NATIONAL SKI PATROL SYSTEM, INC.

AVALANCHE INSTRUCTOR'S MANUAL

SECTION 5

LEVEL 1 AVALANCHE COURSE MODULES
(2023 REVISION)

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SECTION 5
LEVEL 1 AVALANCHE COURSE MODULES
Introduction

Minimum requirement for Level 1 certification includes the completion of Level 1, Module 1 and Module 2. It is the minimum level of avalanche education recommended by the American Avalanche Association (A3) for current and aspiring recreational backcountry travelers. Level 1, Module 3 is optional and recommended for all members of professional rescue organizations (ski patrol, SAR organizations).

Module Descriptions

Level 1 Avalanche Module 1: Avalanche Foundations

This module presents the academic component of a Level 1 Avalanche course including all classroom curriculum of the Companion Rescue course (Section 4). By itself, it constitutes an introductory-level course that qualifies as an NSP senior elective for members in divisions where encountering actual avalanche hazard is negligible and meaningful field education is generally unavailable. For divisions having significant avalanche hazard, it constitutes a prerequisite for the field training and experience provided in Module 2.

This module provides basic knowledge of:

- Avalanche nomenclature and classification
- Weather factors that contribute to avalanche problems
- Terrain factors that contribute to avalanche problems
- Snowpack development leading to avalanche problems
- Types and sources of information about avalanche problems
- Basic documentation of hazard data, including field notes
- Human factors that affect decision making
- Hazard evaluation and decision-making procedures and tools
- Personal safety principles and practices
- Principles of companion rescue

Level 1 Avalanche Module 2: Fundamental Field Skills

This module provides practical training and experience in avalanche hazard evaluation, safe travel and small-group avalanche rescue. Essential skill development requires this module to be taught in representative terrain (see Section 1 for terrain description). It applies the knowledge gained from Module 1 to develop fundamental proficiency in:

- Gathering and documenting weather, terrain and snowpack data
- Using hazard evaluation resources and decision-making tools
- Terrain evaluation and route selection
- Safe travel protocols and communication
- Small-group rescue processes and skills

The combined Modules 1 and 2 meet American Avalanche Association content guidelines for Level 1 (avalanche fundamentals) courses for recreationists.

Level 1 Avalanche Module 3: Organized Rescue Fundamentals

This one-day module has both classroom and field components that help prepare patrollers and other search-and-rescue personnel to competently participate in organized avalanche rescue operations.

- Classroom components
  - Organized rescue principles
  - Personnel safety
  - Rescue in different settings
  - Common mistakes
  - Rescue plans
  - Emergency care
- Field components
  - Rescue hazard evaluation, decision-making and route selection
  - Transceiver search (multiple & deep burials)
  - RECCO and dog search (if available)
  - Formal probe line search
  - Shoveling, extrication and emergency care
  - Organized rescue simulations

Level 1 Avalanche Module 4: Level 1 (Modules 1 and 2) Refresher

This is a short course designed to periodically maintain and update Level 1 Avalanche knowledge and skills over time. It has both classroom and field components that can be covered in a flexible scheduling format. It is recommended this refresher be taken once every three years.

Level 1 Avalanche Module 5: Organized Avalanche Rescue Refresher

This is a customizable short course to maintain and update organized avalanche rescue knowledge and skills.

Administrative Requirements

Each module is administered separately, with separate registration and closure requirements. However, ***IORs need not register a Companion Rescue course but must teach the curriculum of this course as part of Modules 1 & 2***. Modules 1-3 may be scheduled concurrently to allow classroom and field content to be intermixed as in a traditional Level 1 Avalanche course.

A single Certificate of Achievement may be prepared for concurrent courses, for example: *Companion Rescue*, *Level 1 Avalanche Modules 1, & 2:*

Instructor Requirements

The IOR and Instructors for Level 1 Avalanche must be NSP Avalanche Instructors. The IOR must be a Professional Member of the American Avalanche Association, and assisting Instructors must be at least Affiliate Members.

LEVEL 1 AVALANCHE MODULE 1
AVALANCHE FOUNDATIONS
Course Standards

Intended Outcomes

Students completing this course should be able to:

- Describe avalanche types and anatomy
- Describe basic slab mechanics
- Describe mountain snowpack development and factors leading to instability or stability
- Describe essential snow observations, methods for gathering and recording snowpack information: interpret basic test profiles
- Comprehend and apply avalanche center bulletin information to a planned location or route
- Understand basic decision-making principles and vulnerabilities; develop familiarity with various hazard evaluation and decision tools
- Describe safe travel procedures and techniques in avalanche terrain
- Perform effective companion/small-group avalanche search and rescue procedures, techniques and skills, including leadership
- Describe principles and practices for recognition, avoidance and rescue associated with Snow Immersion Suffocation (SIS) hazards

Prerequisites and Pre-Course Study

There are no enrollment prerequisites for this module.

Pre-course reading of an assigned text and completing an IOR-supplied study guide is highly recommended. Pre-course study should be broken into separate, short assignments to allow students to pace themselves.

If pre-course study is assigned, classroom instruction should be question-based rather than lecture-based to generate discussion. If no pre-course study is assigned, instruction time should be extended to accommodate this lack of preparation.

Time Commitment and Scheduling

The time it will take to complete this course varies due to many factors. Courses are competency based not time based. For planning purposes, the table below lists suggested times for instruction. It is ultimately up to the IOR to schedule lesson times that allow students to reasonably attain learning objectives yet not waste time. See Section 1 of this manual for more detailed guidelines on scheduling.

Suggested Time Distribution

Topic	Topic Title	Suggested Duration
0	Orientation	10 Minutes
1	Avalanche Classification and Nomenclature	20 minutes
2	The Avalanche Triangle	
	2A Weather	30 minutes
	2B Snowpack	40 minutes
	2C Terrain	30 minutes
3	Instability and Avalanche Release	25 minutes
4	Human Factors	45 minutes
5	Personal Safety	
	5A Principles of Safe Travel	30 minutes
	5B Travel Planning	55 minutes
	5C Decision Making in the Field	45 minutes
6	Companion Rescue - Classroom	30 minutes
	Total classroom instruction	**6 hours**
	Closing discussion, final exam & student survey	1 hour
	Other non-instructional time	1 hours
	Minimum time commitment	**8 hours**

The module may be scheduled in a variety of formats that meet student and instructor time availability, as long as continuity between lessons is maintained.

Resources

- Section 1 for course management
- Section 4 for Companion Rescue curriculum
- Section 7 for recommended instructional references and other resources

Lesson Guides

Course Check-in/Orientation

Overview

This completes initial administrative matters.

Purpose

- Complete course enrollment/check-in process
- Introduce participants and instructional staff to each other
- Describe how the course will be conducted (classroom, field, etc.)
- Clarify participation/certification standards
- Explain course safety standards and procedures
- Give participants an opportunity to convey personal needs/concerns

Materials/Resources

- Course syllabus, assigned text, study guides, handout packets, etc.
- Name tags
- Division Instructor Activity Report (as appropriate)
- Liability release
- Receipts if collecting on-site enrollment fees

Content

A. Check-in
   1. Students
      a. Ensure all students are properly enrolled
      b. Liability Release (required)
      c. Enrollment fees
      d. Name tags
      e. Turn in pre-course study guide if assigned
   2. Instructors
      a. Information on division Instructor Activity Report (if applicable)
      b. Assist with student check-in, room setup
      c. Check student pre-course study guides (if applicable)

B. Student Orientation
   1. Instructor/student introductions
   2. Purpose of the course; student and instructor expectations
   3. Course schedule, breaks, restrooms, refreshments, meals, gear storage, etc.
   4. Texts, reading assignments, note taking, quizzes/tests, homework
   5. Field session preparation
      a. Personal clothing and equipment needs
      b. Physical condition and ability to navigate in avalanche terrain
   6. Performance and certification standards

Topic 1: Avalanche Classification and Nomenclature

Overview

This discussion should acquaint students with basic vocabulary used to describe and classify avalanches.

Concluding Objectives – students should be able to

- Identify basic types of avalanches
- Define and use basic avalanche-related terms correctly

Key Terms

- Avalanche
- Avalanche action
- Avalanche probability
- Avalanche Hazard
- Avalanche problem
- Bed surface
- Cornice
- Crown
- Crown line
- Crown face
- Deposition zone (Runout)
- Dry snow avalanche
- Flank
- Ice avalanche
- Loose snow avalanche
- Path
- Roof avalanche
- Slab
- Slab avalanche
- Slush avalanche
- Starting zone
- Stauchwall
- Toe
- Track
- Trigger
- Wet Avalanche

Sample Set

Read a sample avalanche incident report that contains a lot of technical jargon about the avalanche characteristics. Ask students to indicate terms that are unclear.

Content

A. Basic avalanche types (names and descriptions)
   1. Loose snow (dry/wet)
   2. Slab (dry/wet)
   3. Cornice
   4. Ice
   5. Glide
   6. Roof
   7. Slush

B. Avalanche Action
    1. Surface
    2. Airborne
    3. Mixed
C. Speeds and destructive force of avalanches
D. Generic avalanche path features
    1. Starting zone
    2. Track
    3. Deposition zone (runout)
    4. Toe
E. Slab avalanche anatomy
    1. Crown
    2. Fracture (crown) line
    3. Flanks
    4. Bed surface
    5. Slab
    6. Stauchwall
F. Avalanche triggers (broad view)
    1. Definition
    2. Types and examples
        a. Natural
        b. Artificial
G. Direct-action vs delayed-action
H. Avalanche probability, risk and hazard
I. Size descriptions
    1. Relative to path (R1-R5)
    2. Relative to destructiveness (D1-D5)

Suggested Demonstrations/Student-Centered Activities

- Display photos or run videos of avalanches. Have students classify and describe the avalanche in detail, using standard terms.

Suggested Questions for Summary/Evaluation

- What did you learn from this lesson? (What else?)
- What are the main types of avalanches? How do you tell them apart? Why is it important?
- What type of avalanche is typically the most dangerous? Why?
- What are the main components of any avalanche path?
- What are the main parts of a slab avalanche?
- What is the difference between avalanche probability and avalanche hazard?
- Is avalanche hazard always related to avalanche size?

Topic 2: The Avalanche Triangle

Introduction

The avalanche triangle is a graphical way to organize and think about factors that contribute to avalanche hazard. The borders of the avalanche triangle represent factors that affect avalanche probability. The interior of the triangle represents consequences associated with human presence, which turns avalanche probability into avalanche hazard. Each subtopic below deals primarily with one leg of the triangle.

Though initially treated separately, students should become aware that all factors interact with each other in complex ways.

2A: Weather Factors

Overview

Students should be able to express concepts of how temperature, wind and precipitation influence how the snowpack develops.

At this level, students are exposed to the effects (not causes) of observed or predicted weather. One possible exception is the role of radiation in warming and cooling the snow surface because it is not directly observable. Instructors need to ensure that this important factor is not overlooked.

The relationships between weather and snowpack will be developed in 2B: Snowpack Factors.

Concluding Objectives – students should be able to:

- Describe how wind, temperature, and precipitation type affect snowfall
- Name and describe the typical snow characteristics of each U.S. snow climate zone
- Identify critical weather conditions that tend to increase avalanche probability
- Describe the relationship between precipitation density and intensity with respect to loading the snowpack

Key Terms

- Climate
- Density
- Humidity
- Loading
- Precipitation
- Precipitation intensity
- Radiation
- Relative humidity
- Snow crystal
- Vapor
- Weather

Sample Set

Weather is often referred to as the architect of avalanches. It not only produces the snow in the first place, but it influences the snowpack in many other ways, even during "fair" weather. At this level, we will focus on observable weather events that serve as warnings of increasing avalanche probability.

Content

A. Temperature
   1. Affects surface and atmospheric warming and cooling
      a. Radiation
         1) Short wave in
         2) Long wave out
      b. Conduction
      c. Convection
   2. Altitude and air temperature
   3. Air temperature and snowpack temperature

B. Precipitation
   1. Temperature and precipitation relationships
      a. Effect on relative humidity and precipitation
      b. Effect on precipitation types
         1) Rain
         2) Snow
         3) Hail
         4) Sleet
   2. Precipitation Snow Classification (as opposed to snowpack grain structure)
      a. Basic forms
         1) Unbranched
         2) Branched
         3) Irregular
      b. Special forms
         1) Rime
            a) Structure and appearance
            b) Atmospheric conditions
            c) Effects
               (1) Rime on snow crystals (graupel)
               (2) Rime on objects
               (3) Rime on snow surface
         2) Frost (Surface hoar)
            a) Structure and appearance
            b) Atmospheric conditions
            c) Effects
         3) In the snowpack, simpler forms tend to pack closer together and bond with each other faster than more complex forms
   3. Snowfall rate
      a. Concept of loading
      b. Snowfall Measurement
         1) Storm total
         2) Snowfall intensity (Based on SWAG but no codes)
            a) Very light trace to ≈0.5 cm (0.25 inch)/h
            b) Light ≈1-2 cm (0.5-0.8 inch)/h
            c) Moderate ≈2-5 cm (0.8-2 inches)/h
            d) Heavy ≈5-10 cm (2-4 inches)/h
            e) Very heavy ≥10 cm (4inches)/h

4. Snowfall Intensity
    a. Accumulation ÷ time (hours)
    b. 2.5 cm (1 inch) per hour is a warning
    c. Peak intensity more significant than average
5. Snow Density
    a. Mass ÷ volume
    b. Relate to crystal type, size, moisture and packing
    c. Denser snow adds greater weight load to snowpack than equal depth of less dense snow
    d. Often reported as snow water equivalent (SWE), or simply "precipitation rate".

C. Wind
1. Direction
    a. Changes
2. Speed
    a. Average
    b. Gusting
    c. Duration
3. Snow transport by wind
    a. Evidence
        1) Scouring
        2) Pillows
        3) Wind slabs
    b. Critical speeds
    c. Wind runs (fetch)
    d. Significance

D. North American snow climate zones
1. Maritime
2. Intermountain
3. Continental

E. Avalanche cycles related to weather
1. During storms
    a. Warm storms
    b. Cold storms
    c. Warm-to-cold storms
    d. Cold-to-warm storms
2. After storms
    a. Cooling trends
    b. Prolonged cold
    c. Warming trends
    d. Prolonged relative warmth

F. Sources of Weather Data (advantages/disadvantages of each)
1. General weather reports (radio, other media)
2. Avalanche center reports
3. Ski area reports
4. Remote weather observation stations (via internet)
5. Personal observations

Suggested Demonstrations/Student-Centered Activities

- Give students examples of actual weather and avalanche data. Have them speculate on relationships.
- Show photos of relative snow depths from windward & leeward aspects of the same ridge (from a single storm, or total depth) to illustrate the immediate and cumulative significance of wind transport.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? What else?
- What is the difference between weather and climate?
- What are the three basic snow climate zones in the U.S.? Where are they located? What are some characteristics of each zone?
- Why is wind an important factor from an avalanche perspective?
- What is snow density? Why is it important to be aware of? How can differences in density be estimated in the field?
- What is the best way to estimate loading of a slope by precipitation? By wind?

2B: Snowpack

Overview

This subtopic should acquaint students with the basic concepts of layering, metamorphism, and bonding as they relate to snowpack stability and avalanche probability. Metamorphism processes should be correlated with weather conditions, ground conditions and other internal snowpack conditions. Focus attention on what can be observed and measured.

Concluding Objectives—the student should be able to:

- Describe mountain snowpack development
- Describe bonding between grains (cohesion)
- Describe bonding between layers (adhesion)
- Describe how temperature gradients are formed
- Describe basic types of metamorphism and conditions under which each kind occurs
- Describe how metamorphism relates to strength and weakness within and between layers in the snowpack

Key Terms

- Adhesion
- Bonding
- Cohesion
- Creep
- Crust
- Deformation
- Elasticity
- Faceting
- Glide
- Grain
- Hardness
- Interface
- Isothermal

- Layering
- Matrix
- Metamorphism
- Percolation
- Persistent layer
- Rounding
- Sintering
- Strength
- Strong layer
- Viscosity
- Weak layer

Sample Set

At first glance, snow on the ground looks pretty simple. It's actually pretty complex and dynamic. Under certain conditions it can rapidly change from very stable to dangerously unstable. We need to explore some of its characteristics. We will later relate them to avalanche probability.

Content

A. Basic snowpack properties
    1. Snowpack matrix
        a. Ice "grains"
        b. Air
        c. Occasionally liquid water
    2. Layering
    3. Bonding
        a. Cohesion within a layer
            1) Basic process
            2) Cohesion and "strength" (hardness)
        b. Adhesion (friction) between layers
            1) Basic processes
            2) Adhesion and stability
    4. Viscouse and elastic (visco-elastic) properties
        a. Viscouse property allows deformation
            1) Compaction ("settlement" if natural)
            2) Creep
            3) Glide
        b. Elastic property resists permanent deformation; represents stored (elastic) energy
        c. Limits to deformation and elasticity
            1) Uneven deformation builds up stress (compression, tension, shear)
            2) Rate (gradual vs. rapid)
            3) Total amount
            4) If exceeded, result in brittle fracture
B. Metamorphism
    1. Definition
    2. Main Types
        a. Rounding metamorphism
            1) Temperature conditions
            2) Rounding process

3) Sintering process
4) Appearance & strength

b. Faceting metamorphism
1) Temperature conditions
2) Growth process
3) Appearance & strength
4) Common names
5) Usual locations
a) Near ground
b) Near surface
c) Adjacent to crusts
6) Persistence

c. Melt/freeze (wet) metamorphism
1) Diurnal temperature conditions
2) Large grains grow at expense of small grains
3) Diurnal freezing and melting of bonds—strong in freezing phase/weak in wet phase

3. Factors affecting the rate of metamorphism
a. Average ambient temperature
1) Occurs fastest at or slightly below 0° C
2) Slows with decreasing overall temperature; effectively stops at -40° C
b. Critical temperature gradient at temperatures below but close to freezing
c. Porosity of snow layer or interface
4. Buried layers that tend to resist further metamorphism ("persistence")
a. Facets (all forms)
b. Very cold snow
c. Surface hoar

C. Rime
D. Effects of wind on snowpack
1. Transport
2. Fragmentation
3. Packing
4. Scouring
E. Crusts (formation and appearance)
1. Sun crust
2. Wind crust
3. Rime
4. Rain crust
F. Liquid Water Content and Strength (see SWAG for descriptions and tests)
1. Classification
a. Dry
b. Moist
c. Wet
d. Very wet
e. Slush
2. Percolation (free water within snowpack)
a. Eroded bonds
G. Impervious layers (ice lenses)

H. Simple examples of seasonal snowpack (local conditions)
I. Effects of surface dust and buried dust layers.

Suggested Demonstrations/Student-Centered Activities

- Show graphics of snow types and layers for students to identify

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- What are snow "grains"?
- Describe snowpack structural components.
- What properties of snow determine how it responds to force?
- What does each storm contribute to the snowpack?
- What happens to snow grains from the time they land until they completely melt?
- How does metamorphism affect snow layers and the interface between them?
- What is bonding? What are the main forms of bonding?
- Describe the rounding process. What temperature conditions encourage rounding?
- What happens to touching grains during the rounding? What is this process called?
- Describe the faceting process. What temperature conditions encourage faceting?
- Where in the snowpack are facets commonly found? What names are used to indicate location?
- What is the effect of faceted snow in the snowpack?
- How does very cold average snow temperature affect metamorphism?
- What is surface hoar? What weather factors are involved in its formation?
- What is the significance of surface hoar if it becomes buried by new snow?
- What are some possible effects of free water in the snowpack?
- Describe melt-freeze metamorphism. What happens to grains as a result of this process?
- What are crusts? How are they formed?
- What is meant by the term "weak layer"? What are some examples of weak layers? How durable are they?

2C: Terrain

Overview

This subtopic should introduce students to the factors of slope angle, elevation, shape, aspect, and vegetation; simple and complex terrain. Students should understand that terrain affects both weather and snowpack factors in complex ways.

Concluding Objectives—students should be able to:

- Identify basic terrain features that increase avalanche probability
- Describe terrain features that indicate avalanche slide paths
- Recognize terrain traps

Key Terms

- Anchor
- Aspect
- Avalanche history
- Compression
- Concave
- Contour

- Convex
- Elevation
- Planar
- Shear
- Slope angle
- Tension
- Terrain
- Transition

Sample Set

No matter what the weather or snow conditions, avalanches need a slope to slide on. Terrain affects the weather, snow deposition patterns and stresses on the snowpack. It can produce huge avalanche paths, or small but deadly terrain traps. The terrain we choose for travel is the only factor under our control and therefore a question to always ask: "Is the terrain capable of producing an avalanche?" Here are some terrain features that need special attention.

Content

A. Slope angle
   1. Slope angle and friction between layers
   2. Angle and downslope gravitational force
   3. Type, proportion and frequency of avalanches at different angles
   4. Measuring slope angle
      a. Human eye error vs. instrument error
         1) Sight estimation highly unreliable (demonstrate)
         2) Instruments give better estimates
      b. Accuracy issues
         1) Varies with perspective
         2) Varies with slope complexity and size
         3) Focus on steepest part
         4) Proper use (where to the measure the angle from)
      c. Popular kinds of instruments (display & briefly describe usage)

B. Aspect
   1. Relative to solar radiation
      a. North-South (seasonal variation)
         1) Effect of shade/low angle of incidence in winter
         2) Effect of high angle of incidence in spring
      b. East-West (time of day variation)
      c. Role of slope angle
   2. Relative to wind
      a. Top loading
      b. Cross loading
      c. Slab formation

C. Elevation effects
   1. Temperature
   2. Wind
   3. Precipitation type and amount

D. Shape (contour)
   1. Convex, concave, planar
   2. Effects on deformation & stress

E. Ground roughness (texture)
   1. Anchoring
   2. Stress concentration
   3. Rock vs. snow—heat conduction
F. Vegetation
   1. Location
   2. Type
   3. Coverage (density)
   4. Heat source
   5. Shading
   6. Size (diameter & height)
G. Avalanche path recognition
   1. Terrain features
      a. Open slopes
      b. Bowls and cirques
      c. Gullies, canyons and gorges
      d. Steep, straight slopes
      e. Multiple start zones
      f. Split paths/blind spots
   2. Clues supplied by vegetation
      a. Observations
         1) Damage to trees
         2) Lack of trees
         3) Swathes of relatively younger trees
         4) Change in species
      b. Interpretations
         1) Frequency
         2) Size
         3) Boundaries
         4) Start zones
         5) Flanks
         6) Runout distances
H. Terrain traps (amplify consequences)
   1. Confined paths (chutes, couloirs, etc.)
   2. Gullies
   3. Abrupt transitions
   4. Paths through trees, rock fields, crevasses, cliff bands, bodies of water, etc.)
I. Cornices
   1. Structure
   2. Indicator of significant wind transport and lee loading
   3. Unpredictable stability
J. Questions to continually ask
   1. Does the terrain contribute to avalanche probability?
   2. What features are there to indicate past and recent avalanche activity?
   3. How does the terrain affect the consequences if I'm caught in a slide?

Suggested Demonstrations/Activities

- Show photos of a slide path from different perspectives. For each perspective have each student write an angle estimate on a piece of 3X5" index card. Collect cards before showing

the next perspective. Read or list the different estimates and also give a measured steepest slope angle. Students quickly see the inconsistencies. Have students identify possible start zones, tracks, and deposition zones from summertime photos.
- Using photos, have students identify terrain features that contribute to cornices, pillows, cross loading, etc.
- Have students describe known slide paths at their respective areas in terms of terrain features.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- What part of the topic needs additional clarification?
- What are some terrain features that contribute to avalanche probability?
- How does slope angle affect stress in the snowpack?
- How does terrain affect snow accumulation?
- What are some ways that terrain influences temperature, wind, force and other factors involved with avalanche probability?
- How do terrain features provide clues of past avalanche history?
- What are terrain traps?

Topic 3: Instability and Avalanche Release

Overview

This topic reviews and emphasizes factors related to snowpack instability and avalanche release. Students should understand that "instability" is associated with sensitivity to triggering avalanches by human activities.

This is also an opportunity to help students understand that looking for any sign of instability is more important than using data to confirm stability.

Concluding Objectives—students should be able to:

- Define instability as a strength relationship between layers and in terms of avalanche triggering by human activity
- Summarize critical weather, snowpack and terrain factors that contribute to snowpack instability
- Describe indicators of snowpack instability
- Describe usefulness and limitations of snowpack "stability tests"
- Compare and contrast loose snow and slab avalanche release mechanisms

Key Terms

- Cornice drop
- Critical structures
- Cross loading
- Creep
- Deform
- Fracture plane
- Glide
- Hand shear test
- Hardness
- Initiation
- Propagation

- Release
- Shear
- Shear quality
- Side loading
- Ski pole test
- Slab margin
- Strength
- Strength test
- Tension
- Top loading

Sample Set

We now have the basic factors that contribute to avalanche probability. But how do they work together to make a slope unstable enough that human presence can start it in motion?

Content

A. Instability defined
B. Terrain contributions to instability
    1. Slope Angle
        a. 30-45^{o} critical; 38^{o} prime
        b. Increased deformation in creep and glide
        c. Increased stress in shear, tension and compression
    2. Aspect (describe in local contexts)
        a. Effects on radiation
            1) Sun/shadow lines
    3. Effects on wind patterns
        a. Ridges
        b. Couloirs
        c. Knobs
        d. Warn about local/regional exceptions to the above, need to examine all aspects and treat with appropriate caution
    4. Shape
        a. Convexities
            1) Tension stress
            2) Lower portion can be heavily loaded
            3) Lower portion may be much steeper than average slope angle
            4) Common human trigger point
        b. Concavities
            1) Compression stress
            2) Often at lower part of slope—high consequence
        c. Planar
            1) Shear stress
            2) More uniform creep & glide; possible widespread sensitivity
    5. Vegetation
        a. Open slopes bordered by trees
        b. Brushy areas
        c. Isolated trees or rocks
C. Weather contributions to instability
    1. Temperature

a. Fair weather temperatures
    1) Sudden change
    2) Prolonged extreme cold (≤ 0°F (-18°C)) after a storm
    3) Warming trend
        a) Moderate—stabilizing
        b) Major thaw—destabilizing
        c) Warm days, cold nights
b. Storm temperatures
    1) Warm storms
        a) Dense snow→Rapid loading of snowpack
        b) Frequent slab avalanches during storm
        c) Rapid stabilization after storm
    2) Cold storms
        a) Less dense snow
        b) Gradual loading
        c) Less consolidated
        d) Loose snow & soft slab releases
        e) Delayed stabilization after storm
    3) Warm to cold storms
        a) Initially denser snow becoming less dense
        b) Loading rate decreases during storm
        c) Tends to stabilize quickly
    4) Cold to warm storms (upside-down)
        a) Initially less dense unconsolidated snow with denser snow on top
        b) Increasing loading rate—greater instability
        c) Frequent slab avalanches
c. Post-storm temperatures
    1) Cooling trends tend to delay stabilization
    2) Prolonged cold may decrease stability
    3) Warming trends tend to increase stability

2. Wind
    a. Scouring/loading
    b. Wind slabs
    c. Wind crusts
3. Precipitation
    a. Precipitation and mass loading
        1) Each millimeter (0.04 inch) of water equivalent precipitation adds:
            a) 1 kg per m^2
            b) 10,000 kg (22,000 lb) to a 100m X100 m surface area
    b. Critical precipitation values (rough averages—local thresholds vary)
        1) Snowfall intensity ≈ 2.5 cm (1 inch) per hour
        2) Precipitation Intensity ≈ 2 mm (0.08 inch) per hour
        3) Total snowfall in 24 hours
            a) Often used to determine average loading rate and total loading
            b) Accumulations ≥ 30 cm (1 foot) are usually significant
            c) Significance varies highly from place to place
        4) Rain on snow (almost immediate increase in avalanche probability)
            a) Greatest loading intensity

b) Possible weakening of snow structure in addition to loading

D. Snowpack Conditions
   1. Direct evidence of instability (Nature's Billboards)
      a. Avalanche activity
      b. Shooting cracks
      c. Hollow sounds
      d. Collapse ("whumpfing")
   2. Surface Observations
      a. Evidence of loading/scouring
         1) Cornices
         2) Pillows
         3) Sastrugi
      b. Rime
      c. Surface hoar
      d. Crusts
      e. Runnels
      f. Glide cracks
      g. Lack of settlement
   3. Snowpack Structure
      a. Slab over weak layer
      b. Depth of weak layer
      c. Layer thickness (slabs and weak layers)
      d. Relative layer hardness
      e. Resistance to collapse
      f. Likeliness of propagation

E. Avalanche Character (Types)
   1. Loose Dry
      a. Natural release
      b. Unconsolidated surface snow
      c. Angle of repose exceeded
      d. Point release
      e. Successive dislodging & entrainment (domino effect)
      f. Fan shaped
      g. Predictability – Good
      h. Tests results - reliable
      i. Hazards
         1) Relatively harmless
         2) Can sweep riders off their feet
         3) Can sweep riders into terrain traps below
         4) Can overload buried weak layers
      j. Precautions
         1) Avoid traveling in or near terrain traps
   2. Loose Wet
      a. Natural release
      b. Wet unconsolidated snow at or near surface
      c. Point release
      d. Loss of strength due to melting
      e. Fan shaped

f. Tend to move slowly
g. Predictability – Relatively good
h. Test results – normally reliable
i. Hazards
    1) Hazard can increase rapidly
    2) Snow is very dense
    3) Can easily sweep riders off their feet
    4) Can sweep riders into terrain traps
    5) Very difficult to dig buried victim out
j. Precautions
    1) Monitor forecasts
    2) Avoid traveling on high solar exposed slopes
    3) Be aware of nighttime temperatures above freezing
    4) Rule of travel "on early – off early"

3. Storm Slab
    a. Natural and human triggered release
    b. Soft cohesive new snow
    c. Failure – Stress exceeds strength of new snow or weak layer below
    d. May stabilize within a few days or become persistent slabs
    e. Predictability – less predictable
    f. Test results – normally reliable
    g. Hazards
        1) Steep slopes during or immediately (few days) after storms
        2) New snow that buries persistent weak layers
        3) Rapid release – fast moving
        4) May run long distance
    h. Precautions
        1) Monitor forecasts
            a) Be alert for buried weak layers
        2) Allow time to stabilize
        3) Avoid all terrain traps
4. Wind Slab
    a. Natural and human triggered release
    b. Soft to very hard wind deposited snow
    c. Failure – Overloading of weak layer below
    d. May stabilize within a few days or become persistent slabs
    e. Found on lee slopes – top loaded or cross loaded
    f. Tend to appear rounded and smooth
    g. Predictability – Somewhat unpredictable
    h. Test results – less reliable
    i. Hazards
        1) May form very brittle slabs which break into large blocks
        2) Appear attractive to ride
        3) May form high or low on a slope
        4) Hard slabs hard to escape
    j. Precautions
        1) Monitor forecasts
            a) Watch for loading events, especially wind events

b) Be alert for any buried weak layers
2) Avoid lee slopes – Stay on wind sheltered or wind scoured slopes
3) Be alert for hollow sounds
4) Avoid slab margins – May be thin and break easily

5. Persistent Slabs
   a. Natural and human triggered release
   b. Soft to hard slab in the middle to upper portion of the snowpack
   c. Slab sitting on persistent weak layer
   d. Tend to be on specific aspects and elevations
   e. These layers can persist for months
   f. Continued loading make these slabs more worrisome
   g. Failure – overloading of buried weak layer
   h. Predictability – Difficult to predict
   i. Test results – relatively unreliable
   j. Hazards
      1) Persist for long periods
      2) Difficulty in predicting
      3) Slabs can break back onto more gentle above
      4) Probability to go big
   k. Precautions
      1) Monitor forecasts closely
      2) Don't try to predict
      3) Make very conservative terrain choices
      4) Give wide buffer both above and below
      5) Be very aware that these slabs can last for long periods of time
6. Deep Persistent Slabs
   a. Natural and human triggered
   b. Hard to trigger but tend to be large
   c. Thick, hard slab deep in the snowpack
   d. Tend to be on specific aspect and elevation
   e. Failure – overloading of persistent weak layer
   f. Predictability – Very unpredictable
   g. Test results – not reliable
   h. Hazards
      1) Persist for long periods of time
      2) Very difficult to predict
      3) Move a large volume of snow
      4) Large amount of destructive force
   i. Precautions
      1) Monitor forecasts closely
      2) Don't try to predict
      3) Make very conservative terrain choices
      4) Give wide buffer both above and below
      5) Be very aware that these slabs can last for long periods of time
7. Wet Slab
   a. Natural and human triggered
   b. Cohesive wet snow
   c. Failure – Release of slab from bed surface due to liquid water breaking bond

d. Predictability – Very unpredictable
    1) Tend to go when bonds are broken not when stress is added
e. Test results – not reliable
f. Hazards
    1) Very dense snow
    2) Very destructive
    3) May run very long distances
    4) Very difficult to predict
g. Precautions
    1) Monitor forecasts closely
        a) Watch melt cycles closely
    2) Don't try to predict
    3) Make very conservative terrain choices
    4) Give wide buffer, especially below suspect slopes

8. Glide Avalanche
    a. Natural release
    b. Entire snowpack release at ground
    c. Can be made up of wet or dry snow
    d. Very is size from small to very large
    e. Occur where ground is steep and smooth
    f. Usually occur on the same slopes year after year
    g. Failure – Breakdown of bond between snowpack and ground
        1) Cracks appear prior to failure
    h. Predictability – Very unpredictable
        1) Tend to go when bonds are broken not when stress is added
    i. Tests – Not recommended and are almost totally useless
    j. Hazards
        1) Can be very dense
        2) Cracks may occur long before failure
        3) Extremely difficult to predict
    k. Precautions
        1) Be aware of historic paths
        2) Monitor forecasts
        3) Don't try to predict
        4) Avoid travelling on or below paths where cracks are showing
        5) If travelling below give very wide buffer
9. Cornice Fall
    a. Natural and human triggered
    b. Overhanging mass of snow normally on lee side of ridges
    c. May be small and soft or large and very hard
    d. Failure – Break in bonding within or behind the cornice
    e. Predictability – Somewhat unpredictable
    f. Tests – Somewhat unreliable
    g. Hazards
        1) Can cause release of slab below
        2) Can break back onto ridge behind
        3) Hard to determine when ridgeline ends, and cornice starts
        4) Can be triggered remotely while approaching

h. Precautions
    1) Monitor forecasts
        a) Be alert for rapid warming or thawing
        b) Be alert for loading events
    2) When travelling ridgelines stay well back
    3) Follow forecasts
    4) Give wide buffer below when cornices are unstable

F. Gathering structure data (test profiles)
1. When
    a. Upon entering avalanche terrain (baseline data)
    b. Significant change in aspect
    c. Every 1000 ft (300m) elevation change
2. Where
    a. Terrain representative of higher consequence slopes
        1) Similar aspect
        2) Similar elevation
        3) Safe slope
    b. Avoid data spoilers
        1) Tree branches overhead
        2) Trees, shrubs and rocks beneath the snow
        3) Previous compaction, wind drifts
    c. Polite
        1) Out of the way of travel routes
        2) Fill in before leaving
3. How
    a. Dimensions
4. Questions to ask
    a. Is there an unstable snow structure?
    b. What is its depth and distribution?
    c. How well are the layers bonded?
    d. How much more force will it take for the slope to avalanche?
5. Observations
    a. Layering
    b. Thickness
    c. Hand hardness (slab above weaker layer?)
    d. Grain type
    e. Grain size
6. Column tests (descriptions, purpose, scoring, interpretation of results)
    a. Types (describe)
        1) Shovel Shear
        2) Compression
        3) Extended Column
    b. Scores indicating significant problem (red flag)
        1) Shovel shear: (don't attempt quantification)
        2) Compression: CT≤ 20
    c. Propagation
        1) Extended Column: ECTP
7. Tests on the move

   a. Ski pole penetration
   b. Switch-back test
   c. Hand shears
   d. Cornice drops
8. Limitations of tests
   a. Indirect data
   b. Spatial variation
   c. FAILURE TO FIND EVIDENCE OF INSTABILITY DOES NOT INDICATE STABILITY

Suggested Demonstrations/Student-Centered Activities

- Collect and show video clips of each kind of release.
- Create an avalanche snowpack using flour, sugar, salt, powdered milk, instant mashed potatoes, etc., and then tip the board. Let students experiment with different layer configurations.
- Demonstrate snow data software, such as SnowPilot.
- Use physical sensations to sense tension, compression and shear. Pull on students for tension, have the students push for compression. A slide or ramp works fine. Have the students put their hands on each other's shoulders in a single file and move across varied terrain. They will note the various stresses placed on them.
- Spray shaving cream between two boards and put them on an incline to illustrate wet layers in the snowpack.
- Use several layers of Styrofoam to "create" a snowpack. Cut out the initial slab. Paint the interface between layers red. Paint the crown, flanks and stauchwall black. Use this to illustrate how much more of the bonding occurs at the stress interface.
- Use a board with a pencil or dowel sticking through it (it represents an isolated tree). Slide tissue paper, silly putty, rubber band, etc., down the board to illustrate how an isolated tree creates a stress point.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- How does slope angle alter the effect of gravity on the snowpack?
- What are the three ways that forces act on the snowpack to induce stress? Which one is most significant in terms of avalanche probability?
- In what ways do terrain features tend to concentrate stress?
- In what ways do weather features tend to concentrate stress?
- In what ways do snowpack features tend to concentrate stress?
- Describe the role of initiation and propagation in slab avalanche release.
- Describe dynamics associated with loose snow release.
- Describe dynamics associated with slab release.
- Describe dynamics associated with wet snow release.
- Why focus on slab avalanches?

Topic 4: Human Factors

Overview

Human factors turn avalanche probability into avalanche hazard and avalanches into incidents. This lesson needs to affect student emotions, attitudes and social values as well as academic knowledge. Use avalanche fatality statistics to drive home how dangerous they can be and human vulnerability to exposing themselves to this danger when emotionally aroused. Use case

studies to drive home the pervasiveness and persistence of poor judgment concerning risk and safety, even with avalanche "experts."

Concluding Objectives—the student should be able to:

- Define danger in terms of consequences
- Describe the role of decision-making in avalanche incidents
- Describe human decision-making processes
- Describe how decision-making processes negatively affect risk management
- Distinguish between small- and large group dynamics
- Propose tactics to help objectify decision-making

Key Terms

- Danger
- Hazard
- Heuristics
- Perception
- Problem
- Risk
- Vulnerability

Sample Set

So far, we have discussed avalanches only in terms of their types and causes. What's really important is the consequences with regard to people. The likelihood of an avalanche and their human consequences, are variously known as avalanche hazard, risk or danger. This covers economic consequences as well as threats to life.

Unfortunately, people have a way of exposing themselves to avalanche hazard, even when they know it is significant. Therefore, this topic deals with the psychology of decision making in the face of risk so we are better able to manage it.

Content

A. Opening Definitions
    1. Avalanche Hazard/Danger/Risk = essentially synonymous terms for the likelihood of a slide combined with consequences to human life or economic assets
    2. Vulnerability = degree to which one is exposed to avalanche hazard
    3. Perceived risk = risk – tolerance of risk
    4. Tolerance of risk = attitude toward risk
B. Consequences
    1. Victims as triggers
    2. Situations
        a. Caught
        b. Carried
        c. Buried
    3. Outcomes (describe mechanisms)
        a. Trauma
        b. Asphyxia
        c. Hypothermia
    4. Approximate survival rates
C. Human decision-making processes
    1. Type 1 Thinking

a. Automatic, intuitive, quick
b. Based on memory & prior experience
c. Influenced by emotions and feelings
d. Self-validating

2. Type 2 Thinking
   a. Conscious, rational, step-by-step problem solving
   b. Takes time and effort
   c. Rarely used and is influenced by Type 1

D. Most Type 1 decision making is irrational
   1. Emotions
      a. Action impulses that occur before thought
   2. Feelings
      a. Often confused with emotions
      b. Include mood
      c. Examples
         1) Pleasure – disgust
         2) Joy - anger
         3) Generosity – greed
         4) Desire - repulsion
   3. Heuristics and heuristic traps
      a. Applying familiar "rules of thumb" to unfamiliar situations
      b. Mentally substituting complex questions with simpler questions
      c. Adapting/abandoning rules only after significant failure
      d. Examples
         1) Safety in numbers
         2) Herding instinct
         3) Scarcity
         4) City thinking vs. mountain thinking
         5) Smelling the barn—the rush home
         6) Bad weather breeds conservatism or haste
         7) Sunny weather gives false confidence
   4. Economic factors
      a. "Open the Area."
      b. "I paid a lot of money for this opportunity."
   5. Individual human factors
      a. Attitudes and behavior that affect risk perception and risk-taking ("No risk—no fun")
      b. Effects of experience, equipment and training
         1) Equipment—illusion of safety
      c. Significance of a poor attitude or physical conditioning/ability match-up
   6. The group size factors
      a. "Groups will assume greater risk than individuals."—Stover 1994
      b. Large groups (≥ five members)
         1) Greater competitiveness
         2) Differing goals/objectives/agendas
         3) Greater diversity of experience/ability
         4) Reduced/fragmented communication
      c. Small groups (two-four members)
         1) Common goals/objectives

2) Common abilities
3) Whole-group communication

E. Means of countering human factors
1. Small groups
2. Following the leader's directions (but not blindly!)
3. Group understanding of the goal
4. Open communication
5. Predetermined criteria for changing goal
6. Detailed planning
7. Willingness to constantly reevaluate
8. Constant and open communication
9. Decision based on facts, not assumptions or desires
10. Each member of group has veto power on a green light decision
11. Options for alternate activities

Suggested Demonstrations/Student-Centered Activities

- Have the students list the attributes for their "ideal travel companion." Discuss positive and negative traits. Expand to "ideal travel groups." Discuss positive and negative group characteristics. Finally, tie this together with how the traits/characteristics might affect decision-making.
- Have students identify stages of a trip where decision making is important and also vulnerable to distortion by human factors.
- Create scenarios that will generate discussion of human factors and how to counter them.
- Use current case studies to identify and discuss how human factors influence bad decisions with tragic consequences. Each small group can be given a different case study to analyze and report to the other groups

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- What is the distinction between avalanche probability and avalanche hazard?
- Do we know enough about avalanche dynamics and contributing factors to avoid most avalanche hazards? Explain.
- What does the following statement mean? "Harm to people or their assets by avalanches are incidents, not accidents."
- What is the most important factor in avalanche hazard and incidents?
- What is the basis for most human judgment and decision making?
- Is human judgment based on emotions, desires and beliefs easy to overcome? Explain.
- When is judgment not influenced by emotions, desires, prejudices and beliefs?
- What are some ways to overcome the dangerous influences of human factors in making decisions?
- Why are people getting caught?
- How can we avoid getting caught?
- How can we change our thought process?

Topic 5: Personal Safety

Overview

This topic brings together different aspects of personal safety in avalanche terrain. It introduces advance-planning principles, travel techniques and procedures that build in safety and act as a

counterpoint to rash decision making. Students should also understand that plans and travel formulas are not perfect; decision making in the field is still essential for safe and efficient travel. Familiarization with the use of decision-making tools helps us to objectify the process and increases the likelihood that these tools will be used in the field. One also needs techniques for improving survival chances if risk management fails and he/she becomes caught in an avalanche.
If there are snowmobilers in the class, be sure to discuss how the principles and practices covered in this topic apply to that mode of travel.

5A: Principles of Safe Travel

Overview

This subtopic starts with general route selection principles based on consideration of the combined effects of terrain, weather and snowpack. These basic principles form the foundation for making appropriate decisions before and during a trip into the backcountry. Application of these principles helps to mitigate problems associated with human factors. This topic should be conducted as a discussion to engage students in recall and developing relationships between all of the information presented beforehand. Draw students into the discussion with focusing questions and case studies.

Concluding Objectives—students should be able to:

- Recognize probability dangerous conditions
- Identify and describe safe terrain selection and travel practices

Key Terms

(None)

Sample Set

Let's explore how we can offset decision-making pitfalls with timing, terrain choices and travel techniques that are completely within our control.

Content

A. Recognize and acknowledge probability of dangerous conditions
    1. Weather prior to and during trip
        a. During or immediately after storms
        b. "Upside-down" storms
        c. Rain on snow
        d. Periods of rapid, significant temperature change
        e. Prolonged very cold or very warm weather
        f. Late in the day when spring snow turns slushy
        g. No nighttime freezing
    2. Terrain
        a. Slope angles ≥30°
        b. Leeward slopes
        c. Cornices
        d. Complex slopes
        e. Obvious avalanche paths
        f. Terrain traps
        g. Rock-snow interfaces

   h. Gentle slopes in runout of steeper slopes
   i. Treed slopes (pro and con)
3. Snowpack
   a. Unstable snow (refer back to strength/propagation/structure discussion)
   b. Cornices (always consider unstable)
4. Apply conditions to a decision matrix
   a. Red, Yellow, Green Light
   b. NSP Avalanche Hazard Checklist

B. Use safe travel "rituals"
1. Preparation (applies to any mode of travel upon exposure to avalanche terrain)
   a. Zip up
   b. Secure pack
   c. Remove pole and safety straps
   d. Ensure all rescue equipment is functioning properly
   e. Ensure Avalung® mouthpiece is readily available
   f. Ensure airbag trigger is readily available
2. General travel "rituals"
   a. Minimize exposure to hazardous terrain
   b. One at a time; no bunching up unless in relatively safe areas
   c. Stay in same track, not below/above your partners
   d. Keep in sight of each other
   e. Always have a probability escape route
   f. Travel gently (many people on slope at once, etc.)
   g. Terrain that least skilled member can negotiate without falling
   h. Continuous observation and informal testing of the snowpack
   i. Only stop at identified safe zone
3. Ascending (best time for observations)
   a. Windward side of ridges
   b. Anchor point to anchor point
   c. Low angle slopes
4. Traversing
   a. Cross as high as possible
   b. One person at a time; everyone else watches
   c. Stay in same track
   d. Safety point to safety point
5. Descending
   a. Identify an escape route
   b. Start from the top
   c. Ski/ride along flanks
   d. One at a time; companions in safe location but able to see descent
   e. Keep in sight of each other
   f. Travel gently - no gorilla turns, jumping or excessive use of poles

Suggested Demonstrations/Student-Centered Activities

- Show and demonstrate use of decision-making aids.
- Use case histories and video clips to illustrate consequences of poor route selection.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)

- What are some generally safe routes and places to avoid in backcountry travel?
- Are generally safe routes always safe? Explain.
- What are some generally safe travel practices for backcountry travel?

5B: Travel Planning and Preparation

Overview

Advance planning may be the most effective place to build safety into a trip. Because of human factors, on-the-spot decisions in the field appear to be far less effective. Plans set the basis for safe decision making in the field. Make this lesson as interactive as possible, with students supplying most of the content. The majority of class time should be devoted to application of the principles in small-group planning activities.
Most students should already have at least a rudimentary familiarity with topographic maps; if not, they need to be informed they are not adequately prepared to navigate out of bounds. It takes only a few minutes to teach the basics, especially with modern 3-D map projections and overlaid satellite imagery. Students lacking map reading skills should be grouped with more capable students during the activities.

Concluding Objectives—students should be able to:

- List and describe basic elements of safe trip planning and preparation
- Identify local resources for backcountry information
- Utilize avalanche bulletins in trip planning
- Identify probability safe and hazardous terrain on a topographic map

Key Terms

- Contour
- Contour interval
- Topographic

Sample Set

Safety begins with advanced travel planning, before human factors have an opportunity to do their dirty work in the field. It gives everybody involved a chance to communicate their attitudes and values toward both enjoyment and safety.

Content

A. Principles
    1. Select companions carefully
        a. Attitudes
        b. Knowledge and skills
        c. Leadership
    2. Everyone properly equipped
        a. Students generate a list and explain why each item is necessary
        b. Supplement student-generated list if necessary
    3. Similar physical abilities and skills
    4. Establish primary and back-up leadership and mode of decision-making
    5. Learn about the terrain to be traveled
    6. Plan alternative routes, destinations, activities
    7. Have an emergency plan
        a. Avalanche

   b. Illness/injury
   c. Stranding by broken equipment, poor visibility, etc.
8. Group buy-in—shared attitude toward safety

B. Preparation
1. Week prior to the trip
   a. Monitor weather
   b. Monitor avalanche forecasts
   c. Check with others who have been there
   d. Mark on map
      1) Probable hazardous terrain
      2) Planned route
      3) Back-up route/destination
   e. Practice transceiver skills
   f. Check condition of all equipment
2. The day before the trip
   a. Obtain weather and avalanche hazard forecasts
      1) Sources
      2) Usage
      3) Contact forecast sources for more specific data
   b. Adjust plans in view of most recent information
   c. Review avalanche risk reduction with group
      1) Communication
      2) Route
      3) Spacing
      4) Hazard recognition
      5) Acceptable/unacceptable hazard levels
      6) Probability test areas
      7) Criteria for going to planned alternatives
      8) Actions if there is an emergency
   d. Leave travel information with friends

C. Upon departure
1. Check function of transceivers and GPS
2. Compare local weather with forecast
3. Dig test profile for baseline information

D. Along the way
1. Minimize exposure
2. Use decision-making tools
3. Bring concerns to conscious level by discussing them
4. Adapt plan to real-time situation

E. Extended travel
1. Begin each day with situational assessment
2. Adjust plan accordingly

Suggested Demonstrations/Student-Centered Activities

- Have students generate a list of minimum equipment each traveler should carry on a trip expected to last a full day and explain why each item is necessary.
- Show a topographic map of some complex terrain and a photo (or Google Earth images) of the same terrain. Have students compare the information presented by each.

- Have students practice using scales that translate contour interval spacing into corresponding slope angle (found on many slope meters and crystal cards).
- Demonstrate ways to mark direction of prevailing winds on contour maps.
- Make prints of a contour map of a high alpine area. Put each print in a clear page protector sleeve. Break class into small groups and hand each group a map. Have them identify and mark slopes with angles of 30° or more, leeward exposures and sunny/shadowed aspects (map scale usually won't allow for identification of terrain traps). Give students notional snowpack and weather data, then have them draw relatively safe routes to a pre-selected destination. When done, project an image of the map onto a whiteboard, or large sheet of butcher paper and have a team spokesperson draw their route for the rest of the class to critique. Repeat this process for each team.
- Using a map similar to the one described above, give small groups a starting point and selection of destinations for a one- or two-day outing. Have them develop a complete travel plan using all of the components presented.
- Discuss ways to minimize exposure to hazards. Use case histories to promote discussion and develop concepts.

Suggested Questions for Summary/Evaluation

- What did you learn from this lesson? (What else?)
- Why is advance planning important?
- What safety factors should be included in backcountry travel planning?
- What are some route selection decisions that can be made as part of advance planning?
- What kinds of information can be used for advance planning?
- Do good plans reduce the need for good decision making in the field? Explain.
- What needs to be done with safe route selection and travel practices in order for them to be effective?

5C: Decision Making in the Field

Overview

Advance plans are the foundation of a continuous decision-making process but plans then need frequent modification based on realities of the environment. Emphasize that this is where people most often make decisions that get them into trouble.
Decision-making aids help to objectify the process—another safeguard against the probability harmful effects of human factors. At least half of the allotted time for this session should be devoted to familiarization and practice with a variety of decision-making aids, which then need to be put to use in the field (thus encouraging likely use).
Mock scenarios in the classroom will help students to become familiar with decision-making aids but follow-up in the field is necessary to make this content stick.

Concluding Objectives—students should be able to:

- List pertinent data for decision-making.
- Integrate multiple types and sources of information when making decisions
- Prioritize evidence of hazard
- Use a variety of decision-making aids.

Key Terms

(None)

Sample Set

As the safety evaluation process begins with initial trip plans, it continues with the ride from home to the resort or trailhead. This is where the plan can begin calibration with reality.

Content

A. Data Gathering
   1. Approach to departure site (What can you see from the car?)
      a. Weather
      b. Avalanche activity
   2. Upon approaching avalanche terrain
      a. Gather baseline snowpack data
B. Use decision making aids (demonstrate)
   1. Information-Based
      a. Avalanche Center Advisory information (interpretation and application)
         1) Where/how to access
         2) North American Public Avalanche Danger Scale
            a) What categories mean
            b) Limitations
         3) Snow test profiles
         4) Aspect and Elevation Roses
         5) Commentaries
            a) Avalanche Problem
               (1) Character (Type)
               (2) Aspect and Elevation
               (3) Likelihood of triggering
               (4) Probability Size
      b. Prioritizing the clues—bull's eye approach
         1) Outer ring—general data (Class III)
            a) Weather reports
            b) Avalanche center bulletins
         2) Inner ring—local interpolated data (Class II)
            a) Weather
            b) Snowpack
            c) Terrain
         3) Bull's eye—direct data (Class I)
            a) Observed avalanches
            b) Shooting cracks
            c) Hollow, drum-like sounds underfoot
            d) "Whumpfing" underfoot
      c. Recognizing/evaluating human factors
         1) Unexpected changes
         2) Physical and mental condition of your party members
         3) Acceptance of risk and vulnerability
   2. Rule based decision making aids
      a. Examples
         1) Obvious Clues (ALPTRUTh)
            a) Avalanche Activity
            b) Loading

c) Path
d) Terrain
e) Rating
f) Unstable Snowpack
g) Thaw Instability
h) Usage
(1) 1-2 = use normal caution
(2) 3-4 = use extra caution
(3) 5+ = don't go

2) Green/Yellow/Red light checklist (Fredston/Fesler)
3) NSP Hazard Evaluation Checklist
4) Avaluator

b. Options indicated
1) No-go
2) Route, destination or activity modification
3) Planned route, extra caution
4) Go as planned

C. Decision to go
1. Constant reevaluation of factors en route
a. Weather
b. Snowpack
c. Terrain
d. Human
1) Alert to the heuristics acting on others
2) Others watch for those acting on you

2. Alternatives if conditions indicate increased danger
a. Continue on original route
b. Alternate route
c. Wait until conditions improve
d. Same route back

D. Precautions if a suspect avalanche slope must be crossed
1. Consider alternatives again
2. Route the least skilled member can traverse without falling
3. Identify the point of no return
4. Choose an escape route
5. Bundle up (especially parka hood, waist draw-cord and cuffs)
6. Snug pack straps
7. Remove pole/ski/board straps
8. Avalung® mouthpiece in mouth, if so equipped
9. Access to avalanche air bag triggering system
10. Cross high and fast
a. From identified safe point to safe point
b. One at a time
c. Same tracks
d. All eyes on person crossing

E. Bottom line
1. Quick decisions in the field are usually Type 1
a. Irrational

   b. Faulty
2. Decision-making tools help engage Type 2
   a. Conclusions still vulnerable to Type 1 filtering
3. Decisions must focus on terrain choices

Suggested Demonstrations/Activities

- Conduct a decision-making exercise integrating the material from this lesson with that from the human factors lesson.
- Draw a bull's eye and have the students categorize notional data.
- Invoke the Alice in Wonderland quote, "I give myself very good advice, but I seldom follow it."
- Give notional weather, snowpack, terrain and human factor data. Have students use decision-making aids to make go/no-go decisions.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- What kinds of information need to be gathered constantly while traveling in the backcountry?
- How does the North American Public Avalanche Danger Scale help with decision-making?
- What did you learn from this presentation? (What else?)
- What kinds of information are used to assess stability?
- How is stability information prioritized?
- Why is it important to make several test profiles and observations on the move?
- What is the usefulness of avalanche advisories?
- Why does the discovery of a relatively small, isolated area of instability outweigh many, widespread findings of stability?
- What is a convenient acronym for assessing avalanche probability?
- Which decision-making tool do you prefer? Why?
- Why might it be useful to have members of a group use more than one type of decision-making tool?
- If the data and tools indicate moderate or higher hazard, what are your options?

Topic 6: Rescue Principles

Overview

What if precautions fail and a group member is caught, carried and buried? What do companions or others nearby immediately do to find and rescue the buried victim? Time is the most critical factor, but this should not blind the group to other considerations. Locating and extricating a buried avalanche victim is often just the start of the rescue process and the safety of the surviving companions must not be overlooked.

6A: Escape and Survival

Overview

This subtopic exposes students to "what if it's you" situations where alternatives are perceived as bad as, or worse than, travel on an avalanche-prone slope. Scenarios centered on a projected image work well. Use questioning techniques to get students to provide most of the content.

Concluding Objectives—students should be able to:

- Describe precautions to take if needing to cross a suspect slope
- Describe procedures for escape if caught
- Describe procedures for increasing survival odds if unable to escape

Key Terms

- Partially buried
- Completely buried

Sample Set

What if all of your attempts at risk management were unsuccessful and someone in your group is caught in an avalanche? What if it is you?

Content

A. Escape
   1. Shout out
   2. Ski/ride to side
   3. Trip airbag if so equipped
   4. Attempt self-arrest
      a. Grab onto rocks or trees, if possible
      b. Dig poles, ski tails into bed surface if slab is shallow
   5. If knocked down
      a. Shed skis/poles (problems with snowboards & shoes)
      b. Try to clamber up moving blocks to get as much snow below you as possible
      c. Attempt to roll or tumble sideways toward a flank

B. Protection/Survival
   1. Try to keep feet downhill, head facing upward
   2. Use hands and arms to protect face and head
   3. Make yourself as "large" as possible
   4. If you sense the slide is slowing, act immediately
      a. Clear and close mouth; make a breathing space
      b. Reach up—attempt to get a body part or equipment to the surface
   5. If buried when the slide stops
      a. Move any body part on the surface
      b. Dig yourself out if possible
      c. Yell if you hear rescuers; if not, conserve energy

C. Survival devices
   1. Helmet
   2. Airbag packs
   3. Avalung®

D. Reality checks
   1. Rapid acceleration and deceleration—little time to do anything
   2. Turbulent flow—"rag doll in a dryer"
   3. You will inhale what surrounds you—snow
   4. Any opening will be packed with snow
   5. As flow slows it sets up solid—body movement of any kind rarely possible
   6. Having an air pocket greatly increases chances of survival

Suggested Demonstrations/Student-Centered Activities

- To illustrate how an airbag system works, put a few dried kidney beans in the bottom of a jar then cover them with uncooked rice. Shaking the jar causes the beans to rise to the surface. Note that the upward displacement of the beans is not due to swimming or floating, but rather to the action of moving solid particles.
- Have students demonstrate and/or describe possible actions or maneuvers to use.
- Review mechanisms of injury in avalanches. Have students speculate on ways to avoid trauma if caught.
- Discuss pros and cons of discarding personal equipment.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- How might crossing a suspect slope become the option of choice?
- How can you minimize impact and exposure on a suspect slope if you decide to go on it?
- What constitutes an acceptable escape route?
- What are some self-protection and survival measures that you can take if caught?
- If buried, what are your chances of freeing yourself?
- If buried, what must you rely on for survival?

6B: Companion Rescue

Follow all classroom curriculum of Section 4: Companion Rescue.

Course Wrap-Up Closing Remarks

- Course alone does not develop proficiency; skills are quickly lost if not used
- Encourage independent practice.
- Encourage students to complete Module 2 prior to entering backcountry terrain

- Written final exam
- NSP Student Feedback Survey.
- IT debrief with instructors
- Course close out

LEVEL 1 AVALANCHE MODULE 2 FIELD SKILLS

Course Standards

Module Description

This module provides the field component of a basic Level 1 avalanche course. This includes all field components of the combined Module 1 and 2 curricula. With completion of Module 1 and 2 plus Companion Rescue the student will meet the American Avalanche Association content guidelines for Level 1 avalanche education for recreationists, considered to be the minimum level of avalanche education needed for recreationists venturing into avalanche terrain.

This module develops hands-on skills for observing and recognizing factors that contribute to avalanche hazards, making hazard evaluations, developing terrain management strategies and techniques for avoiding exposure to hazardous slopes.

Target Audience

This course is for anyone who contemplates travel in avalanche terrain for any reason, either within resort boundaries or in the backcountry.

It is a prerequisite for enrollment in Module 3, which helps prepare them to participate in organized avalanche rescue operations. Although most NSP members taking this course do their patrolling within resort boundaries, they are more likely to respond to avalanche incidents beyond those boundaries, and thus need backcountry travel skills as well as specific in-bounds familiarization with their home resort's avalanche terrain and rescue plan. Others taking this course tend to be oriented mainly toward backcountry patrolling, recreation or rescue.

Prerequisites and Pre-Course Study

Prerequisites include:

- Level 1 Avalanche Module 1
- Sufficient equipment, skills and physical ability to participate in field activities in steep, ungroomed terrain under adverse weather conditions.

If this module is taught concurrently with Module 1, no additional pre-work is needed. If conducted as a stand-alone module for students who completed Module 1 month or even years previously, pre-course study and a pretest is recommended.

Venue

Field activities must be conducted in terrain that is representative of avalanche terrain. Students need to be able to observe and investigate actual slide paths, terrain traps, effects of wind and other weather events, multi-layer natural snowpack, complex slopes, etc. This should include 30-45^{o} slopes, critical aspects, examples of features that develop cross loading, etc. Controlled slide paths at ski resorts are excellent for this purpose. However, any slopes that the class is exposed to must be evaluated as reasonably stable at the time. During unstable conditions, low angle, low consequence terrain must be used. Review Risk Management Guidelines in Section 1 of this manual before conducting this course.

Intended Outcomes—students should be able to:

- Demonstrate effective use of avalanche rescue procedures and equipment to locate, uncover and extricate buried avalanche victims.
- Identify local terrain where avalanche problems mentioned in avalanche center advisories are likely to exist.
- Gather, document and use weather, snowpack and terrain data from their immediate location to evaluate avalanche probability and consequences
- Use basic decision-making principles and tools to identify safe destinations and routes, both when making travel plans and while in the field
- Employ standard safe travel procedures and techniques in avalanche terrain

Time Commitment and Scheduling

The time it will take to complete this course varies due to many factors. Courses are competency based, not time based. For planning purposes, the table below lists suggested times for instruction. It is ultimately up to the IOR to schedule lesson times that allow students to reasonably attain learning objectives yet not waste time. See Section 1 of this manual for

more detailed guidelines on scheduling.

Suggested Time Distribution

Session	Activity	Suggested Duration
1	Terrain Evaluation, Route Selection and Safe Travel Practice	3 hours
2	Snowpack Observation, Tests and Instability Evaluation	2 hours
3	Hazard Evaluation and Decision Tool Familiarization	1 hour
4	Companion Rescue	2 hours
5	Integrated Field Exercises[1]	7 hours
6.	Closing discussion and student survey	1 hour
	Total Field Instruction	**16 hours**
	Minimum time commitment	**16 hours**

[1]Integrated field exercises provide guided and independent practice of skills introduced in previous sessions. Instructors should customize these exercises to optimize skill development based on student performance during the introductory sessions. Evaluations of skill proficiency may be conducted during these exercises.

This module is typically scheduled over a full weekend, but other formats may be used as long as all components are covered within a single season.

Resources

- Section 1 for course and instructional quality guidelines
- Section 7 for recommended instructional references and other resources

Grading

Use the Level 1 Avalanche Skill Evaluation score sheet found in Section 7 of this manual.

Final grade of Pass

- A score of "Pass" on all field skills

Final grade of Incomplete

- Less than passing score in no more than one skill
- Remedial work and skill re-evaluation can be made up before the end of the season

Final grade of Fail

- Less than passing scores on two or more skills

Students who fail the course must repeat the entire course for certification.

Lesson Guides

Course Check-in

Overview

Orientation may not be necessary if this course is comprised of students from an immediately preceding NSP Avalanche Module 1 course or taught concurrently with other modules. If a large portion of the students are entering fresh, at least some of the following items may be appropriate.

- Ensure all students are properly registered
- Ensure all participants (instructors, students and others) have completed a liability release
- Ensure all students meet prerequisite requirements

If course is not immediately following a Level 1, Module 1;

- Ensure all students have completed prerequisites
- Complete all course check-in as per Module 1 instructions

Session 1: Weather Observation, Terrain Evaluation, Route Selection and Safe Travel Practices

Overview

This activity gives students a first look at their surroundings from an avalanche perspective. Its purpose is to start developing an "avalanche eye"—awareness of features as clues of avalanche probability. It should begin with a tour of historically active avalanche terrain, such as along a resort control route or backcountry route. Students should review and practice route selection and safe travel protocols described in Module 1. This session should be conducted on or near complex avalanche terrain, as conditions dictate. Observations and tests should be conducted on low consequence slopes representative of higher consequence slopes.

This is also an opportunity to use surface conditions to observe and recognize terrain-weather interactions.

Multiple short trips to different locations may provide a more varied experience, especially if conducted at a lift-served area that encompasses a wide variety of terrain and slide paths.

Safety guidelines described in Section 1 must be observed.

Concluding Objectives—students should be able to:

- Use wind information to predict where wind loading of slopes is likely to occur during a storm
- Predict how solar radiation may influence slope stability on different slopes at different times of year
- Predict places where snow may be slower to stabilize after a storm than others
- Use a clinometer to measure slope angle
- Identify slopes with an incline $\geq 30^{o}$

- Identify terrain traps
- Identify vegetation clues that indicate history of avalanches
- Demonstrate appropriate route selection and travel practices

Suggested Activities

A. Safe route selection and travel
   1. Review principles
   2. Have students take turns leading and monitoring their travel throughout the session
B. Identification of likely avalanche paths by terrain features
   1. Confined and unconfined paths and the relative hazards associated with each
   2. Terrain traps
   3. Vegetation that indicates past avalanche activity
      a. Trim lines
      b. Debris marking runouts
      c. Different ages and species
   4. Radiation and shading effects on snowpack
   5. Evidence of wind interaction with terrain and snowpack
C. Slope angle estimates and measurements (discuss both proper & improper methods in terms of validity, reliability & safety)
   1. Eyeball estimates from different distances and perspectives
      a. Without discussion, have students write angle estimates on pieces of 3X5" index card & turn into instructor without comment.
      b. Instructor then reads all written estimates and group discusses variance.
   2. Different types of clinometers and different methods for measuring (including identification of improper/unsafe methods)
      a. Sighting (vs. lay on ski pole, etc.)
      b. From side (vs. bottom up, top down)
   3. Dealing with non-planar slopes
   4. Practice
      a. As with eyeball estimates, students measure same slope and compare results
      b. Discuss differences in measurements of the same slope in terms of error (instrument and human) and variability within the slope
D. Wind direction and speed estimates followed by measurements at various points in the area
   1. Same direction? Same speed? Why?
   2. Influence on slope loading patterns

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Session 2: Snowpack Observations, Tests and Instability Evaluation

Overview

In this activity, students should become familiar with basic methods for finding hidden weaknesses in the snowpack. Students should also be introduced to basic documentation of

snow test profiles and column tests. Emphasis should be placed on finding conditions that may contribute to instability rather than looking at overall stability.

Traditionally called "stability" tests, isolated column tests primarily measure the relative force needed to collapse the weakest layer.

The extended column test provides direct evidence of both sensitivity to collapse and propagation regardless of slope angle. This makes it a particularly valuable indicator of instability. It does not necessarily mean that the other tests are to be abandoned in favor of it. Performing the shovel shear test, followed by the compression test and finally the ECT provides more useful data than any one test alone.

Concluding Objectives—students should be able to:

- Identify relatively consolidated/unconsolidated layers, crusts, etc.
- Conduct hand hardness tests of each layer.
- Perform and score the results of isolated column tests (Shovel Shear, Compression and Extended Column).
- Perform tests on the go (ski pole, hand shear, switchback, etc.).
- Describe advantages and disadvantages of the different tests.
- Evaluate snowpack data in terms of instability (likelihood of triggering a collapse and possible propagation).

Suggested Activities

A. Recap criteria for selecting a snowpack test site
B. Travel to test site (practicing safe travel "rituals")
C. Instructor demonstrates a test profile (per SWAG)
    1. To ground or 1.5 m deep (whichever is less) by 2 m wide
    2. Smooth, vertical walls
    3. Brushing and crystal card techniques for identifying layers
    4. Observe/measure/
    5. Thickness of each layer
    6. Hand hardness test of layers
    7. Grain type and sizes, if different forms are present
    8. Instructor demonstrates isolated column tests (in succession)
        a. Shovel shear
        b. Compression
        c. Extended Column
    9. Compare attributes, limitations and scoring system of each test
D. Guided Practice
    1. Small groups dig test profiles, conduct tests in different locations
    2. Compare similarities and differences between observations; discuss possible causes of different data (spatial variation)
E. Avalanche field notebooks
    1. Demonstrate recording weather, terrain and snowpack data
F. Independent practice
    1. Regroup
    2. Each group digs two test profiles in different locations at least 10 m apart
    3. Discuss implications of spatial variation
    4. Have students make stability assessments based on:
        a. Strength (test scores)

   b. Propagation (ECT)
   c. Structure
5. Have students record data in field notebooks

G. Demonstrate/practice tests while traveling to identify near-surface slabs
1. Ski pole
2. Switchback
3. Hand shear

H. Repeat snowpack observations, strength tests and stability assessment on another slope

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Session 3: Hazard Evaluation and Decision Tools

Overview

Evaluation of hazard involves more than just snowpack stability assessment. Because of human factors and decision-making flaws inherent in all of us, it should begin indoors during initial planning, before and upon arrival at the departure point, and continue throughout the trip. Consistent use of hazard evaluation and decision-making tools helps to make the process more objective and less susceptible to manipulation by irrational thought processes. At this level, students should be introduced to some of the simpler rule-based tools and use them in the field. They should be encouraged to develop a preference and consistently use it from then on.

As much as it is practical and safe, students should be able to use these tools under actual conditions, but the instructor must maintain veto power over decisions that may be dangerous under real world conditions.

Concluding Objectives—students should be able to:

- Integrate avalanche forecasts, stability assessments, weather trends and human factors to determine avalanche danger.
- Recognize environmental warning signs and conduct on-the-move tests while traveling in avalanche terrain.
- Demonstrate appropriate use of a variety of basic rule-based decision-making aids.

Suggested Activities

A. Setting
1. Any avalanche terrain, any conditions
2. Small groups—5 or fewer

B. Activity
1. Have students define "best" route (quickest/easiest/safest).
2. Indicate a destination and have students describe a possible route.
3. Provide real or notional data to the students
   a. Terrain
   b. Weather
   c. Snowpack
4. Discuss probability avalanche problems and consequences

5. Have students reevaluate hazard using provided decision making tools, such as:
   a. Green/Yellow/Red Light checklist
   b. NSP Avalanche Hazard Evaluation checklist
   c. Avaluator
6. Students compare conclusions reached by discussion alone and by different decision-making tools.
7. If actually safe to go, travel the route with checkpoints to reevaluate hazard along the way.
   a. Students gather and use available weather, snowpack and terrain data to frequently reassess conditions on different aspects
   b. Be prepared to interject notional conditions ("What ifs") to stimulate thinking and decision making.
8. At the end of the trip, have students critique it. Some questions to stimulate the critique might include:
   a. Were strength tests adequate/underdone/overdone? How/why?
   b. What did strength tests indicate about the strength of the snowpack?
   c. What structural features were found? What was the yellow flag count? Was it consistent? Why/Why not?
   d. In what ways did weather conditions influence your hazard assessment?
   e. What terrain features were significant in your hazard assessment?
   f. What human factors did you notice at work in your hazard assessments? How were they dealt with?
   g. Were unexpected conditions encountered? What were they? What lessons were learned from them?

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Session 4: Integrated Field Exercises

Overview

At this point, all fundamental skills have been introduced, demonstrated and practiced to some degree. Now it's time for students to refine those skills as much as possible, making them fairly efficient, if not automatic. Students should be able to take turns leading segments of short trips in avalanche terrain, verbalize weather, snowpack and terrain observations and evaluations, use a variety of decision-making tools, demonstrate safe travel rituals, and conduct effective companion and second-party rescues. Instructors should only select group leaders, suggest places to go (with preset ambush rescue scenarios) and tag along to keep things organized, on task and safe.

These exercises provide opportunities to score individual skills. Students who demonstrate difficulties can be coached to bring skills up to a passing standard.

The following suggested activities are necessarily sketchy due to the huge variety of conditions that could be actually encountered. Instructors need to use existing conditions and their own creativity to develop meaningful practice for their students.

Concluding Objectives—students should be able to demonstrate:

- Appropriate trip planning and pre-trip avalanche hazard evaluation
- Appropriate observation and evaluation of significant weather, terrain, and snowpack factors before and during actual travel
- Appropriate overall hazard evaluation
- Appropriate route selection and travel practices
- Efficient and effective small group rescue leadership and skills (avalanche and SIS scenarios)

Setup

- Divide students into groups of 3-5
- Predetermine at least two short trip destinations per group
- Sufficient number of instructors to proctor each group
- Sufficient helpers to stage an "incident" along the way or at the destination

Suggested activities

A. Each group assigned a different destination to plan and actually travel
    1. Full plan, including pre-trip data gathering
    2. About 1 hour of actual travel in backcountry
B. Helpers set up surprise incident scenario along route if known; at destination if unknown
C. Students travel their planned route; accompanying instructor:
    1. Provides coaching tips on an as-needed basis
    2. Evaluates student performance of skill objectives
D. Students encounter the mock incident
    1. Leadership and coordination must come from within the group
    2. Participants verbalize their thoughts and reasons as they act
E. Repeat the process as time permits
    1. New destinations or exchange destinations
    2. If new destinations, groups can be rearranged

Debrief

- Student debrief
    - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
    - Evaluate student performance

Module Wrap-Up

- Closing Remarks
    - Course alone does not develop proficiency; skills are quickly lost if not used
    - Encourage independent practice
    - Even with proficiency, these skills only reduce risk, not eliminate it
- NSP Student Feedback Survey if IT is not present
- IT debrief with instructors
- Collate & average skill evaluation scores
- Course completion paperwork according to Section 1 of this manual

LEVEL 1 AVALANCHE MODULE 3
ORGANIZED AVALANCHE RESCUE
Course Standards

Target Audience

The NSP Avalanche 1 for Rescue Personnel Module is a specialized Level 1 curriculum specially designed for ski patrollers and other search and rescue organization personnel who may have organized avalanche rescue responsibilities.

Intended Outcomes

- Awareness of special circumstances and decision-making considerations associated with organized avalanche rescue
- Teamwork skills
- Strong organized avalanche search and rescue skills
- Ability to actively contribute to decisions that affect the safety and effectiveness of a rescue team

Prerequisites and Pre-Course Study

Enrollment Prerequisites include:

- Completion of NSP Avalanche Level 1 - modules 1 and 2, or a non-NSP full level 1 course, or refresher, within the previous three years.
- FEMA ICS-100, ICS-200, and IS-700 certifications. Courses may be completed online at https://training.fema.gov/nims/
- Adequately equipped, physically fit, with sufficient travel skills to negotiate steep, ungroomed terrain under all but the most severe weather conditions, both within resort boundaries and in the backcountry.

Pre-course study is highly recommended. See sample study guide in Section 7. If assigned, the instructor must ensure that the course is registered and scheduled far enough in advance for students to obtain materials and have adequate time to complete the assignment.

Time Commitment and Scheduling

The time it will take to complete this course varies due to many factors. Courses are competency based not time based. For planning purposes, the table below lists suggested times for instruction. It is ultimately up to the IOR to schedule lesson times that allow students to reasonably attain learning objectives yet not waste time. See Section 1 of this manual for more detailed guidelines on scheduling.

Suggested Time Distribution

Classroom Topic	Topic Title	Suggested Duration
0	Orientation	15 minutes
1	Principles of Organized Rescue	25 minutes
2	Avalanche Rescue Plans	30 minutes
3	Rescue in Different Settings and Common Mistakes	30 minutes
4	Personnel Safety in Rescue Operations	30 minutes
5	Emergency Care	20 minutes
	Total Classroom Instruction	**2.5 hours**
Field Activities		
1	Transceiver (& RECCO if available) Search	90 minutes
2	Organized Probe Lines & Shoveling	30 minutes
3	Rescue Route Finding	30 minutes
4	Organized Rescue Simulation	90 minutes
	Total Field Instruction	**4 hours**
	Total Minimum Instruction	**6.5 hours**
	Closing discussion, final exam and student survey	1 hour
	Other non-instructional time (travel to and from site)	1 hour
	Minimum Time Commitment	**8 to 9 hours**

This module may be taught independently or combined with Companion Rescue and Modules 1 and/or 2. Scheduling may be flexible to accommodate student, instructor, and facilities availability, as long as it is completed within a single season.

Resources

- Section 1 for course and instructional quality guidelines
- Section 7 for recommended instructional references and other resources

Lesson Guides

Check-in/Orientation

Overview

Orientation may not be necessary if this course is comprised of students from an immediately preceding NSP Avalanche Module 2 course or taught concurrently with other modules. If a large portion of the students are entering fresh, at least some of the following items may be appropriate.

- Ensure all students are properly registered
- Ensure all participants (instructors, students and others) have completed a liability release
- Ensure all students meet prerequisite requirements

If the course is not immediately following a Level 1, Module 1, ensure that all students meet prerequisite requirements. Complete all course check-in as per Module 1 instructions.

Topic 1: Principles of Organized Rescue

Overview

This topic establishes the validity of organized rescue and describes how an organized avalanche rescue operation may be conducted under ICS emergency management principles.

Students should have some prior background, through pre-course reading and ICS prerequisites. Assess first—avoid lecturing on material they already know.

Customize for the nature of your audience. Resort patrols may have detailed local plans that can be implemented with an IC and one or two team leaders, but some agencies may show up with a portable command post, complete with an ICS overhead team, but very general avalanche rescue plan.

Concluding Objectives—students should be able to:

- Describe the importance of having organized rescue response
- Describe the functional goals of organized rescue operation
- Explain the basic concept and features of ICS

Key Terms

- ICS
- Logistics
- Organized rescue
- Resource
- Rescue stages
- Section
- Team

Sample Set

Although you may hear that rescue by companions is an avalanche victim's best chance for survival, the fact remains that most avalanche rescue attempts ultimately involve organized

search and rescue operations. Not all backcountry groups have the training and equipment that organized rescue teams have. They don't all have sufficient survivors to conduct an effective search. They lack the manpower, equipment or skills needed to care for or evacuate injured or otherwise disabled victims. They are not prepared to bring out their dead.

In Europe, where most avalanche rescue is carried out by specialized response teams with mechanized transportation, the percentage of live rescues is significantly greater than in the U.S. However, organized search and rescue operations in the U.S. are steadily improving and gaining greater support. Your participation is helping this effort.

Content

A. Comparison between companion rescue, group rescue and organized rescue capabilities
    1. Response time
    2. Manpower
    3. Equipment
    4. Medical support
    5. Logistics
    6. Evacuation
B. Reasons for initiating an organized rescue response
    1. Likelihood of trauma
    2. Loss of vital equipment
    3. Lack of preparedness of companions
    4. Remaining or increasing hazard
    5. Onset of darkness
    6. Consequences of delay
C. Means for summoning help
    1. Cell phone
    2. Personal locator beacon (PLB/SPOT)
    3. Radio
    4. Sending someone for help
D. Organized rescue resources
    1. Trained personnel
    2. Pre-positioned resources
    3. Standard response organization and management
    4. Effective teamwork
    5. Communications network
    6. Interagency cooperation and coordination
    7. Mechanized transportation
E. Hazard Assessment
    1. Hazard assessment completed prior to dispatching teams
    2. Follow-up assessments ongoing through deration of field operations
F. Functional Objectives
    1. LAAST
        a. **L -** locate
        b. **A -** access
        c. **A -** assess
        d. **S -** stabilize
        e. **T –** transport

2. Search (Locate)
    a. Personnel dispatched in teams of three to six people with a leader
    b. First team out
        1) Marks safe route to incident site
        2) Determines if site is safe to enter
        3) Starts immediate search
    c. Following teams
        1) Probe lines
        2) Dog team
        3) RECCO detector with operator
3. Rescue (Access, Assess & Stabilize)
    a. Extrication
    b. Medical care
        1) Patrollers/EMT/paramedics/MD dispatched in units of three to six people with a leader
        2) Equipment
            a) Trauma packs, blankets, Oxygen, ALS gear, etc.
            b) Sleds, litters, other transportation gear
4. Transportation/Evacuation (Transport)
    a. Need
        1) Victims frequently disabled, sometimes trapped
        2) Lost equipment (victim's or companion's)
        3) Approaching darkness or increasing danger
    b. Transport options
        1) Self
        2) Toboggan
        3) Mechanized surface transport
        4) Helicopter
5. Logistics support for rescuers (varies with size and complexity of operation)
    a. Equipment and supplies for operation
        1) Transportation
        2) Communications
        3) Specialized equipment
    b. Rescue personnel support
        1) Food, water, extra clothing
        2) Sanitation
        3) Shelter

G. Management by ICS

H. Typical progression of events
1. Incident reported
    a. First person contacted holds onto reporting party or witness (face-to-face or keeps online if by telecommunications)
    b. Information to gather/report
2. Designated IC assumes command
    a. Sets up ICP
    b. Uses prepared plan or customizes to fit circumstances
    c. Assembles Immediate Search team
    d. Notify Dispatch when ready

3. Travel to incident site
    a. Safe route
    b. Mark with flagging wands (any color other than blue, red or yellow)
    c. Alert IC if route is not suitable for transport of heavy or mechanized equipment
4. Upon arrival, evaluate site safety
    a. If additional hazard exists, do not enter site
        1) Call in control team, if possible
        2) Wait until condition stabilize
    b. If safe, enter after establishing emergency exit
5. Commence Immediate Search
    a. If companion search underway, interview leader
        1) Determine and mark LSA
        2) Areas searched & how
    b. Plan & execute
        1) Situational analysis
        2) Integrate available resources
        3) Determine what, where & how
        4) Assign resources to execute
6. Follow-through
    a. Additional search teams
    b. Medical/evacuation team
    c. Logistics support teams
7. Subject(s) located, uncovered & extricated
    a. Provide medical care
    b. Prepare for transport and evacuate
8. Rescuers on site gather gear, return to base, check out
9. Leaders deal with administrative aftermath (documentation)

I. Documentation
    1. What is necessary
    2. Who documents

J. Extended operations
    1. Reasons for and against
    2. When to initiate/When to cease
    3. Resources needed

Suggested Demonstrations/Activities

- Begin each discussion point with a question to find out what students already know. Record student responses on whiteboard or flip chart, then display instructor list for comparison.
- Find out if any students are in an organization that uses ICS and, if so, have them describe how the management structure is adapted for what they do.
- Assign each student to a rescue role; have them group up with their leaders in an "organization chart" type of formation.
- Have a "witness" enter the classroom to report an avalanche; observe how students respond, up to the point of leaving the room. Stop & discuss what transpired.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- How does organized rescue response fit into most avalanche incidents?

- What are some reasons for delaying efforts to get outside help?
- What are some consequences associated with delay in seeking organized rescue response?
- How does organized rescue response fit into trip planning?
- What are the main stages of organized avalanche rescue?
- What emergency response system is used to manage organized avalanche rescue? Why?

Topic 2: Avalanche Rescue Plans

Overview

Now that students have a general idea of how organized rescue works, the next step is to apply it to local realities. If taught to resort patrollers, use that area's rescue plan as a foundation for the class. If taught for a SAR organization, use that organization's plan. If the area where the course is taught does not have a plan, create a notional plan that will serve as a basis for the class organized rescue exercise.

Concluding Objectives—students should be able to:

- Describe the importance/usefulness of a rescue plan
- Describe generic rescue plan components
- Evaluate a local area's specific rescue plan and procedures
- Identify agency, area management and team responsibilities in the rescue plan

Key Terms

(None)

Sample Set

In most states, the county sheriff has legal responsibility for search and rescue functions (state police in Alaska). The sheriff may delegate in-bounds avalanche search and rescue operations to area management who, in turn, assigns the responsibility to the area patrol, but that is not always the case. For out-of-bounds rescues, many sheriffs have their own SAR teams for backcountry incidents but may request resort patrol resources to augment those teams. An avalanche incident plan is thus necessary in order to train, obtain appropriate equipment and arrange for mutual aid resources. Here we will take time to examine your organization's specific plan, or, if unavailable, examine a generic plan to estimate how you might fit into it and how to prepare for a likely role.

Content

A. Discussion: importance/usefulness of a rescue plan
    1. Advantages
    2. Limitations
B. Plan components
    1. Plan initiation
    2. Rescuer notification
    3. Contingent responses
    4. Key leadership positions and responsibilities
    5. Equipment
        a. What
        b. Where
        c. How managed
    6. Supporting agencies

   a. Who
   b. Why
   c. Contact info

C. Plan Objectives
   1. Immediate Search—get rescuers safely to the site; find, uncover and extricate buried subjects
   2. Medical
      a. Life support
      b. Stabilization
      c. Packaging for transport
      d. Death issues
   3. Transportation/Evacuation
   4. Logistics support
   5. Resource management —personnel and equipment
      a. Check in-out
      b. Storage/Camp
      c. Staging areas
      d. Support for searchers
         1) Hydration/food
         2) Spare clothing (gloves, socks, parkas)
         3) Sanitation supplies/privacy screen
         4) Shelter
      e. Outdoor lighting if operation extends into the night
      f. Communications
      g. Dedicated phone lines, radio channels
   6. Common language
      a. Limited to essential information
   7. Documentation (standard forms)

D. Leadership
   1. Incident Commander
   2. Section Chiefs
   3. Immediate Search Team Leader
   4. Site Leader
   5. Other team leaders
   6. Span of control

E. Special Roles
   1. Dispatch
   2. Scribes
   3. Command Staff

F. Snow safety plan
   1. Ongoing hazard evaluation
   2. Route to scene
   3. At scene
      a. Evacuation route
      b. Control resources and strategy

G. Resources Discussion
   1. Search resources
   2. Medical care

3. Transportation
4. Logistic support
5. Outside resource availability

H. Rescue plan development/evaluation activity
   1. Handling initial report
      a. Sources and modes
      b. Information to request
      c. Maintaining contact with the reporting party
   2. Alert and response plan
      a. Entities to notify (local example)
      b. Pre-designated leadership
      c. Search resources
         1) Available on site
         2) Need to request
         3) Staging areas
      d. Who dispatches & tracks
   3. Resources for medical evaluation/care
   4. Resources to evacuate subject(s)
   5. Resources for logistics support

Suggested Demonstrations/Activities

- Show rescue equipment (immediate search, medical/evacuation) necessary to fulfill the rescue plan.
- Hand out a generic planning form. As each feature of the plan is discussed, have students enter personnel/other resources available at their area that would be brought into play.
- Divide the class into three groups. Give each group a copy of the local avalanche alerting and rescue plan or a notional plan. Have each group diagram and report on one of the following plan components:
  - Operational sequence and flow of manpower/materials
  - Operation growth, coordination and succession of leadership, communication
  - Agency representation, influence on the operation and resource contributions
- If the class has members who do not have any specific avalanche rescue plan divide them into small groups to develop one.

Suggested Questions for Summary/Evaluation

- What did you learn from this presentation? (What else?)
- Why does each area or SAR organization need its own avalanche alerting and rescue plan?
- What features must any avalanche alerting and rescue plan include?
- Why must every avalanche rescue plan incorporate ICS protocols?

Topic 3: Rescue in Different Settings and Common Mistakes

Overview

Students should have read the NSP Avalanche Rescue Fundamentals text, so this should be conducted as an interactive discussion instead of a lecture/presentation. If a multimedia presentation is used, its content should contain mainly questions to extend student thinking beyond the recall level.

Concluding Objectives—students should be able to:

- Describe different settings for avalanche rescue
- Compare and contrast special problems associated with the different settings
- Identify special tactics and techniques for unconventional rescue situations
- Describe common rescue mistakes
- Describe strategies, tactics and tools that help avoid significant mistakes

Key Terms

- Side-country
- Backcountry
- Highway
- Urban

Sample Set

Avalanches do not just affect individuals. They can come down into resorts, urban and suburban areas, transportation routes, power transmission and other utility structures. These different settings often require different rescue approaches and resources.

Content

A. Descriptions of special settings and considerations
    1. Mountain resorts
        a. Existing plans and resources
        b. Special challenges
            1) User density
            2) Lifts
            3) Buildings
            4) Parking lots
        c. Rescue strategies
    2. Side-country
        a. Definition/Description
        b. Legal authority and agency involvement
        c. Special challenges
        d. Plans and resources
        e. Rescue strategies
    3. Backcountry
        a. Definition/Description
        b. Legal authority and agency involvement
        c. Special challenges
        d. Resources available
        e. Planning Strategies
        f. Rescue strategies
B. Highway
    1. Definition/Description
    2. Legal authority and agency involvement
    3. Special challenges
    4. Plans and resources
    5. Rescue strategies
C. Urban
    1. Definition/Description

2. Legal authority and agency involvement
3. Special challenges
4. Plans and resources
5. Rescue strategies

D. Common Rescue Mistakes
   1. Types
      a. Poor organization
         1) Description & examples
         2) Strategies for avoidance
      b. Poor communications
      c. Mishandling the witness
         1) Description & examples
         2) Strategies for avoidance
      d. Inadequate search
         1) Description & examples
         2) Strategies for avoidance
      e. Jurisdictional competition
         1) Description & examples
         2) Strategies for avoidance
      f. Inadequate personnel safety
         1) Description & examples
         2) Strategies for avoidance
      g. Misconceptions
         1) Description & examples
         2) Strategies for avoidance
   2. Overall mistake reduction
      a. Communication
      b. Situational awareness
      c. Checklists and forms
         1) Sample forms in ARF Appendix
         2) NSP Avalanche Rescue Quick-Guide

Suggested Demonstrations/Student-Centered Activities

- Describe a hypothetical or actual incident. Have students identify the setting and describe hypothetical planning and rescue strategies for the incident; describe agencies that may play a role in the rescue and what resources and limitations they may bring to the rescue situation.
- Analyze mistakes made during a mock search.

Suggested Questions for Student Summary/Evaluation of Learning

- What is the most likely avalanche incident setting that will involve patrollers? (Accept all justified responses.)
- How would you go about integrating yourself into an urban, front country or highway avalanche rescue operation that is already underway when you arrive?
- What is the root cause of most rescue mistakes? How can this situation be avoided?
- How does the use of standardized forms help reduce rescue errors?
- What is the purpose of the NSP *Avalanche Rescue Quick-Guide*?

Topic 4: Personnel Safety in Rescue Operations

Overview

Rescuers face many of the same human factor challenges as recreationists, plus special pressures associated with the urgency of a rescue situation as well. Students should be led through games, scenarios, selected readings and discussion to get in touch with their own thinking processes and methods for coping with emotional influences. Presenting case studies of rescuers getting into trouble in their haste to save others helps to emphasize the points being made here.

In the risk management world, avalanche rescue would be considered a Red Flag operation because it is a high risk, low frequency event. People taking part in these operations must rely on their knowledge and training because actual experience is limited. People who make a career of emergency response (law enforcement, fire fighters, military, etc.) have common traits. They have plans, procedures and protocols based on lessons learned from past (occasionally tragic) experiences. They practice, test and modify their plans, procedures and protocols through periodic drills and exercises to develop confidence in them. They practice as teams and develop confidence in each other. This is the source of their discipline—their ability to shut out emotional responses and do what they were trained to do.

The general principles of route selection, based on application of the combined effects of terrain, weather and snowpack, form the foundation for making appropriate decisions. In addition, rescue personnel, especially the first unit dispatched, must consider not only their own safety, but everyone else who follows; especially those who may be hauling heavy equipment to the site.

Concluding Objectives—students should be able to:

- Describe situational conditions typically associated with organized avalanche rescue
- Describe special decision-making traps associated with rescue situations
- Identify probability consequences of decision-making mistakes in rescue operations
- Describe factors and conditions that influence route selection and safety in rescue operations
- Identify methods that help objectify decision-making

Key Terms

(none)

Sample Set

Organized rescue brings a new dimension to human factors and decision making. This lesson will compare and contrast some of these factors and their implications for leadership as well as individual safety.

Content

A. Special Problems
    1. Situational conditions
        a. No destination options
        b. Limited route and approach options
        c. May or may not be familiar terrain
        d. Incident indicates high hazard regardless of forecasts
        e. Visibility issues
        f. Diversion of patroller resources

1) Need to reevaluate other in-area slopes
2) Need to keep unaffected parts of area open and covered

2. Human
   a. Internal emotional pressure
      1) Urgency of situation
      2) "Heroics"
      3) Preparation perceived as "delays"
         a) Gathering sufficient equipment & personnel
         b) Gathering hazard assessment data
         c) Mapping probability route & hazardous areas
         d) Selecting and marking safe routes to accommodate different modes of travel
         e) Tracking/documentation of resources
   b. External emotional pressure
      1) Victim's relatives/companions
      2) Press coverage
   c. Narrow focus on objective blinds leaders to condition of personnel
      1) Fatigue
      2) Dehydration, lack of nourishment
      3) Under equipped/overloaded
      4) Under/over dressed

B. Consequences
   1. Team inefficiency
   2. Lack of equipment
   3. Lack of adequate training/skills
   4. Physical exhaustion
   5. Hypothermia/ frostbite
   6. Falls & injury
   7. Rescue party gets caught by another avalanche
      a. Original rescue put on indefinite hold
      b. Probability loss of key personnel/resources
      c. Additional victims to rescue

C. Coping with human factors in rescue operations
   1. Iron-clad rule: Never put the mission ahead of safety; any mishap compromises the effectiveness of the rescue mission. No-go is always an option
   2. Rescuers must be aware of their physical and emotional state and communicate openly and frankly with team leadership.
   3. Assume dangerous avalanche terrain ahead (Bull's-Eye)
   4. Become familiar with avalanche terrain in their operational area
      a. Make periodic snowpack stability assessments
      b. Observe typical wind loading/scouring patterns
   5. Throw out all assumptions of safety if atypical weather patterns are involved
   6. Use teamwork
      a. No one works alone
      b. Keep within ICS span of control guidelines
   7. Train together
   8. Develop a rescue plan
      a. Protocols to support objectivity and discipline
      b. Leadership and checklists to enforce discipline

9. Practice the plan
    a. Advance familiarization
        1) Terrain
        2) Weather, snowpack and avalanche history
        3) Pre-marked maps
            a) 30°-50° slopes
            b) Usual wind direction during storms
            c) Known slide paths
            d) Departure points and initial routes
    b. Equipment
        1) Rescue pack
            a) Extra transceivers
            b) Probes
            c) Shovel
            d) Flagging wands (Describe ICAR standards as well as local protocols, if any)
                (1) Route to site (any color except blue, red or yellow)
                (2) Clues (blue)
                (3) Area(s) searched (red)
                (4) Deposition zone boundaries (yellow)
    c. Pre-packed personal gear
        1) Transceiver
        2) Probe
        3) Shovel
        4) First aid kit
        5) Food/water
        6) Extra clothing
        7) Emergency bivouac gear
        8) Cell phone/radio
        9) Compass/GPS
    d. Practice avalanche SAR skills
        1) Navigation with map and compass/GPS
        2) Hazard assessment
        3) Transceiver search
        4) RECCO search (if available)
        5) Probing and shoveling
10. Leadership
    a. Team equipment check
    b. Communications
    c. Pre-departure briefing
        1) Review avalanche risk reduction with group
        2) Communication
        3) Spacing
        4) Hazard assessment
        5) Initial data
        6) Frequency and locations for reevaluation
        7) Acceptable/unacceptable hazard levels
        8) Turn-back criteria and options
        9) Actions if there is an emergency

d. Check function of transceivers
e. Leave roster of rescue party members

11. En route
    a. Stay alert for terrain traps
    b. Mark route
        1) Safe for others
        2) Appropriate for equipment to follow, if possible
            a) Alert leadership if route selected is inappropriate for transporting heavy gear
    c. Strict adherence to safe travel rituals
        1) Route selection for rescue operations
            a) Windswept ridges
            b) Gentle terrain (nothing hazardous above)
            c) May vary with most recent/ongoing storm activity
            d) Approach incident site from above, if possible
                (1) Less exposure to hazard for rescue team
                (2) Vantage point for assessment of additional hazard
                (3) Explosives mitigation may be necessary before approaching
        2) Considerations if it's necessary to approach from below
            a) What to look for
                (1) Along the way
                (2) Approaching the site
        3) When to delay/postpone approach
12. Stay alert—"usually safe" is not necessarily safe under current conditions

Suggested Demonstrations/Student-Centered Activities

- Create scenarios that will generate discussion of human factors and how to counter them.
- Have students read and analyze case studies where rescuers contributed to the overall problem by putting themselves at risk.
- Use area-specific slides with personal information.
- Demonstrate the use of scales that translate contour interval spacing into corresponding slope angle (found on many slope meters and crystal cards).
- Demonstrate ways to mark direction of prevailing winds and solar aspect on contour maps.
- Show a map marked with probability hazardous areas and appropriate routes to a variety of destinations.
- Discuss ways to minimize exposure to hazards. Use case histories to promote discussion and develop concepts.
- Compare a map and a photo of complex terrain that contains obvious terrain traps. Have students note that maps are useless in preparing for these small-scale but deadly places. Plans are a good start, but not the complete risk management picture.
- Show a route-finding slide set as part of a multimedia presentation that illustrates relatively safe and less safe terrain.
- Use case histories to illustrate consequences of poor route selection.
- Ask students to reevaluate route selection if sleds, backboards, bundles of probes and/or other rescue support supplies need to be transported to an incident.

Suggested Questions for Student Summary/Evaluation of Learning

- What did you learn from this presentation? (What else?)
- What is the first rule of rescue?
- What is the single greatest factor in avalanche hazard and incidents?

- How do emotions, desires and beliefs tend to affect human judgment and decision-making?
- How does a rescue situation influence making safe travel decisions?
- What should be the basis for making travel decisions for avalanche rescue?

Topic 5: Emergency Care for Avalanche Victims (Optional)

Overview

This topic is already covered in NSP Level 1 Avalanche Modules 1 and 2. If a significant number of students took a Level 1 avalanche course from a non-NSP provider and have not had something similar, it should be covered here. Students need to be aware that avalanche rescue nearly always constitutes a medical emergency, and they need to be aware of special circumstances they may encounter.
If presenting this topic, refer to the lesson guide and presentation for L1A-M1 Topic 7.

Transportation considerations:

- Transportation from extrication site to safe site
- Temporary shelters needed for patient care prior to final transportation
- Options for final transportation
    - Improvised toboggan
    - Over-snow machines (snowmobiles, snow cats, etc.)
    - Helicopter

For training in improvised transportation and shelters NSP Mountain Travel and Rescue training courses are advised.

NSP does not offer helicopter safety training but makes the following recommendation for professional rescue organizations (patrols, SAR groups, and others involved in rescue operations)

- Obtain basic helicopter safety training for all members who may be involved with helicopter operations
- For recommended basic safety training providers see Section 7

Field Activity 1: Transceiver Search

Overview

This session provides additional search strategies and skills, including transceiver searches by more than one rescuer, and transceiver search for multiple and deep burials. If RECCO is available, familiarization should be included here.

Concluding Objectives—students should be able to:

- Conduct effective transceiver searches over large debris areas using multiple searchers
- Conduct effective transceiver searches of multiple burials in close proximity to each other
- Conduct a simple RECCO search (if available)

Sample Set

Organized rescue personnel are expected to exhibit higher level rescue skills than recreationists. This gives you an opportunity to refine your skills gained in your Avalanche 1 course (and perhaps to provide some hands-on practice with RECCO).

Recommended Activities

A. Transceiver Search over a large area
   1. Set-up
      a. Mark off a 100 m X 100 m area on a slope. Use bamboo poles or flags to mark 20 m intervals along the perimeter.
      b. Bury one transmitting transceiver (or two widely-spaced transceivers) in the search area.
   2. Signal search demonstration
      a. Single Searcher
      b. Multiple searchers
   3. Guided practice
   4. Independent practice and skill evaluation

B. Locating two closely-spaced transceivers
   1. Set-up
      a. Bury sets of three target transceivers, 3-8m (10-25') apart, with enough separation between pairs so students can search for them independently.
      b. Place a probing target over each buried beacon.
   2. Demonstrate
      a. Three-circle
      b. Micro-strip
   3. Guided Practice
      a. Divide students into pairs, one pair to each multiple burial search site
      b. Have both students search for the first beacon then have each search for the second transceiver, one using the three-circle technique and the other using micro-strip technique. Have them search for the third transceiver via the other technique.
   4. Independent practice and evaluation

C. RECCO
   1. Set-up
      a. Multiple RECCO reflectors buried randomly; demonstration area in the middle
   2. Demonstration
      a. Features
         1) Directionality
         2) Range
         3) Simple transceiver receiver
      b. Basic search procedure
      c. Probability problems associated with RECCO search
         1) Attenuation by body, wet snow, etc.
         2) Other rescuers (including dogs) wearing reflectors
         3) Interference
   3. Practice
      a. Students take turns finding reflectors
      b. Coach as necessary

Debrief

- Student debrief

  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Activity 2: Formal Probe Lines

Overview

Students should already be familiar with spot-probing but may or may not have been introduced to formal probe lines. This activity is intended to bring everyone up to a common level.

To be effective, the probe line needs to have both speed and precision. Above all, probe lines need to be deployed over avalanche debris that is most likely to contain the victim(s). This exercise provides practice in developing those skills.

Concluding Objectives—students should be able to:

- Select most likely burial areas
- Properly align and space probes
- Distinguish between strikes with probability human bodies and other objects
- Lead an organized probe line with and without a guide cord

Suggested Activities

A. Demonstrations/ Discussions
   1. Probes
      a. Single-piece and sectional
      b. Length and rigidity
      c. Alignment and spacing
         1) Plumb
         2) No lateral force on probe shaft (minimize tip deflection)
         3) 3 holes per person, spaced 50 cm (20") apart
         4) If not previously discussed in the classroom, explain Probability of Detection (POD) and Time of Detection (TOD) statistics using 50 cm X 50 cm spacing.
   2. Guide cord
      a. Colors to align probers
         1) 50 cm spacing
      b. Knots in cord to measure 50cm forward advance
         1) Increases both speed and accuracy
         2) Allows offset for 99+% POD on second pass, if needed
         3) Requires additional personnel & markers
   3. Shoveler(s)
      a. Number & equipment
      b. Functions
   4. Where to start
      a. Review how to determine most likely burial area
      b. If in doubt begin at toe
   5. Size of probe line
      a. ICS span of control guidelines
      b. Advantages of multiple short probe lines over one very long one
   6. Marking Search area (flags/wands)

   a. Red—probed area
   b. Blue—clues
   c. Yellow—debris boundary
7. Shovels and role of shovelers

B. Guided Practice (instructor leads)
1. With guide cord
   a. Align students along guide cord
   b. Go through commands for probing three holes
   c. Advance
   d. Repeat about ten times. Mention:
      1) Need to keep people properly aligned
      2) Need to check tops of probes for differences in probe depth
   e. Technique for producing second pass offset
2. Without guide cord
   a. While lined up with guide cord have probers extend arms to see where adjacent probers make contact with each other (Usually wrist-to-wrist or palm-to-palm).
   b. Advance guide cord 50 cm. Without moving forward, have probers extend their probe hand until the probe meets the cord (usually one arm length). Have probers then walk up to where they have placed their probes and spread their feet apart until they are just inside the probe markers on the guide cord (usually hip/shoulder width).
   c. Practice several probe cycles using only body measurements to maintain spacing

C. Independent practice and evaluation
1. Have students take turns directing the probe line
   a. With and without use of the guide cord.
   b. Alignment for offset second pass

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Activity 3: Rescue Route Finding

Overview

Unlike recreationists, who are already at the incident site searching for a buried companion, organized search operations usually begin from a more remote location, such as a resort boundary gate, inbounds closure, or backcountry trailhead. Rescue teams often have not recently traveled any part of the route. They rarely have much hazard information other than that provided by avalanche centers and the knowledge that the snowpack is unstable enough to be triggered by humans. Furthermore, although the initial immediate search team will travel light, other teams following their marked trail may be heavily loaded. This activity should make students more aware of the complexity of finding a safe and suitable route to an incident site.

If the class is large, and if sufficient equipment is available, it can be divided into small groups of 5-6 people. If sufficient equipment or multiple sites for this simulation is not available, it can be run simultaneously with other field activities, thus providing all class members with something to do.

At this point in the course, the instructor must decide whether to appoint a team leader, or to let this scenario play out to see if leadership spontaneously emerges. If the latter option is exercised, leadership should be discussed during debrief.

Concluding Objectives—students should be able to:

- Use a topographic map and simulated avalanche center data to determine if a safe route to a designated site is feasible
- Gather additional hazard information en route to the site
- Mark a safe route
- Safely and efficiently carry/haul rescue gear along the designated route

Resources

- Topographic map of the local area with the location of a notional avalanche incident
- Notional avalanche center data
- Personal packs with appropriate personal and rescue gear
- Immediate Search pack with a variety of markers
- Bundles of heavy-duty probe poles & shovels
- Sled with pack & backboard
- Oxygen pack
- Instructors accompanying each group to provide additional situational information along the route and to evaluate student participation

Simulation Structure

A. Stage equipment at the simulated departure point
    1. Inform students that an incident has just been reported
    2. Provide location information and topographic map; students find their location and incident location on the map
    3. Incident site should be located a sufficient distance to involve travel over challenging terrain but close enough for two round trips in the time allotted
    4. Provide notional simulated avalanche center information

B. Scenario Management
   1. Students plan route, marking probability hazardous aspects/elevations on the topographic map
   2. Divide students into two teams
      a. Immediate search team—told to get to the incident site as quickly as possible
      b. Medical/evacuation team—told to haul equipment to site using immediate search team route
   3. Teams leave roster of members behind
   4. Immediate search team travels to the site with immediate search gear, marking their trail
      a. Along the way, interject additional hazard information which could cause them to consider
         1) Turning back
         2) Altering their route
      b. Once at the site, begin immediate search
   5. Medical/evacuation team departs 3-5 minutes after immediate search team, hauling the heavier equipment to the site along their previously marked trail.
   6. Exercise ends with arrival of medical/evacuation team

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Activity 4: Organized Rescue Simulation

Overview

This is where students demonstrate their ability to function as effective members of an immediate search team and have their skills evaluated. All roles of the rescue operation should receive attention. Instructors or volunteer "extras" should perform roles as witness, IC, medical/evacuation and logistics functions, allowing all students to be engaged in the on-site immediate search operation.

By now, students should be aware that things done in haste tend to be counterproductive and that external pressure to hurry needs to be resisted. Instructors should inject such pressures into the simulation to see how well students remain calm and methodical.

Concluding Objectives—students should be able to:

- Demonstrate appropriate handling of a witness and gathering pertinent initial information
- Demonstrate appropriate incident reporting/alert
- Demonstrate safe and efficient travel to the incident site
- Conduct effective initial search, appropriate medical treatment and transport of "victim(s)"
- Demonstrate effective accounting for rescue operation personnel

Suggested Activities

A. Set-up
   1. Site selection
      a. 25° or steeper slope, preferably a recognizable avalanche slope that is deemed safe
      b. Out of traffic
      c. Travel required
   2. At least three dummies
      a. One with transceiver
      b. One without transceiver in catchment area
      c. One without transceiver near toe
      d. Arrange surface clues with a pattern that very roughly points toward catchment of one victim
   3. Possible roles for instructors or other helpers
      a. IC
      b. Section chiefs
      c. Distractors for student leaders to deal with
      d. Press
      e. Law enforcement personnel
      f. Friends/relatives of "victims"
B. Alarm
   1. Surprise if possible
   2. Begin timing upon initial notification (for post-exercise feedback only—students should not be pressured to meet predetermined time goals)
C. Rescue Operation
   1. Have students conduct the operation
   2. Use Avalanche Rescue Evaluation and Feedback Guide in Section 7

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Module Wrap-Up

- Closing Remarks
  - Course alone does not develop proficiency; skills are quickly lost if not used
  - Encourage independent practice.
- Written final exam
- NSP Student Feedback Survey if IT is not present.
- IT debrief with instructors
- Collate & average skill evaluation scores
- Course completion paperwork according to current NSP procedures plus division, region and/or patrol requirements.

LEVEL 1 AVALANCHE MODULE 4 (MODULES 1 AND 2 REFRESHER)

Course Standards

Introduction

Avalanche course certification has no expiration date and therefore recertification is not required at the national level. However, refreshing fundamental knowledge and skills with this module at least every three years is strongly recommended. This refresher is a prerequisite for enrollment in both the Level 1 Module 3 and the Level 2 Avalanche for Rescue Personnel courses, if prior certification is more than three years old.

Students may already have well-developed knowledge and skills. They should be identified and treated as peer-teaching resources. On the other hand, the instructor must be prepared to control the tendency for such individuals to dominate discussion, to the detriment of full participation by less prepared students.

Target Audience

People whose Level 1 Avalanche knowledge and skills need updating or reinforcement

Intended outcomes

- Reinforce prior learning that is still valid
- Acquire updated knowledge and skills

Prerequisites and Pre-Course Study

Enrollment prerequisites include NSP Level 1 Avalanche Modules 1 and 2, or any prior full avalanche education course that meets American Avalanche Association (A3) Level 1 standards and guidelines

Home study, using an assigned text and study guide is highly recommended. This encourages discussion-based, active, higher-level learning, rather than lecture-based, passive absorption of content.

Time Commitment and Scheduling

The time it will take to complete this course varies due to many factors. Courses are competency based not time based. For planning purposes, the table below lists suggested times for instruction. It is ultimately up to the IOR to schedule lesson times that allow students to reasonably attain learning objectives yet not waste time. See Section 1 of this manual for more detailed guidelines on scheduling.

Suggested Time Distribution

Session	Session Title	Suggested Duration
1	Classroom: Avalanche Classification and Contributory Factors	0.5 hour
2	Classroom: Risk Management & Rescue Principles	1 hour
3	Field: Hazard Evaluation and Safe Travel	1.5 hours
4	Field: Rescue Skills	1.5 hours
5	Field: Small Group Rescue Simulation	1 hour
6	Classroom: Debrief & Summary	0.5 hours
	Total Instruction time	**6 hours**
	Final Written Exam, Student Survey	1 hour
	Other non-instructional time on site	1 hour
	Estimated total minimum time commitment	**8 hours**

Scheduling may be flexible to accommodate student, instructor and facilities availability; however, the course must be completed within a single season.

Resources

- Section 1 for course and instructional quality guidelines
- Section 7 for recommended instructional references and other resources

Refresher Frequency

An Avalanche 1 refresher at least once every three years is highly recommended, but it is an individual or organizational choice. Individual organizations must schedule refreshers to maintain a proper student/instructor ratio and still accommodate all members needing to be refreshed.

Grading

Same as for full course

Lesson Guides

Classroom Topic 1: Avalanche Classification and Contributory Factors

Overview

This reviews the basic nature of avalanches, classification of avalanche types, contributory factors and how they relate to instability and avalanche release mechanisms. Human factors are also reviewed in terms of decision-making and vulnerability.

Considering that students are already acquainted with this curriculum and may have completed a pre-course study guide, lecture should be minimized. Use questions, case studies and "what if" scenario exercises to challenge student recall and thinking about the content. Present information only if updating or providing correction is necessary.

Concluding Objectives—students should be able to:

- Identify/describe principal types of avalanches
- Identify critical factors that contribute to avalanche probability
  - Weather
  - Snowpack
  - Terrain
  - Human

Content

A. Avalanche Classification
   1. Types (brief descriptions)
      a. Loose snow
      b. Slab
      c. Cornice collapse
      c. Ice
      d Roof
      e Glide
      f Slush
   2. Generic avalanche path anatomy (students identify)
      a. Starting zone
      b. Track
      c. Runout
      d. Toe
   3. Slab avalanche anatomy
      a. Crown
      b. Crown face
      c. Crown line
      d. Flanks
      e. Bed surface
      f. Slab
      g. Stauchwall
   4. Size
      a. Relative to path (R1-R5)

   b. Relative to destructiveness (D1-D5)

B. Avalanche Triangle—Weather Factors
   1. Precipitation (per SWAG)
      a. Precipitation types (include rime & surface hoar)
      b. Snowfall rate (inches/cm per hour) and critical rate by climate zone
   2. Snow density and SWE
      a. Precipitation intensity and critical intensities by climate zone
   3. Wind loading
      a. Critical wind velocities
      b. Visible clues
      c. Consequences
   4 Temperature effects on snowpack
      a. Radiation relative to
         1. Atmospheric temperature
         2. Snow temperature
      b. Storm temperature
         1. Warm storms
         2. Cold storms
         3. Warm to cold storms
         4. Cold to warm storms
      c. Rapid warming, regardless of other weather factors
      d. Warm Days with cold, clear nights
      e. Prolonged cold temperatures
      f. Prolonged warm temperatures
      g. Prolonged overcast
      h. Inversions
   5. Sources of weather data

C. Avalanche Triangle—Snowpack Factors
   1. Attributes
      a. Layers
      b. Cohesion
      c. Adhesion
      d. Visco-elastic properties
      e. Deformation and fracture
   2. Metamorphism
      a. Rounding
      b. Faceting
      c. Melt-freeze
   3. Crust formation
      a. Types
      b. Formation processes
   4. Persistent weak layers
   5. Instability
   6. Critical surface observations
      a. Hollow/drumming sound underfoot
      b. Whumpfing sound underfoot
      c. Shooting cracks
      d. Cornices

e. Snow pillows
f. Wind slabs, especially margins
g. Crusts
h. Signs of scouring
i. Surface hoar
j. Rime
k. Graupel pool
l. Deep penetration in wet snow

7. Subsurface observations
   a. More consolidated layer on top of less consolidated (slab)
   b. Buried persistent weak layers or interfaces
   c. Tests for fracture and propagation sensitivity
      1. Shovel Shear Test (locates fracture planes)
      2. Compression Test (quantifies force needed to fracture)
      3. Extended Column Test (fracture & propagation)

D. Avalanche triangle—terrain factors
   1. Slope angles
      a. Type and frequency of avalanches
      b. Measurement
   2. Critical aspects
      a. Relative to radiation
      b. Relative to wind
   3. Slope shape (contour)
      a. Convex
      b. Concave
      c. Planar
   4. Terrain Traps
      a. Confined paths (chutes, couloirs, etc.)
      b. Gullies
      c. Abrupt transitions
      d. Paths through trees, rock bands, etc.
   5. Recognizable paths
      a. Vegetation clues, including lack of vegetation
      b. Debris piles
   6. Sun/shadow lines
   7. Cornices

E. Avalanche dynamics
   1. Loose avalanche release
   2. Slab avalanche release
      a. Initiation
      b. Propagation
      c. Release
   3. Cornice Collapse
   4. Wet snow release
      a. Loss of cohesive strength due to melting bonds
      b. Release can be either loose snow or slab

Suggested Demonstrations/Student-Centered Activities

See suggestions described in appropriate Module 1 lesson guides.

Suggested Questions for Student Summary/Evaluation of Learning

See suggestions described in appropriate Module 1 lesson guides.

Classroom Topic 2: Risk Management and Rescue Principles

Overview

This session is devoted to applying the assessments reviewed in Topic 1, particularly in the area of planning. Planning encourages safety as forethought rather than afterthought and initiates the most important aspect that addresses nearly all human-factor challenges—communication. Likewise, preparing for the prospect of rescue can also reinforce the concept that avoidance is the better alternative.

If feasible, this session can comprise actual planning for Field Session 1, in which each group plans an actual trip to a separate destination. If this approach is taken, the following lesson guide can be used by each small-group instructor to help provide structure and substance to the planning conversation.

Concluding Objectives—students should be able to:

- Describe the role of human factors in avalanche hazard
- Describe methods for gathering hazard information prior to departure
- Develop a travel plan based on available data and safe travel values
- Describe appropriate decision-making and practices for travel in avalanche terrain
- Describe general principles for conducting an effective companion search and rescue

Content

A. The human factor (students supply examples)
    1. Definitions
    2. Humans as triggers
    3. Decision-making types
        a. Type 1 (intuitive)
            1) Impediments to sound judgment
                a) Influenced by
                    (1) Emotions
                    (2) Feelings
                    (3) Desires
                b) Heuristics-based
                    (1) Acceptance
                    (2) Halo effect
                    (3) Availability
                    (4) Tunnel vision
                    (5) Risk perception and tolerance
                    (6) Equipment
                    (7) Weather
                    (8) Economics
                c) Group dynamics

(1) Safety in numbers
(2) Herding instinct
(3) Group size

b. Type 2 (rational)
1) Not possible within human thought
2) Type 1 will always influence

B. Risk Management Principles
1. Advanced planning
a. Use of avalanche center bulletins
1) Features
2) How to apply to area to be traveled
b. Pre-marking route and probability hazardous areas on topographic map
1) Map software
c. Predetermined reassessment points along planned route
d. Alternate routes, destinations, activities
2. Fact-based decisions
3. Communication about human factors
a. Susceptibility to risk perception and tolerance
b. Equipment & skills
c. Group size
d. Watching out for each other
4. Decision-making process & aids
a. Obvious Clues (ALPTRUTh)
1) Avalanche activity within last 48 hours
2) Loading (recent, present, near future)
3) Path
4) Terrain
5) Rating
6) Unstable snowpack
7) Thaw instability
8) Usage ("Yes" count indicates relative danger)
a) 1-2 = use normal caution
b) 3-4 = use extra caution
c) 5+ = don't go
b. Avalanche Hazard Checklists
1) Snow Sense version
2) NSP version
c. Avaluator
d. Others (what do students use?)
5. Safe travel "rituals"

C. Self-Rescue techniques
1. Escape
2. Defense/Survival
3. Survival devices
4. Reality checks

D. Companion rescue
1. Principles
a. Rescuer safety first—no additional casualties

   b. Quick response
   c. Call for help immediately, if possible
   d. All present assist with search
2. Process
   a. Note where caught & direction of travel
   b. Identifying LSA
   c. Select a leader (Why?)
   d. Assessing residual hazard—what to do if it exists
      1) Decision to delay search is very difficult when companions are involved
   e. Always carry personal equipment
   f. Mark LSA
   g. Transceiver search (How many people necessary?)
      1) All non-searching transceiver turned off
   h. What to do upon finding a clue
   i. Using clues and debris flow pattern to determine likely path of victim
   j. Spot probe likely catchments (describe)
   k. Occasionally call out and listen
   l. Do not
      1) Contaminate search area
      2) Displace or destroy clues
   m. Work silently—use eyes and ears
   n. Only form probe line when all other options have been exhausted, and if a sufficient number of rescuers and equipment is available
   o. What to do upon probability strike

E. Second Party Search
1. Safe route and access to scene
2. Leadership concerns
   a. Integrating combined resources
   b. Overlooked functions
3. Multiple burial situations
4. Contacting outside help ASAP without sending people away
   a. Reasons
      1) Large search area/few rescuers
      2) Victim not found within 30-60 minutes
      3) Approaching darkness
      4) Victim found alive but disabled:
      5) Victim in respiratory/cardiac arrest
      6) Victim "dead" (does not respond to CPR)
      7) Worsening weather
      8) Increasing risk
      9) Party not equipped to stay

F. Methods
1. Radio
2. Cell phone
3. Personal locator beacon (PLB)
4. Signal flares
5. Send people to get help (last resort)
   a. Consider consequences

1) Help sought immediately
2) Alarm postponed until victim is located and extricated
3) Alarm postponed for 30 minutes while all available persons search, then one or two people sent to get help

b. How do you decide?

G. Common mistakes
1. Lack of
   a. Leadership
   b. Equipment
   c. Methodical approach
   d. Scene Safety
   e. Clear communications
2. Failure to identify or mark
   a. LSA
   b. Clues
   c. Debris boundaries
   d. Most likely burial areas
3. Sending resources away for outside help
   a. Too soon
   b. Too late
4. Ineffective
   a. Transceiver searches
   b. Probing technique

H. Rescue and Care
1. Causes of death
2. Assume multiple severe injuries until ruled out
3. Extrication principles
4. Begin CPR if indicated
5. Immediate transport

Suggested Demonstrations/Student-Centered Activities

See suggestions described in appropriate Module 1 lesson guides.

Suggested Questions for Student Summary/Evaluation of Learning

See suggestions described in appropriate Module 1 lesson guides.

Field Session 1: Hazard Assessment and Safe Travel Skills

Overview

This field session includes application, synthesis and evaluation of knowledge, demonstration of skills, prioritizing and integrating data into an overall hazard assessment. The class should be divided into small groups of 3-5 students with an instructor. Each instructor conducts the activities as an independent class with freedom to move to different places for each activity.

When done, gather the teams together for comparison of what they observed and learned.

Concluding Objectives—students should be able to:

- Use surface observations to estimate present and past wind events and effects on the snowpack
- Identify aspects of a slope with respect to radiation and wind effects
- Demonstrate acceptable techniques for measuring slope angle
- Identify avalanche slide paths
- Dig an appropriate test profile to observe and test for snowpack instabilities
- Perform a Strength/Propagation/Simple Structure evaluation of snowpack stability
- Demonstrate on-the-move snowpack tests
- Integrate weather, snowpack stability and terrain factors into an overall hazard assessment using the following tools:
  - Bull's Eye model for prioritizing data
  - Obvious Clues method (ALPTRUTh)
  - NSP Avalanche Hazard Checklist
- Demonstrate safe route selection
- Demonstrate safe travel practices

Suggested Activities

(Have students demonstrate and explain whenever possible; intervene only to correct or introduce updated approaches.)

A. Weather Assessment
   1. Snow surface clues of present and past snow transport & loading
   2. Measure/estimate precipitation rates if current or recent snowfall
   3. Critical loading rates for the climate zone

B. Terrain assessment
   1. Slope angle estimates and measurements
      a. Discuss estimates vs. measurements
      b. Use different types of clinometers and different methods for measuring
   2. Determine various aspects (radiation, wind)
      a. Have students identify consequences of radiation influence, if any observable
      b. Have students identify consequences of wind influences, if any observable
   3. Identification of likely avalanche paths by terrain features
      a. Probable starting zone & runout distance
   4. Identify/describe terrain traps
   5. Identify vegetation that indicates past avalanche activity

C. Snowpack data collection and evaluation
    1. Criteria for selecting a snowpack test profile site
        a. When
        b. Where
        c. Considerations when done
    2. Observe/measure/record environmental data
        a. Date, time, observer
        b. Current weather
        c. Elevation
        d. Aspect
        e. Surface penetration
    3. Test profile
        a. Appropriate dimensions
        b. Smooth, vertical walls
        c. Techniques for identifying layers
        d. Hand hardness tests
        e. Isolated column tests
        f. Shovel shear
        g. Compression
        h. Extended column
        i. Compare attributes, limitations and scoring system of each test
        j. Record observations in a simple snow profile
        k. Compare similarities and differences between observations; discuss possible causes of different data
    4. Tests while on the move
        a. Ski pole
        b. Switchback
        c. Hand shear
        d. Others?
D. Hazard Evaluation
    1. Data consistency
        a. Significance?
        b. If not, why not?
    2. Data relevance
    3. Data prioritization
        a. Why important
        b. Bull's Eye method
    4. Identify examples of relatively safe and unsafe terrain under different conditions
E. Review safe travel practices.
F. Compare and evaluate different hazard assessment tools for ease of use, reliability and personal preference.
    1. Obvious Clues Method (OCM/ALPTRUTh) to evaluate avalanche hazard of surroundings using real and notional data.
    2. NSP Hazard Evaluation Checklist to individually assess avalanche hazard of new surroundings using real and notional data.
    3. Note inconsistencies in outcomes; speculate on causes of inconsistencies, if any
    4. Discuss how minor alterations of data may significantly affect outcome of overall assessments (e.g. incoming storm, wind shifts, etc.)

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Session 2: Rescue Skills

Overview

This session provides for assessment and refreshment of student rescue skills. Students should come to this course with good basic skills; there is enough time allotted to evaluate and provide minor improvements in technique, but not enough to reteach them from scratch.

Concluding Objectives—students should be able to demonstrate:

- Effective transceiver function checks
- Four-phase transceiver search method
- Identification of likely burial areas
- Proper spot probing and probe line techniques
- Appropriate shoveling strategies and techniques
- Effective small group search

Setting

- Large class divided into three groups, each starting at one of three stations (transceiver, probing, shoveling)
  - Groups rotate between stations at 25-minute intervals (allowing 5 minutes transition between stations)
- Small class can rotate between stations or change functions at one station

Recommended Activities

A. Transceiver skill station
   1. Set up
      a. Demonstration area
         1) Out of range of practice area beacons
         2) Large enough area for demonstrations
      b. Practice areas
         1) Beacons far enough away to require signal search
         2) Approximately 25^{o} slope
   2. Review of transceiver care and function checks
      a. Batteries
      b. Function checks
      c. Range checks
   3. Review four-phase search sequence
      a. Signal Search
      b. Coarse search
      c. Fine search
      d. Pinpoint search
   4. Special problems
      a. Vertical transmitting antenna orientation (applicable only with 2 antenna beacons)
      b. Deep burials
      c. Multiple burials

5. Student skill demonstration/development (large enough area for each student to search for a different target beacon)
6. Single transceiver searches
   a. Buried ≥ 50 cm deep
   b. Probe target (30x70 cm) above
7. Multiple transceiver searches (if time permits)
   a. ≥ 100 cm deep (if possible)
   b. Approx.5-10 m apart

B. Probing Station
1. Different probe types
2. Spot probing
   a. Selecting places to probe
   b. Probing patterns for clues & catchments
   c. Probe orientation, spacing and size of area to cover
   d. Working around obstacles
   e. Marking
   f. Detecting a strike
3. Formal probe lines (optional, if time permits)
   a. Spacing
   b. Probe orientation
   c. Commands
   d. Working around obstacles
   e. Marking
   f. Making a strike

C. Digging Station
1. Digging principles
2. Strategic shoveling technique
3. Conveyor shoveling technique
4. Students demonstrate/practice digging out dummies marked by probes

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Session 3: Small-Group Rescue Scenarios

Overview

This session is a culmination activity in which students take charge of simulated small-group incident scenarios. The first scenario is demonstrated by instructors, in which a team comes upon another group that has just had multiple members caught, carried and buried in an avalanche. After one demonstration, students themselves set up their own scenarios for another team to resolve.

If the class is large, it may be possible to run multiple similar, simultaneous scenarios, each using two small groups of students. The scenarios do not need much separation, just enough that they do not distract each other.

Concluding Objectives—students should be able to:

- Establish rescue leadership
- Assess residual hazard
- Determine optimal site to commence search
- Effectively utilize available resources
- Avoid scene contamination

Suggested Activity

A. Scenario Setup
   1. Divide class into teams of 4-5 students
   2. Set up a pair of sites for every two teams. Sites should be screened from each other by trees, berm, etc.
   3. Bury at least two dummies, only one with a transmitting beacon at each site.

B. Scenario Initiation (10 min)
   1. An instructor "witness" approaches the student team with a tale about his/her group getting caught in an avalanche:
      a. A little hysterical, confused & anxious to return to the scene; getting coherent information is challenging
      b. Able to give number of victims, approximate locations when caught
      c. Unsure if any were carrying beacons
   2. A member of the student team takes charge, both interviewing the witness and assigning tasks to the other team members.
   3. Team conducts efficient immediate search

C. Instructor observes and conducts short debrief after all dummies have been found and extricated.

D. Scenario Practice

E. After the initial scenario, each team pair sets up their own scenario for the other team in the pair to resolve.
   1. When set up, all but one member team 1 will go to team 2's site, and all members of team 2 will go to team 1's site. The team member staying behind will act as a panicked witness whose companions were all swept away in an avalanche. Each visiting team will select a leader and conduct the rescue.
   2. When all dummies have been extricated, the "witness" from the other team integrates into the team they are with and sets up a new scenario and the process described above is repeated.

3. Repeat the process making successive scenarios more challenging as teams become more efficient

F. Wrap-up

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Module Wrap-Up

- Closing Remarks
  - Course alone does not develop proficiency; skills are quickly lost if not used
  - Encourage independent practice.
- Written final exam
- NSP Student Feedback Survey if IT is not present.
- IT debrief with instructors
- Collate & average skill evaluation scores
- Course completion paperwork according to Section 2 of this manual

LEVEL 1 AVALANCHE MODULE 5 ORGANIZED RESCUE REFRESHER

Course Standards

Target Audience

Annual refresher training is recommended for organized search and rescue teams, but actual frequency is determined by individual patrol or other organization policy.

The main differences between this and the original course is that topics are summarized, and the students have a greater role in the discussion. All lessons and activities need to respect the maturity, prior training and experience of the class members, some of whom may have technical knowledge and experience equaling that of the instructor. Take advantage of peer-teaching opportunities that may arise during the refresher.

Intended outcomes - Students should be able to:

- Use standard avalanche-related key terms correctly
- Describe sources and reliability of avalanche hazard data for rescue planning purposes
- Use basic terrain, weather and snowpack observations to evaluate relative hazard
- Describe principles of avalanche rescue, their local avalanche rescue plan and access to resources
- Perform effectively as a member of an immediate search team in organized avalanche search and rescue simulations.

Prerequisites and Pre-Course Study

Prerequisites include:

- Prior successful completion of the NSP Level 1 Avalanche Module 3

Pre-course study, if used, should include review of the student's area or organization avalanche rescue plan.

Time Commitment and Scheduling

The time it will take to complete this course varies due to many factors. Courses are competency based not time based. For planning purposes, the table below lists suggested times for instruction. It is ultimately up to the IOR to schedule lesson times that allow students to reasonably attain learning objectives yet not waste time. See Section 1 of this manual for more detailed guidelines on scheduling.

Suggested Time Distribution

Session	Session Title	Suggested Duration
Classroom		
1	General Principles of Organized Avalanche Rescue	20 minutes
2	Human Factors and Decision Making in Organized Rescue	20 minutes
3	Avalanche Rescue Plan	20 minutes
Field		
1	Rescue Skills	1 hour
2	Hazard Assessment and Rescue Travel	30 minutes
3	Rescue Simulation Exercises	1 hour
	Total instruction time	**3.5 hours**
	Debrief	30 minutes
	Estimated total minimum time commitment	**4 hours**

The classroom portion can be conducted any time; field sessions should be conducted after sufficient snow is on the ground to provide meaningful practice. Some instructors may prefer to begin the course with a mock rescue scenario, which they then use to calibrate lessons and generate student-based discussion of topics.

Resources

- Section 1 for course and instructional quality guidelines
- Section 7 for recommended instructional references and other resources

Lesson Guides

Classroom Topic 1: General Principles of Organized Avalanche Rescue

Overview

This lesson refreshes students on general approaches to organized rescue, including a general sequence of events, operation management under NIMS standards.

Concluding Objectives—students should be able to:

- Describe general principles of organized avalanche rescue
- Describe other entities that may be co-involved with local avalanche SAR operations and their respective roles
- Describe a typical incident and sequence of events used to manage it

Content

A. Operational Objectives of Rescue Operations
   1. LAAST
      a. **L -** locate
      b. **A -** access
      c. **A -** assess
      d. **S –** stabilize
      e. **T -** transport

B. Immediate Search and Rescue Function
   1. Personnel dispatched in teams of four to six people with a leader
   2. First team out
      a. Evaluates route safety
         1) For themselves
         2) For others that follow
      b. Power to abort
      c. Marks safe route to incident site
      d. Determines if site is safe to enter and how to enter
      e. Conducts immediate search
      f. Equipment
         1) Transceivers, probes and shovels for personal use
         2) Color-coded flagging/wands for marking (ICAR standards or local protocol if different)
         3) Spare probes, shovels, transceivers if immediately available
         4) Communications (radios)
         5) Means of documentation
   3. Following teams
      a. Additional resources for immediate search
         1) May include public volunteers
         2) Heavy-duty probes, long-handled shovels, guide cords for probe lines, etc.
         3) Set up probe lines if immediate search is unsuccessful
      b. Medical and evacuation function
         1) Personnel dispatched in teams of four to six people with a leader
         2) Patrollers, EMT, paramedics, MD

c. Equipment
    1) Trauma packs, blankets, O2, ALS gear, etc.
    2) Sleds, litters, other evacuation/transportation resources

C. Extended operations
1. Additional personnel & equipment for probe lines
2. Operational period/personnel turnover

D. Logistics (rescuer support) function
1. At site
    a. Personnel dispatched in teams of three to six with a leader
    b. Food, water, extra clothing
    c. Sanitation
    d. Shelter
    e. Lighting if needed for night operations
2. At base
    a. Resource check in/out
    b. Food, shelter/sanitation/fuel
    c. Communications
    d. Staging areas for storing/checking out equipment and dispatching teams

E. Typical progression of events
1. Alarm—notification of incident
    a. First person contacted holds onto Reporting Party (face-to-face or keeps online if by telecommunications)
    b. Information to gather/report
2. Rescue leadership activates (ICS designations, if applicable)
3. Hazard assessment
    a. Hazard assess completed prior to dispatching teams
    b. Follow-up assessments ongoing through duration of field operations
4. Operations plan made (usually in place for resort operations)
    a. Best route to site
    b. Best means of travel to site
    c. Start immediately or delay (based on conditions)
5. Immediate Search team assembled and dispatched to scene, if safe
6. Additional Search teams assembled and dispatched
7. Medical & evacuation teams dispatched according to need, as soon as ready
8. Victims found, treated (or declared dead), evacuated
9. Rescuers on site gather gear, return to base, check out

Suggested Demonstrations/Student Centered Activities

- Use case studies to illustrate the roles and functions and vulnerabilities of organized avalanche rescue.
- Begin the course with a mock rescue scenario and use what transpired to generate discussion in this context.

Suggested Questions for Student Summary/Evaluation of Learning

- How does organized rescue response fit into most avalanche incidents?
- What are some reasons for delaying efforts to get outside help?
- What are some consequences associated with delay in seeking organized rescue response?
- How does organized rescue response fit into trip planning?

- What are the main stages of organized avalanche rescue?
- What emergency response system is used to manage organized avalanche rescue? Why?

Classroom Topic 2: Human Factors and Decision Making in Organized Rescue

Overview

Decision making in organized rescue operations tends to be more formalized. This can act as an important buffer for human factors during stressful situations, but they can also become heuristic traps of their own. Students should have an opportunity to express and explore some of the strengths and weaknesses of organized rescue in this respect.

Concluding Objectives—students should be able to:

- Describe human factors that contribute to unacceptable risk in organized avalanche rescue operations
- Describe safety considerations for rescue operations
- Describe situations where pre-planned procedures need to be reconsidered before implementation
- Describe the role of leadership in rescue team safety
- Describe the role of all rescue team members in rescue team safety

Content

A. Defining the problem (discussion)
   1. Advance planning/preparation issues
      a. High hazard conditions presumed
      b. Unfamiliar terrain
   2. Pressure to get to an incident site as quickly as possible
      a. Urgency of trying to save a life
      b. "Heroics"
      c. Victim's relatives/companions
      d. Press coverage
   3. Assessing the situation
      a. Hazard assessment?
      b. Time to gather proper gear?
      c. Time to gather most qualified personnel?
      d. Marked route takes into account equipment to follow?
      e. Usefulness of decision-making aids?
      f. Time to use?
      g. Applicability to situation?
      h. No option for changing destination
      i. Limited route options
   4. Tunnel vision
   5. Focus on objective blinds leaders to condition of personnel
      a. Examples
         1) Fatigue
         2) Dehydration
         3) Under equipped
         4) Under dressed

   b. Consequences
      1) Decreased efficiency
      2) Additional casualties
      3) Rescue party gets caught by another avalanche
      4) Original rescue put on indefinite hold
      5) Probability loss of key personnel/resources
      6) Additional bodies to recover

B. Operational safety
   1. Iron-clad rules
      a. Safety before mission
      b. Assume high hazard (Bull's-Eye)
   2. Advance planning/preparation
      a. Familiarization with territory
      b. Pre-marked maps
      c. Pre-staged equipment
      d. Pre-packed personal gear
      e. Pre-screened personnel
      f. Practice SAR skills as a team
      g. "Buddy watch"
   3. Before departure
      a. Initial hazard assessment
      b. Decision to go or delay search
      c. Review avalanche risk reduction with group
      d. Situational awareness and communication
      e. Turn-back criteria and options – anyone can call for halt and reassessment
      f. Actions if there is an emergency
      g. Check function of transceivers
      h. Maintain documentation of personnel and equipment deployed
   4. En route
      a. Strict adherence to safe travel procedures
      b. Constant reevaluation
      c. Mark route
         1) Color determined by local protocol
         2) Safe for others
         3) Appropriate for equipment to follow
   5. Approach incident site from above, if possible
      a. Less exposure to hazard for rescue team
      b. Vantage point for assessment of additional hazard
      c. Control may be necessary before entering
   6. Stay alert—"usually safe" is not necessarily always safe

Suggested Demonstrations/Student Centered Activities

- Conduct Field Session 2 immediately following this session.
- Discuss applicable issues that came up with the initial mock rescue scenario, if conducted prior to this lesson.

Suggested Questions for Student Summary/Evaluation of Learning

- What portions of this discussion served as reminders to you?

- What comments, if any, served to change your thinking about the topic in some way?

Classroom Topic 3: Avalanche Rescue Plan

Overview

This session is intended to provide an opportunity for students to review and evaluate their existing rescue plan and to develop suggestions for improving them. See the initial course lesson guide for content details.

Concluding Objectives—students should be able to:

- Describe essential components of an avalanche rescue plan
- Determine if their rescue plan contains all essential components

Essential Content

A. Description of Essential Rescue Components (personnel, equipment, tasks)
B. What's in Your Rescue Plan?
    1. Initial alert and response plan?
    2. Leadership structure?
    3. Communications?
    4. Who conducts immediate search?
        a. Leadership?
        b. Team qualifications?
        c. Equipment?
    5. Who provides medical care?
        a. Immediate resources?
        b. Outside resources?
    6. Evacuation options?
    7. Support?
        a. Immediate resources?
        b. Outside resources?
    8. Documentation
        a. What? By whom?
C. Contingencies
    1. Residual avalanche hazard at site?
    2. Emergency evacuation of personnel?

Suggested Demonstrations/Student Centered Activities

- Use the above content outline to pose questions that elicit student descriptions of functions, personnel, equipment and tasks.
- If students come from more than one organization, group them by organization to share and compare features and resources in their respective rescue plans.

Suggested Questions for Student Summary/Evaluation of Learning

- What did this discussion help you to remember or understand better?
- Did anything come up that you had not thought about before?
- Did you come up with any new thoughts about your rescue plan?

Field Session 1: Rescue Skills

Overview

This field session should be devoted to evaluation and refinement of existing rescue skills. Students should be advised to practice them beforehand.

Concluding Objectives—students should be able to:

- Conduct a competent site safety evaluation
- Conduct competent transceiver/RECCO search, based on terrain, search area size and rescuer availability
- Identify most likely burial areas
- Conduct a competent clue and catchment search, including spot probing and marking
- Demonstrate proper probe line techniques, with and without a guide cord
- Demonstrate proper rescue shoveling principles and techniques

Suggested Activities

A. Set up stations that small groups of students can rotate through at 15 to 20-minute intervals
B. Station 1: Scene safety, identification of likely burial areas
    1. Preferably complex terrain where more than one slide path empties into a single drainage
    2. Clues placed in a real or hypothetical deposition zone for students to probe and determine possible burial area
    3. Bury at least two dummies without transceivers for students to find
    4. Have students:
        a. Identify probability hang-fire and/multiple starting zone hazards for the site
        b. Describe possible actions to take, if real or notional hazards exist
        c. Determine likely burial areas based on clues, terrain and flow described by the instructor
        d. Spot probe clues, catchments and other likely burial areas; find buried dummies
C. Station 2: Transceiver/RECCO search
    1. Students find two transceivers
        a. At least one meter deep
        b. 5-10 m apart
    2. If RECCO receiver available:
        a. Describe pros, cons and precautions
        b. Locate a buried RECCO reflector
D. Station 3: Formal probe line search
    1. Student directed
    2. With and without a guide cord
    3. Marking
    4. Offset second pass
E. Station 4: Shoveling principles and techniques
    1. Students describe general shoveling principles
    2. Practice
        a. Strategic (side-by-side) shoveling technique
        b. V-shaped, conveyor shoveling technique

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Session 2: Route Finding and Safe Travel

Overview

This session should provide opportunities for students to demonstrate off-area route finding. Off-area avalanche terrain is preferred, but any area with avalanche terrain will do.

This field session includes application of knowledge, demonstration of skills, prioritizing and integrating data into an overall hazard assessment. The class should be divided into small groups of 3-5 students with an instructor. Each instructor conducts the activities as an independent class with freedom to move to different places for each activity.

When done, gather the teams together for comparison of what they observed and learned.

Concluding Objectives—students should be able to:

- Use surface observations to identify wind loaded slopes
- Identify aspects of a slope with respect to
  - Probability radiation effects
  - Probability wind effects
- Demonstrate acceptable techniques for measuring slope angle
- Identify avalanche slide paths
- using the following tools
  - Bull's Eye model for prioritizing data
  - Obvious Clues method
  - NSP Avalanche Hazard Checklist
- Demonstrate safer route selection
- Demonstrate safer travel practices

Suggested Activities

(Have students demonstrate and explain whenever possible; intervene only to correct or introduce newer approaches.)

A. Weather Assessment
   1. Snowpack surface observations that predict past weather events
   2. Estimating precipitation
      a. Critical snowfall rates
   3. Liquid water content (snowball test)

B. Terrain assessment
   1. Slope angle estimates and measurements
      a. Discuss estimates vs. measurements
      b. Different types of clinometers and proper methods for measuring
   2. Aspect
      a. Radiation
         1) Types

        2) Effects
        3) Influence of aspect & slope angle
    b. Influence on wind patterns
3. Identification of likely avalanche paths
    a. Confined and unconfined paths
    b. Probable starting zone & runout distance
4. Terrain traps
    a. Definition
    b. Examples
5. Identify vegetation that indicates past avalanche activity

C. Hazard Evaluation
1. Data consistency and relevance
2. Data prioritization
    a. Importance
    b. Bull's Eye method
3. Identify examples of relatively safe and unsafe terrain under different conditions
4. Review safe travel practices.
5. Compare and evaluate different hazard assessment tools for ease of use, reliability and personal preference.
    a. Obvious Clues Method (OCM/ALPTRUTh) to evaluate avalanche hazard of surroundings using real and notional data.
    b. NSP Hazard Evaluation Checklist to individually assess avalanche hazard of new surroundings using real and notional data.
    c. Note inconsistencies in outcomes; speculate on causes of inconsistencies, if any
6. Discuss how minor alterations of data may significantly affect outcome of overall assessments (e.g. incoming storm, wind shifts, etc.)

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Field Session 3: Organized Search Field Exercise

Overview

If a large class, two simultaneous, nearly identical scenarios are suggested, each using half of the class. If the whole class is 12 or fewer, one scenario can be used, adding another "victim" to keep everybody occupied. After all "victims" have been found and rescued, the class will reconvene at the classroom to return borrowed equipment, compare experiences, summarize what was learned, take a final exam and evaluate the course.

Concluding Objectives—students should be able to:

- Effectively interview reporting party to ascertain nature of the incident
- Find and mark a safe route to the site
- Assess residual avalanche hazard at the site
- Effectively utilize available resources in simultaneous search components
- Call for additional resources for search/medical/evacuation functions

- Locate multiple buried subjects, only one of which has a functioning transceiver

Scenario Setup

- Bury three dummies at each site
  - One near "toe"
  - One in a catchment (with transceiver)
  - One near a surface clue
- Simulate radio communications as needed

Rescue Activity

A. Set up
   1. Scenario site
      a. Known slide path
         1) Stable at the time
         2) With avalanche debris is ideal
         3) If no natural demarcations, shovel simulated
            a) Crown
            b) Flanks
            c) Catchments
            d) Runout
      b. At least three dummies, two with beacons
      c. If avalanche dog available, an additional snow-cave burial
      d. Clues distributed on the surface
   2. Equipment
      a. Use equipment available depending on setting
         1) Resort/patrol equipment
         2) Backcountry SAR group equipment
      b. Individual equipment
   3. Students
      a. If twelve or fewer, set up single scenario
      b. If more than twelve
         1) Divide class into two groups
         2) Each group work a separate but similar scenario

B. Initiation
   1. Instructor "RP" reports an avalanche
      a. To a student
      b. While student group engaged in some other activity
   2. ICS structure forms
      a. Instructors assign leadership (all students assigned to on-site positions)
         1) IC (non-student)
      b. ICS overhead appoints student leadership
         1) Immediate Search team leader
         2) Follow-on team leaders
            a) Additional search resources
            b) Medical/evacuation

C. Preparation
   1. Immediate search team Leader assembles team and reports back to IC
   2. IC dispatches the team after getting names and inventory of equipment.
   3. Remaining students assigned follow-on duties

   a. Additional search resources
   b. Medical/evacuation
4. Actual/Simulated equipment available (per group) if requested

D. Observe and evaluate student performance
1. Use Rescue Simulation Score Sheet found in Section 7
2. Immediate Search Team Leader
   a. Assembles team
      1) Checks equipment
      2) Assigns witness handler
      3) Documents personnel & equipment – gives copy to Rescue Leader (IC)
      4) Reports to Rescue Leader (IC) when team is ready for dispatch
   b. Establishes/marks safe route for subsequent teams
   c. Site Safety Evaluation
   d. Designates site for rescuer equipment
   e. Immediate Search tasking
      1) Visual/Audible
      2) Identify, mark LSA
      3) Beacon, RECCO as appropriate
      4) Clue Search
      5) Catchment search
3. Site Leader
   a. Obtain briefing from Immediate Search leader
   b. Request additional resources
      1) RECCO
      2) Dog
      3) Probe line teams
   c. Set up at least one formal probe line

E. Session ends when all victims have been extricated.
F. Can add medical care if time allows

Debrief

- Student debrief
  - Summarize and compare what they learned/improved
- Instructor debrief after students dismissed
  - Evaluate student performance

Module Wrap-Up

- Closing Remarks
  - Course alone does not develop proficiency; skills are quickly lost if not used
  - Encourage independent practice.
- NSP Student Feedback Survey if IT is not present.
- IT debrief with instructors
- Collate & average skill evaluation scores
- Course completion paperwork according to Section 1 of this manual

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