Water Rescue
Awareness Training
US&R Operations
Course Introduction

- Floods most destructive of natural catastrophes
- Kills more people than any other form of disaster
- Rescue capability limited and usually an afterthought
Earth is 80% Water
Course Objectives

• Provide potential rescue personnel awareness level training
• Students will understand the responsibility of awareness level responders to water rescue situations
• Students will recognize a water rescue situation and understand the risks associated with performing water rescue
Types of Water

...per NFPA
Dive
More Dangerous than most forms of rescue!

Moving Water kills more Americans each year than fires.
Moving water is powerful
Deaths by drowning

- Firefighters: 7 since 1999
- Police Officers: 22 since 1995
- Children 1-14: second leading cause of death > 900 per year
- 112 drowning deaths per year in Washington
- Second leading cause of death to 15-19 year olds in Washington
Definition of “swiftwater”...

...faster than ___ mph

1.5 mph
NFPA 1670 standards

- Adopted 1998
- Covers all special rescue disciplines
- Establishes guidelines for AHJ to identify hazards, determine levels of training, and response SOP's

- *Water rescue
- *Rope rescue
- Confined Space
- Wilderness SAR
- Trench
- Structural Collapse
- Vehicle and machinery rescue
Three levels of capability

- Awareness
- Operations
- Technician
**Awareness**

Minimum capability for any responder Who may, during regular duties, respond to technical rescue incidents

Not considered "rescuer"

- Scene assessment & size up
- Risk Vs. Benefit
- Resource ordering
- Site control & ICS
- Hazard recognition and avoidance procedures
Operations

- Hazard recognition
- Equipment use
- Shore & boat based rescue skills
- Assist technician level rescuers
- Low risk tactics
- PPE required
- Self rescue skills
- Victim packaging
Technician

- Hazard recognition
- Equipment use
- Coordination skills
- Perform and supervise technical rescues
- Search, rescue and recovery operations
Agency Having Jurisdiction

NFPA requirements

- BLS is minimal medical care
- Establish procedures consistent with chosen level of operations
- Provide training commensurate with operation level
- Provide continuing education and performance evaluations
- Maintain training documentation
- Have personnel accountability system
Special Rescue

Any incident where a person is stranded, trapped, injured or killed and skills and equipment that are not normally available with first responders are needed to safely rescue or recover the victim.
Examples of Special Rescue

- Water, ice, river rescue
- High angle
- Confined space
- Hazmat
- Trench
- Wilderness
- Structural collapse
Awareness Level Responders

“If you do not have the skills, if you do not have the equipment, if you do not have the knowledge, you should not attempt the rescue!”
Awareness Level Response

- Identify the problem
- Stabilize the situation
- Prevent it from getting any worse
- Call the appropriate resources and get them enroute
Rescue Philosophy
Rescue Priority

- All rescue personnel must be prepared to:
  - Self rescue
  - Back up and rescue team members
  - Rescue the subject only when safety of the rescuers is maximized

- “Self sacrifice is traditional and commendable---- and a useless waste”
14 absolute rules of swiftwater rescue

- Always wear a PFD
- Deploy upstream spotters
- Self, team, victim
- Have a backup plan
- Downstream backup
- Keep it simple
- Use the right gear
- Be proactive
- Never put feet down
- Don’t rely on victim
- Never tie a rope to a rescuer
- Never tension a line 90° to current
- Never lose a victim once contacted
- No fire helmets
Successful Rescue

- Training
- Experience
- Practice
- Judgement

"Training is not enough. Practice and Experience are vital in order for the rescue leader to make correct Judgments"
Self Rescue & Personal Safety

- **Awareness**
  - Understand the dangers

- **Capability**
  - Strength and equipment
  - Improved ability to survive

- **Knowledge**
  - Have a plan,
  - Know what to do
  - Know how to do it
Common characteristics of failed rescues

- Good people
- Good intentions
- Poor training, no training
- Wrong equipment
- Failed to recognize hazards
- Failure to evaluate Risk Vs Benefit
Site Control

- Hot Zone –
  - “The Water”
  - Technicians only
Site Control

- Warm Zone –
  - Within 10 feet of the water
  - Within a Rescue Craft
  - For Operations, Techs only
Site Control

- Cold Zone –
  - Outside of the Hot or Warm Zones
  - Awareness Level
  - Family & Bystanders
Determine if rescue or body recovery
Determine time and location that victim was last seen
Obtain Witness Statements
River Search Tactics

- Hasty Search
- Evaluate the river
- Likely spots
- River banks / Clues
- Obstructions
Determine rescue method involving the least risk...
Reach
Throw
Helo!
Identify Specific Hazards

- Low head dams = Drowning machines.
Training exercise gone bad
Rescuers entered past boil line and could
Not get back out
Second rescue boat attempted to pull first out using a throw bag

Current directions
Pulling against the current caused orange boat to swamp
Making a bad situation worse
Second boat enters past boil line to
Rescue the two in trouble placing all
four at risk.
White water and current work
Against the efficiency of
A water jet that powers the gray watercraft

Solution was for the rescuer in the stern of the
orange boat to get to the bow of the orange boat,
get it turned the opposite direction and pull it out
bow first not stern first with the gray boat.

This second effort would have been successful but pulling
from the stern again was doomed to fail
Gray craft is now facing into the dam moving with the current in white water. Whitewater is full of air which = less floatation and is less efficient for water jets or props.
The driver of the gray water craft
Does not survive this error!
Was this necessary?
Was this preventable?
The river is 8 feet above flood stage!
This was a training event!
Judgment?
The equipment was not adequate
For the environment and force and power
Of the water.
Rescuers failed to recognize the limitation
of their equipment or the best way to use it.
Proper PPE did provide additional capability and increased survivability allowing three of the four to survive long enough to be rescued.
✓ Good people
✓ Good intentions, misplaced judgment
✓ Used good equipment in wrong way
✓ Failed to recognize All of the hazards
✓ Failure to evaluate Risk Vs Benefit
Survived because they
Were Aware, stayed with boats
Had Knowledge, worked together
Were Capable, All were strong and wore PPE
What went wrong?
Advanced Hazards require advanced rescue skills

- **Strainers**

  Anything in the current that will trap swimmer or boat

  Trees, fences, rocks etc.
Man made hazards
When wading, crossing a stream or river, if you trap a part of your body, the force of the current can force you under and hold you there. Debris, rocks, fences, etc can snag and hold a person and not allow them to float to the surface where rescue is possible.
Reoccurring hazards

- Vehicles
- Low lying roads
- Wash or urban storm drains
Flood Situations

- Two feet of water will float the average car
- Do not drive over a flooded roadway
- Nearly half of all flood related deaths occur in vehicles.
- The underlying roadbed may be washed out
- If the roadway was elevated, you could be washed into a low headwall dam, or “drowning machine.”
Identify Specific Hazards

➢ All flood waters should be considered to be Contaminated Water.
Waterfalls
Cold Water

- Hypothermia
  - Still water steals heat away from the body 25 times as fast as still air
  - A 5 mph current increases this to 250x
  - “Hypothermic debility”
Cold Water Shock

- Accounts for dozens of fatalities each year
- Occurs in water 32 - 50 degrees
- Leads to the principal cause of death
  - Drowning
  - Hypothermia
  - Heart attack
Memorial Day Weekend 2005 Western Washington statistics

- 6 drowning deaths in 24 hours
- 90 degree air temperature
- 50 degree water temperature
- 1 rescuer died
- Deaths occurred in Lakes, rivers and in Puget Sound
Drowning deaths, Memorial day Washington 2005

- W/M 40, Drove into Snohomish river
- W/M 13, Swimming in Green River
- W/F 13, Cedar River, Rescue attempt
  - Attempted rescue of friend, friend survived
- W/M 24, Swimming in Snoqualmie River
- W/M 28, Jumped from boat in Lake Wash
- W/F 12, Silver lake, Rescue attempt
  - Attempted rescue of cousin, Cousin drowned
- W/F 10, Swimming in Silver lake
Major Obstacles

- Reduced ability to hold breath
  - Average less than 15 seconds
- Rapid numbing of extremities
- Rapid loss of coordination, grip strength, motor skills
- Death from hypothermia 20 to 30 times faster than air
Reflex actions

• Involuntary gasp reflex
  – Aspiration of cold water
  – Laryngospasms

• Hyperventilation
  – Respiration increases up to five times

• Sudden heart rate acceleration
Rules of 50

- An average adult has 50% chance of surviving a 50 yard swim in 50° water
- A 50 year old person in 50° water has a 50% chance of surviving for 50 minutes
Identify Specific Hazards

- Hypothermia
  - Wind-chill factor increases significantly when person is wet
  - Increases even more when immersed in moving water
Boats, Pros & cons

- Motorized boats
  - Engines fail

- Airboats
  - Not meant for rivers

- PWC
  - Limited crew and passenger capacity

- Hovercraft
  - Expensive, loud, crew limitations, extensive training

- Inflatable rafts
  - Requires multiple trained crew

- Kayaks
  - Limited rescue capability
  - Good scout craft

- Rigid Hull Inflatable's (RHI)
  - Best choice, multiple uses
  - Requires crew management and training
Request Additional Resources
Request Additional Resources

SCUBA
Search and Rescue SCUBA is High Risk

- Few actual rescues
- Rescue of fellow team members more likely
- Black Water
- Cold water
- Contaminated Water
- Confined Space Dive
- Moving water
SCUBA in moving water

- Physically fit
- Very strong swimmer
- Experienced
- Self rescue knowledge
- Swiftwater trained
Minimum Training for SCUBA in Swiftwater

- SRT I & SRTA
- Advanced open water SCUBA
- Dive Rescue I
Moving water is Powerful

- Powerful
- Relentless
- Predictable

- Flow is measured in Cubic Feet/Sec (CFS)
- Water speed doubles, force increases X 4
  - 40 lbs psi @ 4mph
  - 160 lbs psi @ 8mph
Moving water is predictable if you understand River Dynamics.

Water moves over, around and through objects in a predictable manner.

- Every obstruction creates an eddy.
- Every constriction creates an increase in water speed.

X = throwbag location

Downstream v

strainer
Example of the power of moving water
Any floating object that stops
Against a stationary object
Will be pulled under by the current
If you are lucky enough to not be caught by obstructions you may pop back to the surface.
River loads

• **Bottom load**
  Anything that moves along the bottom with the current

• **Suspended load**
  Anything that is suspended in the water but is not floating on the surface

• **Surface load**
  Anything that floats on the surface
Terminology

- **Hydraulic**
  - Water flowing over an object
- **Eddy**
  - Reverse flow of water around an object
- **Eddy fence**
  - Line between two opposite current flows
- **Hole, stopper, keeper**
  - Large hydraulic capable of holding a swimmer or a boat
- **Standing wave**
  - Created downstream of an underwater object
- **Strainer**
  - Bad place for a swimmer or a boat to be
- **Frowning hole**
  - Hard to escape from
- **Smiling hole**
  - Easier to escape from
- **Downstream V**
  - Fastest moving water, usually best route through obstructions
- **Upstream V**
  - Indicates something under the water
- **Cushion**
  - Created upstream of an object
- **Confluence**
  - Point where two convergent currents meet
Directions are always given while looking down river.
River Categories

- **Class I**
  - Moving, few riffles

- **Class II**
  - Waves up to 3’

- **Class III**
  - Complex waves & maneuvering

- **Class IV**
  - Difficult, long rapids

- **Class V**
  - Serious risk of injury

- **Class VI**
  - Nearly impossible, very dangerous
Hydraulics

Calm waters

Standing waves

Cushion

Eddy
Hydraulic, Hole, Keeper

Reaction wave

Eddy
Lowheadwall dam,
A rope tied to a swimmer and secured on shore will cause the swimmer to be pulled underwater and held there.

The swimmer must be trained and capable of releasing the line when it is no longer an aid to them or they will drown!
Leave the Technical Rescue to the “Technicians!”
Use the included test to answer your questions and return by e-mail or fax.
1. True or False

• A person trained at the awareness level should not enter the water to conduct rescue operations.
2. True or False

- Moving water is any water that moves faster than 1.5 mph and is one of the most dangerous forms of rescue that can be undertaken.
3. At the scene of a missing person in a lake, a person trained at the awareness level should do all of the following except what:

A. Identify the problem
B. Stabilize the situation
C. Prevent it from getting any worse
D. Call the appropriate resources and get them enroute
E. Put on a PFD and get in a boat to help locate the point the victim was last seen.
4. Rescue priority should be in what order?

A. Self rescue
   Back up and rescue team members
   Rescue the subject

B. Back up and rescue team members
   Self rescue

C. Rescue the subject

D. Rescue the subject

E. Self rescue
   Back up and rescue team members
5. List the order of rescue from least to greatest risk

A. Go, Throw, Reach, Tow, Helo, Row
B. Reach, Throw, Row, Tow, Go, Helo
C. Go, Tow, Helo, Throw, Reach, Row
D. Helo, Row, Reach, Throw, Tow, Go
6. True or False

- The current just below a low head wall dam is actually flowing back up stream towards the face of the dam!
7. Which of the following is correct

A. Two feet of water will float the average car.
B. Do not drive over a flooded roadway.
C. Nearly half of all flood related deaths occur in vehicles.
D. The underlying roadbed may be washed out.
E. If the roadway was elevated, you could be washed into a low headwall dam, or “drowning machine.”
F. All of the above.
8. True or False

Cold water shock accounts for dozens of fatalities each year and occurs in water 32-50 degrees
9. Which of the following is caused by cold water

A. Reduced ability to hold breath
   • Average less than 15 seconds
B. Rapid numbing of extremities
C. Rapid loss of coordination, grip strength, motor skills
D. Death from hypothermia 20 to 30 times faster than air
E. All of the above
10. True or False

- A floating object such as a boat or swimmer will be forced under water by moving water if it comes up against an immovable object such as a bridge or a strainer.