Excerpts from:
Whitewater Rescue Manual
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Charlie Walbridge is one of the first seven individuals inducted into the International Whitewater Hall of Fame. He is being recognized for his many contributions to the whitewater safety and rescue field. Charlie has conducted numerous swiftwater rescue clinics for NRS associates and we're proud to be associated with him!

The International Whitewater Hall of Fame and Museum is located at the Adventure Sports Center International, McHenry, Maryland

Cold-Water Protection (Pg 24-25)

Water draws heat from the body 25 times faster than air. Like windchill, the effects of cold water increase when the current is fast. Sudden immersion in snowmelt or spring runoff is extremely debilitating, causing a substantial loss of strength, coordination, and judgment rather quickly. All cold-weather paddlers should select the gear needed for the insulation required to stay warm.

Drysuits and wetsuits both work effectively in cold water. In a wetsuit, air is trapped inside the neoprene material, and the suit fits snugly enough to keep most cold water out. What little water gets inside is quickly warmed by the user's body heat. Drysuits create an actual barrier between the environment and the paddler, eliminating that initial "cold-water shock." Paddling drysuits are made of a waterproof material with latex seals at the neck, wrists, and ankles. The paddler regulates the inside temperature by adding or removing layers of insulation, such as pile or polypropylene. In milder weather, a water-proof shell top or paddle jacket can be combined with pile clothing or a wetsuit for comfort.

The first goal is to protect the torso, which shelters the "core" of the body. The greatest heat loss occurs in the armpits and crotch. Next, pay special attention to the extremities. The head radiates a surprising amount of heat. If the helmet alone is not warm enough, pile or neoprene liners can be worn inside. Neoprene booties cover the paddler's feet, and if the sole is thick enough they can be used alone. Another alternative is to wear lightweight neoprene socks inside sneakers. In cold weather a boater's hands quickly lose the strength and sensitivity needed for effective paddling. Neoprene gloves or mittens are one answer; mittens are warmer than gloves, but more awkward and harder to find. Pogies (mittens that cover both the hand and the paddle) permit direct hand-to-paddle contact for maximum control with a kayak paddle. In borderline weather, carry hand protection along for possible use later in the day.

Hypothermia (Pg 129-130)

The human body functions only within a narrow temperature range. Warmth must be maintained to support the chemical and metabolic functions sustaining life. When the body cools below acceptable levels (hypothermia), there is a significant loss of strength, coordination, and alertness. Patients suffering from hypothermia may become unable to paddle effectively or to assist in their own rescue.

Paddlers must often contend with water that is dangerously cold. The effects are felt with surprising speed. Just like the effects of windchill, those of moving water produce an enhanced cooling effect that multiplies the impact of co!d water. But hypothermia does not always occur in cold weather. Unexpected summer storms can soak an unprepared boater, or the wind can steal heat from his body. An unprotected boater who takes a long swim on a cool, overcast day may find it hard to rewarm. An injured victim may experience hypothermia as shock sets in

Levels of Hypothermia

The human body has three layers; an outer superficial layer, an intermediate layer; and the inner core. The superficial layer consists of the skin and subcutaneous tissue; the intermediate layer is made up of the extremities, skeletal and muscular tissues, and some lesser organs; the inner core contains the most critical

organs; the heart, lungs, and brain. When hypothermia sets in, the body prioritizes heat distribution. It works to keep the vital core warm, hoarding the additional calories required to heat parts of the body that are not necessary for survival,

As the body begins to chill, the first signs of hypothermia come in the form of muscle tension and goose bumps. This non-shivering heat generation can double the metabolic rate. As the core temperature continues to drop, shivering begins. These uncontrolled contractions can increase the metabolism to five times the normal rate. Now the body is burning roughly 400 calories per hour. That's approximately the number of calories in two Snickers candy bars. Under the right conditions, the body can still rewarn itself.

At some point, the body starts to realize it is beginning to lose its battle to heat all its layers and decides it can survive without the superficial one. By shunting the blood flow away from the skin and outer tissues, it reduces the flow by about I to 2 percent. Strenuous activity could increase heat output, but the body has limited stores of fuel. Heating the entire body might burn what reserves are left and leave the victim to cool even more quickly.

When core body temperature fails below 95°F, shivering diminishes. The patient may become confused; reasoning becomes clouded. With continued heat loss, the body decides to sacrifice parts of itself so that the brain can survive. By reducing the area being heated, life is prolonged. First, the body decides it doesn't need the extremities, and carbon dioxide and lactic acid build up in these areas. Then it begins to shut down blood flow to unnecessary organs. And finally, it will limit flow to the three organs that sustain life itself.

As the body continues to cool, the victim begins to lose touch with reality. In some cases. they experience atypical mood swings and may become argumentative or combative when assistance is offered. Once the core body temperature drops to 90°F, shivering is replaced by muscle rigidity, and mental facilities are severely impaired. The victim is semiconscious, progressing toward unconsciousness. As the core temperature continues to drop, the metabolic rate diminishes, oxygen consumption drops, and respiration slows. Cardiac output also slows and weakens, resulting in further reduction in blood flow.

As lung and cardiac function diminish, cardiac arrhythmias develop, and ventricular fibrillation, a spasm of the heart muscle, eventually leads to cardiac arrest. A review of hypothermia symptoms follows:

- *Temperature above 95°F. Conscious and alert. Vigorous uncontrollable shivering, pain or numbness in extremities, loss of manual dexterity, slurring of speech.*
- *90° to 95°F. Conscious. Mildly impaired mental facilities. Diminished shivering is replaced by muscle rigidity.*
- *86° to 90°F. Semi- or fully unconscious. Severely impaired mental abilities; may appear intoxicated. Rigid muscles, cardiac arrhythmias.*
- *80° to 86°F. Unresponsive, unconscious. Rigid muscles, dilated pupils barely responsive to light, diminishing or nonexistent pulse and respiration, blue-gray skin color.*
- *80°F. Ventricular fibrillation, cardiac arrest. Pupils fixed and dilated. Death.*

Loss of body heat occurs in a number of ways that may affect a paddler simultaneously:

- *Radiation: Heat is given off to a cooler environment directly. The amount lost to cold water is many times that of cold air.*
- *Conduction: Heat passes out of the body directly into a cooler object, such as the ground an injured person is lying on.*
- *Convection: Heat rises away from the body into the air. Clothing helps prevent this.*
- *Evaporation: Heat is removed from the body as water or perspiration evaporates and the skin dries. This is why wet clothing should be removed from hypothermia victims.*
- *Respiration: Heat is continually lost as cold air is drawn into the lungs, warmed, and then exhaled.*