



# Over-water Safety Awareness



**“There are inherent dangers and risks to USGS employees associated with work they performed in and around water...”**



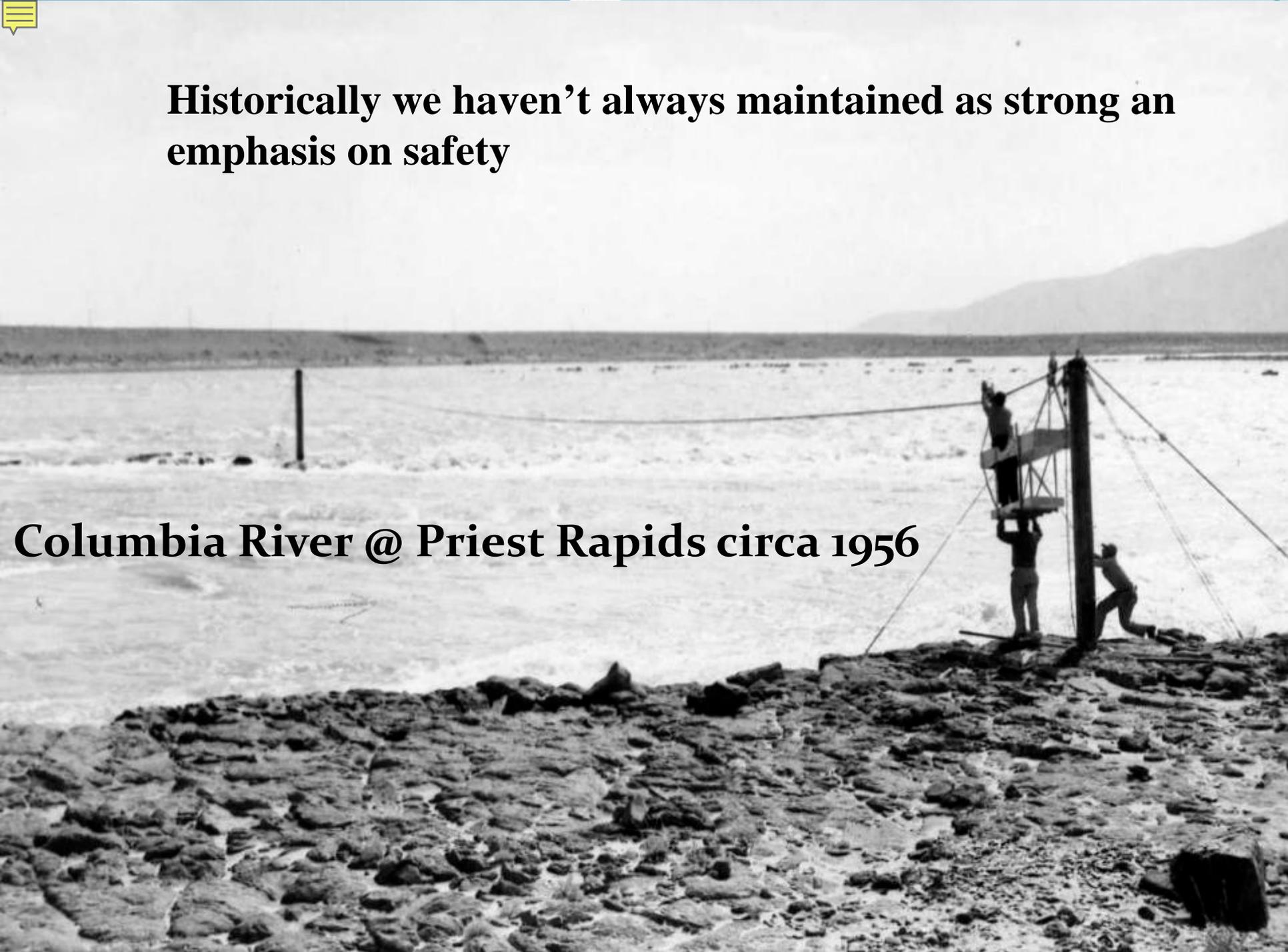
Risks can be partially mitigated through:  
Awareness & Training  
Preparation & Planning



Safety First, Every Job, Every time

**Historically we haven't always maintained as strong an emphasis on safety**

**Columbia River @ Priest Rapids circa 1956**



# Continued exposure to risk can lead to over confidence & poor decisions



Attempted helicopter rescue of rafters caught in recirculating hole below diversion dam in 1979

*Roger Henderson*



# Fatal accident at Souris River Dam, North Dakota in 1999



Similar incident could have happened in  
any of our Districts...North Dakota  
District had a good safety program and  
safety record



# Accident Investigation Team

## Findings: ---Inconsistent Policies within WRD

- One policy instructed employees working at a gaging station to “always wear your personal flotation device” (PFD) 445-1-H, chap.15.4.C
- A less stringent policy required PFD use “when the water is deep, the bottom rocky, or currents swift” WRD memo’s 67.79 & 88.01





# WRD Memorandum No. 99.32

- Personal Flotation Devices (PFDs) are required in ALL operations near, in, or over water EXCEPT in those cases where an approved site-specific Job Hazard Analysis (JHA) defines the conditions for an exemption.

# WRD Memorandum No. 00.11

- To help ensure that employees safely conduct their fieldwork in, over, and around water, it is WRD policy that all employees (permanent, temporary, and contract) who perform duties in this environment, must receive safety training.

# Job Hazard Analyses

- Required for new projects and regular work locations
- Addresses significant hazards and safety concerns
- Identifies needed safety equipment
- Outlines specialized preparation needed
- Signed by the supervisor with the knowledge and approval of the next level supervisor and/or the Center Director



# USGS Safety Manual 445-2-H Chap 26

## Personal Protective Equipment

- A properly fitting PFD must be worn when working near, in, on, or over water on a cableway, bridge, or water retention or control structure; on ice, in a boat, or wading streams.
- For work conducted in a boat, U.S. Coast Guard (USCG)-approved PFD's must be used. Additional PFD requirements for boating operations are also discussed in Chapter 31, "Watercraft Safety," of this Handbook.



PFDs must be worn while working over water or near water (close enough to fall in)



# PFDs must be worn when wading streams



## Before wading consider self rescue options



- Look downstream and think rescue

# U.S. Coast Guard-approved PFDs must be used when working in a boat

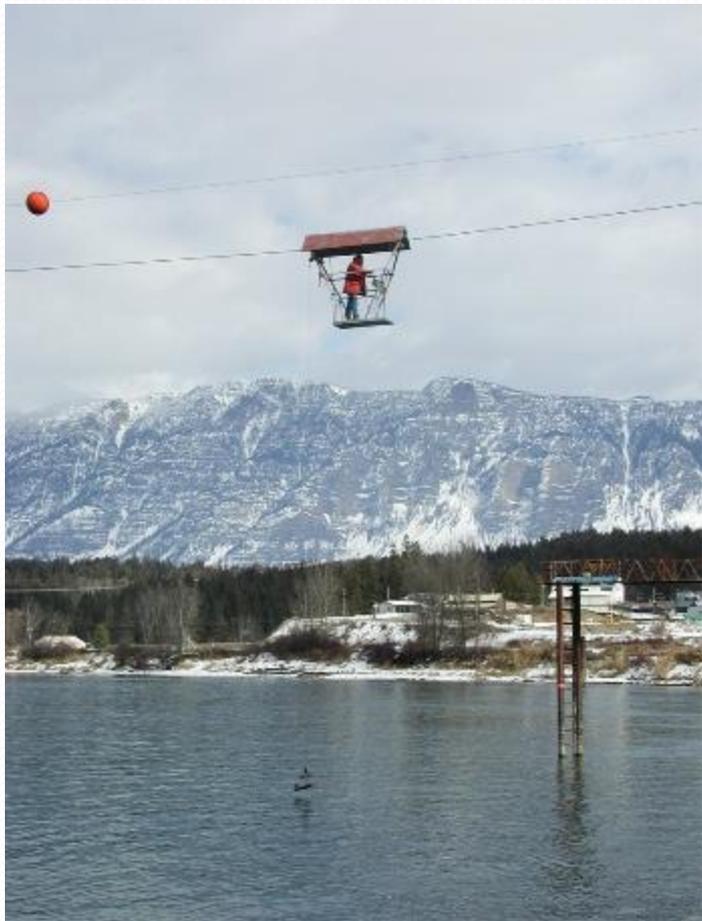


**USCG approved high-visibility lime green/yellow and international orange auto-inflate PFDs have been approved for use on USGS watercraft.**





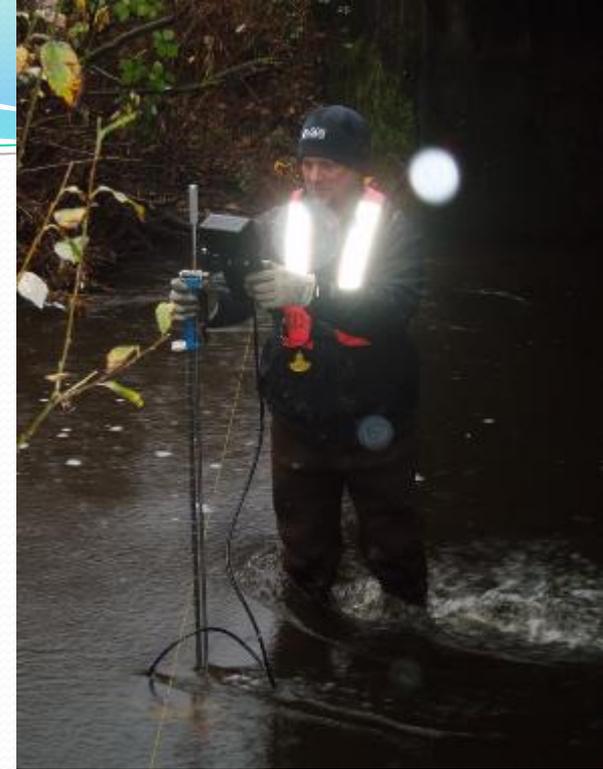
PFDs must be worn when working near, in, or over water on a cableway, bridge, or water-control structure



# Personal Flotation Device Specifications

ALL PFD's must be:

- U.S. Coast Guard approved
- IN ADDITION, USGS approved PFD's must be:
  - **International Orange** or **Hi Vis Lime-Green** in color
  - Equipped with at least 31 sq. inches (200 sq. cm) of reflective material
- All PFD's should be:
  - Inspected prior to use for cuts, loss of flotation or other damage
  - Worn with all zippers, clasps and buckles secured and adjusted for proper fit
  - Maintained in good working condition



# Classification of PFDs

- Type I– Off-Shore Abandon ship
- Type II—Near-Shore Buoyant Vest
- Type III – Flotation Aid
- Type IV – Throw Devices
- Type V—Special Use & Inflatable



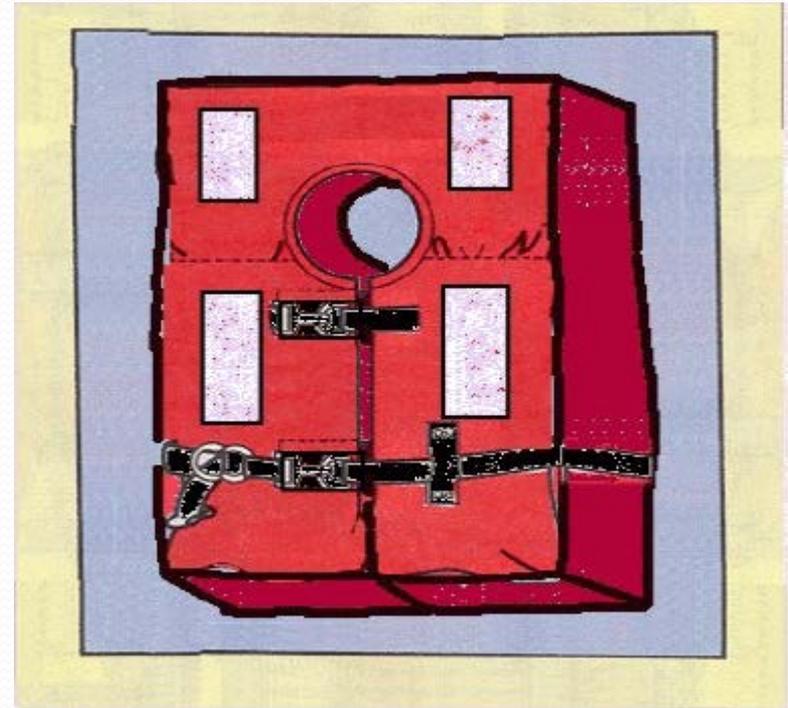
**BUOYANCY:** Most adults only need an extra seven to twelve pounds of buoyancy to keep their heads above water. A PFD can give that "extra lift," and it's made to keep you floating until help comes. But a PFD is a personal flotation device and it's important to get the right one for you.

Your weight isn't the only factor in finding out how much "extra lift" you need in water. Body fat, lung size, clothing, and whether the water is rough or calm, all play a part.

# Type I Off-Shore 'Abandon ship'

**Turns most unconscious wearers face-up in water**

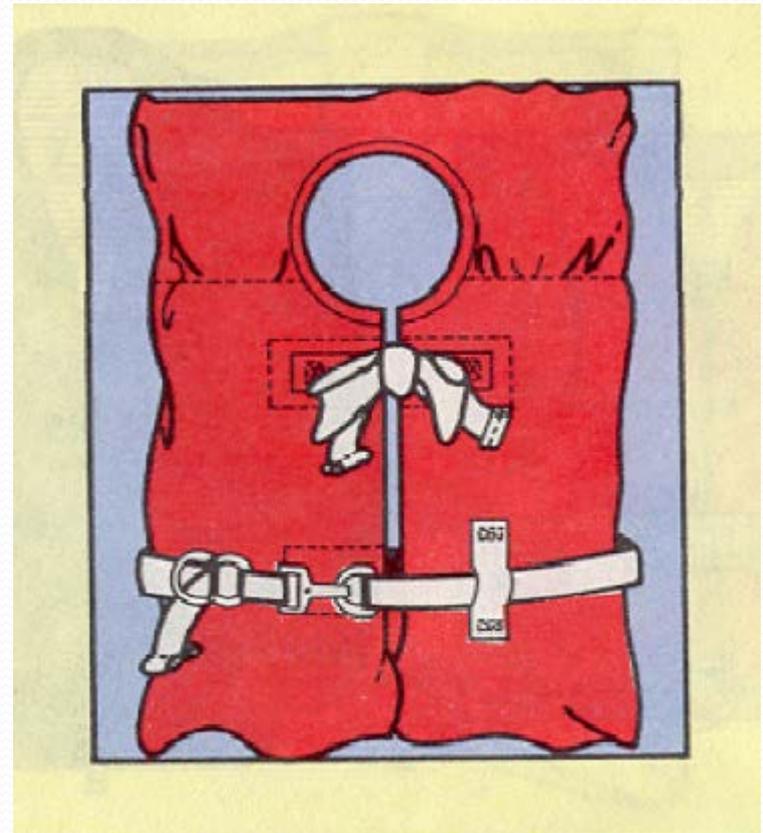
- **Most effective type in rough water or open ocean**
- **22 pounds of 'inherent' buoyancy**
- **Two sizes to fit most children and adults.**
- **Best for all waters but bulky and uncomfortable, & very difficult to work in**



# Type II Near-shore buoyant vest

**Will turn some unconscious wearers face-up in water**

- **Sizes: Infant, child-small, child-medium, and adult**
- **Compromise between Type I PFD performance and wearer comfort; 15 pounds inherent buoyancy**



# Type III Flotation Aid

**Designed to provide a stable face-up position in calm water for a wearer floating with head tilted back**

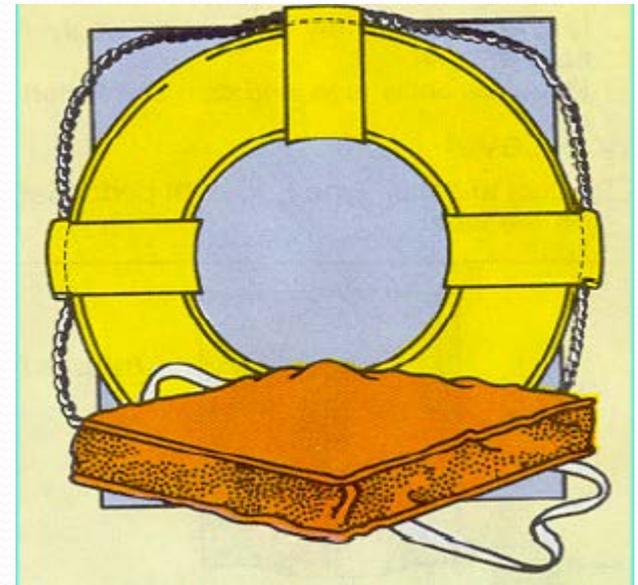
- **About 15.5 pounds inherent buoyancy**
- **Available in a wide variety of styles**
- **Available in many sizes for good fit**
- **Suitable for extended wear and specialized activity such as kayaking**



# Type IV Throw Devices

**Designed to be grasped and held by the user until rescued; ring buoys have 16 pounds inherent buoyancy, boat cushions have 18 pounds inherent buoyancy**

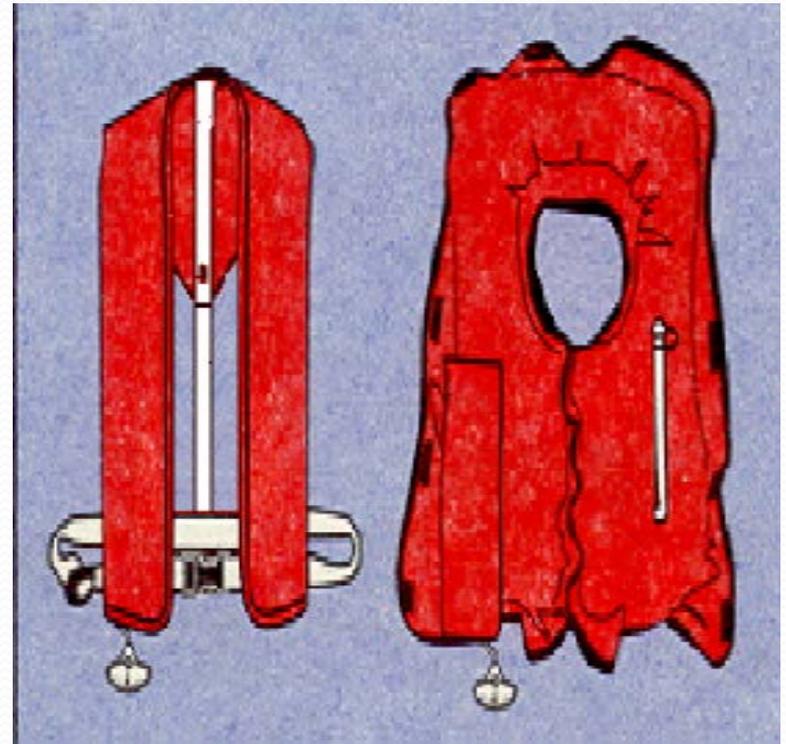
- **Provides enough buoyancy for users to hold their heads out of the water**



# Type V : Hybrid, Special Use, & Inflatable vests

**Designed for special uses or conditions (see label for limits of use)**

- **Generally light weight and less bulky**
- **Excellent for continuous wear in hot conditions**
- **Widely adjustable for many sizes**
- **Inflatable vests can provide 22 pounds of buoyancy when inflated**



# Suspender Type Flotation Devices

## Requirements:

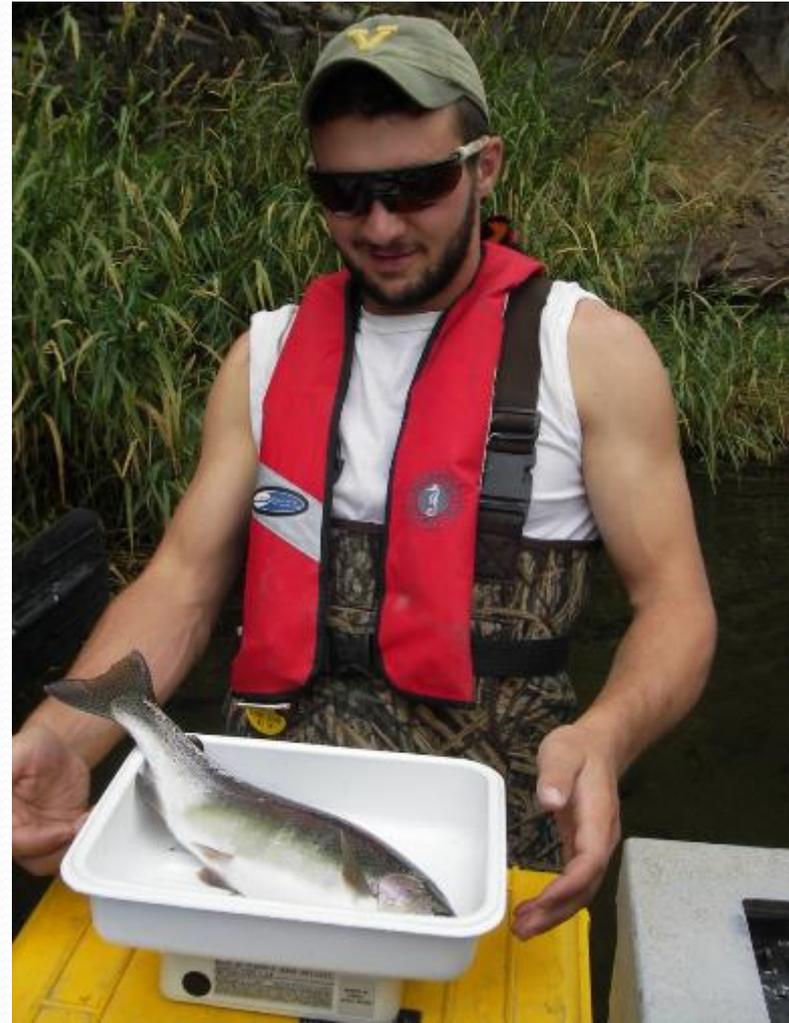
- STFD's must be worn as the outermost garment and with careful consideration of manufacturer's use restrictions.
- The outer cover of STFD's shall be international orange in color for boating use. The air bladder shall be international orange or yellow. The outer cover and the air bladder shall be equipped with retroreflective tape that is visible whether or not the device is inflated.



# Suspender Type Flotation Devices

## Requirements:

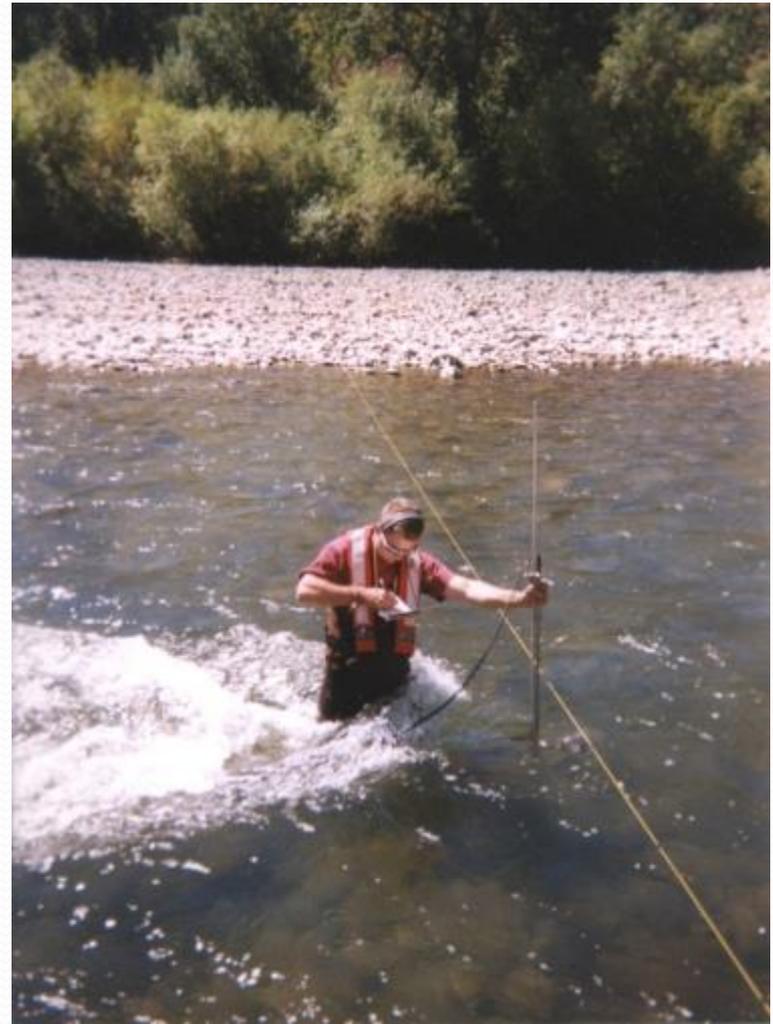
- STFD's that are not USCG-approved are currently only acceptable for non-boating use (e.g., wading streams, making measurements from cableways or bridges, on ice, on a water retention or control structure, and working from docks and piers).



# Suspender Type Flotation Devices

## Requirements:

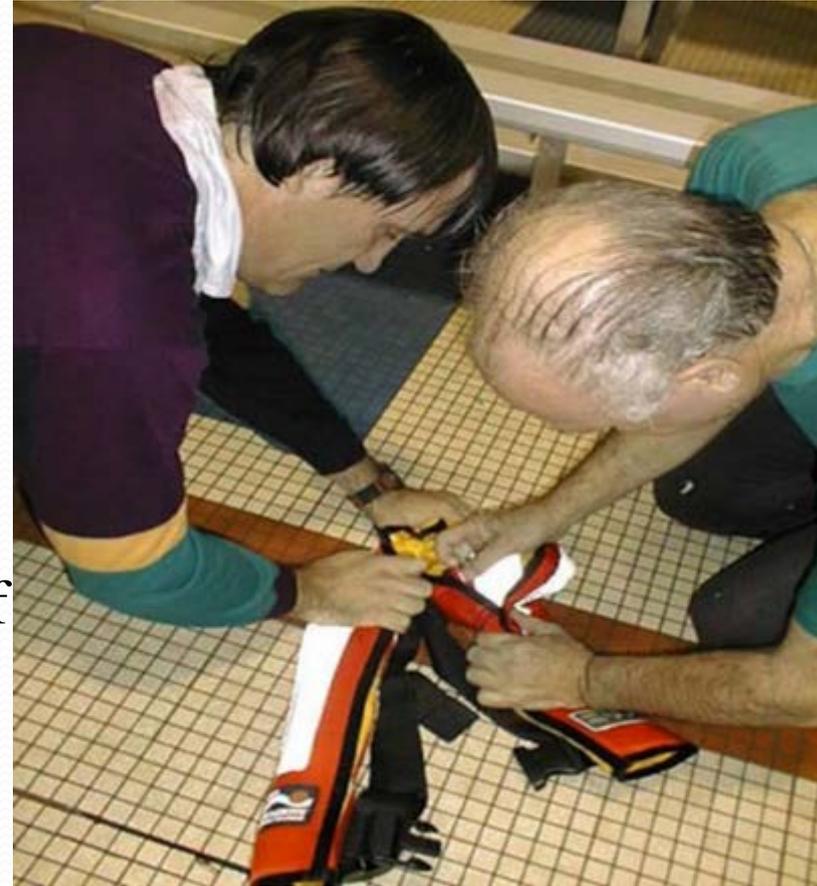
- The STFD's shall be equipped to self-inflate when the employee is immersed in water, with one exception. In low velocity conditions, if the water is too deep to use a self-inflating type STFD (because it will actuate the triggering mechanism), and a PFD cannot be used (because it will cause personnel to float and lose their footing), a manual-inflating STFD must be used.



# Suspender Type Flotation Devices

## Requirements:

- STFD's shall be inspected and maintained in accordance with the manufacturer's instructions, and the USGS SM 445-2-H Chapter 26.
- Employees shall be trained in the operation and maintenance. A record of inspections and maintenance must be kept in each office location.
- Not allowed for non-swimmers, weak swimmers, short people or other hazardous conditions.





# STFD Inspections

- Inspect all straps, buckles, and fabric covers for excessive wear or damage.
- Expose and examine the inflator mechanism check the indicator to see if the device has been fired. Check the expiration date.
- If the indicator shows that the device has been fired then unscrew and remove the inflator mechanism and replace with a fresh inflator mechanism .
- Check that the oral inflation tube cap is capped and properly placed in the stowed position.
- Reposition the bladder's protective cover and refasten all closures.
- The buoyancy cell (bladder) and inflation system should be checked every 2 months during the field season by manually inflating the bladder and letting sit for 24 hours. The bladder should remain full.
- Activation of the CO<sub>2</sub> firing mechanism should be done on a schedule as recommended by the manufacturer. Refer to owner's manual and familiarize yourself with the instructions specific to your model PFD.
- If there is any doubt about the integrity of the buoyancy cell or any part of the CO<sub>2</sub> inflation system return the PFD to the manufacturer for repair or replacement.

# Inspecting Standard PFD's



- Check every inch for rips, tears, loose stitching, abrasions, and cracked or broken buckles.
- Feel the material inside, check for balling or matting of the foam. The foam material will naturally thin with age, decreasing your PFD's buoyancy.
- Make sure zippers, buckles, belts and straps all function properly.
- Check that reflective patches are clean and securely attached.
- Make sure all collars and other attachments are secure.



# Care for your PFD?

- Hang PFD on a hanger to drip dry. Do not wring water by twisting. This can tear the foam inner lining.
- Never dry your PFD on a radiator, heater, or any other direct heat source. Just let air dry.
- Hand wash with mild soap and water if soiled. Rinse the PFD thoroughly. Do not dry clean.
- Store your PFD in a well ventilated, dry place away from excessive heat or sunlight.
- Do not fix or make any alterations to your PFD. If your PFD is old or does not work properly, get a new one and destroy the old one.

# Swift Water Awareness



Swift Water Awareness teaches recognition and avoidance of common river hazards, execution of self-rescue techniques, and rescue techniques for others in distress.

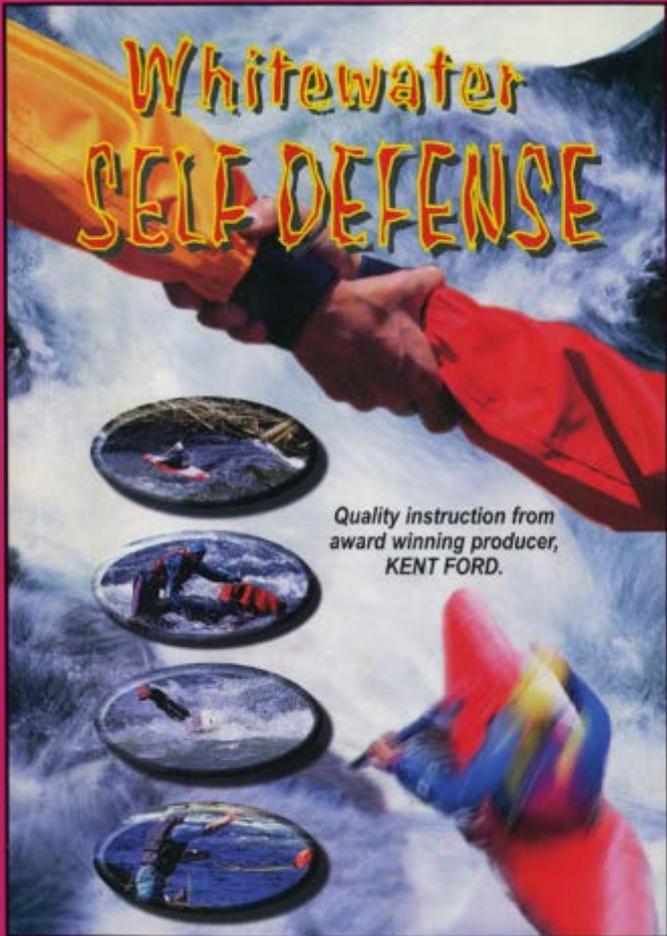
Be prepared:  
Conditions can  
change in a hurry!

- Silvercloud flood video  
see how fast conditions can  
change



# Video Resource

**Whitewater SELF DEFENSE**



## Whitewater SELF DEFENSE

Quality instruction from award winning producer, KENT FORD.

## Whitewater SELF DEFENSE!

Whitewater Self Defense helps paddlers avoid trouble and deal with unexpected problems. The emphasis is "everyday" river safety and rescue, including fundamental skills every whitewater paddler should know. Includes new and proven safety techniques, bridging the gap between basic safety techniques and hard core river rescue. Contributors include Charlie Walbridge, Ellen DeCuir, Kent Ford, and over a hundred other paddlers.

This video helps recreational paddlers tackle their most worrisome question: "Will we have the knowledge, skill, and equipment to help if someone in our group gets in trouble on the river?"

"From start to finish it imparts rescue fundamentals anyone taking to the water should know. Quick pace keeps it interesting for all levels of boaters."  
Paddler Magazine.

"Mandatory Viewing." - National Paddling Film Festival Judges report. Winner Safety/Instructional.

**CONTENTS:**

- The formula for a safer trip.
- Hazard recognition.
- A dozen swimming techniques.
- Controlling runaway gear.
- Rope handling basics.
- Introduction to rescue vests.
- Recovering pinned boats without complex haul systems.
- Strategies for entrapment stabilization and rescue.

**Produced in association with:**



**Try our other highly acclaimed titles:**



**SAFETY WARNING:** Whitewater kayaking and rescue is dangerous. Viewers must acknowledge both an understanding and assumption of these risks. Safety and rescue techniques are not guaranteed in any way. There's no substitute for on-the-water instruction and practice.

Produced and distributed by  
Performance Video and Instruction, Inc.  
888-259-5805 [www.performancevideo.com](http://www.performancevideo.com)  
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**DVD**



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# Swimming in Swift water

What do you do if you find yourself in the water?

- White water Self defense—Video Swimming

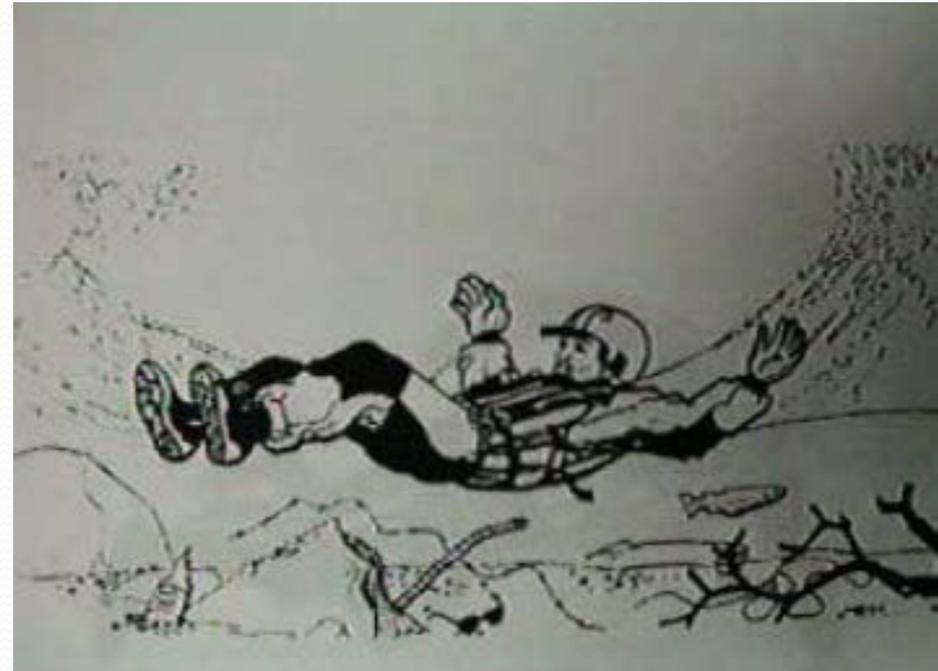


# Swimming in Swiftwater

- Don't try to stand up, avoid foot entrapment!
- Use an aggressive swimming technique to get to shore.
- Keep your feet down stream to adsorb the impact with exposed rocks.
- Arch your back to keep your butt up.
- Time you breaths between waves, turn your head to the side.
- Back stroke with your hands to position yourself in the river.
- Reverse position to dive over logs and 'strainers'



Foot Entrapment



# Swim over logs/ strainers



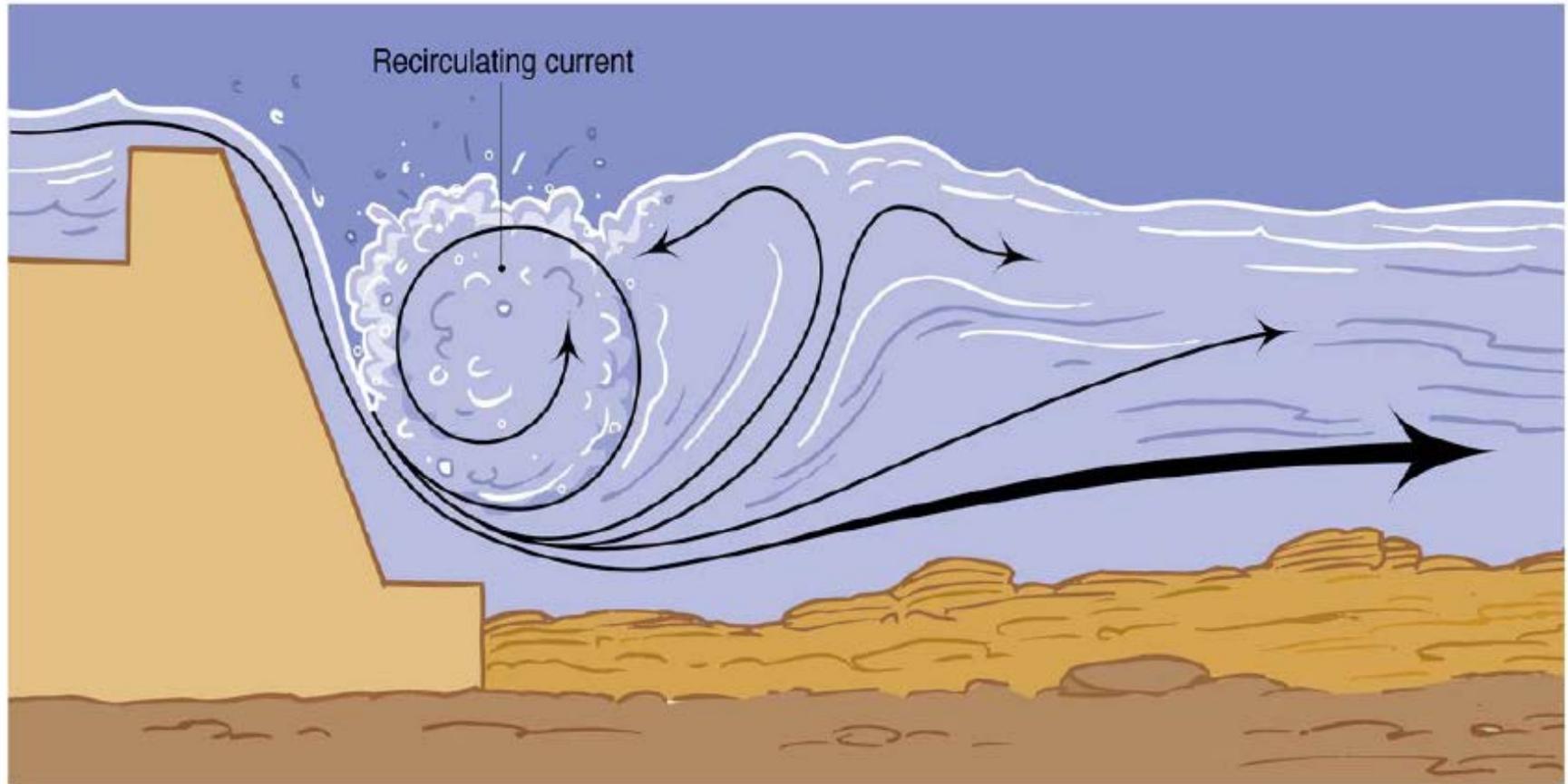
**Never go UNDER!**



# **River Wide Reversals = DEATH!**



# Low Dams are “Drowning Machines”



# General Safety

## Guidelines for Wading

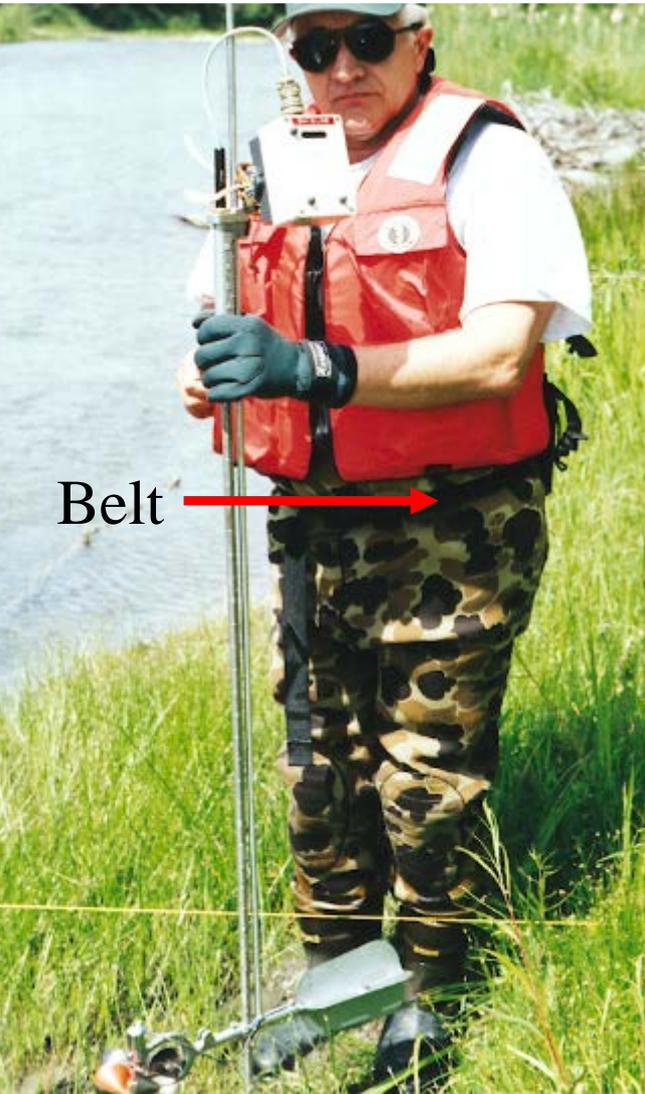
- Know your limits. Do not attempt the measurement unless it is safe to do so.
- Always wear your PFD.
- Be prepared for slippery streambed conditions.
- Dress appropriate for the conditions—check the weather report before you leave. Be prepared for cold water.
- Use any wading-limiting formulas with caution (such as  $\text{depth} \times \text{velocity} = 10$ ). Take into account site conditions and personal abilities and limitations.

### **MOST IMPORTANTLY,**

- Do not attempt wading measurements upstream from low-head dams or other river hazards such as logs, undercuts or vertical banks where there is no way to get out.



# Wader Safety



Belt →

- Belts can prevent waders from rapidly filling with water, if you fall in or over-top your waders.
- Once they are full of water waders become very heavy



# Wading techniques

- White water Self defense—Wading Techniques



# Working from bridges

- Do not attempt any kind of bridge work without an approved DOT or local transportation agency approved traffic control plan for the bridge, or if the plan cannot be carried out for any reason (such as lack of personnel or equipment).
- ANSI Class III reflective Vests are required on all roadways.
- Wear a USGS-approved PFD.
- Only the new lime-green inflatable vests that match the ANSI class III traffic vests are approved for work on bridges.



# Working from boats

- Do not attempt any kind of boat work without a DOI-certified boat operator.
- Wear a U.S.C.G. and U.S.G.S. approved PFD at all times.
- Passengers and crew should keep an eye out for hazards and notify the operator when they see something the operator does not.
- Avoid measuring upstream of bridges or other obstructions that do not allow sufficient boat clearance.
- Do not attempt a boat measurement if boat traffic will interfere with the tag-line.
- Always carry an appropriate break-away device and wire cutters for emergency use.
- Refer to USGS SM 445-2-H Chapter 31 on Watercraft Safety for more information.





# In-the-water survival hazards

- Drowning – "Every year approximately 8,000 people drown, making drowning the third leading cause of accidental death in the United States." (National Safety Council)
  - Males (80%) and Children (ages 1-4) are most at risk
  - Most not wearing PFD
  - Alcohol is frequently involved
- Hypothermia
  - 50% of drowning incidents happen in cold water (<70 degrees)

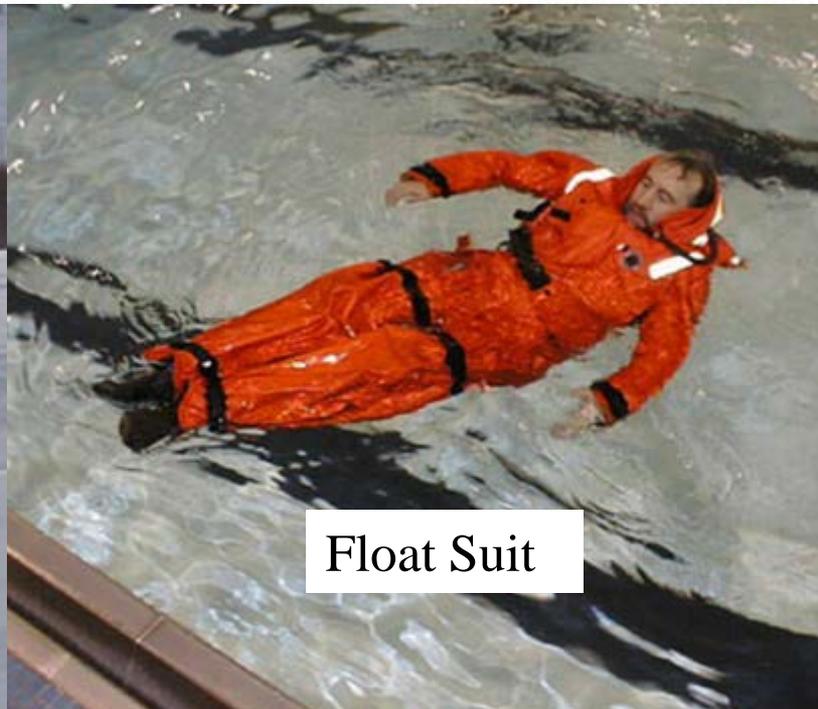
# Cold Water Awareness

USGS SM 445-2-H Chapter 31, Watercraft Safety states:

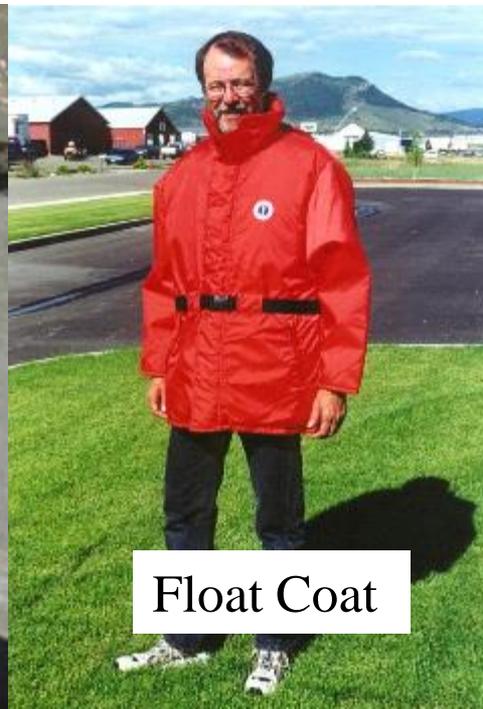
- Cold water protective PFD's such as anti-exposure coats, coveralls, jackets or immersion suits must be provided where operations pose a potential exposure to hypothermia (water temperatures of less than 21 °C [70 °F]).
- All personnel aboard will be trained in the proper use of the cold water protective PFD's.



Dry  
Suit



Float Suit



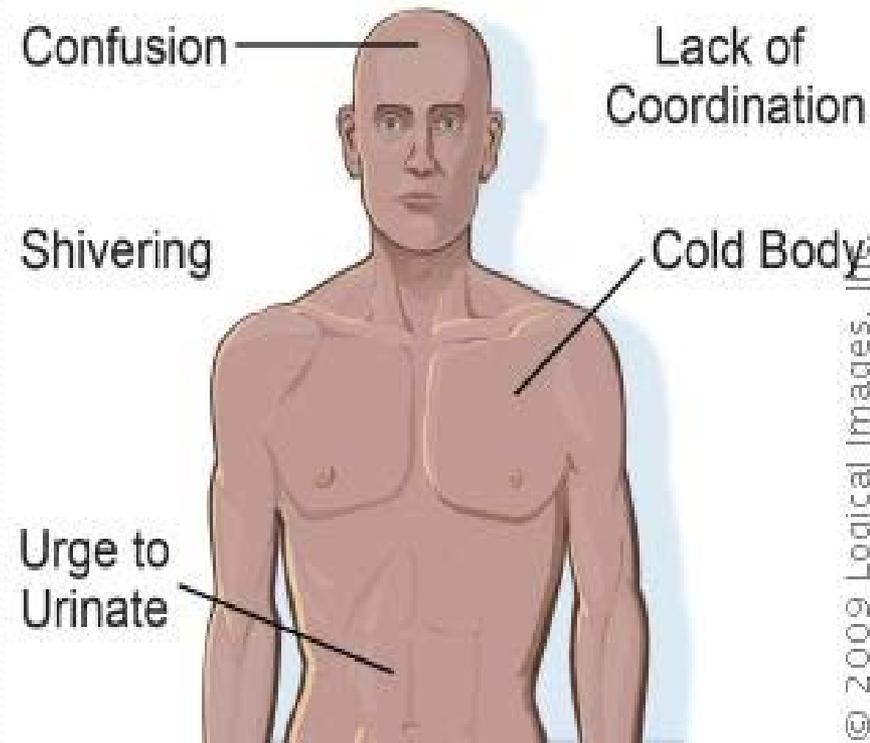
Float Coat



# Hypothermia facts

Hypothermia is a condition that exists when body temperature drops below 95 degrees. This can be caused by water or air exposure.

Water conducts heat away from the body 25 times faster than air. Factors such as water temperature, body fat, body size and movement all play a part in how quickly the body's temperature drops.

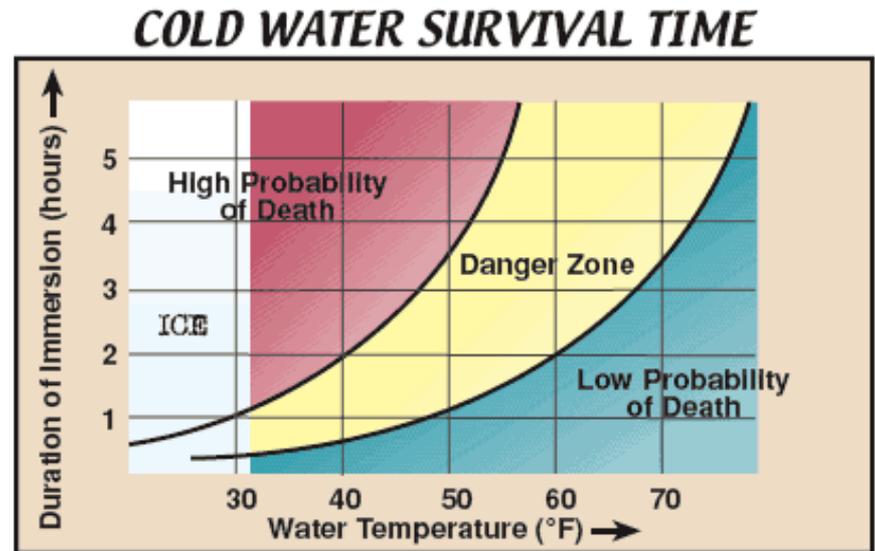


# Survival Time

The temperature of the water, body size, body fat, type of clothing, and activity-level all determine survival time.

## Generally:

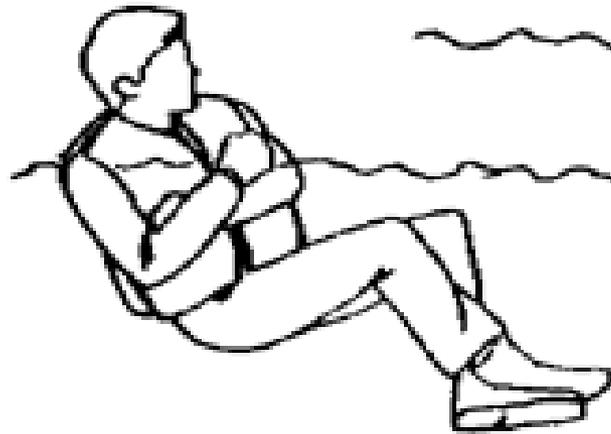
- Survival time increases with extra body fat
- Survival time decreases with smaller body size
- Children cool faster than adults
- Predicted survival time in 50 degree water is only 3 ½ hrs



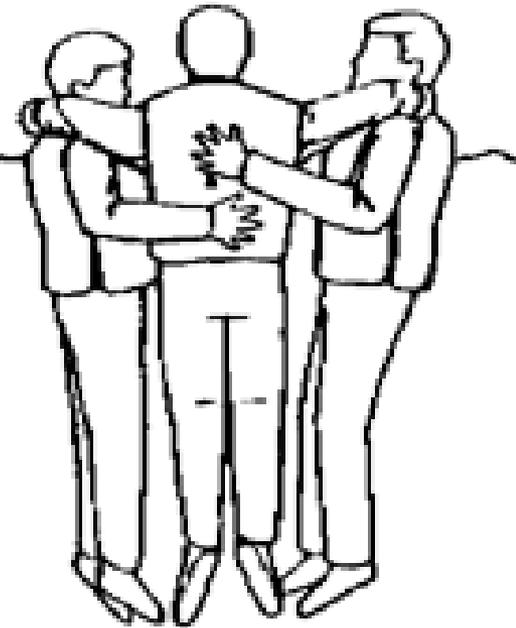
*The Danger Zone indicates where safety precautions and appropriate behavior can increase your chances of survival when immersed in cold water.*

# Life-saving postures

- Heat Escape Lessening Posture (H.E.L.P.)
- About 50% of body heat is lost from the head
- Other areas of high heat loss are neck, sides, underarms, and groin

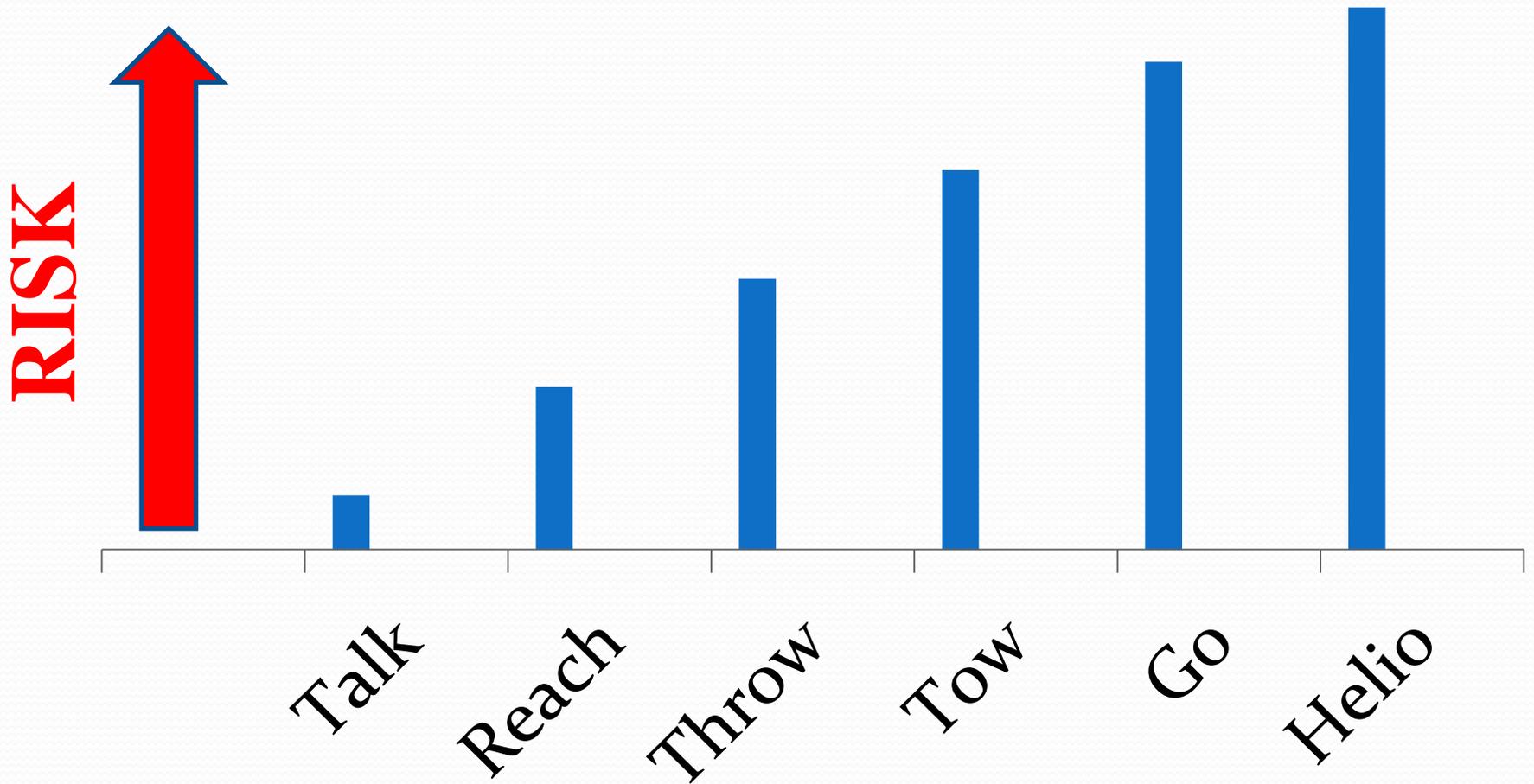


**H.E.L.P.**  
**(Heat Escape**  
**Lessening Posture)**



**HUDDLE**  
**to maintain**  
**body heat**

# Rescue team risk ordered rescue options

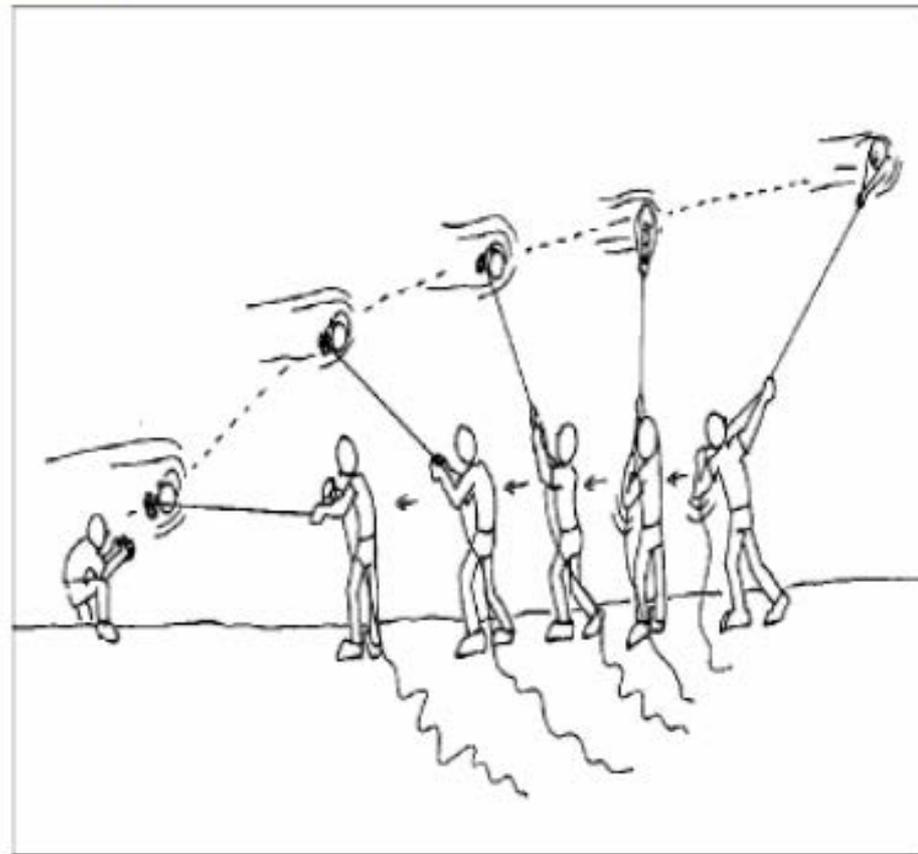


# Throw bags

## Shore Based Rescue Options

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- Reach
  - Pole, Paddle
- Throw
  - Throwbag, Coiled Line, Rescue Disk
  - Try for 2 accurate throws in 20 seconds.



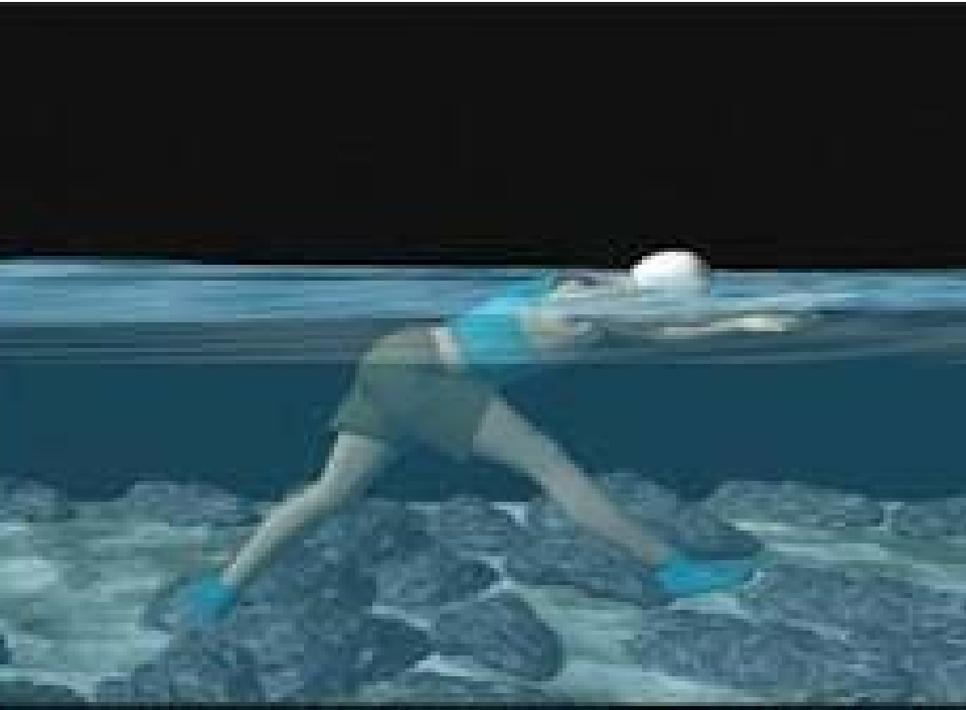
# Throw bags

- White water Self defense—Throw bags



# Stabilization Tag-line

- White water Self defense—Stabilization tag-line to provide support who is caught in a foot entrapment



# Over the Water Safety



Winter measurement  
Snake River near Moran, WY

“Both supervisors and employees will be held accountable if safety policies are not followed.”

# Penalties for failure to observe Safety Practices

- **First Offense**– written reprimand to removal
- **Subsequent Offenses** – 5-day suspension to removal
- **Possible Charges**
  - Failure to observe safety practices
  - Carelessness
  - Endangering oneself
  - Engaging in unsafe work practices





# Review questions

- When can work be conducted around water without wearing a PFD?
- Define hypothermia.
- How many times faster than air does water conduct heat away from the body?
- At what water temperature does a person become vulnerable to rapid heat loss?
- What is a strainer? How would you get past it?
- What is a low-head dam and why is it dangerous?
- What should always be your first consideration when assessing the scene of a potential water rescue?

# Review questions

- List water rescue procedures in the order they should be performed.
- What techniques would you use if you being swept downstream?
- When tossing a throwbag where should you aim?
- What is a foot entrapment and why is it dangerous?
- What does HELP stand for?
- Why do STFD's need to be inspected?
- When is a PFD not required to be worn on a boat?

# “Safety First, Every Job, Every Time”

Because...you never know all the dangers that may lurk beneath the water surface



# Safety First, Every Job, Every Time



# Selected references

Video references:

## **Whitewater Self Defense**

available from major whitewater equipment suppliers

## **Staying Alive Swiftwater Rescue Techniques**

available from Rescue 3 International

<http://www.rescuesourcestore.com/cart/ecom-prodshow/VH1815D.html>

Vendors:

**Rescue 3 International** is the primary source for Instructor certifications. Most local vendors who conduct Swiftwater Rescue training will be affiliated with Rescue 3.

<http://www.rescue3international.com/index.php>