Technical Rescuer;

Water Rescue

Rescue Operations

Are you Ready For the Storm?

Just The Facts…

- Drowning is the 2nd leading cause of accidental death in America.
- Most drownings occur in open bodies of water such as lakes, rivers, creeks.
- The quicker the rescuer can reach the victim, the greater the chance for survival.
  Time is crucial without air to breathe.
- Priority must be given to the victim's airway, breathing, and circulation.

Just The Facts…

- Water rescues are low frequency; high risk rescues.
- Are Resource Driven (Requires specialized equipment & training)
- Can be:
  - Single Agency Response
  - Multi-Agency Response
  - Multi-Jurisdictional Response
  - Multi-Event Responses
  - Multi-day Responses
  - Rescue & Recovery simultaneously
- The majority of responders are not sufficiently trained in water rescue.
- Rescuers will operate outside their scope of training.
- This creates a safety hazard to patients and rescuers.

Creating the Site Survey

Site Surveys & Pre-planning

- Provides responders with projected problems likely to be encountered.
- Identifies High Probability Areas of Detection
- Identifies specialized equipment & training where rescues are likely to occur.
  - (Tourist areas, flooded roadways.

Site-surveys Consists of:

- *Information From Previous Rescue & Recovery Incidents*
- Hazard Identification
- Site Visit To Observe Low Water / High Water Surveys
- Take Pictures
- Identifies Upstream & Downstream Problems.
- Various Water Flows
- Identifies PPE And Specialized Resource Needs.
- Use Fema Flood Plain or GIS Mapping

Site-survey

- Map Systems:
  - Commercial
  - Orthophoto
  - Hand-drawn
  - GIS & Tax office.

- Maps Assists in search planning

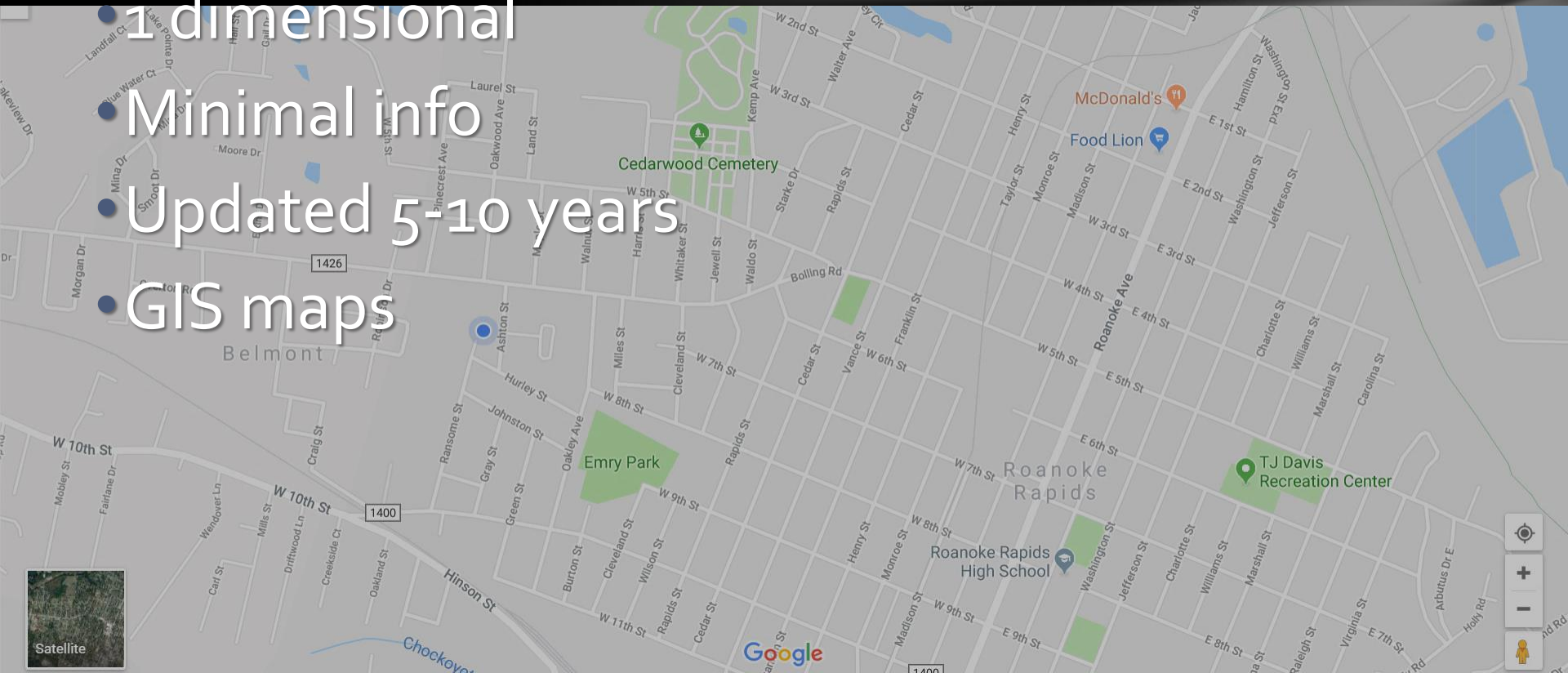
Maps

Types of Maps:

- Commercial
- Ortho photographic
- Topographical
- GIS Technology

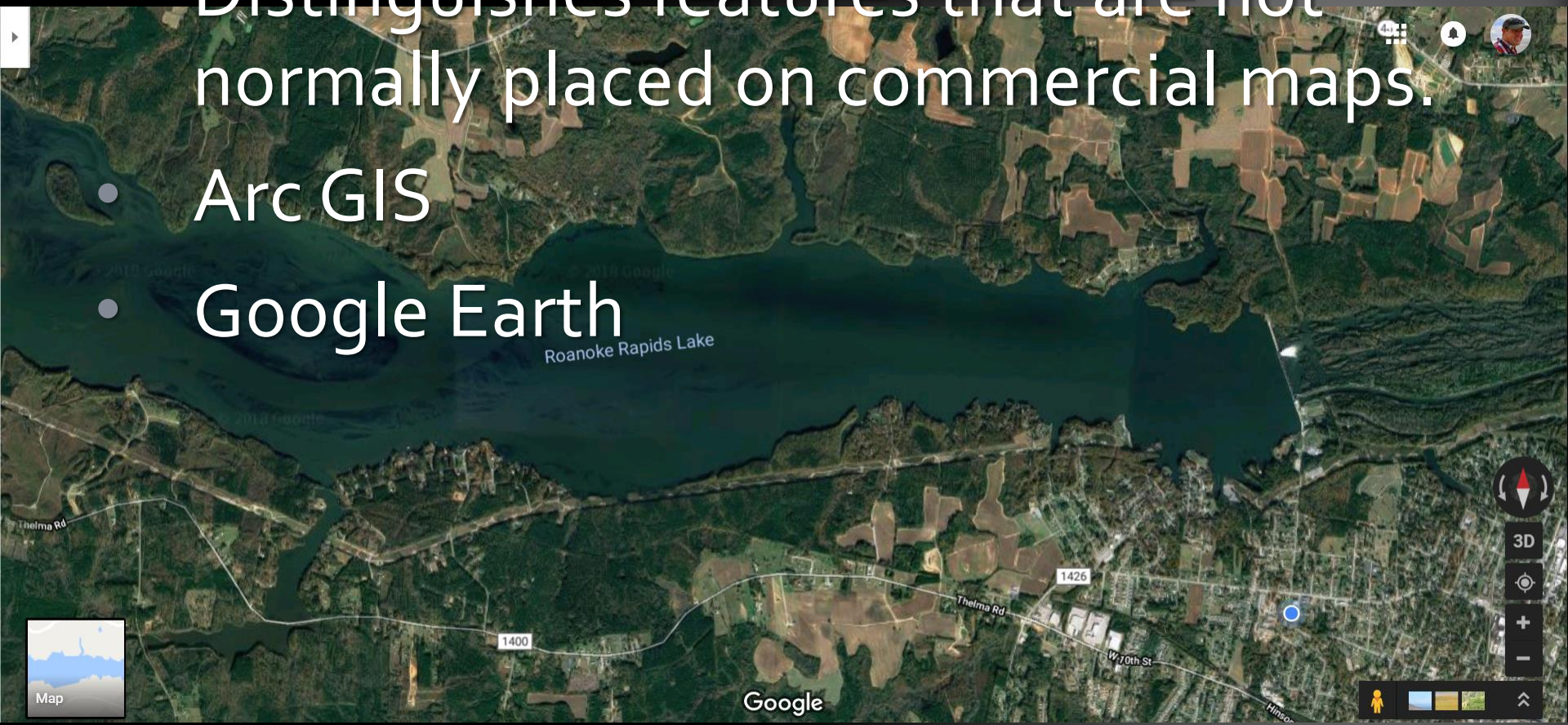
Commercial Maps

- Wide Variety of Manufacturers
- Causes confusion among multiple agencies
- 1 dimensional
- Minimal info
- Updated 5-10 years
- GIS maps



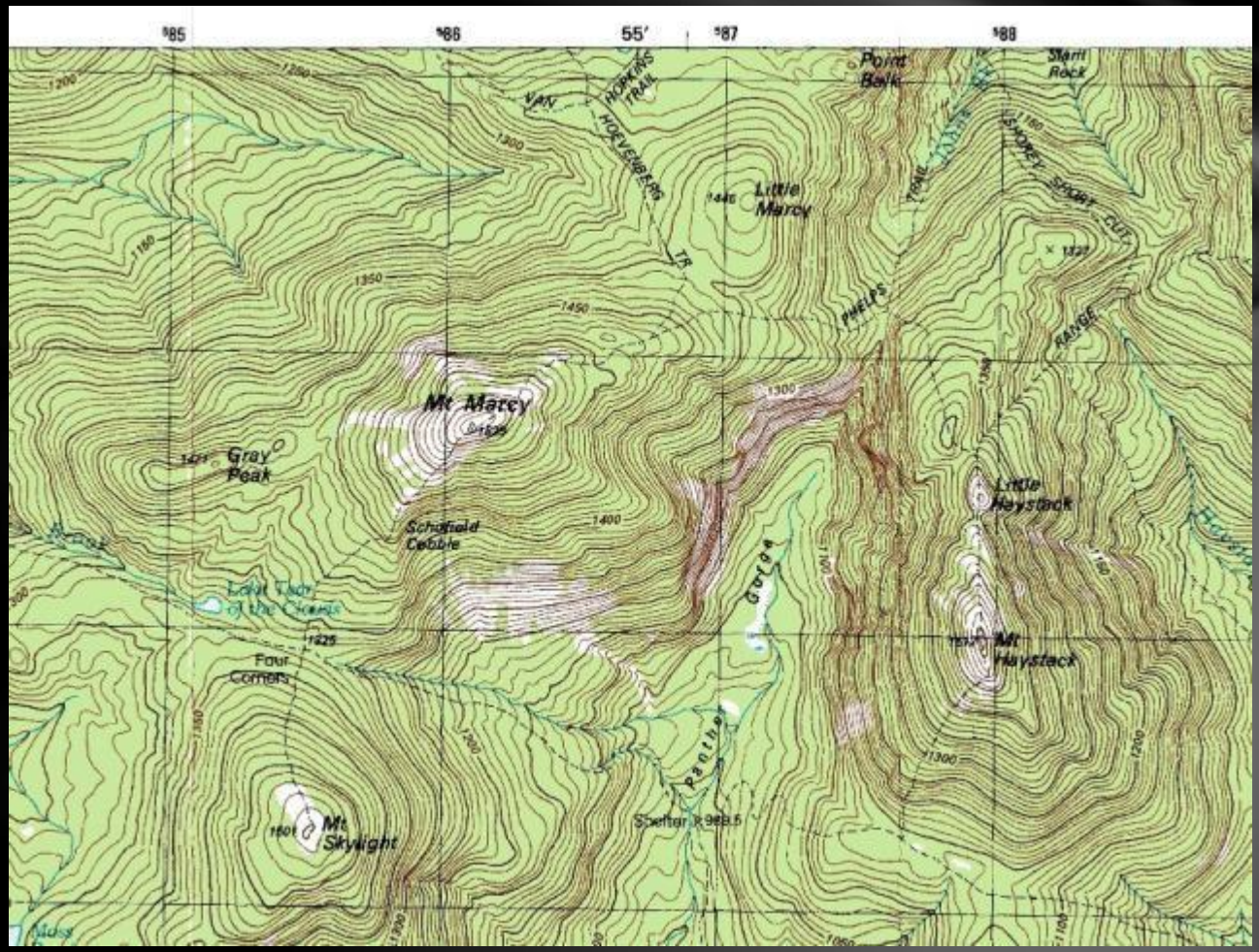
Ortho Photographic

- Created by local governments
- Distinguishes features that are not normally placed on commercial maps.
- Arc GIS
- Google Earth



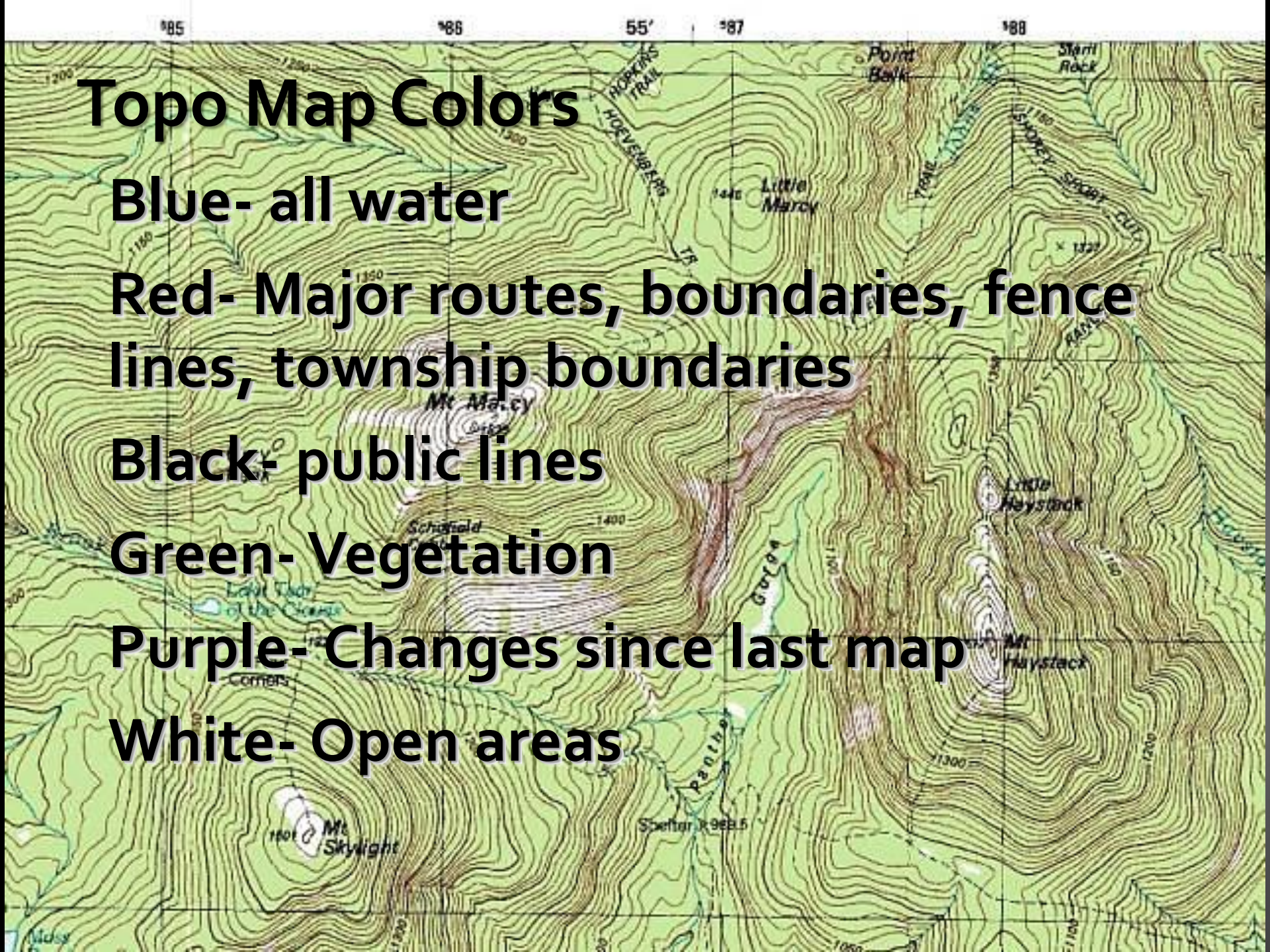
Topographical

- Shows a photographic image of an area in many colors
- Various symbols represent different features within the map.
- Updated every 10 years



Topo Map Symbols

- Contour Lines- Brown
- Roads- Solid, dotted, or dashed lines
- Railroad Tracks- Line w/ hash
- Bridges or dams
- Towers & Power Lines ROW's
- Benchmarks
- Buildings


Topo Map Colors
Blue- all water
Red- Major routes, boundaries, fence lines, township boundaries
Black- public lines
Green- Vegetation
Purple- Changes since last map
White- Open areas

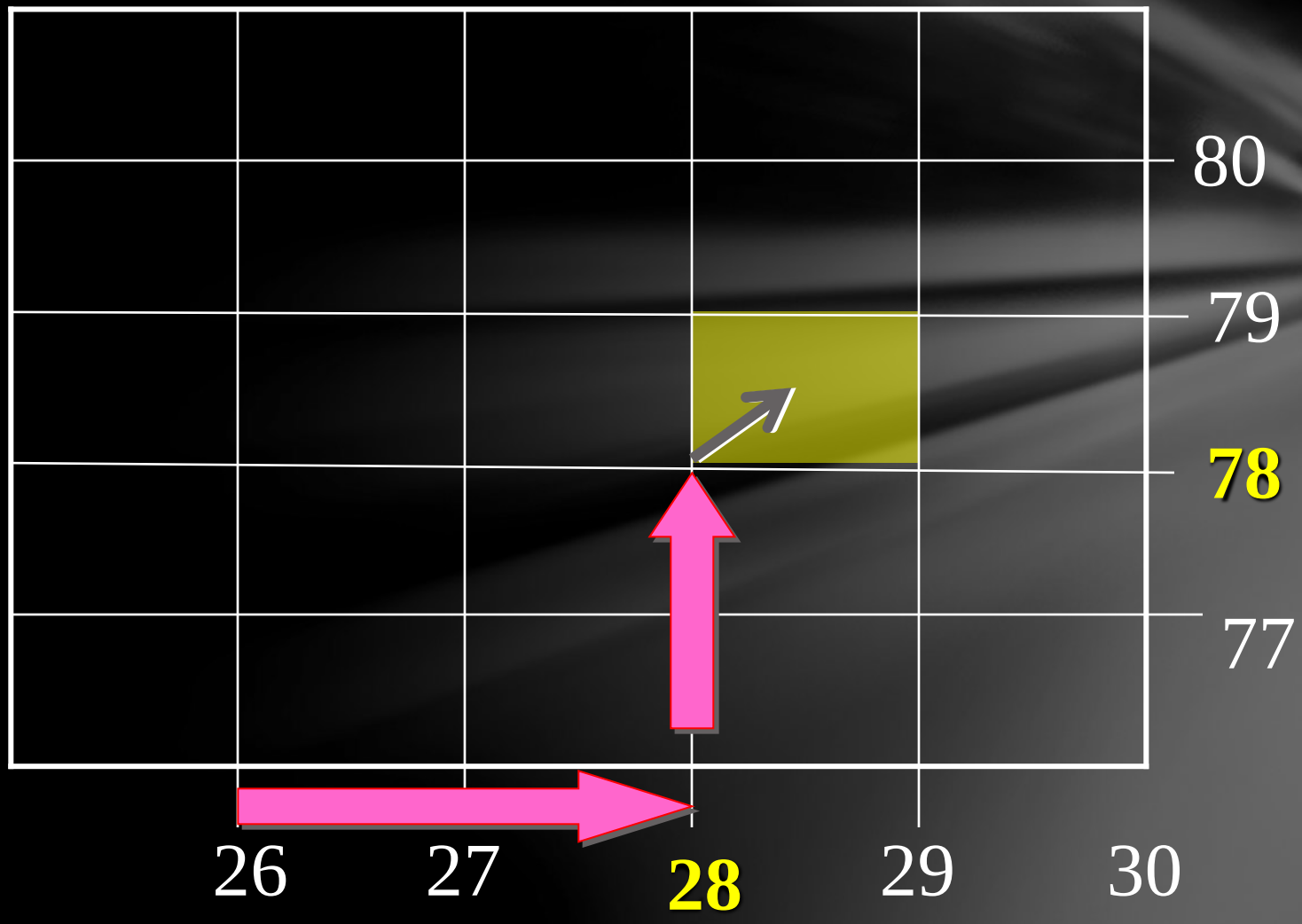
Topo Grid Systems

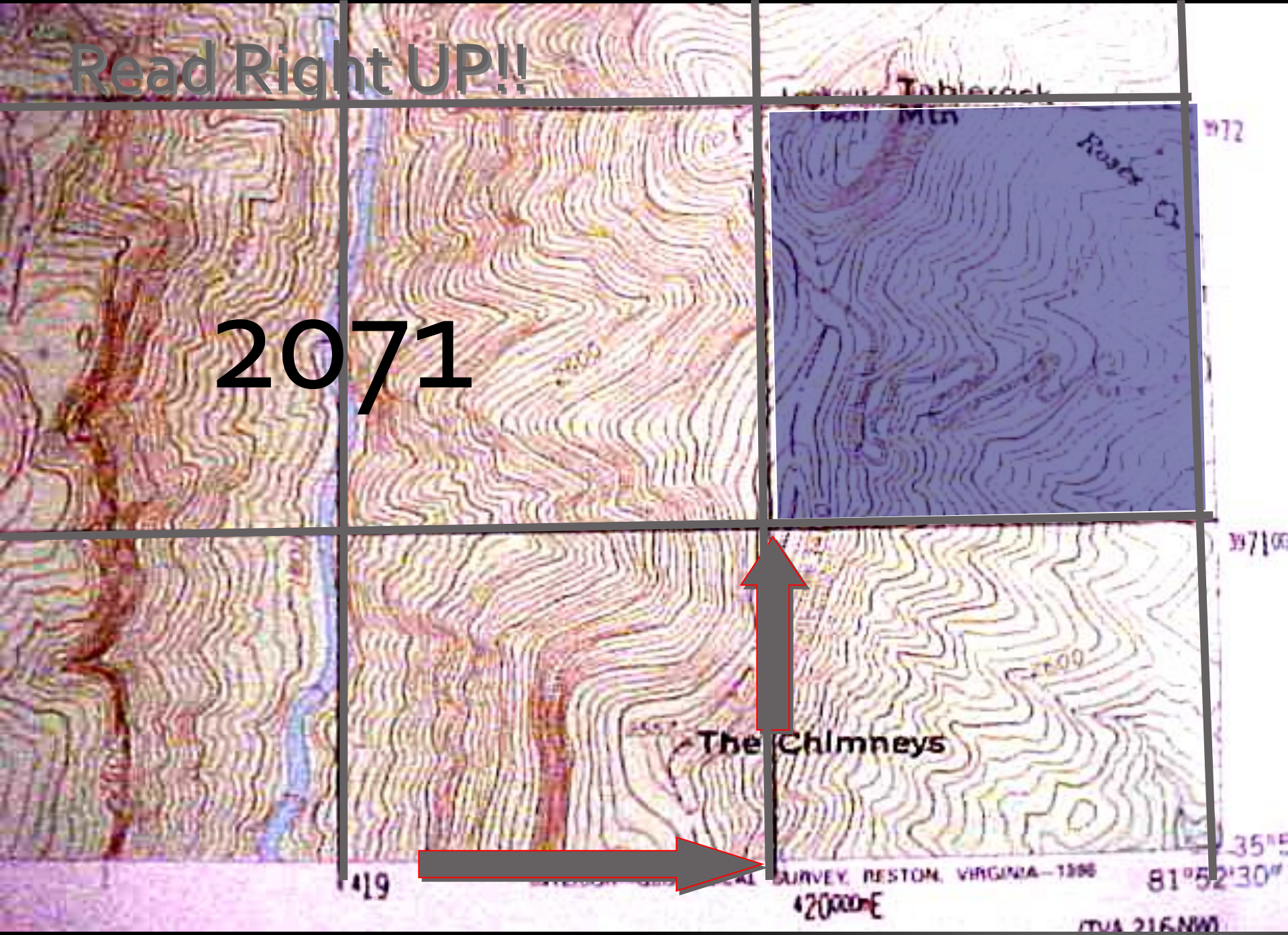
Universal Transverse Mercator System (UTM)

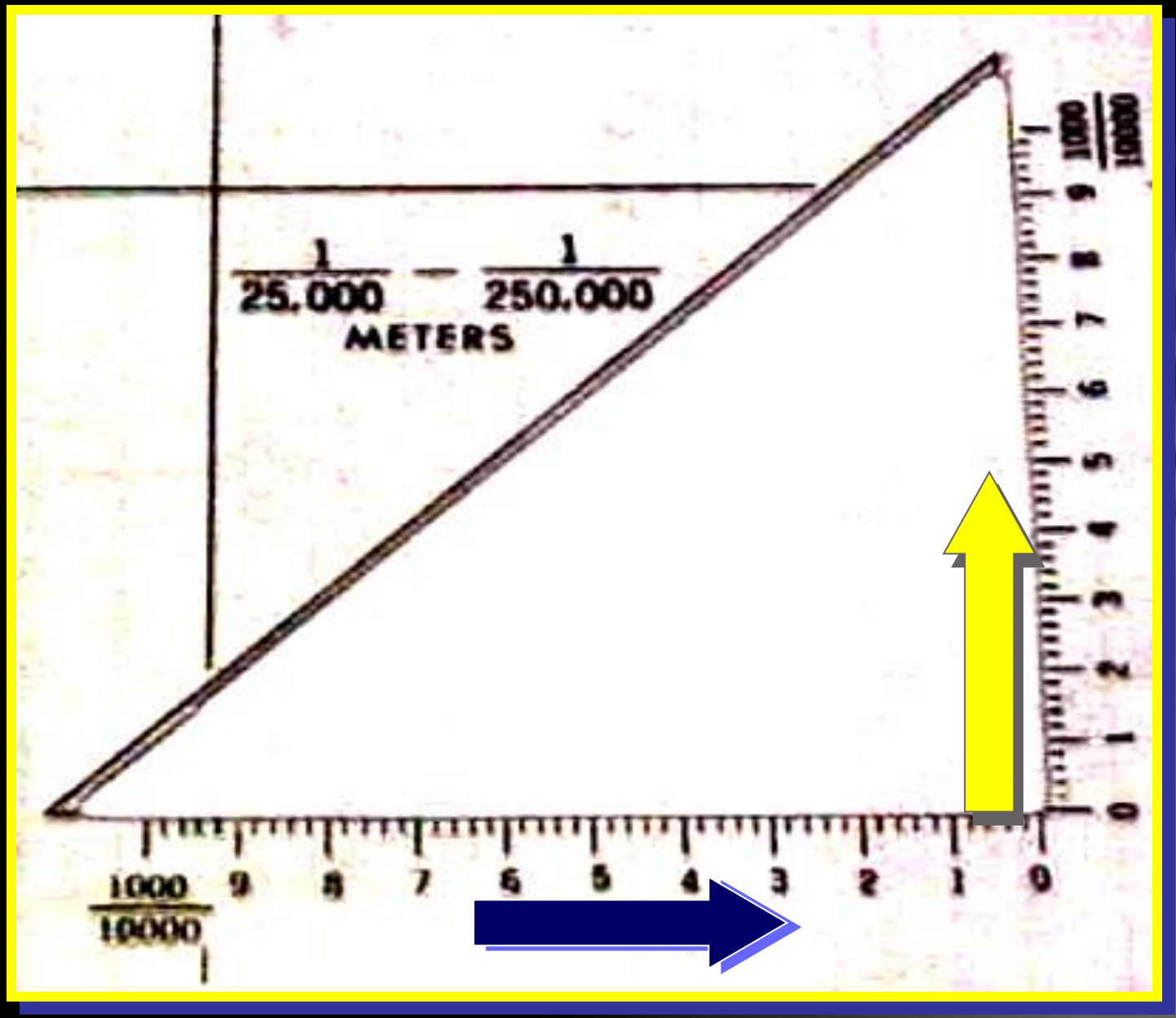
- Provides for a standard unit of Measurement
- 4 digit coordinates=1,000 meters
- 6 digit coordinates= 100 meters
- 8 digit coordinates = 10 meters

- READ RIGHT UP!!

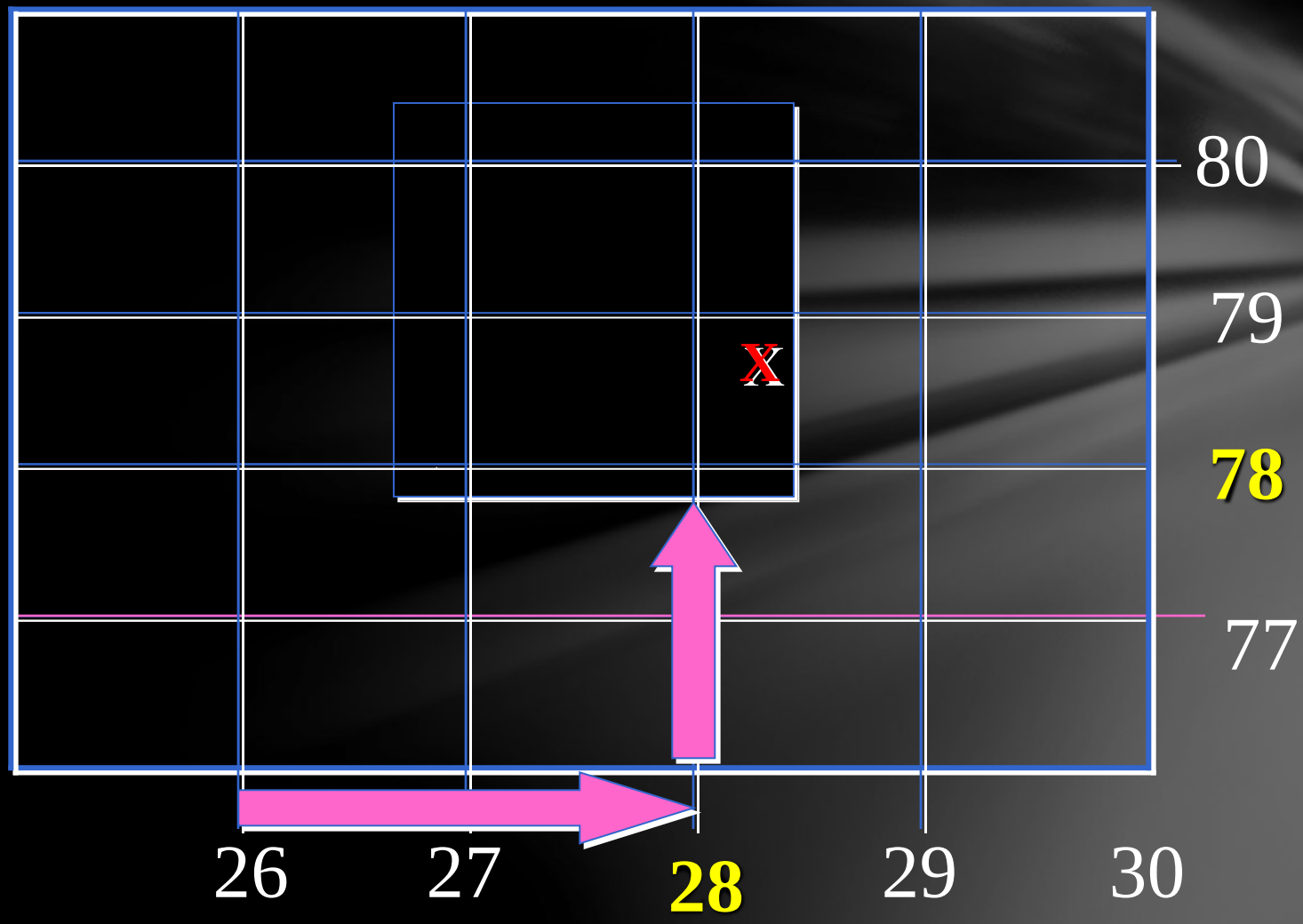
4 Digits = 1000 meters Coordinates 2878




Read Right UP!!
2071
The Chimneys
SURVEY, RESTON, VIRGINIA—1986
81°52'30"
4220000mE
4219

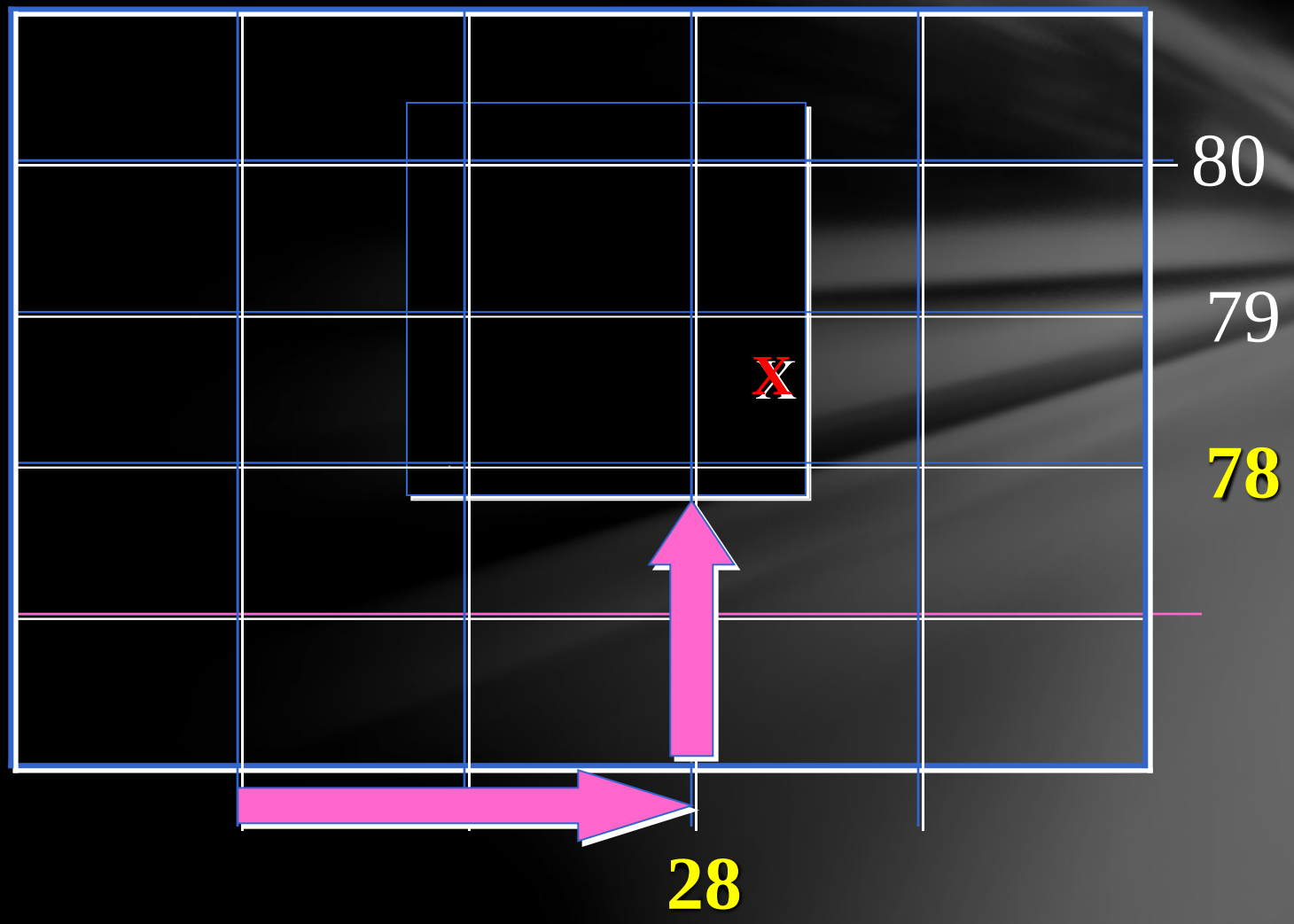

1/25.000 − 1/250.000
METERS
1000/10000
9 8 7 6 5 4 3 2 1 0
1000/10000
9 8 7 6 5 4 3 2 1 0

6 Digits= 100 Meters Coordinates 282783



8 Digits=10 Meters Coordinates 28257825

1

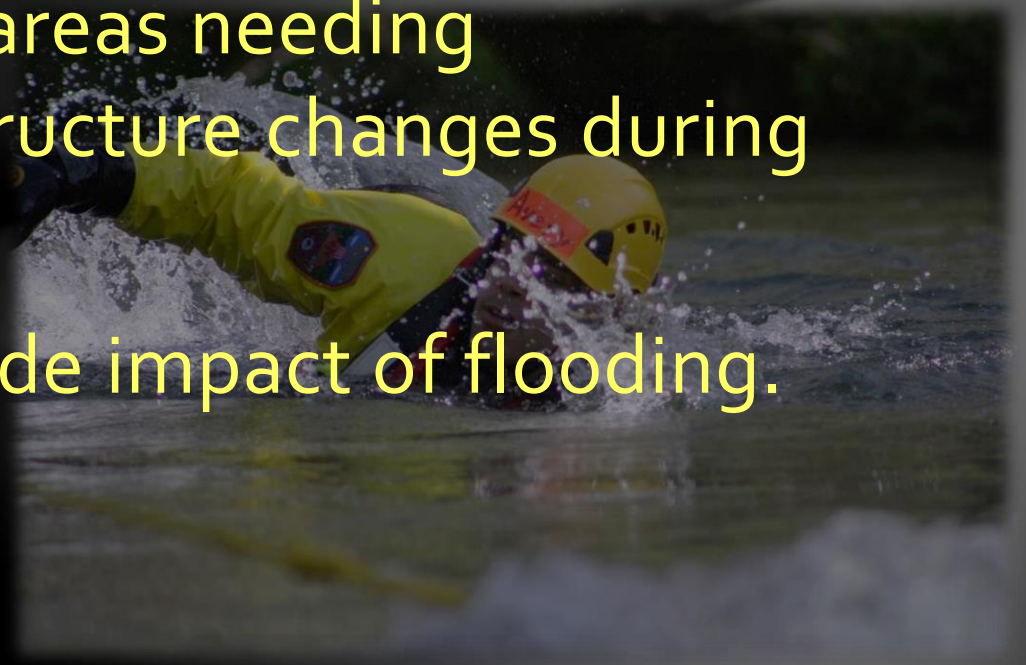


Resources:

- What is a resources?
- DNR / Wildlife Commission
- Qualified Fire and Rescue Departments
- River Outfitters
- Boating Paddling organizations
- Emergency Management
- Park & Rec
- Coast Guard

Site Surveys

- Identify access and egress routes for boat launch sites for deployment and downstream rescue sites.
- Identify flood prone areas needing evacuation or infrastructure changes during floods.
- Citywide & Countywide impact of flooding.



Size –Up's

Scene Size-up (Interview)

- What is it?
  - Rapid Information Gathering phase.(RIG Assessment)
- *Included in the Incident Action Plan to determine the agency's response mode.*
- *Time until a victim re-surfaces is based upon water temperature and stomach contents.*
- *Critical to interview and maintain possession of witnesses:*
  - *Reason the victim was in water.*
  - *Description of the victim; clothing worn*
  - *Time the subject went under*
  - *Point Last Seen (PLS)*
  - *What &when was last meal, alcohol involved?*

Scene Size-up (Interview)
Scene (RIG) Assessment

- Establish the Point Last Seen (PLS).
- *Determine Probability of Detection (POD) analysis of the search area by considering:*
  - *River Hazards*
  - *Consensus of search leaders experience*
  - *Availability of personnel to conduct search*

- Conduct a Hazard Assessment within search area.
- Distribute maps of search area to each search team
- Types and Mechanics of Drowning.
- "Reading the river" based upon dynamics of surface water behavior.

Scene Size-up

- ***Search area can be determined by multiplying the speed of the current by the time since the last sighting of the victim.***
- In order to manage a successful Surface Water rescue / recovery operation you must apply:
  - Specialized Knowledge
  - "Skills sets" to perform the techniques.
  - Good Physical Fitness
  - Judgment

Scene Size-up ;Incident Action Plan

- Classical Decision Making
  - 90% of water incidents are managed in this manner.
- Naturalistic Decision Making
  (Recognition Prime Decision Making)
  - Information from previous events.
  - Strategies and tactics used.
  - Compare previous incidents with your proposed operations.

Classical vs. Naturalistic

- Nantahala River Fatality
- Cullasaja River Fatality

Scene Size-up; Equipment Needs

- Vary according to incident environments.
- Equipment for rescuers.
- Rescue equipment for operations.
- Support and logistics needs.

Scene Size-up; Assessing the patient

- Determine level of consciousness (LOC).
- Head above or below surface.
- Is victim wearing PFD.
- Is the victim trapped or pinned?
- What type of medical problem?
- What is the degree of rescue problem? What resources will be needed?

Scene Size-up; Hazards

- Vary according to surface water.
  - Open water.
  - Large lake or pond.
  - Low-head dam.
  - Flood water.
  - Swift water.
  - Ice.
  - Surf and / or Tidal.

Scene Size-up ; Environmental conditions

- Time and Temperature
- Rainfall
  - Current and past.
  - 12 hour forecast.
  - Training Affect

Mode of Operation

- Rescue or recovery
- Combination of both?
- Number and types of victims.

Risk vs. Benefit Analysis

- Victim's time in water.
- Level of training of on-scene rescuers

Recovery Operations

- Ensure the safety of all on-scene rescuers.
- Impressing it is a recovery operation; not an emergency.
- High-risk tactics such as night ops. cannot be tolerated during recovery operations.

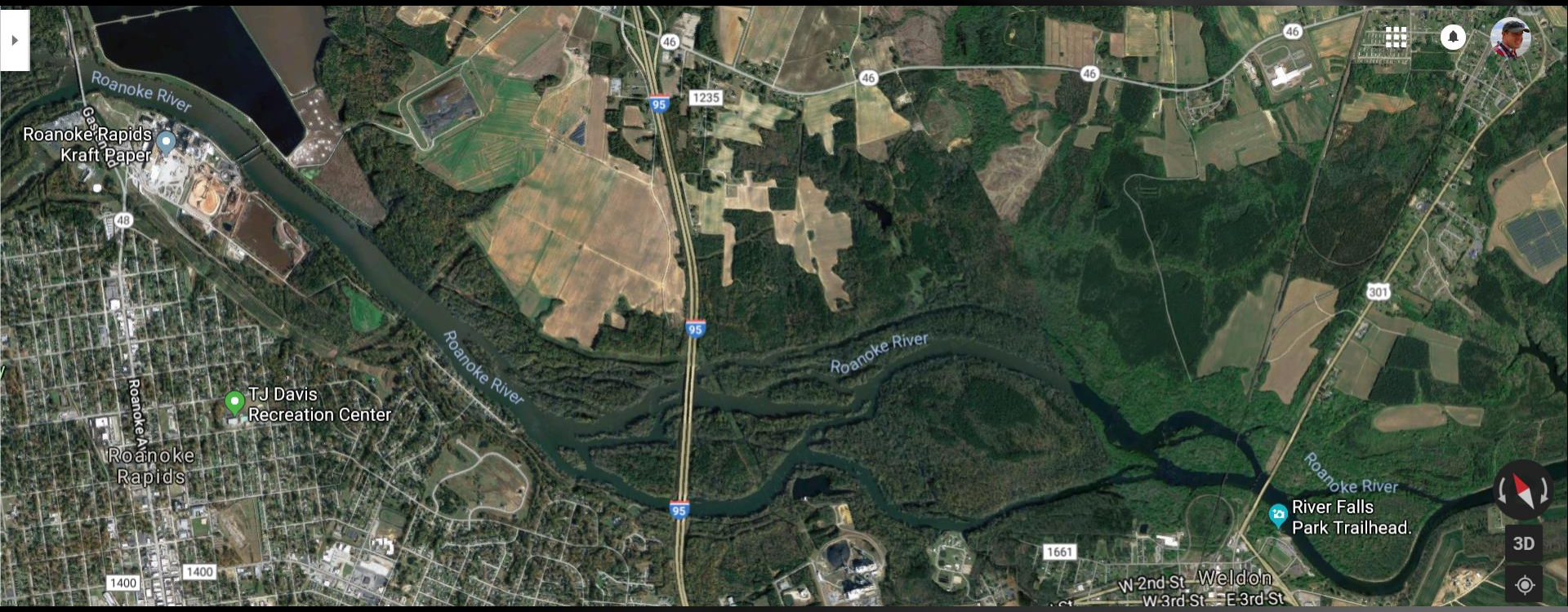
Site Survey Practical Exercise

- Interpret flow rates & hazards
- Interpret previous rescue or recovery events
- Interviews witnesses & records information
- Determine Access & Egress and rescue points
- Implement & interpret maps into the operation
- Determine high probability areas of victim detection
- Establish communications, protocols,safety

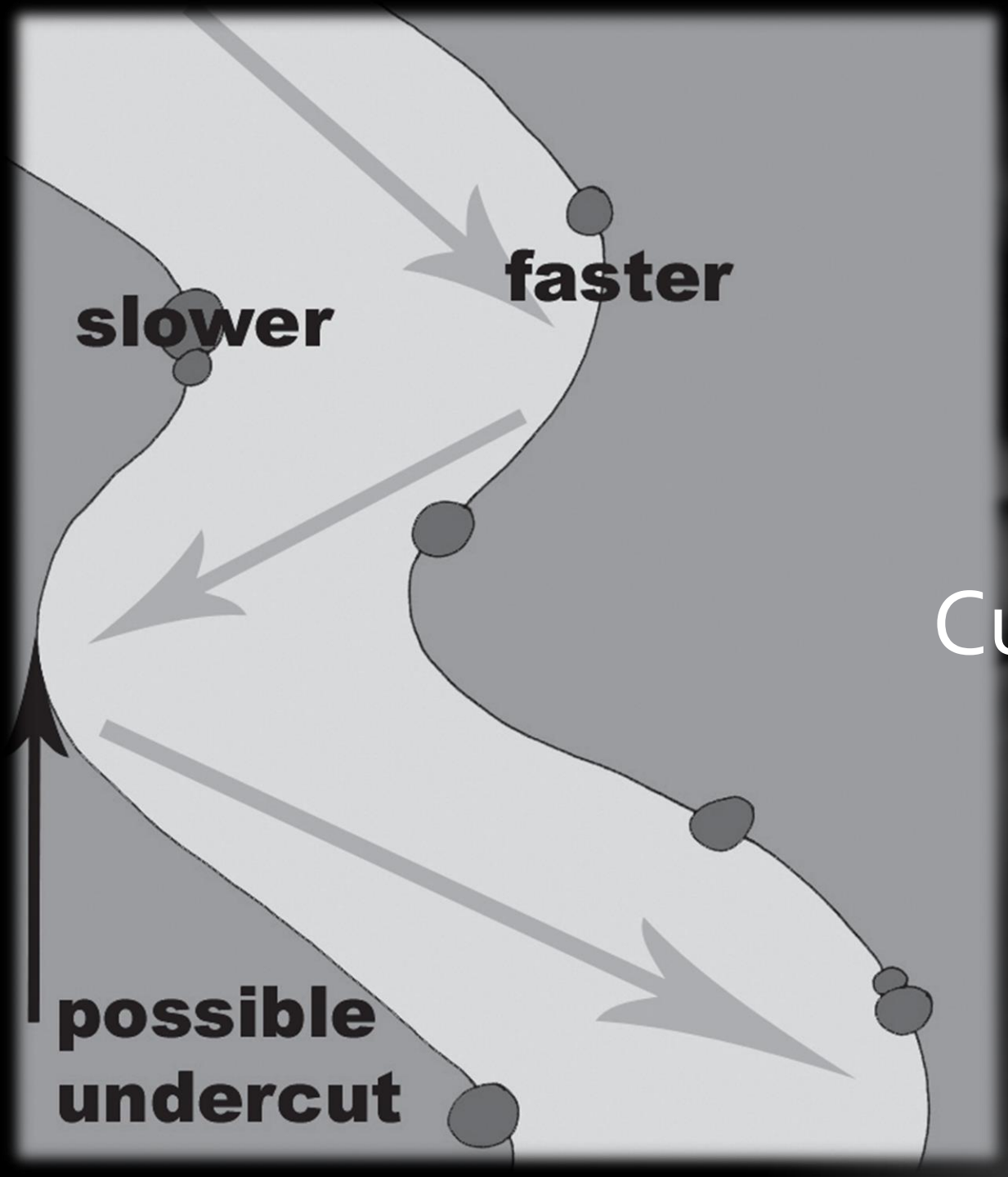
Site Survey Practical Exercise

- From site survey;
  - Determine level of PPE
  - Apply info to Risk vs. Benefit Analysis
  - Apply info towards creating an IAP based on hazards and entrapments problems.
  - Ensure searchers & rescuers are trained
  - Resource needs for Active & Passive Searches.
    - Who is trained to what parts?


Division A
Division B
Division C
Division D
Roanoke Rapids Kraft Paper
Roanoke River
TJ Davis
Roanoke Rapids
River Falls Park Trailhead.
Veldon
E 3rd St
3D


Roanoke River
Roanoke Rapids
Kraft Paper
46
1235
95
48
TJ Davis
Recreation Center
Roanoke
Rapids
1400
301
River Falls
Park Trailhead.
1661
W 2nd St
Weldon
W 3rd St
E 3rd St
3D

Hydrology & Hazards



Current Vector

Eddy:

- *A segment of water that flows back on itself or moving in the opposite directionto the main current.*
- Where the Currents Meet Is Called the Eddy Fence.
- Provides a Good Area to Launch Boats From.
- Good Place to Rest & Analyze the River.

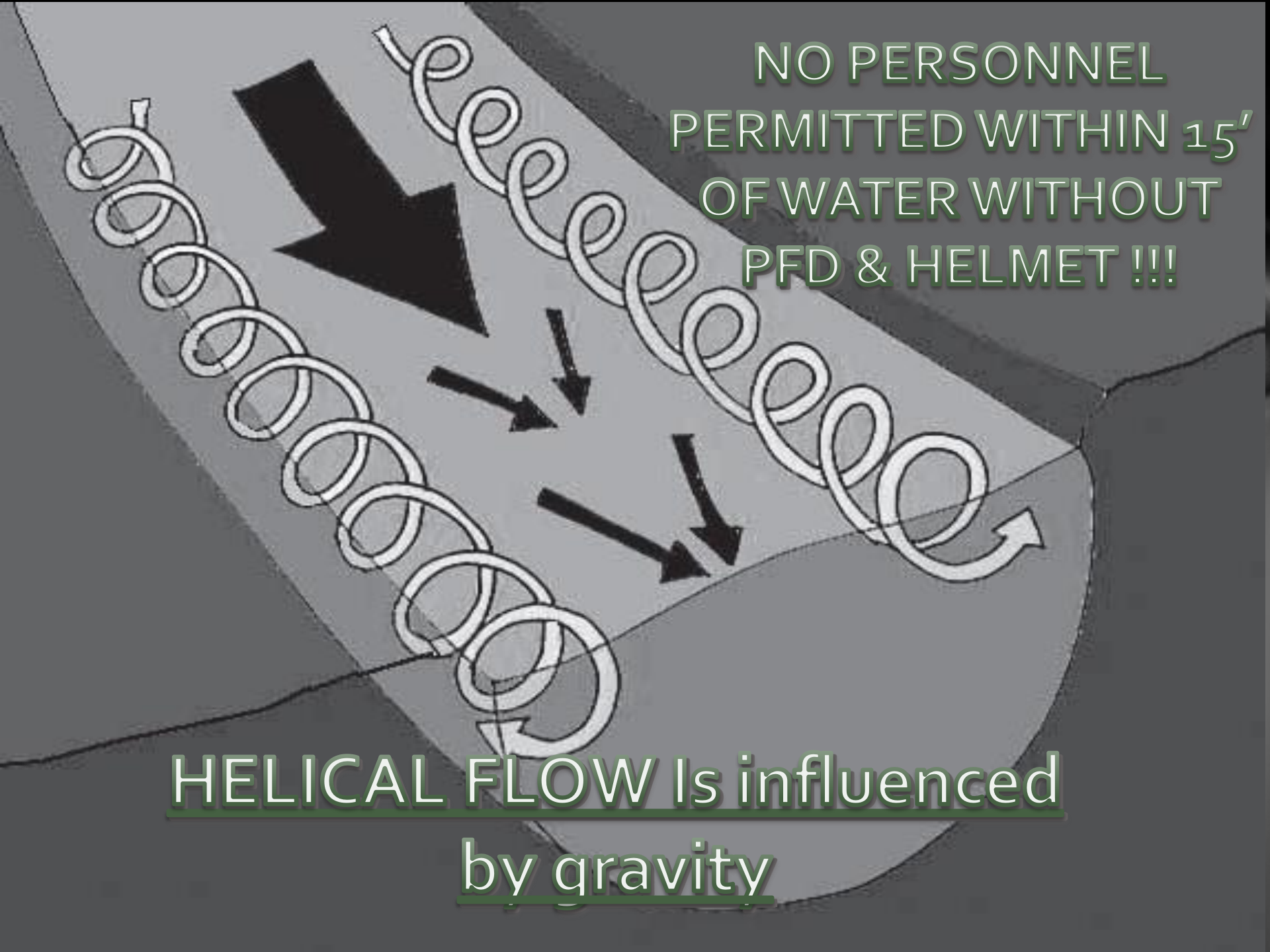
Eddy Video


EDDY
High
Pressure
Low
Pressure
Eddy
Line
High
Pressure

Hydrology & Hazards

Helical Flow:

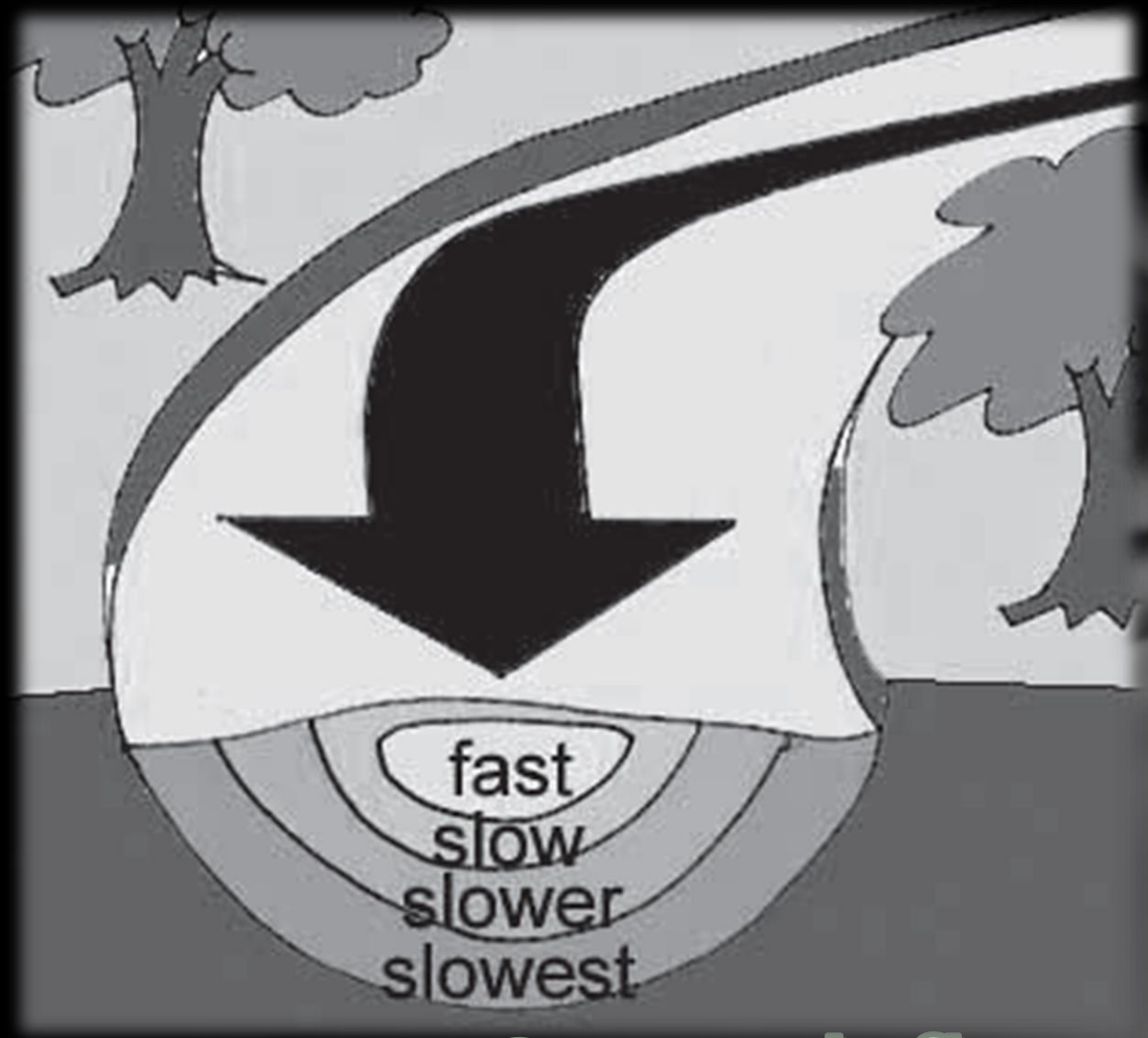
- Friction along the shoreline of the water creates a helical spring-like current that *can keep the victim from reaching the shore by pushing them back out into the main channel*.
- The higher the velocity the stronger the helical flow.


NO PERSONNEL
PERMITTED WITHIN 15'
OF WATER WITHOUT
PFD & HELMET !!!
HELICAL FLOW Is influenced
by gravity

Hydrology & Hazards

Laminar Flow:

Currents influenced by the shoreline and gravity & river bottom. Friction changes the velocity creating different layers of speed of current.

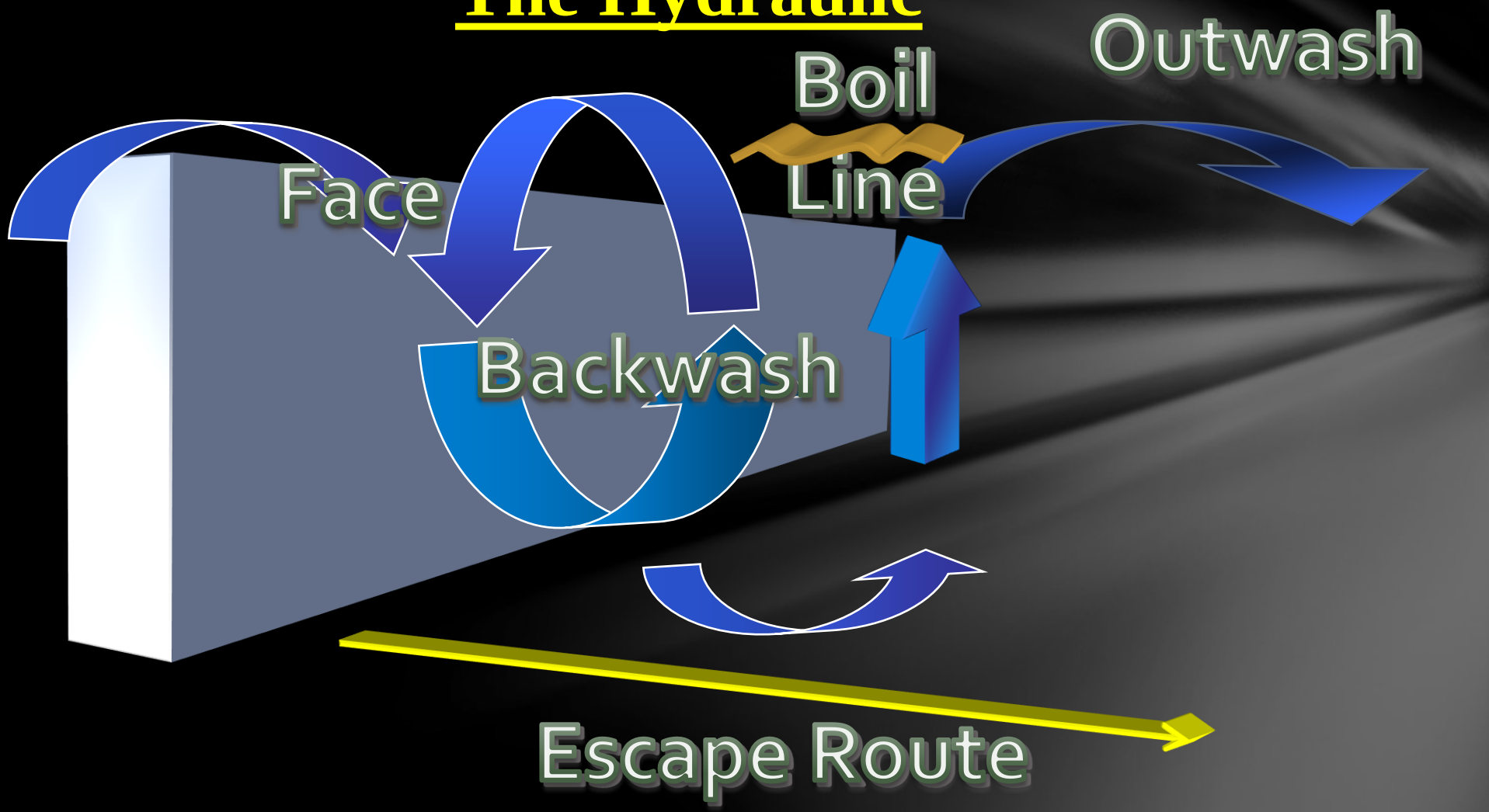


LAMINAR FLOW : Is influenced by the shore currents

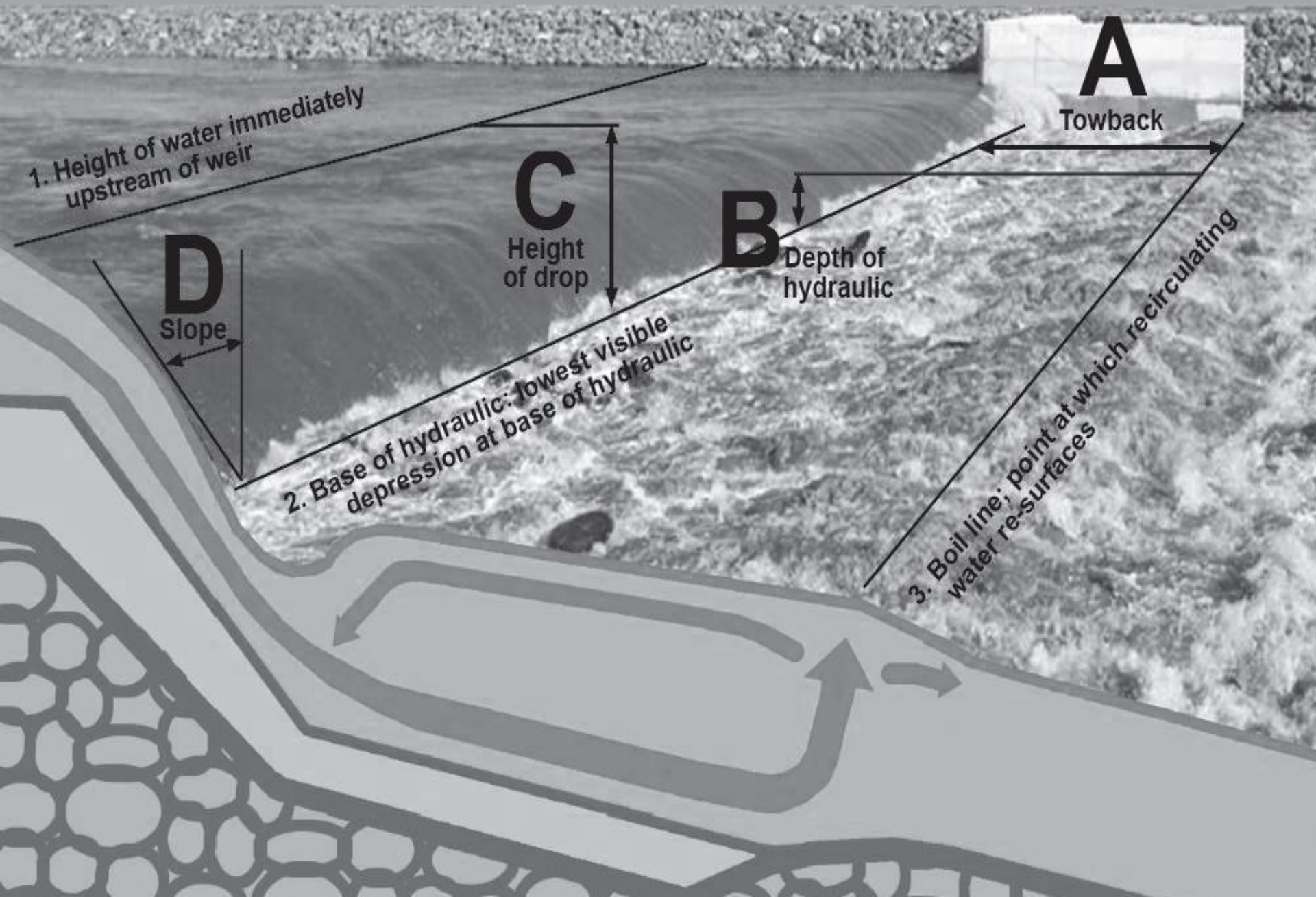

Downstream V
Indicates safest point of travel
Video


Upstream "V"

The Hydraulic

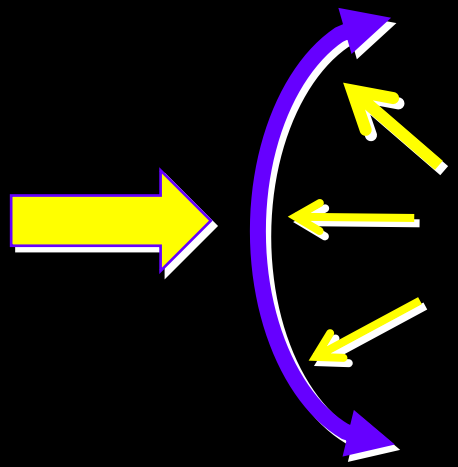



OUTWASH
BOILINE
FACE


A
Towback
1. Height of water immediately upstream of weir
C
Height of drop
B
Depth of hydraulic
D
Slope
2. Base of hydraulic: lowest visible depression at base of hydraulic
3. Boil line; point at which recirculating water re-surfaces

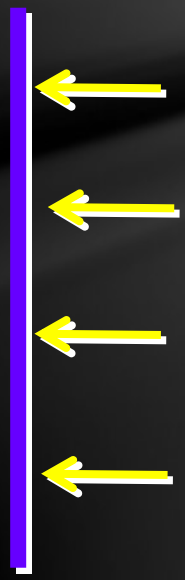
Hydraulics & Low Head Dams

Smiling Hole



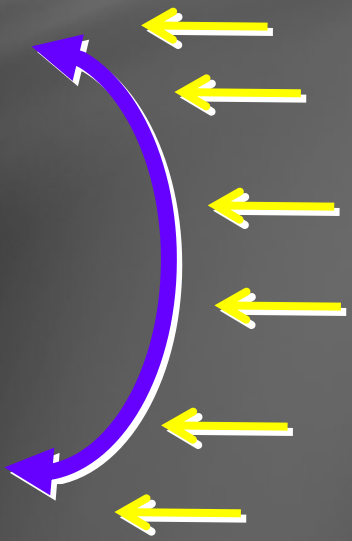
Medium

Mona Lisa



Most Difficult

Frowning Hole



Difficult


Face
Backwash
Boil Line
Outwash

Obstructions/ *Strainers,Sweepers*

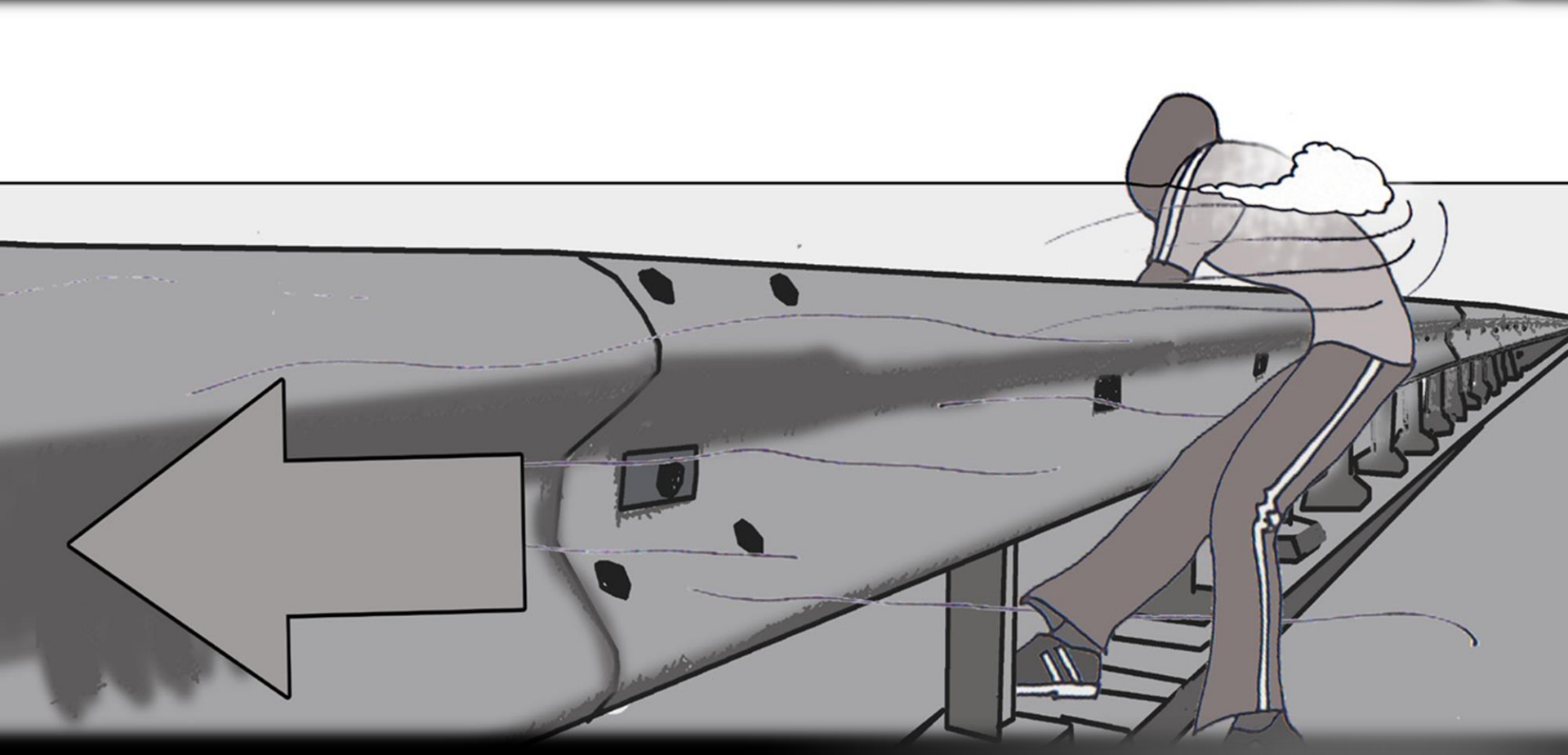
Any stationary object above or below the surface that can present an entrapment hazard.

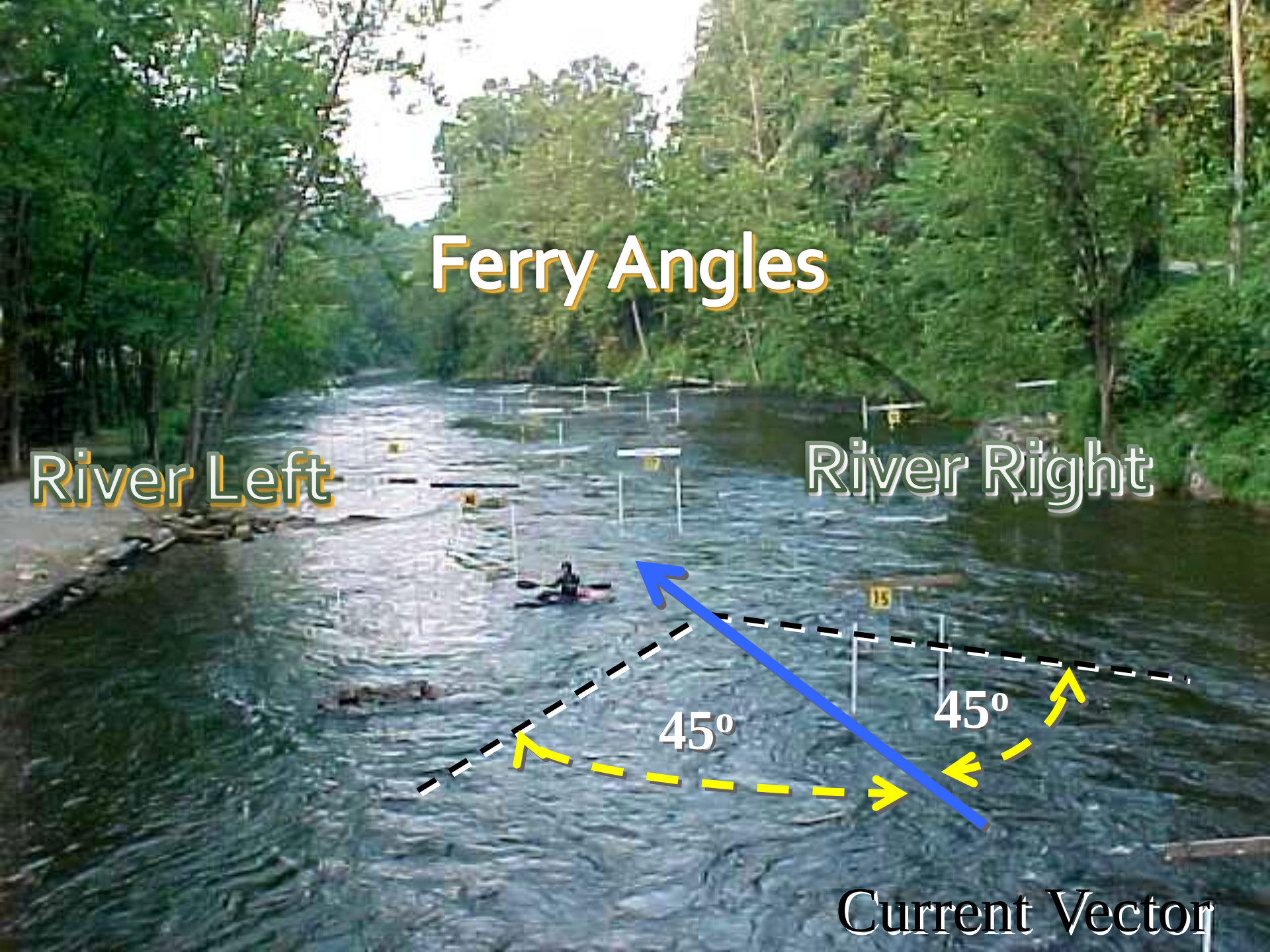
Obstruction in Water That Hampers Clear Passage of People, Boats or Other Objects in a Current.

Downed Trees, Fences, Intakes, Pipes, Autos, Debris Found in Creeks.

Avoid These!!

STRAINERS:




Ferry Angles
River Left
River Right
45º
45º
Current Vector

Ferry Angles

- Position Your Body So That Your Head Is Pointing to the Bank You Wish to.
- Go 45º to the Current Vector.


Helical Flow
Pillow
Hydraulic
Eddy
Eddy
Downstream V

Videos

- RESCUE 3 STAYING ALIVE HYDROLOGY
- RESCUE 3 STAYING ALIVE; SELF RESCUE
- RESCUE SWIMMING TECHNIQUES

CATEGORIES OF SWIFTWATER

CLASS I:

MOVING WATER at 1.6 mph+

FEW RIPPLES, SMALL WAVES

FEW OR NO OBSTRUCTIONS

CLASS II:

EASY RAPIDS WITH WAVES UP TO 3 FEET.

SOME MANEUVERING MAY BE REQUIRED.

CLASS III:

RAPIDS WITH HIGH, & IRREGULAR WAVES.

CAN SWAMP A CANOE.

MAY REQUIRE COMPLEX MANUVERING

SCOUT FROM SHORE

CLASS IV:

DIFFICULT RAPIDS

TURBULANT WATERS

SCOUTING FROM SHORE REQUIRED

CLASS V:

VIOLENT RAPIDS

SCOUTING REQUIRED

RESCUE EXTREMELY DIFFCULT

DANGEROUS TO BOATS

CLASS VI:

NEARLY IMPOSSIBLE TO NAVIGATE.

FOR EXPERT RESCUE TEAMS TO ATTEMPT, AFTER RECON HAS BEEN ACCOMPLISHED.

River Classes Video

Loads

- Top Loads
- Suspended Loads
- Bottom Loads

Types of Loads

- *Hazards:*
  - *Objects that are either floating or moving on the surface or beneath the surface of the water that may strike a victim or rescuer.*
- *Obstructions: Strainers/ Sweepers*
  - *Stationary objects within the body of water, either seen or unseen that may catch and hold a victim or patient.*

Turbidity

- Consists of silt
- Surface Water organisms
- Any other particulates that obscure vision beneath the surface
- May penetrate a victim's clothing and weigh them down.
- Difficult to swim in these conditions

Contaminated Waters

- Causes contamination for victim, rescuer and
- equipment.
- Certification at the Haz-Mat *First responder /Operations* level for decontamination of victims, equipment, and rescuers.
- Avoid contamination always wear the proper PPE
- Appropriate respiratory protection if needed

Cold-water Rescues

- **Hypothermia:**
- Gradual cooling of the body's core temperature
- Greater a danger for rescuers than the victims.
- *Cold-water immersion extends the chances of victim survival because of the Mammalian Diving Reflex (MDR) in which the body automatically concentrates bloodflow to the brain, lungs, and heart and away from extremities.*

Cold-water Rescues

- **Hypothermia:**
- *Hot Molecules travel to cold molecules.*
- *Cold exposure is the primary concern because rapid immersion in still water water without proper environmental protection will cause the victim's body temperature to drop 25 times faster than in air.*
- *Wind or moving water compounds the problem as body temperature can cool the body 250 times faster than air.*
- Rescuers should always don appropriate thermal PPE when attempting a cold water rescue to avoid exposure.

Victim Types

- Non-swimmer.
- Weak or tired swimmer.
- Injured / hypothermic swimmer.
- Unconscious swimmer.

- Evaluate by talking to victim to determine method of rescue

- *Identifying the victim type is important because the physical and emotional condition of the victim can seriously jeopardize the safety of the rescuer.*
- **Know the problem before you solve the problem!**
- *Reverse & Ready Position*
- *Abandonment; Never push away or lose contact with a victim*

Incident Organization Command Responsibilities.

- Maintain scene control
- Accountability
- Safe operation
- Develop primary strategy. Plan A
- Develop secondary strategy. Plan B

Observations

- Monitor overall operation
- Re-assess operations, resources, environment periodically.
- Was anything missed during the size-up?
- Has the situation changed?
  Is it going to change?
  Is it changing upstream?
- Re-assess personnel's status periodically.

Command Responsibilities

- Assign tactical tasks to trained personnel.
- Establish and maintain communications.
- Ensure safety for all personnel involved.

Three K's of command

- Keep personnel & scene safe.
- Keep trying to implement your entire plan.
- Keep thinking and assimilating any new information.

Assessment Of Priorities

- Locate
- Access & Assess
- Stabilization
- Transport / Extrication

Scene Control

- Controlling spectators and Reporting Parties.
- Security for evidence gathering and personnel.
- Identifying witnesses.
- Secured & isolated area for family.
- Isolation from media & spectators
- Control for rescue operations.
- Establish PIO and Joint Information Center
- This is an absolute must for any operation.

Command Structure

- Small-scale operations.
  - Command may control both strategy and tactics.
  - Training & Experience of the command officer is the determining factor.

Command Structure

- Large-scale Operations.
  - Command should be sub-divided.
  - Maintains continuity of command structure
  - Ensures good communication among organizations.
  - Sub-division of ICS is determined by needs-assessment during the initial size-up

Method Of Rescue.

- Assess Danger to Victim
- Medical priority of victim & condition of rescue problem.
- Set up time
- Patient's condition is determining factor.
- Keep It Simple & Safe (KISS).

Risk vs. Benefit

- Consider the risk to personnel.
- The prime concern is rescuer safety.
- Consider Probability of Success (POS).
  - Will strategy and tactics solve the problem?

PERSONAL PROTECTIVE EQUIPMENT

Protective Equipment

- Head Protection
- Flotation Considerations
- Thermal Protection
- Foot & Hand Protection
- Throw Bags & Other Stuff

Use of turnout gear

DO NOT USE !!!!

"You don't wear your drysuits to your fire so don't wear your turnouts to your water rescues!"

No Flotation

Becomes weighted down

Prohibits ability to swim

Larger surface area of fire helmets

PPE

- NO Turnouts!!
  Layered clothing.
- Vented lightweight helmet with interior padding.
- Wet Suit.
- Dry Suit.
- Waterproofed boots or river boots
- Throw Bag, Ring Buoy, Cans or Life Rings.
- Boogie Board, Surf Board or Kick Board
- Wool or polypropylene socks.

Head Protection

Helmets must have holes for draining water.

Multi-point chinstraps

Adjustable ratchet

Capable of mounting headlamp

Different colors for training levels

No Fire Helmets!!!

Thermal Protection

Wetsuits

- *Traps the body heat of the wearer thus heating the water in layers between the wetsuit and the wearer*
- Neoprene
- Thicker neoprene … warmer
  - 5mm+ is optimal
- Less expensive
- Difficult to don / doff
- Poor for wind protection
- Poor for haz-mat protection
- Good for impact protection

Thermal Protection

Drysuits:

- *Provides the best thermal and contact protection for rescuers*.
- More Expensive
- Requires under garment thermal protectio
  - Poly Propylene
  - Thin neoprene
- Adequate for haz-mat protection
- Material breathability

Hand Protection

Neoprene 3mm+

Leather palm

Kevlar

Suitable for rope work and paddling

Suitable for swimming

Tight fit for warmth

Foot Protection

Neoprene Work boots

Neoprene Socks

Wool Socks

Old Tennis Shoes

River Shoes w. laces

Covered toes sandals

Personal Flotation Devices (PFD)

- Fit is essential
- USCG approved type III, type V
- Blow-out strap operation one locking d-ring to strap
- Cinch strap on bottom
- Minimum 22-25 lbs. of flotation

PFDs

- *Minimum Floatation 15.5 lbs.*
- Type I: Off-Shore use
  - Extended rescue
  - Rolls victims to face-up position
- Type II:
  - Near-Shore use
- Type III:
  - Calm inland waters
  - Conscious victims
  - Most comfortable to work in.

PFDs

- Type IV:
  - Throwable devices
    Cans, *ring buoys, boat cushions*.

- Type V:
  - Special Use (Rescue),
  - "Mustang suits",
  - Cold Water Survival Suits.

PPE

- Type III or V PFD's w/reflective material
- Quick Release type belts and rings are recommended for swimmer belayed type operations.
- *PFD's like those used on fishing boats are not acceptable for Swiftwater Rescue.*
- Flashlight (Chem-stick, strobe).
- Whistle (waterproof).
- Sheathed Knife (secured to PFD).
- Carabiners (2, non-locking).
- 5mm. X 4 feet long prussic cords (2).

Other Stuff

Other Rescue Aids

- Inflated Fire Hose
- Rescue Board "Boogie Board".
- Pike Poles.
- Ladders.
- Brooms.