National Center for Cold Water Safety

Cold Water Safety Best Practices Avoiding Fatalities and Lawsuits

By
Moulton Avery



www.coldwatersafety.org



Moulton Avery

© 2026 Moulton Avery / National Center for Cold Water Safety

2024 US Coast Guard Boating Statistics

157 Paddlesports Fatalities

28% of Total Boating Fatalities

Cold Water Best Practices

Five Golden Rules

Twelve
Major Contributing Factors

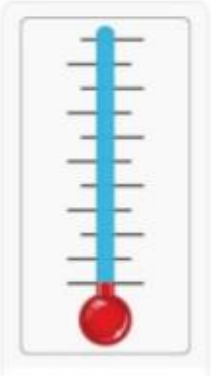
Building Your Cold Water Safety Net

BEST PRACTICE GUARDRAILS

PREVENT MISTAKES

FROM TURNING INTO DISASTERS

Five Golden Rules of Cold Water Safety



PFD	Wear Your PFD (Lifejacket)
GEAR	Dress For The Water Temperature
FIELD TEST	Field Test Your Gear
SWIM TEST	Swim Test Your Gear
PLAN	Plan For The Worst That Can Happen


Field Testing Gear
40F (4.4C) Water

Cold Water Certification Swim Test



Twelve Major Contributing Factors

- No PFD (Lifejacket)
- Not Dressed For Water Temperature
- Unable To Recover From Capsize
- Unable to Call For Help
- Unaware of Hazards
- Being Complacent / Overconfident
- Lack of Weather Awareness
- Unable To Deal With Wind and Waves
- Poor Navigation Skills
- No Light - Invisible At Night
- Poor Group Management
- Paddling Solo

Building Your Cold Water Safety Net

A Three-Step Process

Hazard Awareness
Risk Assessment
Risk Management

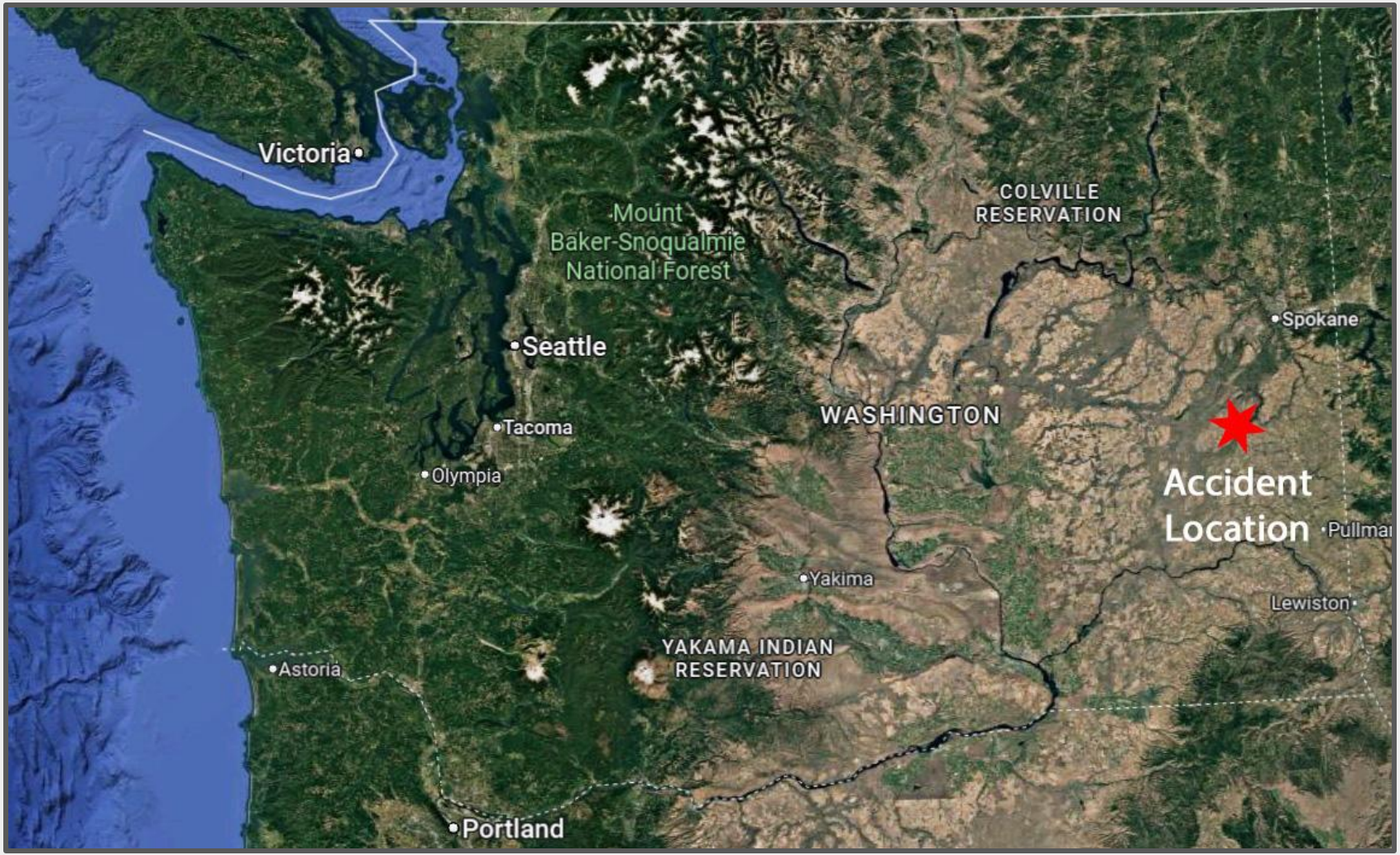

National Center for Cold Water Safety

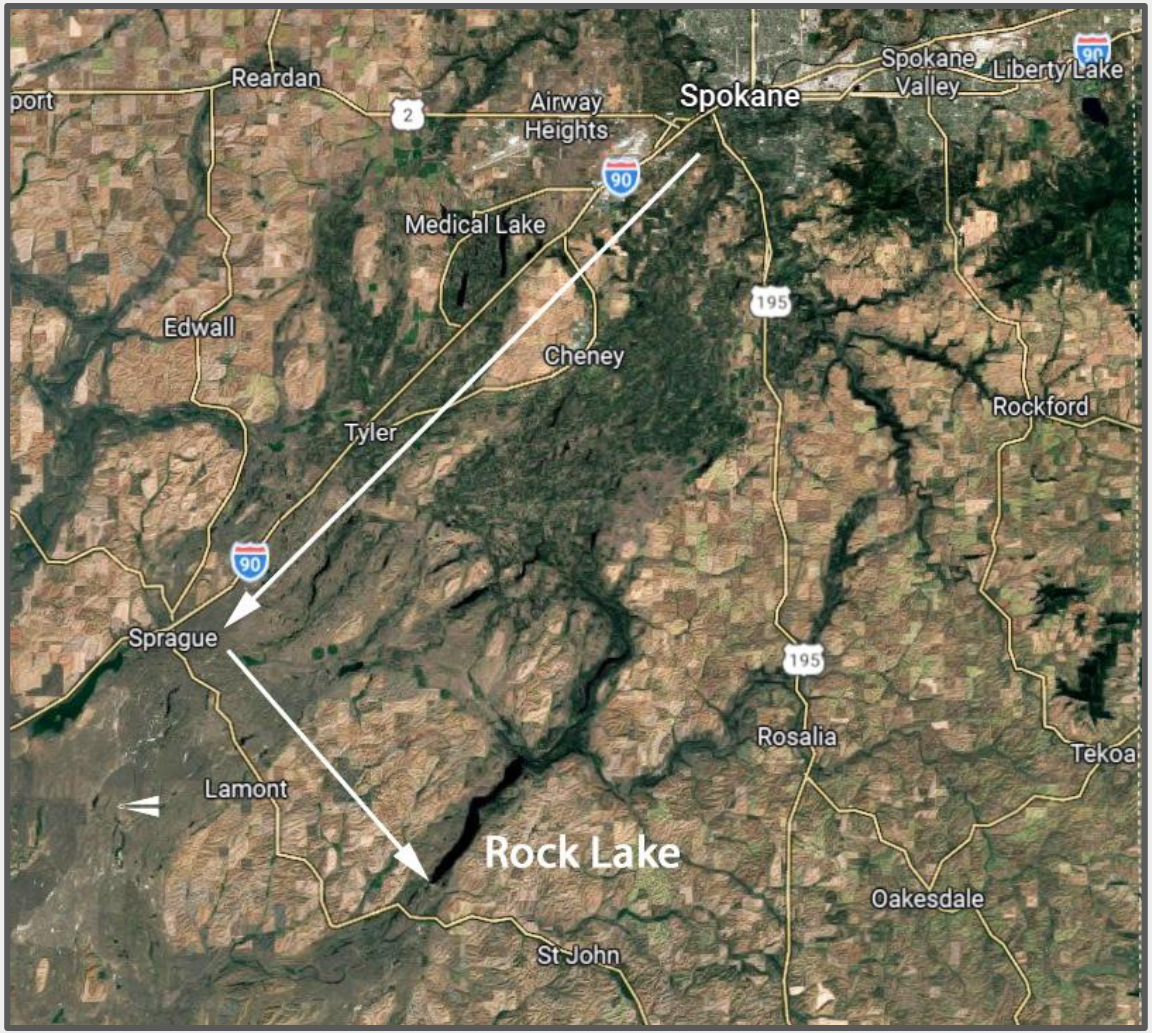
The Rock Lake Tragedy

April 1, 2012

One Fatality

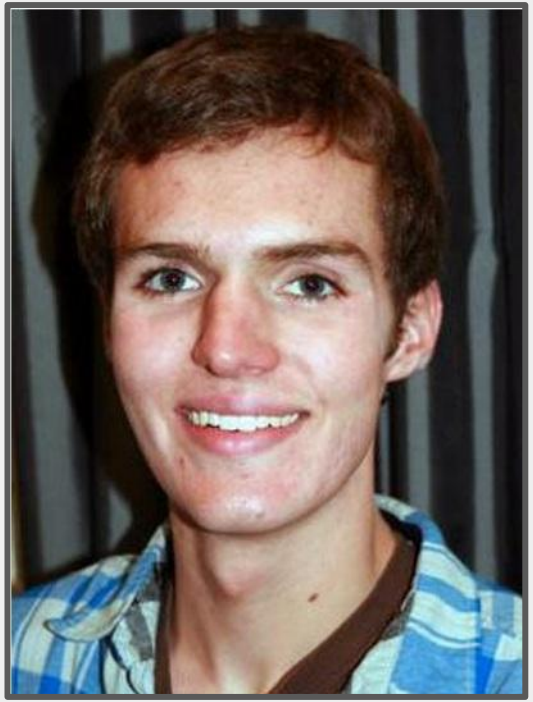
$950,000 Lawsuit Settlement

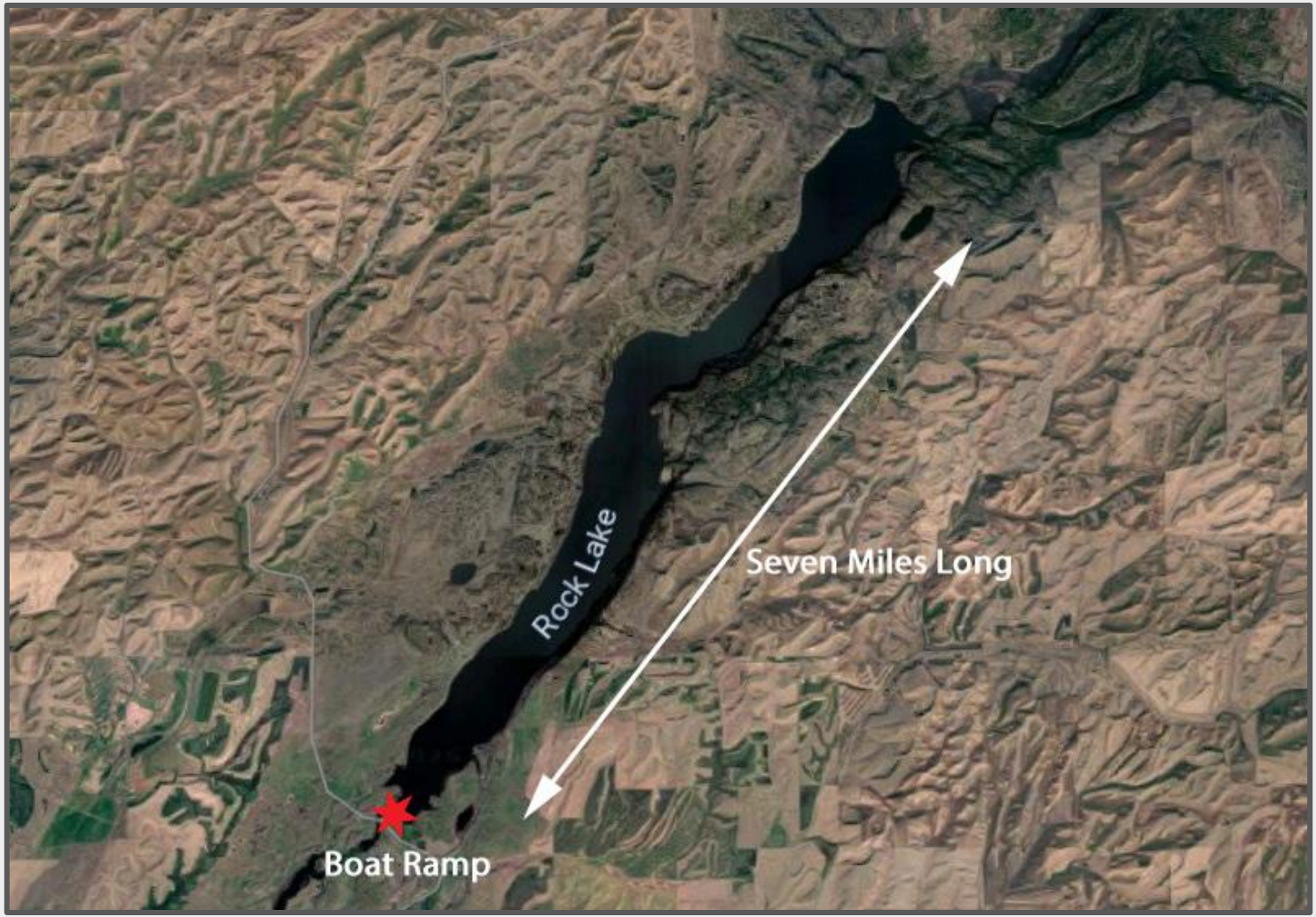

Victoria
Mount
Baker-Snoqualmie
National Forest
COLVILLE
RESERVATION
Spokane
Seattle
WASHINGTON
Tacoma
Olympia
Accident
Location
Pullman
Yakima
Lewiston
YAKAMA INDIAN
RESERVATION
Astoria
Portland


Reardan
port
2
Airway
Heights
Spokane
Spokane
Valley
Liberty Lake
90
Medical Lake
195
Edwall
Cheney
Rockford
Tyler
90
Sprague
195
Rosalia
Tekoa
Lamont
Rock Lake
Oakesdale
St John

Christopher Gormley

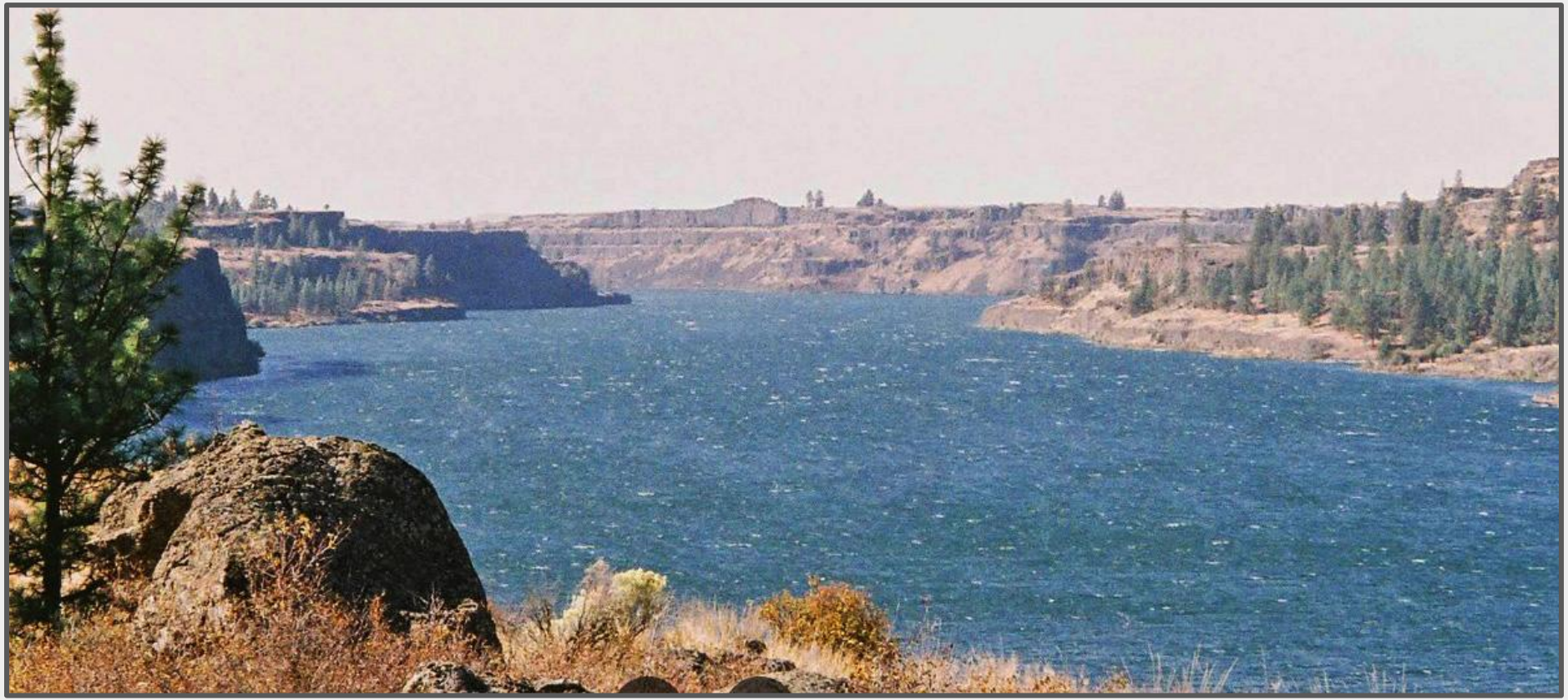
Freshman Honors Student




Rock Lake
Seven Miles Long
Boat Ramp



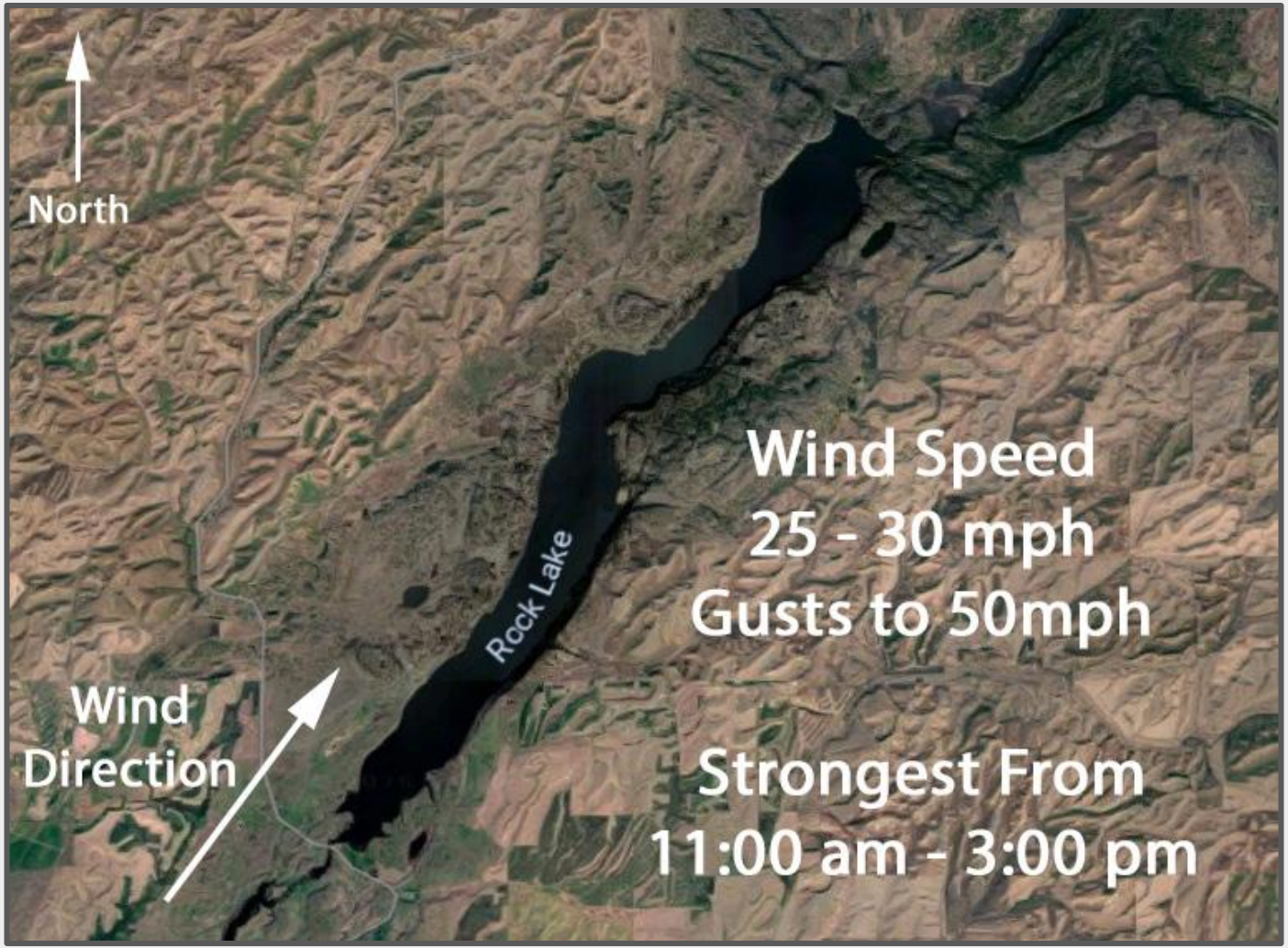
Large Waves and Whitecaps



Rock Lake Boat Ramp



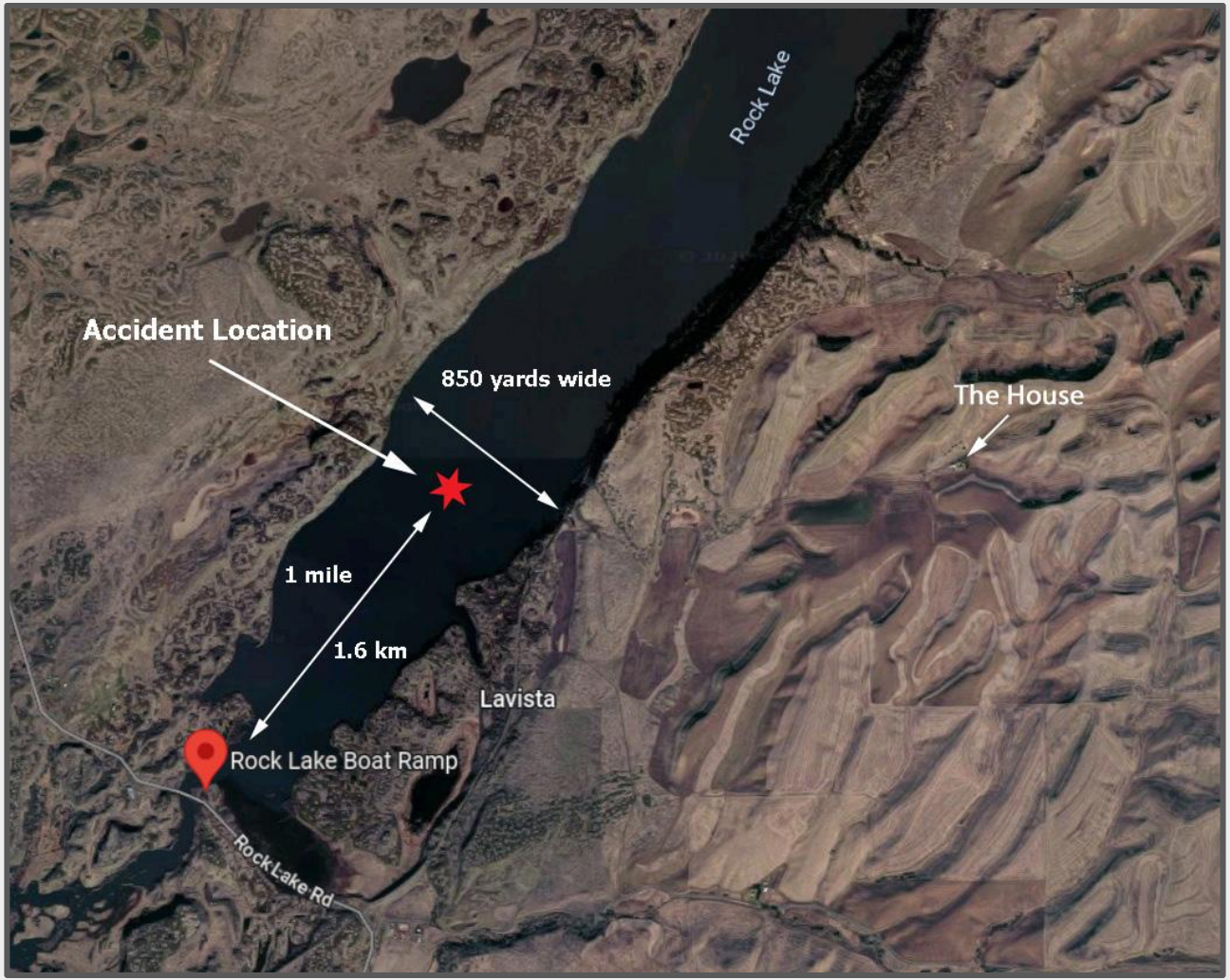
Air Temperature Near Freezing / Water Temperature 40F (4.4C)

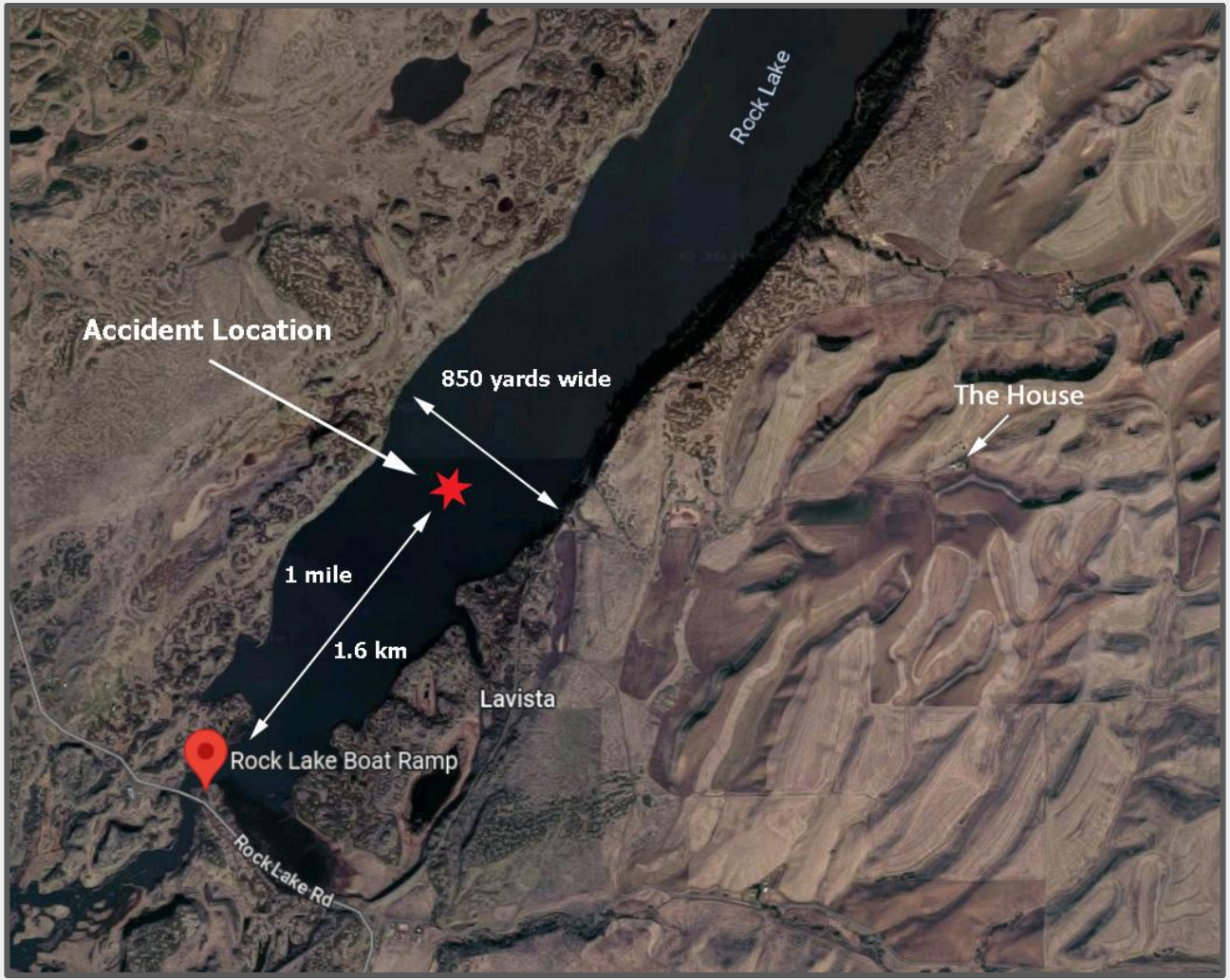

North
Rock Lake
Wind Speed
25 - 30 mph
Gusts to 50mph
Wind
Direction
Strongest From
11:00 am - 3:00 pm

“It was rough at the launch area.

And that’s usually the calmest part of the lake.”


A Classic Wind Shadow Trap
Water is calm along the shore
Wind Shadow
Wind Direction
Water Temperature
54F (12.2 C)
1 mile
from shore
Waves 2-3 feet.
Wind gusts 23 mph
As you get farther away from shore,
the wind gets stronger and the waves get bigger.


Rock Lake
Accident Location
850 yards wide
The House
1 mile
1.6 km
Lavista
Rock Lake Boat Ramp
Rock Lake Rd


Rock Lake
Accident Location
850 yards wide
The House
1 mile
1.6 km
Lavista
Rock Lake Boat Ramp
Rock Lake Rd

Remarkably Fast SAR Response



The Lawsuit

Trip Location Change

Weather Policy Violation

Little Spokane River



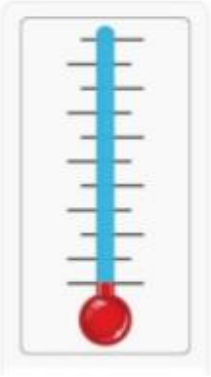
Major Contributing Factors

- No PFD (Lifejacket)
- Not Dressed For Water Temperature
- Unable To Recover From Capsize
- Lack of Weather Awareness
- Unable To Deal With Wind and Waves
- Unable to Call For Help (House Phone = Long Delay)
- Unaware of Hazards
- Being Complacent / Overconfident
- Poor Navigation Skills
- No Light - Invisible At Night
- Poor Group Management
- Paddling Solo

Winter Rescue Rodeo - Washington State



Five Golden Rules of Cold Water Safety



PFD	Wear Your PFD (Lifejacket)
GEAR	Dress For The Water Temperature
FIELD TEST	Field Test Your Gear
SWIM TEST	Swim Test Your Gear
PLAN	Plan For The Worst That Can Happen

Fatal Sea Kayaking Incident

Coast of Maine - June 22, 2016



Registered Maine Sea Kayaking Guide

14 Years of Experience

Certified by MASKGI

Adequate Precautions?

- Wearing Life Jackets
- Paddling Seaworthy Kayaks
- Knew About Rescues
- Previous Trips At Same Location
- Filed A Float Plan
- Had A VHF Radio

Troubling Questions

How did the guide miss this critical safety message?

How did the Maine Association of Sea Kayak Guides and Instructors miss it?

How does any wilderness organization miss it today?

Why do some organizations follow Cold Water Safety Best Practices …

While others don't take the threat of cold water seriously?

Cold Water Myths

Understate The Danger

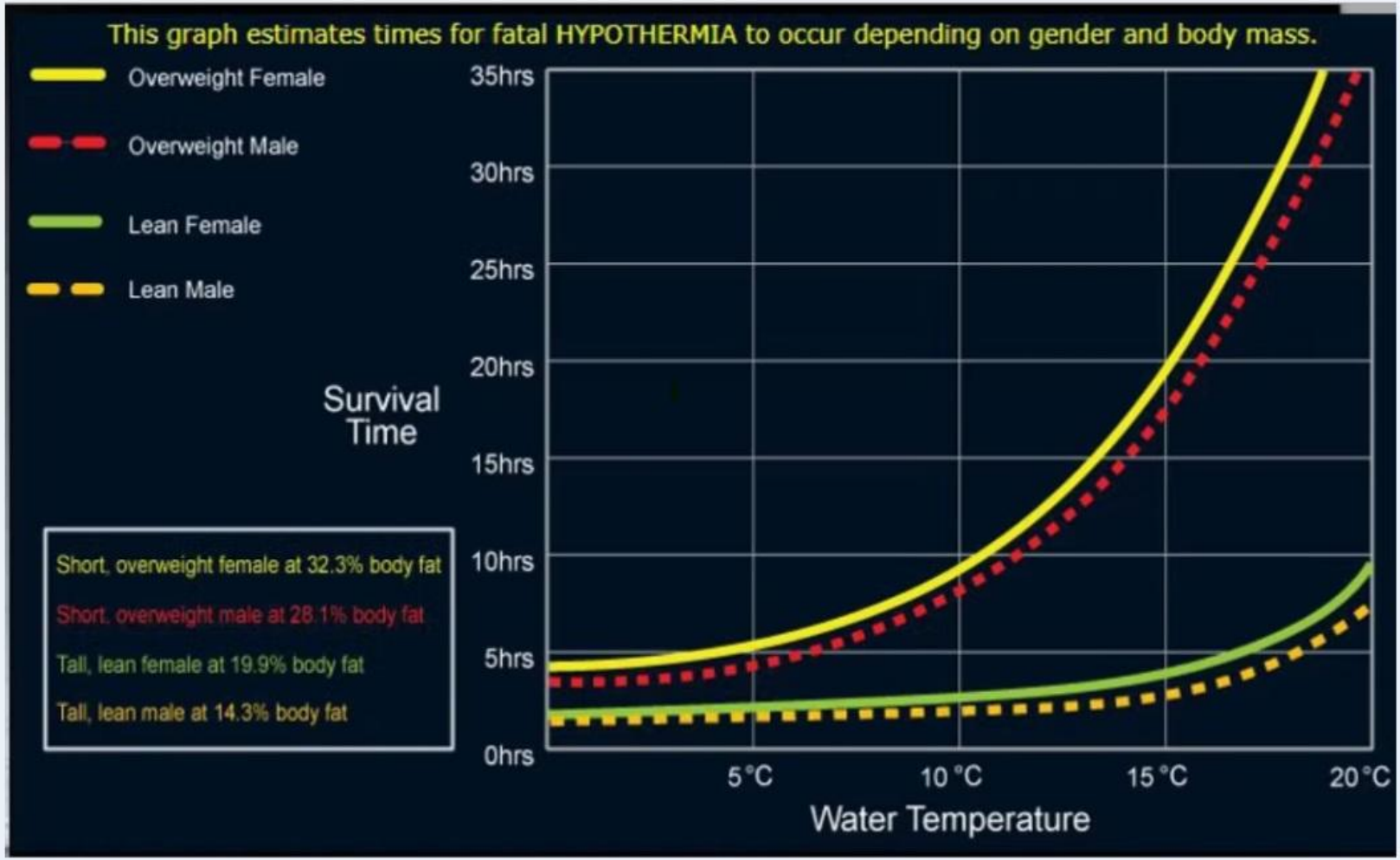
The 1-10-1 Myth

1-10-1 Immersion Myth Says	1-10-1 Immersion Myth Says
You **have** 1 minute to get your breathing under control.	You **have** 10 minutes until you're incapacitated.
You Don't	You Don't
You actually **have** a **loss of breathing control** that can last for 5 minutes or more - and that's if you're a volunteer.	You actually have a **desperate race against the clock** and every minute, you get progressively weaker.

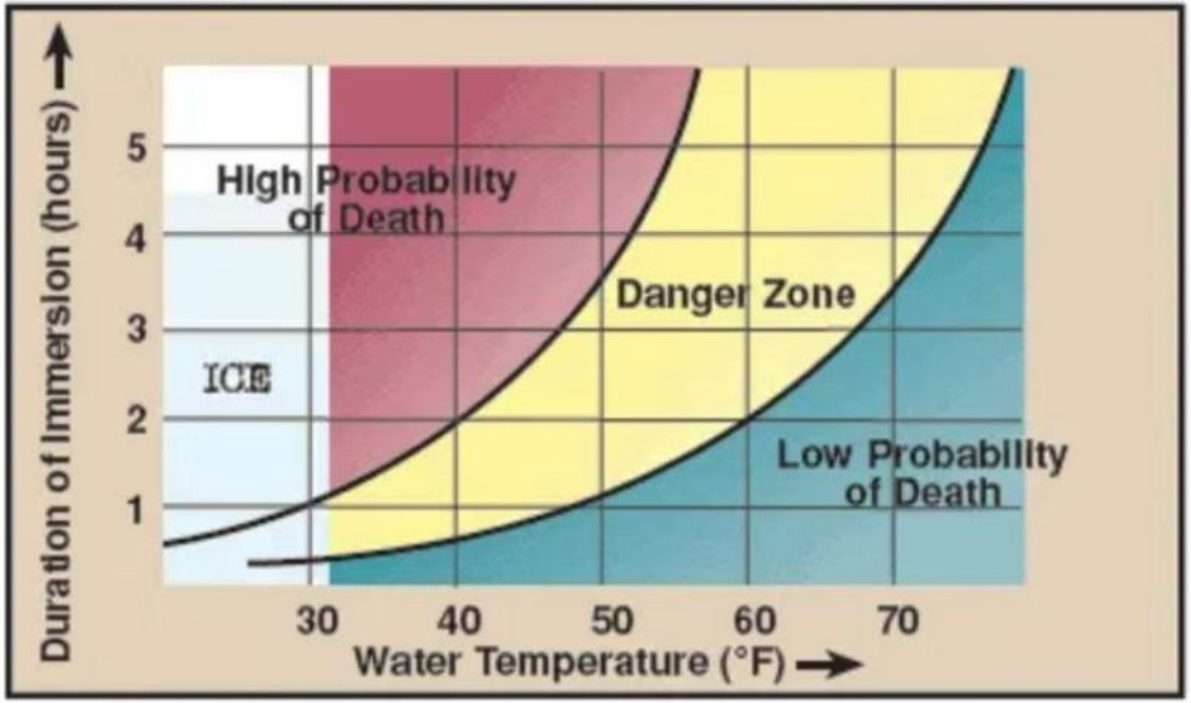
Air Temperature (F)	Water Temperature (F)	Combined Temperature
75	53	128
80	45	125

Hypothermia Table

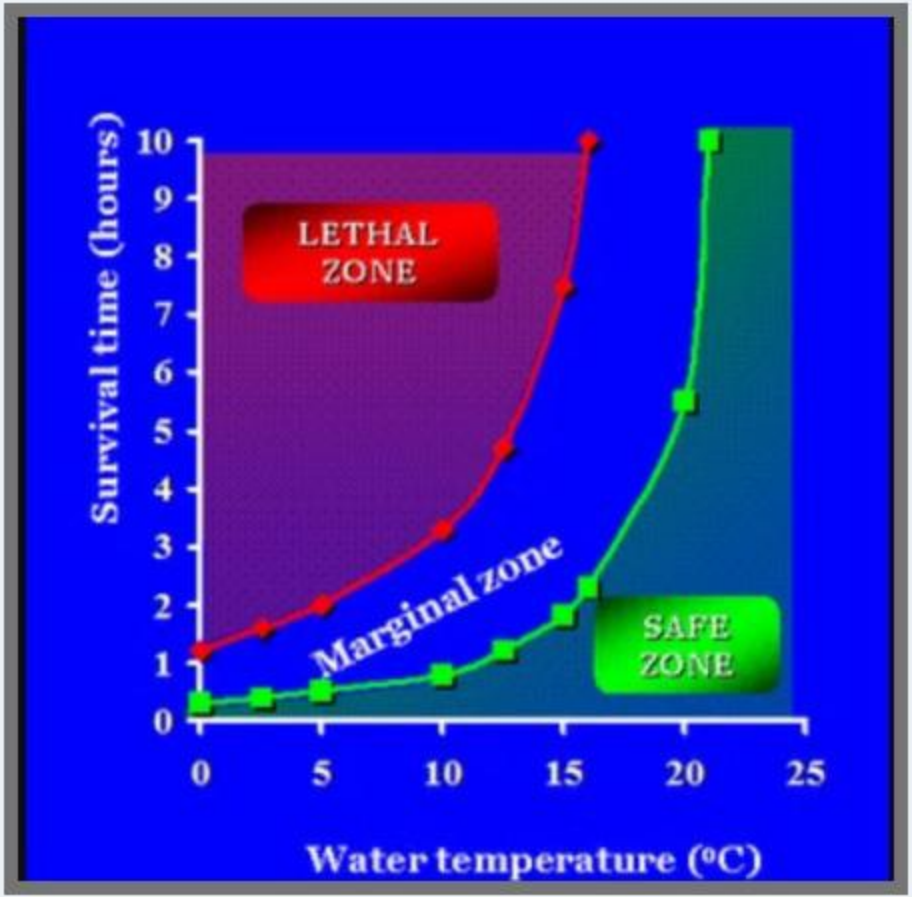
Water Temperature in Degrees F (Degrees C)	Loss of Dexterity (with no protective clothing)	Exhaustion or Unconsciousness	Expected Time of Survival
32.5 (0.3)	Under 2 min.	Under 15 min.	Under 15 to 45 min.
32.5 to 40 (0.3 to 4.5)	Under 3 min.	15 to 30 min.	30 to 90 min.
40 to 50 (4.5 to 10)	Under 5 min.	30 to 60 min.	1 to 3 hrs.
50 to 60 (10 to 15.5)	10 to 15 min.	1 to 2 hrs.	1 to 6 hrs.
60 to 70 (15.5 to 21)	30 to 40 min.	2 to 7 hrs.	2 to 40 hrs.
70 to 80 (21 to 26.5)	1 to 2 hrs.	2 to 12 hrs.	3 hrs. to indefinite
Over 80 (Over 26.5)	2 to 12 hrs.	Indefinite	Indefinite


This graph estimates times for fatal HYPOTHERMIA to occur depending on gender and body mass.
Overweight Female
Overweight Male
Lean Female
Lean Male
Survival Time
35hrs
30hrs
25hrs
20hrs
15hrs
10hrs
5hrs
0hrs
Short, overweight female at 32.3% body fat
Short, overweight male at 28.1% body fat
Tall, lean female at 19.9% body fat
Tall, lean male at 14.3% body fat
5 °C
10 °C
15 °C
20 °C
Water Temperature

COLD WATER SURVIVAL TIME



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


Survival time (hours)
10
9
8
7
6
5
4
3
2
1
0
LETHAL ZONE
Marginal zone
SAFE ZONE
0
5
10
15
20
25
Water temperature (°C)

Unnecessarily Extreme? Seriously?

Wetsuits



Drysuits



Organizational Level

Undermine Accurate Risk Assessment

Promote Threat Dismissal

Lead To Very Unsafe Policies

Eight Cold Water Safety Myths

- Challenging Conditions
- The 1-10-1 Myth
- Overheating
- 50-50-50 Rules
- Survival Estimates
- Paddling Jackets
- What PFD's Can and Can't Do
- Air + Water Temperature Formulas

The Challenging Conditions Myth

Undermining Risk Management For Decades

What The Challenging Conditions Myth Says

You don't need to wear a wetsuit or drysuit when paddling on lethally cold water unless you plan on encountering challenging conditions.

Automobile Safety

You don't need to wear your seatbelt unless you plan on encountering challenging driving conditions or having an accident.

Nothing On This List Is A Substitute For Thermal Protection

Classic Challenging Conditions Paddling Advice

- **Paddle close to shore in protected waters.**
- **Paddle with a group & have a rescue plan.**
- **Leave a Float Plan with someone.**
- **Carry spare clothes in a drybag & be able to make a fire.**
- **Have a thermos of hot liquid in your hatch.**
- **Bring “high energy” snacks to “stoke your furnace”.**

IT'S EVERYWHERE

BOOKS

MAGAZINE ARTICLES

NEWS STORIES

VIDEOS

PRODUCT ADVERTISING

INSTRUCTION MANUALS

COURSES


Kayak Manufacturer’s Ad
No Thermal Protection


Commercial Outfitter
Michigan


Alsaka Glacier
Commercial Tour


aruba 1.0
Kayak Manufacturer’s Ad


Kayak Manufacturer's Ad
No PFD / No Thermal Protection



No Protection / Snow / Hiking Boots



Dressed in street clothes.

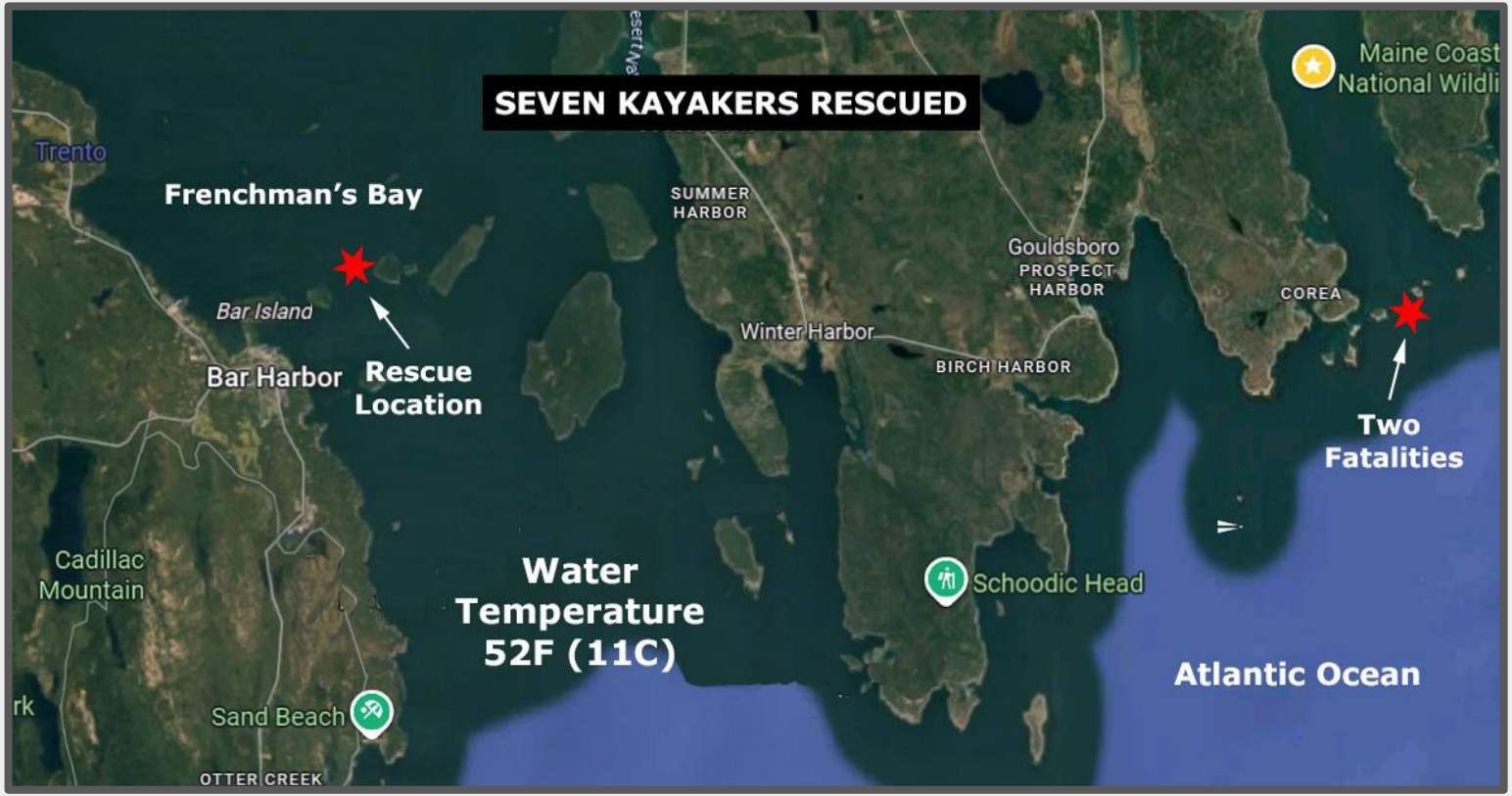
Paddling Jacket Ad



COLD WATER MYTHS

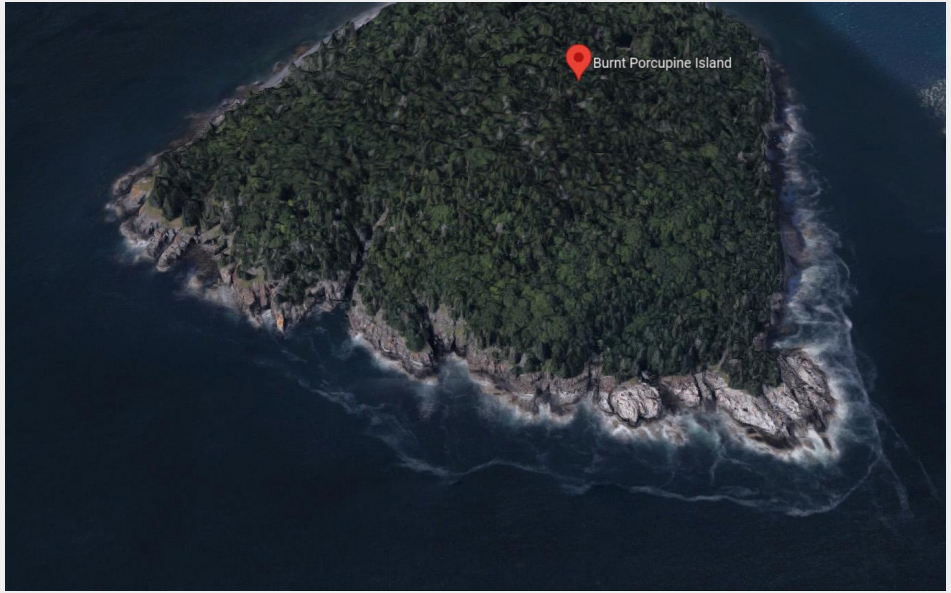
PROMOTE
RISK ENHANCEMENT

10 Days and 10 Miles Apart



Burnt Porcupine Island, Frenchman’s Bay, Maine





Water Temperature 52F (11C)


Twin Fatality on Shoshone Lake
Shoshone Lake
Yellowstone National Park



Mark O’Neill and Kim Crumbo

www.seakayakermag.com
Sea Kayaker Magazine
Originally published in Sea Kayaker magazine's August 2010 issue.
Copied with permission of the editor.

by Randy Morgart

Cold and Alone on an Icy River

Friday, February 19th, the weather was better than it had been in some time with temperatures in the upper thirties and overcast. I knew I couldn't make a Saturday trip with friends and I was in the mood to paddle solo.

My plan was to launch into the Mississippi River from the gravel ramp at the Foley, Missouri access, 3.5 miles above the Winfield Lock and Dam and paddle upstream in the calm, slow-moving water sheltered from the main channel by a string of islands. On my return I could easily pop out into the main channel and return downstream to my car. I realize the risks of paddling alone. Even my wife, who rarely paddles, had heard enough discussions that she voiced some concern about my decision to paddle solo in the Mississippi River. The Foley access is one of the closest to my home and I paddle there frequently either solo or with the St. Louis Canoe and Kayak Club. It has been a long time since I unintentionally flipped a sea kayak, and far longer since I had to wet exit, so I felt quite secure paddling in a familiar setting on calm water.

Getting my QCC 700 kayak ready to go, I stowed my spare paddle—a two-piece Euro-blade—on the front deck. I'd paddle with my mainstay Greenland paddle. My paddle float and pump were already in the aft compartment, often stowed there during transport, and I decided to leave them there. I felt they wouldn't be needed for a flat-water paddle, although they were still available. I knew there was phone service in the area so my cell phone joined my wallet and car keys in the dry bag with basic gear I always carry. In the back hatch with that dry bag were some snacks and a sports drink in case I chose to land along the way. Over my insulating poly base layer I wore splash-proof nylon pants, a fleece pullover and rubber-soled booties with waterproof socks. A breathable rain jacket, knit watch cap and waterproof neoprene gloves completed



Wouldn’t need his wetsuit for a flatwater paddle because he had no intention of capsizing.

Feature Article

November 2010 – Sea Kayaker Magazine Newsletter

Randy Morgart's article "Cold and Alone on an Icy River" in our August issue drew a response from Moulton Avery, an expert in environmental physiology and the author of the frequently cited article "Cold Shock" from our Spring 1991 issue. Here he looks at a psychology of decision-making that helps explain how an experienced paddler can make a mistake that we would expect of a novice paddler.

- Christopher Cunningham

Anatomy of a Bad Decision

By Moulton Avery

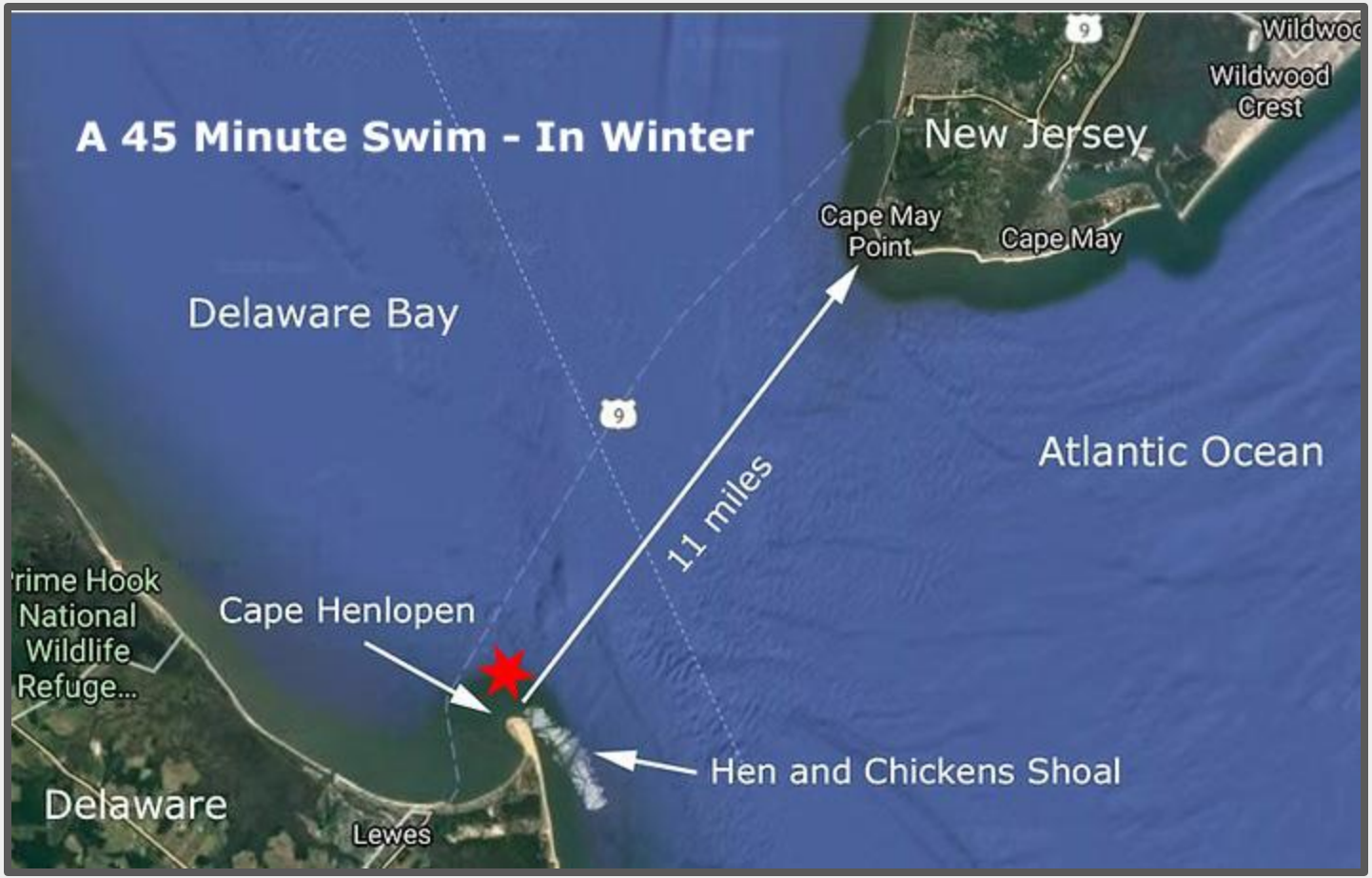
It takes a lot of courage to publicly write about making a really big mistake, and Randy Morgart has my respect and gratitude for his willingness to share his terrifying near-death experience following an unexpected February capsize on the freezing Mississippi River. There are a lot of lessons to be learned from his experience, and he did a great job discussing them. I want to add one more to his list.

Reason vs. Emotion

Recent studies of human emotion, cognition, and behavioral psychology have shed






A 45 Minute Swim - In Winter
New Jersey
Wildwood Crest
Cape May Point
Cape May
Delaware Bay
Atlantic Ocean
11 miles
Cape Henlopen
Hen and Chickens Shoal
Delaware
Lewes

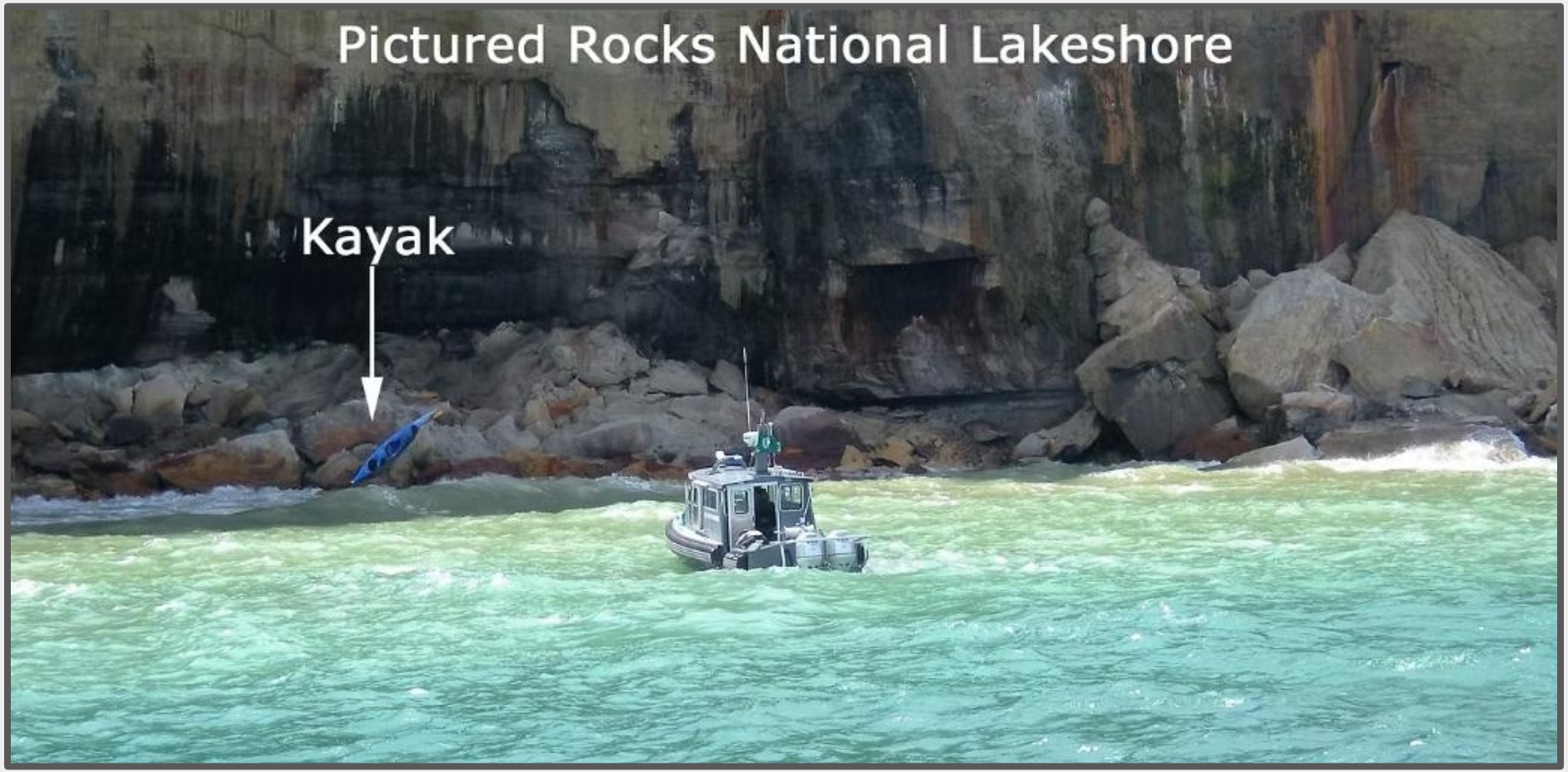
Large Commercial Trips

Dangerously Cold Water

No Thermal Protection

2016 / Lake Superior, Michigan
30 Kayaks Abandoned / 60 Paddlers Rescued




Pictured Rocks National Lakeshore
Kayak

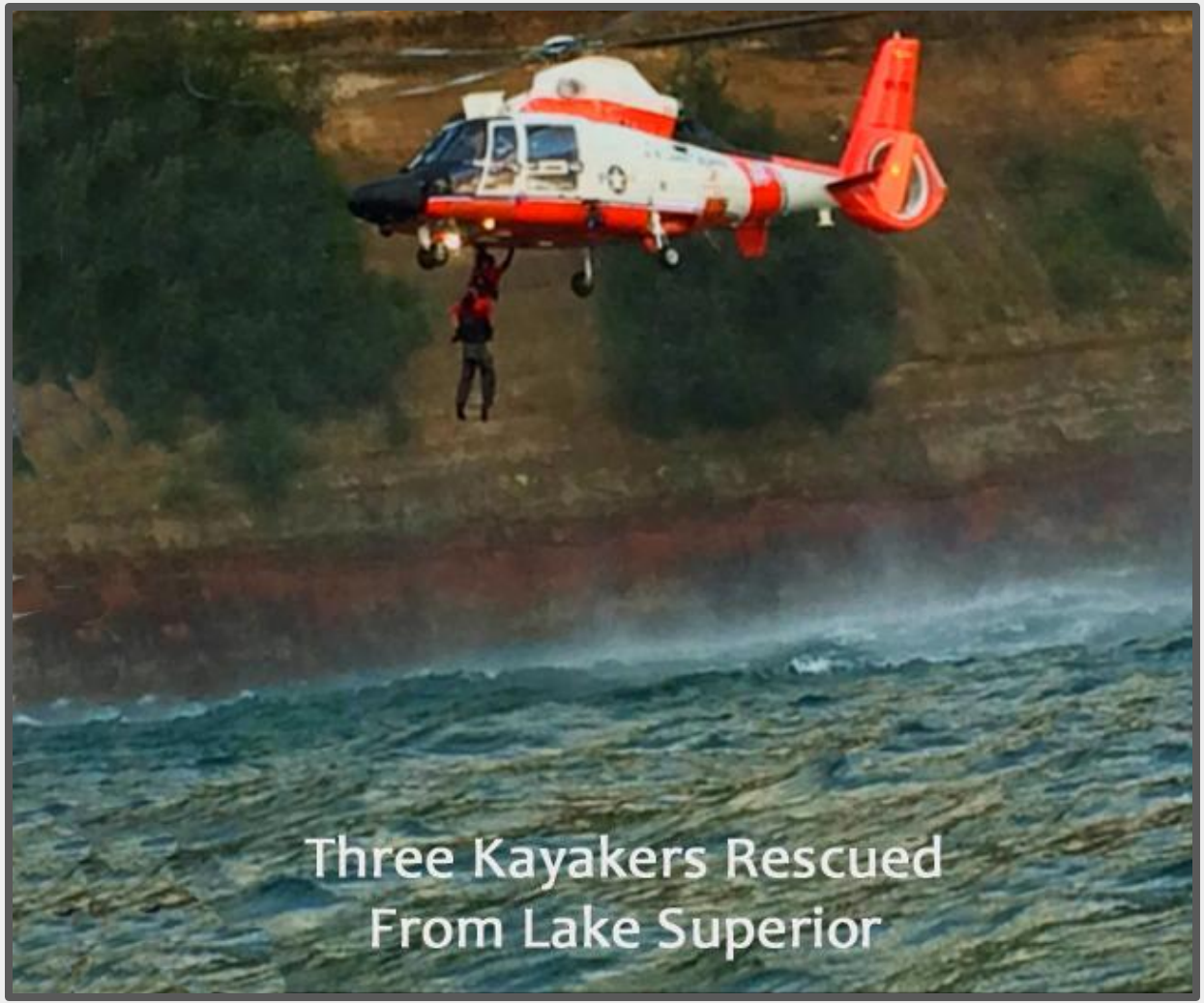

Grand Island North Lighthouse
Grand Island National Recreation Area
Grand Island
Indian Head Rock
Mosquito Beach
Wind Shadow Area
Southwest Wind 17-23 mph Gusts to 39 mph
Trout Bay
Miners Beach Kayaks Launched
Shipwreck Bermuda



National Center for Cold Water Safety

Lake Superior
30 Kayaks Abandoned / 60 Paddlers Rescued
July 13, 2016

(Raw Footage Courtesy of Laura Watson)


Three Kayakers Rescued
From Lake Superior

2015 / Tomales Bay, California



54 Paddlers Rescued

National Center for Cold Water Safety

San Juan Islands, Washington

Twelve Kayakers Rescued

August 14, 2025

National Center for Cold Water Safety

San Juan Islands, Washington

Twelve Kayakers Rescued

August 14, 2025



Tim Conant


Yellowstone National Park
Lake
Pahaska Tep
14
Accident
Location
20
Yellowstone Lake



Kayaks on Shore After Accident





Lifejacket Pictures From Accident Report

Single Kayaks On The Beach





Kayak With Bilge Pump

National Park Service Accident Report

LAW ENFORCEMENT SENSITIVE (FOUO)

IMARS Incident details

Printed by:	U.S. Department of the Interior , National Park Service
Printed:	09/15/2017 08:29
Incident:	**NP17079324**

Incident details:

Report no.:	NP17079324
Incident Type:	EMS (Medical Injury/Illness/Death)
Incident time:	06/14/2017 17:58 -
Reported time:	06/14/2017 17:58
Place of incident:	YNP GRAND LOOP RD, YELLOWSTONE NATIONAL PARK, TETON WY 82190 (WEST THUMB GEYSER BASIN) (Region: IMR, State/Zone: WY, Area: YELL, Site: SNAKE)
Clearance status:	Open
Concluded:	No
Concluded date:	
Summary:	YELL Snake SAR- Timothy CONANT - OARS Guide fatality Investigation... DeLuca IC / Investigator. Rangers responded with multiple rescue boats and ground units to reports of a commercial kayak group in trouble, with people in the water off West Thumb Geyser Basin. The first arriving rescue boat discovered one victim already on shore who had been rescued by guides/clients and soon located a second victim still in the water approximately a quarter mile off shore. Rangers brought this second victim aboard their rescue boat and began CPR. The patient was returned to the boat ramp where resuscitation efforts continued and the patient was moved to a waiting helicopter. Efforts to revive this patient proved unsuccessful and the patient was pronounced deceased on the helipad. The first kayaker that had been rescued was transported to the local park medical clinic, treated for hypothermia, and later released. A follow-up investigation into the events of the incident is being conducted by the National Park Service and the Teton County Coroner's Office.
Remarks:	

Associated incidents:

Very Disturbing Facts

Only been in a kayak 5 times.

No kayak safety training.

Had never used a paddle float.

No rescue training.

No emergency training.



Paddle Float In Kayak

Final Thoughts

Leadership
&
Legal Liability

Leadership

Undermining Safety on Two Levels

During The Trip

After The Trip Is Over

Undermining Safety on Two Levels

During The Trip

After The Trip Is Over

Leaders as Role Models

"It's not what you say, it's what you do that students remember and emulate. Good role models are people who portray good values, attitudes and behaviors in their actions. Participants often admire and imitate their guides, instructors or leaders. They closely observe them and do what they do. If a leader is cautious near a cliff edge, the participants likely will do the same."

- NOLS / Risk Management for Outdoor Leaders

We Lead Best
When We Lead By Example

Legal Liability

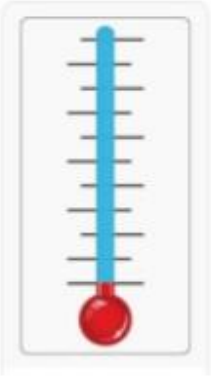
Is This a “Fortress of Protection”?

Waivers

Training & Certification

Whether or not the trip followed well-established best practices for cold water safety.

Five Golden Rules of Cold Water Safety



PFD	Wear Your PFD (Lifejacket)
GEAR	Dress For The Water Temperature
FIELD TEST	Field Test Your Gear
SWIM TEST	Swim Test Your Gear
PLAN	Plan For The Worst That Can Happen

Participants *rightfully expect* that a trip is going to be conducted in a *safety-conscious manner.*

Does Your Program Meet That Very Reasonable Expectation?

Three Key Takeaways From This Presentation

Takeaway One

Always dressing for the water temperature - by wearing a wetsuit or drysuit - is an essential cold water safety best practice. There is no workaround that allows you to safely skip this rule.

Takeaway Two

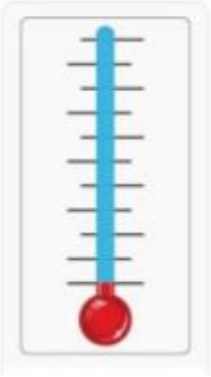
We lead best when we lead by example. Your program should model cold water safety best practices for your participants and encourage them to follow those practices when the trip is over and they head out on their own.

Takeaway Three

Regarding cold water lawsuits: The issue is not certification or waivers.

It's whether or not your program was following well-established cold water safety best practices when the close call or fatality occurred.

Five Golden Rules of Cold Water Safety



PFD	Wear Your PFD (Lifejacket)
GEAR	Dress For The Water Temperature
FIELD TEST	Field Test Your Gear
SWIM TEST	Swim Test Your Gear
PLAN	Plan For The Worst That Can Happen

Answers to Two Great Questions

Water Temperatures

Drawing the safety line at 70F (21C)

Cold Tolerance

Polar Bear Events
Cold Plunging
Ice-Water Swimming

Interesting Temperature Facts

- **99.6F (37.5C)** Core temperature of your body.
- **98.6F (37C)** Normal body temperature measured with an oral thermometer.
- **95F (35C)** Medical definition of hypothermia.
- **91F (32.7C)** Your skin temperature.
- **85F (29.4C)** Water feels pleasantly cool.
- **77-82F (25-28C)** Pool temperature range for Olympic swimming competition. Below 77F breathing is adversely affected.

Cold Water Safety Temperatures

- **70F (21C)** Water feels quite cold to most people. Wear thermal protection below this level.
- **50-60F (10-15.5C)** Maximum Intensity cold shock range. Complete loss of breathing control. Swimming failure.
- **45F (7C)** Water is painfully cold.

You should treat any water temperature below 70F with caution.

Learn why we use 70F (21C) when recommending that people consider wearing thermal protection like wetsuits and drysuits.



What is Cold Water?
Why It's Dangerous
Stages of Immersion
Cold Shock
Physical Incapacitation
Hypothermia
Circumrescue Collapse
Water Temperature Safety Guide
Reckless IceBreakers
Why 70F (21C)?
Acclimation To Cold Water
Real World vs Lab Test

empera

C)

which breathing be

icial water tempera

).

mperature below 70

Learn why we emphasize 70F (21C).

Acclimation To Cold Water



Competing in an International Ice Swimming Race

Acclimation To Cold Water

Training & Consulting

You can't manage a risk you don't recognize and understand.

The National Center for Cold Water Safety provides evidence-based training and consulting on heat stress, cold stress, and cold water safety through a prevention-centered approach to risk management.



Link To Narrated Slide Presentation on Vimeo

https://vimeo.com/1241550129