Draft

Injuries in Commercial Whitewater Rafting

❖ 1998 Annual Report ❖

A Summary of Injuries Reported by
Licensed Commercial Whitewater Outfitters
on West Virginia Rivers

Prepared for: The West Virginia Division of Natural Resources on behalf of the Whitewater Commission

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Introduction

Since 1994, commercial rafting outfitters in West Virginia have been required to report injuries sustained by their guests that "occur during the performance of a licensee's [outfitter's] services while underway [on the river]" that "require medical treatment by a licensed health care provider, excluding diagnostic analysis" (West Virginia Legislative Rule §47-27-11 [*Accident Reports*]). This generally has been interpreted by the industry and West Virginia Division of Natural Resources (DNR) to mean that injuries requiring a treatment procedure (e. g., setting a fracture, sutures, etc.) performed by a medical doctor, osteopath, registered nurse, or physician's assistant must be reported. In this report, an overview and analysis is presented of injuries reported by the commercial rafting industry during the 1998 season under the requirement set forth in §47-27-11. No judgment was made in this analysis as to whether reported injuries conform to reporting requirement, thus, all injury reports submitted by licensed outfitters are included. However, evidence will be presented suggesting that many injuries that were reported fail to meet the reporting requirement.

Table 1. Reported Injuries in 1998 by Licensed Outfitters

Outfitter	Frequency	Percent
ACE Whitewater (ACE)	1	1%
Rivers/River II (RIV)	0	0%
Extreme Expeditions (EEI)	3	3%
Alpine Bible Camp (ABC)	0	0%
Blackwater Outdoor Center (BOC)	0	0%
Blueridge Outfitters (BRO)	0	0%
Cantrell Canoes (CCR)	1	1%
Cheat River Outfitters (CRO)	2	2%
Class VI (CVI)	11	10%
Drift-a-Bit (DAB)	4	4%
Historical River Tours (HRT)	0	0%
Laurel Highlands (LHR)	0	0%
Mountain River Tours (MRT)	29	25%
Mountain Streams and Trails (MST)	4	4%
New River Scenic NRSW)	0	0%
New and Gauley River Tours (NGRA)	0	0%
North American (NARR)	3	3%
Passages to Adventures (PTA)	1	1%
Precision Rafting (PRE)	0	0%
River Riders (RRI)	19	17%
River & Trails (RTO)	7	6%
Songer Whitewater (SW)	21	18%
The Rivermen (TR)	3	3%
USA Raft (USA)	0	0%
Appalachian Wildwater (AW)	0	0%
Whitewater Adventurers (WWA)	0	0%
Cheat Whitewater World (WWW)	0	0%
WV Whitewater (WVW)	1	1%
Whitewater Information (WWI)	2	2%
Wildwater Expeditions (WWE)	2	2%

Injuries were unevenly distributed among licensed outfitters (Table 1). Four outfitters accounted for 70% of reported injuries, with 30% distributed among the remaining 26 outfitters. This suggests that these four outfitters are over-reporting for documentation, liability, or other undetermined reasons, while other outfitters may be under-reporting or not reporting at all. Determining how many injuries go unreported is made difficult by verification

complexities and self-reporting methodologies used by most regulatory agencies (Whisman and Hollenhorst, 1999).

Incidence Rates

A total of 114 injuries sustained by rafting guests were reported in 1998. Three reports describing injuries of river guides were submitted but are excluded from this analysis. Fifty-one injuries (45%) were reported on the Lower New River, which in 1998 accounted for 53% of reported commercial river use (Table 2). Second was the Shenandoah River with 24 (21%) reported injuries, which appears to be a substantial distortion relative to previous years -- only eight injuries were reported on the Shenandoah in the three years previous to 1998. Most of the injuries on the Shenandoah in 1998 were reported by River Riders, Inc. which came under new management during the year, suggesting that inadvertent over-reporting occurred.

Table 2. Reported Injuries and Injury Incidence Rates in 1998 by Designated Whitewater Zones.

River Segment	Frequency	Percent	Incidence per 1,000 User Days
Cheat Canyon	2	2%	0.400
Lower New	51	45%	0.381
Upper New	3	3%	0.121
Upper Gauley	19	17%	0.456
Lower Gauley	12	11%	0.512
Shenandoah	24	21%	1.239
Potomac*	2	2%	n/a
Not Reported	1	1%	n/a
Total	114	--	0.441

* Not a designated whitewater zone

Nineteen (17%) of injuries were reported on the Upper Gauley, 12 (11%) on the Lower Gauley, 3 (3%) on the Upper New, and 2 (2%) on the Cheat Canyon. Two (2%) injuries were reported on the Potomac River, a popular river adjacent to the Shenandoah, but that has not been designated as a whitewater zone by the Whitewater Commission.

Injury incidence rates ranged from 0.121 per 1,000 user days on the Upper New to 1.239 per 1,000 on the Shenandoah, for an overall incidence rate of 0.441 per 1,000 across all rivers. These rates appear to be somewhat elevated compared to previous years, especially on the Shenandoah. For example, Whisman and Hollenhorst (1999) reported overall injury incidence rates 0.263 per 1,000 for the 1995-97 seasons. The accuracy of injury incidence rates in commercial rafting is questionable because of suspected over-reporting of minor injuries that may not meet the reporting criteria, and by verification complexities that preclude the determination of how many possibly reportable injuries that go unreported.

Injuries

The age of persons for whom injury reports were submitted in 1998 ranged from 9 to 69, with an average of 34 years. A majority were between the ages of 20 to 39 years (29%) or were over forty (27%). Fifteen percent of injured individuals were less than 20 years old, but the age or birth date of 27% of injured boaters was not reported. Fifty-five percent of injured persons were female. Most individuals (48%)

sustaining injuries during 1998 had previous rafting experience, meaning they had taken at least one commercial rafting trip prior to the trip on which they were injured. These individuals had taken an average of 2.7 previous rafting trips.

Types of injuries reported in 1998 included sprains/strains (20%), lacerations (20%), contusions/bruises (18%), abrasions (11%), fractures (11%), and dislocations (4%). The remaining injuries included other unspecified injuries (8%), or were not specified at all (9%) (Figure 1). With exception to a substantial increase in reported abrasions, these proportions are similar to the prevalence of injury types reported in the previous three years (Whisman and Hollenhorst 1999).

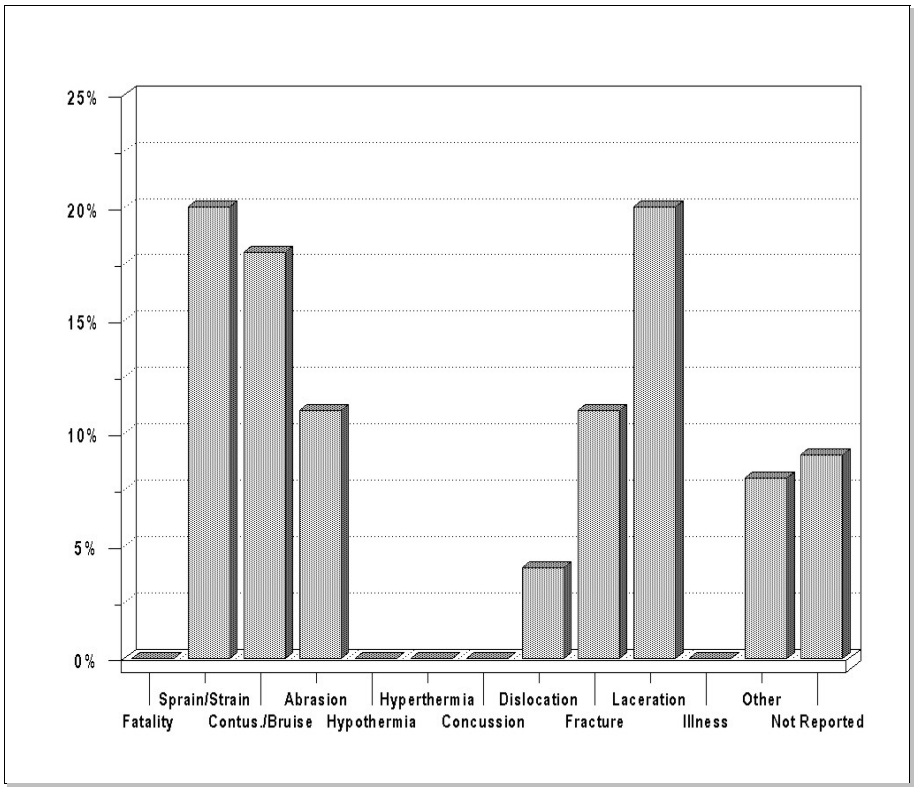

Figure 1. Percent of injuries by type of injury

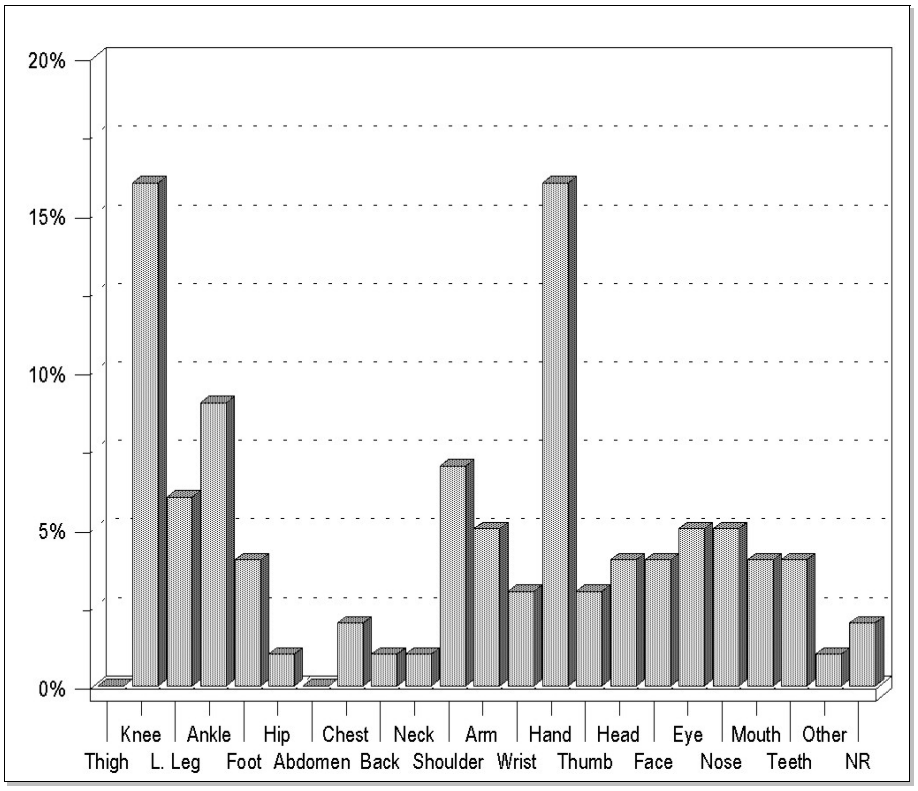

Figure 2. Percent of injuries by injured body part

The most frequently injured parts of the body were the arm/wrist/hand (27%), including injuries to the hand (16%), arm (5%), wrist (3%) and thumb (3%). Twenty-two percent of injuries involved some part of the face, including the eye (5%), nose (5%), mouth (4%), teeth (4%), or other facial parts (4%). Knee injuries (16%) were prominent, as were injuries to the ankle (9%), shoulder (7%), lower leg (6%), foot (4%) and head (4%). Injuries to all other body parts accounted for 3% or fewer injuries (Figure. 2).

Twenty-seven percent of injuries involved evacuation on the injured person either to an outfitter base camp or medical facility, or otherwise prevented the injured person from completing the raft trip. This was significantly lower that in previous three years when an evacuation rate of 40% occurred. Significantly higher rates of reported abrasions and hand injuries, combined with substantially fewer evacuations, suggests that relatively minor injuries likely were unnecessarily over-reported in 1998.

Most injuries sustained by commercial boaters occurred in the raft (45%). Injuries sustained on board the raft typically result from collisions between passengers in the raft, being struck by a paddle or other rafting equipment, or entanglement of extremities in parts of the raft. This was followed by injuries occurring in the water after falling from the raft while running rapids (35%). Passengers thrown from a raft are subject to the forces of high volume, turbulent water in which they may encounter boulder entrapments, floating debris, or other hazards. The remaining 20% of injuries occurred on shore (12%), or at other unspecified (4%) or unreported (4%) locations.

On-site administration of first aid for injuries included application of ice (31%), bandages (24%), splinting/immobilization (12%), antiseptic (11%), elevation (7%), direct pressure (6%), and treatment for shock (0.6%). No first aid was administered for 4% of injuries.

As stated above, the legislative rule governing injury reporting (§47-27-11 [*Accident Reports*]) specifies that injuries that "require medical treatment by a licensed health care provider, excluding diagnostic analysis" must be reported to the West Virginia DNR. Of the injury reports submitted during 1998, only 18% indicated that injured individuals were evaluated by a medical or osteopathic doctor (MD or DO), 3% by a registered nurse (RN), 5% by an EMT or paramedic, and none by a physicians assistant (Figure 3). Eleven percent of reports indicated that evaluation of injured individuals was performed by persons with some other training (e.g., First Responder) who most likely were trip leaders or guides. On 74 (65%) of injury reports, no response was given as to by whom or if the injured individuals were evaluated. Also, only 19% of reports indicated that injured individuals received some form of treatment in the form of a splint or cast (8%), stitches (4%), medication (1%), oxygen (1%), or other unspecified treatment (6%). Seven percent of reports indicated "diagnosis only," while on 74% of reports no treatment was not reported.

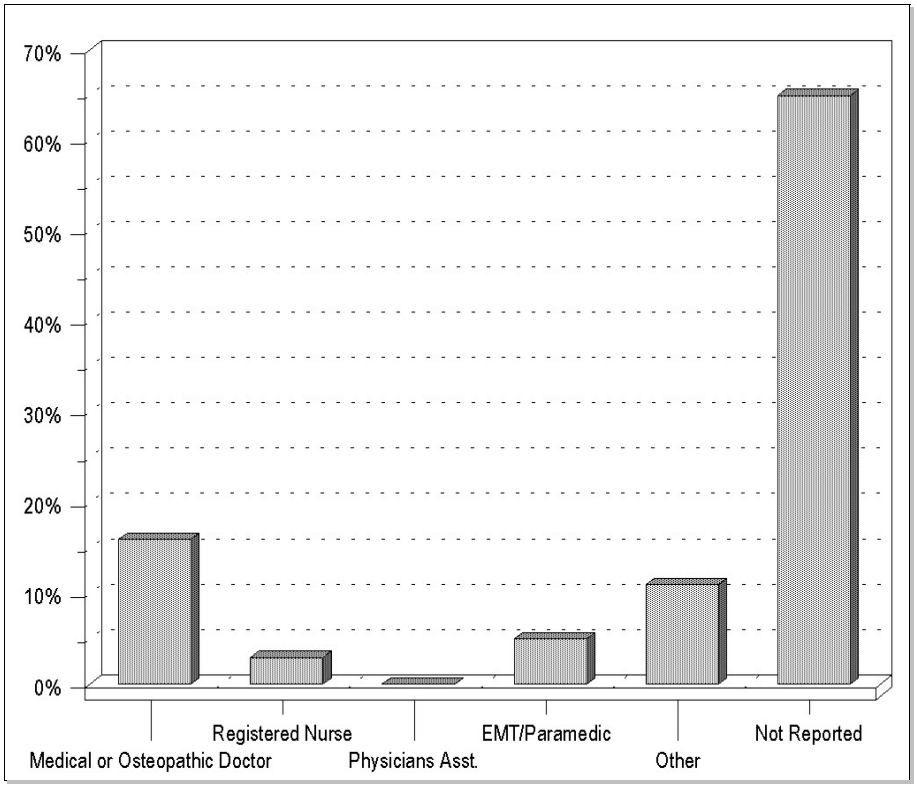

Figure 3. Percent of injuries by type of health care professional

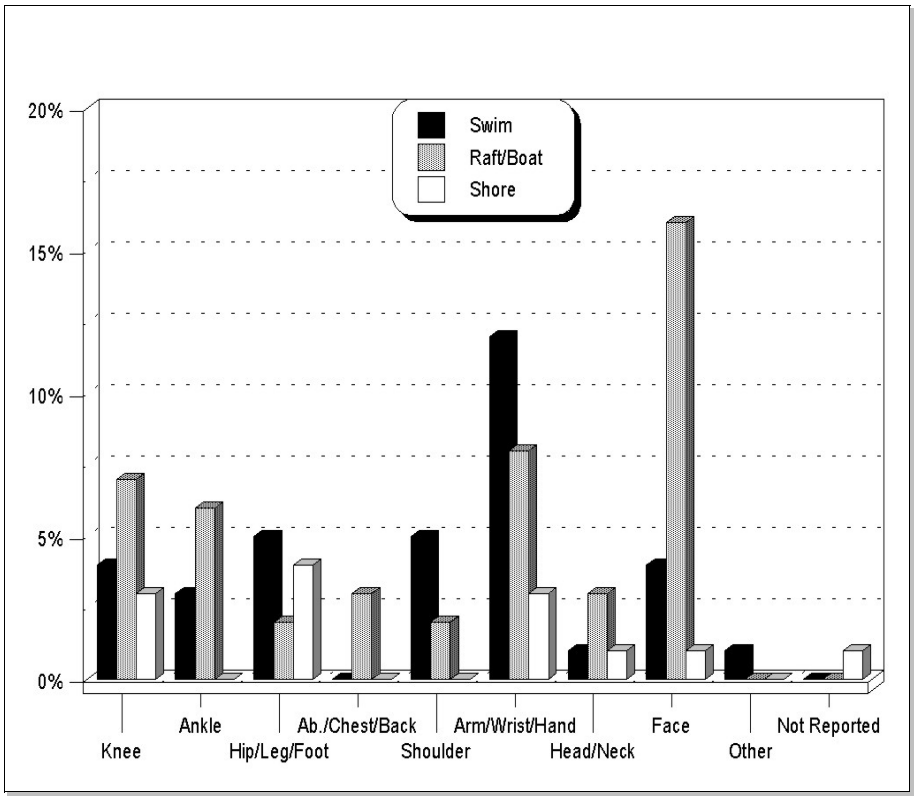

Figure 4. Percent of Injuries sustained in various body parts by location of occurrence.

The large number of body part categories were collapsed to facilitate cross-tabulation for the purpose of identifying injury associations. Apparent associations were observed in injured body parts by location of occurrence (Figure 4). Injuries occurring in the raft more commonly were to the face, while injuries occurring in the water involved the arm/wrist/hand and shoulder. Injured body parts also appeared to vary by gender, with female boaters more frequently sustaining arm/wrist/hand and facial injuries, while males slightly more frequently sustained injuries to the knee and shoulder (Figure 5). Finally, an association was observed between types of injuries and injured body part: lacerations more commonly involved injuries to the face; sprains/strains occurred more often to the knee, ankle, and arm/wrist/hand; fractures more often involved the extremities, including the hip/leg/foot and arm/wrist/hand, or the face (i.e, nose); and dislocations more often involved the shoulder.

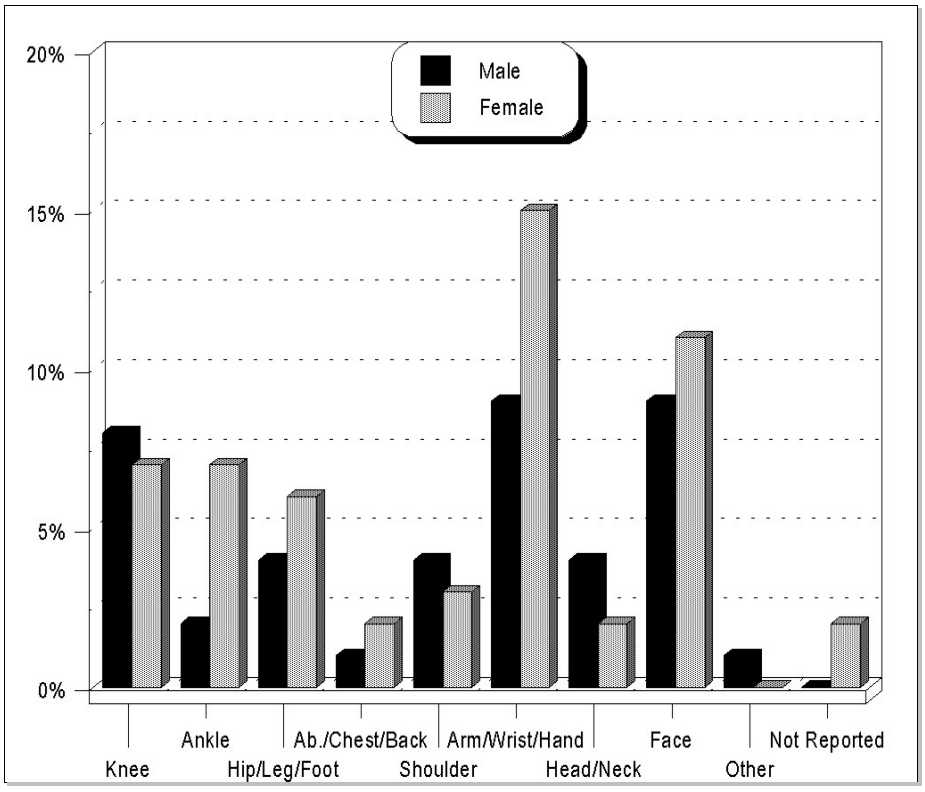

Figure 5. Percent of injuries sustained in various body parts by gender.

Summary

During the 1998 rafting season, a total of 114 injury reports were submitted on behalf of guests of

commercial rafting outfitters who sustained injuries. The average age of injured persons was 34 years, 55% were female, and 48% had previous rafting experience. The overall injury incidence rate was 0.441 per 1,000 rafters for the year, which was higher than the previous three years, most likely because of over-reporting of relatively minor injuries.

The most frequently injured parts of the body were the extremities (arm/wrist/hand, hip/leg/foot, knee, ankle) and parts of the face. Predominant injury types included lacerations and sprains/strains, followed by contusions/bruises, fractures abrasions, and dislocations. On-site administration of first aid included application of ice, bandages, splinting/ immobilization, antiseptic, elevation, direct pressure, and treatment for shock. No first aid was administered for 4% of injuries.

Most injuries occurred in the raft as a result of collisions among passengers, being struck by a paddle or other equipment, or entanglement of extremities in parts of the raft. Injuries occurring in the raft more commonly were to the face, while injuries occurring in the water involved the extremities. Female boaters more frequently sustained arm/wrist/hand and facial injuries, while males more frequently sustained injuries to the knee and shoulder. Finally, facial injuries more commonly were lacerations; knee, ankle, and arm/wrist/hand injuries were more frequently sprains/strains; fractures more often involved the extremities or the face (i.e, nose); and dislocations more often involved the shoulder.

Conclusions and Recommendations

It appears that many injuries reported in 1998 were not necessarily "*reportable*" under current reporting requirements and may have resulted in a higher injury incidence rate in 1998 than previous years. As well, only four outfitters accounted for most of the injuries reported in the year. Similarly, verification limitations make it difficult to determine if or how many injuries go unreported. Combined, these factors are cause for concern in that they almost certainly affect the determination of actual incidence rates or the true characteristics of rafting injuries.

Since most injuries occur in the raft while running rapids, involve injuries to the face, and result from contact among passengers or paddling equipment, preventive measures such as attaching face protection to paddling helmets, carrying fewer passengers per raft, or portaging dangerous rapids are suggested. However, these remedies likely are not without undesirable consequences. More effort is needed to verify injury rates and injury severity, and to document the magnitude of related medical costs.

References

Whisman, S. A. and S. J. Hollenhorst. 1999. Injuries in Commercial Whitewater Rafting. *Clinical Journal of Sports Medicine* 9:18-23.