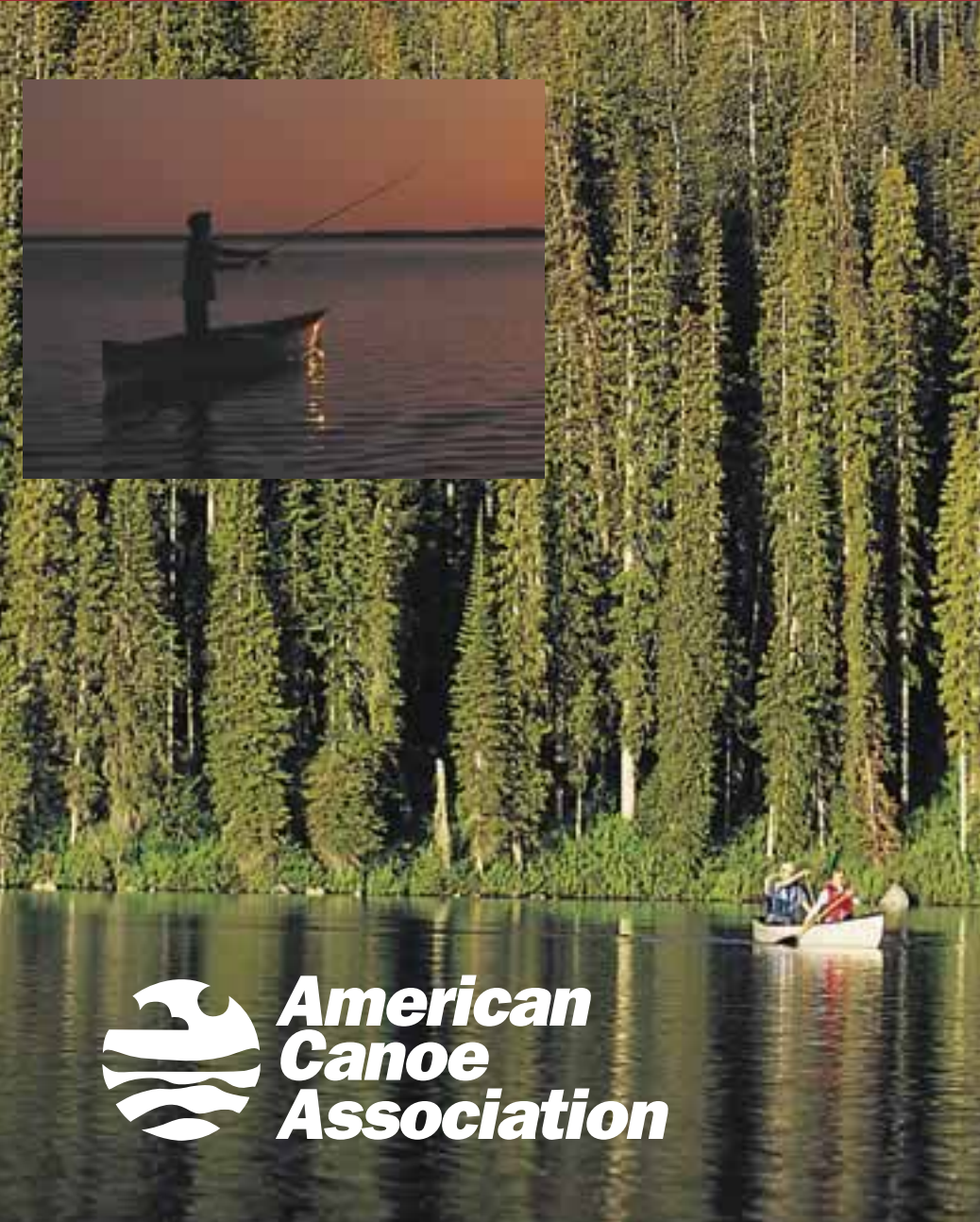




CRITICAL JUDGMENT

Understanding and Preventing Canoe and Kayak Fatalities



**American
Canoe
Association**

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ABOUT THE AMERICAN CANOE ASSOCIATION



Mission: The American Canoe Association (ACA) is a national nonprofit membership organization dedicated to promoting canoeing, kayaking and rafting as safe and enjoyable lifetime recreation, while working to protect and preserve the waterways on which those activities depend.

History: Founded in 1880 by a small group of avid outdoorsmen in the State of New York, today ACA is the nation's oldest and largest nonprofit organization serving the paddlesport community. ACA also holds the distinction of being the oldest recreation-based waterway conservation organization in America and ranks among the country's oldest sporting organizations.

Membership: ACA currently has more than 50,000 individual members enrolled in a variety of membership categories, with thousands of additional individuals affiliated through a nationwide network of local ACA-affiliated paddling clubs. During the past decade, ACA experienced a tenfold increase in its membership base as the Association expanded its marketing and programs.

Program Areas: The primary mission-based programs and services provided by ACA include: safety education and instruction; waterway conservation and access; athletic competition, recreation and public education.

Safety Education & Instruction Activities: Historically, ACA has been at the forefront of promoting boating safety, providing safety education and maintaining a nationally recognized program of paddlesport instruction and certification. Working in concert with the U.S. Coast Guard, American Red Cross, National Safe Boating Council and others, ACA provides a comprehensive range of programs, publications and other materials toward this end. ACA currently certifies approximately 4,000 ACA Instructors in various types of canoeing, kayaking and rafting. Each year ACA Instructors deliver the ACA program to an estimated 100,000 individuals participating at the student level.

Waterway Conservation Activities: ACA is dedicated to the preservation and protection of America's natural areas, focusing primarily on rivers, streams, lakes, coastal waterways and their surrounding environments. ACA is active in a wide variety of efforts from promoting stewardship to advocacy on issues important to paddlers. ACA weighs in on resource management plans, public land funding and policy issues, water quality standards, pollution limits, user conflicts, and recreation related fee and access issues. Since 1995 ACA has been one of the nation's leading enforcers of the Federal Clean Water Act through environmental litigation on behalf of its members.

Programs & Special Events: With the support of a full-time professional staff, ACA sanctions and/or directly produces more than 700 paddlesport events annually. ACA's Programs and Special Events department also recruits and services corporate sponsors associated with such events. ACA events range from instructional clinics and other small local events to many of the largest, most visible event properties in paddlesport.

Publishing Activities: Working both independently and through its subsidiary, Paddlesport Publishing, Inc., ACA currently publishes a wide range of periodicals, books, videos and other paddlesport-related media. Its lead publication, bimonthly *Paddler* magazine, is published through PPI and currently has an estimated readership of 225,000 readers per issue. A full-color publication, *Paddler* is provided as a benefit to ACA members and is also sold on newsstands and to individual subscribers. PPI also publishes a quarterly trade magazine (*Paddle Dealer*), a bi-annual magazine for whitewater enthusiasts (*Kayak*), and an annual fly-fishing magazine (*The Drake*). In addition to the publications produced through PPI, ACA currently publishes 16 book titles, 7 videos, an on-line quarterly Association newsletter (*The American Canoeist*) and a host of other informational and educational literature.

FOREWORD FROM THE NATIONAL SAFE BOATING COUNCIL

The National Safe Boating Council has a vital interest in the content of this examination of canoe and kayak accidents by the American Canoe Association. This report addresses the known risks in this popular and growing form of recreational boating, and provides important recommendations for prevention measures. All can benefit from heeding the important, over-arching message derived from this report; **in most cases fatal paddlesports accidents are preventable.**

Any paddler can capsize. The novice paddler, especially, should consider capsize part of the sport. As you review the information in this document, you will see that what overall paddler preparation and response to a mishap were keys factors that determined the final outcome. Paddler behavior such as wearing a properly fitted life jacket (personal flotation device), dressing suitably for the experience (critical when boating on cold water), avoiding alcohol, and selecting a waterway commensurate with ones' experience, could prove to be the difference between just getting wet or never going home. What is intended to be an enjoyable activity can turn tragic if wrong choices are made.

Canoeing and kayaking are enjoyable forms of recreation that should be promoted to all. The newest paddlers need access to information on intrinsic risks and how to be safe. These risks can be calculated, diminished, avoided, or managed through awareness, education, and training. Reading through the report, these conclusions are clear.

Thanks to the American Canoe Association for analyzing and presenting this important look at paddlesport accident statistics. The ACA, from their position as the leader in paddlesports, has relayed important findings to the national recreational boating safety community on this growing segment of recreation.

Virgil Chambers
Executive Director
National Safe Boating Council

The National Safe Boating Council is a national non-profit 501c3 advocacy membership organization that provides a forum for advancing and fostering safe and enjoyable recreational boating. The NSBC promotes the need for research initiatives that support boating education and safety awareness. The American Canoe Association is a long-time organizational member of the NSBC, and the organizations share a common goal of boating safety education and outreach.



Today, canoeing and kayaking are among the fastest growing recreational activities in the United States. Kayaking, in fact, is currently growing faster than any other outdoor activity – on land or water. As a result of this popularity, canoeing and kayaking are representing an ever-larger portion of the boating that occurs on the nation’s waterways. Unfortunately, along with this growth trend has come an increasing number of canoeing and kayaking related fatalities.

In order to understand and address the fatalities that occur while canoeing and kayaking, it is essential that one first understand the wide variety of specific activities that are included under the broader category of “canoeing and kayaking.” This “canoeing and kayaking” category includes pursuits such as extended wilderness expeditions, challenging descents of whitewater rivers, and multi-day trips on the open ocean. These adventurous activities have more in common with backpacking and mountain climbing than with most other forms of boating. Also included in “canoeing and kayaking” are seemingly milder activities, such as a casual paddle on a lake, a float down a gently flowing river, or a fishing trip. These milder activities have broad appeal and are participated in by a very large portion of the population.

Since its inception, the American Canoe Association (ACA) has been working to improve paddlesport safety. It has done so by helping train and certify canoeing, kayaking and rescue instructors, and by getting safety messages and information out to ACA members and other paddlers who are within the organization’s reach. This dedicated effort has helped produce a safety ethic among experienced paddlers that is well beyond that of most boaters. Most canoeing and kayaking enthusiasts wear personal flotation devices (PFDs), travel with other experienced paddlers, dress properly for conditions, and have taken courses in paddling technique, safety and rescue.

In recent years, concerned with the rising fatality numbers attributed to canoeing and kayaking, ACA started reviewing the narrative summaries of each canoeing and kayaking fatality reported to

the United States Coast Guard (USCG). These accident descriptions suggest that a large portion of canoeing and kayaking fatalities involve people who have little or no experience with canoes or kayaks, who lack fundamental paddling skills, and who have not been effectively reached with safety messages. Many of those who die while using a canoe or a kayak probably do not even consider themselves a “canoeist” or a “kayaker” and therefore do not seek out paddling-specific safety information.

To more effectively address the safety needs of all people who take a canoe or kayak onto the water, and to better reach those at highest risk, the ACA conducted further research into the specific details of and contributing factors associated with canoeing and kayaking fatalities. This report documents those findings, provides relevant information on the nature of paddlesport, and makes recommendations on how to reduce canoe and kayak related fatalities.

In this report the ACA also provides important information about the nature of canoeing and kayaking and about the recreational goals of people who participate. Because of paddlesport’s steady growth over the past decade, it is increasingly important that lawmakers and boating regulators develop a better understanding of this diverse sport. Understanding the unique nature of canoeing and kayaking, and the objectives of those who participate, will help these officials to more effectively address paddlesports-related issues and to recognize when some of the rules and regulations governing other boats — such as motorized craft — simply are not relevant to small human propelled boats. Most importantly, by understanding the unique challenges associated with paddlesports, these officials can help improve paddler safety.

Critical Judgment represents an important new chapter in ACA’s ongoing effort to reduce the number of fatalities that occur while canoeing and kayaking. It provides an informational foundation that will help everyone concerned with canoe and kayak safety to develop programs and messages that can effectively reach those who are most at risk.

Many of those who die while using a canoe or a kayak probably do not even consider themselves a “canoeist” or a “kayaker” and therefore do not seek out paddling-specific safety information.

CANOEING AND KAYAKING: AN OVERVIEW

The Experience

The joys and benefits of paddling a canoe or kayak are many, and the reasons people are drawn to paddling are equally varied. Each year thousands of people contact ACA expressing a desire to take up canoeing or kayaking. Many of those people share with ACA staff the reasons they want to pursue these activities. Some want to escape the noise and stress of everyday life by exploring the rivers or lakes near their home; others seek a means to venture into the wilderness; exercise is an objective for many paddlers, as is observing wildlife, playing in whitewater, plunging down steep creeks and over waterfalls, and navigating the open ocean. There are also those who utilize a canoe or a kayak in activities such as photography, fishing, or social outings.

Canoeing or kayaking enthusiasts do not typically view themselves as part of the broader boating community. For them, canoeing and kayaking are self-reliant forms of recreation that are part of a human-powered outdoor recreation community that includes hiking, backpacking, mountain biking, rock climbing and mountaineering. To the paddling enthusiast, canoeing and kayaking have as much in common with other forms of boating as hiking does with driving a car. Casual

To the paddling enthusiast, canoeing and kayaking have as much in common with other forms of boating as hiking does with driving a car.

paddlers are more likely to see themselves as traditional boaters, but some of these people consider a canoe or kayak to be a simple, toy-like object that requires little or no skill to operate.

Canoes and kayaks take people to places they cannot reach by any other means, not just the physical places that are found on a map, but the internal places of the mind and spirit. No other form of boating provides a more intimate experience with the water and its surrounding environment than does canoeing and kayaking. Whether one knows the joy of paddling a canoe across a wilderness lake - miles from the nearest person, splashing a kayak into the froth of a whitewater stream, or exploring a placid cove less than a mile from home, their lives are forever enriched by the experience.

Participation

Who Paddles and Why

Throughout history mankind has paddled canoes and kayaks for many reasons. These small craft have been used by Lewis and Clark to explore the west, by fur traders to transport their pelts to market, and by the Inuit peoples of the arctic to hunt seals. Today the reasons people paddle these craft are even more diverse. There is no typical profile of a person who goes paddling in a canoe or kayak.

Skilled and experienced paddlers are typically enthusiasts for whom paddling is a major pastime. These paddlers are drawn to one or more paddling activities (see sidebar: *The Paddle's Many Paths*) simply because they enjoy a particular aspect of paddling. Some are nature lovers who view these non-motorized vessels as the best way to experience the natural world. Others enjoy the mystery and discovery of exploring the nation's many remote waterways. Paddlers seeking an adrenalin boost typically gravitate towards whitewater activities such as running steep creeks, jumping waterfalls and floating big powerful rivers, or towards coastal activities such as playing in surf, exploring sea caves, and tackling big waves in the open ocean.

More casual paddlers are often drawn to



COURTESY OF OLD TOWN

The Paddle's Many Paths

There are many types of canoeing and kayaking. This diversity is present in vessel type, paddling technique, and in the waters that are traveled. Here is a list of the most common varieties:

Flatwater Canoeing – This is canoeing on a lake, reservoir, slow flowing river, or other relatively calm body of water. Falling within this category is everything from taking a rental canoe out on a lake for a few hours, to going on a multi-day canoe journey down a gentle river.

Recreational Kayaking – Like flatwater canoeing, this type of kayaking occurs on flat or slow moving water. It is characterized primarily by the use of slow and stable recreational kayaks. These kayaks are fairly inexpensive, wide, and usually have a flat-bottomed hull. This is the fastest growing segment of the kayak market. Some consider recreational kayaking to be an entry level of kayak touring.

Kayak Touring – This category of kayaking, sometimes referred to as **sea kayaking**, includes such diverse activities as day kayaking on a small lake, multi-day kayak excursions, and kayaking on the open ocean. Touring kayaks are typically long, sleek, have storage compartments, and are designed for speed and efficiency. These kayaks are often used for long expeditions and are very sea worthy.

Whitewater Canoeing – This form of canoeing occurs on rivers and streams with fast current and rapids. It occurs on everything from mild, bouncy class I and II rivers, to raging class IV and V rivers. All types of canoes are used on very mild whitewater, but paddling more difficult whitewater requires the use of canoes specifically designed for whitewater use. Whitewater canoes are designed with more rocker for quick turning and accommodate the use of floatation bags to keep water out and improve buoyancy. Some whitewater canoes are decked and resemble whitewater kayaks.

Whitewater Kayaking – This describes kayaking on rivers and streams with fast current and rapids. Whitewater kayaks are less than 12 feet in length, typically made of plastic, and can take paddlers into the deepest, wildest gorges, through

powerful rapids, over waterfalls as high as 80 feet, and down raging flood-swollen rivers. Whitewater kayakers are always on the cutting edge of testing the navigability of rivers and streams. Over the past 20 years technical advances in the design of whitewater kayaks has turned once unrunnable chasms into popular play spots.

Squirt Boating – This subcategory within whitewater kayaking is so unique that it deserves separate mention. The main objective of squirt boating is, as odd as it seems, not to play in the surface waves of whitewater, but to play in the underwater currents created by rapids. Squirt boats are low volume kayaks, typically made of fiberglass or Kevlar, that function best just below the water's surface.

Wilderness Tripping – This categorizes the taking of extended canoe or kayak journeys deep into wild, uninhabited landscapes. These journeys are typically longer than a week and require the use of large canoes or kayaks that have a lot of storage space.

Surf Kayaking – This activity utilizes short kayaks, similar to those used on whitewater, to surf ocean waves. Surf kayakers try to catch and surf waves the same as traditional surfers do, the main differences are that the kayakers are sitting down and use a paddle for steering.

Outrigger Canoeing – Very popular in Hawaii, this traditional south pacific type of canoeing utilizes a canoe with an outrigger. The outrigger canoe is very stable and used for general recreation and competition on the open ocean.

Canoe Sailing – Just like it sounds, this is the sailing of canoes that have been outfitted with a sail. The sport of canoe sailing dates back at least to the 1800s.

Poling – In most river canoeing the objective is to travel downstream, the objective in poling is to travel upstream utilizing a canoe and a long pole.

CANOEING AND KAYAKING: AN OVERVIEW

canoeing and kayaking for the simple pleasures of solitude, relaxation, family fun, or exercise. People also utilize canoeing or kayaking as a means to engage in other activities such as fishing, hunting, or even partying. Casual paddlers can be people who have taken paddling seriously enough to develop good paddling skills, or they can be people who barely know which end of the paddle to place in the water.

Just as diverse as the objectives and skill level of people who canoe and kayak is the demographic profile those people. Paddlers transcend all walks of life, income levels, geographic location, age, race and sex. Avid paddlers can be found among the ranks of doctors, lawyers, college professors, military officers, Governors, and members of Congress. Former Attorney General Janet Reno and the current Administrator of the Environmental Protection Agency (EPA), Christine Todd-Whitman are both avid paddlers. Participation in paddlesports used to be much higher among men, but recent data indicates that today almost as many women paddle as men.

The Numbers

A huge number of Americans participate annually in paddlesports, and this involvement increases every year. In fact, kayaking is (according to the available studies) *the* fastest growing segment of the entire boating community

These numbers suggest that paddlesports makes up a substantial percentage of the total annual participation in boating.

with a growth rate of 182.5% over the past seven years. The National Survey of Recreation and the Environment (NSRE) found that, during 2002, 20.6 million Americans paddled in canoes, 7.3 million paddled in kayaks, and 20.2 million went rafting. These numbers suggest that paddlesports makes up a substantial percentage of the total annual participation in boating. According to the NSRE, 76.5 million Americans went out in some kind of boat in 2002. All three of these activities show healthy growth over the last seven years, with canoeing showing 49.9% more participants, rafting showing 35.9% more, and kayaking

increasing at the abovementioned 182%.

Future Trends

These impressive participation figures give every indication of continuing to increase. The NSRE projects that canoeing will continue to grow slowly and steadily from 1995 to 2020. This rise will be complemented by an even greater increase in the number of days those individuals will spend paddling. In other words, not only is the canoeing population projected to grow, the number of days this population will spend canoeing should increase even faster. Despite the overall rise in canoeing, some segments of the canoe market are in dramatic decline. For instance, whitewater canoeing has suffered a drastic drop over the last ten to twelve years, most likely due to the increasing popularity of whitewater kayaking. The Nantahala Outdoor Center in western North Carolina was at one time the largest whitewater paddling school in the world, and whitewater canoeing made up half of its classes in the late 80's. By the late 90's, in contrast, whitewater canoeing was responsible for less than 20% of its classes.

Manufacturers, retailers, and outfitters, as well as the ACA instruction program, all indicate that of all forms of paddlesport, kayaking is experiencing the most explosive rise in demand. Canoeists still outnumber kayakers about 3 to 1, but with the relative growth rates that gap is rapidly closing. For example, the decline in the Nantahala Outdoor Center's number of whitewater canoeing courses over the past two decades has been easily offset by the rising demand for whitewater kayaking instruction.

The upper Midwest and the New England states remain canoeing strongholds, probably because of strong traditions, and the type of paddling trip most popular in those regions. Long trips with frequent portages around rapids or between closely situated lakes is much easier with a quickly unloaded and reloaded canoe than with a kayak.

Unlike the canoeing market where, despite the overall increase, certain types of boats (such as whitewater canoes) are less and less popular, the kayaking market is rising across the

CANOEING AND KAYAKING: AN OVERVIEW

board. Whitewater kayaking and kayak touring both show healthy increases. These increases, however, are dwarfed by the explosive demand for the inexpensive, easily accessible, and versatile “recreational kayak.” The likelihood that a sizable portion of people currently buying “recreational kayaks” will eventually purchase a more performance-oriented kayak has made manufacturers very optimistic about future kayak sales.

Recreational paddlesport in its many forms is easy to access in all fifty states and is generally regarded as fun, healthful, non-damaging to the environment, and inexpensive. For these reasons paddlesport will continue to grow rapidly in the near future. Furthermore, paddlesports has strong participation from a variety of demographic groups. For example, women make up nearly 50% of paddlesport participants (whereas in motorized craft, female participation is much lower). Minorities are also well represented. Both female and minority participation continue to increase.

Unique Hazards

While the vast majority of paddlers had a safe, enjoyable experience, hazards do exist. Many factors can increase or decrease a paddler’s exposure to risk. Venue, conditions, experience, training, preparation and judgment can all play a part in how likely a paddler is to have an accident. These factors are often related, and a comprehensive approach to safety can make the difference between a safe, pleasant day on the water and one that includes a brush with danger, an accident, or even a fatality. Since the risks inherent in paddlesport are often different from the risks of other watersports, it is important to know the unique hazards of paddling.

Water itself is one of the great, unrecognized hazards. Because of the nature of the crafts, the paddler is more likely to end up *in* the water than other types of boaters are, and a responsible paddler should always assume that he or she is likely to get wet. A simple awareness that water can be cold and deadly is a vital part of enjoying paddlesports in a safe manner.

A serious obstacle to instilling this vital concept in many potential victims is that they don’t consider themselves as “paddlers” per se, don’t seek out instruction, and often ignore paddler-specific safety education. For example, many hunters who practice flawless gun safety

venture out into paddlecraft without adequate knowledge of the risks and basic safety skills, or paddling safety equipment



PHOTO BY BROOKE WINGER

Watercraft Size and Stability

The size and stability of canoes and kayaks are key risk factors that far too many people do not fully appreciate.

Being relatively small and narrow, these craft require a special attention to issues such as balance and wave action. Inexperienced paddlers often make critical mistakes such as standing in or leaning over the edge of a canoe. These actions dramatically change the center of gravity and increase the likelihood of capsizing.

These same factors mean that a certain level of skill and attention is required to safely navigate these craft in choppy waves, wind or strong current. In today’s world people are often unwilling to take the time and effort to acquire the basic skills and knowledge needed to operate a canoe or kayak safely.

Any circumstance that increases the likelihood of a person swimming in the water without a Personal Flotation Device (PFD) is also likely to result in fatalities. Each year

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more than 4,000 people in the United States die from drowning. Many of these fatalities occur in the relative safety of a swimming pool. It should be no surprise then, that when people end up swimming in the variable waters of a river, lake or ocean without benefit of a PFD, that a significant number of fatalities occur. The greater likelihood of swimming associated with canoeing and kayaking, along with the other unique aspects of these activities, brings into question the value of viewing and approaching canoe and kayak fatalities the same as those resulting from other boating activities.

Perception of Skill Required

The narrative descriptions of fatal canoeing and kayaking accidents reviewed by the ACA

It appears that the simplicity of design that characterizes a canoe or kayak is often misinterpreted as an indication that these craft are simple to operate and inherently safe.

indicate that many of the victims exhibited little or no paddling skills and failed to practice even the most basic safety precautions. This raises a concern that many people who operate a canoe or kayak

do not take the craft seriously or perceive the associated safety risks. It appears that the simplicity of design that characterizes a canoe or kayak is often misinterpreted as an indication that these craft are simple to operate and inherently safe.

Impact of Weather Conditions

The challenges presented by various weather conditions are an integral part of paddling. Weather can have an enormous impact on the operation of a canoe or kayak, particularly for the inexperienced paddler. Wind can quickly turn a pleasant paddle on a placid lake into a very challenging paddle. Rain falling miles away can change a calm river into a pushy torrent. Cold weather and rain can sap a paddler's energy, cause hypothermia, and greatly reduce the margin for error.

Experienced paddlers understand the significant role weather plays in canoeing and kayaking, and prepare accordingly. Checking weather forecasts, knowing personal limitations, and wearing proper clothing are key to having a safe and enjoyable paddling experience. Those who fail to understand and prepare for the risks associated with different weather conditions significantly increase the possibility of a fatal accident.

Low-Head Dams

Low-head dams are one of the most dangerous features encountered by river paddlers. Unfortunately, these are common on many rivers (not primarily whitewater ones) and often do not look overly threatening. In fact, they can be virtually "invisible" from the low sight angle afforded by a typical upstream paddlecraft, until the boat is too close to the drop to escape the powerful currents. These dams are usually easy to avoid, but too many people are uninformed about their potential deadliness. Paddling literature and courses put special emphasis on the dangers of these dams and stress the importance of recognizing and avoiding them.

Strainers (Sweepers)

Paddlers on rivers and ocean currents must be particularly cautious around fallen trees or other obstacles in the water that permit water to pass through while retaining solid objects. The current can push boats or swimmers toward the strainer, causing them to become entrapped. It is important that all paddlers understand the potential risks of such obstacles, be able to recognize these hazards, and have the skills to avoid them.

Whitewater and Surf Zone

Whitewater is created when fast moving water flows over, around, or through obstacles in the riverbed. The gradient of a river increases the velocity of the water, and obstacles (river features) create wave action ranging from mild to extreme. Whitewater presents a whole set of challenges and hazards that cannot be thoroughly covered

in this document. Those wishing to paddle on whitewater rivers, even moderate ones, must seek competent instruction and learn the risks involved. Most whitewater paddlers *are* adequately prepared and outfitted. A large percentage of the fatalities associated with whitewater involve highly competent, well-outfitted paddlers who are challenging themselves by attempting to paddle in extreme conditions. These paddlers are making an informed decision to expose themselves to the many hazards found in these extreme conditions.

Many coastal areas are subject to surf conditions that can be hazardous. Surf conditions change frequently, sometimes very rapidly, and even moderate waves can be powerful. Waves and/or current can push unwary paddlers into obstacles such as rocks, piers, jetties, and other boats. Piers and fallen or floating trees form dangerous strainers, and even a sandy shore can be dangerous if a boater is propelled onto it out of control. All users of the surf zone — boaters, swimmers, anglers and others — need a significant level of knowledge and skill before venturing out.

Remoteness

More adventurous paddlers often seek out remote places to paddle and experience nature on its own terms. This remoteness can be an inaccessible river gorge only a few miles from a highway, or it can be a vast wilderness a hundred miles from the nearest person. This remoteness also greatly decreases a paddler's margin of error. Even a minor miscalculation can have fatal consequences.

The most common problem with remote locations is alerting outside help and evacuating an injured person. This is one reason experienced paddlers typically venture into these areas with other paddlers that are equally skilled in wilderness travel and first aid. In places like Alaska, kayakers are often dropped by plane or charter vessel at wild and remote locations. In such environments paddlers must carry extra supplies in case weather conditions delay their return or



PHOTO BY KEN MADSEN

prevent a scheduled pickup.

Managing the Risks

One basic way to improve paddler safety on the water is to respect the power of natural forces such as current, wind, waves, and weather and to respect human limitations in the face of these natural forces. We don't breathe water, so we all need to wear a life jacket to keep our face above water. The water can cool us rapidly, so we need to wear adequate protective clothing. Our muscle strength is nothing compared to the forces we will encounter while paddling, so we need to develop skills to help us work with the water, not against it. In order to know when the conditions are too threatening, all paddlers need to be able to recognize and avoid hazards. Knowledge, and to some extent skills, can be learned from books, videos, signage, and other media, but the most effective means for passing along safety information is through well-designed courses taught by qualified instructors. Warning and informational signage, books, videos, and public awareness media campaigns should all strongly recommend that the participant seek competent guidance and instruction.

Basic Safety Knowledge

Safety is — first and foremost — an attitude. The prudent paddler can recognize hazards, assess risk, know his or her limits, and exercise good judgment. Beyond this safety-first attitude, knowing the following important safety practices will help make any paddling

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experience a safer one. The prudent paddler should:

- ▶ **Know the importance of wearing a PFD, regardless of one's swimming ability.**
- ▶ **Not drink alcohol immediately prior to or during a paddling trip, and never paddle while under the influence of alcohol or drugs.**
- ▶ **Understand the limitations of the vessel with respect to size, carrying capacity, stability and designed purpose.**
- ▶ **Plan ahead. Research the venue; check the weather, and make sure skill level, equipment and provisions are adequate for the trip.**
- ▶ **Know how to swim; even with a life jacket on being comfortable in the water is a big advantage in case an unexpected capsize occurs.**
- ▶ **Never paddle alone. There is safety in numbers — more eyes to look for hazards, more minds to assess risk, more hands to help with rescues. Consider the skills of paddling partners and their ability to help in the event of a capsize.**

Proper Gear and Clothing

Many of the annual paddling fatalities and serious injuries in the U.S. involve paddlers who are ill-equipped for the conditions. Hypothermia, for example, is a major threat but can be offset by proper gear and a good knowledge of how to stay warm even when wet. It is essential that all gear is well suited to the type of paddling planned. Canoes and kayaks vary widely in their design and intended uses, and fatalities can and do result from paddlers taking a craft designed for a lake onto moving water or onto the ocean. Kayaks designed for open ocean-touring lack the maneuverability required for running whitewater and can be quite hazardous if taken on rivers requiring

“tight moves.” The many issues involved in matching gear to conditions cannot be covered here, but it is essential to know a craft's intended uses and to respect those.

The most important and basic rule of paddling is: **Wear a lifejacket (PFD)!** Unfortunately, this practice is not ingrained in the minds of many casual paddlers. This may be in part because of the PFD ethic people develop while operating larger boats. On these larger - typically motorized - vessels the operators often do not wear the lifejackets; they simply have them onboard. Perhaps this practice carries over when they venture out in a canoe or kayak. Particularly when paddling on any type of current, it is not sufficient to have a lifejacket loose in the boat; it must be worn securely on the body.

Paddling Skills

A chief pleasure of paddlesports is that the paddler relies only on his or her own physical skills to propel the craft. Hazards, however, arise when paddlers do not have the skills needed. It is imperative that all paddlers practice the skills needed to handle a canoe or kayak. Those basic skills should include:

- ▶ **Knowing how to balance the boat and keep it from capsizing. This includes entering and exiting these often tippy boats without turning over or falling out, and performing all maneuvers necessary with the boat upright.**
- ▶ **Being able to propel the boat in a (relatively) straight line.**
- ▶ **Being able to turn the boat in either direction quickly and efficiently — preferably, even in waves and current.**
- ▶ **Being able to stop the boat's forward progress, and back up at least a short distance.**
- ▶ **Rescue and recovery skills. A paddler should be able to quickly perform a “self rescue,” and should be able to**

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effectively assist with the rescue of others (see *Rescue* below).

No one should venture out onto water without training and assume that he or she is instinctively prepared to meet any circumstance. Experience does not equate with knowledge or skill. Many people operate canoes and kayaks for years without developing paddling skills or practicing basic safety. Being lucky enough not to have an accident does not make one a safe and capable paddler. All paddlers should educate themselves, either by reading available literature or by seeking qualified instruction, preferably both.

Rescue

Because canoes and kayaks are smaller and have a different hull design than typical motorized craft, the risk of capsize can be higher and avoiding capsize is more dependent on the skill of the operator. Recognizing this, all paddlers must also know

what to do in the event of an upset and be skilled in getting themselves and their gear to shore or back into the boat. Many kayaks and certain types of canoes can be rolled back to the upright position after a capsize while the operator is still in the craft. In decked boats such as touring or whitewater kayaks and properly designed and outfitted open boats such as whitewater canoes, rolling can allow the boater to continue paddling immediately. Learning and practicing self-rescue and recoveries are integral and important responsibilities of prudent paddlers.

Paddling with a well-trained and supportive group improves the safety of each member of that group. Some or ideally all of the group should be trained in rescue and recovery, have taken first aid and Cardiopulmonary Resuscitation (CPR) classes, and share common goals and interests regarding the paddling trip. Watching out for each other is simply an accepted part of paddling for all experienced paddlers.

Adventure & Managing Risk

While adventure and exploration are steeped in the nation's history, in recent years the popularity of adventurous outdoor activities has grown like never before. The variety of adventurous activities available to the public is equally unparalleled. Common tickets to adventure include mountain biking, rock climbing, backcountry skiing, scuba diving, backpacking, mountaineering, surfing, ice climbing, skydiving, wilderness canoeing, ocean kayak touring, and whitewater kayaking.

These activities, while diverse, all share the allure of adventure and its many benefits. Outdoor adventure teaches self-reliance and personal responsibility, it causes participants to challenge themselves physically and mentally, and rewards the effort with a unique personal satisfaction. For those who are not enticed by these adventurous activities, the pursuit of them may seem too risky - or even crazy. That view is typically an uninformed one, lacking knowledge or understanding of the training and skill level of those engaging in such activities.

Adventure is largely about managing risk. The keys to managing any risk are knowledge and skill. A whitewater paddler skilled at running the most challenging rapids and waterfalls has spent countless hours in practice, recognizes hazards, has prepared for possible mishaps, and is in an environment he or she knows and understands. An inexperienced and unskilled person who takes a canoe out on a placid lake or a gentle river is arguably at higher risk than the experienced and skilled adventurer. The absence of skill, experience and sound judgment creates a greater likelihood of errors, while at the same time leaving absolutely no margin for errors.

While casual paddlers do not require the same level of skill and knowledge as the most adventurous, they should emulate the adventurers approach to managing risk. Developing paddling skills, understanding the environment one is in, and taking safety precautions (such as wearing a PFD) are the practices of the most capable athletes, failing to do so is the practice of the foolhardy.

U.S. CANOE & KAYAK FATALITY ANALYSIS, 1996-2000

Overview

For this report, ACA analyzed all reported canoe and kayak related fatalities occurring between 1996 and 2000. Although 2001 accident information became available prior to finalizing this report, the 2001 data reflects a change in accident reporting criteria and ACA research staff made a conscious decision to examine it separately. From calendar year 1996 through 2000, 403

Table 1: Canoe & Kayak Fatalities by Vessel Type, 1996-2000

Vessel Type	Percent
Canoe	75%
Kayak	25%
Total Observations = 398	
<i>Note: Vessel Type Unknown = 5</i>	

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

fatalities reported to the U.S. Coast Guard were categorized as being associated with canoeing or kayaking. For 5 of those reported fatalities, the exact type of boat paddled was not reported. Among the 398 paddling fatalities for which type of vessel is known, 75% were associated with canoes (Table 1). The remainder was associated with kayaks.

The number of reported fatalities among canoes and kayaks has been increasing over time. It is likely that in part this reflects increased participation in paddle sports over the same time period. In 1996, 1997, 1998, 1999, and 2000, roughly three quarters of reported fatalities that involved a paddle-powered boat were associated with canoes (Table 2).

Table 2: Canoe & Kayak Fatalities by Year

Year	Canoe	Kayak	Total Number
1996	77%	23%	43
1997	72%	28%	83
1998	77%	23%	90
1999	74%	23%	79
2000	74%	26%	103

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Exposure Data

Exposure is essentially the amount of time a vessel operator spends operating a certain vessel. In 2000, a USCG supported survey conducted by JSI Research and Training Institute, Inc. attempted to assess the safety risk associated with various types of boating by comparing the number of accidents and fatalities with the total exposure. Two factors play a role in the exposure rate associated with a particular vessel type. One is the total number of vessels of that type in operation. The other is the amount of time operators spend operating the vessel. The JSI survey reported that canoeists and kayakers had a higher fatality rate per hours of exposure than other types of boating.

The ACA found a serious sampling error in this survey and reported it to USCG. Both JSI Research and Training Institute, Inc. and USCG acknowledge that the sampling method used for the JSI study relied too heavily on registered boat owners and thus failed to accurately assess canoe and kayak exposure data. Since only a small portion of canoes and kayaks are required to be registered, a survey of registered boat owners would primarily capture motorized boat owners that also happen to own a canoe or kayak. These owners would probably spend less time in a canoe or kayak than those who only own a canoe or kayak. The ACA is providing USCG with contact information on paddlers that will hopefully help the next survey produce more reliable results.

Accident Types

The USCG data provide information on the type and cause of boating accidents. Among canoes and kayaks, the majority of fatalities, 75%, were classified as "capsizes" by the USCG. Other possible classifications were "fell overboard," collision with fixed or floating object, swamped boat, and "other." Out of 403 canoe/kayak fatalities, 11 were not assigned to any of these categories.

A review of accident narratives indicates that a significant number of canoe accidents classified as "capsizes" also involved a person falling overboard. Often a person standing or moving around in a canoe loses his or her balance and

Table 3: Capsize Fatalities by Type of Boat, 1996-2000

Boat	Did not capsize	Capsized	Total
Canoe	24%	76%	292
Kayak	25%	75%	95
<i>Note: Status could not be determined for 16 vessels</i>			
Pearson $\chi^2(1) = 0.1$ Pr = 0.7			

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

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falls over the side of the canoe. Since these falls typically capsize the canoe, the resulting accident is classified as a capsize.

When examined by type of boat, it appears that there is no difference in probability of capsize between canoe and kayak fatalities (Table 3). Also there was no firm evidence that alcohol

consumption increased the likelihood that a fatality was due to capsize (Odds Ratio: 1.0, C.I.=0.6-1.7).

Interestingly, capsize fatalities appear to be as likely to be found on calm water as on choppy, rough or very rough water. As can be seen from Table 4, among all fatalities that occurred on "calm" water, 74% were capsizes. Among fatalities that occurred on choppy, rough or very rough water, 77% were classified as capsizes.

Table 4: Canoe and Kayak Capsize Fatalities by Water Conditions, 1996-2000

Water	Did not capsize	Capsized	Total
Choppy, Rough, Very Rough	22%	77%	157
Calm	26%	74%	152
Total Observations	75	234	309

Pearson $\chi^2(1) = 0.7$ $p = 0.4$

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Accident Causes and Risk Factors

When evaluating the causes of canoeing and kayaking accidents and the risk factors associated with the resulting fatalities, the causes identified in the USCG Boating Accident Report Database (BARD) are of limited value. Causes typically reported include: *operator inexperience, operator error, skier/passenger/other, alcohol, hazardous water/weather, and other*. Table 5 breaks down the causes of canoe and kayak accidents as they are presented in USCG BARD.

The USCG data report up to three causes

Table 5: Detail of Canoe & Kayak Fatality Causes Based on Up to Three Causes

Cause of Fatality	Canoe Fatalities	Kayak Fatalities
Hazardous Water/Weather (only)	16%	45%
Operator Inexperience or Error (only)	20%	16%
Skier/Passenger/Other (only)	12%	3%
Alcohol (only)	7%	0%
Hazardous Water/Weather + Operator Inexperience or Error	10%	20%
Hazardous Water/Weather + Alcohol	2%	0%
Hazardous Water/Weather + Other	4%	8%
Operator Inexperience or Error + Alcohol	5%	2%
Operator Inexperience or Error + Other	6%	1%
Alcohol + Other	5%	0%
Alcohol + Operator Inexperience or Error + Hazardous Water/Weather	1%	0%
Alcohol + Operator Inexperience or Error + Other	2%	0%
Alcohol + Hazardous Water/Weather + Other	1%	0%
Hazardous Water/Weather + Operator Inexperience or Error + Other	1%	0%
All other	8%	1%

The total number of fatalities represented in this table: Canoe = 270, Kayak = 93

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

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for each reported fatality. Using all three causes and breaking this down by type of boat, provides evidence of differences in causal factors between canoe and kayak deaths (Table 5). Operator inexperience or inattention and hazardous water or weather by themselves, or combined with other factors, were the major causes of canoe and kayak fatalities. These factors accounted for 57% of all canoeing fatalities, and for 90% of all kayaking fatalities.

Alcohol use was another significant contributing factor in canoeing fatalities, listed as a causal factor in 23% of canoeing deaths. Among kayakers, only 3% of fatalities involved alcohol use. This difference in proportions is statistically significant. Passenger involvement also plays a larger role in canoe fatalities than in kayak fatalities.

For the purposes of this report, any category that included alcohol as a causal factor was counted as alcohol involvement. If both hazardous water or weather and alcohol were causal factors, the fatality was tabulated as an alcohol-related fatality. Consequently, proportions presented for hazardous water or weather and operator inexperience or inattention include only non-alcohol related fatalities.

The cause categories used by boating officials and reported in BARD are helpful in understanding generally what contributes to fatal accidents, they are not specific enough to reveal very much about the details of what actually happened. For these specific details, the most useful information is contained in the accident narratives that are captured in BARD and the information presented on PFD wearage. The ACA has utilized all of this information in determining the primary causes and risk factors in most canoe and kayak fatalities.

Occupant Movement / Weight Shift

The ACA is convinced that occupant movement and weight shift within a canoe plays a major role in approximately 50% of all canoeing accidents. A careful review of the narrative information available on fatal canoeing accidents from 1996 through 2000 found that occupant movement and/or weight shift was specifically cited as the cause of capsizes that resulted in 73 of the fatalities. Based on accident circumstances,

including water and weather conditions, ACA also determined that 89 additional fatalities likely involved such capsizes. The ACA reviewed narrative information on 300 canoeing fatalities. Of the 300 fatalities, 162 occurred after capsizes that were likely due to occupant movement and/or weight shift. The BARD data indicate that all of these 162 fatalities occurred in calm water and weather conditions.

Typical behaviors that result in such capsizes include: occupants switching positions, an occupant leaning over the side of the canoe to retrieve something from the water, horseplay, casting a fishing rod, and occupants standing up in the canoe. Here are a few examples of the narrative accounts of these accidents:

- ▶ **Four men were in a canoe. One of the four was tipping the boat. The others asked him to stop, and when he shifted his position, he caused the canoe to capsize. The man tipping the boat went under and drowned. Alcohol was a factor, as the deceased had reportedly been drinking.**
- ▶ **Three adults and two Black Labs were in a canoe on backwater going to a friend's house. One of the victims stood up to relieve himself. When he did, the canoe turned over.**
- ▶ **Three men were fishing. While passing under a low tree a snake startled the men and they capsized the boat.**
- ▶ **Victim was fishing off dock on the river. His fishing line got hung up in the water. He got in a canoe to get the line out. As he was attempting to free the line the canoe turned over. Victim fell in water and drowned.**
- ▶ **The vessel capsized when the occupant stood up to land a fish.**
- ▶ **A woman and her husband were out in their aluminum canoe fishing. They had just started paddling across the pond when the man dropped something into the water. He leaned over the edge to retrieve the object and the canoe capsized.**

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Capsizes due to occupant movement/ weight shift were prevalent both in accidents where alcohol was involved and in accidents not involving alcohol. The narrative accident descriptions suggest that these capsizes are most often associated with inexperienced occupants and the use of a canoe for activities such as fishing.

PFD Use

PFD use is the single most prevalent factor among canoe fatalities. While the reasons people occupying these vessels end up swimming in the water are varied -- including causes such as wind, wave action, occupant movement, swift current, and overloading the vessel -- the vast majority of those who do not survive such mishaps are not wearing a PFD.

Among canoeing and kayaking fatalities, three quarters were not wearing a personal flotation device (PFD). Among fatalities who had been paddling canoes at the time of death, 83% were not wearing a PFD (Table 6). The odds that individuals who were paddling kayaks when they died were wearing a properly worn PFD was over six times that of their counterparts in canoes (Odds Ratio=6.5, 95% C.I.= 4.0-10.9). However, a substantial proportion of the fatalities among kayakers were also not wearing PFDs.

Since non-fatal canoeing and kayaking accidents

occur, invariably, those who were wearing a PFD survived and those who were not wearing a PFD perished.

The following accident descriptions are typical of what the ACA found:

- ▶ **On May 23, 1998 four young males were in a canoe on Moore Lake in Minnesota. The canoe capsized while one of the occupants was removing his shirt. All occupants except the man who removed his shirt were wearing a PFD and survived. The man without a PFD struggled, went under, and drowned.**
- ▶ **On July 25, 1998 a family was paddling a canoe on a pond near Fairbanks Alaska and the canoe they were in capsized. The man told his wife and 5-year-old daughter to swim to shore. The wife and daughter, who were both wearing PFDs, successfully reached the shore. The man, who was not wearing a PFD, failed to reach the shore and drowned.**

One of the few published studies that looked at PFD use in a general population, Quan et al (1998) found that in the state of Washington in 1995, kayakers had the highest rate of PFD use (78%) while canoeists averaged 41%. If these rates are representative of PFD use rates among paddlers in the entire US, then PFD use among fatalities reported to the USCG is lower than that what would be found among non-fatalities. Over the five-year period from 1996-2000, 28 fatalities occurred in Washington where Quan et al conducted their study. Among these 28 fatalities, PFD use averaged 25%, well below the rate they found among the general paddling population in that state. This lends additional support to the belief that failure to wear a properly fastened PFD contributes to canoe and kayak fatalities.

The tabulations in Table 7 indicate a steady trend of decreasing PFD use among paddling fatalities from 1996 to 1998. This trend appears to reverse after 1998. These variations could simply represent the normal variation of accident circumstances from year to year. Only additional information about PFD use over time

Table 6: Canoe & Kayak Fatalities by Vessel Type and PFD Use, 1996-2000

PFD use	Canoe	Kayak	Unknown
PFD worn	16%	50%	—
PFD not worn	83%	44%	100%
Unknown Status	1%	—	—
Total Observations	299	99	5

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BAR), 1996-2000

rarely meet the reporting criteria, there is not much available PFD wearage information about people involved in canoe and kayak accidents who do not die. Still, a great deal about the role PFD use plays in the survivability of these accidents can be derived from the narrative descriptions of fatal accidents. ACA reviewed all available narratives for canoe and kayak accidents where there were multiple occupants in a canoe or kayak and a

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would provide a definitive explanation of this observed trend among fatalities.

Other risk factors for canoe and kayak fatalities such as alcohol impairment, rough or choppy water, strong currents, cold water, and inexperienced paddlers may have a direct influence on a person's likelihood of wearing a PFD. For example, individuals who know they will be paddling rough water may be more likely to wear a PFD, whereas individuals paddling calm water may be less likely to wear a PFD or more likely to consume alcohol. The following tables show the distribution of these factors among canoe and kayak fatalities over the study period.

In order to determine the interplay between PFD use and various other risk factors associated with USCG reported fatalities, we use a method called logistic regression that allows us to estimate the strength of the association between another risk factor and PFD use while controlling for other risk factors that may have been present. In this way, we hope to be able to say something about PFD use relative to other risk factors including how these risk factors may influence PFD use.

Table 7: Canoe & Kayak Fatalities by PFD Use, 1996-2000

Year	No PFD	PFD Worn	Total Fatalities
1996	74%	26%	43
1997	77%	23%	83
1998	83%	17%	86
1999	72%	28%	82
2000	68%	32%	105
5-year average	74%	26%	399

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Table 8 provides odds ratios that measure the relative importance of several different risk factors in determining PFD use. Each odds ratio measures the effect of that risk factor on PFD use while holding all other risk factors constant. For example, individuals who were paddling choppy, rough or very rough water at the time of death had odds of PFD use that were twice that of individuals paddling calm water at time of death (O.R.=2.0, 95% C.I.=(0.98-

Table 8: Correlations of PFD Use Among Canoe & Kayak Fatalities, 1996-2000

	Odds Ratio	95% Confidence Interval
Choppy, Rough, Very Rough Water	2.0	(1.0-4.2)
Strong Current	3.0	(1.5-5.8)
Kayak	4.2	(2.1-8.1)
Alcohol Involved	0.4	(0.1-1.0)
Likelihood Ratio $\chi^2(4) = 70.0, \hat{p} = 0.001, n = 306$		

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

4.2)) regardless of what type of boat they were paddling, whether or not there was a strong current and whether or not they had consumed alcohol. The lower bound on the confidence interval for rough or choppy water indicates that this estimate should be regarded as tenuous.

The odds of PFD use among individuals paddling in strong current were three times that of individuals paddling calm water with no strong current regardless of the other risk factors. When these two characteristics of the water are controlled for, that the odds ratio for PFD use among kayakers falls from six (estimated previously without controlling for other risk factors) to four (O.R.=4.2, C.I.=(2.1-8.1). This change in the odds ratio when a new variable is controlled suggests that among reported fatalities, kayakers were more likely to be paddling rough or choppy water or in strong current. In fact, in this data set, the odds that kayakers were paddling rough or choppy water at the time of death were nearly eight times that of canoeists (O.R.=7.6, 95% C.I.=(3.7-15.6).

As can also be seen in Table 8, alcohol use lowers the odds of PFD use by about 60% even when water conditions and type of vessel are controlled for (O.R.=0.4, 95% C.I.=(0.1-1.0)). It should be noted however, that this effect was not statistically significant at conventional levels. We found some evidence that alcohol use is correlated with other factors that can affect fatality risk

Paddler experience is not included in this regression because of the large number of observations for which this variable is missing. When experience is included in this regression,

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the results in Table 8 are unchanged except for alcohol involvement where the odds ratio rises to 0.9. Fatalities in the two more experienced categories had much higher odds of PFD use compared to the least experienced group (3.0 and 6.2 respectively).

Among the boating fatalities in this data set, more experienced paddlers were more likely to be wearing a PFD when they died (Table 9). Individuals who were reported to have less than 10 hours of experience were least likely to be wearing

Table 9: Paddler Experience and PFD Use Among Canoe and Kayak Fatalities, 1996-2000

Hours	Odds Ratio	95% Confidence Interval
10-100 hrs	4.6	(1.6-12.4)
> 100 hrs	9.4	(3.4-26.0)
Likelihood Ratio $\chi^2(2) = 25.1, \hat{p} = 0.001, n = 234$		

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

a PFD at death. The odds of PFD use among fatalities with 10-100 hours were four times that of the least experienced fatalities. The odds of PFD use among fatalities with more than 100 hours of experience were nine times the odds of PFD use among the least experienced fatalities. Of course, these results should be viewed as somewhat tenuous, since "experience" was reported for only 58% of all known canoe or kayak fatalities.

There is some evidence in the US Coast Guard data that, with the exception of alcohol use, PFD use increases with risk factors commonly thought to be associated with a higher probability of capsizing, such as rough or choppy water. This suggests that among paddlers who died, PFD use was influenced to some extent by perceived risk of misadventure while on the water. Fatalities paddling relatively calm water tended not to be wearing a PFD when they died. Unfortunately, it appears that calm water may foster other high-risk behaviors as well. Alcohol appeared to be a factor in proportionately more deaths on calm water than on choppy, rough or very rough water. Only research that collects data on both nonfatal and fatal boating can ever answer the PFD question with certainty. However, based on the USCG data, it appears that individuals who died boating

and who were wearing PFDs tended to be more experienced, were more likely to be paddling on rougher water and were more likely paddling a kayak. Those who were not wearing PFDs at time of death appear to have been less experienced, were more likely to have consumed alcohol, and were more likely to have been paddling a canoe.

Water and Weather Conditions

Water and weather conditions are a significant factor in many canoe and kayak fatalities. While canoes and kayaks are very capable of handling rough water conditions, much of this capability depends on the skill of the operator. Experienced paddlers regularly navigate rough water successfully, but when an inexperienced paddler encounters waves or strong current there is a much higher risk of capsizing.

From the figures in Table 10, it appears that fatalities were evenly divided between calm water and water classified as choppy, rough or very rough by the USCG. It is likely that the majority of people in the U.S. who went canoeing or kayaking prefer to paddle on relatively calm waters, such as small lakes, ponds, and quiet rivers. A smaller proportion of boaters, usually kayakers, prefer the greater challenge of whitewater boating and an even smaller proportion enjoy the risks of ocean kayaking. The roughly equal proportions in Table 10 are difficult to interpret since we don't know what the relative rates of exposure are to the two types of water conditions. Some of those in the rough water category are probably risk-preferring whitewater boaters and sea-kayakers, while some are canoeists and kayakers who were caught in storms on open water.

Table 10: Canoe and Kayak Fatalities by Water Conditions, 1996-2000

Water	Percent
Choppy, Rough, Very Rough	49%
Calm	51%
Total Observations	319

Table 11 indicates that the majority of canoe and kayak fatalities do not occur in strong current (70%). Again, risk preferring whitewater boater fatalities would be

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

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expected to fall into the “strong current” category.

Hypothermia due to exposure to cold-water temperatures is also a risk factor for death among paddlers. In the USCG data, just over half of all fatalities for which water temperature was known occurred in water that was less than 65 degrees

Fahrenheit (Table 12).

Table 11: Canoe & Kayak Fatalities by Strong Current, 1996-2000

	Percent
Yes	30%
No	70%
Total Observations	403

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Table 12: Canoe & Kayak Fatalities by Water Temperature, 1996-2000

Temp. (°F)	Percent
< 50°	24%
51-65°	28%
> 65°	48%
Total Observations	403

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Table 13: Canoe and Kayak Fatalities by Operator Experience, 1996-2000

Hours	Percent
< 10 hrs	26%
10-100 hrs	43%
> 100 hrs	32%
Total Observations	234

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Operator Experience

Another risk factor for mishap and injury among paddlers is inexperience. Information on experience is only available for 234 of the 403 known canoe and kayak fatalities in the USCG database. The majority of these fatalities had more than 10 hours of experience (74%) with just over a third reporting more than 100 hours of experience (Table 13).

Alcohol Use

Alcohol was officially cited as an accident cause in 23% of canoeing fatalities and in 3% of the kayaking fatalities. ACA's review of the accident narratives indicate that the percentage of fatal canoeing accidents

involving alcohol is actually over 25%. This disparity is likely the result of reporting inconsistencies between individual investigators and between different states. In addition, it is worth noting that alcoholic beverages were present in a number of fatal accidents where it was unclear whether or not it played a direct role in the accident.

The odds of alcohol use were almost twice as great among fatalities that occurred on calm water as on rough (O.R.=1.8, 95% C.I.=1.0-3.1). Also, the odds that alcohol had been involved in the fatality nearly quadrupled if a canoe was paddled rather than a kayak (O.R. 3.6, 95% C.I.=1.3-9.7).

Table 14: Correlates Alcohol Use Among Canoe & Kayak Fatalities, 1996-2000

	Odds Ratio	95% Confidence Interval
Canoe	3.6	(1.3-9.7)
Calm Water	1.8	(1.0-3.1)
Likelihood Ratio $\chi^2(2) = 17.7, \hat{p} = 0.001, n = 306$		

SOURCE: US COAST GUARD RECREATIONAL BOATING ACCIDENT REPORT DATABASE (BARD), 1996-2000

Man-made Hazards

Dams and weirs and other man-made hazards contribute to numerous canoe and kayak deaths each year. During the 5-year study period, at least 27 canoeing and kayaking deaths involved dams or weirs. Dams often present a greater hazard to paddlers than natural river features. Because of their uniform shape, dams typically create a powerful hydraulic that will hold and recirculate anything near its face. As noted in the *Unique Hazards* section earlier, low-head dams are particularly problematic. These dams are often only a few feet high and appear benign to people who are unaware of the hydrology associated with them.

The circumstances surrounding dam-related deaths vary, but some scenarios are more common than others. Often paddlers are involuntarily swept over a dam by current. Typically the paddler either underestimated the force of the current upstream of the dam, or underestimated the force of the water below the dam. Large flood control

U.S. CANOE & KAYAK FATALITY ANALYSIS, 1996-2000

and hydroelectric dams can pose an unseen risk to paddlers downstream by releasing large volumes of water that can quickly and dramatically change the character of a river.

In addition to dams and weirs, other common man-made hazards for paddlers include fences placed across streams, bridge piers (abutments), low-water bridges, culverts, and large trash (such as old cars and washing machines) that has been discarded in rivers. These man-made hazards are most problematic in swift moving water, where they pose pinning or entrapment hazards.

Other Vessels

The extent to which other vessels contribute to canoe and kayak fatalities is hard to determine. In its review of narrative accident data, the ACA found only a few fatal accidents that were positively identified as involving another vessel. However, there are a significant number of fatal capsizes that were unwitnessed and where the cause of the capsize is unknown. Many paddlers have reported accidents and near accidents resulting from the operation of motorized craft to ACA. Most often these complaints involve personal watercraft (PWC).

The narrative descriptions of fatal accidents involving canoes or kayaks and other vessels, while few in number, do point out the risk to paddlers that other vessels can present. Here are some examples:

- ▶ **The operator was towing a person on a kneeboard. There was an observer present, but the operator turned around to look at the kneeboarder and when doing so, failed to see an anchored canoe not far from shore and ran over it. The accident killed a passenger in the canoe and severely injured its operator.**
- ▶ **A 30-year-old man lost his life when the 14-foot canoe from which he was fishing capsized. The canoe was in an area where several powerboats were operating and was apparently struck by a wake.**
- ▶ **A canoe was operating on the Buffalo River with three passengers and no personal flotation devices. Vessel B passed closely at a high rate of speed and**

its wake caused the canoe to swamp and sink. The victim was not able to stay above water.

Some boaters and boating officials have raised questions about the low profile of touring kayaks and whether they are visible enough to other vessels. Nothing in the BARD accident data or in the accident descriptions reviewed by ACA indicate that the low profile of a kayak has played a role in boating accidents or fatalities. Many other objects in the water, such as marine mammals, debris, and certain types of buoys have a similarly low profile. This potential risk is greatly reduced by boaters maintaining proper lookout.

Accident Victims

Key to the ability of ACA and others to reduce the number of canoeing and kayaking fatalities is understanding who the victims are. All of the data analyzed in this report reveal information about accident victims. For example, the report shows that most victims were paddling canoes and not wearing a PFD. Beyond that, ACA cross-referenced what it could discern from the general accident, vessel and victim information in BARD and the narrative descriptions of the fatal accidents. Through that research ACA also concludes that:

- ▶ **Approximately 90 % of canoeing and kayaking fatalities are male.**
- ▶ **Approximately 50 % of victims categorized as canoeing and kayaking fatalities were fishing when the accident occurred.**
- ▶ **Approximately 40% of canoeing fatalities for which information is available were in aluminum canoes at the time of the accident.**
- ▶ **Victims of fatal canoeing accidents most commonly were operating inexpensive canoe brands at the time of accident.**
- ▶ **At least 25% of victims in canoeing related fatalities are believed to have consumed alcohol immediately prior to the accident.**

While ACA research was able to derive some valuable victim information from USCG, there

ACA STRATEGY TO REDUCE CANOE & KAYAK FATALITIES

are many gaps and inaccuracies in the reporting on canoe and kayak fatalities. Basic information such as the type of canoe or kayak, vessel hull material and manufacturer, and gender of the victim were either absent or incorrect for many of the accidents. This information needs to be as complete and accurate as possible in order for ACA and others involved in boating safety to effectively target and impact the individuals at highest risk of having a fatal accident.

While paddlesport participation is increasing at an explosive rate, the educational opportunities available to paddlers have declined. The American Red Cross (ARC) discontinued its national programs in 1996 and many local chapters subsequently followed suit. Currently only a few ARC Chapters continue to offer certification as an Instructor in paddlesports. ACA, recognizing the gap left by ARC, has altered several of its educational programs but is not yet large enough to meet the national need. In addition to this, there are populations of infrequent or casual paddlers that have never been reached with any paddling-related safety information.

This report, *Critical Judgment, Understanding and Preventing Canoe and Kayak Fatalities*,

comes at a most important time in the history of paddlesports and presents much needed information on paddling-related fatalities. Based on the information contained in this report, ACA has developed a strategy for reducing canoe and kayak fatalities. Successfully implementing this strategy will require a significant commitment of effort and resources by ACA, other boating safety organizations, state boating agencies and USCG.

ACA, working within the greater boating safety community, hopes to develop a *Paddlesports Education and Safety Awareness National Plan of Action*. The focus of this plan will be to identify gaps in the current system of paddlesport education, instruction and information and identify methods to close those gaps.

Reaching Accident Prone Populations

Canoeing and kayaking related fatalities occur in virtually all aspects of these activities. Because of this diversity, and the diverse background of victims, no single approach or message can reach all of those who need to be reached. Using the information presented in this report on vessel manufacturer and hull material, victim age and gender, the activity being pursued, and the mistakes made, ACA will develop programs, products, and partnerships that can effectively target those people at greatest risk.

There is a particular need to reach the populations of infrequent or casual paddlers that are most involved in capsizes on calm water, and who are not likely to be wearing a PFD. A significant number of these victims were utilizing a canoe for fishing when the accident occurred. This indicates that more effort should be focused on venues and resources that are popular with casual anglers. Aluminum canoes were also prevalent in a large number of fatal accidents. ACA has not uniquely focused its safety efforts at the aluminum canoe market. This oversight needs to be corrected.

ACA will use all of the information contained in this report to target its efforts. To ensure success, new approaches will often need to be tested on a small scale and evaluated for effectiveness. Once deemed effective, these new approaches can be rolled out on a larger scale with confidence of having the desired impact.



PHOTO BY DUFFY PEET

ACA STRATEGY TO REDUCE CANOE & KAYAK FATALITIES

Crafting Effective Messages

The same diversity that drives targeting of specific high-risk populations also drives the content of effective safety messages. The knowledge presented in this report about who the victims are and what mistakes they typically make is key to crafting effective messages.

For example, by knowing that a large portion of fatal capsizes result from occupant movement within a canoe informs ACA and other boating safety groups that there is a need for messages that increase awareness about the risk associated with standing in or moving about a canoe and information on how to do this to minimize capsize risk. The information that needs to be effectively conveyed includes:

- ▶ **Standing up or moving about in a canoe greatly increases the chance of capsize.**
- ▶ **Maintain three points of contact while moving around.** If you move a foot to step forward, you should be holding onto the boat with BOTH hands.
- ▶ **Load the boat properly.** Stay within the limits of the boat's capacity rating listed on the capacity plate (if one is present). Keep weight centered both from side to side and bow to stern. The lower and the closer the load in the boat is to the boat's centerline, generally the more stable the boat will be, assuming there is adequate freeboard.
- ▶ **Keep your shoulders inside the gunwales of the boat.** When retrieving something from the water, reach with your paddle or guide the boat close to the object so you can grab the item from the water without leaning your shoulders over the gunwale.
- ▶ **Take hands-on training.** Paddling instruction will teach you balance, use of stabilizing strokes, and safe exit and entry on the water.

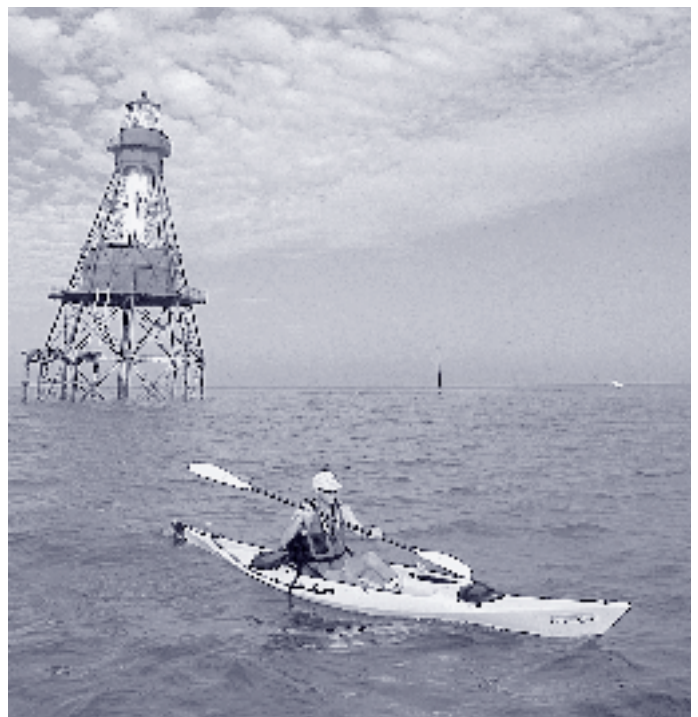
More is involved in crafting effective messages than knowing what needs to be conveyed.

Those creating the message must understand what kind of message will resonate with a specific audience. If one is trying to reach a young image-conscious audience with a message encouraging PFD use, perhaps conveying the risk of drowning will not be as effective as conveying that people on the water without a PFD look silly or ignorant.

Expanded Delivery of Education and Instruction

ACA wants to ensure the widest distribution of targeting paddlesport safety information by partnering with federal, state, and local agencies to utilize public resources. An initial method of producing this "multiplier effect" is to target active attendance and participation by paddlesport experts in key boating safety meetings. It is imperative that the national, state, and local boating safety programs include strong partnerships with the paddlesport community at multiple levels.

It is also important to provide in-depth and up-to-date paddlesport information and training (hands-on and classroom) created specifically for boating safety professionals to deliver to a general land based audience. The full force and effort of the boating safety community of instructors should be armed with the information to provide basic paddlesport safety information.



COURTESY OF WILDERNESS SYSTEMS

PUBLIC POLICY RECOMMENDATIONS

The knowledge presented in this report and gained during its research and development point to a number of key public policy needs, ranging from increased funding for boating safety to more complete and comprehensive accident reporting. ACA proposes a comprehensive package of policy recommendations that it believes will significantly reduce the number of canoeing and kayaking related fatalities.

Accident Reporting

In reviewing and analyzing accident data for this report, ACA discovered a variety of problems that hindered its ability to discern important factual information about the accidents, the vessels involved, and the victims. These problems included missing or inaccurate data, difficultly accessing data, and a failure to capture needed information. To correct these problems the ACA recommends the following:

- 1. Increased training for state and federal marine patrol officers in paddlesport accident investigation is needed to improve the accuracy, detail, and completeness of paddlesport accident reports. Accident investigators need to be more familiar with canoeing and kayaking and the equipment utilized in these activities (both required and optional).**
- 2. Revision of accident report forms to enable the capture of additional information critical to targeting and crafting effective safety messages for those at highest risk of being involved in a fatal canoe or kayak accident.**
- 3. For the purpose of gathering and presenting accident information, canoes and kayaks should be considered as separate types of boats. For accidents involving kayaks, the specific type of kayak involved should be identified in the accident report. Examples include: Whitewater, Touring and Recreational.**
- 4. For the purpose of gathering and**

presenting accident information, canoes powered by outboard motors should be classified as open motorboats.

Funding

State and federal boating safety programs need to be adequately funded. Key to all efforts to reduce boating fatalities is the securing of a greater portion of Wallop-Breaux dollars for boating safety. In addition to seeking this additional boating safety revenue, the ACA recommends several specific projects that should be funding priorities. They are as follows:

- 1. Funding is needed to improve the level of paddlesports knowledge among state boating officials, accident investigators and boating safety educators. To this end, funding priorities should include paddlesport-specific education efforts aimed at boating safety professionals and volunteers.**
Such efforts include: the *Paddlesports Safety Track* and the *National Paddlesport Leadership Forum* proposed for the International Boating and Water Safety Summit (IBWSS), the development and delivery of classroom and on-water courses for boating safety professionals and volunteers, and partnership funding to increase paddlesports representation at boating safety meetings, conferences and educational venues.
- 2. A funding priority must be the development, testing, and delivery of new safety messages aimed at fulfilling the safety education deficiencies evidenced by this report. This includes messages designed to inform all boaters of the unique stability characteristics of small boats, how to avoid capsize, and the increased need to wear a PFD in small craft. The funding should anticipate the possible need to use mass media vehicles such as billboards and theater advertising. It also includes messages specifically targeted at people who occasionally use a canoe or kayak and lack basic**

knowledge about safely operating such craft.

3. Increased funding should be allocated for signage and other educational efforts designed to inform the public of hazards such as low-head dams and high water levels.
4. States should increase funding for waterway law enforcement. Since law enforcement benefits the public as a whole, such funding should be allocated from general funds derived from tax revenue.
5. Federal, state and local funding to maintain and improve the nation's streamgage network should be increased. On the federal side, ACA recommends that the FY2004 funding level for the USGS National Streamflow Information Program (NSIP) be \$28.4 million.

Safety Education

The findings contained in *Critical Judgment* point to a number of public education deficiencies that increase the likelihood of people being involved in fatal canoe and kayak accidents. The following recommendations are designed to eliminate those deficiencies and effectively reach the people at the greatest risk of being involved in a fatal canoe or kayak accident.

1. State and federal agencies, as well as boating safety organizations, need to expand efforts to increase PFD wearage across all segments of the boating community. The effectiveness of the methods, messages, and targeting involved in these efforts needs to be evaluated using measurable benchmarks. Such efforts should draw on the methods successfully used by anti-smoking and seat belt campaigns.
2. Efforts are needed to better inform all boaters of the unique stability characteristics of small boats, the

increased likelihood of capsizing, and how to avoid capsizing. This study reveals that anglers in particular are in great need of this information. The development and delivery of information specific to small boats should utilize the expertise of ACA.

3. When developing boating safety campaigns, state and federal agencies should include basic canoe and kayak safety information that explains the operating differences between small paddle craft and other boats.
4. When developing safety messages specifically related to canoeing and kayaking, state and federal agencies, as well as boating safety organizations, should work with ACA to ensure that the information presented is accurate and up-to-date.
5. States need to develop a consistent statewide approach to signage and portage of low-head dams. The design of such signage should be standardized nationwide. Warning signs for low-head dams should be located well upstream of the dam and should indicate which side of the river the portage is located on.
6. A nationwide study is needed of river put-in/launch areas where boating accidents have occurred downstream due to high water levels that significantly altered the characteristics of the river. These put-in/launch areas should have signage warning the public about high-water hazards.

Waterway Management

Since canoeing and kayaking represent a significant portion of the boating activity that occurs on U.S. waters, state and federal agencies need to adapt waterway management strategies to better meet the safety and recreational needs of paddlers. Waterway management must be responsive to the challenges presented by overcrowding and the diverse mix of boating activities that occur on the nation's waterways.

PUBLIC POLICY RECOMMENDATIONS

1. Since a large number of boating fatalities involve alcohol use, stronger laws should be established to prohibit alcohol consumption while boating. Stronger boating while intoxicated (BWI) laws are also needed in many states, along with severe mandatory penalties for BWI violations.
2. State boating agencies and boating safety organizations should strongly advocate for the removal of low-head dams that are no longer serving a significant public need.
3. Measures should be taken to minimize the mixing of high-speed motorized boating with all other boating activity. Measures considered should include limiting high-speed use to specific zones, wider use of horsepower limits, and adoption of ACA management recommendations concerning personal watercraft use.
4. State boating agencies and boating safety organizations should monitor the placement of waterway obstructions (weirs, low-water bridges, bridge abutments, low-head dams, rootwads, etc.) to ensure that they do not present significant recreational boating hazards, and should oppose the placement of such hazards.
5. State and federal boating agencies and boating safety organizations should support enforceable, recreation-friendly navigability laws in order to prevent private interests from erecting fences and other navigational hazards across recreational waterways.
6. ACA supports the United States Coast Guard (USCG) standard of mandatory PFD wearage for children less than 13 years of age, and urges all states to adopt regulations that are no less stringent. The only exception to this should be the training and competition exemptions, such as those allowed by the USCG PFD carrying regulations.

Manufacturing Standards

While the ACA understands the rationale behind NASBLA and USCG efforts to review canoe and kayak design and function issues such as hull floatation and supplemental floatation, the ACA believes it is critical that any such reviews adequately consider the critical importance of other canoe and kayak performance characteristics to boater safety. The most qualified to evaluate such matters are the actual canoe and kayak designers. The ACA strongly urges that any review of canoe and kayak design involve canoe and kayak manufacturers, top paddlers, and the ACA.

It should be noted that the findings of *Critical Judgment* indicate that the most significant floatation factor in canoe and kayak fatalities is the failure to wear personal floatation. Nothing in any of the accident narratives reviewed for this study pointed to hull floatation, or the lack thereof, as a major factor.

Public Outreach

Because canoeing and kayaking represent a significant portion of the boating activity that occurs on US waters, boating agencies need to reflect that reality and be better positioned to respond to the safety needs of people who canoe and kayak. To that end, ACA recommends the following measures:

1. State boating agencies and the USCG should place a high priority on increasing the proportion of staff that come from a canoeing and kayaking background.
2. State boating agencies should place a priority on building stronger relationships with local paddling clubs.



COURTESY OF MAD RIVER

CONCLUSIONS

Today, canoeing and kayaking are rapidly growing activities that are comprised of many diverse pursuits and that occur in a wide variety of water environments. Canoes and kayaks are small, narrow craft designed to provide a close and intimate encounter with the water. It is a given that greater opportunities for capsizing exist with these activities and that greater opportunities for capsizing can impact the number of fatalities.

With paddling representing as much as half of all boating activity that occurs on U.S. waters, one cannot conclude that the number of fatalities associated with canoeing and kayaking compares unfavorably with the fatality numbers associated with other boating activities. Regardless, any fatality is tragic and any number of fatalities is too many. The facts presented in this report provide valuable insight into canoe and kayak related fatalities, and its recommendations provide the clear direction on how best to reduce the occurrence of such fatalities in the future.

Since fatalities occur across the range of canoeing and kayaking activities, education efforts should continue to be directed to all segments of the paddlesports community. However, the findings of *Critical Judgment* identify priority problem areas and targets that offer the greatest opportunity to significantly reduce canoe and kayak fatalities, namely:

- 1. 75% of all fatalities examined in this report were associated with canoeing.**
- 2. 83% of all canoeing related fatality victims were not wearing a PFD at the time of accident.**
- 3. Occupant movement and weight shift within a canoe played a major role in roughly 50% of all canoeing accidents.**
- 4. Approximately 50% of canoe and kayak related fatalities were fishing at the time of the accident.**
- 5. Approximately 40% of canoeing fatalities were in aluminum canoes at the time of the accident.**
- 6. At least 25% of victims in fatal canoeing accidents are believed to have consumed alcohol immediately prior to the accident. This was not an issue with kayaking fatalities.**

The information presented in *Critical Judgment* reveals that a little bit of knowledge and good judgment could have easily prevented a majority of the fatalities associated with canoeing and kayaking. Increasing awareness about the stability characteristics of canoes and more effectively promoting PFD wearage among casual paddlers must be high priorities. Altering the unsafe behavior of some casual paddler populations will require well crafted and innovative messages designed to specifically resonate with them.

In response to the areas of concern identified in *Critical Judgment*, ACA has developed an organizational strategy to better target and expand its own safety and education efforts, and has proposed a comprehensive package of state and federal policy recommendations. ACA believes that implementing these measures will result in a significant reduction of canoe and kayak related fatalities. With the possible exception of some localized or regional efforts, most of the measures ACA is recommending are not currently part of established boating safety campaigns or programs.

ACA hopes this report will help everyone concerned with canoe and kayak safety to better understand the scope and nature of paddling, the hazards paddlers encounter, the nature of canoe and kayak related accidents, and the populations at most risk of being involved in a fatal canoe or kayak related accident. Armed with this knowledge, ACA and others can more effectively act to reduce canoe and kayak related fatalities.

The benefits and joys canoeing and kayaking bring to millions of Americans each year are innumerable. These activities are clean, relaxing, and healthy ways to enjoy the nation's waters. The recent growth in paddlesports participation is a positive development for a society that struggles with problems such as obesity, stress and pollution. Helping people learn to canoe and kayak safely not only saves life, it encourages participation in activities that greatly improve the quality of life.

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ACA PROGRAMS & RESOURCES

The American Canoe Association national Instruction program has been a driving force in paddlesport education for more than 30 years. In 1929 prior to the establishment of its own instructor certification program, the ACA was instrumental with the development of a standardized paddlesport nomenclature in conjunction with the American Red Cross, Boy Scouts of America and Girl Scouts of the USA.

Today, the ACA has a host of available courses covering many different craft and environments. ACA courses range from basic skills workshops to Instructor Certification courses. "Quickstart" orientation courses may be as short as 3 hours while more advanced Instructor workshops may run to 60 contact hours of instruction.

Courses are available within:

- ▶ **Touring Canoe** — designed for flatwater environments such as ponds and lakes
- ▶ **River Canoe** — designed for moving waters and whitewater to Class III-IV

- ▶ **River Kayak** — designed for moving waters and whitewater to Class III-IV
- ▶ **Coastal Kayak** — designed for tidal marsh areas and coastal areas with surf up to 1 mile from shore in specific wind conditions. This would appear to be the most popular area of programming for 2002 and 2003.
- ▶ **Swiftwater Rescue** — designed for the whitewater paddler and/or rescue personnel who may be called to assist in an entrapment or rescue situation.
- ▶ **Surf Kayak** — a specialize type of paddling which occurs in the coastal surf zone using whitewater type craft
- ▶ **Rafting** — ACA's rafting program is centered on the personal or family raft
- ▶ **Adaptive Paddling** courses are available across most craft in order to facilitate our

Instructors ability to modify programs for those requiring adaptations of equipment due to injury or disability.

- ▶ **Operation Paddle Safe** — designed for individuals who need documentation of exposure to safe paddling practices but not instructor certification.

Additional ACA resources

ACA has produced a series of safety material including:

- ▶ **National Livery Safety System** is a series of 3 canoeing tapes (2 general public, 1 staff training), a risk management manual and livery posters designed to be used in commercial livery/rental facilities, to expose staff and the paddling public to safe paddling practices.
- ▶ **National Paddlesport Safety System** is a series of 3 tapes including Whitewater Rafting, Whitewater Kayaking and the award winning Coastal Kayaking. These tapes, also designed for use in livery/rental facilities increase the breath of safety materials available to the rental customer.
- ▶ **Quickstart Your Canoe/Quickstart Your Kayak Videos** are a pair of tapes produced to offer manufacturers, retailers or municipalities the option of providing safety education to the purchaser of canoes and kayaks in America. This is our latest video series and has been widely distributed since its release in January 2003.
- ▶ **Know Your Limits-** an 8 page glossy pamphlet designed to convey very elementary concepts in paddlesport safety across the widest possible audience. More than 270,000 have been distributed and will be available through the ACA website in the near future.

▶ The **International Scale of River Rating Difficulty** is a guide for assessing the difficulty of a stretch of water. Some rivers will not clearly fall into a neat system. Temperatures below 50 °F should change a rating to be one class more difficult than normal.

- ▶ **Class I** — Moving water with few riffles and small waves. Few or no obstructions.
- ▶ **Class II** — Easy rapids with waves up to three feet and wide clear channels that are obvious.
- ▶ **Class III** — Rapids with high, irregular waves often capable of swamping an open canoe. Narrow passages that often require complex maneuvering. May require some scouting from shore.
- ▶ **Class IV** — Long, difficult rapids and constricted passages that often require precise maneuvering in very turbulent waters. Scout from shore often necessary and conditions make rescue difficult. Canoeists and kayakers should have the ability to roll.
- ▶ **Class V** — Extremely difficult. Long very violent rapids with highly congested routes that nearly always must be scouted. Rescue conditions are difficult and there is a significant hazard to life in the event of a mishap. Ability to execute a roll is essential for all boaters in kayaks and closed canoes.
- ▶ **Class VI** — Difficulties in Class V carried to the extreme of navigability. Nearly impossible and very dangerous. For experts only.

GLOSSARY OF PADDLING TERMS

Bow: The front of the boat

Brace: A defensive maneuver to avoid capsizing that combines a paddle stroke and hip snap.

Deck: The top of the boat keeps the water out and helps the handling in big water.

Deckplates: Plates at the bow and stern of a canoe that attach to the gunwales and deflect water.

Eddy: Quiet spot in whitewater, just downstream of the rock. Paddlers use eddies to stop and rest, to scout an upcoming rapid, and for access to fun play spots.

Eddy Turns: Eddy turns are the foundation for controlling the speed of your descent down the river. In the quiet of the eddy, a paddler can look at the rest of the rapid, rest, and line up for your next move or get out to portage.

Ferry: A ferry is a maneuver that combines paddling with boat angle to maneuver a kayak across a whitewater river.

Flare: Progressive widening of the hull from the waterline to the gunwales to deflect water and increase stability in rough water.

Float Bags: Bags filled with air that fit within the hull of a canoe or kayak to provide extra flotation.

Gunwales: The rails along the top edge of the hull.

Hatch: A covered opening in the deck of a sea kayak that allows easy access to supplies.

Hull: The bottom of the boat, the hull design affects the tracking and turning characteristics of the boat.

Hole: A hydraulic (reversal of current) that is formed by water flowing over a submerged rock.

Hydraulic: A reversal of current formed by water flowing over a submerged rock, generally less water than forms a hole, although the words are often used interchangeably.

Hypothermia: A potentially life-threatening condition created when the human body's core

temperature is below 95° Fahrenheit.

Initial stability: Stable platform feel to a boat. Boats that have a lot of initial stability generally have a very hard chine, or sharp corner on the hull.

Keepers: An extremely powerful variation of hydraulics.

Rocker: Rocker is the degree to which the hull curves at the ends. A boat that has a lot of rocker will spin more easily, while a boat that has little rocker will be faster.

Rolling: A self-rescue technique used to right a properly outfitted craft while the paddler remains inside.

Secondary stability: Boats that have solid secondary stability tend to have a rounder hull in the cross section. These boats are not quite as stable when you first enter, but exhibit more stability when leaned over on their sides.

Strainers: Objects, such as downed trees or single branches, in river current that allow water to flow through but not people. Strainers cause a severe pinning hazard for paddlers.

Stern: The rear of the boat.

Spray skirt: A neoprene or nylon cockpit cover that is worn by the paddler and secured around the rim of the cockpit to keep the water out of the kayak.

Surfing: Just like surfers on boards in the ocean, kayakers can surf. On rivers the wave stays in the same spot, while on the ocean it moves.

Throwbag: A nylon bag filled with foam and climbing grade rope that is thrown to rescue paddlers swimming in whitewater.

Tracking: The ability of the boat to go straight easily.

Tumblehome: The inward curve of the hull from its widest point to the gunwales.

Undercut Rocks: Undercuts are a water feature where a slab of rock, or rock shape, forces the current flow to go under the surface.



*This project made possible through support provided by the National Safe Boating Council.
NSBC Mission: To enhance the safety of the recreational boating experience through education and outreach.*

*For additional information on boating safety visit:
www.acanet.org
www.safeboatingcouncil.org*