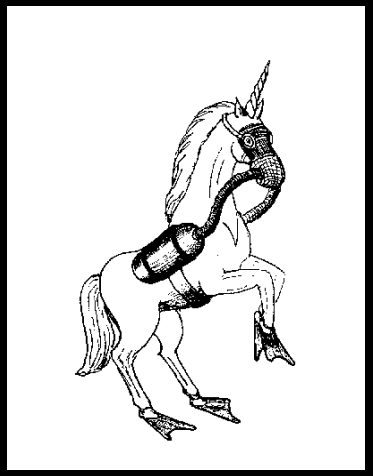


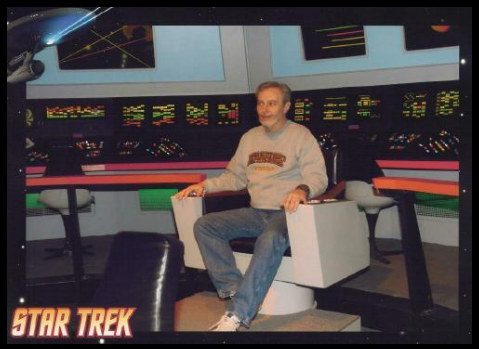
River Diving

Larry “Harris” Taylor, Ph.D.

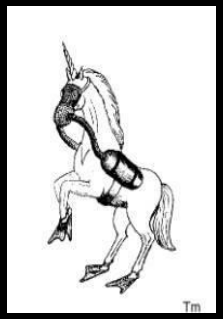
Diving Safety Coordinator, U of Michigan

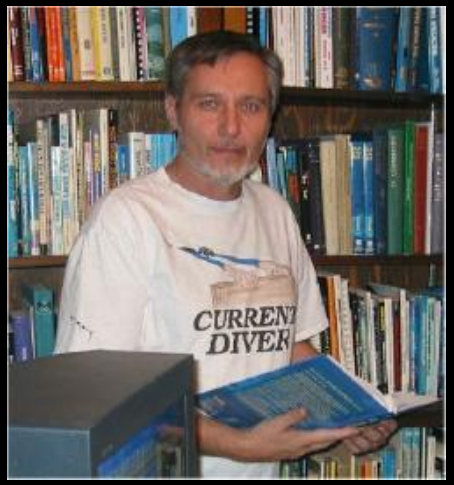
LPT

Your Instructor



U of MI Diving Safety Coordinator
AAUS sanctioned Diving Safety Officer
Internationally rated 3 - star instructor (CMAS)
National Master Scuba Instructor (President's Council)
> 100 Diving Certifications
> 200 Diving Publications
> 1,200,000 visitors to "Diving Myths & Realities" web site
Library: one of the best resources in North America
Scuba Diver since 1977
Scuba Instructor since 1980
DAN Instructor since 1991
EAN_x Instructor since 1992
Ph.D. Biochemistry





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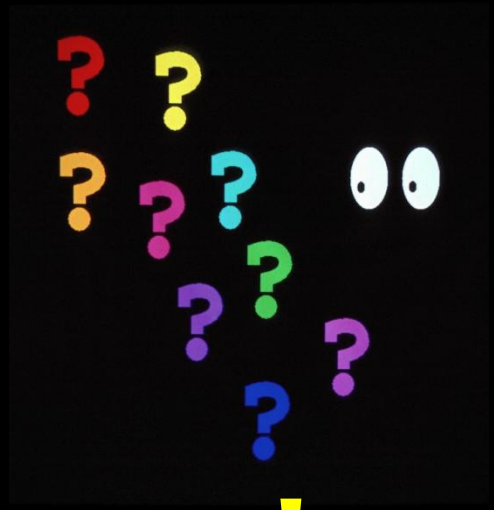
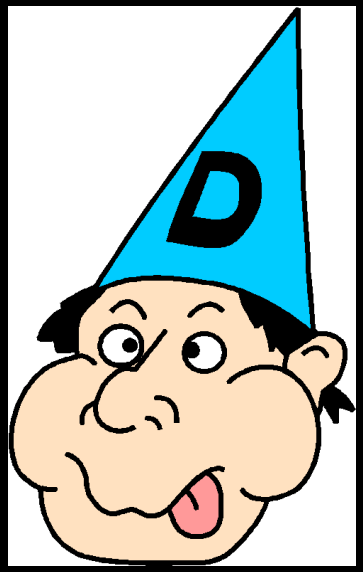


Lecture is a Democracy!

You control speed with your questions

LPT

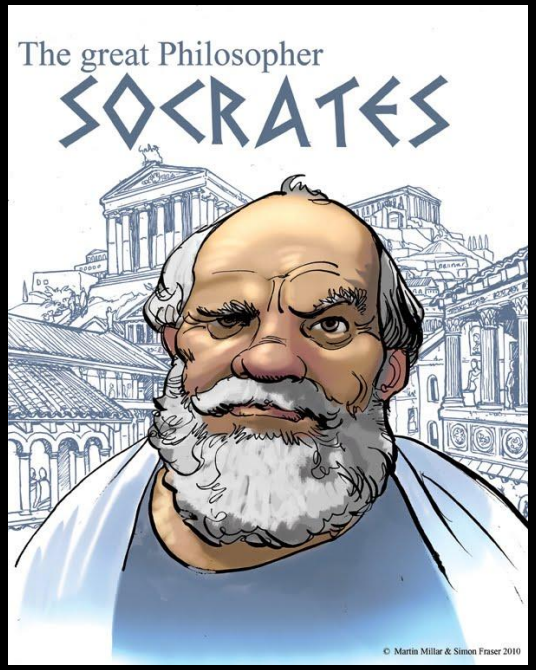
There are no “stupid questions” !



The only “Dumb Question”
is the one that is unanswered ‘cause it was not asked

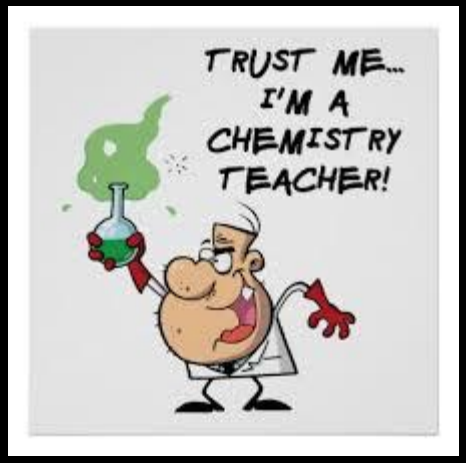
The “Dumbest Question”
is the unasked question that could’ve solved a problem

LPT



Socratic Method:
Asking & Answering Questions

Still one of the best learning tools



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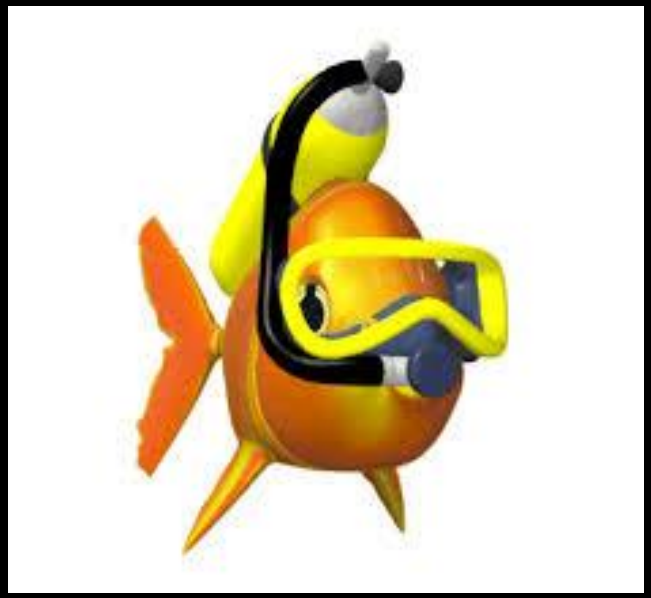
The Water-work is Dictatorship!

Do as instructed or leave the water



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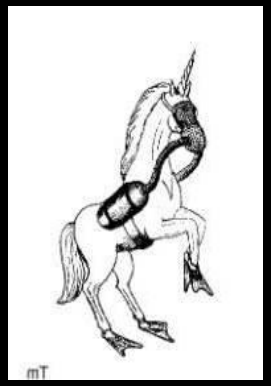
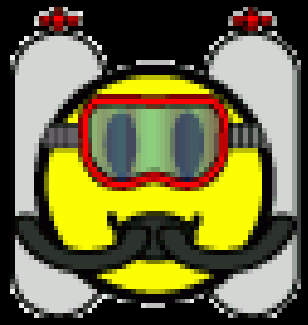
Knowledgeable, Physically Fit Divers

Gospel

According to "Harris"

Have More Fun!





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The St. Clair River

~ Forty mile long river
Connects Lake Huron to Lake St. Clair

Named by La Salle (1679)
Used commercially for more 300 years
> 27 million cargo tons / year
Vast numbers of recreational boats
MI has largest # registered boats in US

LPT

The St. Clair River

Considered One Of Best Walleye Fishing Sites in NA

Rummaging Pine Grove Park, Port Huron:

- **Artifacts**
- **Antiques**
- **Contraband**
- **Fishing Tackle (lures, weights, bells)**
- **Bicycles**
- **Skate Boards**
- **Anchors**
- **Waterway = Garbage dump for > 300 years**

LPT

The St. Clair River

Flow ~ 182,000 – 230,000 ft^3 / sec (~ 81.7 - 85.1 million gallons per min)
One of NA's most intense navigable waterways

Drainage area ~ 223,600 square miles

Current under Blue Water Bridge can exceed 10 knots

Recreational Source For Boaters, Fishermen, Tubers

LPT

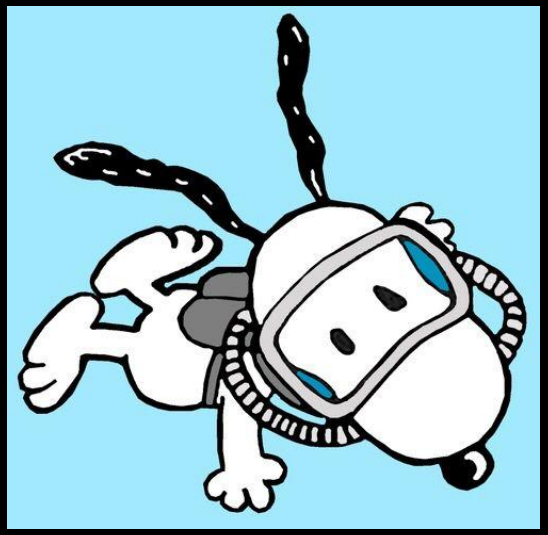
Drinking Water

~ 40 % (~132 Million) Michigan Residents rely on St Clair-Detroit River

St Clair River
Water Filtration Plants
Port Huron
Marysville
St. Clair
East China
Marine City
Algonac

Underwater: Large pipes headed to river bottom locates water plant

LPT



River Diving Specialty

LPT

Why River Diving?

Physically Challenging
Mentally Stimulating
Emotionally Thrilling

Like driving 100 mph at night in the rain with the lights on dim

Ever changing environment
Exploring Wrecks
Prospecting for old bottles, anchors, fossils, and fishing tackle
> 300 years of "stuff" on the bottom of the river

No two dives are ever identical

LPT

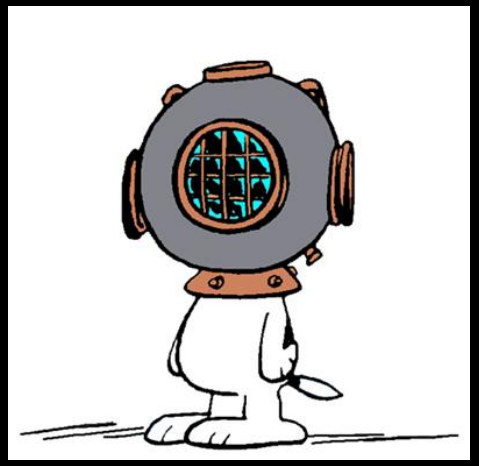
Why River Diving?

Swift Water Rivers:
An exhilarating place to play
With proper equipment, training, and experience
Or
A terrifying place to die

Open water training/ techniques / equipment are not sufficient where the bubbles do not move straight up!

Many deaths result from:
Overestimation of skill
Underestimation of the force of moving water

LPT



River Diving Equipment

LPT

River Diving Equipment

River diving equipment must:

- **Be Reliable**
- **Be Durable**
- **Withstand forces of the swift water environment**

River Diving Is Equipment Intensive

LPT

Dive Flag: Exit Point Marker

Marks drift dive exit point

- 10 pound anchor with yellow duct tape stripes
- 20’ double eye-spiced 3/8” polypropylene line
- 2 locking carabineers (for line attachment)
- Dive flag float
  - with 2 3/16” polypropylene eye-splices

Port Huron Local Custom:

Dive flag not towed north of Black River:

- Intense current
- Abundance of fishing lines

LPT

Dive Flag: Drift Diving Assembly

Truck tire inner tube
Trident inner tube flag support
Figure 8 for line attachment
2 Locking carabineers for attachments
90’ 3/8” polypropylene line
Eye-spliced at each end
3.5” (ID) Stainless steel ring
Buddy line & float attached to the ring

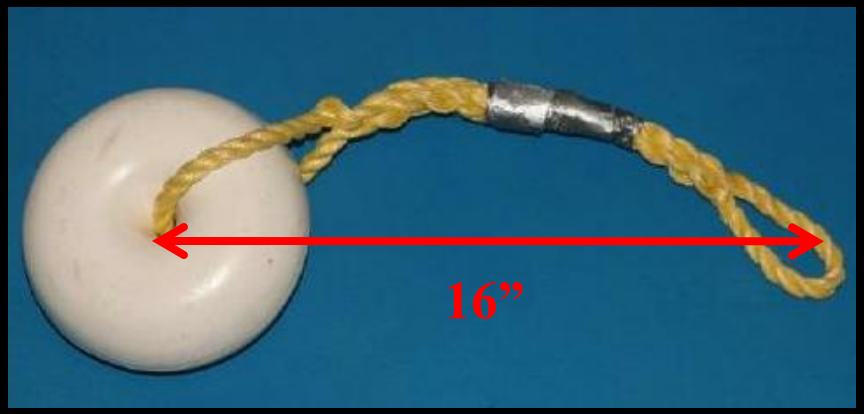
LPT

Drift Diving: Inner Tube Flag Support

- 32” Inner tube
  - Inflated to 29” (60 psig)
- Trident flag support
  - ½” reflective tape
- Figure 8 for line attachment
- For attaching “goodies”
  - 3 3/8” Additional lines
  - 3 non-locking carabineers
  - 2 2” clips
- Blue case holds:
  - Laminated business card
  - Inner tube tool
  - 2 Extra valve cores
- 3 Yellow Strobes
  - For inland night diving

LPT

Drift Diving: Line Attachment and Float

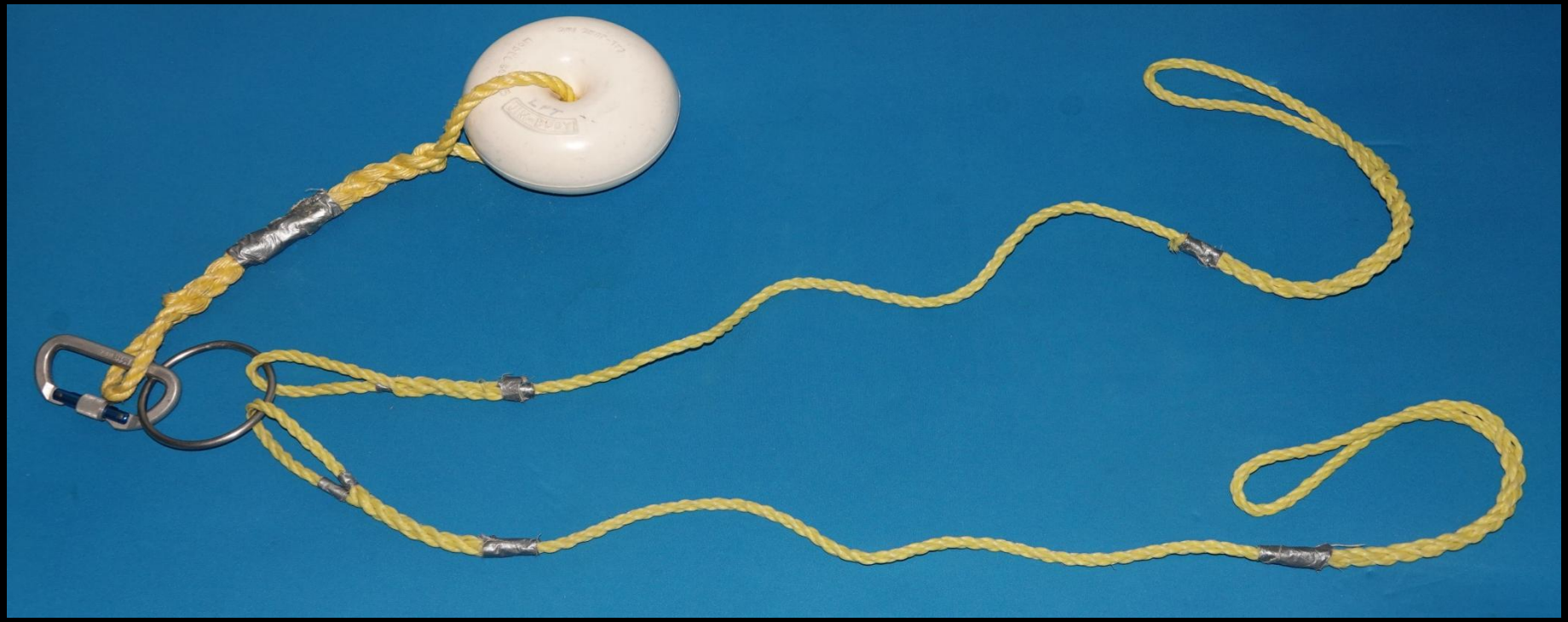


Line Attachment
- Separate 3/8” line
- Each end eye spliced
- Figure 8

Float lifts buddy line above bottom
- 6” float
- 3/8” line
- Eye spliced at each end
- Attaches to buddy line carabineer

LPT

Drift Diving: Buddy Line



3.5” (ID) Stainless steel ring

Attaches to line from diver’s flag float with a locking carabineer

2 4’ 3/8” Polypropylene lines – eye spliced at both ends

6” Float attaches to the locking carabineer

Allows Buddy contact in limited visibility

Minimizes snag potential of buddy lines

LPT

Thermal Protection

Wet suit
Dry Suit
As Needed

Moving water rapidly removes heat

Buoyancy Control

BC always worn
Back mount minimizes potential abrasion

Diving a dry suit without BC is “death-seeking behavior”

LPT

Gloves: Always Worn

Protection from:
- **Abrasion**
- **Thermal loss**

Kevlar abrasion resistance
- **Especially at finger tips**

LPT

Instrument Console

Gauges:

- SPG
- Depth
- Timing Device

Optional:

- Compass
- Thermometer
- Slate

Protect console with plexiglass plate

LPT

Masks

Straps taped
Holds firm during dive

Snorkel has quick connect
Quick install if needed

Snorkel carried (in chaps), but not worn
In current, the snorkel constantly strikes the head

LPT

Storm Whistle

Worn on BC hose
Much louder than common BC whistles

Considered “World’s Loudest Whistle”

Works underwater

LPT

Weight belt (If weights on belt)

Double buckle

Both buckles arranged to open in same direction

Minimizes risk of lost belt

Typically a few pounds (not more than 5 extra) heavier than open water diving

After dive: remove belt as practice dropping belt

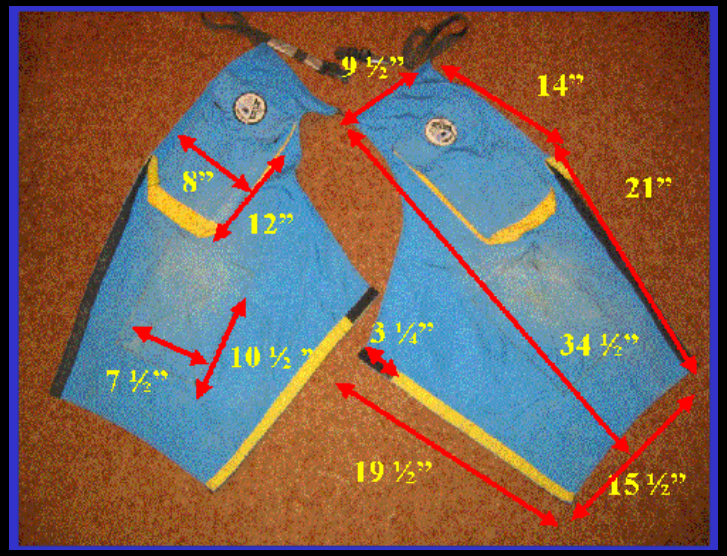
LPT

Fins

Best to have solid, rigid fin blade (no holes)
(holes are potential source of entrapment)
I have seen objects protrude thru the holes
Tape straps to minimize potential snags

Commercial Chaps

Protection for wet / dry suit
Carry snorkel in pocket
Velcro secures leg covering
Made from pack cloth



Front

Back

LPT

Knives

Minimum of three easily accessible cutting edges

Primary

Large “Bowie” Knife

Worn on thigh to minimize snag hazard

More useful as pry tool than as a cutter

Secondary

Mounted on wrist plate

(To facilitate safe replacement)

LPT

Additional Cutting Edges

“Penny Cutters”
Worn on chest strap of BC
Mounts in front of chest

Line Cutter
Superb for cutting fishing line

“River Stick”

Primary Tool That Allows:

Control of position / direction / speed while drifting near bottom

Ability to stop and hold position

Moving upstream

US Govt. Surplus Pick Ax

Seat belt cutter

For cutting line entanglements

Yellow duct tape for visibility

Velcro Wrist strap

Larger stick preferred:

Better locking mechanism

More rigid spike right angle

LPT

Comparison Of Control Tools

Large River Stick – 20”
2.2 pounds

Small River Stick – 15”
1.0 pound

Crawl Dad – 12”
1.4 pounds

Other “Control” Devices

Rick Ryan’s Crawl-Dad
Works well for:
- **Scrapping**
- **Digging**

Mini-Pick Axes
Gardening 3-prong trowel
- **Spikes may break free**

Securing Velcro Strap

Angle the Velcro Strap attachment

Allows rapid removal

Divers should avoid “dangles”

Gauges / Octopus, etc

Excess Strap Length

Fins, mask, knives, etc

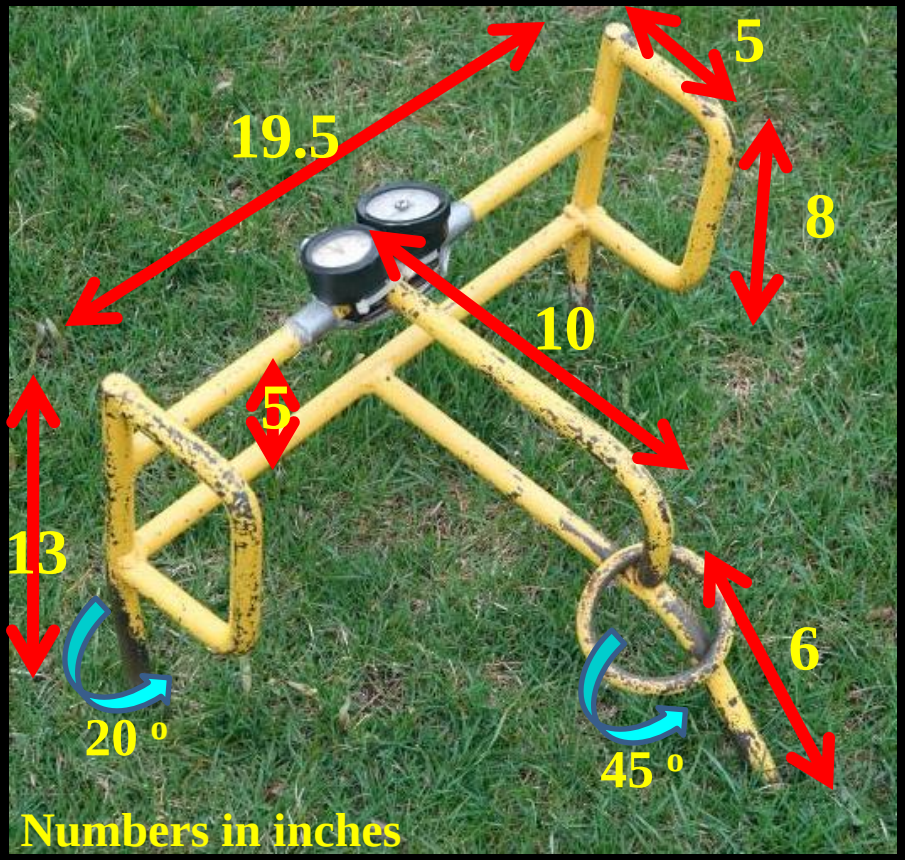
Anything attached

Potential snag hazards

Everything attached should be easily removed and replaced

LPT

Moving Upstream: The “Creeper”



Not commercially available
Made by welding ¾” steel rods
Weighs 17.5 pounds

Angling front legs backwards facilitates moving the creeper
Also used as stable anchor for search operations
Center ring is attachment point for flag and diver(s)
Attachment to diver via snap shackle

LPT

Storing / Transporting The Creeper

Tips Protected:

Tubes from M&M Mini's

Small piece of foam

Snap Shackle:

Locked on top bar

The Creeper As Stationary Search Anchor

Dive flag attached to creeper

Line: ~ 1.5 x the depth

Allows surface to monitor location

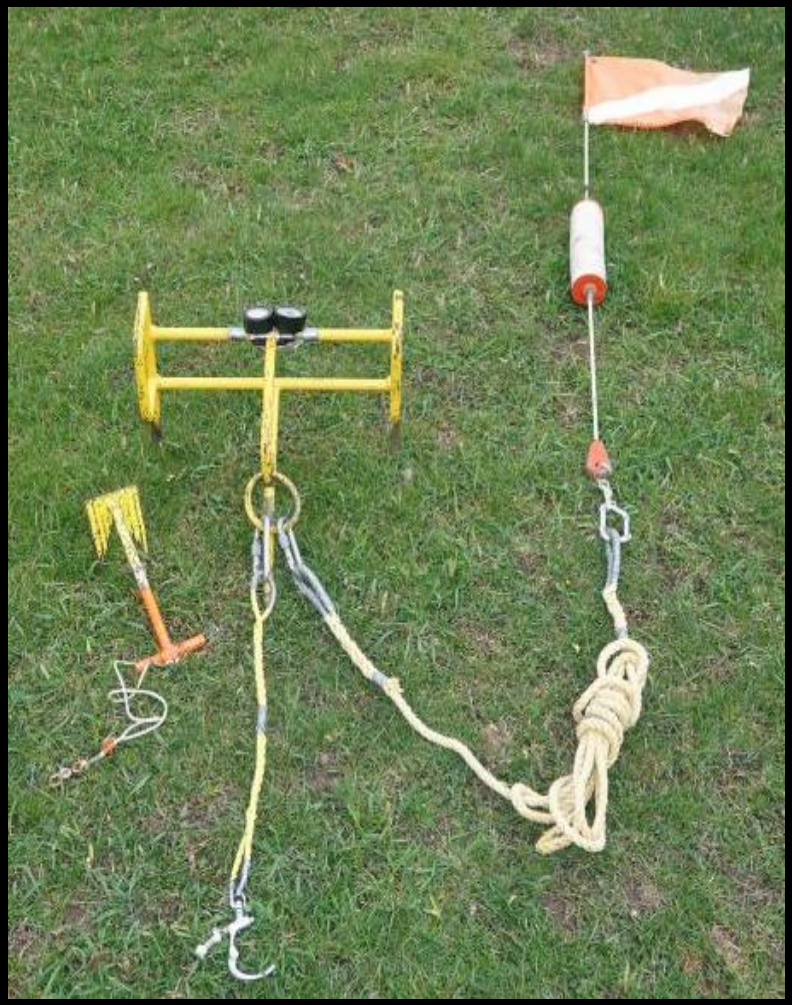
Diver attached via snap shackle

Attached to chest harness

Search site by scraping bottom

Current carries away silt

Depth gauge & timer on front bar



Single Diver Configuration

For 2 divers:

Attach buddy line to large ring

LPT

Minnow Bucket

Replaces mesh “goody bags”
Allows safe containment of fishing lures
Smooth surface not an entanglement hazard
Trap-door facilitates ease of use
15” line allows bucket to ride along side diver
Secured with quick-release snap-shackles
Attached to diver via climbing chest harness

Air chambers drilled
Top and bottom
Allows flooding (sinking)

LPT

Snap Shackle

Pull to open

Preferred attachment device
Will open under full load

LPT

Scrapers and Paddles

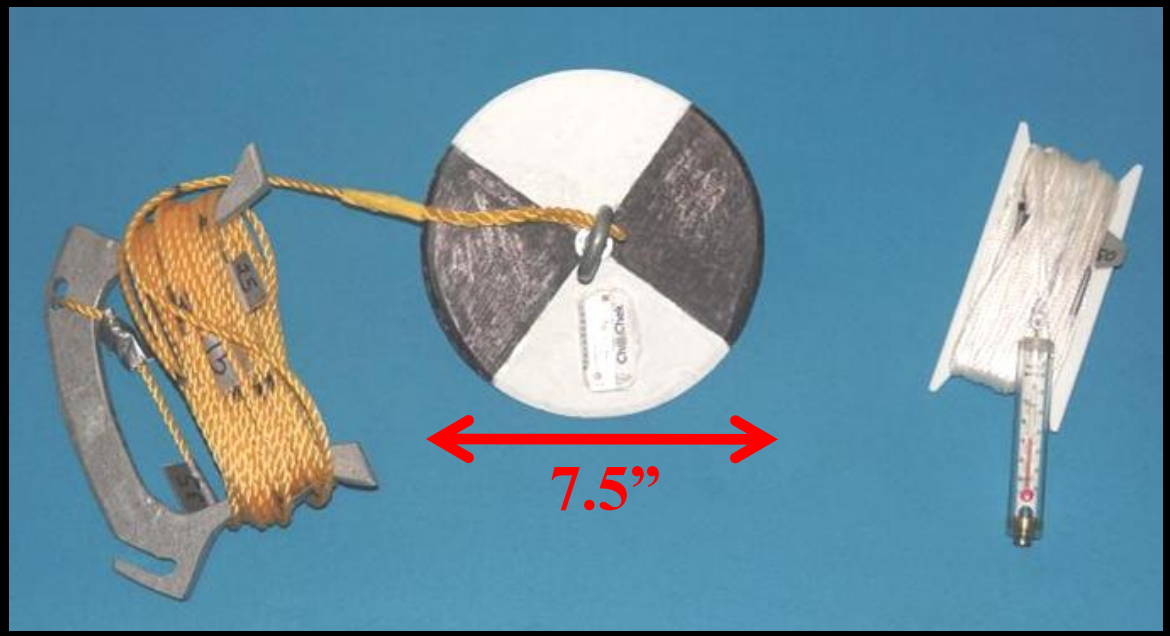
Used to move surface silt / dirt in stationary search

Gardener's Saw

For seldom used need to do underwater cutting
Very labor intensive

LPT

Secchi Disk and Thermometer



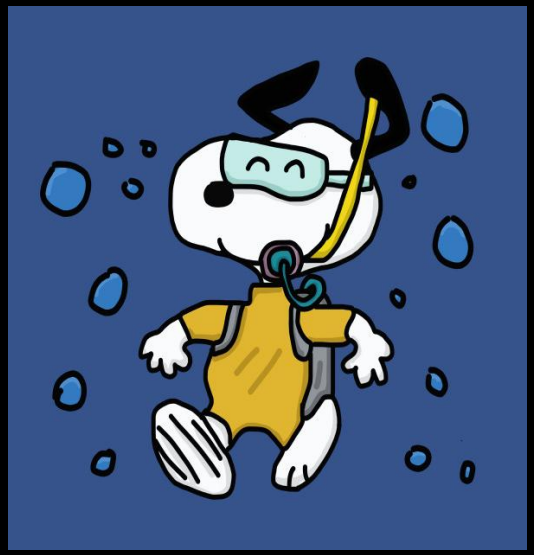
Secchi disk used to estimate visibility

- 6 lbs of lead in inverted mushroom form plus 1” (ID) eye bolt
- Black and white acrylic paint
- 3/16 ” polypropylene line marked every foot to 35 feet
- Tags every 5 feet

Fisherman‘s thermometer used to estimate thermocline depth

Infrared thermometer used to estimate surface temperature

LPT



Diving Techniques

LPT

Physical Fitness a Necessity

River diving can be physically demanding
May instantly require increased work load

Divers should have physical fitness program
Aerobic conditioning for stamina
Anaerobic conditioning for strength

Diet affects weight
Exercise affects size

Fatigue a factor in ~ 50 % of diving fatalities
Many fatalities at the end of a dive
Tired diver cannot cope with environment

Consider Physical Fitness To Be Part Of Your Life Support

LPT

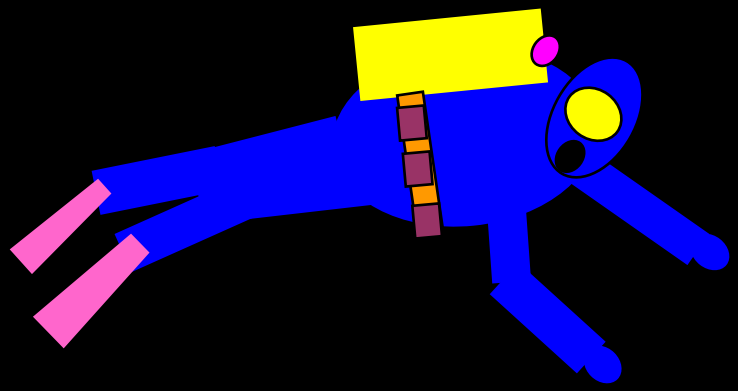
Current Demands Respect

Respect moving water
‘cause
If you fight the river, you will lose
Be content with what the river provides

LPT

River Diving “Cardinal Rule”

Keep Your Fins Lower Than Your Ass



Fins higher than ass:

Loss of control

Possible tumbling

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Before Dive Checks

Buddy Check = SEABAG:

- S = Signals
- E = Emergency Plans
- A = Activity of Dive
- B = Buoyancy Check
- A = Air On
- G = Go Diving!

Each Diver Air Check:

- Check SPG
- Breathe 4 Times
- Recheck Gauge

For Diving Along Breakwall
Designate Status for Lost Diver:

- Mover
- Non-Mover

LPT

Lost Buddy Procedure: Drift Along Seawall

Non-Mover:

- Wait 3 minutes

Mover:

- Move upstream for 2 minutes
- Drift downstream for 1 minute

After 3 minutes:

- Both ascend
- Use “river sticks” to hold position
  - Use spike contact to wall
- Note position

Wait 10 minutes

- If no contact, exit and call for assistance

LPT

Lost Buddy Procedure: Drifting With Flag

If buddy line lost:

- Move to surface
- Note position relative to shore
- Move to inner tube/flag

If float moving:

- Stay on surface

If float stationary:

- Move down line to check for buddy

LPT

Descent At The Breakwall (Pine Grove Park)

Divers ~ 50 feet apart on the surface fencing

Enter heavy

- BC / Dry Suit deflated

Grab the breakwall with the river stick and descend to bottom

Downstream diver

- Enters first
- Descends to bottom and faces upstream

Upstream diver

- Waits ~ 30 sec after downstream diver has entered
- Descends to bottom and drifts downstream to make contact

Moving Downstream

Move downstream using river stick to “stick and glide”

Preferred to move perpendicular to current
- Allows facing buddy
- Allows better visibility
  - Silt created separate from diver’s face

Avoid moving feet first
- “nightmare” = Drifting into an open 55 gallon drum

Moving Upstream: River Stick

Use river stick as a pivot point
Then
“Stick and Pull”

Physically demanding

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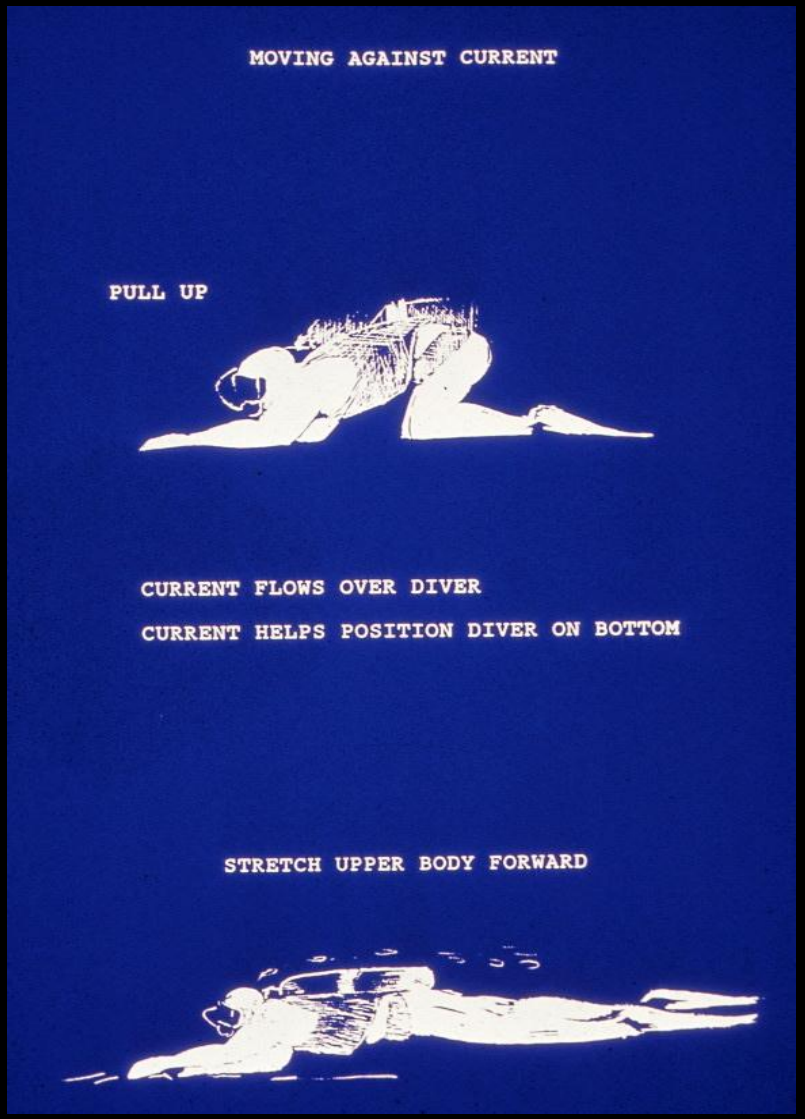
Moving Upstream: “Inch Worm”

- Lift Ass
  - Current will hold body to bottom
- Stretch forward
- Repeat
  - Physically demanding



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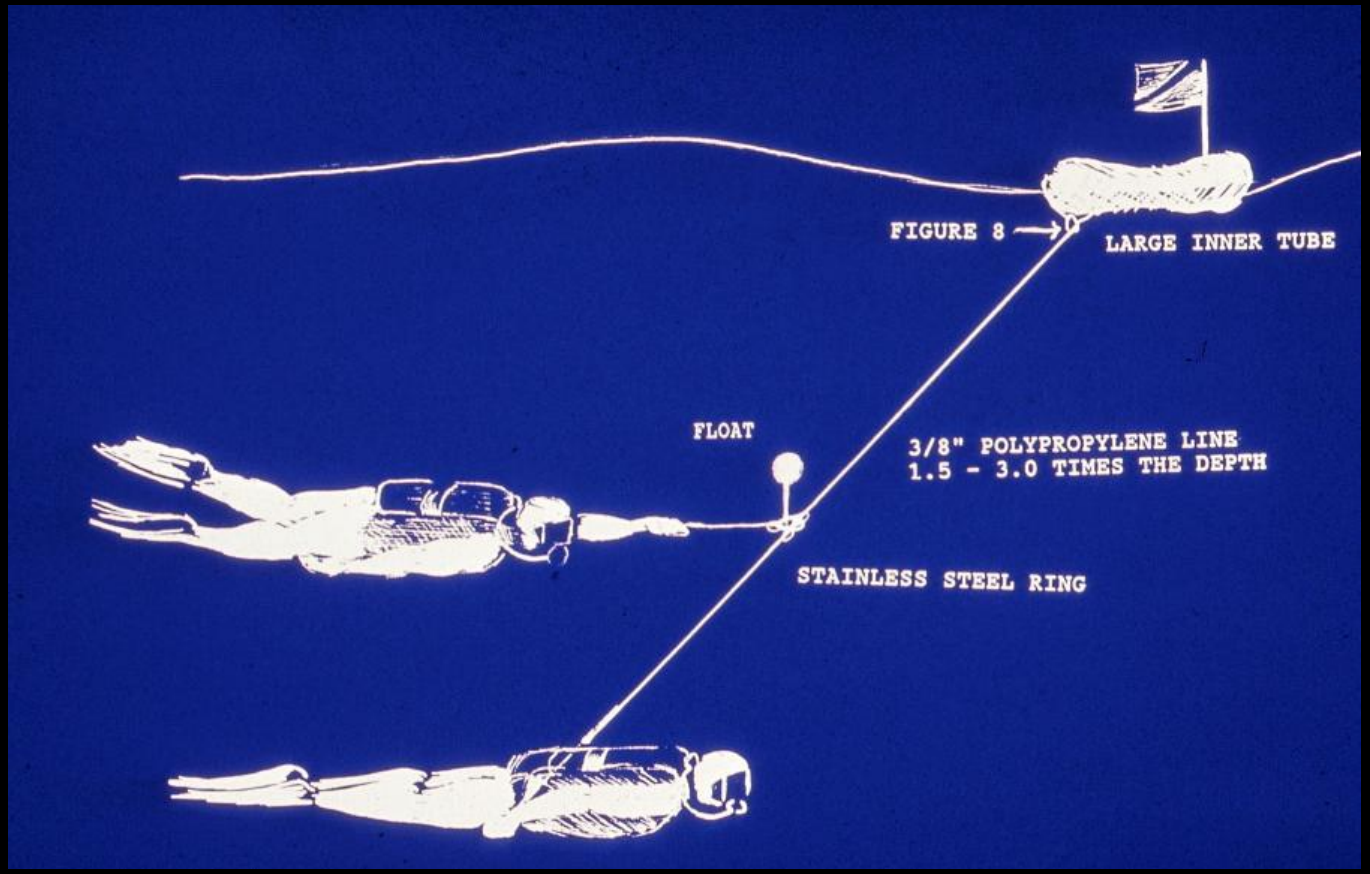
Drift Diving: Technique



Buddy line signals between divers:

2 pulls: stop … I found something worth exploring

4 pulls: I need assistance

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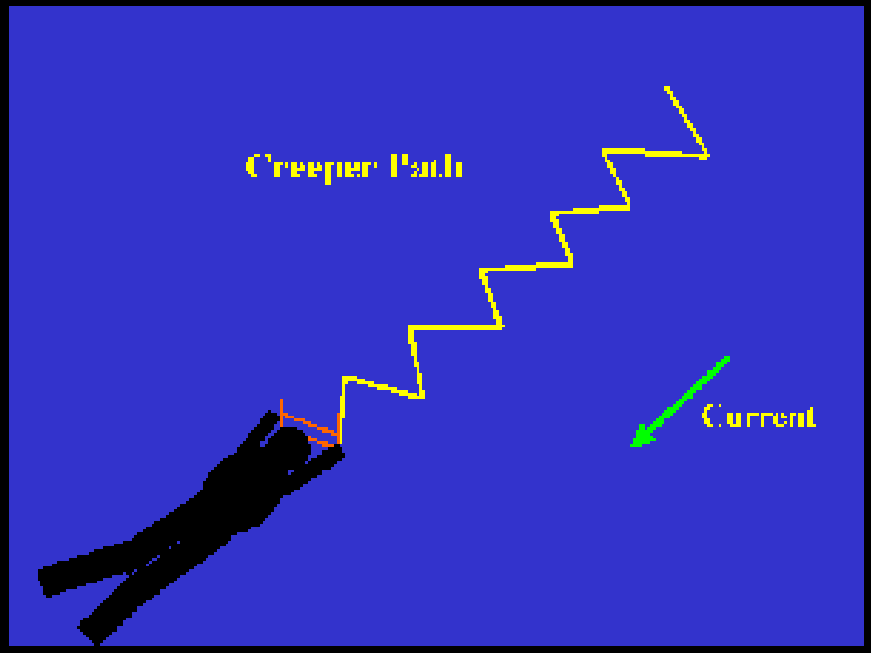
Moving Upstream In Intense Current: The Creeper

- Use front spikes as pivot points
  - Lift one spike and move forward
  - Anchor and move other front spike
- Walk upstream in zig-zag fashion



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The Creeper: Search Point

Secure dive flag to the Creeper using carabineer

Allows surface to monitor progress

Anchor the Creeper

Secure diver to Creeper with a snap shackle

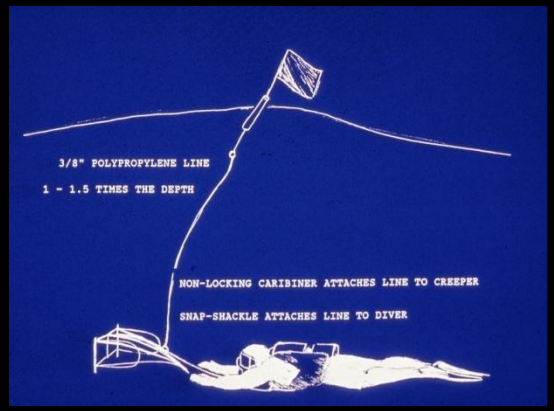
Search Local area

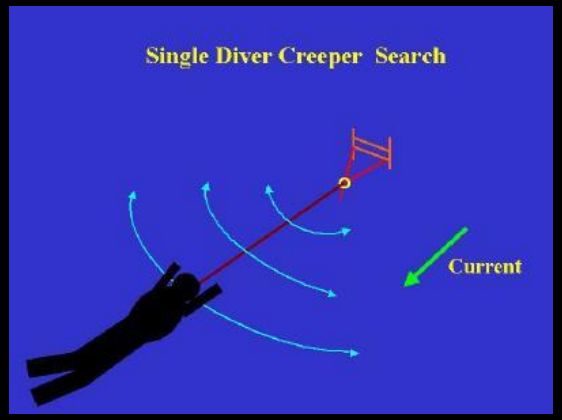
For extended operation:

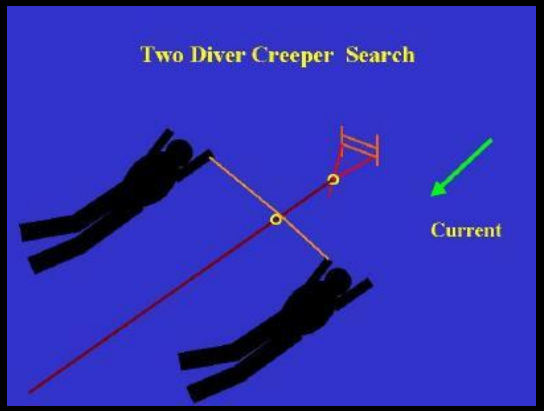
Secure search line to the creeper with locking carabineer

Single diver: use the creeper as a focal point for search sweeps

Two divers: use buddy to widen search area







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Ascents

Best to avoid direct ascents

- **Danger from surface traffic**

Prefer to move along bottom to exit point

- **Allows easy holding depth for safety stop**

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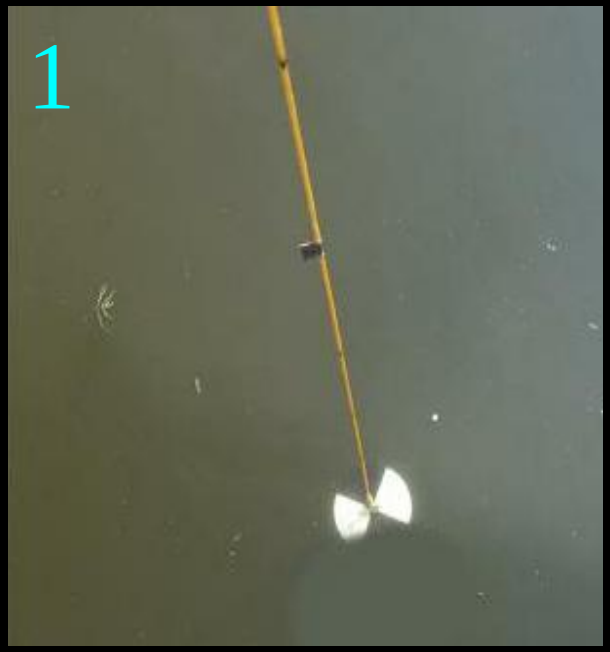
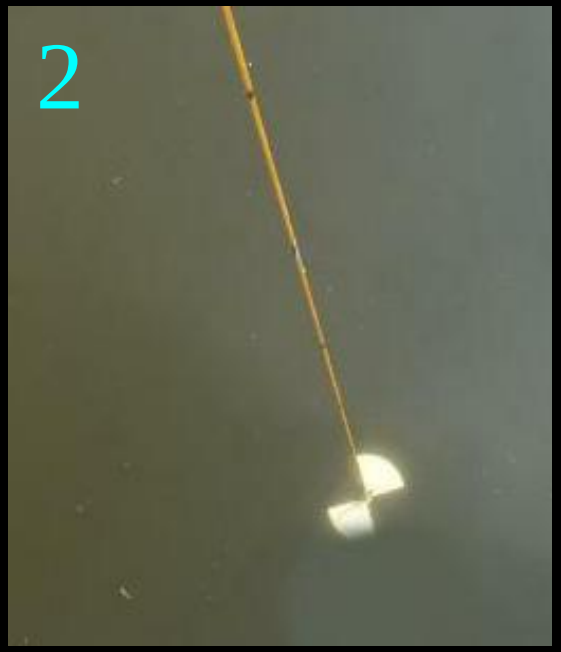
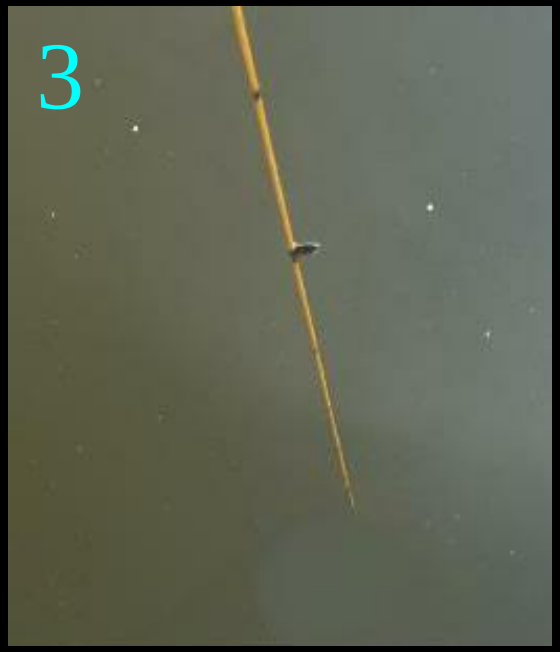
Secchi Disk: Estimating Visibility







1. Measure distance to water surface
2. Lower disk
3. Measure distance to disappearance of contrasting quarters
4. Distance 3 – Distance 1 = Estimate of in-water visibility

LPT

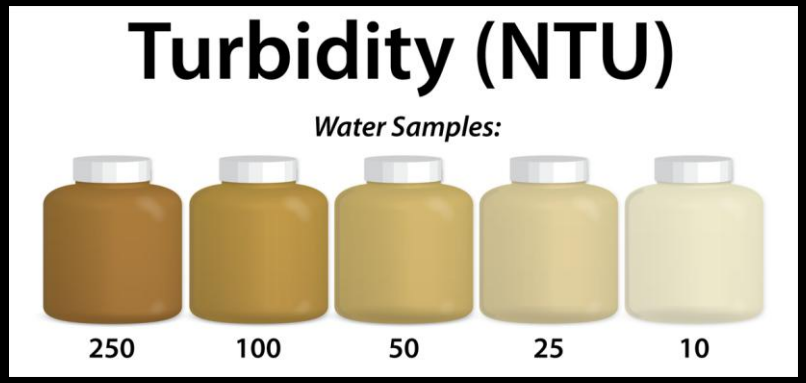
Turbidity Index

Measurement of suspended solids (Visibility)

Water Plant	Phone Number
Algonac	810-794-3281
Marine City	810-765-8087
Port Huron	810-984-9780
St. Clair	810-329-7121

Reading	~Visibility (feet)
< 1.0	30 - 50
1.0	15 - 20
10	5 - 10
20	0.5

Port Huron Metrics



1 Nephelometric Turbidity Unit (NTU) = 1 mg finely divided silica / liter

LPT

Special Hazards

Fishing Lines / Lures / Hooks

Lines Often Invisible Underwater

Active Fishing Lines

Abundant in Pine Grove Park Area

Lost Fishing lines / Lures

Lines can entangle

Lures can cut / embed in diver

Primary Reason for Multiple Cutting edges

If entangled, first try to free from line

Cut line only as last resort

LPT

Bottom Entanglements

Low Visibility / Fast Current Increases Risk

Man-made structures
Nets
Dead Branches
Wire Mesh
Chains
Wrecks

LPT

Sharp Edges

- Logs / Pilings
- Broken Glass
- Scrap Metal
- Fishing Hooks
- Re-Rod
- Construction Debris
- Wrecks
- Garbage Dumps

LPT

Chemical Pollution

St Clair River: Designated Area of Concern by both US and Canada

- Sewage
- Storm Water Run-off
- Refinery Waste
- Mercury
- Manufacturing Waste
- Pulp Mill Acids
- Pesticides
- Farm Waste

LPT

Surface Traffic

St. Clair River Has Intense Surface Traffic

Sailboats may be "silent"

Stay out of shipping channel

Avoid surface

Avoid major river events / races

When you hear / feel freighter prop wash

Check depth

Hug bottom

LPT

Marinas

Hazards:

Surface Traffic

Pollution

Improperly Grounded Boats

"can electrify the water"

LPT

Ferries

Near Islands:

- **Harsens**
- **Russell**
- **Walpole**

Avoid:

- **Docking areas**

LPT

Large Dams


Barton Dam

Provide:

- Increased depth for recreation
- Flood Control
- Electrical power

Avoid areas anywhere near a dam


Geddes Dam

Circular Flow (hydraulic)

LPT

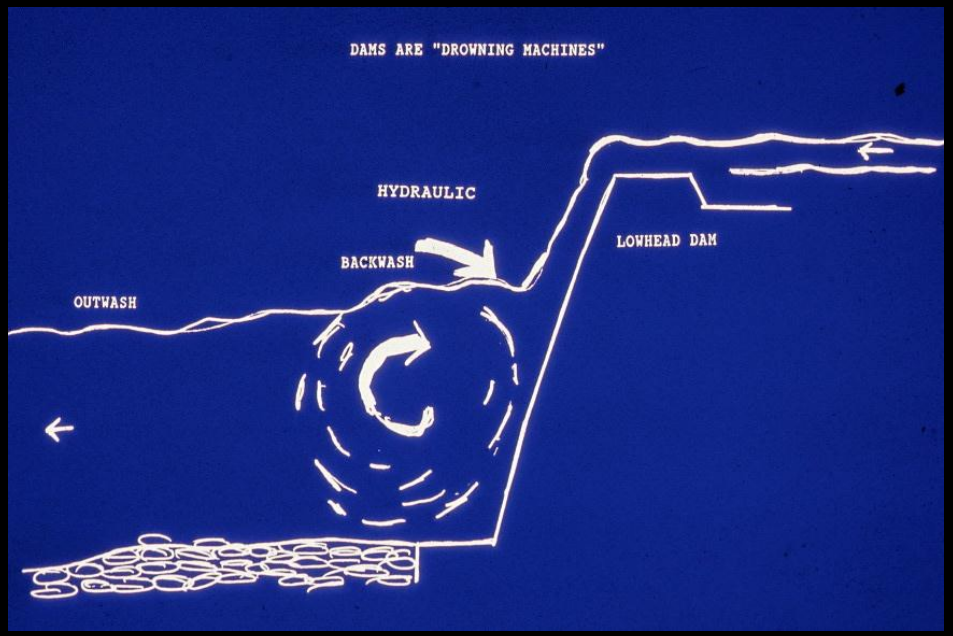
Low-Head Dams

Typically just an underwater wall (no spillways or flood gates)

"Drowning Machines"

Flow over dam creates circular flow nearly impossible to escape

Circular flow termed "roller" or "hydraulic"



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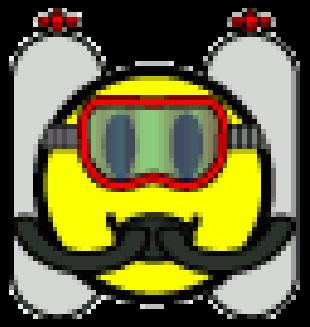
Reading Rivers



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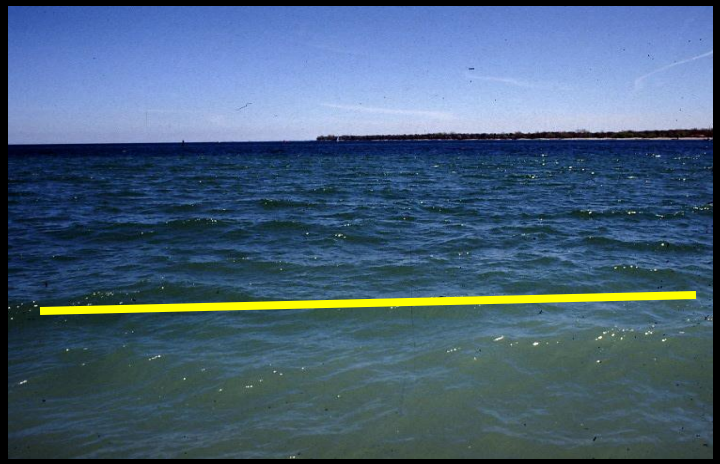
Reading Rivers

Looking at river topology, traffic, and current flow

Assists in:

- Planning dive entry / exits
- Determining places to search
- Determining potential hazards

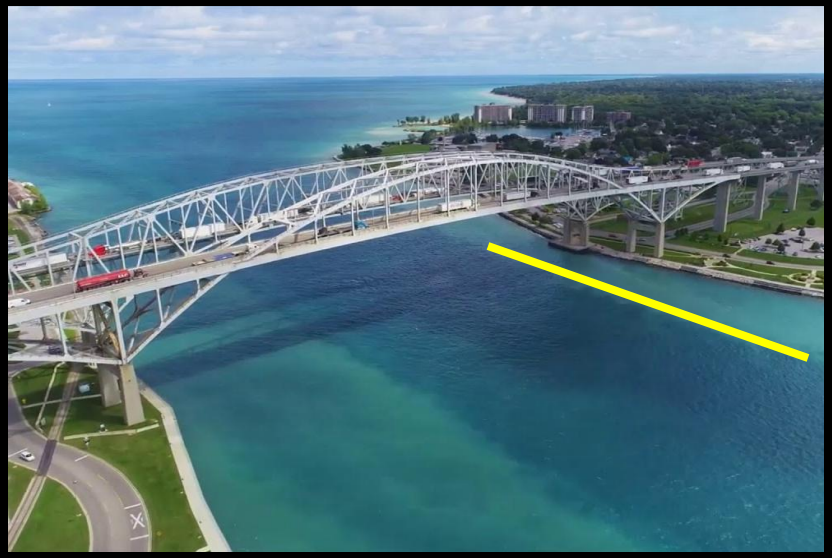
Depth Indicators



Difference in color from changes in:

- **Depth**
- **Plants covering bottom**

Riffles, when further out is calm, or
Calm, when further out is choppy



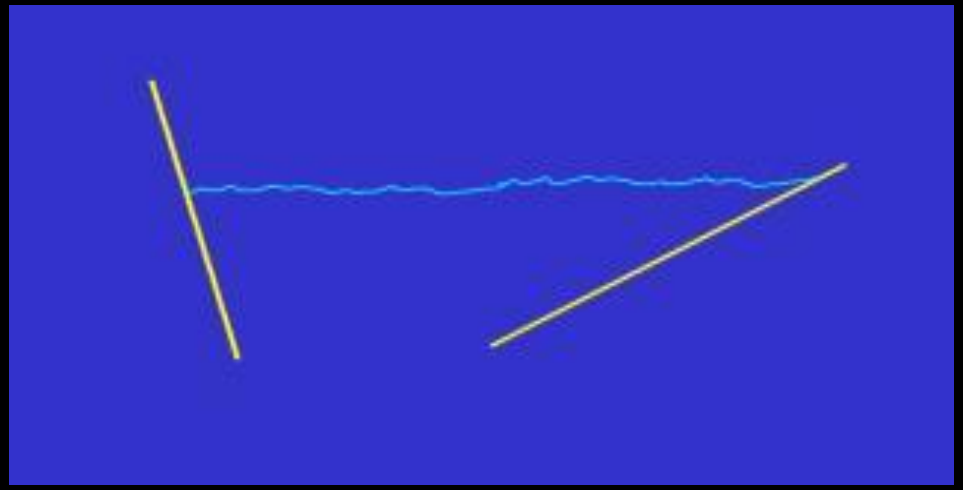
Seasonal Variation Effected by:

- **Rain**
- **Melting snow / ice**
- **Evaporation**
- **Ice floes / dams**
- **Winds**
- **Tides / Bores**

US Army Corps of Engineering keeps level appropriate for commercial traffic

LPT

River Bank Slope Is Clue to Depth



Opposite sides of river often have different slopes

Result of:

- **Current flow strength**
- **Geology of river bank**
- **Geologic age of river**
- **Erosion at different rates**

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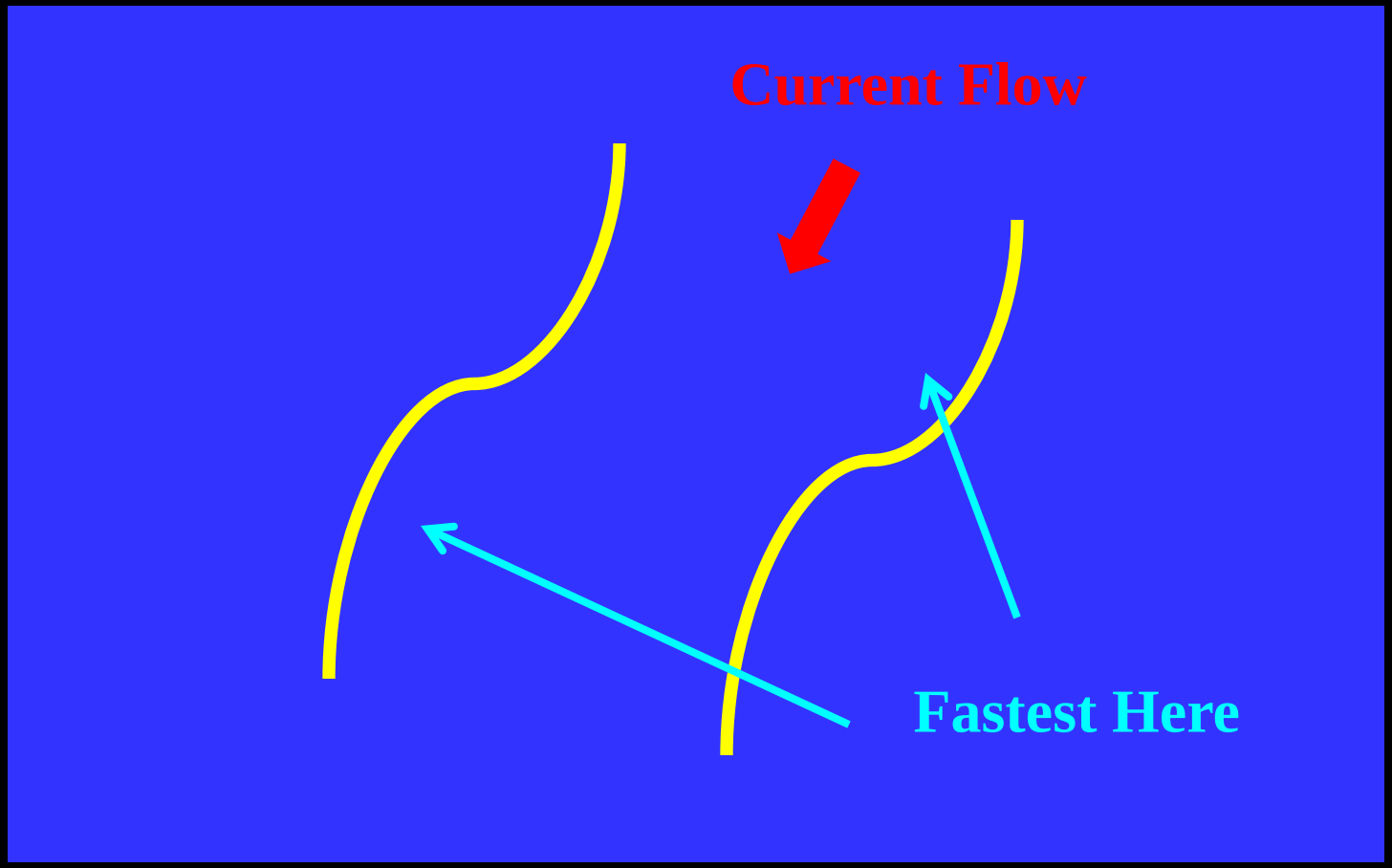
Current Is Swiftest On Outside of River Bend



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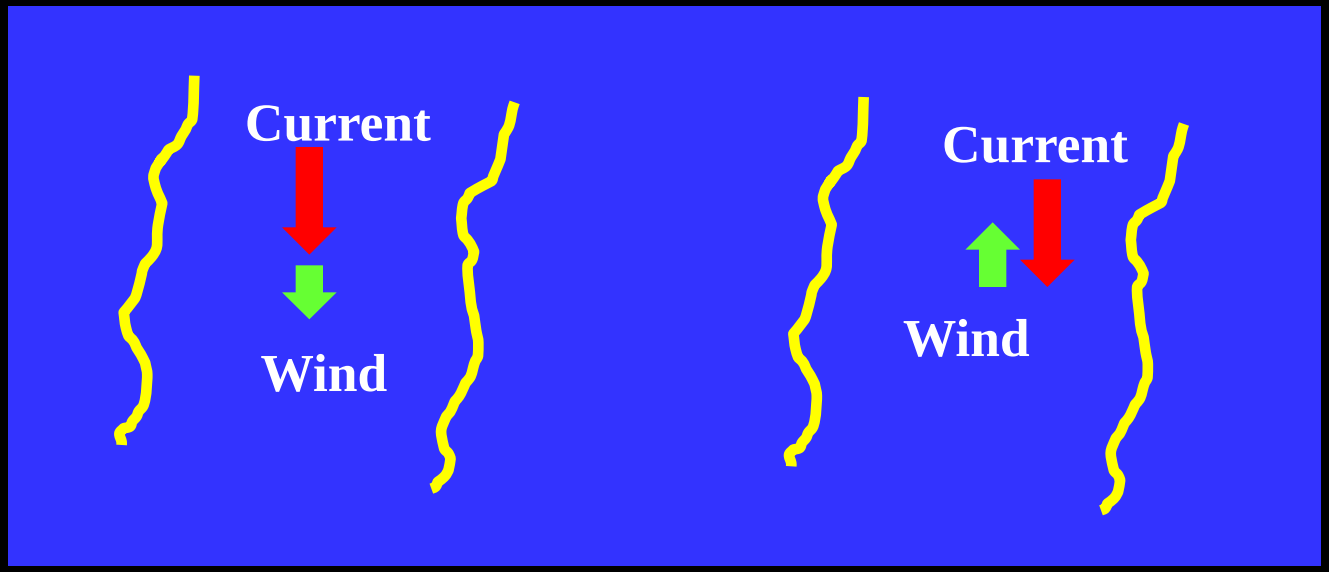
Wind Influences Current Flow

Opposing wind decreases current / can increase visibility

Strong opposing wind indicated by white caps

Similar wind increases current / can decrease visibility



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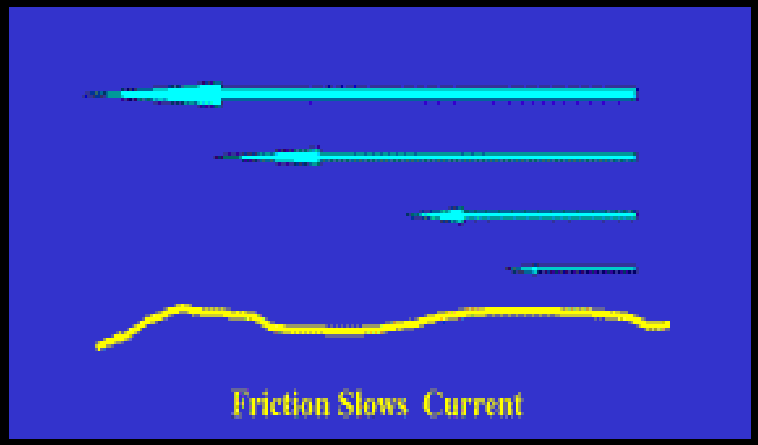
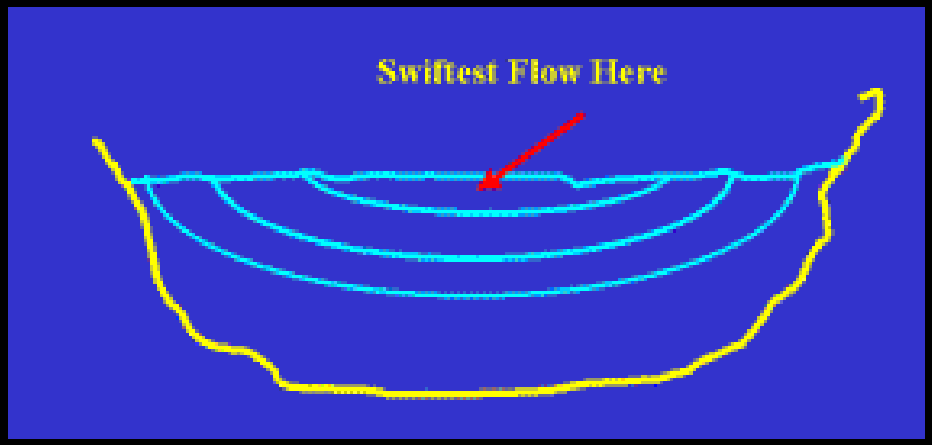
Current Flow Differs With Cross-Section

Assuming Laminar (Parallel) Flow



Side View



Front View

Fastest Current: Center, near surface

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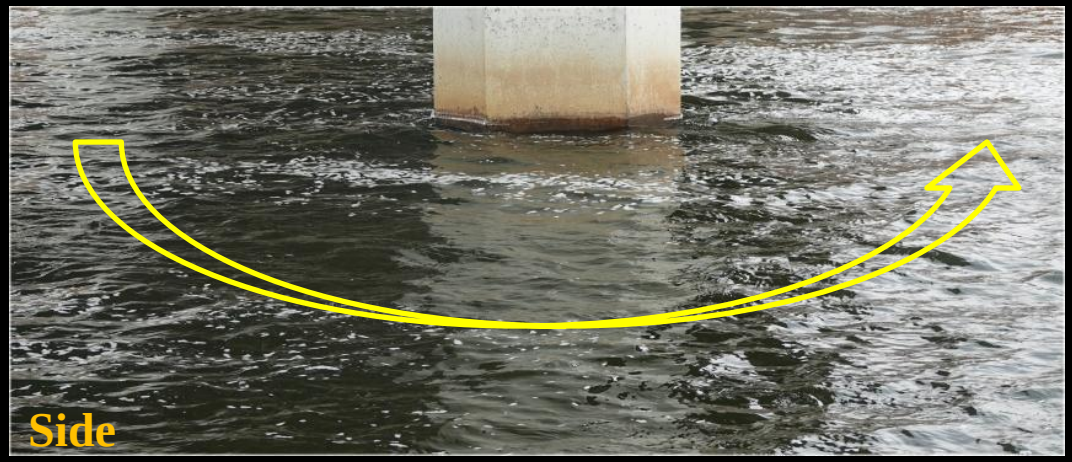
Turbulent Flow Around Objects



Objects “splits” flow

Alters direction

Alters velocity

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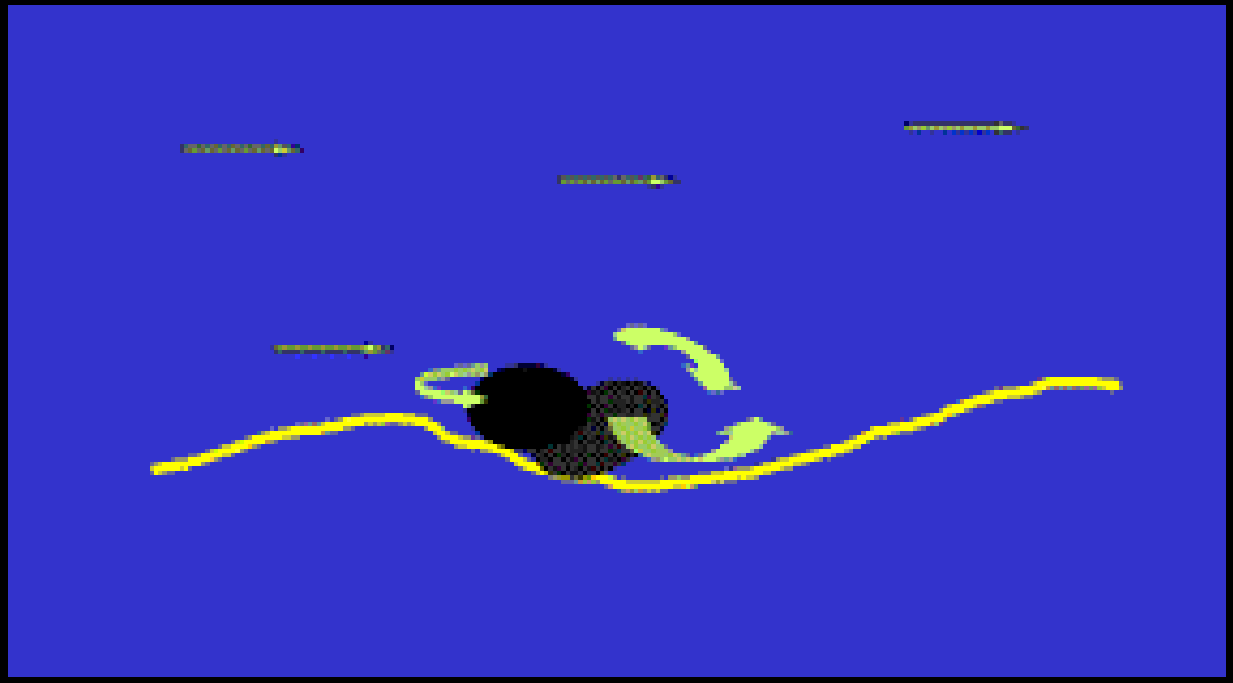
Turbulent Flow Around Objects

Flow disturbances can deposit debris



Area behind objects:

Good place to search for "goodies"

Rest area when moving upstream

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Debris Builds Up Where Current Slows

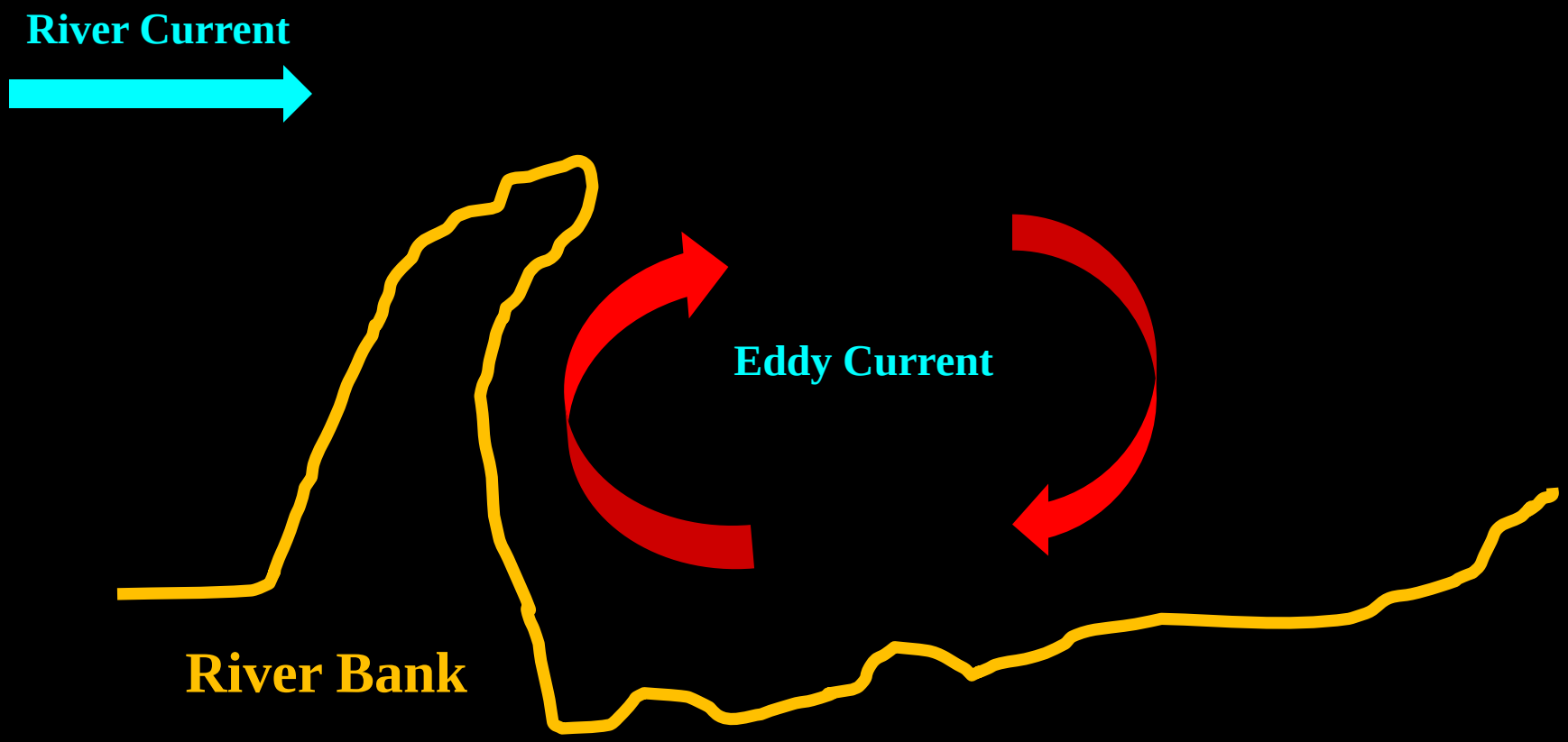
Debris accumulation (X) is a good place to search for objects

Inner Bend of River

Each End of Island

LPT

Eddy Currents



Eddy current forms downstream from any diversion of current
Can be horizontal or vertical (depending on local topography)

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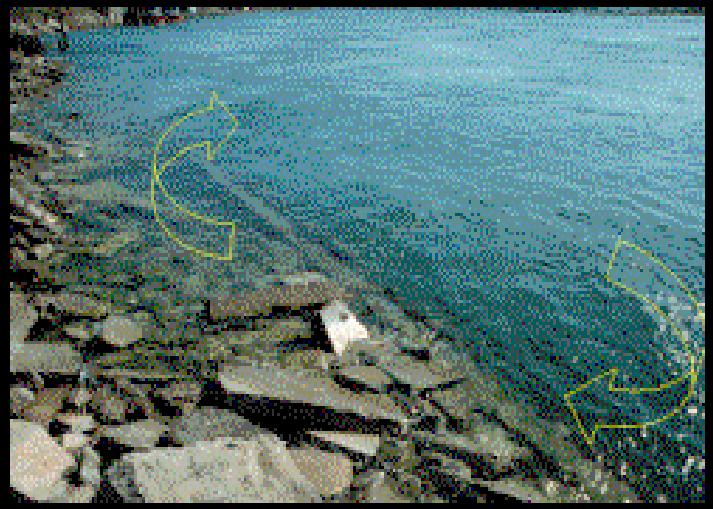
Eddy Currents

Circular flow as water “backfills” around objects



Where eddy meets main flow:

- Often visible sharp line of “wave cancellation”
- Sand ripples on the bottom

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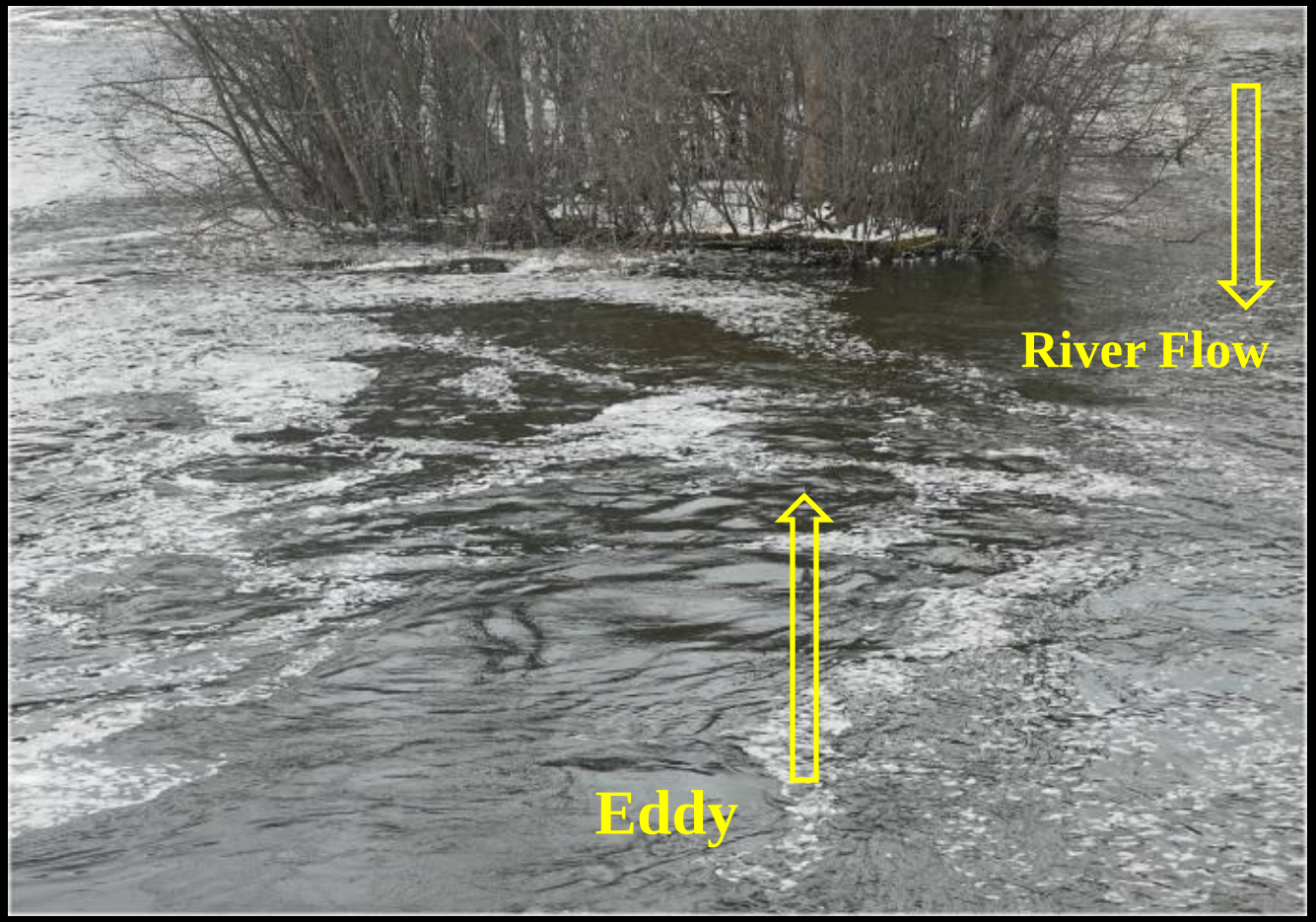
Eddy Currents



Backflow can be a substantial movement upstream

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Current Flow

$$\text{Current Velocity} = \frac{\text{Volume of Flow}}{\text{Width x Depth}}$$

At Constant Flow:

River Narrows – Current Increases
River Widens – Current Decreases
River Deepens – Current Decreases
River Less Deep – Current Increases

LPT

Determining Surface Current Flow

Measure time it takes for object to move 100 feet

Time (sec)	ft/sec	ft/min	knots	miles/hour
5	20.00	1200.00	11.85	13.64
10	10.00	600.00	5.92	6.82
15	6.67	400.00	3.95	4.55
16	6.25	375.00	3.70	4.26
17	5.88	352.94	3.49	4.01
18	5.56	333.33	3.29	3.79
19	5.26	315.79	3.12	3.59
20	5.00	300.00	2.96	3.41
21	4.76	285.71	2.82	3.25
22	4.55	272.73	2.69	3.10
23	4.35	260.87	2.58	2.96
24	4.17	250.00	2.47	2.84
25	4.00	240.00	2.37	2.73
30	3.33	200.00	1.97	2.27
35	2.86	171.43	1.69	1.95
40	2.50	150.00	1.48	1.70
45	2.22	133.33	1.32	1.52
50	2.00	120.00	1.18	1.36
60	1.67	100.00	0.99	1.14
70	1.43	85.71	0.85	0.97
80	1.25	75.00	0.74	0.85
90	1.11	66.67	0.66	0.76
100	1.00	60.00	0.59	0.68

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Moving Water Exerts Force

St Clair River Current Can Move 1000’ Freighters

Moving water always defeats humans

Current Velocity (mph)	Current Velocity (knots)	Average Force On Legs (lbs)	Average Force On Body (lbs)	Average Force Swamped Boat (lbs)
3	2.6	16.8	33.6	168
6	5.2	67.2	134	672
9	7.8	151.0	302	1512
12	10.4	269	538	2668

LPT

NOAA Charts

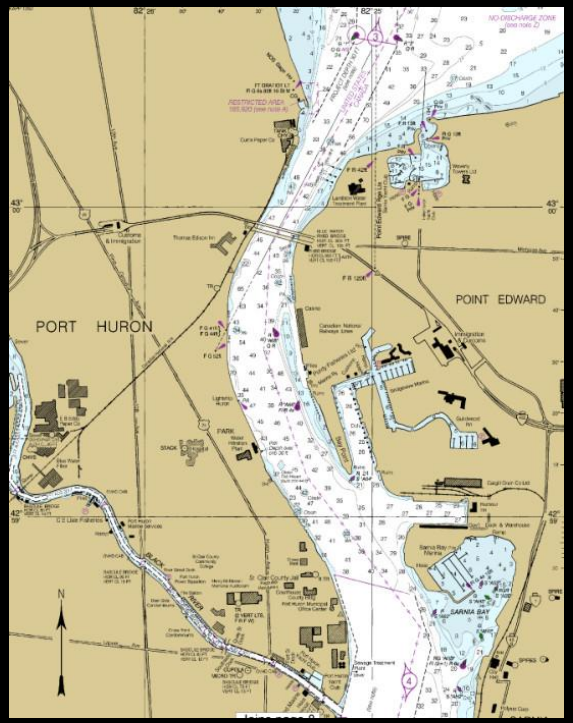
[NOAA Chart Locator]

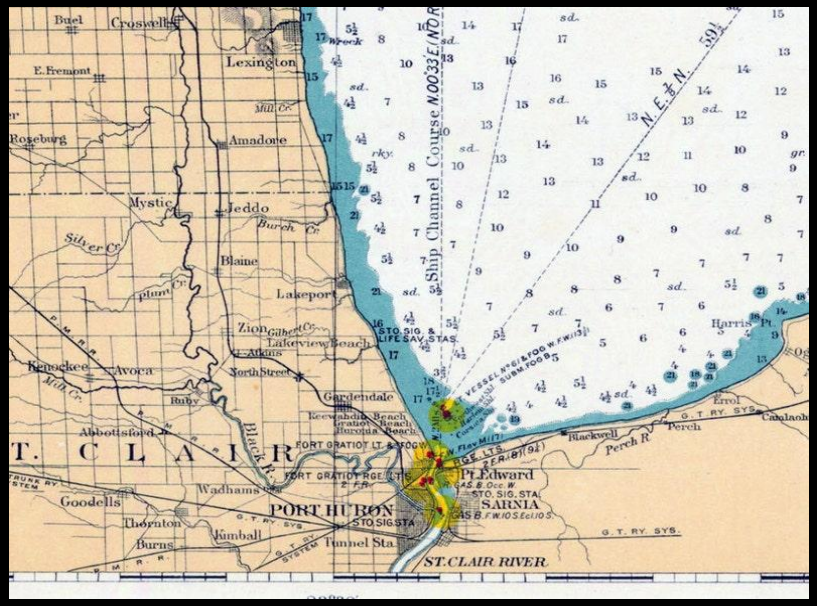
[Chart No 1 (Abbreviations and Symbols)]

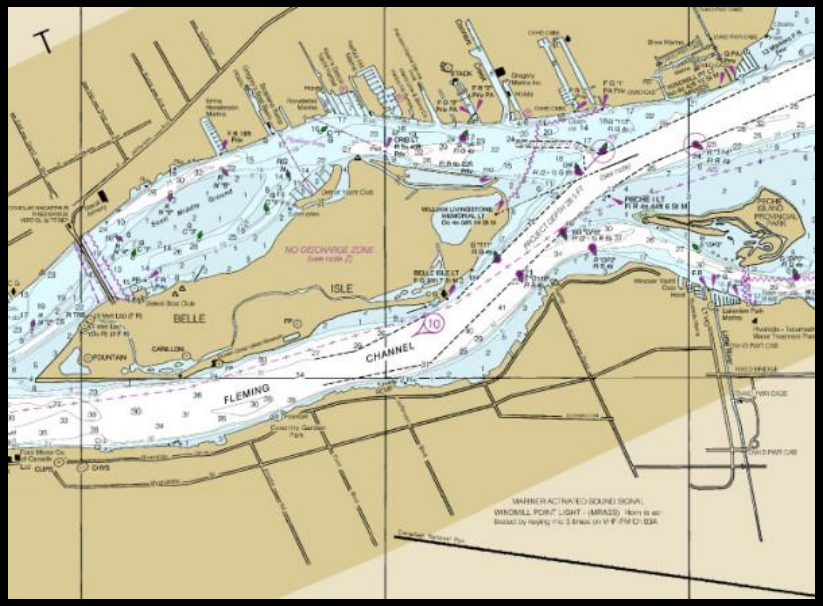
[St. Clair River Booklet Chart]

[Detroit River Booklet Chart]

[Coast Pilot 6 (Great Lakes)]







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Vector Approach to Navigation

LPT

Navigation

Navigation:

Process of precisely determining position on map or chart

Art of determining path between two points

Vector approach assumes:

Current flow is constant in speed and direction

Diver swims in a straight line at constant speed and direction

In reality: vector approach is a “best guess”

Best to aim for area upstream from calculated track

LPT

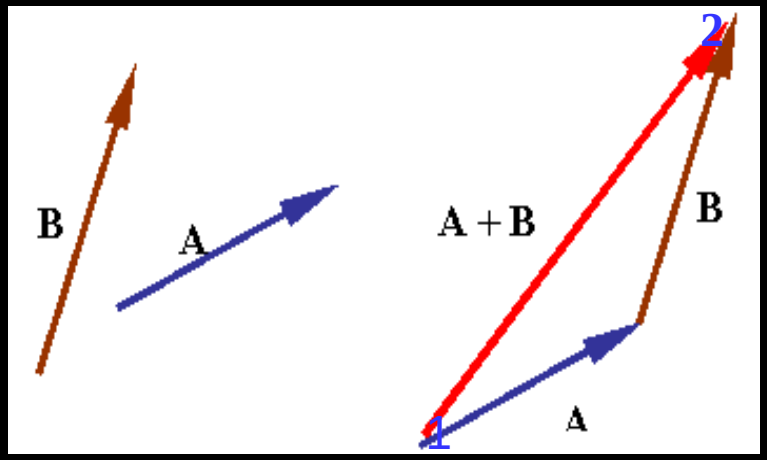
Vectors Represent Velocity

Vector = A line that has:
- **Specific direction**
- **Specific length (magnitude)**

Example:

A = Direction and velocity of river current

B = Divers swimming direction and speed

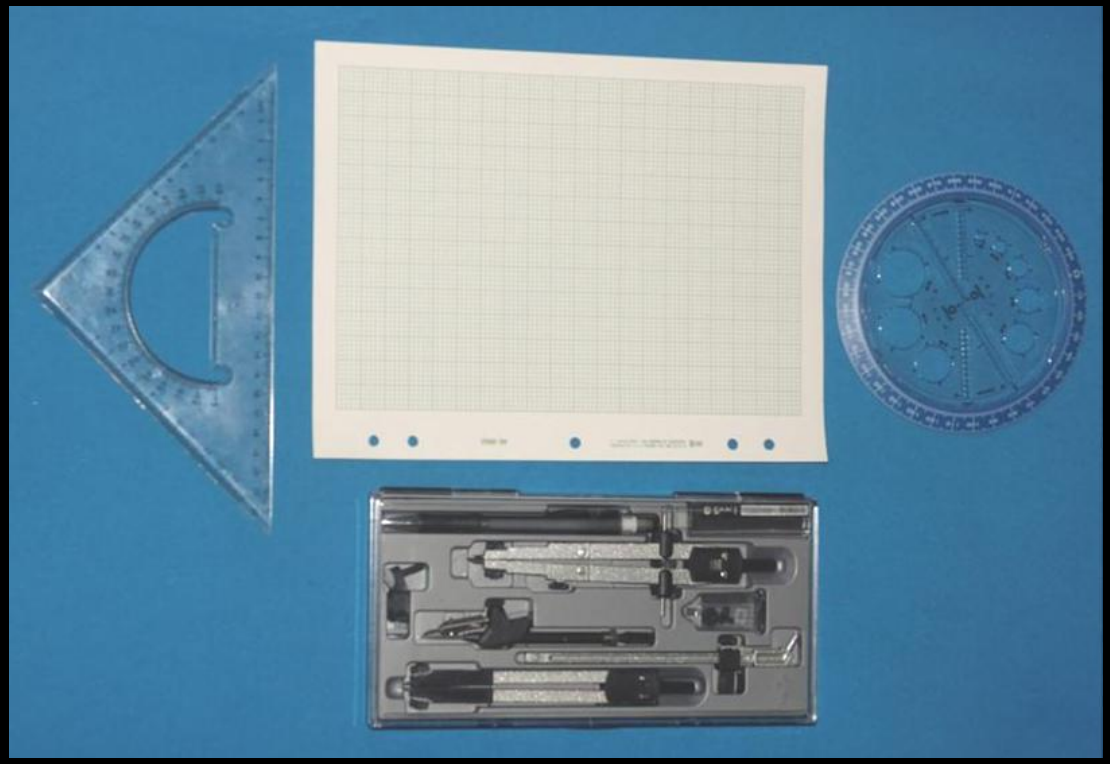


Combining vectors (head-to-tail addition)
Gives result of the interacting forces

Diver, swimming at speed and direction, B
In current direction and velocity, A
Moves from point 1 to 2

LPT

Drawing Vectors: Tools Needed

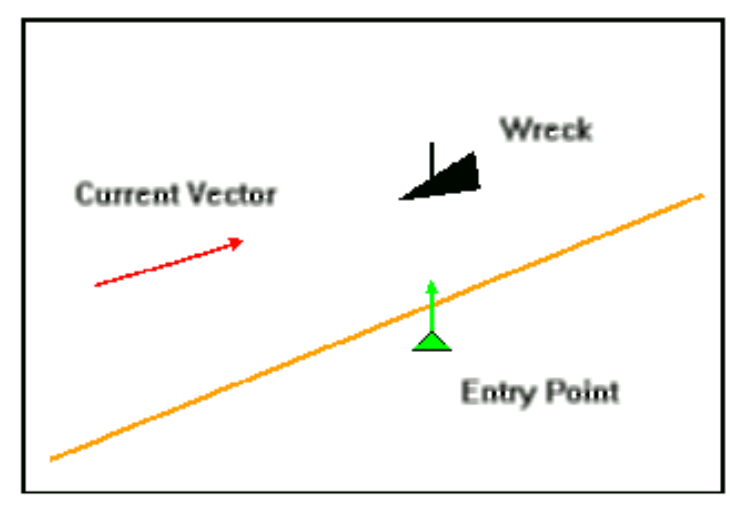


Graph Paper
Straight Edge
Protractor
Drawing Compass

Estimating Dive to a Wreck

A diver wishes to dive on the a river wreck
Diver measures current
Diver knows (from previous determination) their swimming speed

The wreck is directly North on the entry point and 500 feet offshore
The current is moving 50 ft/min in direction 075 degrees
The diver swims 100 feet in 1.5 minutes (speed = 66.7 ft / min)



Time to wreck:

550 ft / 66.7 ft / min = 7.5 min

The diver assumes they can swim directly from entry to wreck

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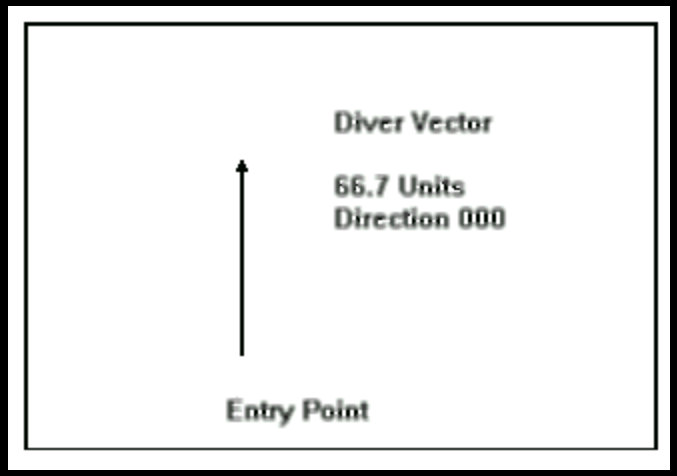
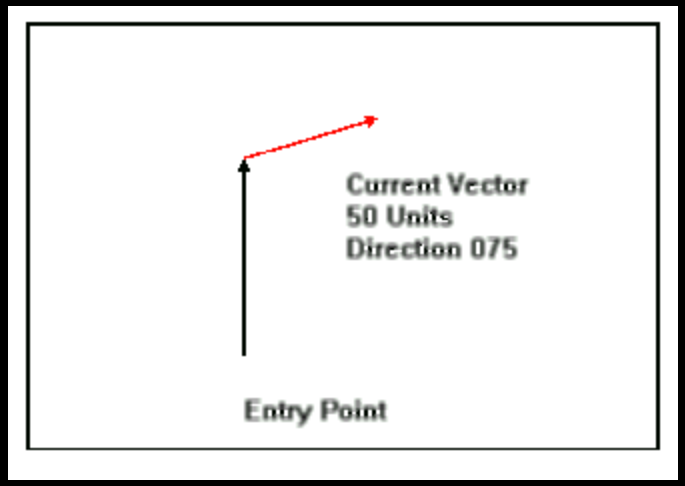
Estimating Divers Path

Use graph paper where:
- graph scale represents time
- lines represent direction and speed

Start with diver's vector



Add the current vector

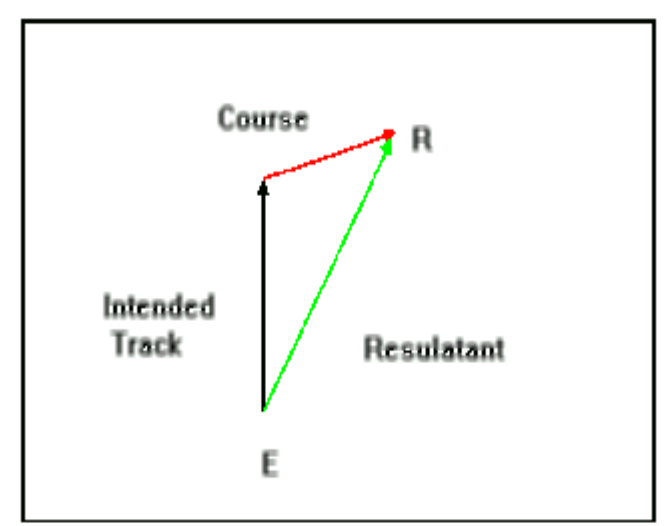


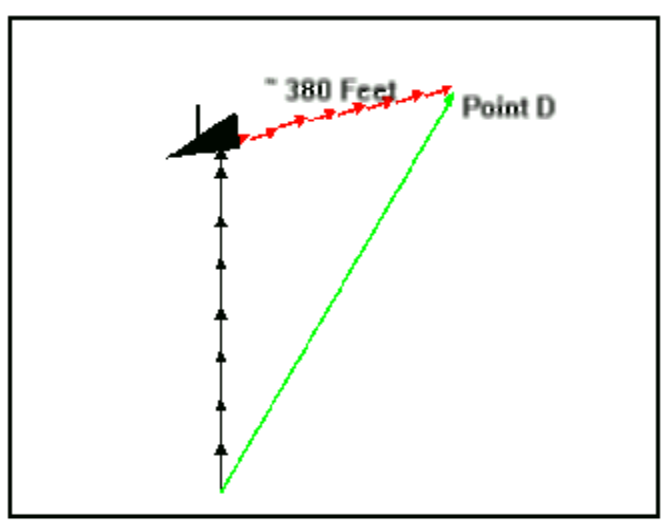
LPT

Estimating Diver's Path

Draw the resultant (the addition product) connecting the two points

Vectors suggest at 7.5 minutes, the diver is 300 feet beyond target





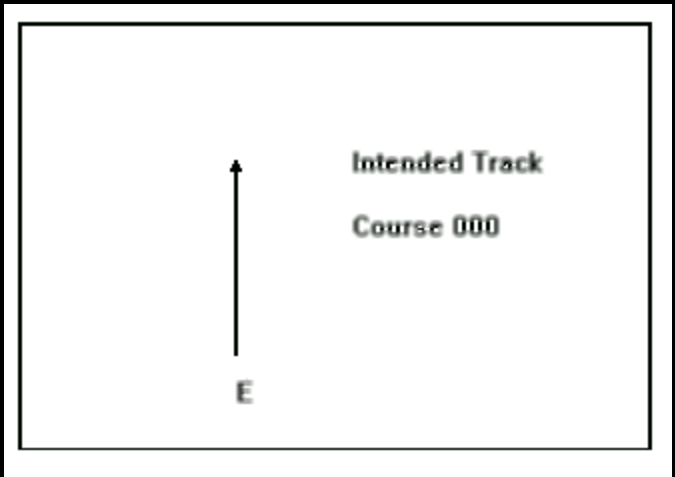
Pont D is estimated position of diver swimming straight North from entry point

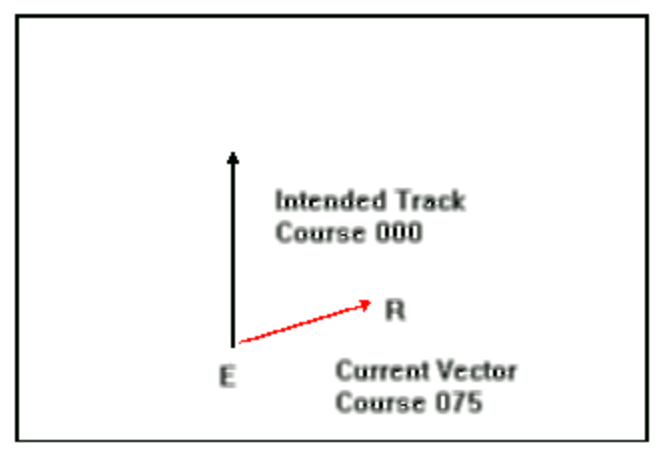
LPT

Estimating Diver's Path

First, draw the intended track from entry to wreck on graph paper
Second, draw the current vector from the starting point

This presents result of current acting on the diver



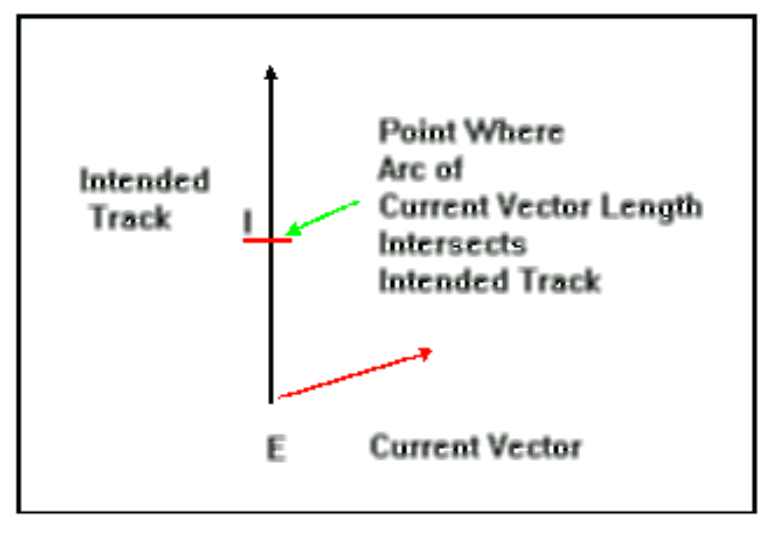


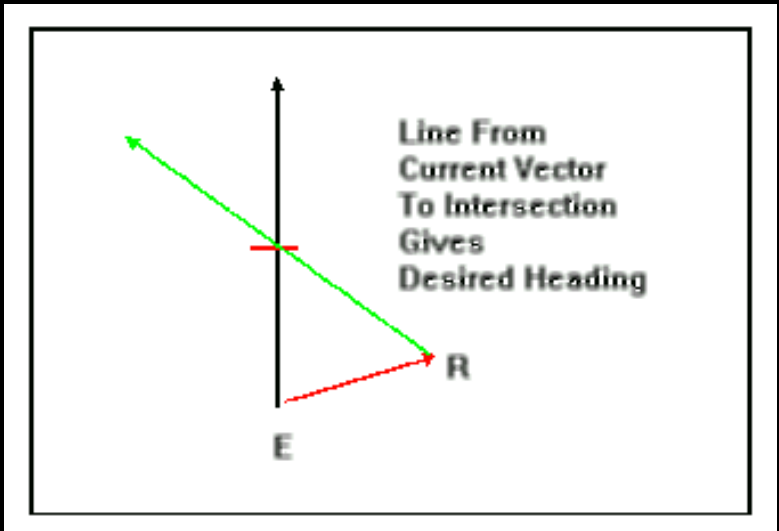
E = Entry Point
R = Result of current vector

Estimating Diver's Path

Set a drawing compass to the length of the current vector
Draw an arc that intersects the intended path line

Connect current lector R to the intersection point





Desired heading (315 degrees … from R to intended track)
To reach wreck From entry point:
Swim Against the current at heading 315 for 7.5 minutes

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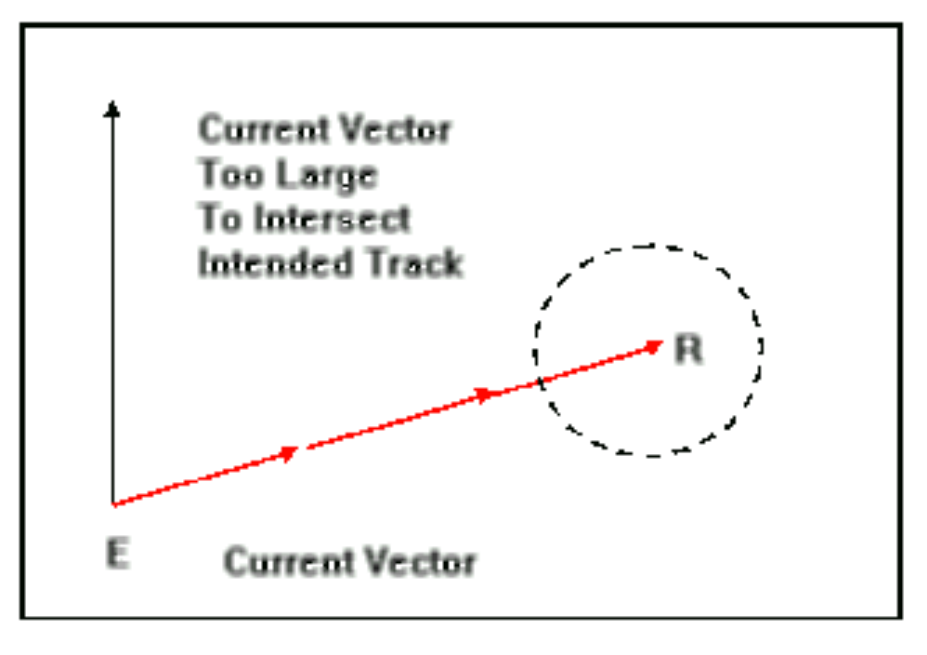
Estimating Diver's Path

If current has increased to 300 ft / minute (about 3 knots)



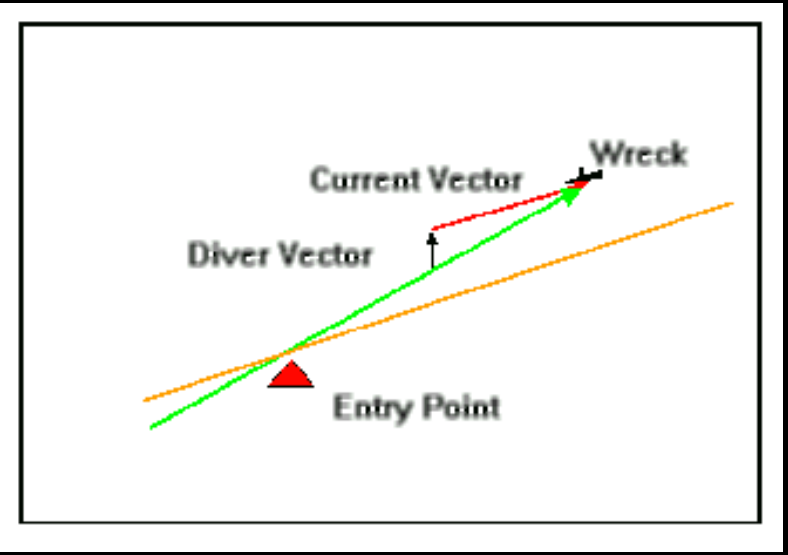
Arc of diver's speed vector does not intersect intended track
Dive from entry point not possible by diver swimming

LPT

Estimating Diver's Path

If current has increased to 300 ft / minute (about 3 knots)

Start from the wreck and draw reciprocal of the current vector
Add the diver's speed vector
Extend the resultant to the chart to determine new entry point



New entry point 1080 feet upstream from original entry point

LPT

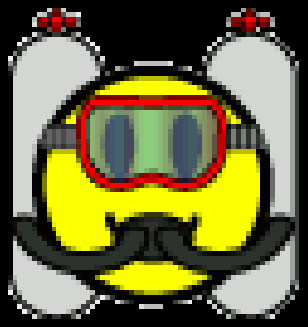
Vector Approach: Conclusion

This method is not perfect

But,

It does give reasonable guesses for short paths

Legal Stuff



State of Michigan

Michigan Law 324.76115 – Dangers Accepted by Scuba Divers

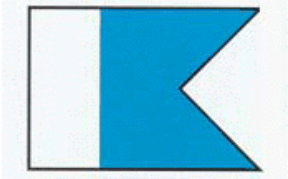
Each person who participates in the sport of scuba diving on the Great Lakes bottomlands accepts the dangers that adhere in that sport insofar as the dangers are obvious and necessary. Those dangers include, but are not limited to, injuries which can result from entanglements in sunken watercraft or aircraft; the condition of sunken watercraft or aircraft; the location of sunken watercraft or aircraft; the failure of the state to fund staff or programs at bottomlands preserves; and the depth of the objects and bottomlands within preserves.

LPT

Michigan DNR – Dive Flag Guide

DIVER DOWN FLAG

Do not approach, divers are below. Stay at least 200 feet away from diving operations. This flag may be flown vessel or float.



ALPHA FLAG

Vessel has personnel and/or equipment in water and is unable to maneuver. Do not approach; maintain a safe distance of at least 100 feet around vessel. Watch for divers.

Vessels displaying these signal flags could be moored, anchored, drifting or slowing towing divers.
DO NOT APPROACH. STAY A SAFE DISTANCE AWAY.
Divers: use common sense; avoid high boat traffic areas and always display a diver down flag when diving

Michigan Act 451 of 1994324.80155

Any person diving or submerging in any of the waters of this state with the aid of a diving suit or other mechanical diving device shall place a buoy or boat in the water at or near the point of submergence. The buoy or boat shall bear a red flag not less than 14 inches by 16 inches with a 3-1/2 inch white stripe running from 1 upper corner to a diagonal lower corner. The flag shall be in place only while actual diving operations are in progress. A vessel shall not be operated within *200 feet* of a buoyed diver's flag unless it is involved in tendering the diving operation. A person diving shall stay within a surface area of *100 feet* of the diver's flag.

LPT

Port Huron

Ordinance Sec 18-3

Scuba diving from city owned property allowed

But, prohibited in:

- **Harbors**
- **Boat Launching Sites**
- **Mooring Facilities**

Exceptions:

- **Authorization of harbor master**
- **Search and rescue operations**

LPT

Detroit

Ordinance 39-1-81

Swimming, water skiing, surf boarding, and skin diving prohibited in all or on all city rivers, canals, ditches, and fountains

Ordinance 39-1-83

Diving allowed if properly fitted with underwater breathing apparatus which covers all portions of the body so that no water can reach the mouth, nostrils, or skin.

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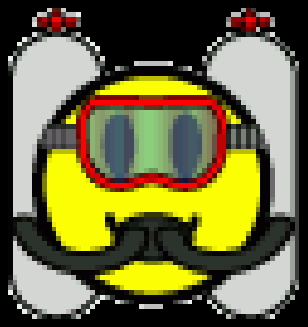
Critters



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Common St. Clair River Game Fish

Northern Pike

Yellow Perch

Lake Whitefish

Walleye Pike

Smallmouth Bass

Muskellunge

Brown Trout

Slender reddish-brown body with long, narrow head

Length: 16-31 inches
Weight: 2.2 - 60 pounds
Lifespan ~ 10-23 years

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Carp

Covered with silvery scales appearing like body armor

Considered an invasive / pest fish:
destroys vegetation
Length: 15 - 32 inches
Weight : 15- 25 pounds
Lifespan ~ 38 - 47 years

LPT

Catfish

Named for prominent barbels which resemble cat's whiskers

Length: 4 - 62 inches
Weight: 1- 220 pounds
Lifespan ~ 5 - 30 years

LPT

Crappie

Length: 10 - 19 inches
Weight: 1- 2 pounds
Lifespan ~ 4 - 15 years

LPT

Crayfish / Crawldad

Length: 1 - 7 inches
Weight: 1- 500 grams
Lifespan ~ 3 - 8 years

LPT

Drum

Length: 1 - 4 feet
Weight: 1- 225 pounds
Lifespan ~ 10 - 50 years

LPT

Large Mouth Bass

Length: 10 - 38 inches
Weight: 1- 25 pounds
Lifespan ~ 10 - 50 years

LPT

Muskellunge (Muskie)

Length: 20 - 72 inches
Weight: 15- 36 pounds
Lifespan ~ 10 - 30 years

LPT

Northern Pike

Length: 24 - 30 inches
Weight: 3- 6 pounds
Lifespan ~ 10 - 30 years

LPT

Salmon

Length: 24 - 58 inches
Weight: 3 - 126 pounds
Lifespan ~ 10 - 30 years

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Silver (White) Bass

Length: 12 - 20 inches
Weight: 2 - 7 pounds
Lifespan ~ 4 - 9 years

LPT

Small Mouth Bass

Length: 12 - 16 inches
Weight: 2 - 12 pounds
Lifespan ~ 6 - 14 years

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Smelt

Length: 1- 8 inches
Weight: 1 - 6 ounces
Lifespan ~ 8 - 10 years

LPT

Sturgeon

Length: 3- 23 feet
Weight: 80 - 3400 pounds
Lifespan ~ 50 - 150 years

LPT

Walleye

Length: 20- 42 inches
Weight: 80 - 30 pounds
Lifespan ~ 10 - 29 years

LPT

White Fish

Length: 14 - 20 inches
Weight: 1 - 3 pounds
Lifespan ~ 10 - 20 years

LPT

Yellow Perch

Length: 7 - 20 inches
Weight: 1 - 4 pounds
Lifespan ~ 8 - 11 years

LPT

Zebra Muscles

Length: 0.25 - 1.5 in
Lifespan ~ 2 - 9 years

LPT

Last Thoughts

The Difference Between Fun & Tragedy:

- Physical Fitness
- Training
- Proper Equipment
- Gradual Increase In Comfort Zone
- Practice

LPT


"Thats all Folks!"


Woo Hoo!
All done!


End of Class This Is


Dive long and prosper

LPT