message is received and understood
AFFIRMATIVE	Yes
CHANNEL	change to channel
CONFIRM	confirm a message has been correctly received
CORRECTION	An error has been made in the message. The correct version is …
DISREGARD	Consider message as not sent
GO AHEAD	proceed with message
HOW DO YOU READ?	How well is the transmission being read
I SAY AGAIN	Repeats the message
MAYDAY	Distress transmission
MONITOR	Listen to specified channel
NEGATIVE	No
OUT	End of conversation, no further response expected
OVER	End of transmission, response expected
READ BACK	Repeat all of the message back to the sender
ROGER	transmission received
SAY AGAIN	Asks the sender to repeat the message.
STAND BY	unable to receive message now, please wait a few seconds or minutes
THAT IS CORRECT	confirms that the message read back is correct
VERIFY	checks the correctness of the message with the sender
WORDS TWICE	each word is sent twice during difficult communications.

Obj. 6.8

CALL SIGNS

- A call sign is a name that is assigned to a specific radio.
- The most common call signs used in SAR operations are "Base", "Team One", "Team Two", etc.
- During a SAR operation every radio, base or portable must be assigned a call sign.
- Call signs should be used for both initiating and finishing calls.
- The following is a simple example of how to initiate a call:
  - *TEAM ONE, THIS IS BASE, OVER*
  - *BASE, THIS IS TEAM ONE, GO AHEAD, OVER*
- When more than one station is being called at the same time, the stations should reply in the order they were called, for example:
  - *TEAMS ONE, THREE AND FIVE, THIS IS BASE, OVER*
  - *BASE, THIS IS TEAM ONE, OVER*
  - *BASE, THIS IS TEAM THREE, OVER*
  - *BASE THIS IS TEAM FIVE, OVER*
- Once all teams have responded, Base would give the message to the teams. All stations should then acknowledge the message in the appropriate order as follows:
  - *BASE, THIS IS TEAM ONE, ROGER, OUT*
  - *BASE, THIS IS TEAM THREE, ROGER, OUT*
  - *BASE, THIS IS TEAM FIVE, ROGER, OUT*
- Any time a station is contacted but is not ready to receive a message, the operator should respond to the call and advise the calling station to ***"Stand By",*** followed by an approximate time of delay.

Obj. 6.9

CHECKING RADIO SIGNAL

- All field teams that are assigned a radio must perform a radio check before commencing their assignment.
- All teams should contact the base station and request a radio check similar to the following:
  - *BASE, THS IS TEAM ONE, RADIO CHECK 1, 2, 3, 4, 5, OVER*
- The base station will then reply to the radio check using the following scale:

1 = Bad	(unreadable)
2 = Poor	(readable now and then, "breaking up")
3 = Fair	(readable but with difficulty)
4 = good	(readable)
5 = Excellent	(perfectly readable)

- Based on the scale the base station may respond as follows:
  - *TEAM ONE, THIS IS BASE, READING YOU STRENGTH FOUR, OVER*
- When traversing through rough and hilly terrain, radio checks should be performed periodically to ensure adequate communications.
- If the base station cannot be reached, the operator must try to communicate to another team, which will in turn, relay the message to the base.

Obj. 6.10

TROUBLESHOOTING

- The most common problems associated with portable radio are Batteries.
- Over time, rechargeable batteries lose their capacity and as a result will last for shorter periods of time, even if they are kept charged.
- Every SAR member issued a portable, should check the voltage of their batteries and should always carry spare charged batteries.
- Cold weather will reduce the operation time of a fully charged battery. In cold weather, keep the radio protected inside of your jacket.
- To test if there is a problem with the battery, switch batteries with a working radio.
- Ensure battery terminals and contacts are always kept clean.
- If the problem is not with the battery, check all connections for proper fit or corrosion.
- Most portables are not waterproof; protect the radio from rain, snow and any form of moisture.
- If the radio signal is breaking up, trying moving around or up to a higher point, since most portables are VHF and transmit only on line of sight.
- In areas with rough, hilly terrain, the only solution to inconsistent communications may be the use of Drop Repeaters. These are portable repeaters which can be placed on a point of high elevation to allow VHF transmissions to clear line of sight obstacles.
- Using a repeater takes time to get use to since all transmissions are repeated twice.

Obj. 7

LOST PERSON BEHAVIOUR

Obj. 7.1

BASIC CONCEPTS IN UNDERSTANDING LOST PERSONS

- The analysis of past lost person behaviour can assist searchers in the "prediction" of actions taken by a current lost subject.
- Lost person behaviour characteristics are a search management tool, which only indicates tendencies and probabilities, they are not absolutes. However, they can assist a search manager in identifying areas of high probability that should be searched early in the first operational period.
- Much of the pioneering work in this field was done by William Syrotuck with further studies being carried out by Ken Hill, Barry Mitchell, Edward Cornell, Donald Heth and Bob Koester.
- One of their most important finding was that lost persons seldom exhibit perfect logic.
- All lost persons will exhibit some degree of fear. It is this fear that clouds their better judgement and commonly results in panic.
- Panic or Bush Panic is one of the worst enemies of survival and is generally manifested by aimless running and scrambling through the bush.
- Bush panic causes discomfort, cold and exhaustion which results in a further increase in irrational behaviour.
- During this stage, even individuals that are well equipped for the wilderness will not use the materials that they have.
- Instead, they often discard useful items including their clothing.
- Many lost persons at this stage often fail to even recognize the searchers that are looking for them.
- According to the data displayed in BLM 95, on average, individuals in all categories of lost persons, are generally found between .95 km and 2.62 km from the PLS.
- According to the data displayed in BLM 96, between 56% and 89% of all categories of lost persons are found downhill from the PLS.
- This tells the search manager that about .95 km to 2.6 km downhill from the PLS is high probability search area and that hasty teams should be dispatched to this area early in the search.

Obj. 7.2

LOST SUBJECT PROFILE

- A lost subject profile is a useful tool for the search manager when trying to determine where, when and how to search for the subject.
- The profile is a compilation of all the information regarding the subject which enables the search manager to plan a course of action.
- Components of a lost subject profile include:
  - Physical abilities
  - Mental condition
  - Experience
  - Personality
  - Behaviour statistics
- The majority of the information for the first four components comes from family, friends, coworkers, and medical personnel.
- The behavioural statistics are derived from the analysis of similar past incidents.
- Once a profile is created, searchers should try to think like the missing person and decide what they would do.

Obj. 7.3

LOST PERSONS CATEGORIES

- *Please be advised that these categories only describe the typical average behaviour of the lost person and are not always right. They are only one of many tools that a search manager has at their disposal. Please use you own judgment when considering this information.*

Children: 1 to 3 Years (Hill, Syrotuck)

- No concept of being lost
- No navigational skills or sense of direction.
- Tend to wander aimlessly
- Do not respond to whistles or calls
- Will travel through areas that appear impassible.
- Attracted by random events such as a tunnel, path or animal.
- Tend to remain in the general area.
- They often look for a place to lie down and go to sleep. Usually in, under or beside some sort of shelter.
- Good survivability due to their tendency to find shelter.

Children: 3 to 6 Years (Hill, Syrotuck)

- Often understand the concept of being lost and will try to return home or somewhere familiar.
- They may panic and become further lost as they attempt to find their way home.
- More mobile than children 1-3 years old.
- Generally become lost following an animal, friends or a path.
- May follow trails that are not very evident to adults.
- Will seek out a sheltered place to sleep when tired.
- Stranger resistant at first and often will not respond to unfamiliar calls.

Children: 6 to 12 Years (Hill, Syrotuck)

- Navigation and direction skills are much more developed than younger children.
- Orientated to familiar settings but become confused in a strange environment.
- May intentionally "run away" if mad or to avoid punishment, or to gain attention.
- Frequently become lost following shortcuts or adventure playing.
- May become upset and confused when lost and react irrationally.
- Often resort to trail running which may take them some distance from the PLS.
- Often will not answer when called until they become hungry or it becomes cold and dark.
- Often found in secret play places or hideouts.

Children: 13 to 16 Years (Hill, Syrotuck)

- Navigation and direction skills are much more developed than 6-12 year olds.
- Frequently become lost in groups while engaged in adventure activities.
- Rarely travel far in groups.
- Respond well to call and whistles.
- Will try to locate familiar landmarks.
- Will try to find themselves but may panic and resort to irrational tactics.

Despondents (Hill, Syrotuck, Koester)

- Not their intention to travel far but to find a place of solitude and possibly contemplate suicide.
- Frequently found at the interface of two different terrain types.
- Often found near a scenic location especially one overlooking civilization.
- Rarely found in the bush
- Usually found within sight and sound of civilization.
- Rarely respond to searchers and may even hide to avoid detection.
- This group has an extremely high fatality rate and drugs and/or alcohol are frequently involved.

Psychotics (Koester)

- May be evasive and frequently will run away and/or hide.
- Do not respond to searchers.
- Purposeful travel is rare.
- Associated medication and/or lack of it may be a problem.
- May be frightened of authority and of being lost.
- Can be aggressive, always be aware of the safety for searchers.
- Often found along the edges of woods, buildings or along roads, streams or trails.
- Behaviour is extremely difficult to predict.

Mentally Challenged (Koester)

- Lack the concept of being lost.
- Good survivability. May remain in the same location for days.
- Rarely respond to searchers and may even run away or hide.
- May do little to help themselves.
- May have an associated physical impairment.
- Purposeful travel is rare.
- Will travel deep into the bush.

Alzheimer's (Koester)

- Often lost due to senility.
- Impaired ability to make sense of surroundings and recognize hazards.
- Easily attracted to things.
- Often oriented to past environments.
- May experience hallucinations.
- May have a history of wandering.
- Will easily overexert themselves.
- Will not cry out for help or respond to searchers.
- May cross roads and trails.
- Usually found a short distance from a road or stream.
- Usually succumb to the environment and have a high risk of developing hypothermia.
- Loss occurs when they leave their residence or nursing home.

Hunters (Hill, Syrotuck)

- Concentration on game often distracts their navigation.
- Frequently become disoriented chasing wounded game into the bush.
- Will overexert themselves and push beyond their physical abilities.
- Often only prepared for the day.
- May travel long distances.
- Easily detectable if wearing hunter orange clothing.
- Will respond to searchers and may fire shots to attract searchers.
- Will take shelter at night or when the weather changes and may try to walk out at daybreak.
- High survivability.

Fisherpersons (Hill, Syrotuck)

- Usually well oriented.
- Usually overdue due to an accident, falling overboard or cold water immersion hypothermia.
- Always check weather and water conditions around the PLS.
- Look for clothing/fishing gear along shoreline and downstream/down current from the PLS.
- Body recoveries are commonly associated with this group.

Boaters (Hill Syrotuck)

- Usually well oriented.
- May take shelter in lees or bays to wait out weather.
- Often delayed by mechanical breakdown.
- Easily detectable if the boat is afloat.
- Capsized victims will commonly suffer hypothermia.

Hikers (Hill, Syrotuck)

- They are trail oriented and often become lost when trails become obscure or at confusing trail junctions.
- Will travel further than most with an intended destination.
- Often become lost by falling behind their party due to different physical abilities.
- Dependent on trails and travel aids for navigation.
- Sometimes poorly prepared and lack experience of remote areas.
- Will attempt to find themselves by trail running or finding a high spot.
- Easily detectable but will look for shelter at nightfall or if they are injured.

Mountain Bikers (Cornell, Heth)

- Usually focused on their activity and riding known trails.
- Will travel 2-3 times farther than hikers.
- Will only ditch their bike as a last resort or mechanical failure.
- Often lost trying to follow shortcuts.
- Often travel further than expected and as a result do not return at their expected time.
- Often overdue as a result of injury.

Climbers (Hill, Syrotuck)

- Include hill climbers, rock climbers, ice climbers and alpine mountaineers.
- Generally well equipped and self-sufficient.
- Tend to stay on or near routes.
- Often stranded by weather or rock falls.
- Falling is a major cause of injuries.
- Often subject to accidents or delays on their descent route.
- Rescue and recovery requires specialized equipment.

Skiers (Hill, Syrotuck)

- Includes both novice and experienced front and back country skiers.
- Generally well equipped and clothed.
- Generally in good physical and mental condition.
- Most are delayed or lost due to accidents, weather, fatigue or hypothermia.
- Many are prepared for an overnight stay and have survival training experience.

Snowmobilers and ATV Users (Hill, Syrotuck)

- Operators can travel a long distance in a short period of time.
- Often lost due to accidents, becoming stuck, mechanical failure, running out of fuel or weather conditions.
- Most are poorly prepared for an overnight stay and lack essential survival equipment.
- Lack of experience and size of machine usually results in speed related accidents and injuries.
- Often take chances especially on thin ice.

Miscellaneous Adults (Hill, Syrotuck)

- This group involves individuals such as berry pickers, photographers, prospectors, surveyors, foresters, conservation officers, etc.
- Often inexperienced in the bush.
- Most enter the bush during good conditions and are unprepared for changes in the weather.
- Become easily disorientated and attempts to find themselves usually results in panic and often causes the situation to become worse.
- Often poorly equipped and are at a high survival risk.

Obj. 8

SEARCH TECHNIQUES

Obj. 8.1

CLUE AWARENESS

- Observation and seeking clues is the major job of the field searcher and is critical to search success.
- A single competent clue-finder is worth more than hundreds of untrained grid searchers.
- Always search for clues before you search for the subject.
- A ***Clue*** is a fact, an object, information, or some type of evidence that helps solve a mystery or problem.
- The purpose of seeking clues is to assist in the reasoning of a problem and its ultimate solution.
- The finding of clues that can be linked to the missing person may provide the basis for search tactics and actions in the field and may eventually lead to the subject's location.
- It is virtually impossible to pass through the environment without leaving some trace or evidence. Tracks, scent, disturbances, discarded articles, all indicate the presence of a person in an area. These clues can yield a direction of travel, time and positive identification for a subject, and thus reduce the potential search area size.
- Important points to remember regarding clues:
    - There are more clues than subjects.
    - The subject is the ultimate clue.
    - The lack of clues may be a clue in itself (ie. searching in the wrong place).
    - Clue seeking is an ongoing process that continues throughout the mission.
    - Clue seeking is a skill. It must be learned and practiced.
    - Avoid forming opinions and then gathering information to support that opinion.
    - Do not form an opinion about the value of a clue.
    - Gather information from everyone. One person cannot gather all the facts.
    - Assemble a complete profile of the subject and the situation and let it offer direction.

Obj. 8.2

TYPES OF CLUES

- Many forms of clues exist.
- Most people think of clues as being physical items (ie. discarded wrappers, cigarettes, etc.), however, ***Intangibles*** are also clues.

1. **Intangible Clues**
   - Subject's state of mind.
   - Destination.
   - Health.
   - Equipment and Clothing.
   - Experience.
   - History.

2. **Weather**
   - An important clue.
   - Can force a subject to take cover and become less detectable.
   - Can cause a subject to veer away from a head wind.
   - Can force a boater to the leeward shore.

3. **People**
   - Witnesses that have seen or talked to the subject are obvious clues.
   - People who knew of the intent or destination of the subject.
   - People who have not seen the subject in a suspected location also provide clues.

4. **Recorded Clues**
   - Includes items such as sign-out forms, trail registers, summit logs, trip plans, notes left in cabins, notes left on calendars at home, etc.

5. **Event Clues**
   - Includes events such as a campfire, signal, light, human voice, sound (whistle), PLB, ELT, etc.

6. **Physical Clues**
   - Includes discarded items such as candy wrappers, cigarette butts, tissue, etc.

7. **Tracks or Sign**
   - Most common type of physical clues.
   - ***Sign*** refers to any evidence of a person's passage.
   - Include things such as footprints, scent, flattened earth, freshly broken branches at shoulder height, bent grass, bruised leaves, etc. (BLM 97)
   - Some signs can be positively identified as human in origin, however, some could be made by animals.

Obj. 8.3

TRACKING AND SIGN CUTTING

- ***Tracking*** is the process of finding a track or line of sign and staying on it, step by step. This is usually performed by skilled searchers called ***Trackers***.

- **Sign Cutting** is the process of looking for sign.
  - Trackers start by doing a perimeter around the PLS to ***"Cut Sign"*** where the subject has left the area.
  - Trackers also cut sign by ***"Cutting Ahead"*** or jumping ahead of an established track and moving across the projected line of travel to discover if the subject has continued in that direction.
  - Sign cutting is much more difficult than step-by-step tracking and should only be attempted by experienced individuals.

- Sign cutting and cutting ahead techniques can quickly reduce the effective size of a search area.

Obj. 8.4

THE PROCESS OF TRACKING

- Trackers generally work in teams of three: a point man and two flankers.
- After receiving a briefing from relatives, witnesses and the overhead team, they commence the search by cutting a perimeter around the PLS until they find the subject's track.
- If the subject's track is not found, they may search ***"Track Traps"*** on logical routes away from the PLS.
- This process may be the single most time-consuming point of the search, especially if earlier searchers, police or bystanders have crossed or even obliterated the sign.

- Trackers may have to cut several perimeters before the first positive sign is found.
- When a ***"Signature"*** track is found and established as that of the subject, it is carefully measured and examined.
- Markers on a ***"Tracking Stick"*** are then adjusted to show track size and pace length.
- The trail is then followed, with the point man concentrating on the track and the flankers watching for sudden turns or incoming trails.
- A complete track is rarely seen.
- When a track is found, the stick is used to give the approximate location of the next, if it is not seen.
- Step-by-step tracking is a slow process, however, once the general direction is established, the ***"Cutting Ahead"*** stage will commence.
- In the cutting ahead stage, a second tracking team moves around the first and cuts across the estimated line of travel at right angles – if possible on a feature such as a logging road, stream bed, cut-bank or other area that would readily take an impression.
- They must determine if the subject continued in the original direction.
- They cut for sign and if they find another signature track, they will then radio back to the first team to let them know that they can "cut ahead" in their turn.
- If there are several teams, the others may be cutting along the outermost potential boundaries or on other track traps or possible travel routes to limit the area to be searched.
- This leap-frog process will continue until the subject is found or other search tactics are commenced.

Obj. 8.5

CLUE PRESERVATION

- It is very important that clues be preserved, especially those that are easily destroyed.
- Skilled trackers and hasty teams should be bought in before other search resources.
- Vehicle tires and searchers tracks can easily erase a lost subject's tracks, and searchers and bystanders can easily create false clues by crashing through the woods on their own.
- As a result, searchers must be very conscious of what they may be doing to clues and must be constantly searching for them.
- Searchers with limited training should stay out of areas with a high potential for yielding clues until it has been searched thoroughly by trackers or a skilled hasty team.

- ***Scent*** is also a very important clue.
- There are three types of search dogs; tracking, trailing and air scenting.
- Most police forces used dogs that are trained to be alert to ***any*** recent human scent rather than a specific one.
- The scent of searchers can easily be a distraction to police dogs.
- For police dogs to be effective, they must search an area that has not been contaminated by the scent of searchers.
- When the early use of police dogs is anticipated, some high probability areas should be kept free of searchers until the dog has finished.
- The decisions on areas of high probability, timing and on the use of police dogs and search teams are the responsibility of the incident commander and the search management team.
- Search dogs are most effective in humid conditions and light winds, and can function effectively either day or night.

Obj. 8.6

INTERVIEWING WITNESSES IN THE FIELD

- Occasionally, a searcher may encounter a person in the wilderness other than the subject, and will find it necessary to interview this individual. All responses must be written down and relayed to the search manager.
- Once contact has been made, searchers should identify themselves and state in general terms only the purpose of the search.
- The person should be asked to describe where they have been and any people that they have encountered in the area.
- Ask the person to describe, with as much detail as possible, anyone that they have seen.
- *Avoid putting words in the witness's mouth and any leading questions.*
- The time and location of any sightings is essential.
- If possible, have the witness take the searcher to the exact location of the meeting.
- The direction of travel is vital and the witness should be asked which way the subject was heading.
- If the witness did not encounter anyone, the possibility of other evidence should be explored. This would include any obvious clues. The precise time and locations of any sighted clues are vital.

- If the witness is willing to give their name and future whereabouts, record it, but do not press the issue with a reluctant witness.
- All witnesses should be encouraged to go to the command centre for a further interview with the incident commander or search manager.
- All witness should be thanked for their assistance.
- Report all information received from a witness to the command centre.

Obj. 8.7

GENERAL SEARCH TECHNIQUES

- Become clue aware, do not just walk through an area but be constantly on the lookout for clues.
- Move through a search area slowly, not more than half of your normal walking speed. It is hard to find clues while rushing through the woods.
- Keep your mind focused on the search at hand rather than whether it is cold, hot, wet or if the terrain is too rough. Dress appropriately so that these factors will not be a hindrance.
- Do not take so much stuff that its weight and size will cause discomfort and will interfere with your ability to search.
- Use all of your senses while searching. If you do not use all of your senses you will likely miss something.
- Consciously look up, down and all around while searching.
- Try to imagine what the subject would do in this situation and environment.
- Observe to the rear. Look behind often. Looking behind provides a different view of the search area.
- Wander purposely and never assume anything. Check the obvious and behind or around anything you cannot see around or through.
- Be alert for objects or locations that might attract the missing subject (ie. caves, buildings, lights, natural shelters, etc.)
- Maintain a positive mental attitude.
- Maintain mental alertness.
- Know your limitations and inform the overhead team when you feel that you are no longer being effective due to fatigue or other factors.
- Use sound (ie. whistles) to obtain a response from the missing subject.
- Talk to any non-searchers that you come across. They may have valuable information that may assist in the search.
- Be able to briefly but accurately describe the subject to a non-searcher.

- Do not talk unnecessarily with other searchers in your team. It will distract you from searching and you may not, for instance, hear a call for help.

Obj. 8.8

INITIAL RESPONSE SEARCH METHODS

- As a search begins, the potential search area is usually quite large and the number of SAR personnel is usually quite small.

- ***Establishing the initial search area is the most critical step in preparing a search plan.***

- There are two types of Initial Response Search Methods:
  1. Passive Methods
  2. Active Methods

Obj. 8.9

- Passive Initial Response Methods include:
  1. **Confinement**
     - Confinement techniques attempt to keep the subject within the initial search area.
     - Used as soon as possible in most searches to minimize search area size.
     - Decreases the chances of a massive search.
     - Vital in searches involving walking subjects but becomes impractical in snowmobile/ATV searches due to the vast possible search area.
     - Confinement techniques include:
       - ***Road Blocks*** – used to intercept the subject if they find a road and either walks along it or finds a ride. They are also used to determine if passers-by have seen the subject and to alert them to keep an eye out for the subject. (BLM 98)
       - ***Trail Blocks*** – used to prevent lost subjects from travelling deeper into the wilderness along cut trails, old wood roads, power lines, seismic lines, drainages, beaches, shorelines, etc. A trail block should consist of 2-3 members located in a position where a person can be seen approaching for some distance. (BLM 98)
       - ***Look-Outs*** – used in open areas, where searchers equipped with binoculars may be stationed in areas of

high visibility. Look-out teams usually consist of 2 members which operate day and night.

- ***Camp-In*** – refers to any of the confinement techniques where searchers are stationed on a full-time basis. Generally located on the periphery of the search area.
- ***String Lines*** – used to create an artificial search boundary. Paper tags stuck to the string at intervals tell the lost person which way to proceed.
- ***Track Traps*** – refers to areas where evidence of the subjects passage can been seen. They can be natural or man-made and may consist of soft stream or lake shores, snowbanks, dusty or muddy sections of a trail, road shoulders, boggy areas etc.
- ***Combinations*** – to achieve maximum efficiency and success, many of the confinement techniques may be used in combination with one another.

Obj. 8.10

2. Attraction

- Searchers produce some form of signal which attracts the lost subject to either respond or walk out on their own.
- Attraction techniques assume that the subject is ***Responsive***.
- Attraction techniques include the use of:
  - ***Sounds*** – whistles, horns, sirens, gunshots, calls, etc.
  - ***Visual Beacons in Daylight*** – smoke, signal panels, weather balloons, reflections, etc.
  - ***Visual Beacons at Night*** – lights, fire, flares, etc.
- Attraction must be used with discretion and plenty of time should be allowed between signals to listen for a response from the subject.
- Attraction techniques include:
  - ***Calling*** – most common type of attraction and is generally used in conjunction with confinement techniques when the subject is believed to be responsive. Silence must be kept for 10-30 seconds between calls in order to listen for a response. Assume responsiveness for the first 72 hours of a search.
  - ***Sound transmitters*** – loud sounds such as whistles, sirens, horns or gunshots may be heard over a

considerable distance. Lost subjects may proceed to the sound if it is repeated or may simply respond. Stationary sound attraction should be used in conjunction with a visual homing signal (ie. flare) to give the lost subject a better sense of direction.

- ***Loud Sound Attraction and Response (LSAR)*** – the use of guns or "bear bangers" is an excellent initial response attraction technique. In Newfoundland and Labrador, many individuals who become lost in the wilderness carry firearms. Under good conditions, signal shots from lost subjects can be heard for several kilometres. Police searchers will often carry out LSAR searches using firearms due to their training and legal background.
- ***Airborne LSAR*** – makes use of a helicopter to transport the "attractor" to systematically arranged attraction points throughout the search area. The helicopter must be shut down at each attraction point. The procedure is outlined as follows:
  - Alert all rescuers by radio of impending signals,
  - Fire two shots, at least 10 sec apart,
  - Listen for several minutes before proceeding to the next attraction point, and
  - Scan the search area with binoculars for a visible signal response.

  If a response is heard, it may be in the form of three shots or three of anything (ie. whistle blasts). Try to get an approximate bearing to the subject and then move to another point and try to get a bearing again. These bearing can be plotted on a map, and by using triangulation, can indicate the subject's approximate location. Wind plays a major factor. Airborne LSAR should begin upwind of the search area and then progress to downwind attraction points. Signals from a lost subject will be picked up by searchers more clearly downwind.
- ***LSA from Vehicles*** – makes use of trucks, cars, snowmobiles, ATVs, etc. Two main approaches:
  - **Route or Corridor Search** – the search vehicle travels along a given route, pausing at

specific intervals to stop, signal and listen. Shutting down the engine at each point is critical.

- **Area Search** - the search vehicle travels along a predetermined grid pattern, pausing at specific intervals to stop, signal and listen. Shutting down the engine at each point is critical.

- ***Visual Beacons*** – especially useful at night when any light source can attract a subject. Any light source on an elevation is highly visible. Smoke, reflections, signal panels, fire, flares, even a helicopter rising from a landing area, are all useful visual beacons.

Obj. 8.11

- Active Initial Response Methods include:

1. Perimeter Sign Cuts

- Sign cutter are sent in at the beginning of a search to examine features around the PLS for any signs which may indicate the direction in which the subject traveled.
- Road shoulders, stream beds, lake shores, trails, wood roads, snow banks, etc., often form boundaries and preserve tracks well.

2. Quick Reconnaissance

- Most successful technique for locating lost subjects.
- Since greater than 50% of missing persons are found on travel aids, initial response tactics should include an active search of roads, trails, ridges and drainages.
- This is often accomplished with the use of ATVs, 4WDs, snowmobiles, boats, dirt bikes, etc.
- Be aware that ATVs and snowmobiles are the greatest destroyers of sign.
- Whenever searchers use motorized equipment, they should understand that ***Observation*** is the primary concern and not speed.
- *Searchers should also shut the engine down frequently, use some form of attraction and carefully listen for a response.*
- Ground recon team should consist of three members, with skills in navigation, radio communications and sign-cutting.

3. Police/SAR Dog Teams

- If a dog can be brought to the PLS early in the search, before the area has become contaminated by other searchers, the chances of success will be fairly high.
- The effectiveness of search dogs decreases as a search becomes prolonged over several days especially during hot, dry weather.

4. Aerial Reconnaissance

- Very effective in open areas and on linear features such as streams, roads, trails and shorelines.
- Extremely ineffective in forested areas.
- Helicopters are more effective for searching than fixed-wing aircraft but have extremely high associated costs.
- ***Areas searched by aircraft should not be considered well searched.***

5. Forward Looking Infrared (FLIR)

- This is becoming increasingly popular among policing agencies and search managers as an initial response tool.
- This helicopter mounted, temperature sensitive unit can scan a swath area of 100-150m wide, and is capable of displaying an on-screen picture with temperature differences of as little as 0.2°C.
- Human bodies are easily identified if they are not blocked by an obstruction.
- FLIR is most effective in a cool or cold environment with little forest cover.
- FLIR is ineffective in dense foliage and has reduced capabilities in hot weather when many objects in the environment will be as warm as the lost subject.
- It is also difficult to determine if an area has been adequately searched using this technology.
- Currently, the success rate of FLIR in SAR operations is estimated to be only 5%.
- In order to avoid confusion, ground searchers and FLIR operators must use mutually agreed upon arm signals.
- *Arms straight out from the body and* ***not*** *over the head* are a common signal indicating that the signaller is a searcher and not the lost subject.

6. Tracking and Sign Cutting

- As previously discussed, tracking and sign cutting is the single most effective search technique.
- Step by step tracking can be extremely slow, unless at least two teams are available so that "cutting ahead" can be utilized.
- Sign cutters should always flag their routes so that their sign is not later mistaken for that of the subject.
- Sign cutting around a search perimeter and covering all travel routes and natural track traps within it, will often bring the search to a quick conclusion. (BLM 99)

Obj. 8.12

NIGHT SEARCHING

- To be an effective searcher, volunteers must know how to search at night.
- For night searches, it is the duty of the search manager to assess the urgency as well as the probability of success against the risk to searchers.
- Night searching requires experienced and trained searchers.

- Advantages of Night Searching include:
  - Tracks and sign show up much better at night when illuminated by flashlight.
  - Footprints and tracks are better preserved at night because they do not dry out as quickly thus maintaining their shape and identity.
  - In hot weather, night travel is less strenuous than day travel.
  - Human voices and sounds carry further at night, thus increasing the effectiveness of sound sweeps.
  - Radio transmissions are often better at night.
  - Sounds, smells and light signals are more easily detected by searchers.
  - The subject is usually not mobile at night and is more alert to searcher sounds.

- Disadvantages of Night Searching include:
  - Night searches require a longer search time, which can have a negative impact on victim survival.
  - Possible risk to searchers (ie. hazards).

- Missing person could be injured attempting to move to or away from searchers.
- Accidental destruction of clues.
- Missing vital clues.
- Use of light hampers searcher's night vision.
- Natural fear of dark may cause searcher anxiety.

Obj. 8.13

TYPES OF SWEEP SEARCHES

- Also known as grid searches and requires that search teams "grid" an area following approximately parallel lines.
- Two common types of sweep searches:
  1. Sound Sweeps
  2. Visual Sweeps
     - Open Grid (searcher spacing > 10m)
     - Closed Grid (searcher spacing < 10m)
- Sweep searches are not as simple as they appear and require practice.
- Communications are critical during sweep searches. At a wide spacing, a single whistle blast means STOP. All searchers must then stop until the leader determines the reason for the stoppage. Two whistle blasts means the sweep should resume.
- Sweep boundaries should be flagged so that two flags of a line are visible at all times.
- To achieve assigned PODs, teamwork is vital in order to maintain the pattern of the sweep.
- Do not rush a sweep search; the primary objective is to search the area well.

Obj. 8.14

SOUND SWEEPS

- Sound has been found to be many times more effective than sight in finding lost subjects provided:
  - The subject is able and willing to respond
  - The conditions for sound transmission and reception are reasonable.
- Martin Colwell (1992) developed a sound sweep technique that proves to be quite effective for locating responsive subjects.
- The sound sweep is a very wide-spaced (210m) open grid search during which searchers blow whistles at specific intervals.

- This technique completely covers the search area with sound signals and listening for a response at each interval.
- Teams are generally comprised of three searchers equipped with radios, compasses and loud whistles, plus a team leader.
- In order to accurately cover the search area, all searchers start from assigned points along a baseline and follow parallel compass courses.
- Searchers do not need to start simultaneously.
- The team leader does not follow any of the assigned grid lines, and gives radio commands to stop, blow the whistle and listen (~15 sec) at specific intervals.
- If no response is heard, the searchers continue with the sweep.
- Depending on the terrain, the intervals are usually 1 – 2 minutes. (BLM 100)

Obj. 8.15

VISUAL SWEEPS

- Visual sweeps are used:
  - When the subject cannot or will not respond.
  - When the search area is small enough to search within the estimated survival time.
  - When enough trained searchers are available.
- Searchers are spaced close enough so that they can see each other most of the time.
- Visual searchers should also make use of sound and listen at frequent intervals. There is always a chance of even the faintest response.

Obj. 8.16

1. Open Grid Sweeps

- An open grid search uses a spacing of greater than 10m and is most effective when:
  - It is used to search a high probability area.
  - The subject is believed to be easily visible.
- An open grid sweep is a compromise between thoroughness and time, however, the POD will increase dramatically with several sweeps.
- The most effective teams are comprised of three members, with one of the members being the team leader.
- If several teams are being used, their starts should be staggered to reduce the possibility of confusion of signals between teams.
- The outer members of the team flag their route so that the team

searching the adjacent swath may guide on the flags.

- The centre searcher performs the compass work and will be less effective than the flankers as some attention must be devoted to maintaining a bearing.
- The flankers will carry out ***"Purposeful Wandering"***, which involves maintaining an approximate spacing but wandering slightly from side to side to see better and to check out routes of least resistance. (BLM 101)

Obj. 8.17

2. Closed Grid Sweeps

- A closed grid search uses a spacing of less than 10m and is useful when:
  - The search area is very small (< $1km^2$).
  - There is a high probability that the subject is in the area.
  - The subject is unresponsive, hiding or dead.
  - Conditions prevent hearing the subject's response.
  - There is an excess of many trained searchers available.
- Closed grid searches are a last resort and should only be used when initial response and open-grid sweep searches prove unsuccessful.
- Closed grid searches are often unsuccessful due to the large amount of time required to locate a subject.

Obj. 8.18

- ***Closed Grid Search Procedures***
  - Teams should be comprised of 6 – 10 members.
  - The search area must be flagged in advance. This includes: (BLM 102)
    - The baseline, from which the search starts.
    - The datum lines, which confine the sides of the search area at 90^o to the baseline.
    - The sweep boundary, where the sweep ends.
    - The boundaries for each search team swath.
  - Team sweep width is determined using the following formula:
    - Searcher spacing X number of searchers
  - Thus, 8 searchers with 5m spacing would result in a sweep width of 40m.
  - End searchers of each sweep team work *one half* of the spacing from the sweep boundary, thus maintaining a 5m

spacing from the end searcher in the adjoining swath.

- To maintain the line, the end searchers will guide on the flagged boundaries, while the searchers to the left of centre use the searcher to their left as a guide and those to the right of centre use the searcher to their right as a guide.
- To maintain spacing, no searcher should get too far ahead or fall too far behind.
- Rather than trying to maintain a straight line, search teams should use a ***sagging line***. (BLM 103)
- The sagging line allows searchers to keep track of their position using their peripheral vision rather than having to look to the fully to left or the right and thus possibly reducing their fine detail search ability.
- To begin the closed grid search:
  - The searchers line up on the baseline at a predetermined spacing.
  - The end searchers should be one-half the spacing distance from the side boundaries.
  - The leader must ensure that all searchers are familiar with the signals; a single whistle blast for "stop" and two blasts for "go".
  - When the first "go" signal is given, the end searchers move out first and then each successive searcher begins to move when their guide is within their peripheral vision.
  - The leader will then "float" behind the team, giving commands and ensuring that all members maintain their spacing.
  - To avoid confusion, multiple teams searching adjoining swaths should stagger their start times.
- Closed grid searchers should remember the following:
  - They are expected to find all clues and check every hiding place for the subject.
  - Look for anything that does not appear natural.
  - Look forward, to the sides, backward, and even up trees.
  - Maintain spacing with great accuracy.
  - Maintain the search line while moving.

Obj. 8.19

CRITICAL SEPERATION

- A technique used to determine the spacing for open grid searches in terrain where the POD is unknown or when POD tables are unavailable.
- The following outlines the procedure for determining the critical separation for any given set of terrain conditions:
    - Place an object on the ground that bears some relation (size, shape, colour, etc.) to that which is being sought.
    - Two searchers then walk away from the object in opposite directions until it is out of sight, and then move back toward it until they reach a point where it just becomes visible.
    - The distance between the two searchers should be noted.
    - The searchers then turn 90^{o} to the object and repeat the process, again making note of the distance.
    - The average of the two results will yield the critical separation.
- By using the critical separation, each searcher should theoretically be able to see something halfway between them.
- Through experiment it has been determined that a search at one critical separation produced a POD of ~50%, that half a critical separation produced a POD of ~75%, and that two critical separations produced a POD of ~25%.
- With critical separation, approximate POD's can be determined for any type of cover, day or night, clear or low visibility.

Obj. 8.20

INLAND WATER AND SHORELINE SEARCHES

- Drowning is one of the greatest hazards in wilderness travel.
- A Red Cross study shows that the Atlantic Provinces have almost twice the national rate of drowning in which; 83% of victims are male, the majority are a result of boating accidents and alcohol plays a major role.
- Searcher safety is a major concern in water searches.
- Water rescue must only be attempted by trained specialists.
- Shoreline searchers can recover subjects using pike poles or grapples but should never enter the water.

Obj. 8.21

- **River Searches**
  - With the continuing increase in recreational boating and kayaking, river accidents are becoming more and more common.
  - While most rivers are fairly linear and easy to search, subjects may drag themselves out of the river and into the bush, thus resulting in a further area search.
  - River searches are usually a high urgency since in many cases, the subjects will be suffering from some degree of hypothermia.
  - Search managers must also take into account the ***"survival zone"***, which is the downstream distance within which a person floating at maximum current velocity can reasonably be expected to have survived.
  - The survival zone varies depending on:
    - Water temperature.
    - Subjects clothing, condition and experience.
    - The roughness of the water.
  - A person is generally unable to continue swimming for more than 10-15 minutes in water colder than 10ºC.
  - Most people are unable to hold their breath for more than 15 – 25 seconds in water colder than 15ºC.
  - River searchers should always carry First-Aid equipment and a means for preserving body heat (ie. hypo bag, sleeping bag, fire-making materials, shelter, high-energy foods, etc.)

  - ***Small River Searches***
    - A small river contains few islands or multiple channels that require separate investigation and both banks can be searched simultaneously from an aircraft.
    - Initial river searches should be carried out by aircraft or boat.
    - Aircraft searches are preferred however, if boat searches are used, the initial response should involve a fast boat to carry out a quick search, followed with slower boats performing more detailed searching.
    - Foot searches of river banks are extremely slow but should be performed as follows:
      - Numerous small teams search separate

segments of the river bank.
- Teams should consist of 2-3 members.
- Teams work down the river from the PLS on opposite banks.
- A confinement team should be placed at the theoretical maximum downstream distance as lookouts.
- Teams on opposite riverbanks should coordinate by radio as sometimes the team on the far side will be able to see into areas invisible to those on the near side.
- Due to urgency, many teams as possible should be searching the river simultaneously from various access points.
- Searchers must be aware of riverbank sign, in the event that that subject escaped from the river and moved into the bush seeking shelter.
- If there is evidence that the subject left the water and entered the bush, an open bush search should be initiated. (BLM 104)

▪ With all water-related incidents, there is always the possibility that the subject may have drowned.
▪ Certain features tend to trap bodies and should be carefully investigated. These include:
- Logs jams and sweepers.
- Bottoms of pools.
- Sandbars.
- "Holes" where water over an obstacle recirculates vertically.
- Eddies.

○ ***Big River Searches***
▪ Big rivers are very wide, with numerous islands, sandbars and multiple channels.
▪ Big rivers are often turbid making it difficult to spot submerged objects.
▪ Islands and banks must be searched carefully in the event that the subject may have come ashore and entered the bush for shelter.
▪ Searchers must be constantly on the lookout for tracks where a subject has come ashore, discarded items (ie.

lifejacket) and for signals (ie. smoke) in the bush.

- Any debris from the incident found above the water line is a clue to a survivor in the area.
- All searchers should record and flag their routes so that later searchers are not misled by their sign.
- Searchers must report and plot all debris which appears to have come from the incident.
- The location of a swamped boat is a critical clue as it will help identify current patterns and suggest a subject's drift path.

Obj. 8.22

- **Shoreline Searches**
  - Shoreline searches are usually a high urgency due to the risks of drowning and hypothermia.
  - Subjects are generally found downwind of the incident.
  - Searches generally start on a downwind shore near the location of flotsam or wreckage.
  - Searchers must be constantly on the lookout for sign that would indicate that the subject has left the area.
  - Sandy shorelines are excellent track traps.
  - Sign cutting teams should pay particular attention to obvious travel routes away from the wreckage.
  - If track traps are good and there is no sign, it is an indication that the subjects have not survived or may have come ashore elsewhere.
  - Particular attention must be paid to areas of driftwood and debris accumulation. These areas should be carefully checked for clues or bodies. (BLM 105)

Obj. 8.23

SNOWMOBILE SEARCHES

- The majority of winter searches are a result of overdue snowmobilers.
- These searches commonly cover vast areas and it is critical that some clue to the travel route be discovered.
- Safety must be the primary concern of searchers due to the changing weather conditions and possibility of accident.

Obj. 8.23

- Searchers must adhere to the following safety preparedness standards:
  - Ensure snowmobiles are in good condition.
  - Carry more than adequate fuel and oil.
  - Be thoroughly familiar with the snowmobile.
  - Carry basic spare parts for the snowmobile.
  - Wear a CSA approved helmet.
  - Wear and carry clothing for the worst possible weather.
  - Be comfortable with cold weather travel.
  - Be prepared for a 48-hour camp under hostile conditions.
  - Carry snowshoes, flagging tape and a probe.
- Each snowmobile search team must:
  - Consist of a minimum of two experienced drivers and snowmobiles.
  - Have a means of transporting a casualty or extra rider.
  - Carry a radio, GPS, and map and compass.
  - Include one member who is familiar with basic repair and troubleshooting.

Obj. 8.24

- **Snowmobile Search Tactics**
  - The search should begin with identifying distinguishing features of the subject's snowmobile track, either at home or the PLS.
  - If the subject was towing a sled, get the distinguishing features and characteristics of the sled.
  - In many cases, later tracks will cover the subject's tracks, thus making tracking more difficult.
  - Searchers should start out on the main trail, and investigate any tracks that leave the trail.
  - Any tracks that that does not match the description of the subject's will be flagged ***yellow*** and the search will continue.
  - Tracks that match the description of the subject's will be flagged ***red*** and will be investigated further until the subject is found or it proves to be negative.
  - A yellow flag will be placed on all negatively searched tracks. (BLM 106)
  - Searchers should preserve tracks for identification by avoiding driving over them.
  - Snowmobilers that breakdown, often attempt to walk home. They will often follow their track back, but will branch off to take a more direct route or to find shelter. Searchers must

constantly be on the lookout for footprints in the trail that they are following.
- Tracking is often better at night when snowmobile headlights accentuate the shadows in the tracks.
- Light attraction is useful in snowmobile searches. If the subject's machine can be just turned over, the headlight will be powerful enough to be seen for considerable distances at night and even on an overcast day.
- Upon locating a subject in good condition, immediate repairs should be made to the snowmobile or the subject should be doubled up with one of the searchers and brought back.
- If the subject is injured and must be transported by snowmobile, a good sled is essential. (BLM 107)

Obj. 8.25

- **Types of Snowmobilers**
  - Snowmobilers can be differentiated into two general types:
    1. Recreational Snowmobilers
    2. Purposeful Travellers

  - ***Recreational Snowmobilers***
    - Tend to use the machine for fun, speed, and hill climbing.
    - Often go out to run through the powder without a specific destination in mind.
    - This group are more likely to suffer major machine damage or an injury due to the reckless abandon with which they sometimes use their machines.
    - Accidents and collisions are common.
    - These people are commonly unprepared for an emergency.

  - ***Purposeful Traveller***
    - Tend to have a set destination in mind, whether it is hunting, fishing, working, or travelling to a cabin or scenic location.
    - Often found broken down on the trail by the first quick search team.
    - Often prepared for emergencies.
    - Will travel considerably farther than recreational snowmobilers.

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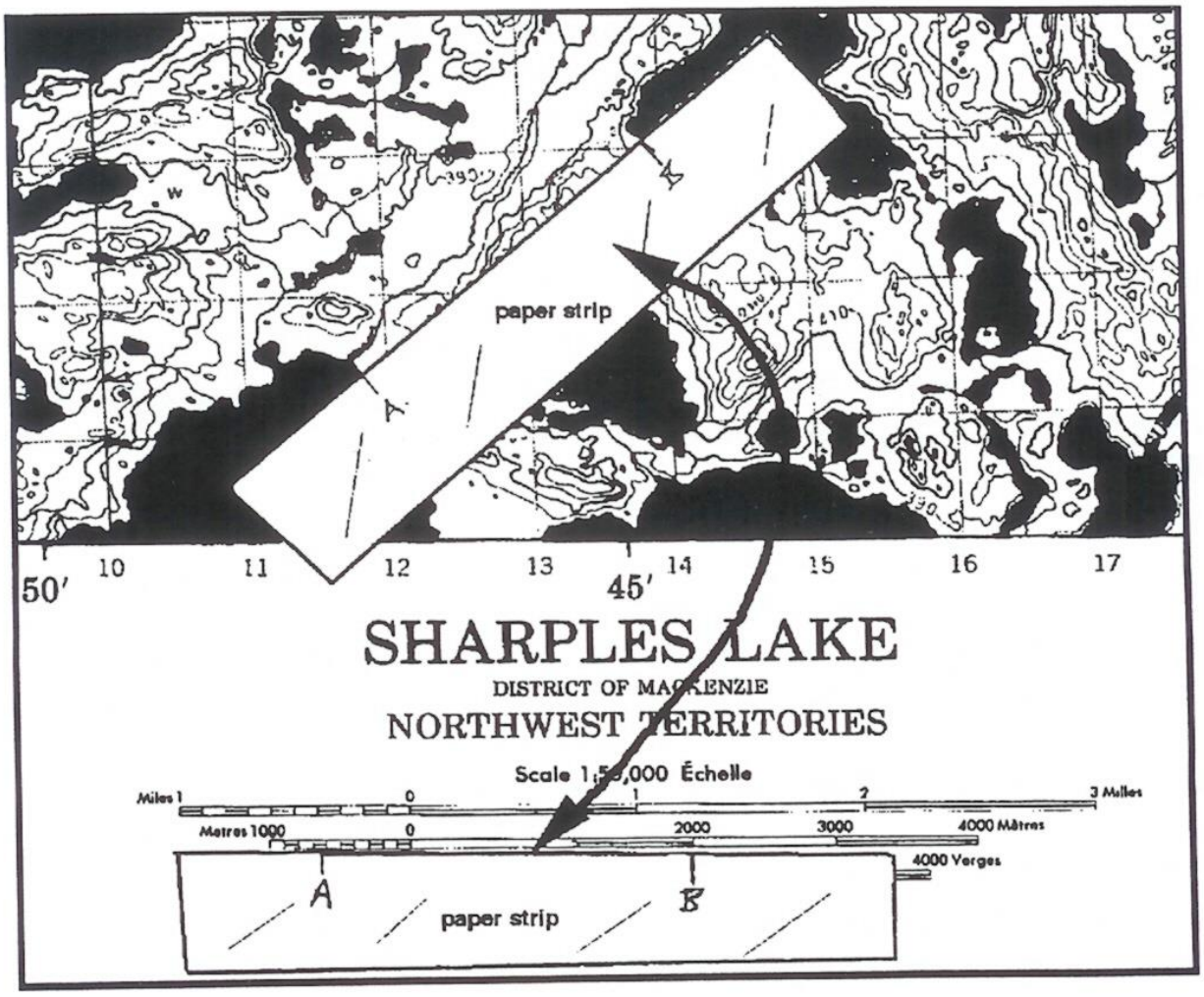
BLACK LINE MASTERS


2 C/4
ÉDITION 3
RANDOM ISLAND
RANDOM ISLAND
NEWFOUNDLAND TERRE-NEUVE
S M I T H
S O U N D
R A N D O M
I S L A N D
N O R T H W E S T
A R M
S O U T H W E S T
A R M
R A N D O M S O U N D
T R I N I T Y
B A Y
Clarenville
Shoal Harbour
Lady Pond
QV NAVIGATOR
M. Francis Kelly Ltd.
Energy, Mines and Resources Canada


paper strip
A
B
50′
10
11
12
13
45′
14
15
16
17
SHARPLES LAKE
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES
Scale 1:50,000 Échelle
Miles 1
0
1
2
3 Milles
Metres 1000
0
2000
3000
4000 Mètres
4000 Verges
A
B
paper strip

Meridians of Latitude

Alternating black and white bars along side of shaded map

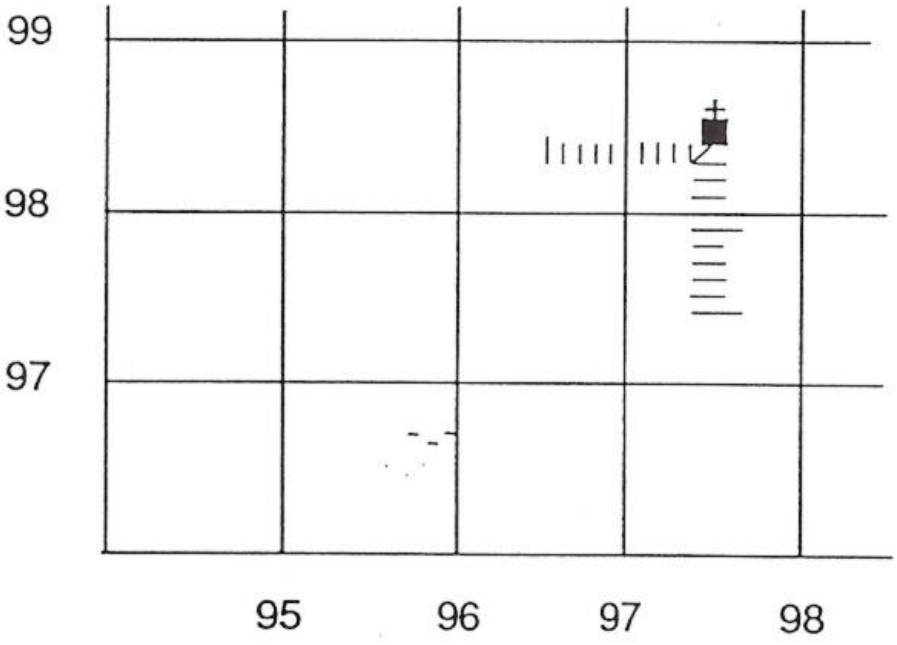
Meridians of Longitude

Alternating black and white bars along bottom of shaded map

Meridians of Latitude and Longitude

Example of method used to give a reference to nearest 100 metres

The following grid reference is a sample only and does not refer to a point on this map.



REFERENCE POINT **CHURCH (as above)**

EASTING: Read number on grid line immediately to left of point. Estimate tenths of a square from this line eastward to point.

97 | 5 → 975

NORTHING: Read number on grid line immediately below point. Estimate tenths of a square from this line northward to point.

98 | 4 → 984

Example Military Grid Reference 975984

TOPOGRAPHIC MAP SYMBOLS

USED ON MEDIUM AND LARGE SCALE MAPS OF THE NATIONAL TOPOGRAPHIC SYSTEM

(VARIATIONS WILL BE FOUND ON OLDER MAPS).

ROADS AND RELATED FEATURES

- Hard surface, all weather — more than 2 lanes / dual
- Hard surface, all weather — 2 lanes / 1 lane
- Loose surface, all weather — 2 lanes or more / less than 2 lanes
- Loose surface, dry weather
- Winter road; cart track — Winter Road
- Trail, cut line, or portage
- Highway route marker — 20
- Ferry
- Ford

RAILWAYS AND RELATED FEATURES

- Single track — Stop
- Multiple track — Station
- Narrow gauge, single track
- Abandoned or under construction
- Bridge
- Drawbridge
- Tunnel
- Cutting
- Embankment

BOUNDARIES

- International, with monument
- Provincial
- County or district
- Township or parish
- Township, unsurveyed
- City or town, municipality
- Park, reserve, etc.
- Section line
- Surveyed line, lot line

MISCELLANEOUS CULTURE

- Building; barn
- Built up area
- Town
- Village or settlement
- Church
- School
- Post Office
- Cemetery — C
- R.C.M.P. post
- Elevator — E
- Tower; chimney — Chimney
- Well; tank
- Historic site
- Airport
- Airfield or landing ground
- Seaplane base; anchorage
- Telephone line
- Power transmission line
- Mine
- Sand or gravel pit
- Quarry
- Lighthouse
- Wharf or pier; breakwater
- Levee or dyke
- Dam; small, large

CONTROL

- Horizontal control point, with elevation — △454
- Bench mark, with elevation — BM 157
- Spot elevation — ·125

HYDROGRAPHIC FEATURES

Stream, intermittent or dry

Stream, indefinite

Falls; large, small

Rapids; large, small

Lake; intermittent, indefinite

Dry river bed with channel

Inundated land

Marsh or swamp

Glacier or permanent snowfield

Foreshore flats

Rocky reef

Submerged reef; rock, bare or awash

RELIEF FEATURES

Contours

Depression contours

Approximate contours

Auxiliary contour

Cliff

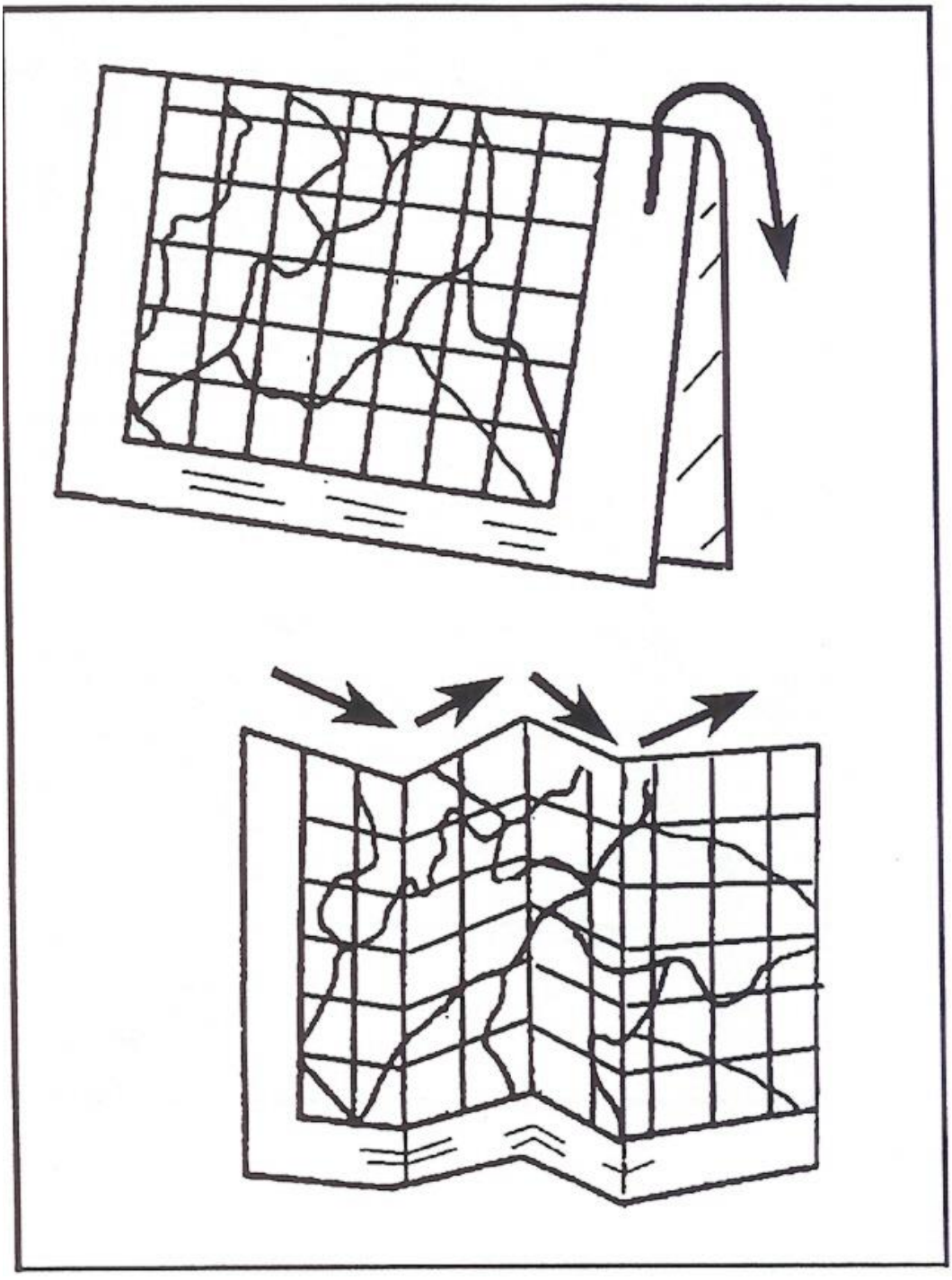
Moraine, scree

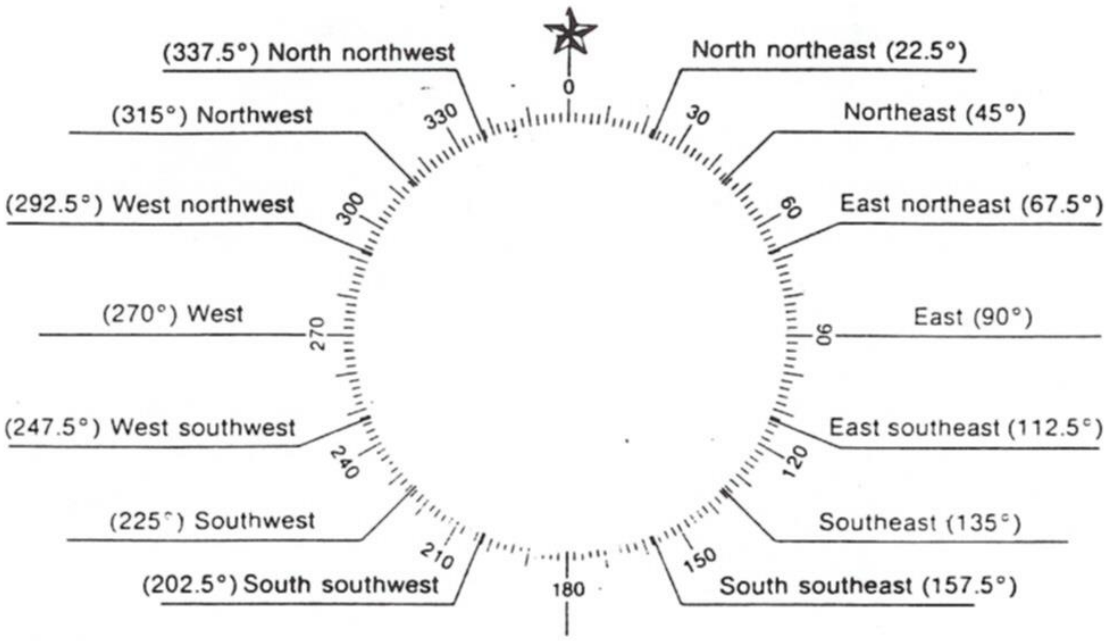
Esker

Sand

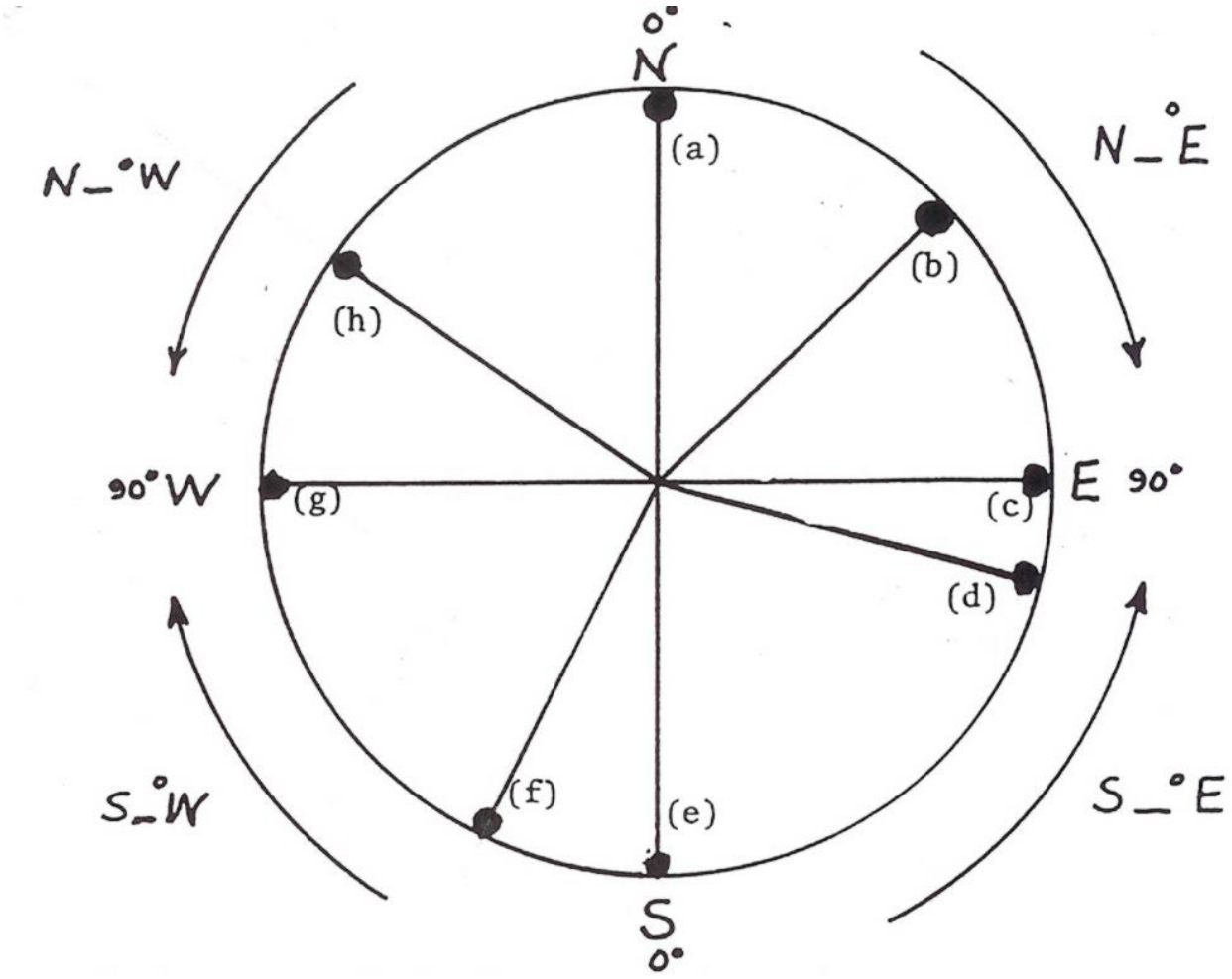
VEGETATION

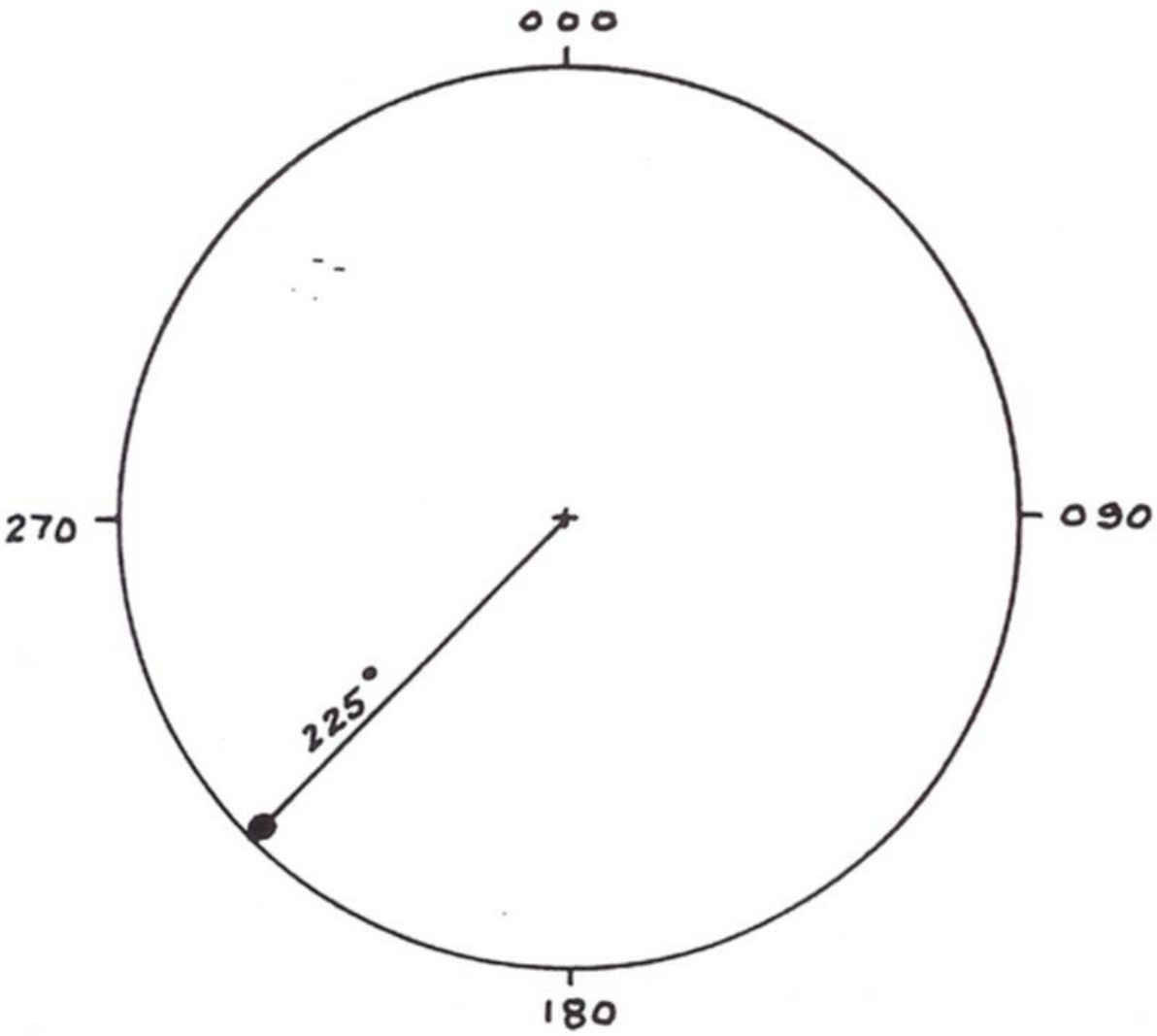
Wooded areas

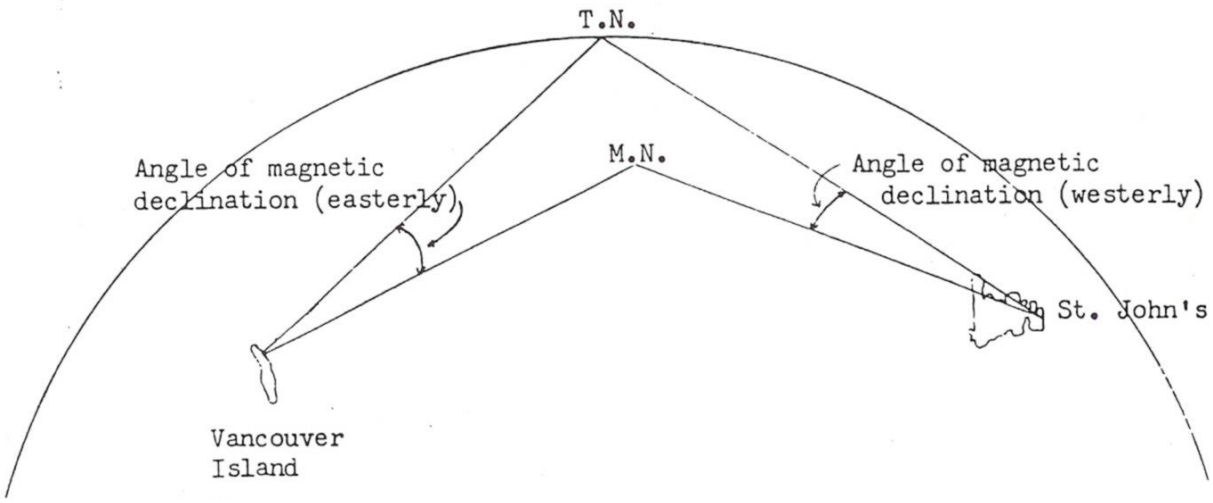


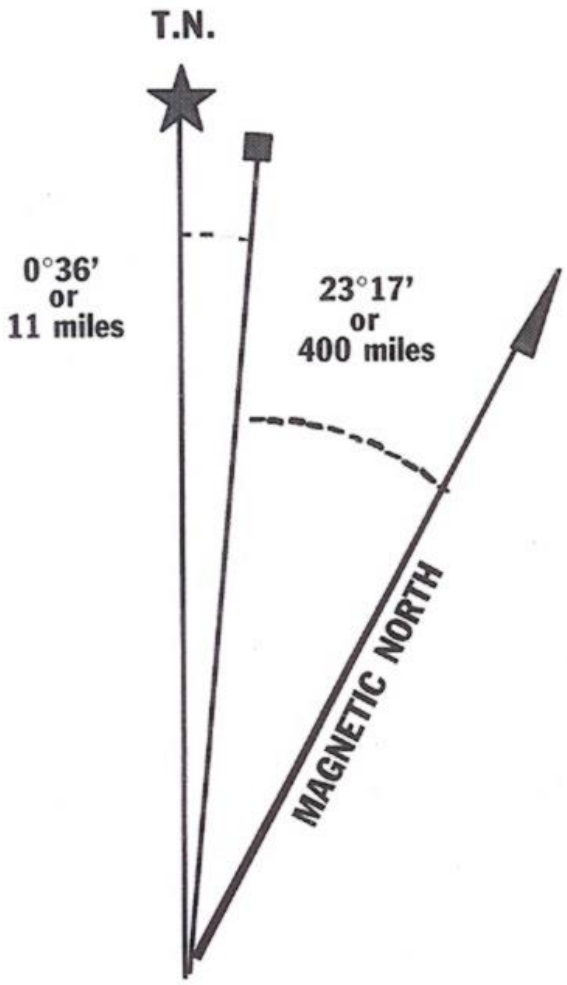


The compass rose.

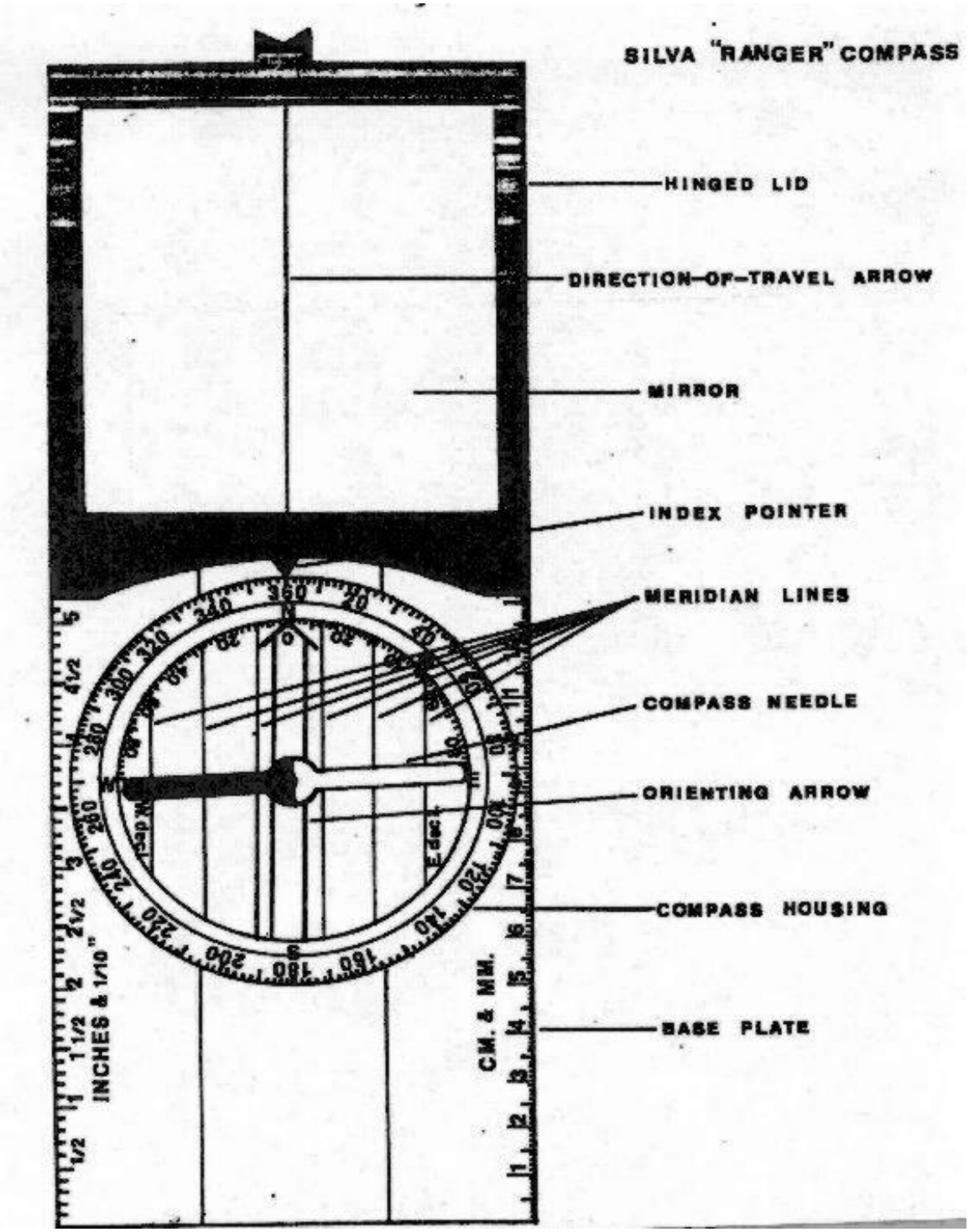

0°
N
N_°E
N_°W
(a)
(b)
(h)
90°W
(g)
E 90°
(c)
(d)
S_°W
(f)
(e)
S_°E
S
0°

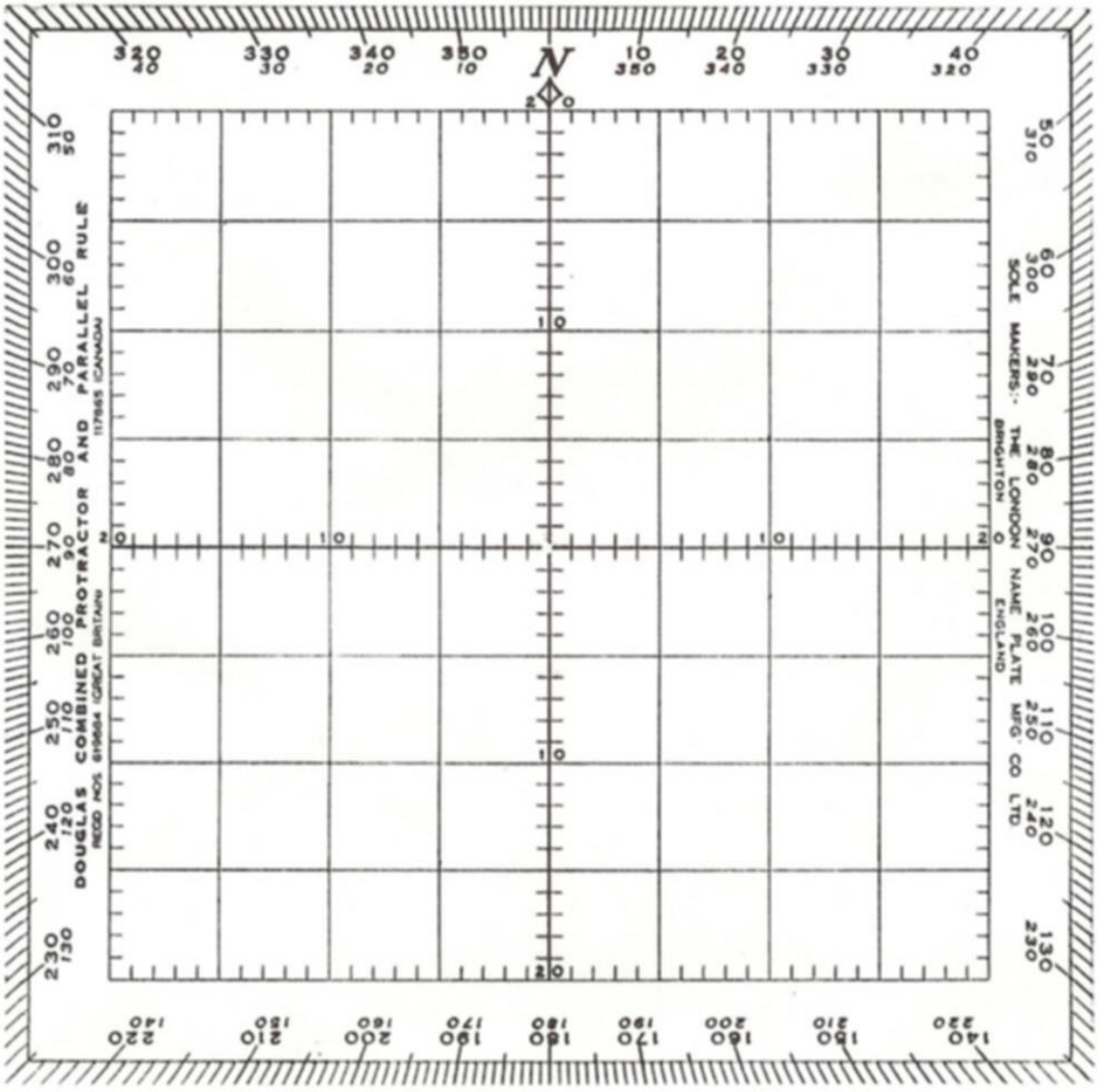

000
090
180
270
225°

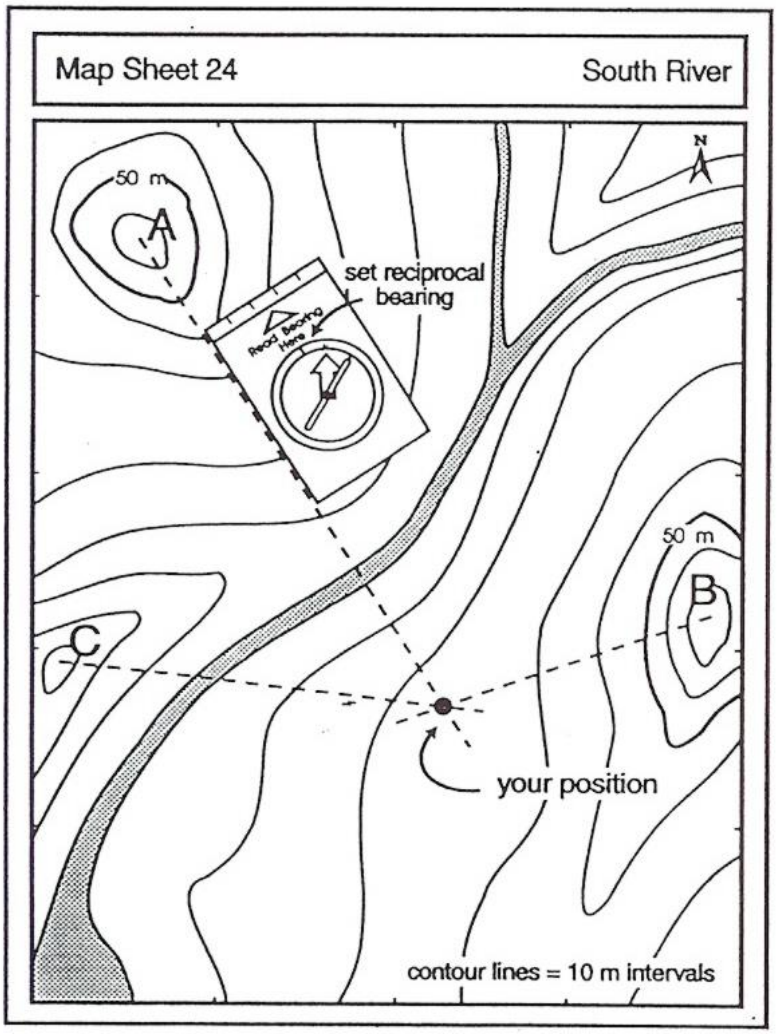

T.N.
M.N.
Angle of magnetic declination (easterly)
Angle of magnetic declination (westerly)
St. John's
Vancouver Island



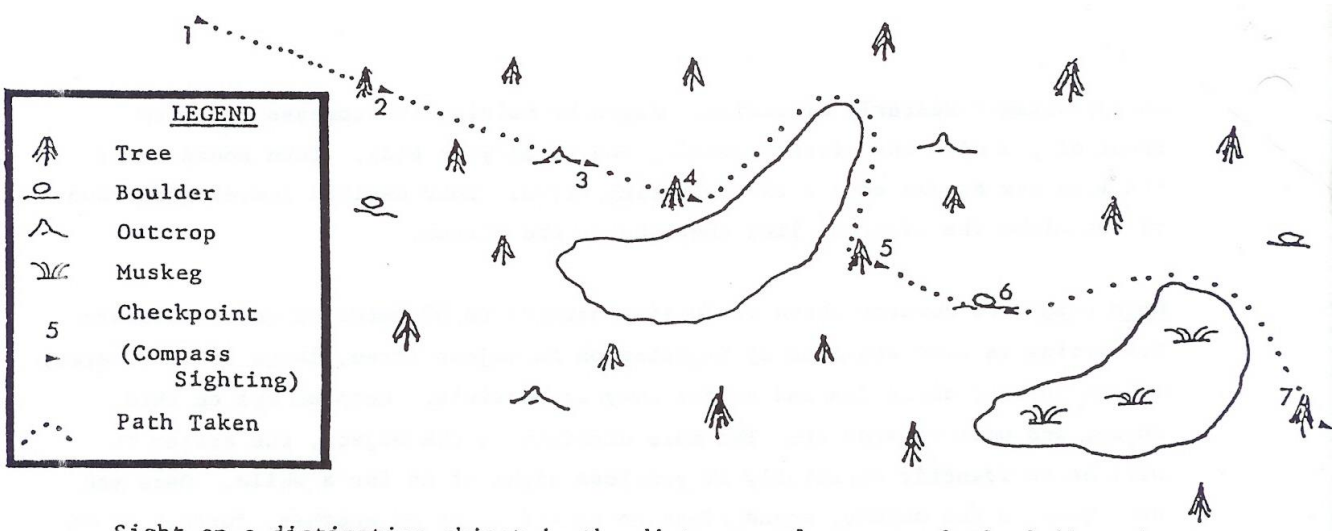
Use diagram only to obtain
numerical values
APPROXIMATE MEAN
DECLINATION 1976
FOR CENTRE OF MAP
Annual change decreasing 5.4'


SILVA "RANGER" COMPASS
HINGED LID
DIRECTION-OF-TRAVEL ARROW
MIRROR
INDEX POINTER
MERIDIAN LINES
COMPASS NEEDLE
ORIENTING ARROW
COMPASS HOUSING
BASE PLATE
INCHES & 1/10"
CM. & MM.


DOUGLAS COMBINED PROTRACTOR AND PARALLEL RULE
SOLE MAKERS:- THE LONDON NAME PLATE MFG. CO LTD
BRIGHTON ENGLAND



Feature	Magnetic bearing	Grid bearing	Reciprocal bearing
A	328°	355°	175°
B	71°	98°	278°
C	277°	304°	124°

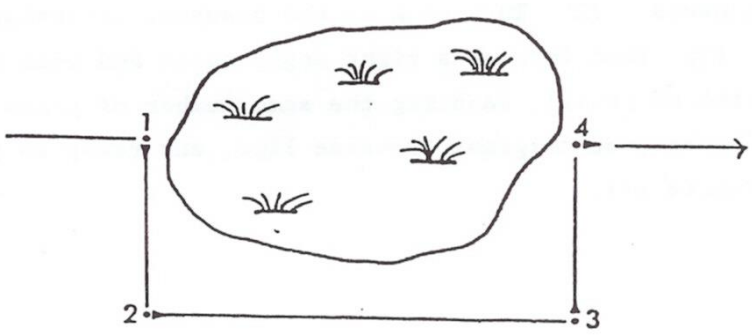


Sight on a distinctive object in the distance, along your desired direction of travel. You can then choose the most comfortable route to that point, avoiding lakes, muskegs, etc.

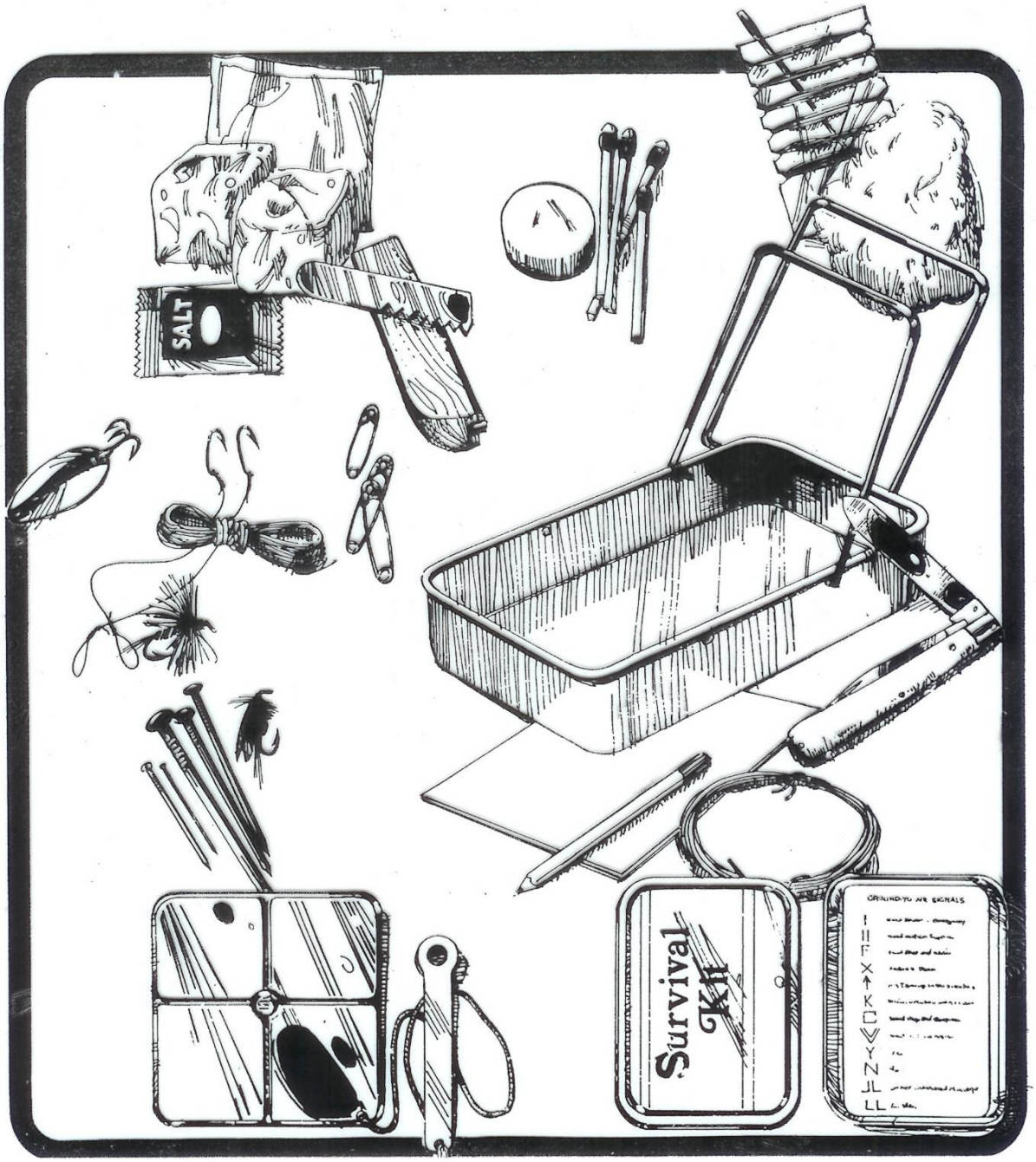
'A' & 'B' start together

'A' goes out ahead keeping as close to the bearing as possible; 'B' moves 'A' back on to the correct line

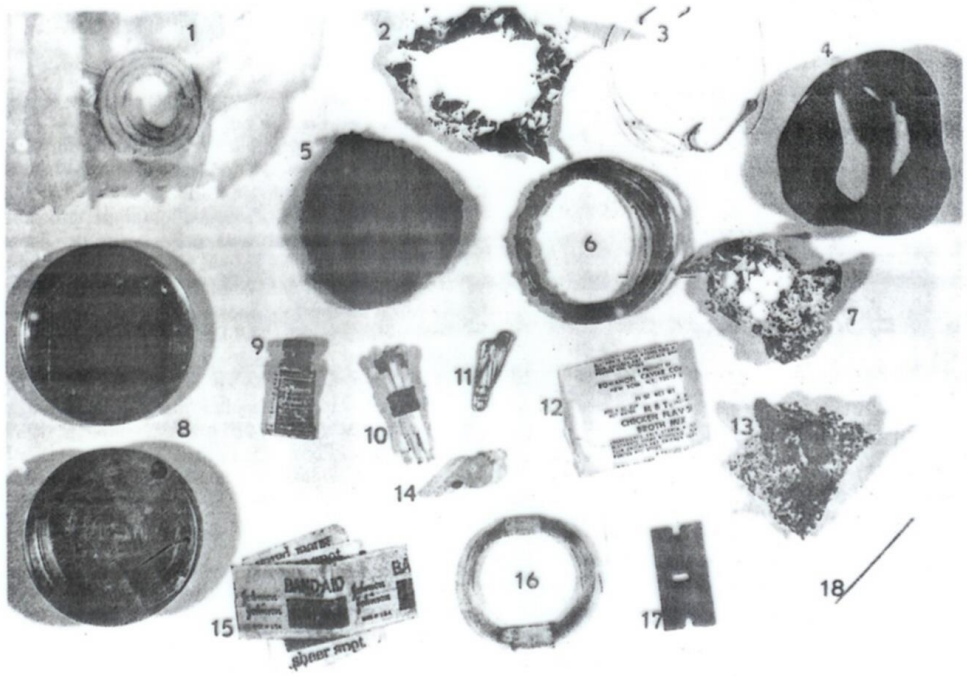
'B' walks to 'A' and the cycle is repeated



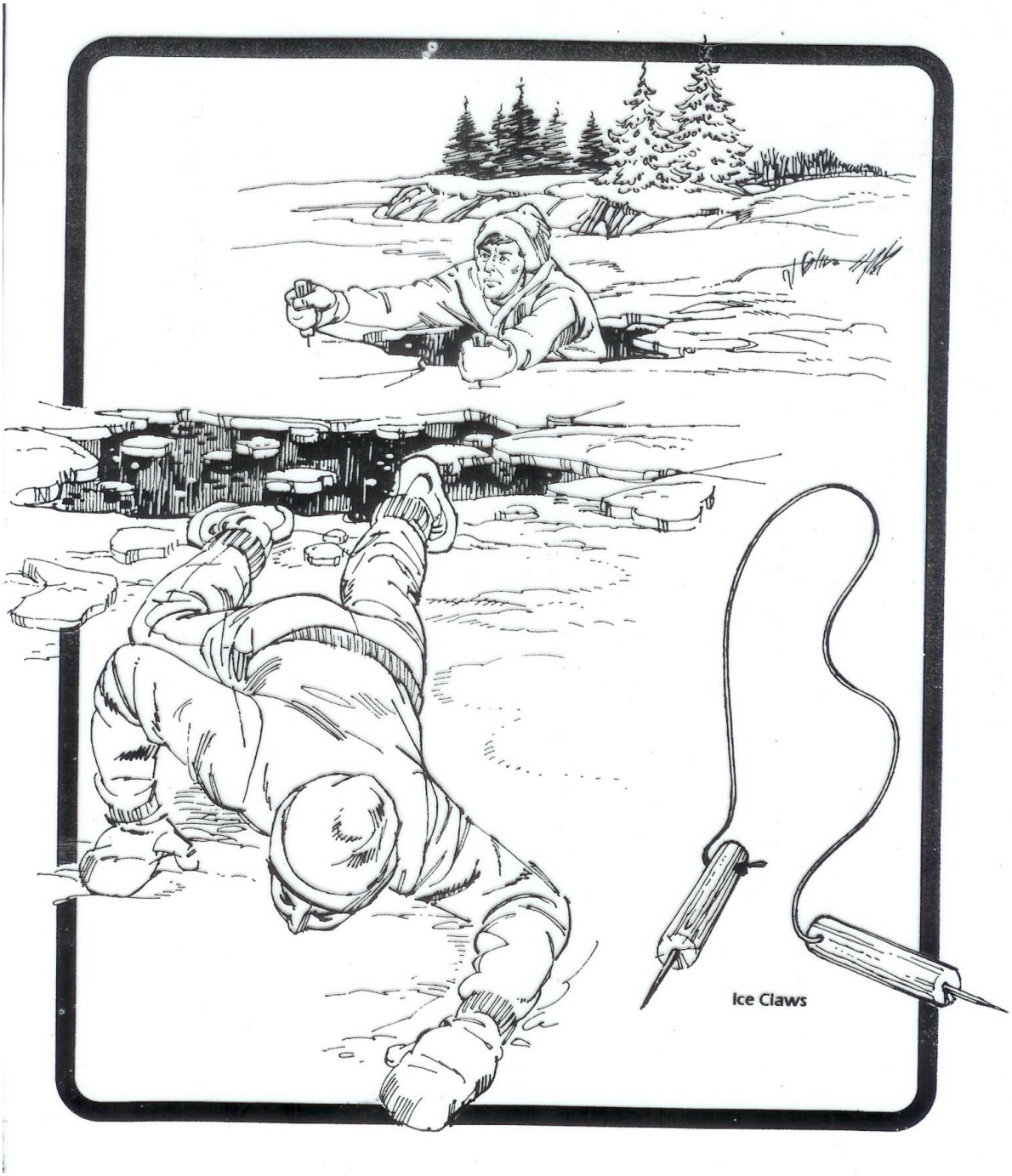
Change bearing by 90° and pace far enough to avoid the obstacle (1-2). Return to original direction and walk beyond the obstacle (2-3). If you are measuring distance along the traverse you should record distance 2-3. Change bearing by 90° again and walk back to your original line (3-4). Measure off same distance as 1-2. You are now ready to proceed on your line at 4.


SALT
Survival Kit

How to Make a Survival Kit in a Can

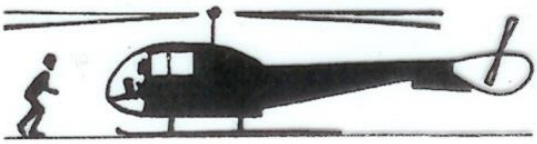


1. One foot of heavy cotton string, dipped in melted paraffin and then wrapped in waxed paper. Cut off 1½" piece, fray end, light with match and use to start fire. Burns longer and hotter than match alone.
2. Salt, wrapped in foil packet. Improves flavor of anything caught and cooked for food.
3. Two snelled fish hooks. May be used with leader to catch fish for food.
4. Four feet of black plastic electrician's tape. Used originally to seal and waterproof can. May also be used to fasten splints on broken limb, repair torn clothing, etc.
5. Steel wool, 00 or finer. Makes excellent tinder, even after being wet. Water can be shaken out and it will start from small spark. Burns very hot but very quickly so should be used with other tinder (such as pine needles, twigs, etc.) wrapped inside to start fire.
6. Picture hanging wire. Makes excellent snare wire; may also be used in erecting shelter.
7. Water purification tablets. Use if there is any doubt about purity of drinking water.
8. Metal container, with mirror glued in lid. Mirror may be used to signal searching aircraft. Container used to melt snow for water; also may be used to mix up small quantities of soup.
9. Small tube of antibiotic ointment. Use on small cuts and burns to avoid infection.
10. Wooden matches, dipped in paraffin to make them waterproof; stick broken off to be shorter.
11. Safety pins. Use to fasten together torn clothing or replace lost buttons.
12. Packet of condensed soup mix. May be mixed, small amount at a time, with water in can.
13. Vitamin pills (one per day type). To help maintain health on inadequate diet.
14. Small whistle. Use to signal. Three blasts are recognized distress signal. Saves voice.
15. Adhesive bandages. Use on small cuts, abrasions, burns.
16. 20-lb. test leader. Use with hooks for fishing; use with needle to sew clothing, use for snares; use to lash shelter together.
17. Razor blade (single edge). Use to make fuzz stick to start fire; use to clean and skin small creatures caught for food; use to cut up belt or other material to make thongs, ties.
18. Needle with large eye. Use with leader for sewing; use to remove slivers.
19. A sealable plastic bag to protect things from moisture.
20. A surplus army belt ammo pouch for easy carrying and storage.


Ice Claws

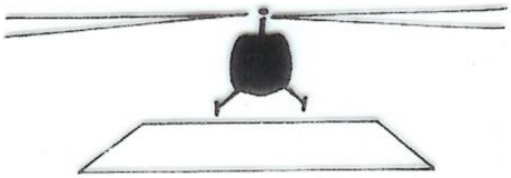
Approach or leave machine in a crouching manner *(for extra clearance from main rotor).*

Approach or leave slope side *(to avoid main rotor).*



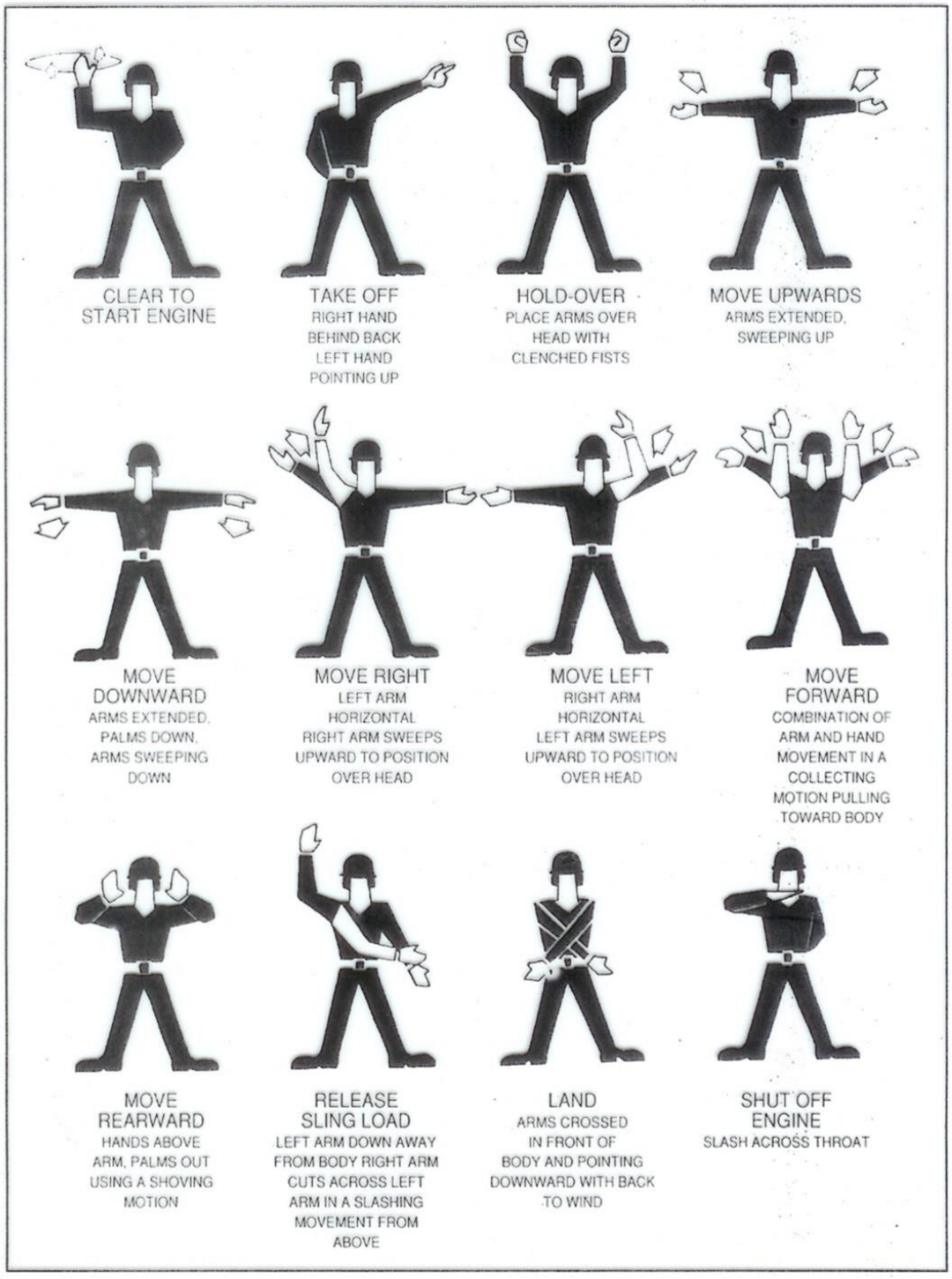
Approach or leave in pilot's field of vision *(to avoid tail rotor).*

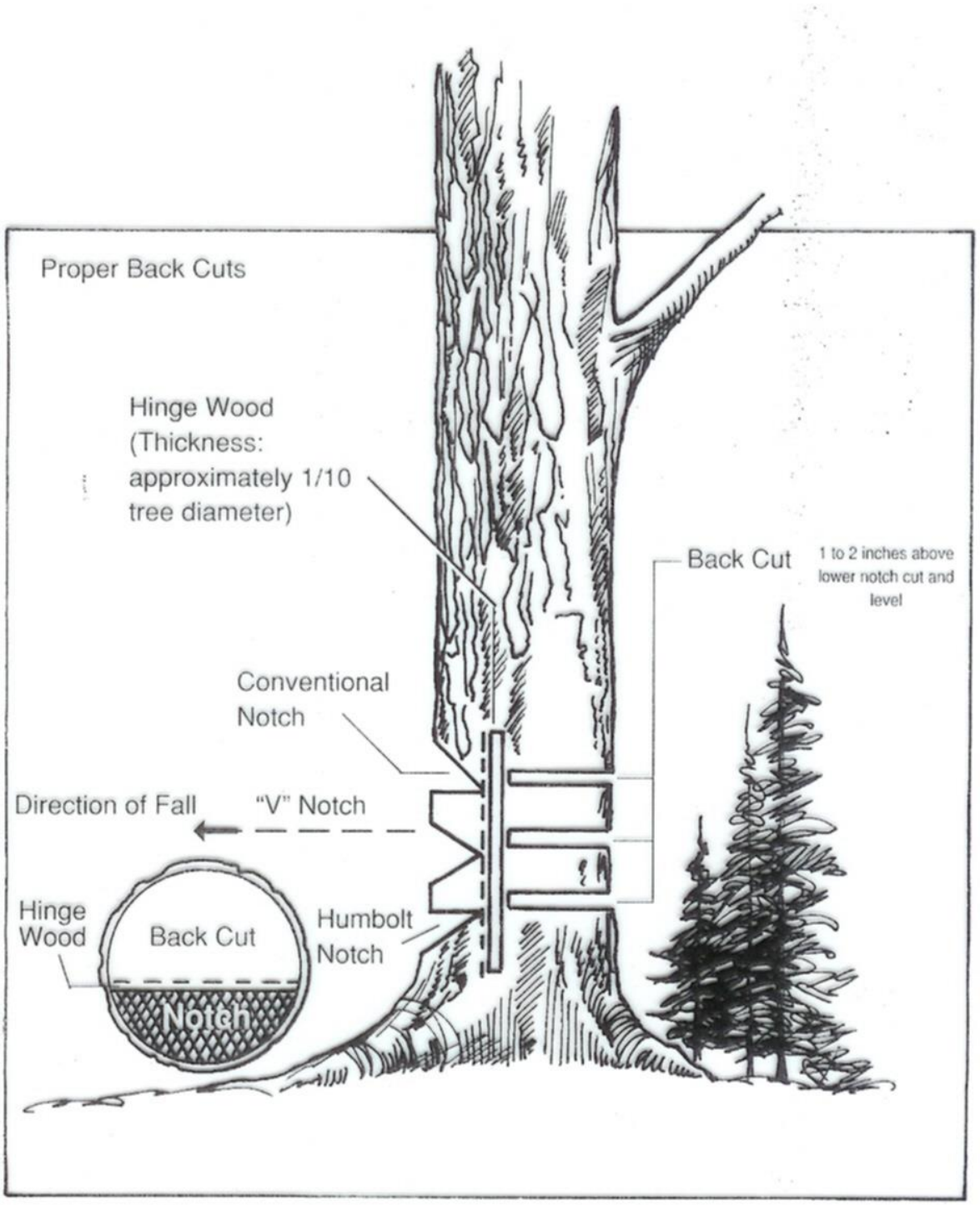
Do not touch bubble or any of the moving parts *(tail rotor linkage, etc.).*

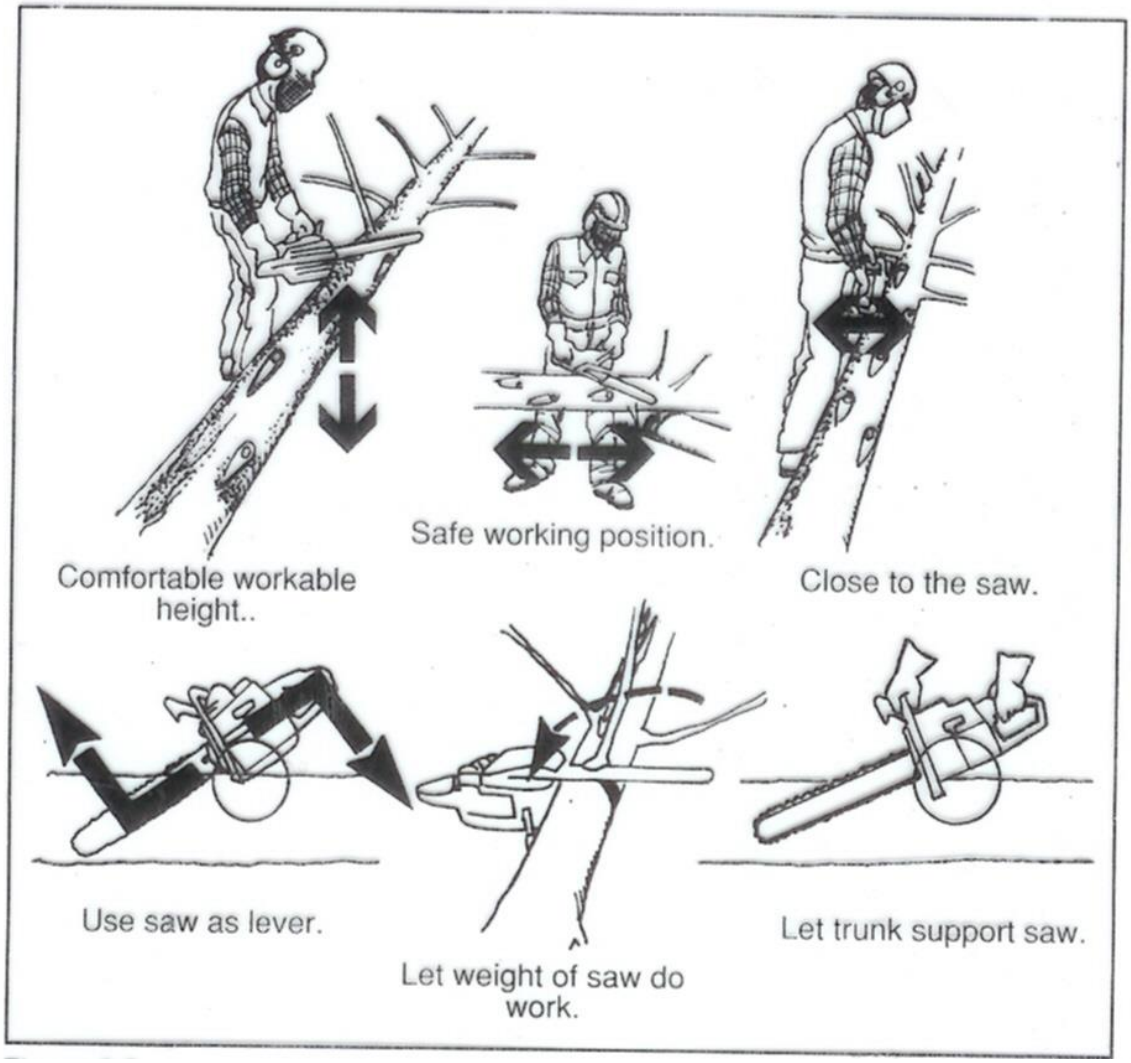


Keep helispot clear of loose articles — water bags, groundsheets, empty cans, etc.

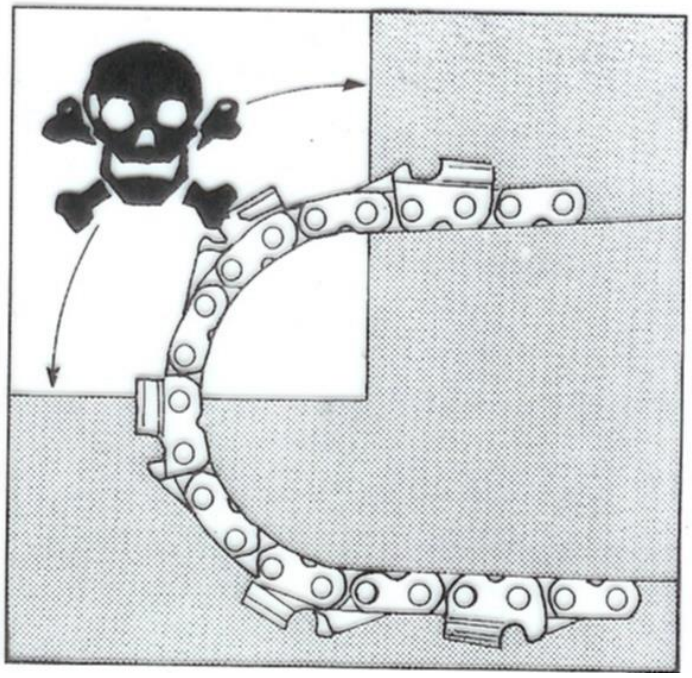
Keep cooking fires well clear of helispot.

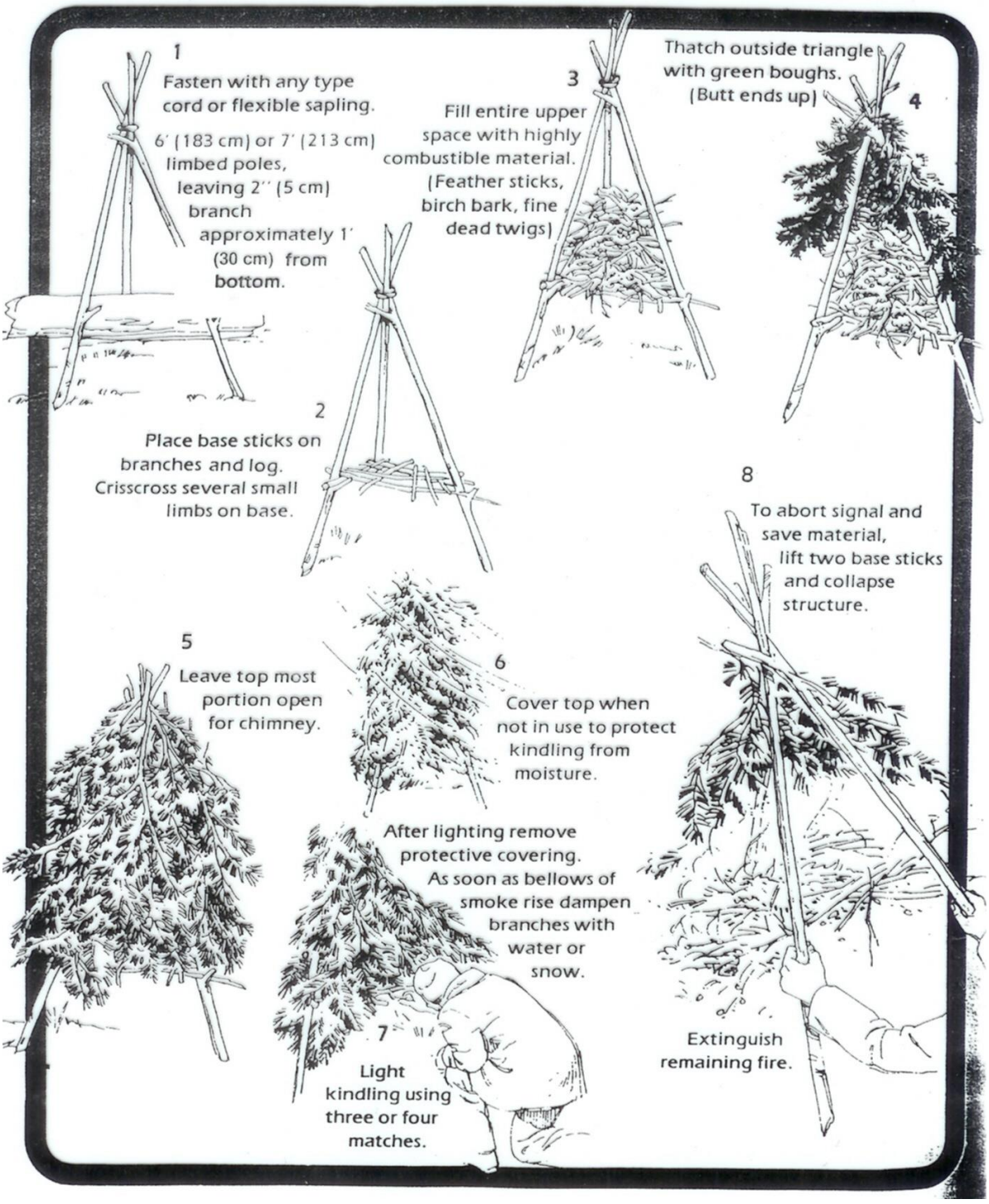

CLEAR TO START ENGINE
TAKE OFF
RIGHT HAND BEHIND BACK LEFT HAND POINTING UP
HOLD-OVER
PLACE ARMS OVER HEAD WITH CLENCHED FISTS
MOVE UPWARDS
ARMS EXTENDED, SWEEPING UP
MOVE DOWNWARD
ARMS EXTENDED, PALMS DOWN, ARMS SWEEPING DOWN
MOVE RIGHT
LEFT ARM HORIZONTAL RIGHT ARM SWEEPS UPWARD TO POSITION OVER HEAD
MOVE LEFT
RIGHT ARM HORIZONTAL LEFT ARM SWEEPS UPWARD TO POSITION OVER HEAD
MOVE FORWARD
COMBINATION OF ARM AND HAND MOVEMENT IN A COLLECTING MOTION PULLING TOWARD BODY
MOVE REARWARD
HANDS ABOVE ARM, PALMS OUT USING A SHOVING MOTION
RELEASE SLING LOAD
LEFT ARM DOWN AWAY FROM BODY RIGHT ARM CUTS ACROSS LEFT ARM IN A SLASHING MOVEMENT FROM ABOVE
LAND
ARMS CROSSED IN FRONT OF BODY AND POINTING DOWNWARD WITH BACK TO WIND
SHUT OFF ENGINE
SLASH ACROSS THROAT


Proper Back Cuts
Hinge Wood
(Thickness:
approximately 1/10
tree diameter)
Back Cut
1 to 2 inches above
lower notch cut and
level
Conventional
Notch
Direction of Fall
"V" Notch
Hinge
Wood
Back Cut
Humbolt
Notch
Notch


Comfortable workable height..
Safe working position.
Close to the saw.
Use saw as lever.
Let weight of saw do work.
Let trunk support saw.

Most Dangerous Kickback Zone!




1
Fasten with any type cord or flexible sapling.
6' (183 cm) or 7' (213 cm) limbed poles, leaving 2" (5 cm) branch approximately 1' (30 cm) from bottom.
2
Place base sticks on branches and log. Crisscross several small limbs on base.
3
Fill entire upper space with highly combustible material. (Feather sticks, birch bark, fine dead twigs)
4
Thatch outside triangle with green boughs. (Butt ends up)
5
Leave top most portion open for chimney.
6
Cover top when not in use to protect kindling from moisture.
7
After lighting remove protective covering. As soon as bellows of smoke rise dampen branches with water or snow.
Light kindling using three or four matches.
8
To abort signal and save material, lift two base sticks and collapse structure.
Extinguish remaining fire.

SURFACE TO AIR VISUAL SIGNALS

Require Assistance	V
Require Medical Assistance or Unable to Proceed (old)	X
No or Negative	N
Yes or Affirmative	Y
Proceeding In This Direction	↑
We Have Found Only Some Missing Personnel	++
We are not able to continue. Returning to base.	XX
Have divided into two groups. Each proceding in direction indicated.	
Information received that aircraft is in this direction	→→
Require Doctor Serious Injuries	I
Require Medical Supplies	II
Require Food & Water	F
Indicate Direction to Proceed	K

Aircraft Seriously Damaged	
Operation Completed	LLL
We Have Found All Missing Personnel	LL
All Well	LL
Require Fuel & Oil	L
Not Understood	JL
Require Map & Compass	□
Require Signal Lamp	I I
Will Attempt Takeoff	I>
Nothing found. Will continue to search	NN
Require Firearm & Ammunition	V V
Require Engineer (old) Need Repairs	W
Probably Safe To Land Here	△
International Symbol of Distress	SOS

SURFACE TO AIR VISUAL BODY SIGNALS

Our receiver is operating

All OK, do not wait

Pick us up, our (aircraft) is abandoned

Do not attempt to land here

Use drop message

Can proceed shortly, wait if possible

Need mechanical help or parts, long delay

Land here (point in direction of landing)

No or negative

Yes or affirmative

Need medical assistance

AIR TO GROUND VISUAL SIGNALS

a. Message received and understood

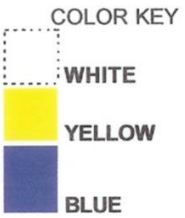
b. Message received but NOT understood

c. Yes or affirmative

d. No or negative

PANEL SIGNALS

NOTE: Survivors use liferaft sails to convey signals but any square piece of cloth or canvas with each side of contrasting colors can be used.



ON LAND: WALKING IN THIS DIRECTION
AT SEA: DRIFTING

ON LAND: NEED QUININE OR ATABRINE
AT SEA: NEED SUN COVER

ON LAND: NEED WARM CLOTHING
AT SEA: NEED EXPOSURE SUIT OR CLOTHING INDICATED

ON LAND & AT SEA: PLANE FLYABLE, NEED TOOLS

ON LAND & AT SEA: NEED FOOD AND WATER

ON LAND: NEED GAS AND OIL, PLANE IS FLYABLE
AT SEA: N/A

ON LAND & AT SEA: NEED MEDICAL ATTENTION

ON LAND & AT SEA: NEED FIRST AID SUPPLIES

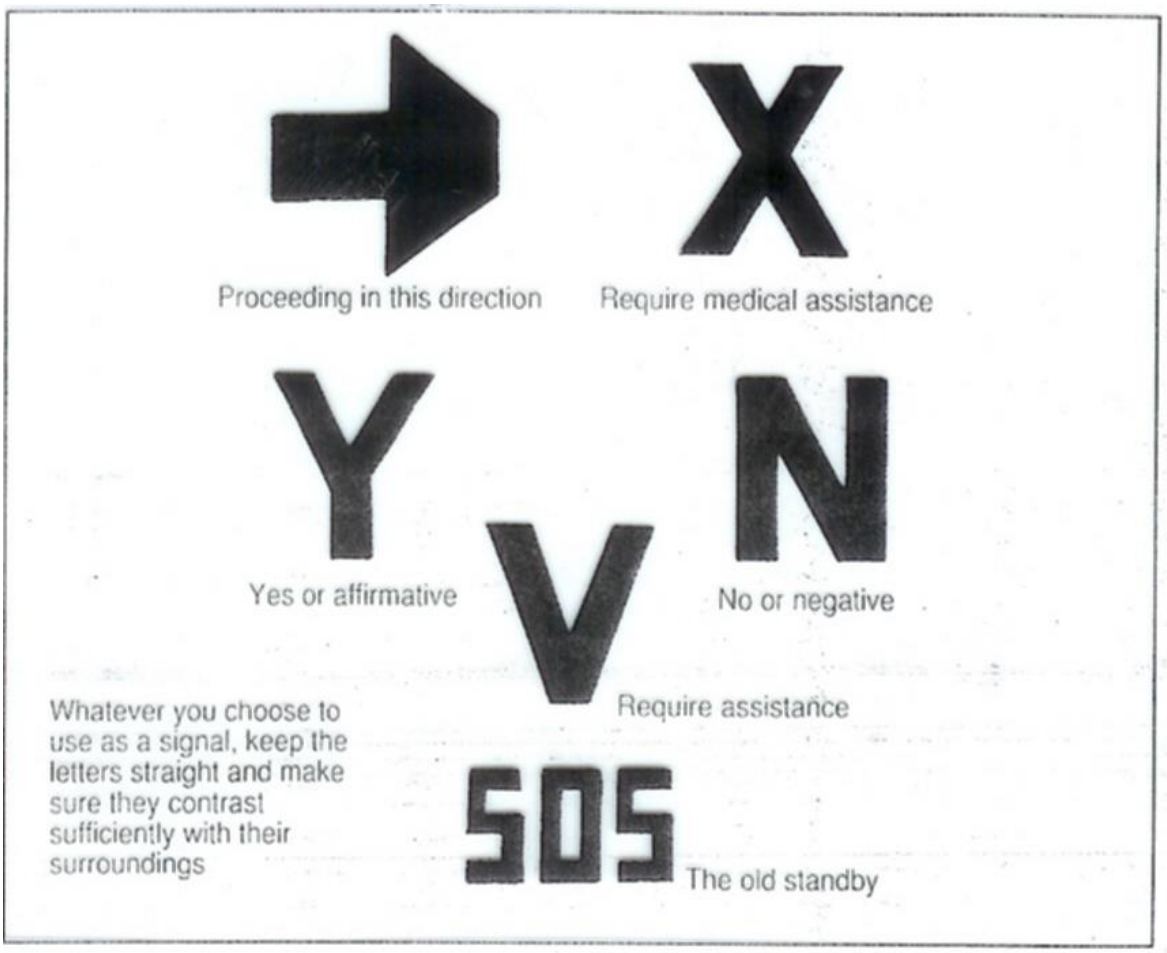
ON LAND & AT SEA: NEED EQUIPMENT AS INDICATED SIGNALS FOLLOW

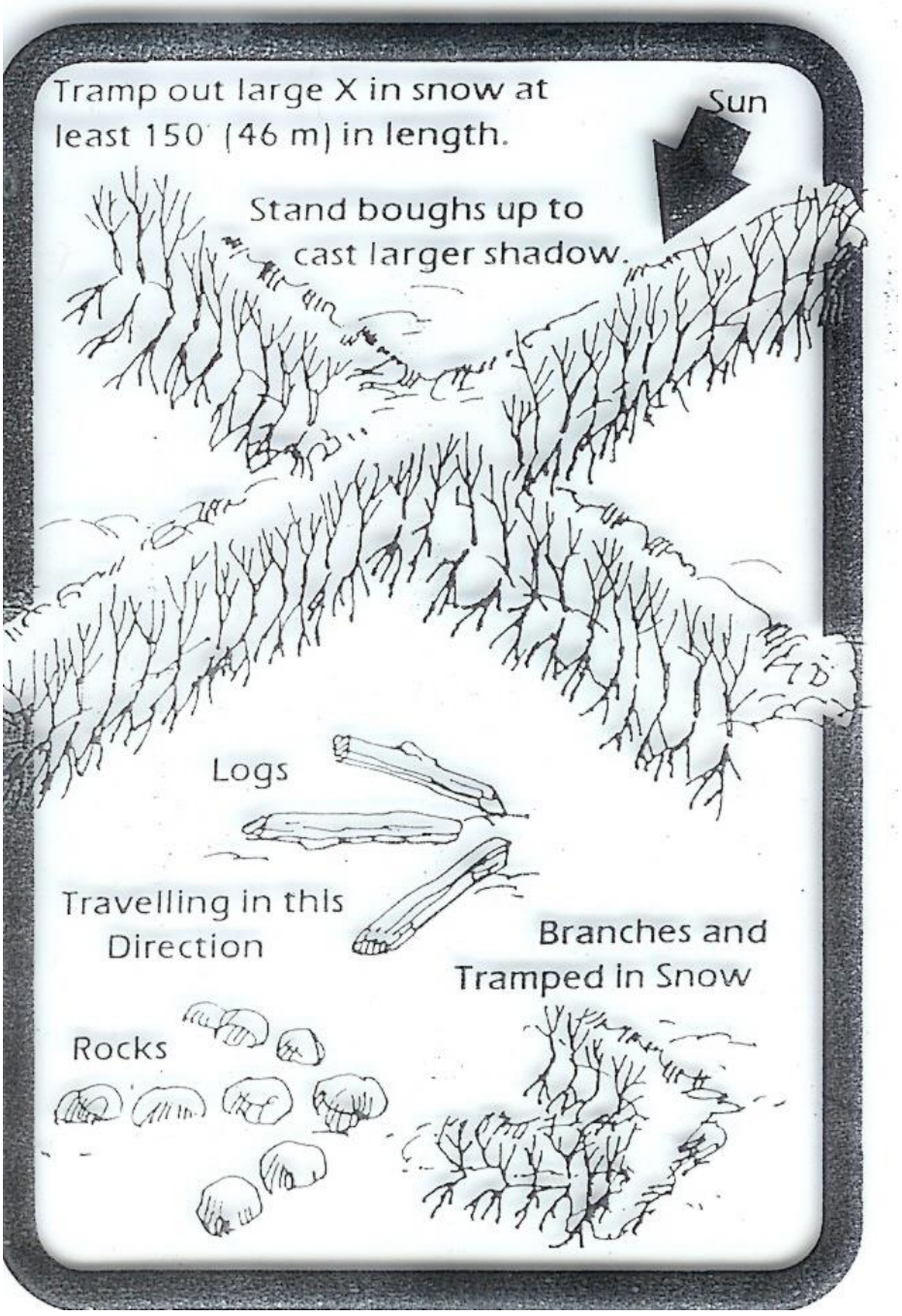
ON LAND: INDICATE DIRECTION OF NEAREST CIVILIZATION
AT SEA: INDICATE DIRECTION OF RESCUE CRAFT

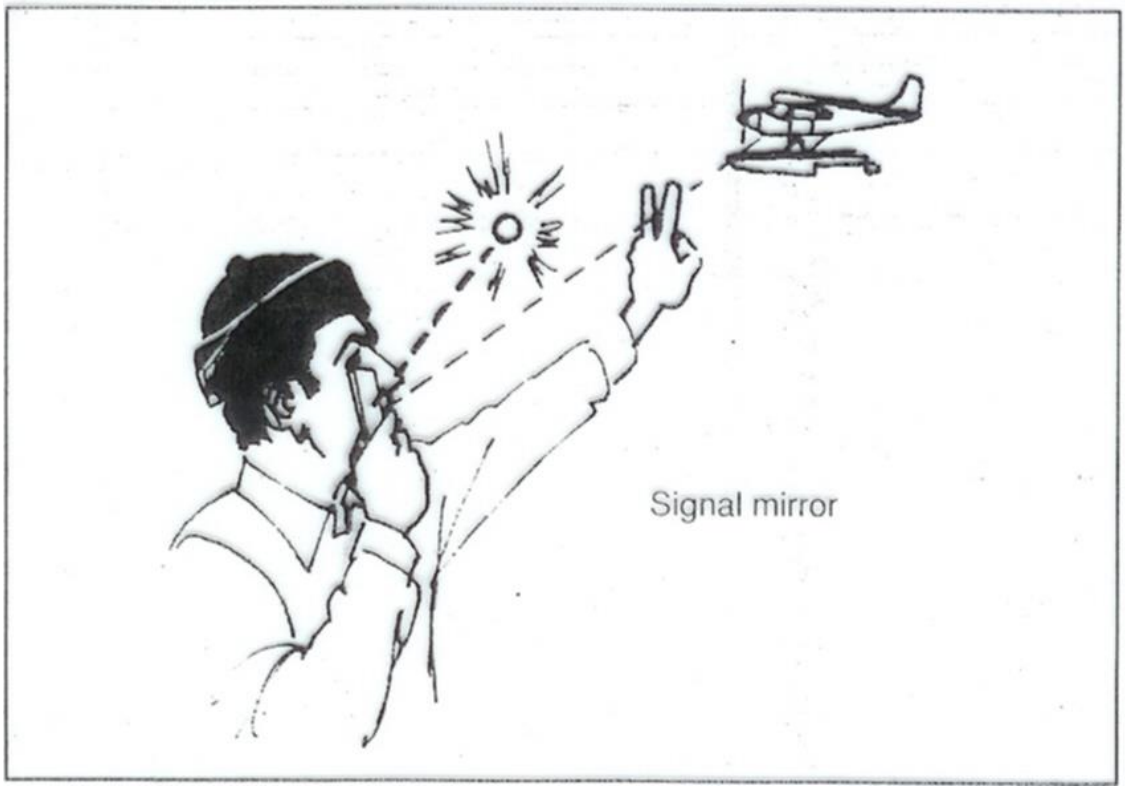
ON LAND: SHOULD WE WAIT FOR RESCUE PLANE?
AT SEA: NOTIFY RESCUE AGENCY OF MY POSITION

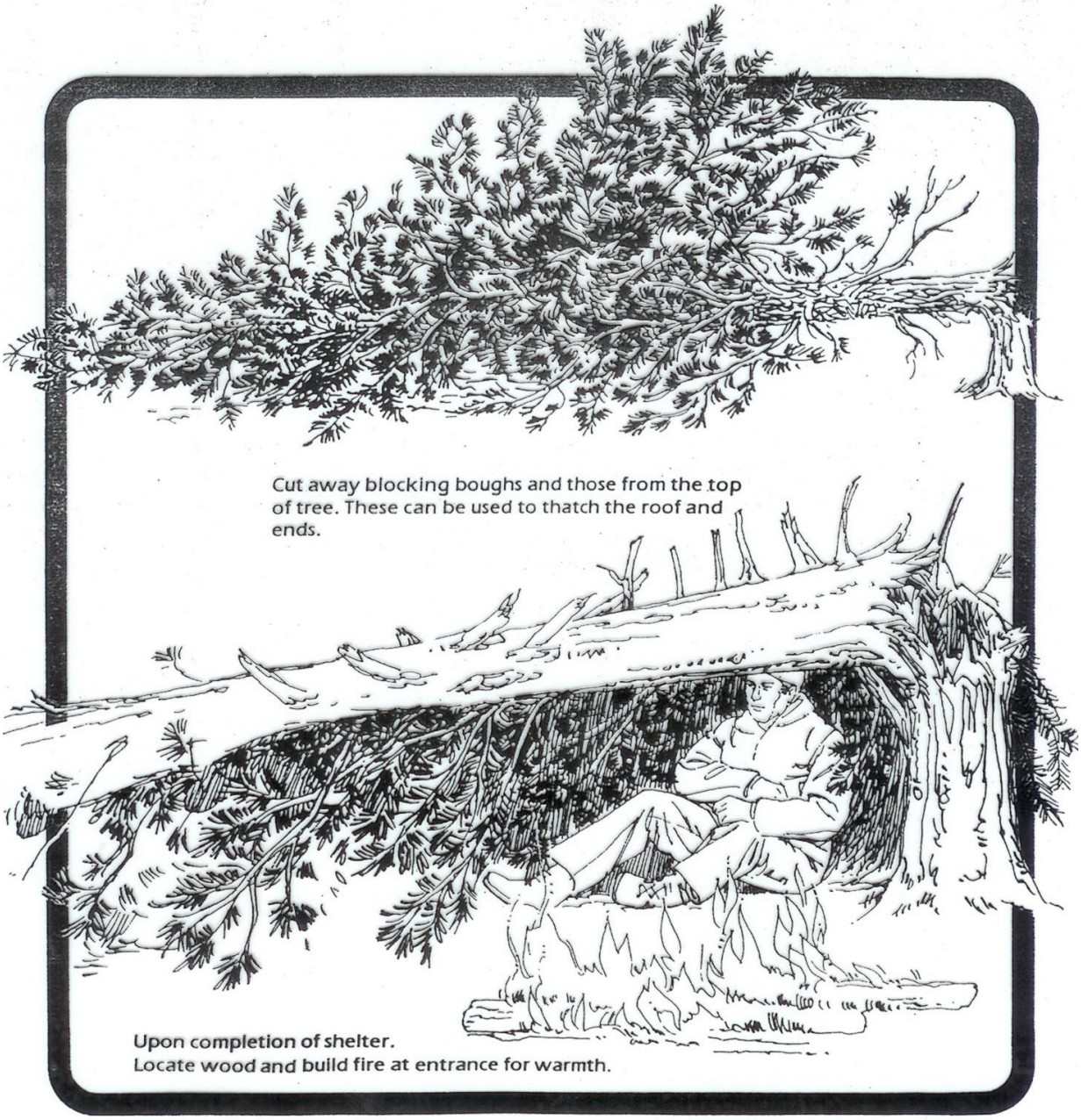
ON LAND & AT SEA: O.K. TO LAND. ARROW SHOWS LANDING DIRECTION

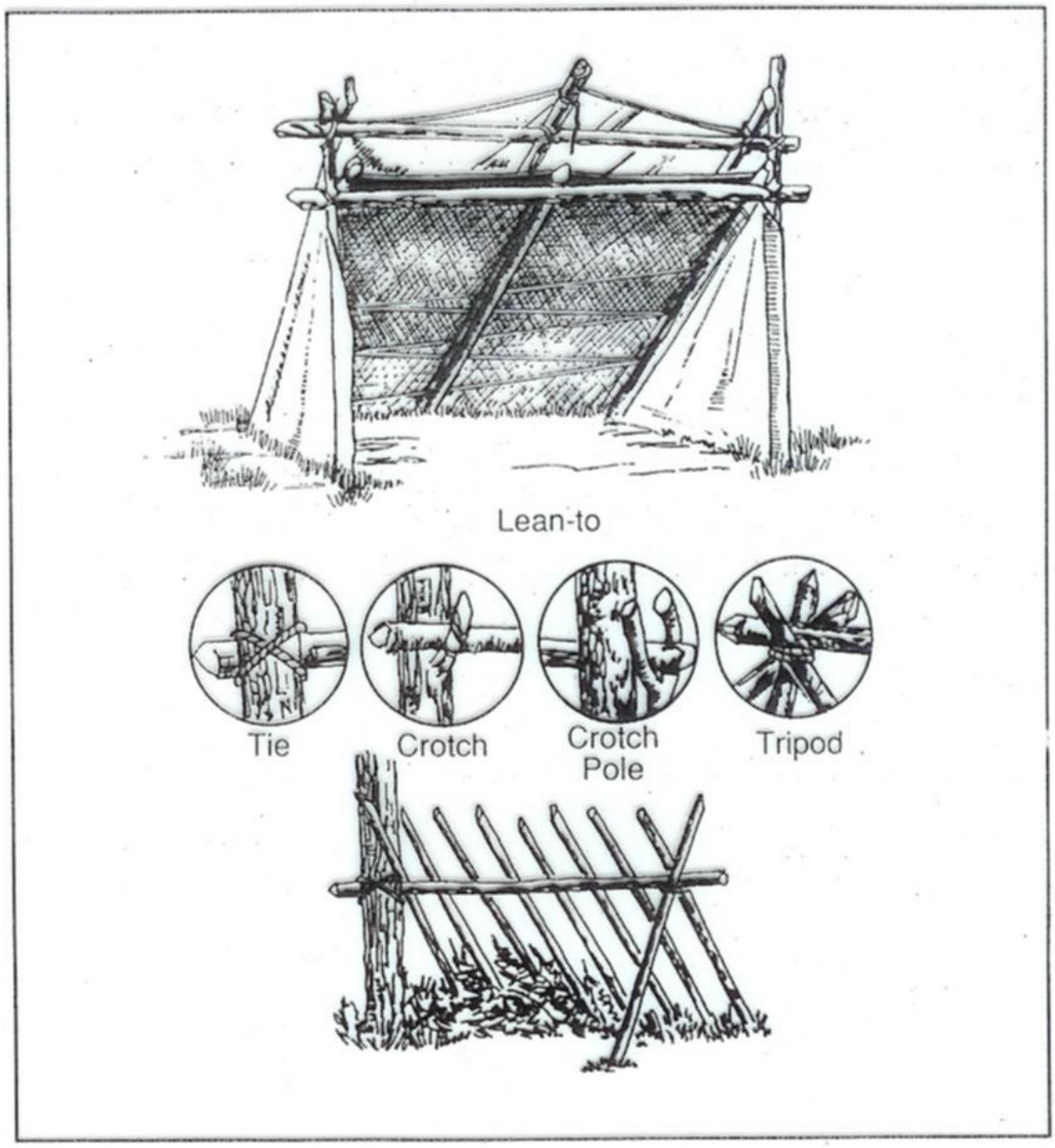
ON LAND & AT SEA: DO NOT ATTEMPT LANDING

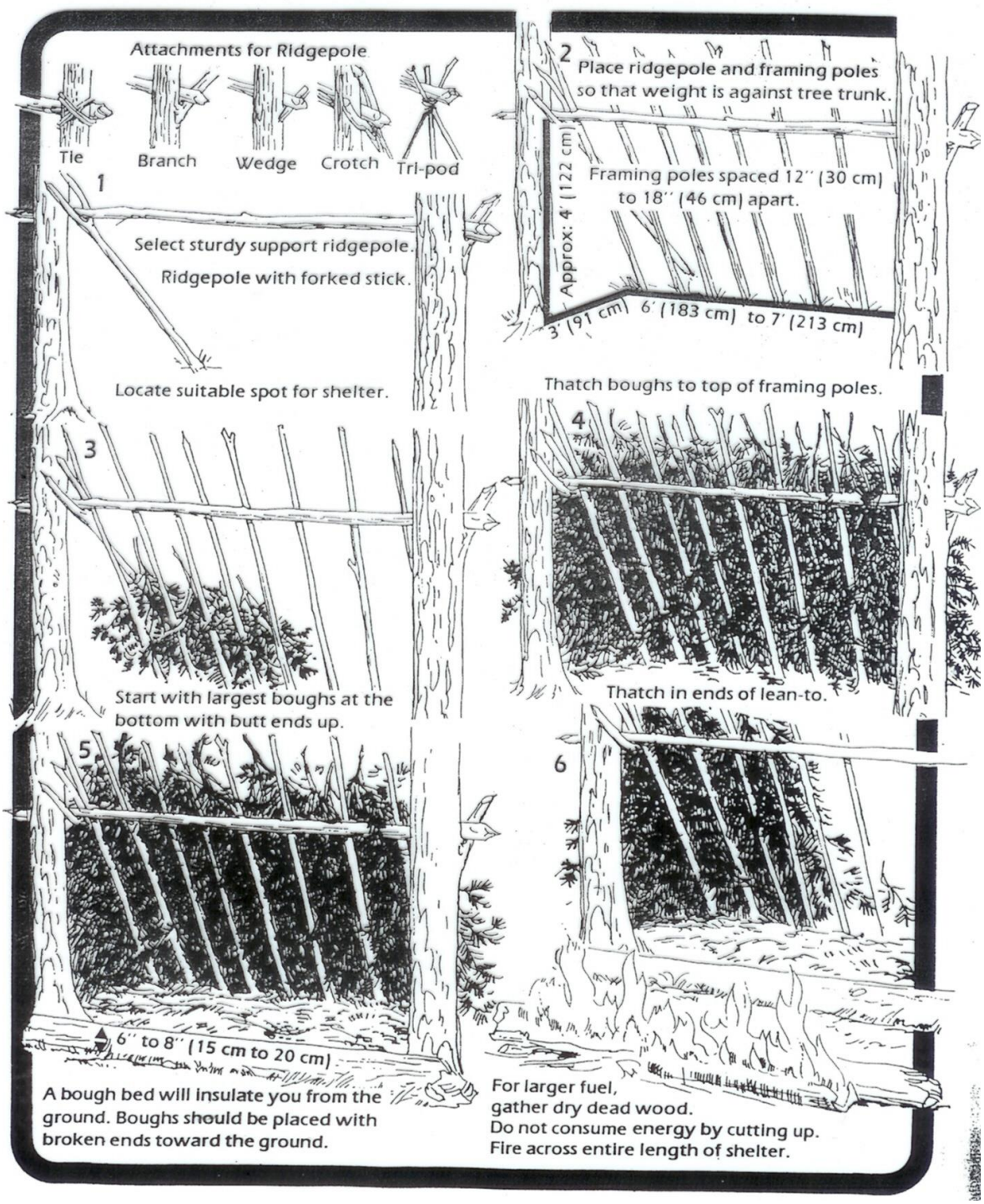

Proceeding in this direction
X
Require medical assistance
Y
Yes or affirmative
N
No or negative
V
Require assistance
Whatever you choose to use as a signal, keep the letters straight and make sure they contrast sufficiently with their surroundings
SOS
The old standby

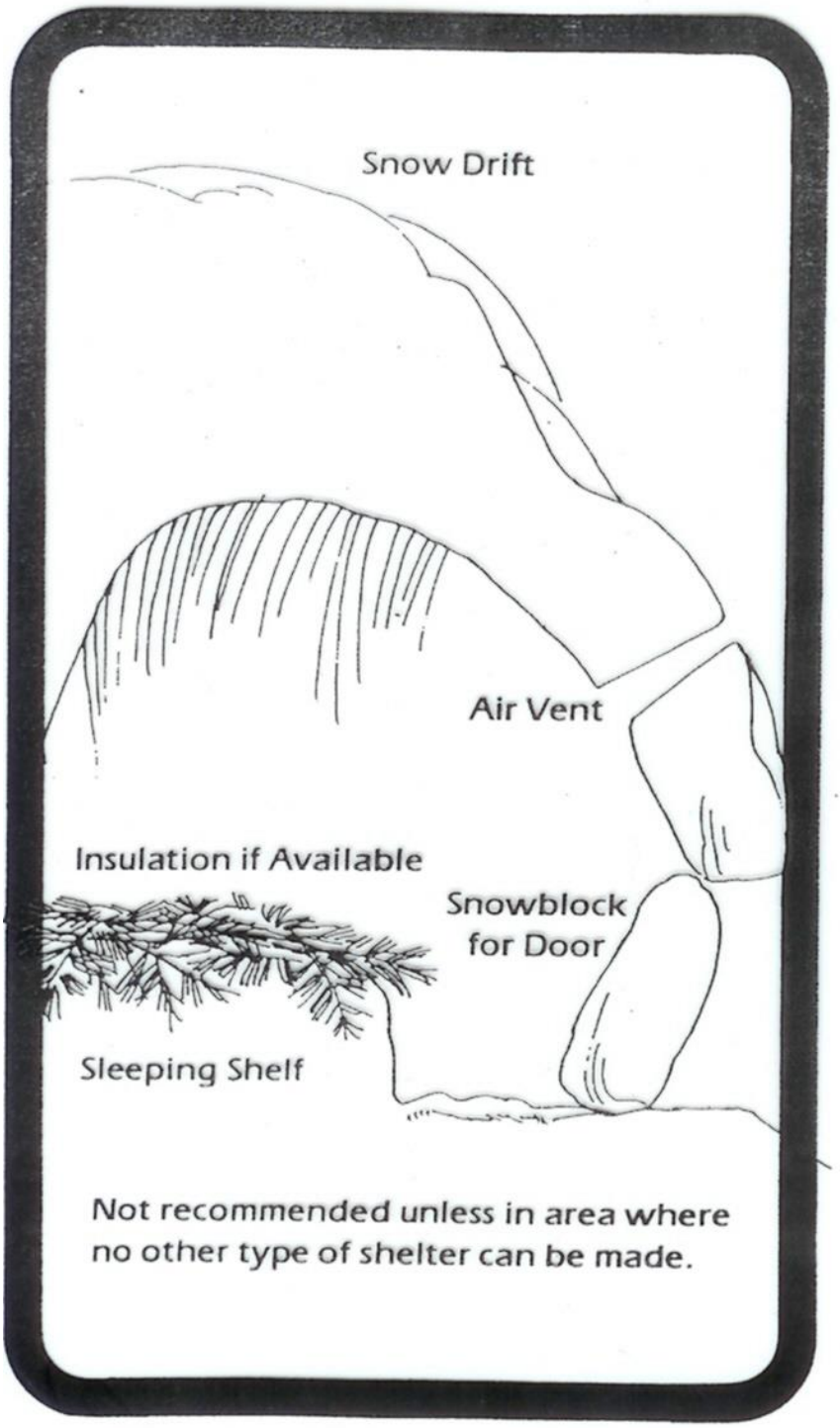

Tramp out large X in snow at least 150' (46 m) in length.
Sun
Stand boughs up to cast larger shadow.
Logs
Travelling in this Direction
Branches and Tramped in Snow
Rocks

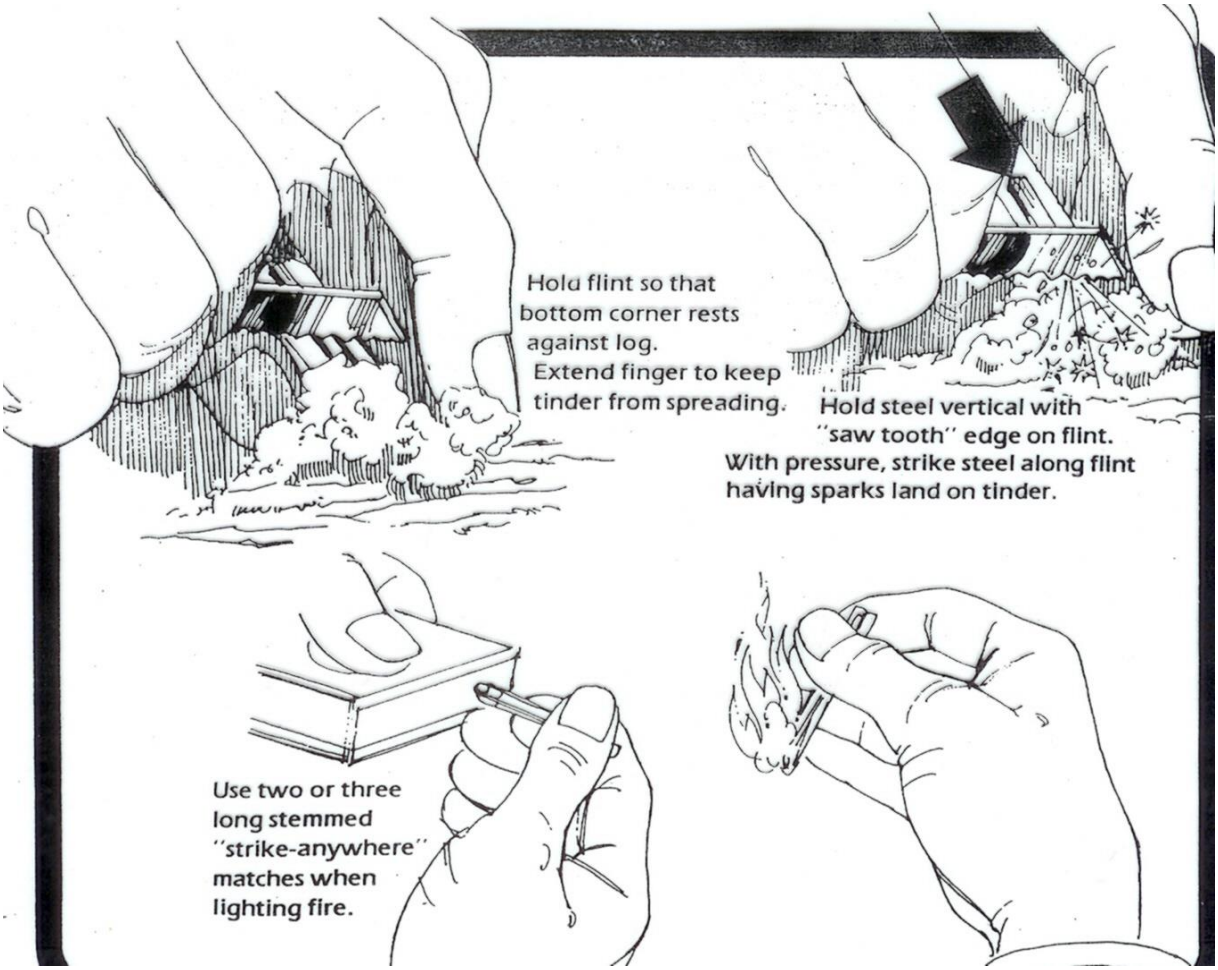

Signal mirror

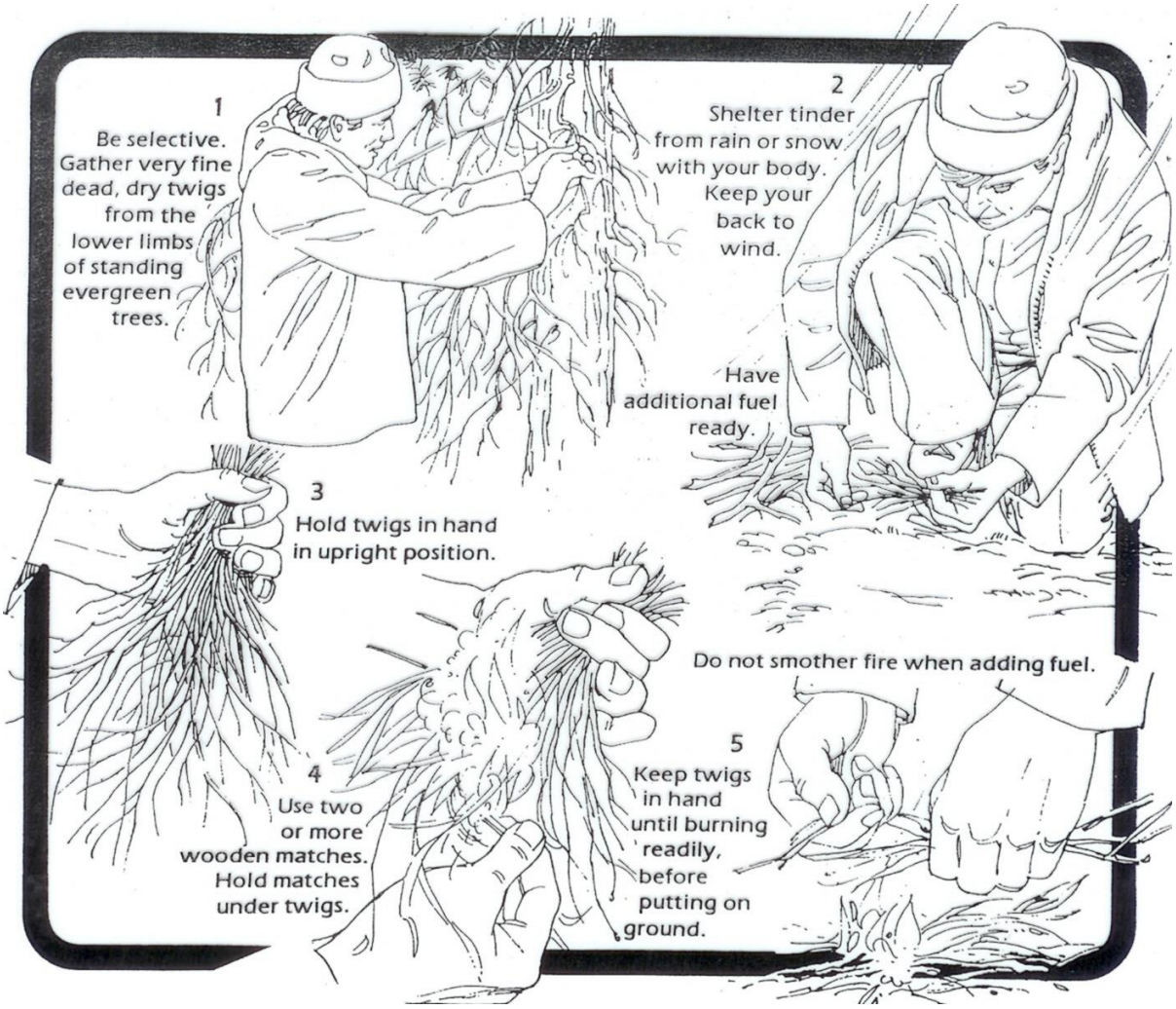

Cut away blocking boughs and those from the top of tree. These can be used to thatch the roof and ends.
Upon completion of shelter.
Locate wood and build fire at entrance for warmth.


Lean-to
Tie
Crotch
Crotch Pole
Tripod


Attachments for Ridgepole
Tie
Branch
Wedge
Crotch
Tri-pod
1
Select sturdy support ridgepole.
Ridgepole with forked stick.
Locate suitable spot for shelter.
2
Place ridgepole and framing poles so that weight is against tree trunk.
Framing poles spaced 12" (30 cm) to 18" (46 cm) apart.
Approx: 4' (122 cm)
3' (91 cm) 6' (183 cm) to 7' (213 cm)
3
Start with largest boughs at the bottom with butt ends up.
4
Thatch boughs to top of framing poles.
Thatch in ends of lean-to.
5
6" to 8" (15 cm to 20 cm)
A bough bed will insulate you from the ground. Boughs should be placed with broken ends toward the ground.
6
For larger fuel, gather dry dead wood.
Do not consume energy by cutting up.
Fire across entire length of shelter.


Snow Drift
Air Vent
Insulation if Available
Snowblock for Door
Sleeping Shelf
Not recommended unless in area where no other type of shelter can be made.


Hold flint so that bottom corner rests against log.
Extend finger to keep tinder from spreading.
Hold steel vertical with "saw tooth" edge on flint.
With pressure, strike steel along flint having sparks land on tinder.
Use two or three long stemmed "strike-anywhere" matches when lighting fire.

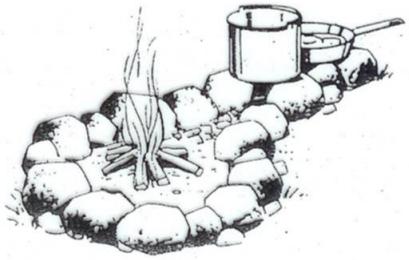

1
Be selective. Gather very fine dead, dry twigs from the lower limbs of standing evergreen trees.
2
Shelter tinder from rain or snow with your body. Keep your back to wind.
Have additional fuel ready.
3
Hold twigs in hand in upright position.
Do not smother fire when adding fuel.
4
Use two or more wooden matches. Hold matches under twigs.
5
Keep twigs in hand until burning readily, before putting on ground.

3 CAMPFIRES

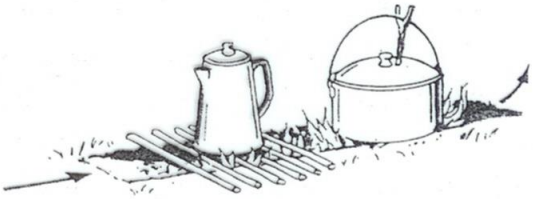
To start a campfire, always clear a site on dirt or rock and remove debris for at least three feet on all sides. A good fire for cooking, light or heat starts with tinder, thin sticks of kindling and medium-size sticks of firewood. Stack them loosely or in a pyramid fashion in that order. Once the tinder is ignited, blow on it or fan the fire gently. The tinder will light the slim sticks, which in turn will set the medium-size sticks ablaze.

Tinder can be birch or cedar bark. Dead grass, weeds or scrap paper rolled into a ball will also work. The basic firewood is not added until both tinder and kindling are burning. The best cooking fire comes from firewood no than three or four inches in diameter. Oak and hickory rate as good woods, but remember that these hardwoods will quickly take the edge off an ax or saw. And if smoke and sparks bother you, avoid the pines and spruces, basswood and chestnut.

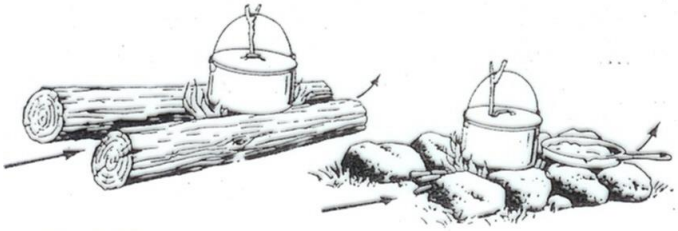
Finally, make certain campfires are permitted in your area and leave no trace of your campfire when you leave.—*Vin T. Sparano, Editor.*



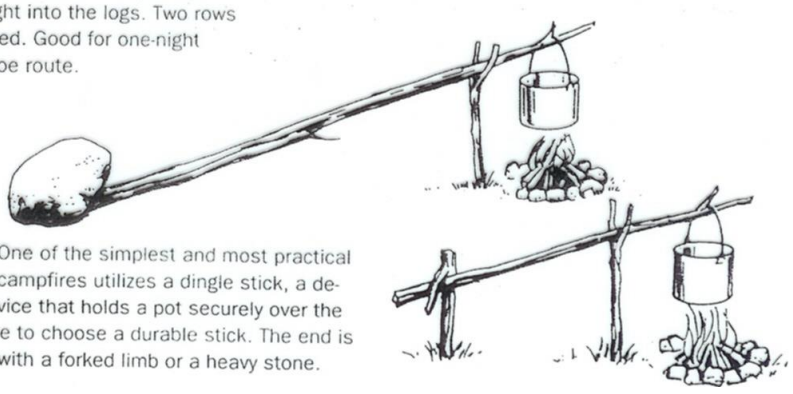
KEYHOLE FIRE Like the hunter's fire, the keyhole fire supplies heat and light and a place for cooking. The fire consists of small flat rocks arranged in a keyhole shape. It features a corridor three to six feet long and one foot wide, and a circle adjacent to the rectangle. Start the fire in the circle and push the hot coals into the narrower cooking area. Keep adding wood to maintain a good supply of hot coals.



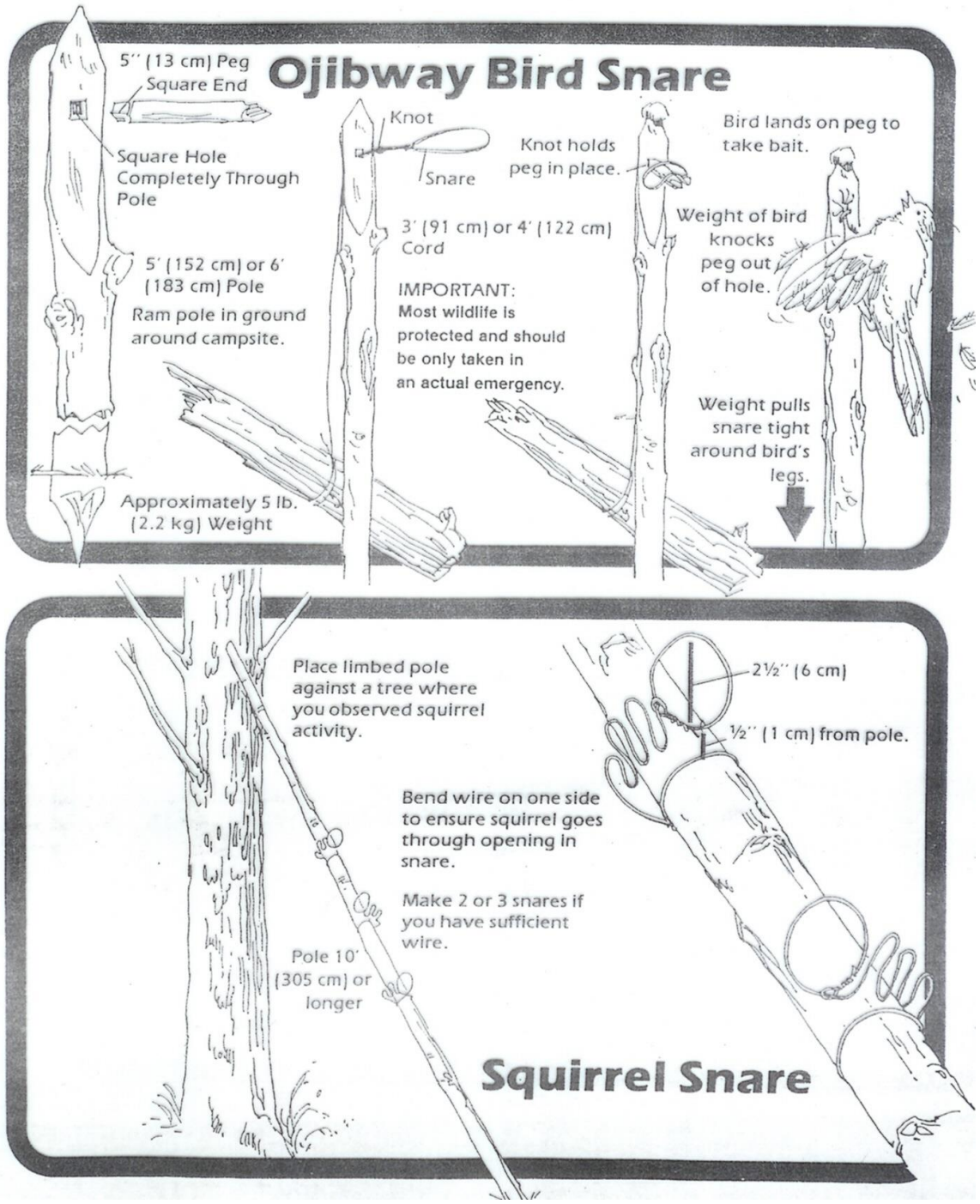
TRENCH FIRE When stoves and wood are nowhere to be found, and your pots have no handles, set up a trench fire. Dig a trench as deep as you need, parallel to the wind. If the trench is narrow, it may support big pots. Otherwise, use green sticks to hold up your cooking gear.

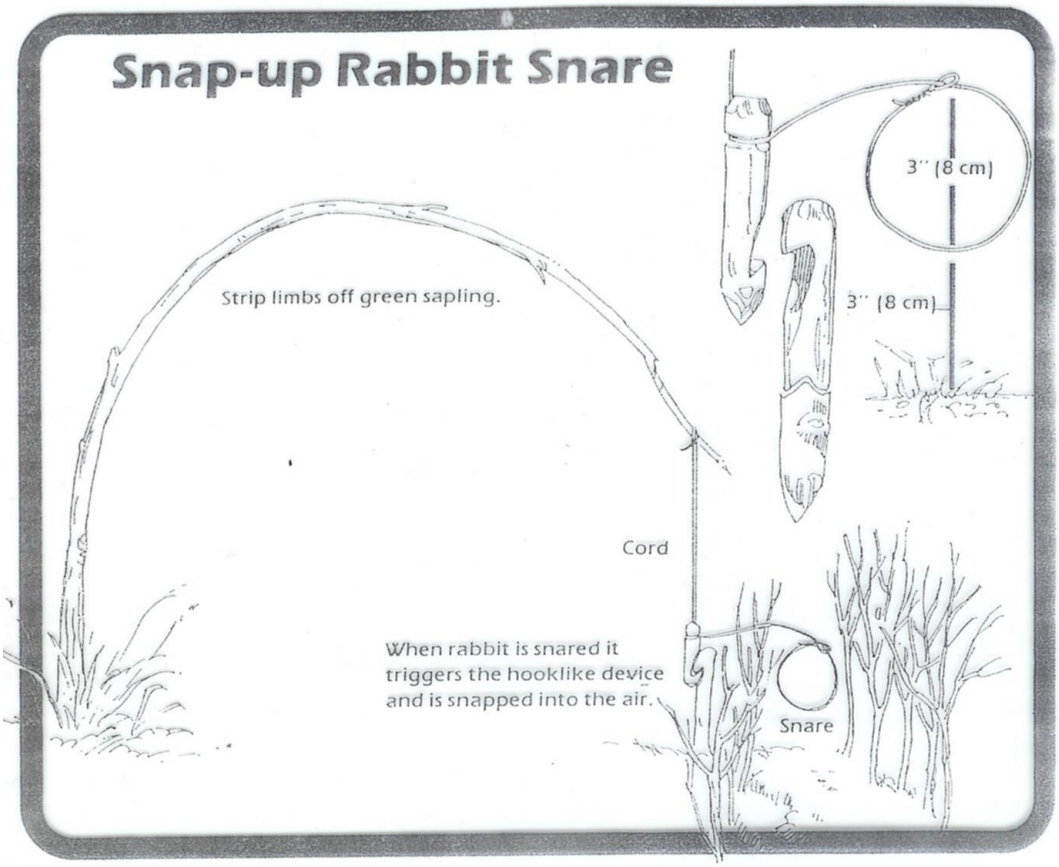


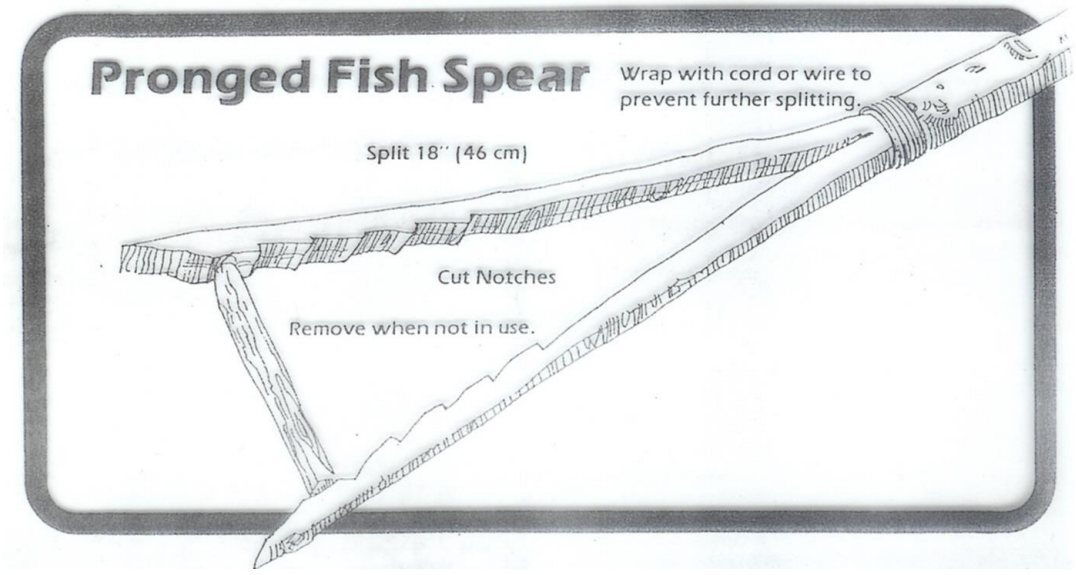
HUNTER'S FIRE Start your fire, then place two green logs on either side of the fire, which will eat right into the logs. Two rows of rocks can also be used. Good for one-night stands on a trail or canoe route.

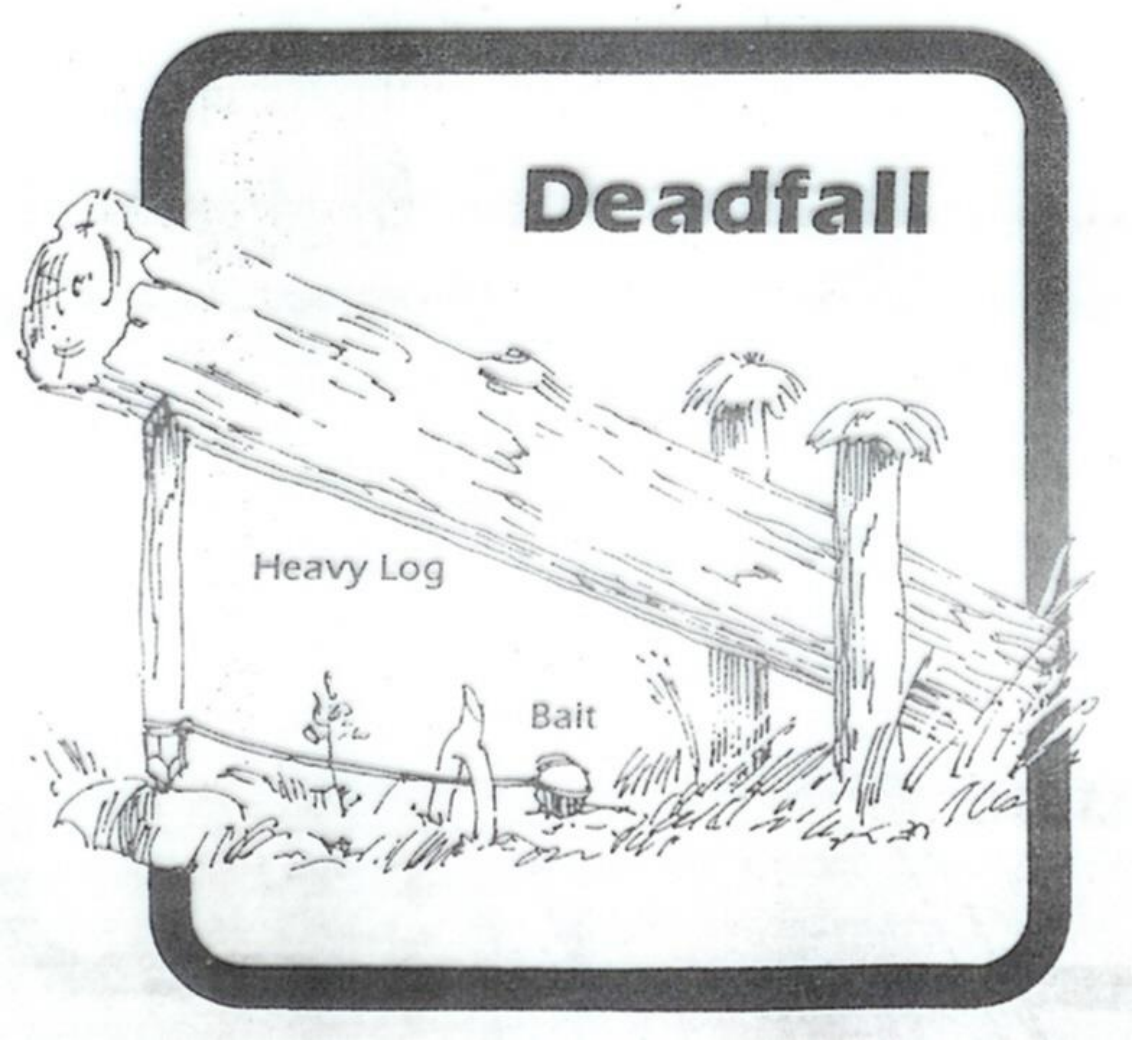


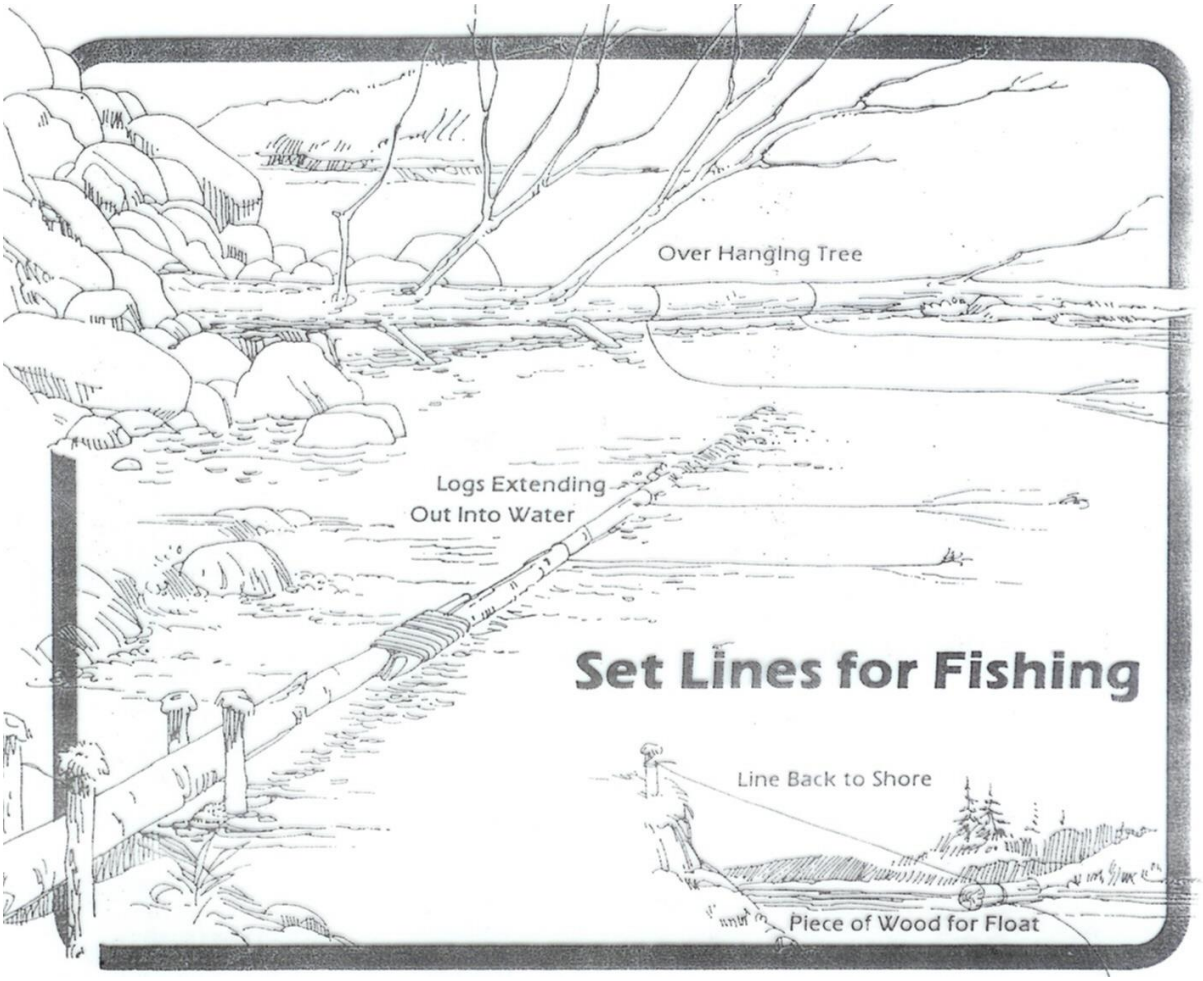
DINGLE STICKS One of the simplest and most practical campfires utilizes a dingle stick, a device that holds a pot securely over the fire. Be sure to choose a durable stick. The end is held down with a forked limb or a heavy stone.

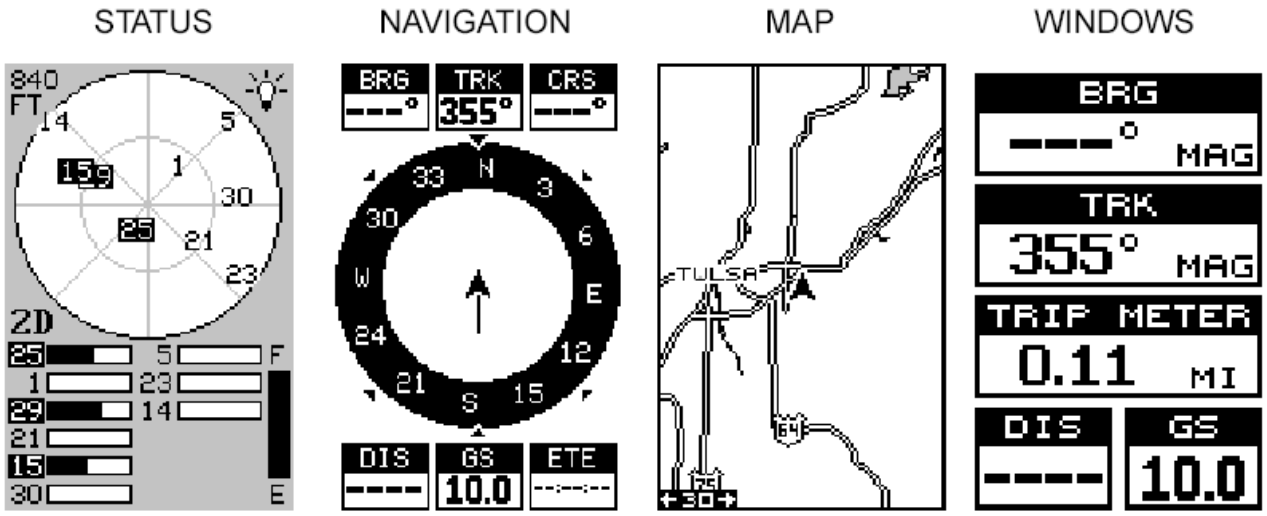

Ojibway Bird Snare
5'' (13 cm) Peg
Square End
Square Hole
Completely Through
Pole
5' (152 cm) or 6'
(183 cm) Pole
Ram pole in ground
around campsite.
Approximately 5 lb.
(2.2 kg) Weight
Knot
Snare
3' (91 cm) or 4' (122 cm)
Cord
IMPORTANT:
Most wildlife is
protected and should
be only taken in
an actual emergency.
Knot holds
peg in place.
Bird lands on peg to
take bait.
Weight of bird
knocks
peg out
of hole.
Weight pulls
snare tight
around bird's
legs.
Place limbed pole
against a tree where
you observed squirrel
activity.
Bend wire on one side
to ensure squirrel goes
through opening in
snare.
Make 2 or 3 snares if
you have sufficient
wire.
Pole 10'
(305 cm) or
longer
2½'' (6 cm)
½'' (1 cm) from pole.
Squirrel Snare


Snap-up Rabbit Snare
3'' (8 cm)
3'' (8 cm)
Strip limbs off green sapling.
Cord
When rabbit is snared it triggers the hooklike device and is snapped into the air.
Snare


Pronged Fish Spear
Wrap with cord or wire to prevent further splitting.
Split 18'' (46 cm)
Cut Notches
Remove when not in use.


Deadfall
Heavy Log
Bait


Over Hanging Tree
Logs Extending
Out Into Water
Set Lines for Fishing
Line Back to Shore
Piece of Wood for Float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23
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CRS
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DIS

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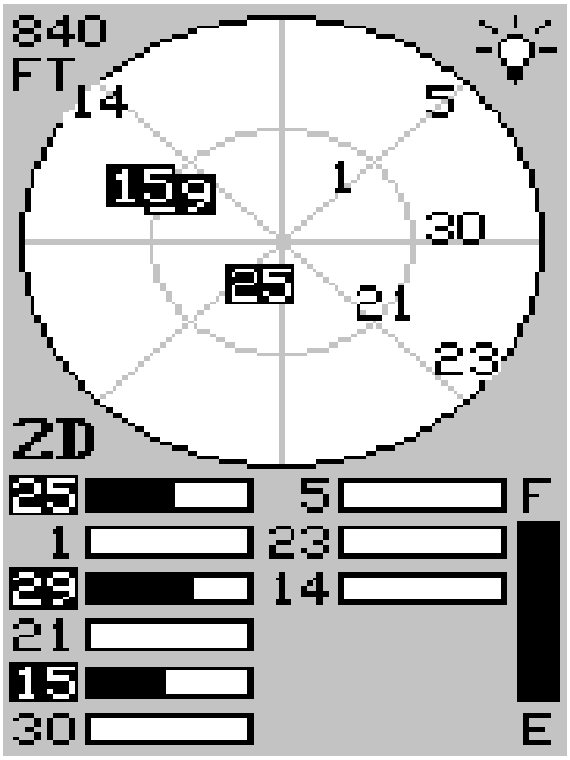
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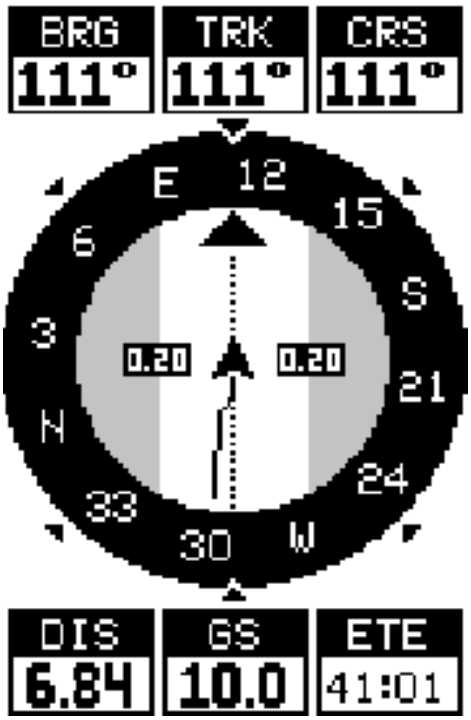
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S
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24
W
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DIS
6.84
GS
10.0
ETE
41:01


BRG
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MAG
TRK
111°
MAG
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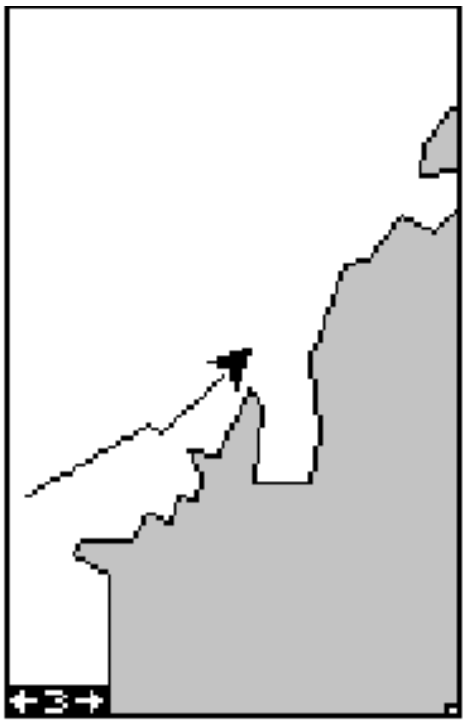
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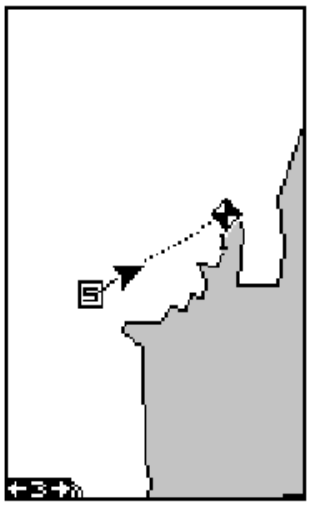
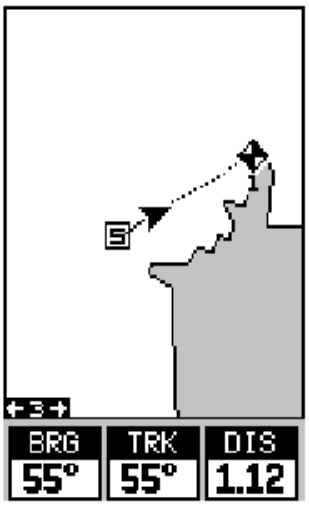
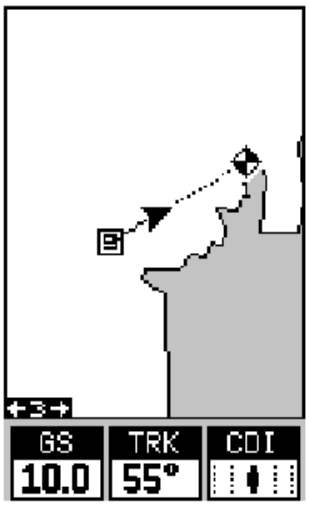
MAP-1

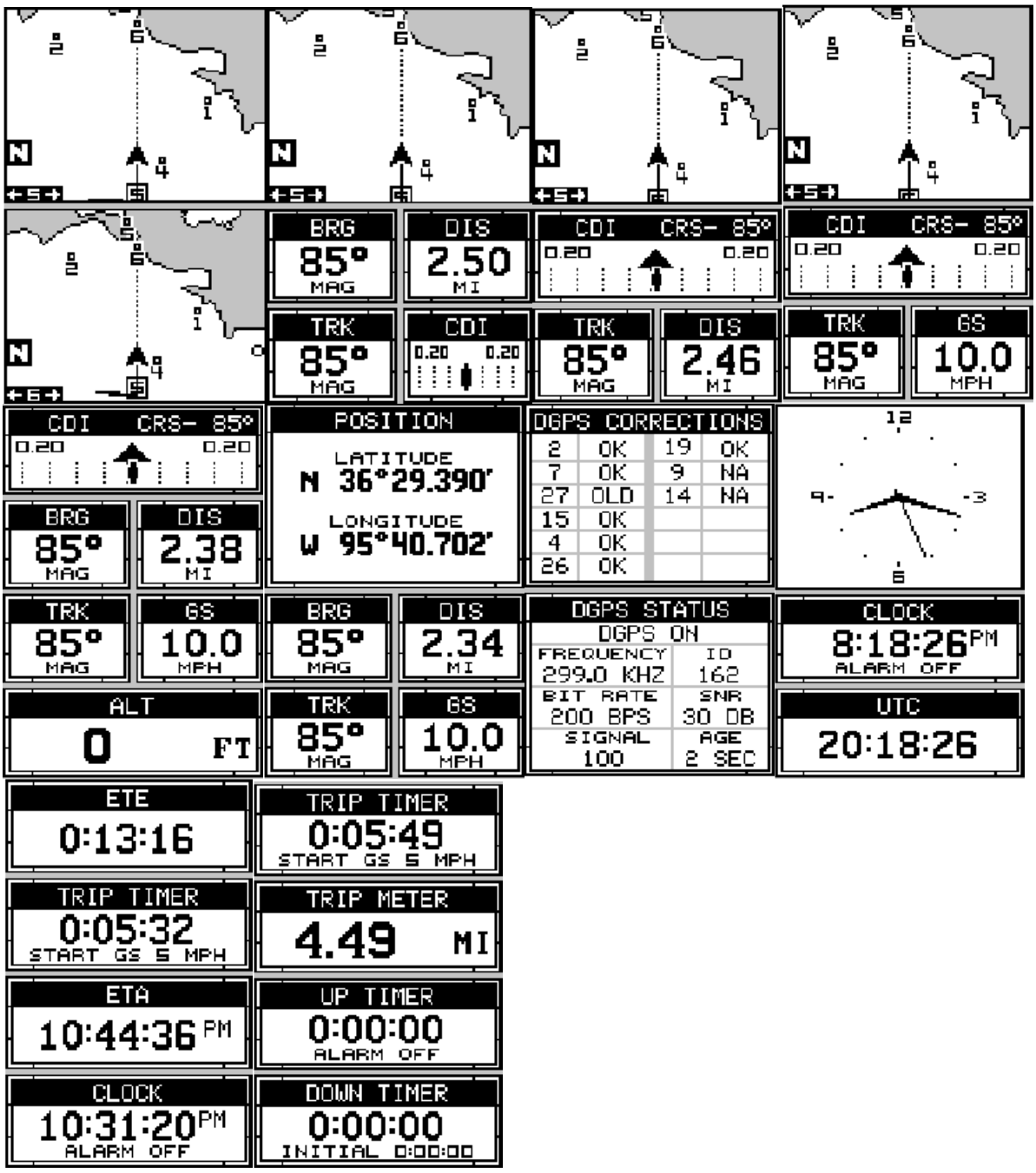


MAP-2



MAP-3

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TRK 85° MAG
CDI 0.20 0.20
TRK 85° MAG
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TRK 85° MAG
GS 10.0 MPH
CDI CRS- 85° 0.20 0.20
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LONGITUDE W 95°40.702'
DGPS CORRECTIONS
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7 OK 9 NA
27 OLD 14 NA
15 OK
4 OK
26 OK
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DIS 2.38 MI
TRK 85° MAG
GS 10.0 MPH
BRG 85° MAG
DIS 2.34 MI
DGPS STATUS
DGPS ON
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SNR 30 DB
SIGNAL 100
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ALT 0 FT
TRK 85° MAG
GS 10.0 MPH
UTC 20:18:26
ETE 0:13:16
TRIP TIMER 0:05:49 START GS 5 MPH
TRIP TIMER 0:05:32 START GS 5 MPH
TRIP METER 4.49 MI
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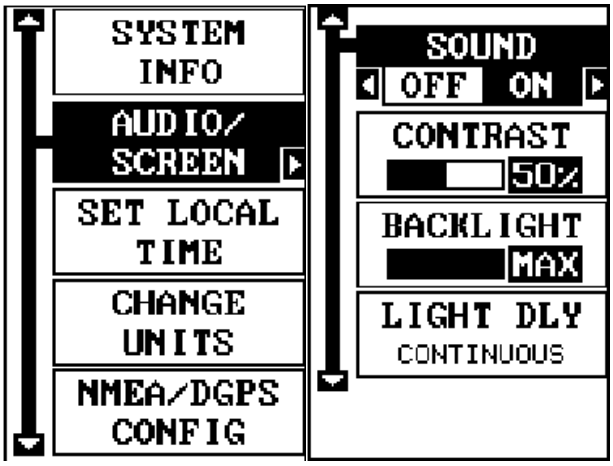
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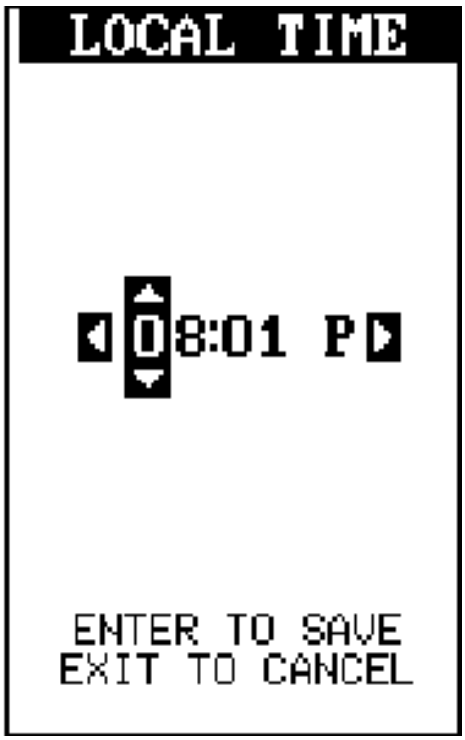
LIGHT DLY
CONTINUOUS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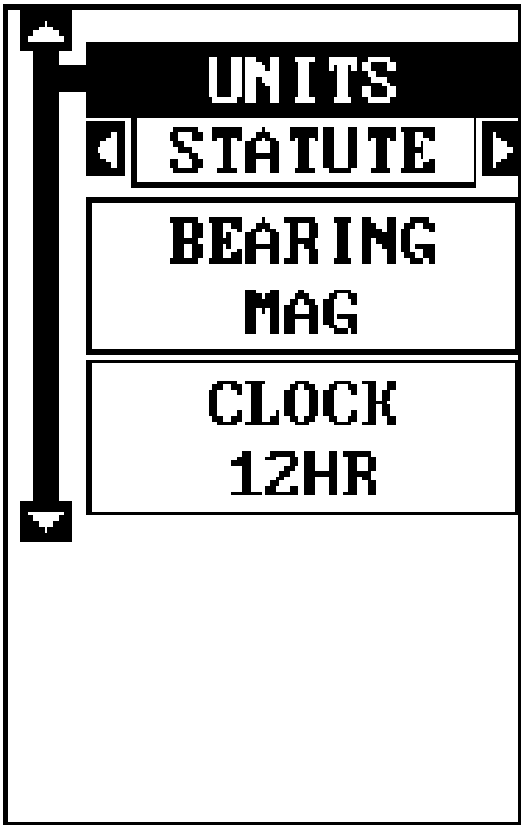
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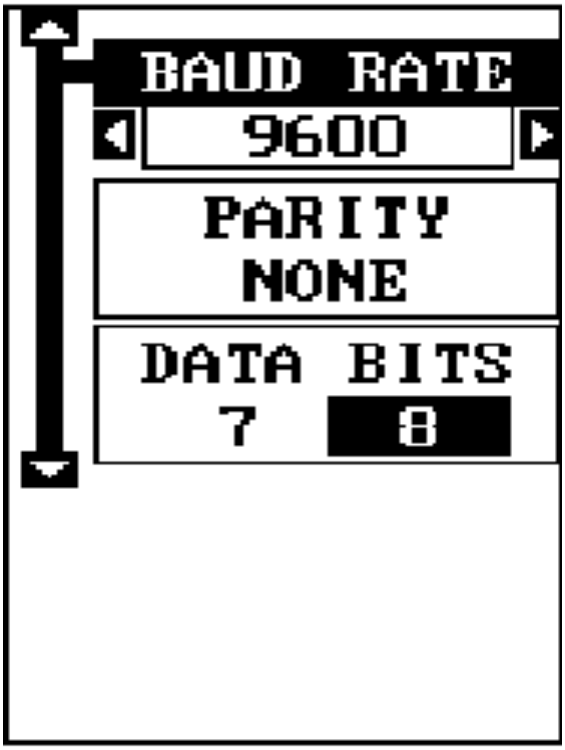
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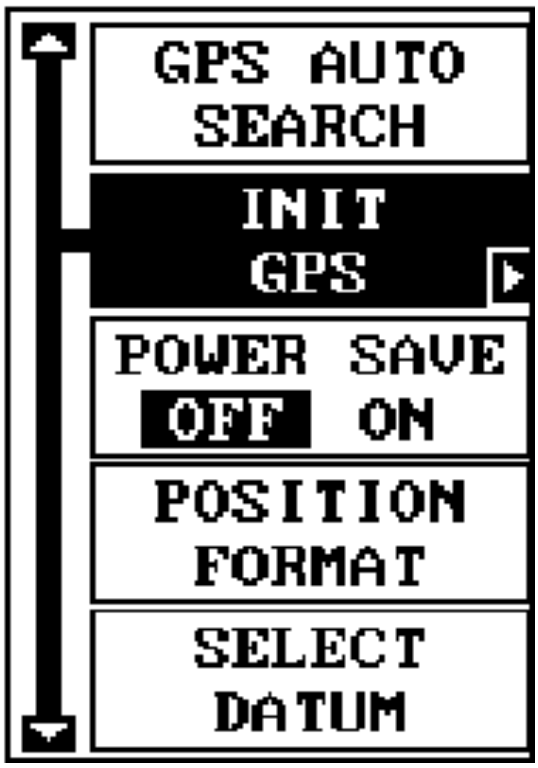
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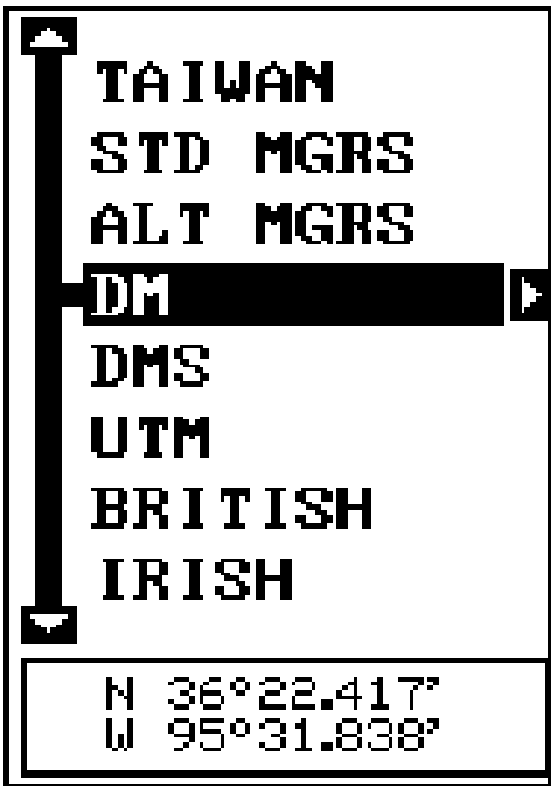
SELECT DATUM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ALT MGRS
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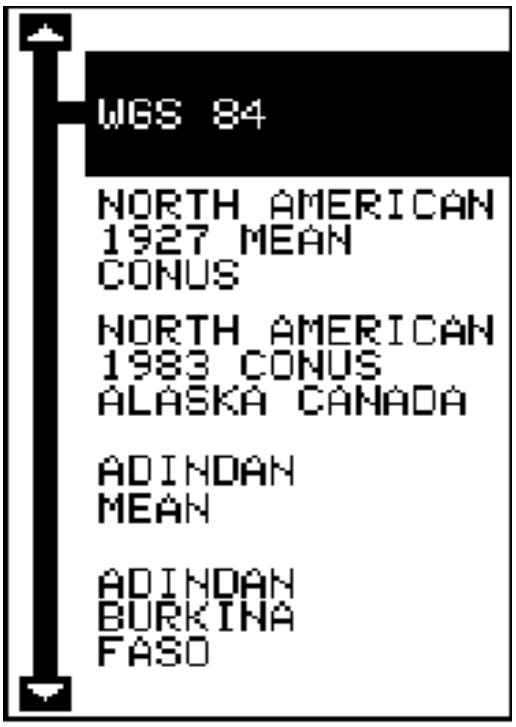
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CONUS
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1983 CONUS
ALASKA CANADA
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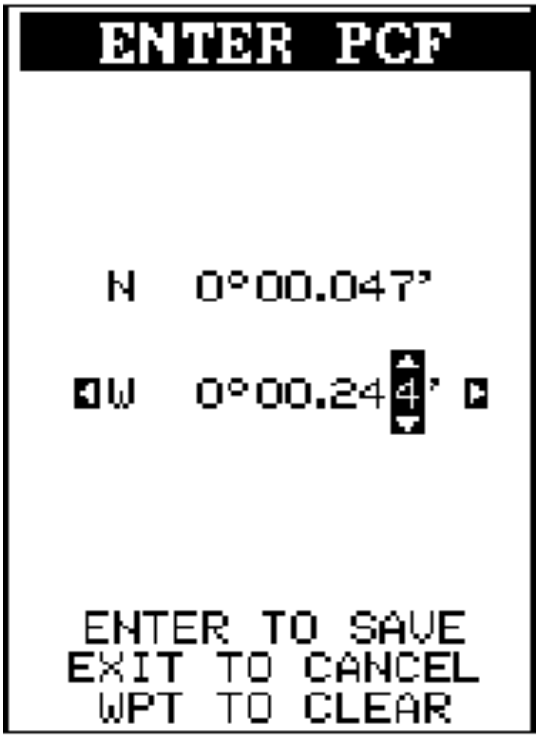
MEAN
ADINDAN
BURKINA
FASO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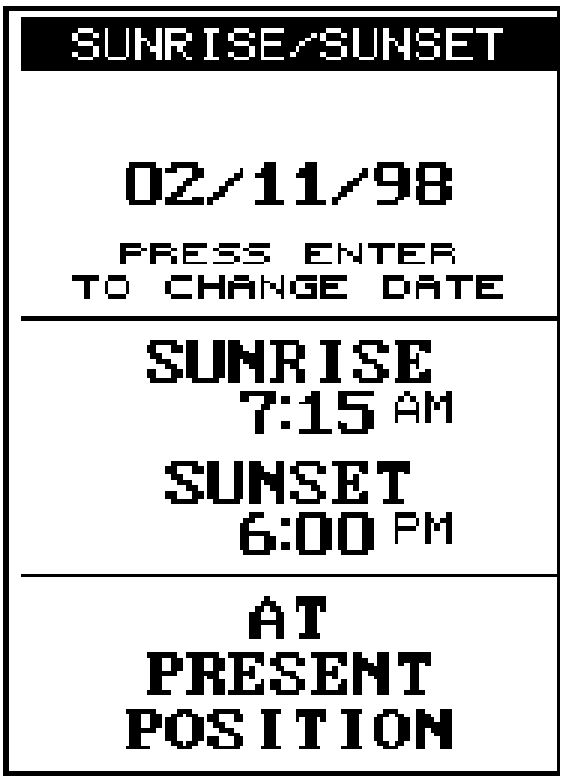
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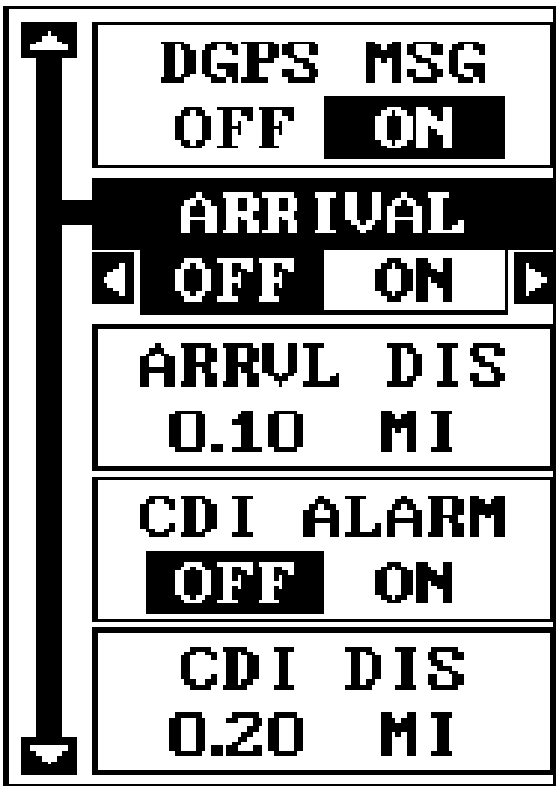
SUNSET
6:00 PM
AT
PRESENT
POSITION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ARRVL DIS
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CDI ALARM
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CDI DIS
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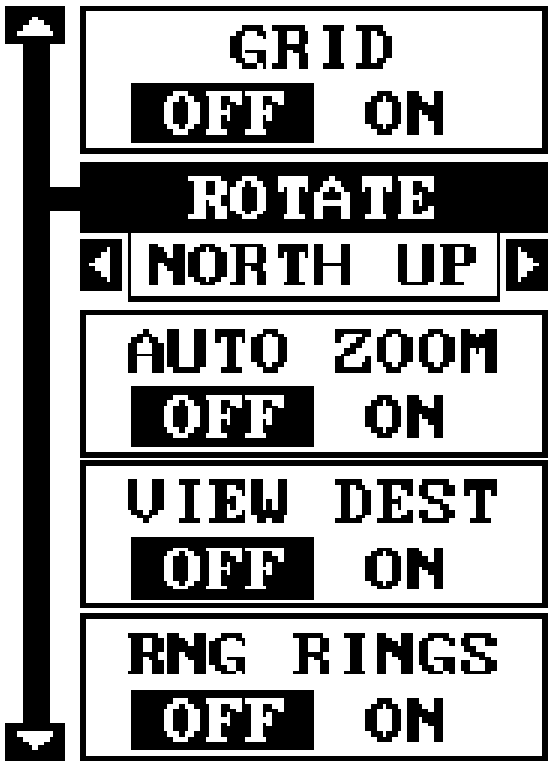
TRAIL
OPTIONS
CHANGE
ALL MAPS
MAP
OPTIONS
EARTH MAP
OPTIONS
WAYPOINT
OPTIONS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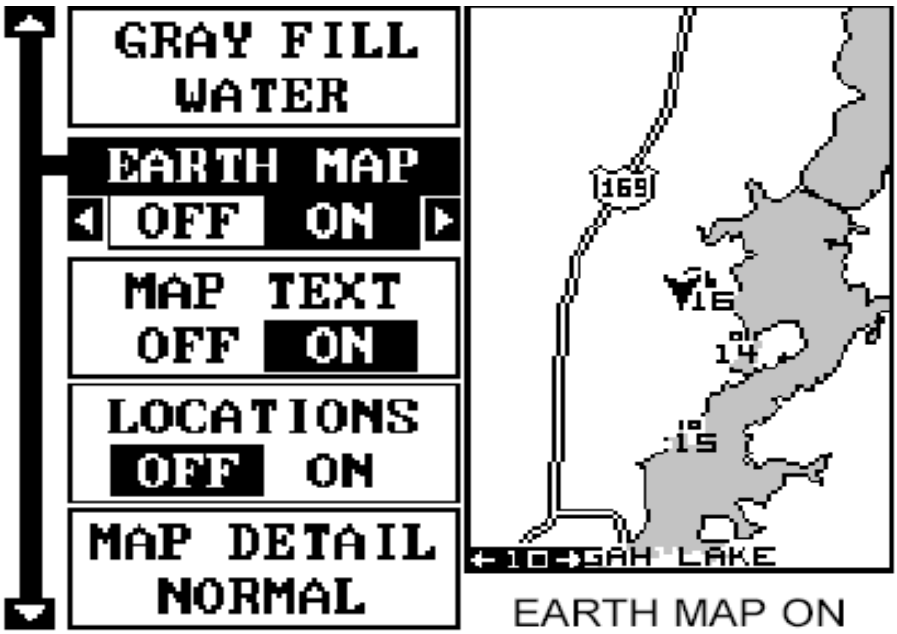
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WATER
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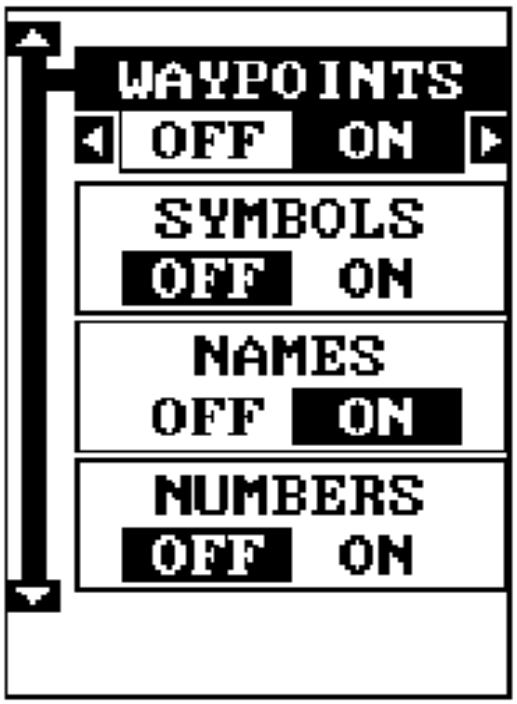
EARTH MAP ON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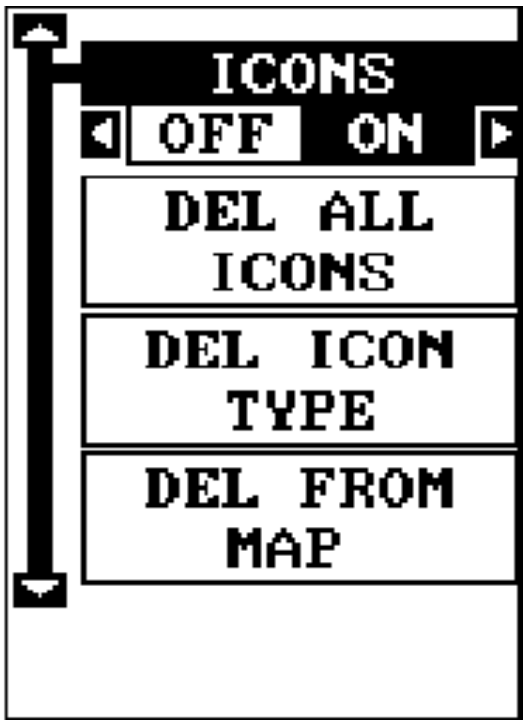
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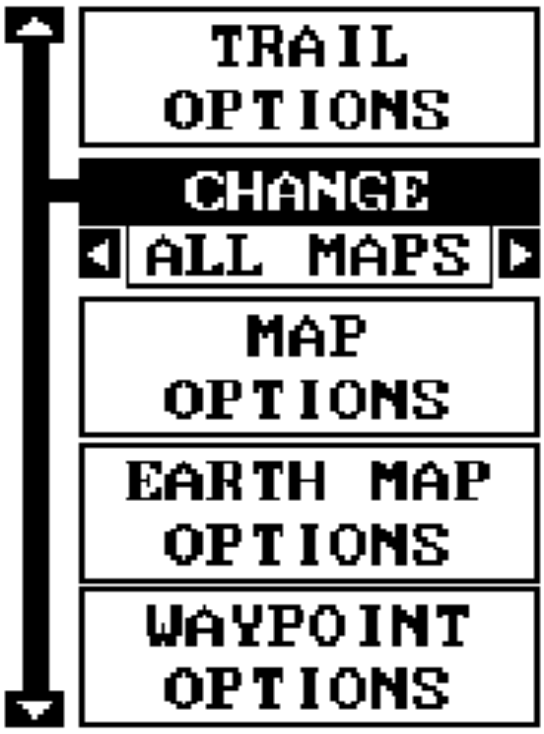
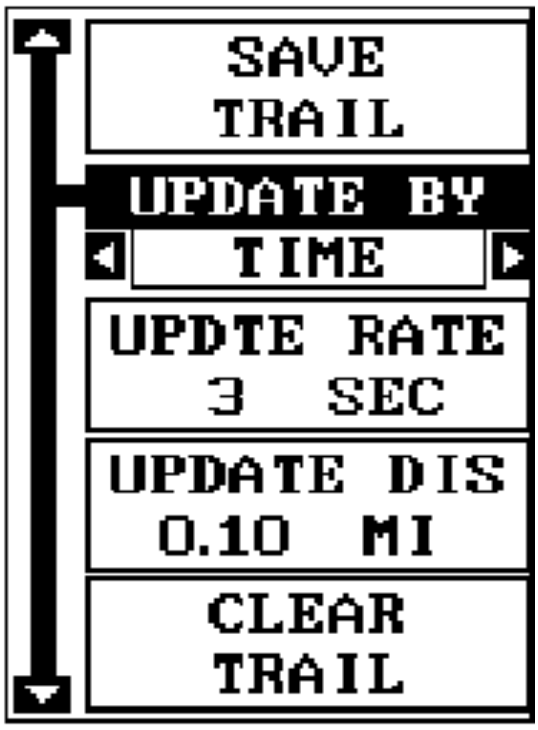
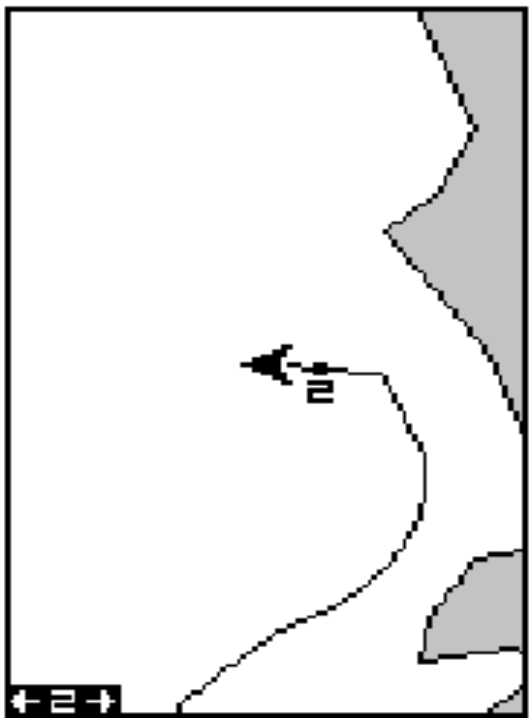
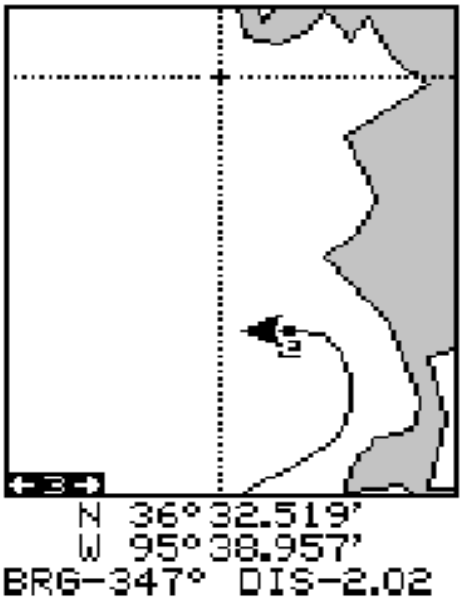
DEL ICON TYPE
DEL FROM MAP


TRAIL
OPTIONS
CHANGE
ALL MAPS
MAP
OPTIONS
EARTH MAP
OPTIONS
WAYPOINT
OPTIONS

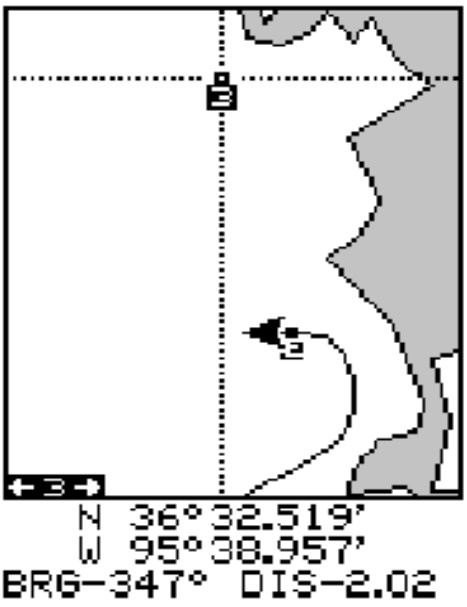

SAVE
TRAIL
UPDATE BY
TIME
UPDTE RATE
3 SEC
UPDATE DIS
0.10 MI
CLEAR
TRAIL


WPT# 1
GO TO WPT
NAME-WPT 001*
WPT LIST
CREATE WPT
EDIT POSITION
EDIT NAME
EDIT SYMBOL
DELETE WPT
MOVE WPT
WPT TO QUICK SAVE
2-FEB-98 3:52 P
N 36° 28.212'
W 95° 39.779'
DIS- 0.99 MI
BRG-211° MAG

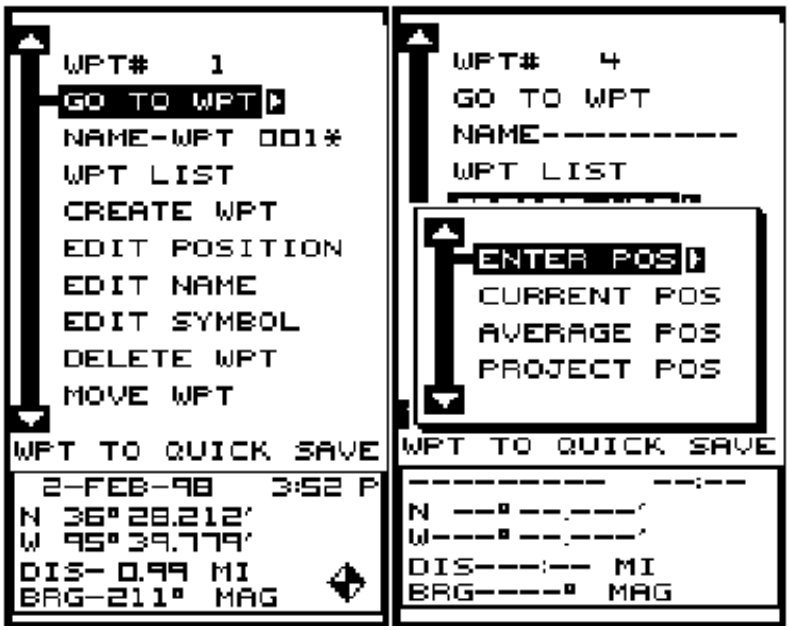

2
2

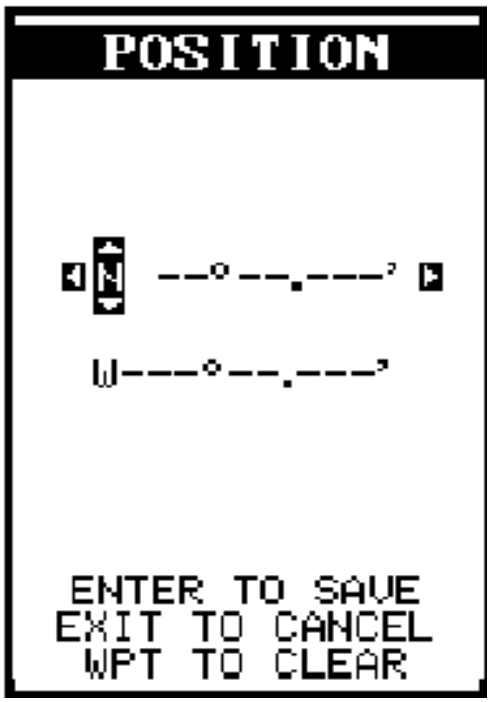


MOVE CURSOR TO DESIRED LOCATION

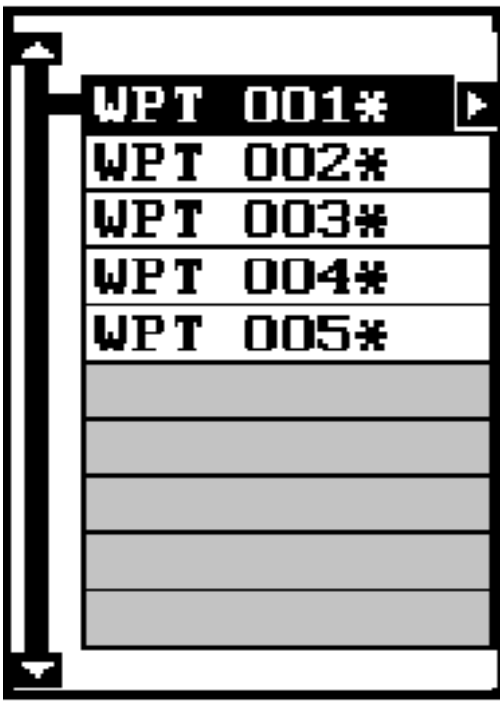


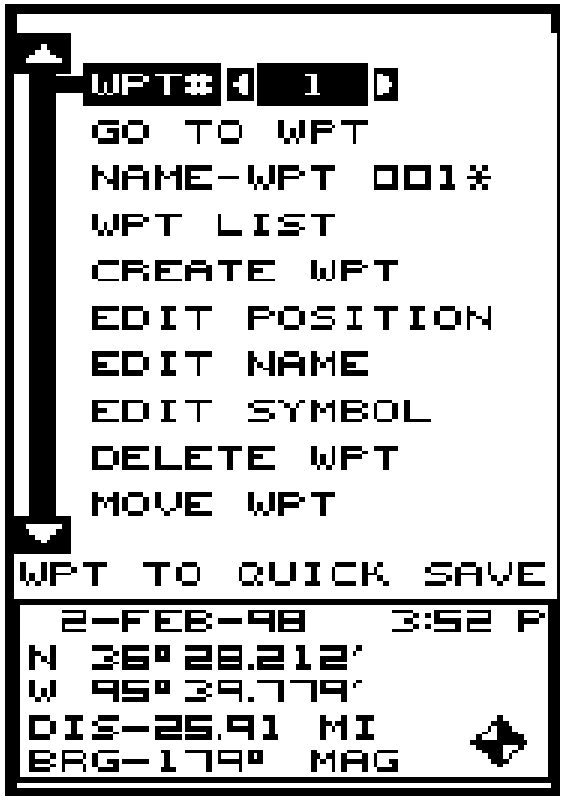
PRESS WPT KEY TWICE


WPT# 1
GO TO WPT
NAME-WPT 001*
WPT LIST
CREATE WPT
EDIT POSITION
EDIT NAME
EDIT SYMBOL
DELETE WPT
MOVE WPT
WPT TO QUICK SAVE
2-FEB-98 3:52 P
N 36° 28.212'
W 95° 39.779'
DIS- 0.99 MI
BRG-211° MAG
WPT# 4
GO TO WPT
NAME---------
WPT LIST
ENTER POS
CURRENT POS
AVERAGE POS
PROJECT POS
WPT TO QUICK SAVE
--------- --:--
N --° --.---'
W---° --.---'
DIS---.-- MI
BRG----° MAG

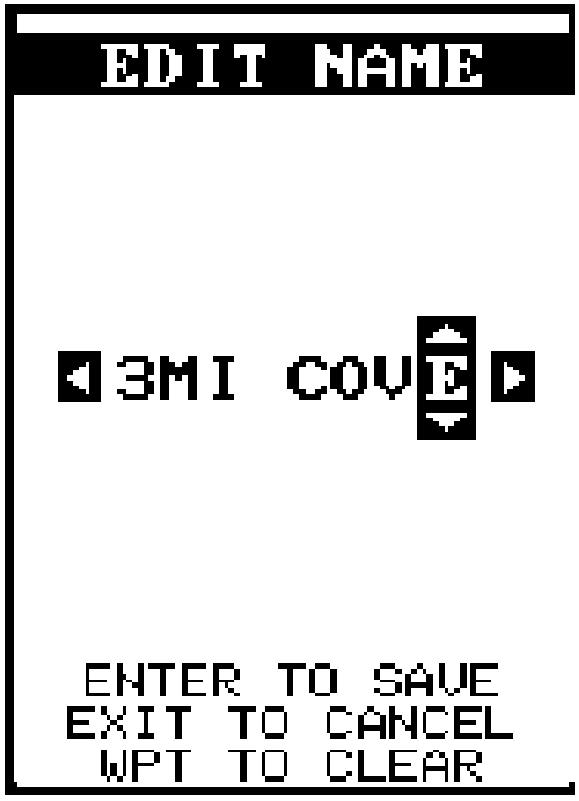

POSITION
N --° --.---'
W---° --.---'
ENTER TO SAVE
EXIT TO CANCEL
WPT TO CLEAR

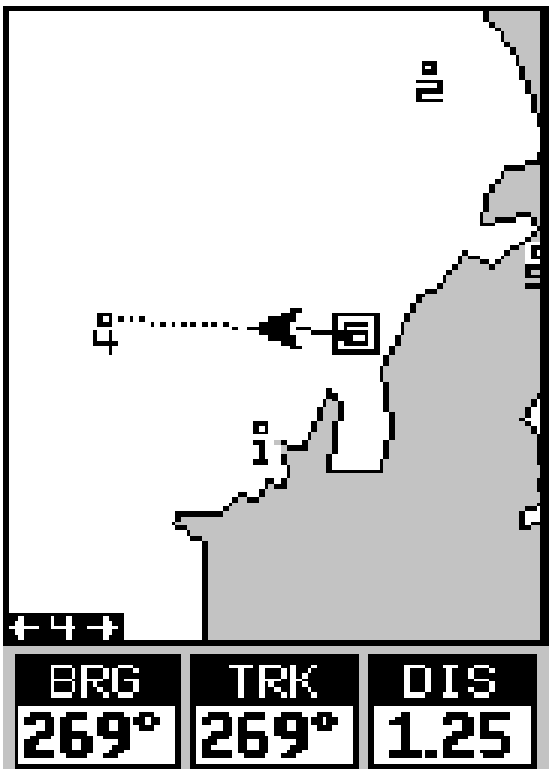

WPT# 1
GO TO WPT
NAME-WPT 001*
WPT LIST
CREATE WPT
EDIT POSITION
EDIT NAME
EDIT SYMBOL
DELETE WPT
MOVE WPT
WPT TO QUICK SAVE
2-FEB-98 3:52 P
N 36° 28.212'
W 95° 39.779'
DIS-25.91 MI
BRG-179° MAG

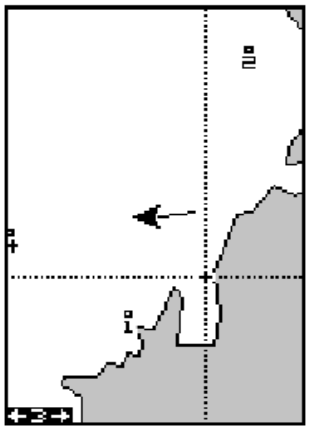

WPT 001*
WPT 002*
WPT 003*
WPT 004*
WPT 005*


WPT# 1
GO TO WPT
NAME-WPT 001%
WPT LIST
CREATE WPT
EDIT POSITION
EDIT NAME
EDIT SYMBOL
DELETE WPT
MOVE WPT
WPT TO QUICK SAVE
2-FEB-98 3:52 P
N 36° 28.212'
W 95° 39.779'
DIS-25.91 MI
BRG-179° MAG

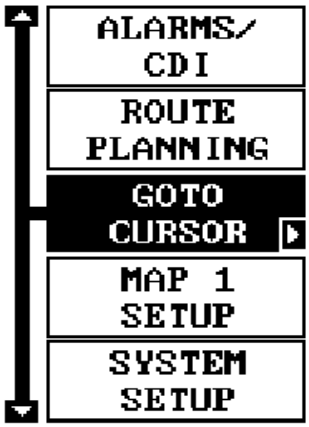

POSITION
N 36°28.212'
W 95°39.779'
ENTER TO SAVE
EXIT TO CANCEL
WPT TO CLEAR


EDIT NAME
3MI COVE
ENTER TO SAVE
EXIT TO CANCEL
WPT TO CLEAR

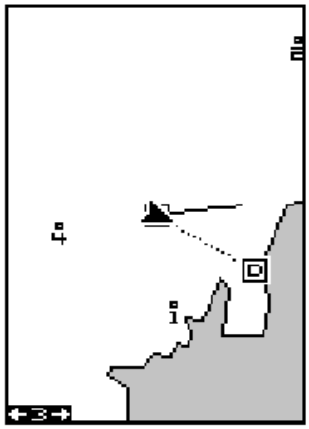

BRG
269°
TRK
269°
DIS
1.25



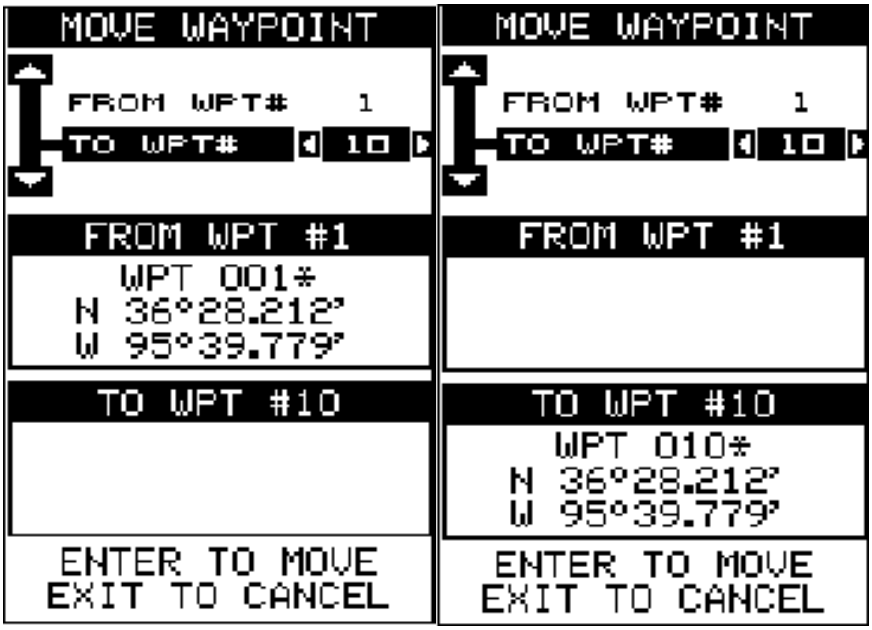
MOVE CURSOR TO DESIRED LOCATION

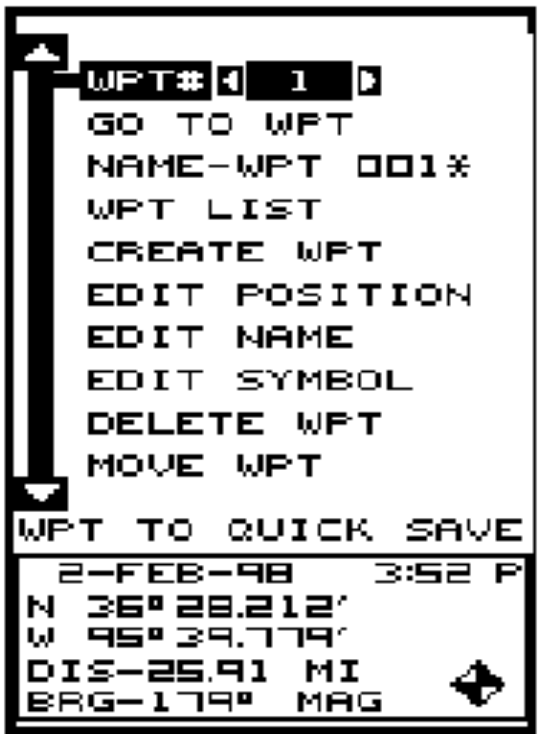


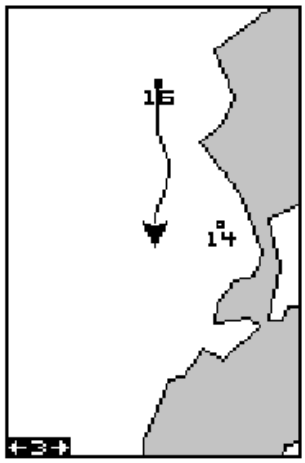
PRESS MENU KEY, THEN PRESS RIGHT ARROW KEY



NAVIGATING TO CURSOR POSITION

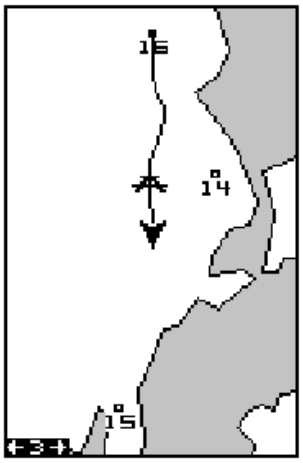

MOVE WAYPOINT
FROM WPT# 1
TO WPT# 10
FROM WPT #1
WPT 001*
N 36°28.212'
W 95°39.779'
TO WPT #10
ENTER TO MOVE
EXIT TO CANCEL
MOVE WAYPOINT
FROM WPT# 1
TO WPT# 10
FROM WPT #1
TO WPT #10
WPT 010*
N 36°28.212'
W 95°39.779'
ENTER TO MOVE
EXIT TO CANCEL


WPT# 1
GO TO WPT
NAME-WPT 001*
WPT LIST
CREATE WPT
EDIT POSITION
EDIT NAME
EDIT SYMBOL
DELETE WPT
MOVE WPT
WPT TO QUICK SAVE
2-FEB-98 3:52 P
N 36° 28.212'
W 95° 39.779'
DIS-25.91 MI
BRG-179° MAG

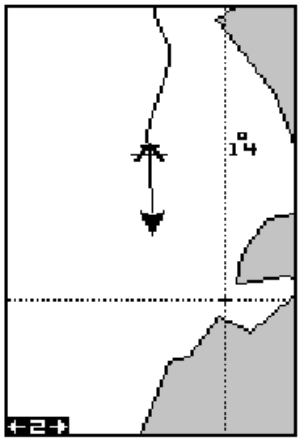


MAP-1 SCREEN
PRESS ENT KEY

SELECT ICON
PRESS ENT KEY

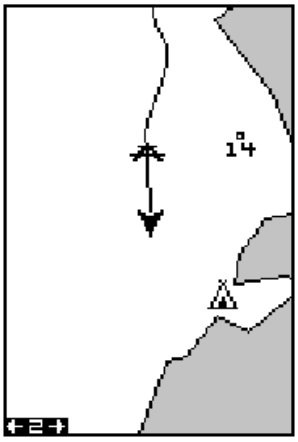


ICON PLACED
AT POSITION.

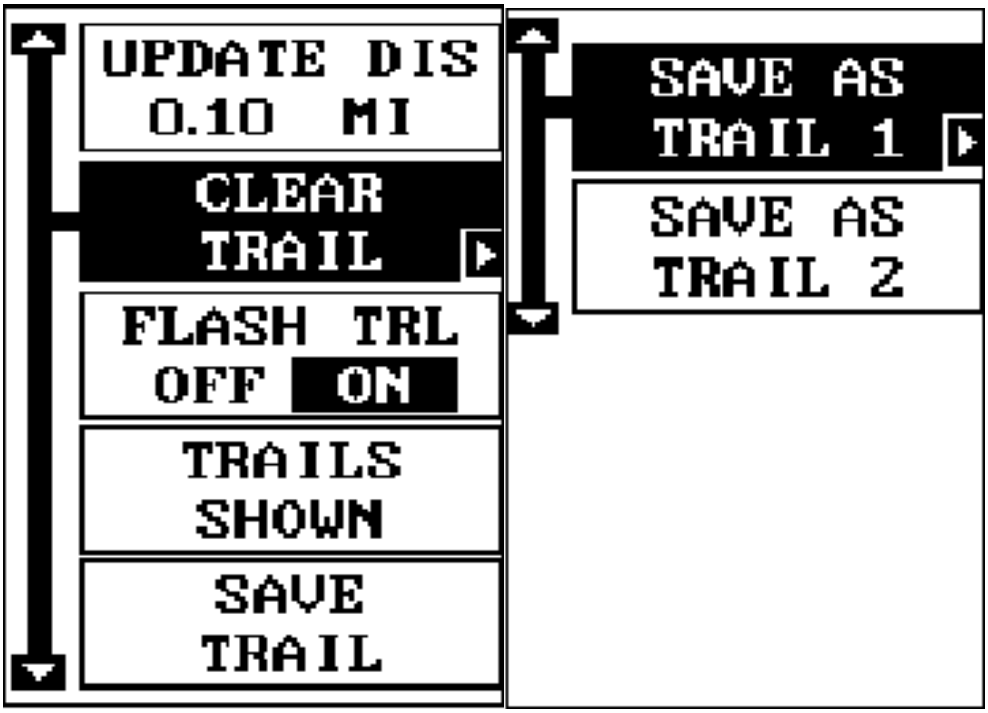


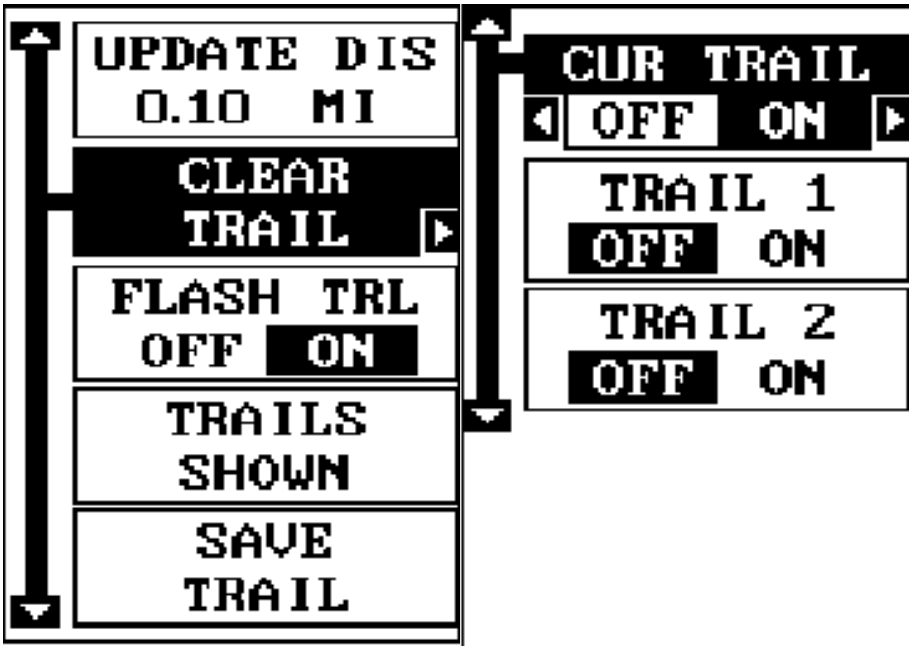
MOVE CURSOR
PRESS ENT KEY

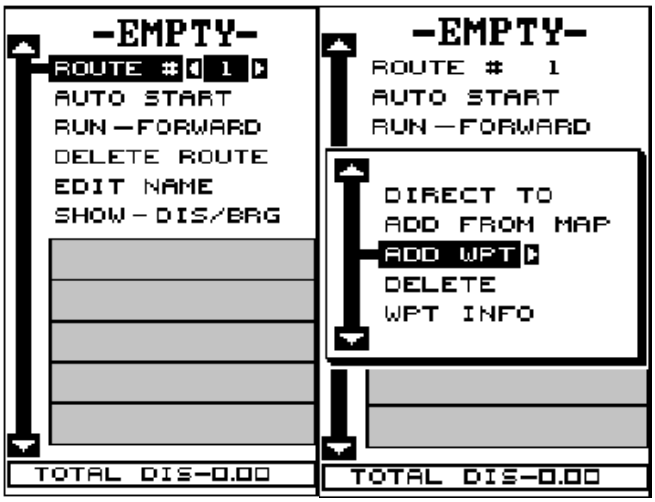
SELECT ICON
PRESS ENT KEY

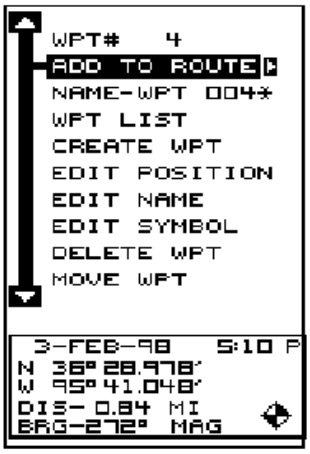


ICON PLACED AT
CURSOR POS.


UPDATE DIS
0.10 MI
CLEAR
TRAIL
FLASH TRL
OFF ON
TRAILS
SHOWN
SAVE
TRAIL
SAVE AS
TRAIL 1
SAVE AS
TRAIL 2


UPDATE DIS
0.10 MI
CLEAR
TRAIL
FLASH TRL
OFF ON
TRAILS
SHOWN
SAVE
TRAIL
CUR TRAIL
OFF ON
TRAIL 1
OFF ON
TRAIL 2
OFF ON

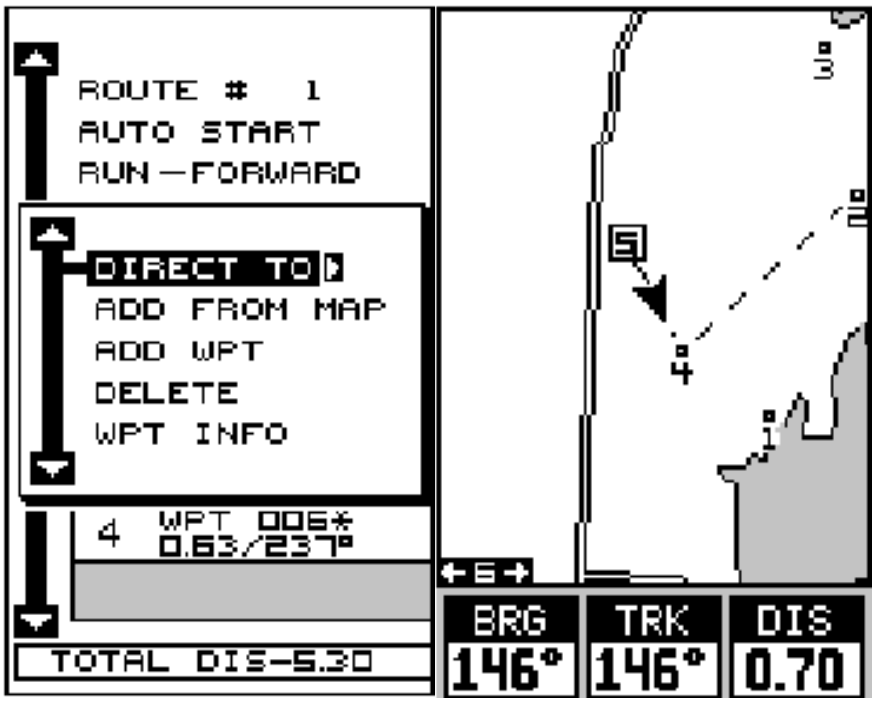


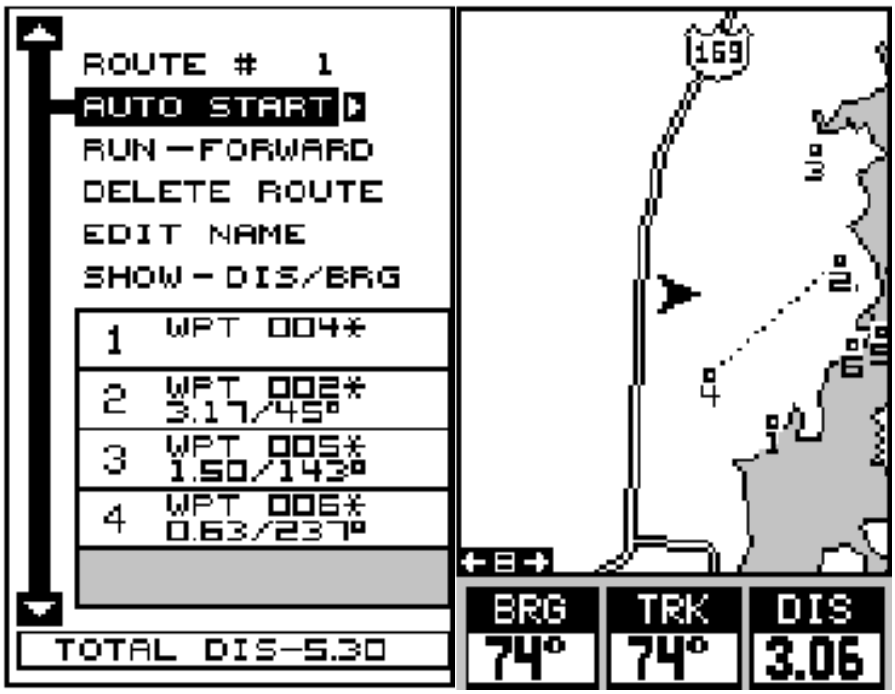


SELECT FIRST WAYPOINT AND ADD TO ROUTE

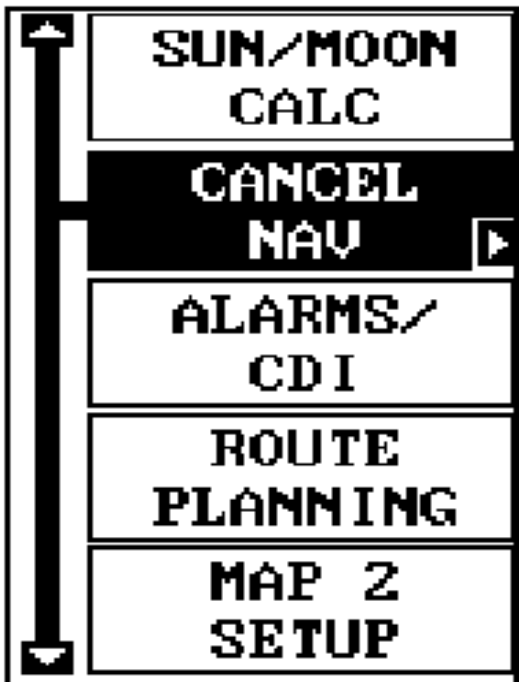
UNIT RETURNS TO ROUTE PAGE

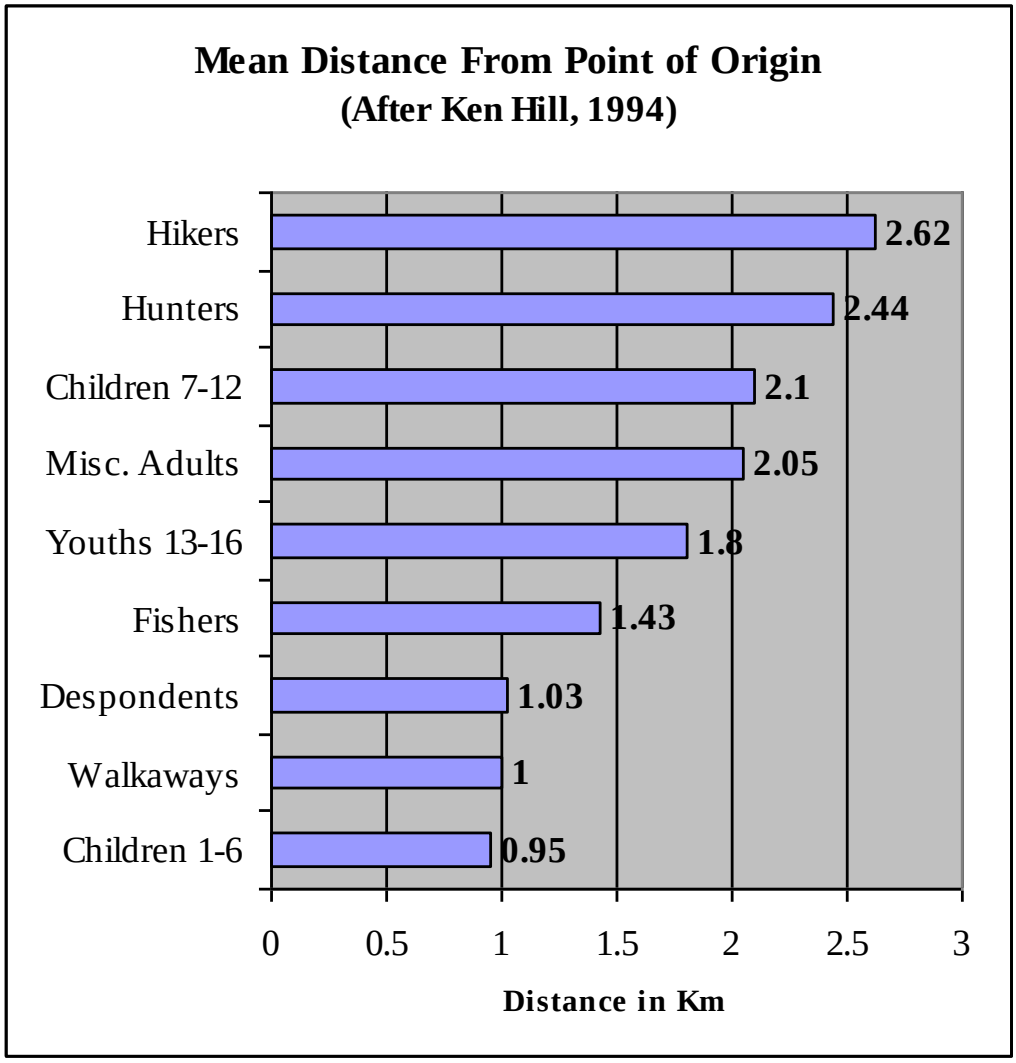
REPEAT UNTIL ALL WAYPOINTS ARE IN ROUTE


ROUTE # 1
AUTO START
RUN—FORWARD
DIRECT TO
ADD FROM MAP
ADD WPT
DELETE
WPT INFO
4 WPT 006*
0.63/237°
TOTAL DIS-5.30
3
2
5
4
1
BRG
146°
TRK
146°
DIS
0.70


ROUTE # 1
AUTO START
RUN-FORWARD
DELETE ROUTE
EDIT NAME
SHOW-DIS/BRG
1 WPT 004*
2 WPT 002* 3.17/45°
3 WPT 005* 1.50/143°
4 WPT 006* 0.63/237°
TOTAL DIS-5.30
169
BRG
74°
TRK
74°
DIS
3.06

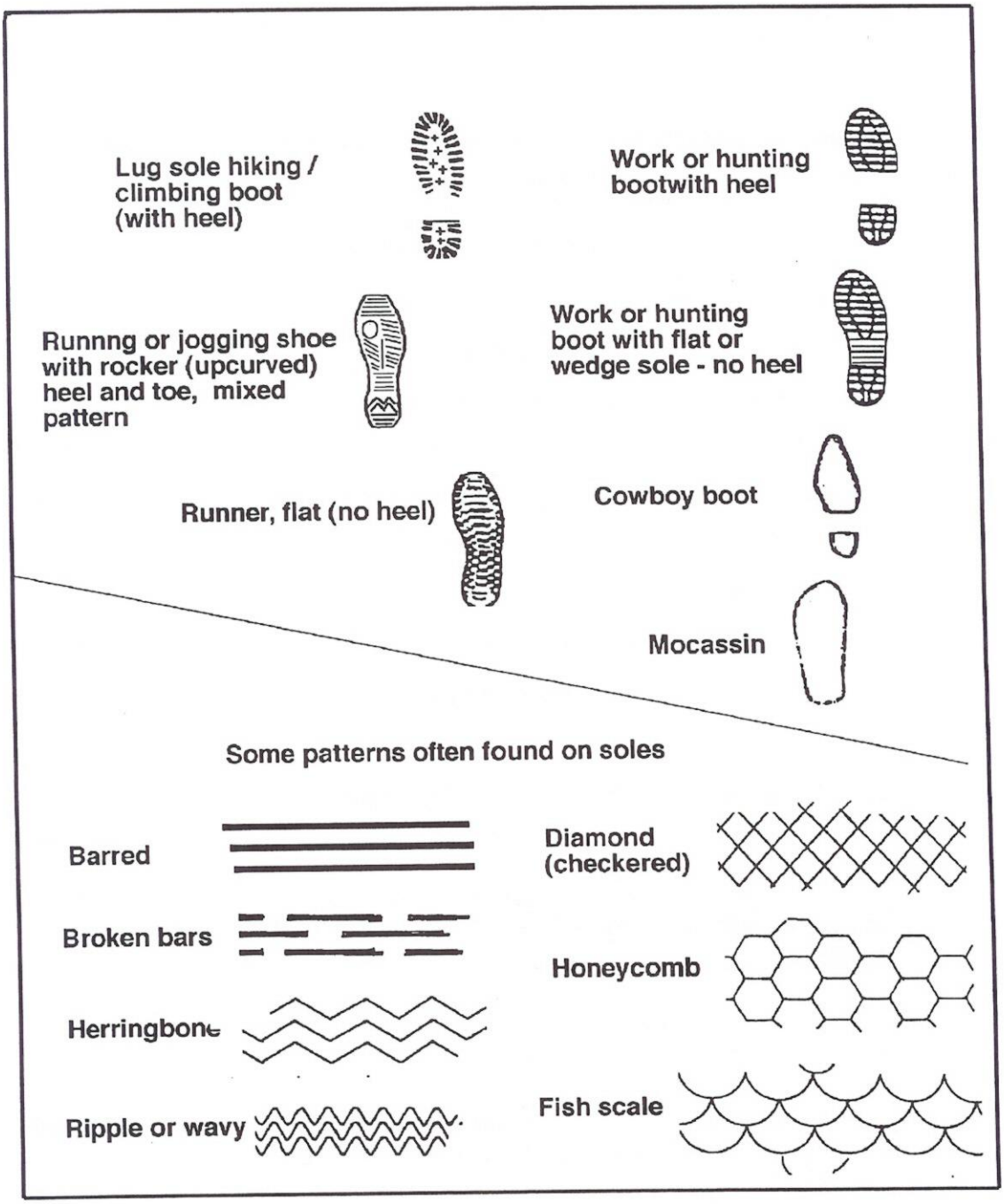

ROUTE # 1
AUTO START
RUN—FORWARD
DELETE ROUTE
EDIT NAME
SHOW—DIS/BRG
1 WPT 004*
2 WPT 002*
3.17/45°
3 WPT 005*
1.50/143°
4 WPT 006*
0.63/237°
TOTAL DIS=5.30


SUN/MOON
CALC
CANCEL
NAV
ALARMS/
CDI
ROUTE
PLANNING
MAP 2
SETUP

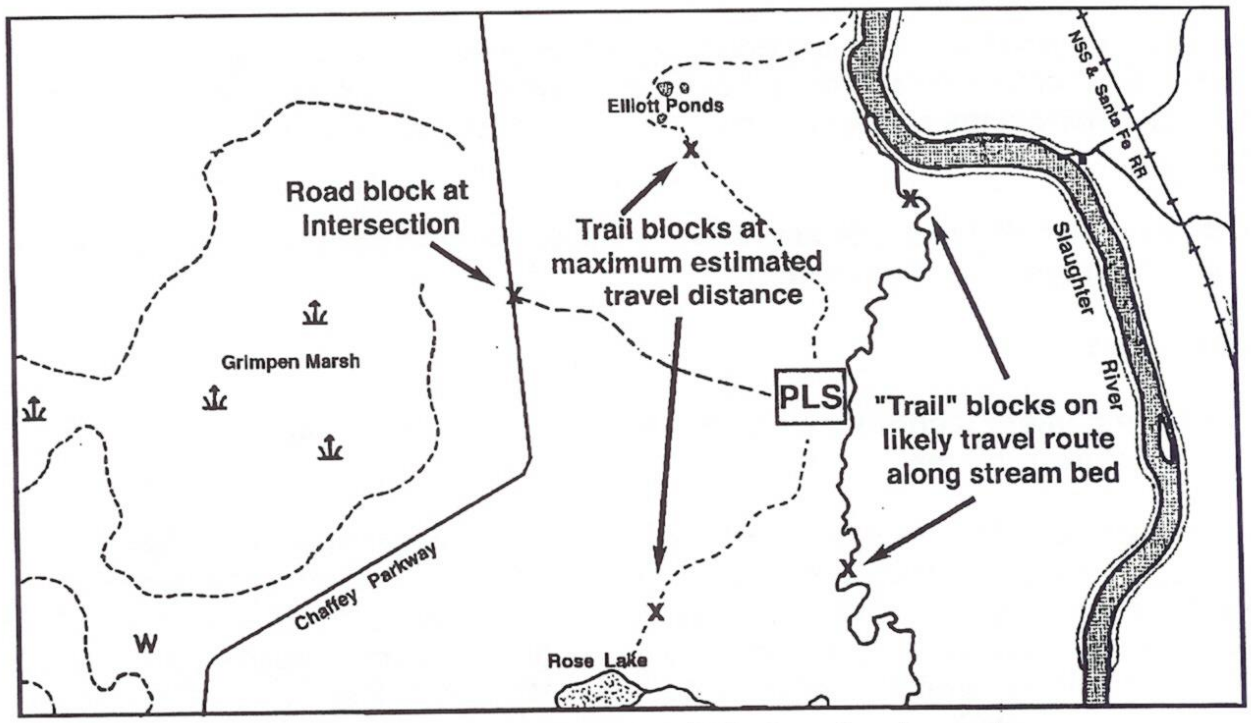

Mean Distance From Point of Origin
(After Ken Hill, 1994)
Hikers
Hunters
Children 7-12
Misc. Adults
Youths 13-16
Fishers
Despondents
Walkaways
Children 1-6
2.62
2.44
2.1
2.05
1.8
1.43
1.03
1
0.95
0
0.5
1
1.5
2
2.5
3
Distance in Km

Travel Tendencies of Lost Persons in Mountainous Terrain (After W. Syrotuck, 1976)

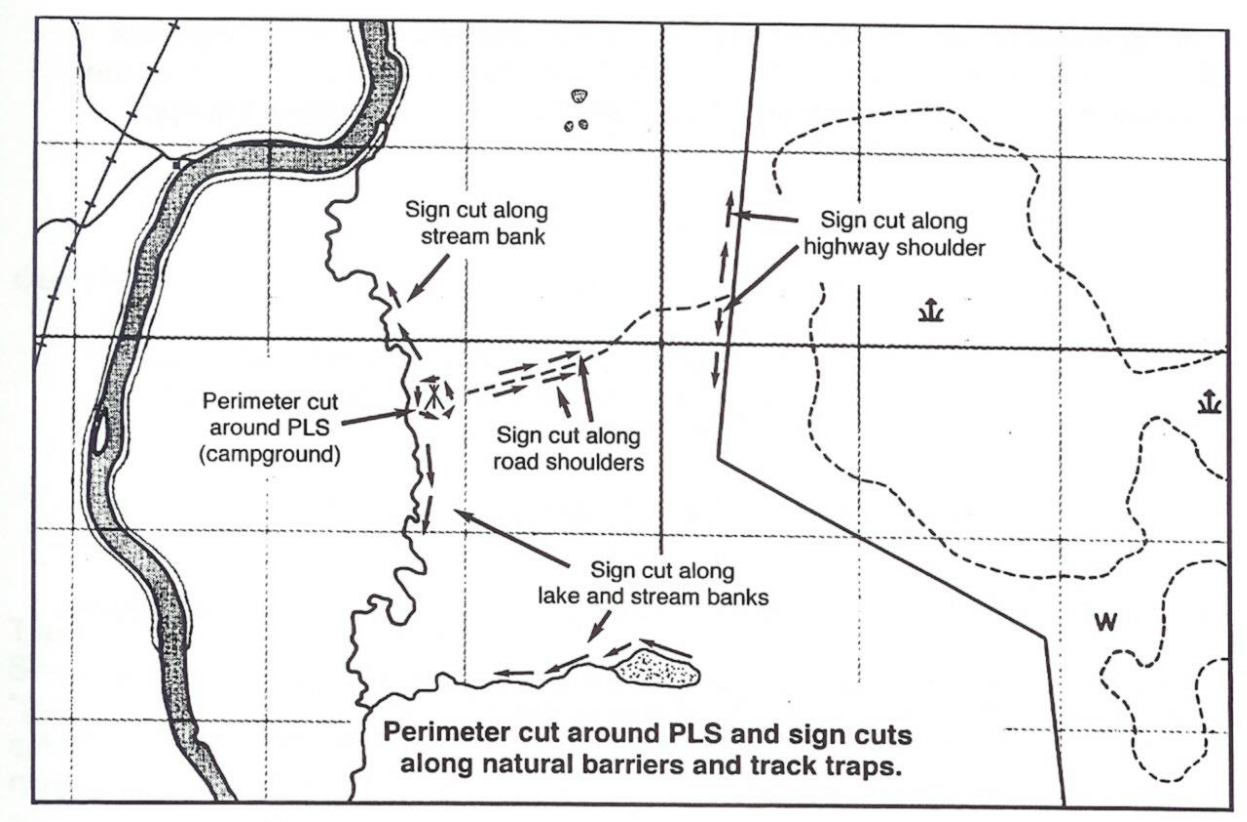
Children 1-6	Hunters	Elderly
33% uphill	6% uphill	10% uphill
11% same level	11% same level	20% same Level
56% downhill	86% downhill	70% downhill
Children 6-12	**Hikers**	**Misc. Persons**
33% uphill	7% uphill	17% uphill
8% same level	4% same level	17% same Level
59% downhill	89% downhill	66% downhill

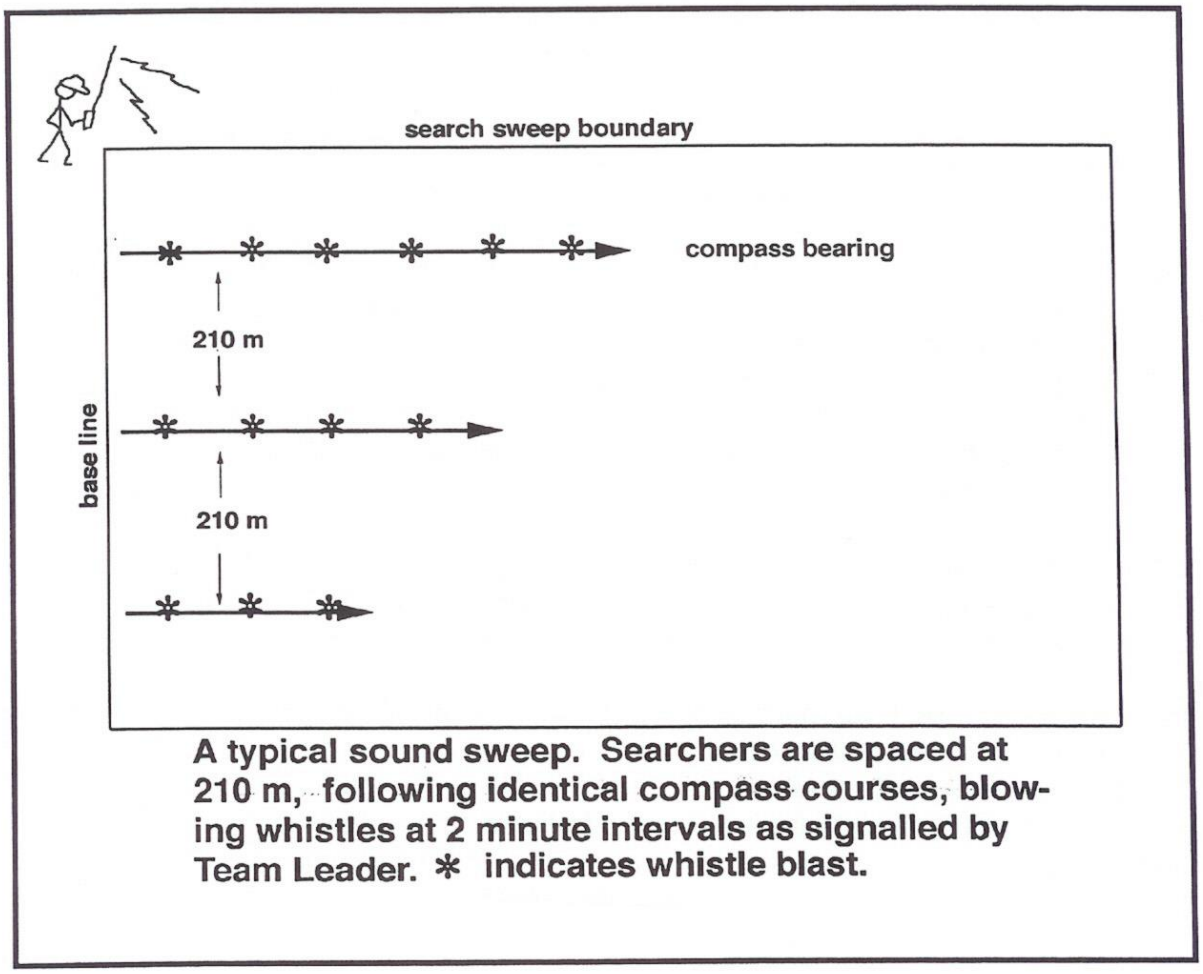


Some Common Sole Types

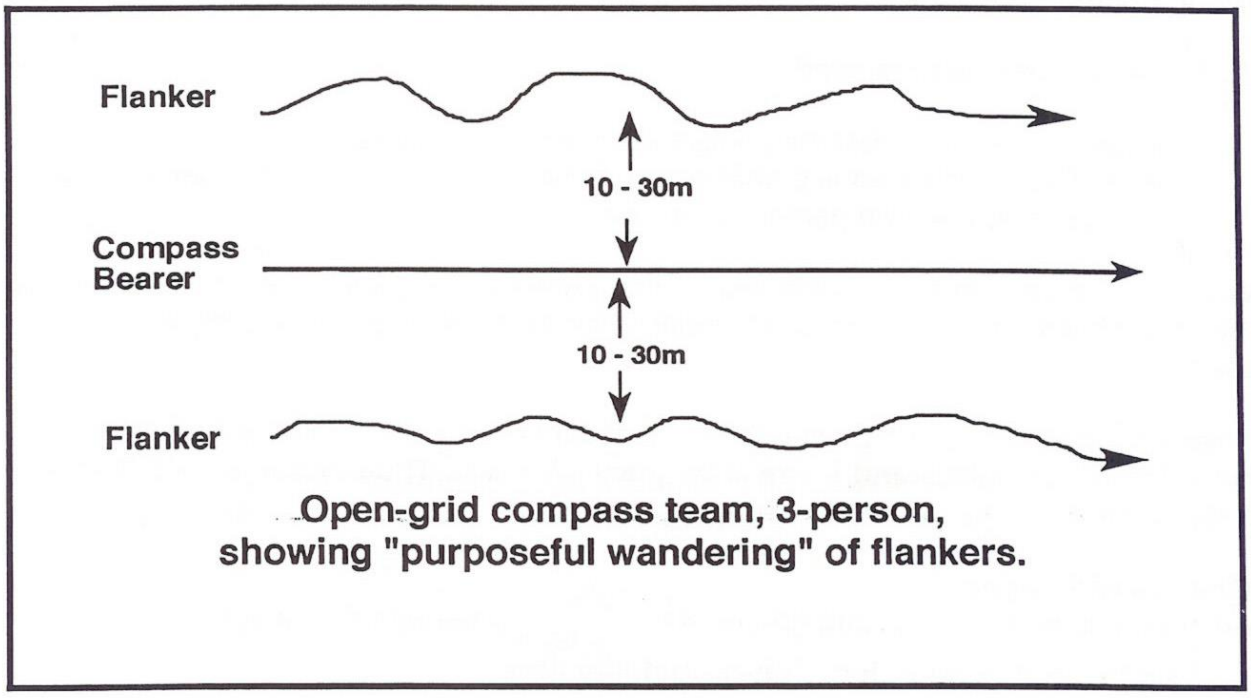


Confinement with road and trail blocks set up beyond subject's maximum estimated travel distance.

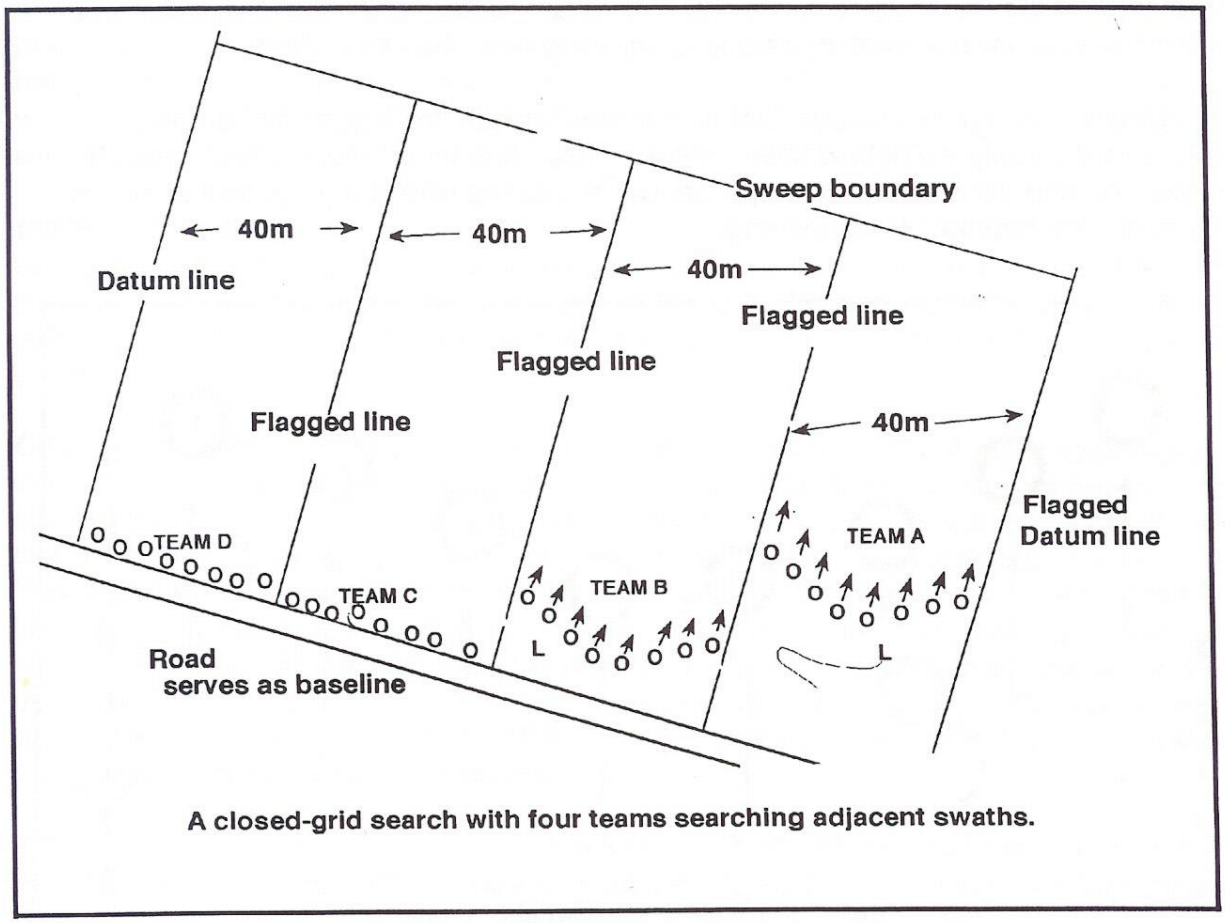

Sign cut along
stream bank
Sign cut along
highway shoulder
Perimeter cut
around PLS
(campground)
Sign cut along
road shoulders
Sign cut along
lake and stream banks
W
Perimeter cut around PLS and sign cuts
along natural barriers and track traps.



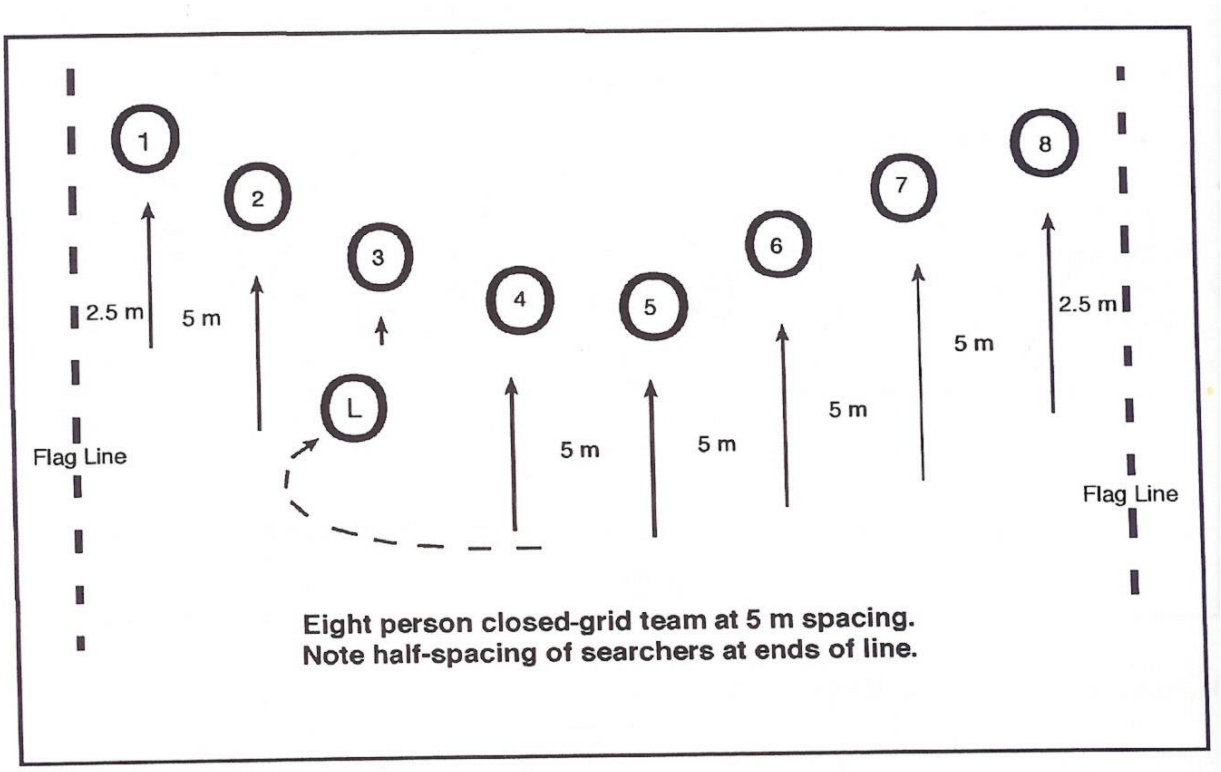
A typical sound sweep. Searchers are spaced at 210 m, following identical compass courses, blowing whistles at 2 minute intervals as signalled by Team Leader. * indicates whistle blast.



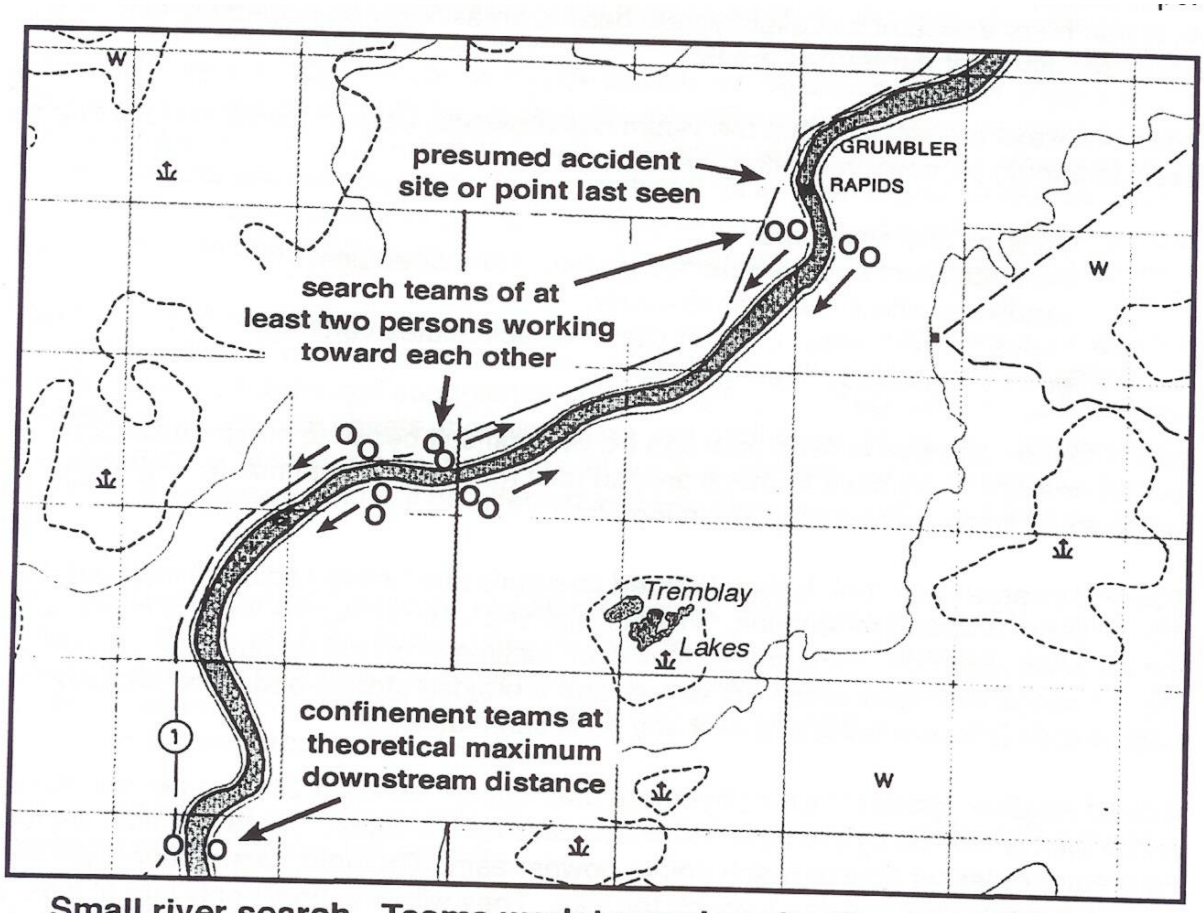
Open-grid compass team, 3-person,
showing "purposeful wandering" of flankers.



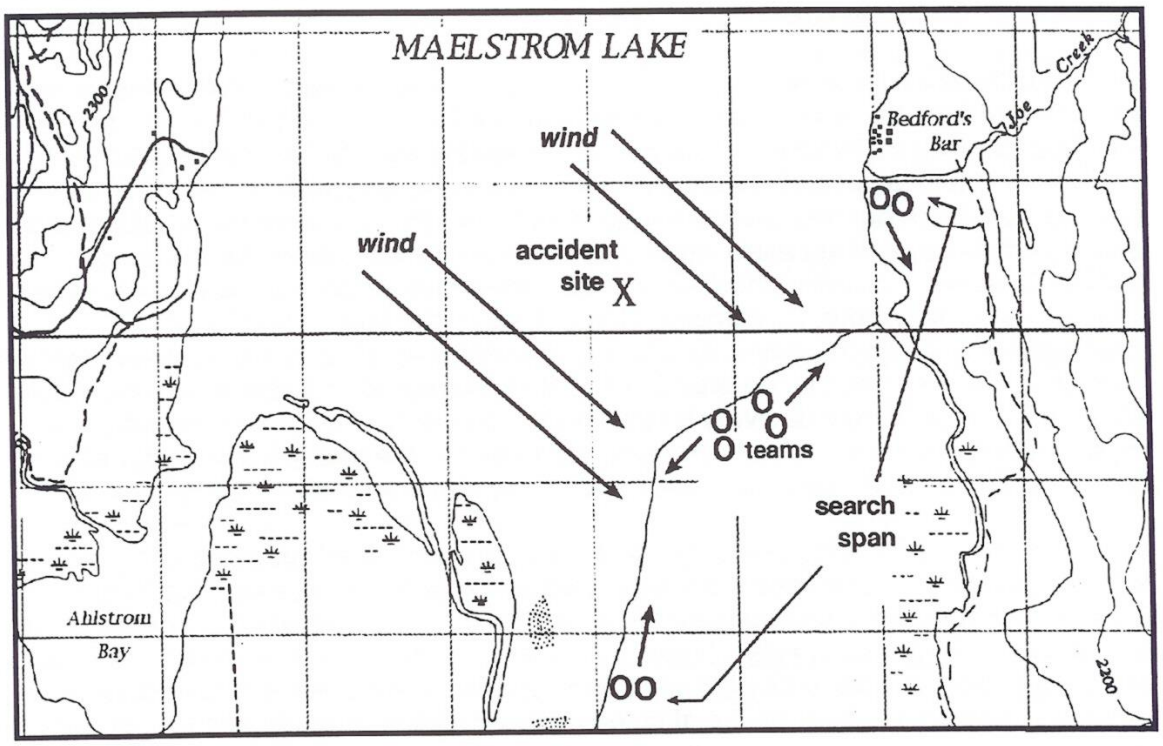
A closed-grid search with four teams searching adjacent swaths.



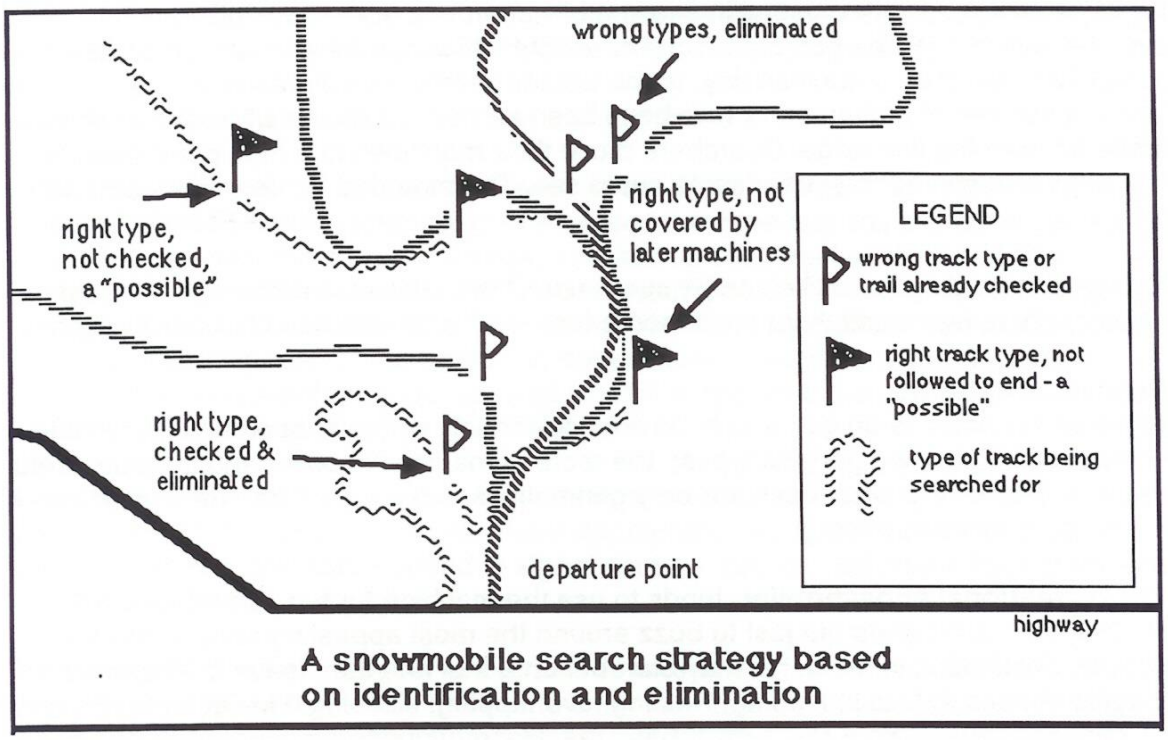
Eight person closed-grid team at 5 m spacing.
Note half-spacing of searchers at ends of line.



Small river search. Teams work toward each other to speed effort.



Shoreline search



A snowmobile search strategy based on identification and elimination


DEER LAKE SEARCH & RESCUE