Introduction

This report is an overview and analysis of the injuries reported to the West Virginia Whitewater Commission by the commercial rafting industry for the year 2009. The information contained in this report is based on the requirement described in West Virginia Legislative Rule §58-12-11. No judgment was made in this analysis whether reported injuries follow the criteria for reporting established by West Virginia Legislative Rule §58-12-11. Therefore, all injury reports submitted by licensed outfitters are included.

Demographics

A total of 31 individuals were injured while participating in a commercial rafting trip during 2009. The age of persons for whom injury reports were submitted in 2009 ranged from 16 to 72 years, with a mean of 37 years. The majority (55%) was between the ages of 17 to 40 years or was over age forty (22%). Seven percent of injured individuals were less than 20 years of age. The age of injured individuals was not recorded on twenty-two percent of report forms.

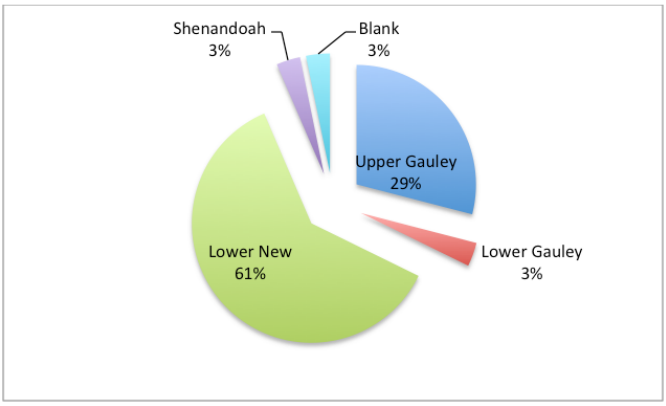
Over half (55%) of the injured were male. Over one-third (37%) of those injured had taken at least one commercial rafting trip prior to the trip on which they were injured.

River Where Injury Occurred

Sixty-one percent of reported injuries occurred on the New River, followed by the Gauley with forty two percent. The least number of injuries (1) occurred on the Shenandoah River (Figure 1).

Nineteen injuries (61%) were recorded for the Lower New River, which accounted for 55% of commercial river use, followed by the Upper Gauley with nine injuries (29%) and 11% of river use (Table 1).

Figure 1. Reported Injury Rates by River



Injury rates in commercial whitewater rafting is questionable because of suspected discrepancies in the reporting of minor injuries that may not meet the criteria established by the WV Whitewater Commission, reportable injuries that go unreported, and the variability of monthly user numbers.

Injury rates are presented in Table 1 by *Injuries Per 1000 Rafter Days* (*IPTRD*). Dividing the number of reported injuries by the total number of rafting participants and multiplying by 1000 calculate this rate. The total number of rafting participants FY 2009 = 155,673 (West Virginia Department of Natural Resources, 2009). IPTRD rates FY 2009 ranged from 0.049 on the Shenandoah to .524 on the Upper Gauley. The overall *IRPD* for all rivers was 0.167.

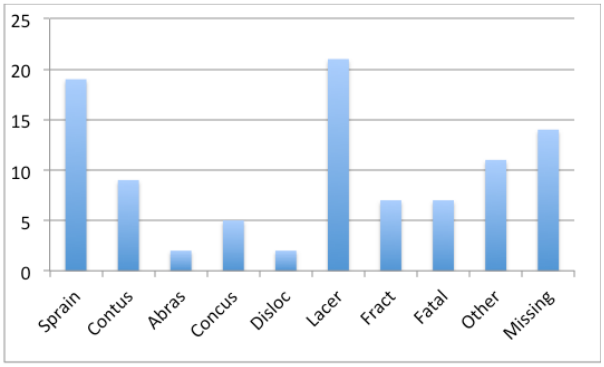
Table 1. *Reported Injuries and Injury Incidence Rates by River*

River	Number Injured	Percent	*IPTRD*
Upper Gauley	9	29	0.524
Lower Gauley	1	3	0.108
Lower New	19	61	0.221
Shenandoah	1	10	0.049
Missing	1	3	0.000
Total	19	100	0.167

Injuries

Types of injuries reported in 2009 included lacerations/punctures (21%), sprains/strains (19%), contusions (9%), and fractures (7%). The remaining injuries included other unspecified injuries (12%), or were not specified (missing) at all (14.%) (Figure 2).

Figure 2. *Type of Injury by Percent*



The most frequently injured anatomical regions of the body were the head (12%) arm/hand (10%), including injuries to the hand (5%) and arm (5%). Twenty four percent of injuries involved some part of the face (7%), including the eye (2%), nose (5%), mouth (5%), and teeth (5%). Knee injuries (7%) were noticeable, as were injuries to the ankle (7%). The anatomical location of the injury was not specified on 21% of reports (Table. 2).

Table 2. Injuries by Anatomical Location

Anatomical Location	%
Upper Leg	2.3
Knee	7.1
Ankle	7.1
Hip	2.3
Chest	2.3
Back	4.7
Neck	2.3
Shoulder	4.7
Arm	4.7
Hand	4.7
Head	11.9
Face	7.1
Eye	2.3
Nose	4.7
Mouth	4.7
Teeth	4.7
Missing	21.4

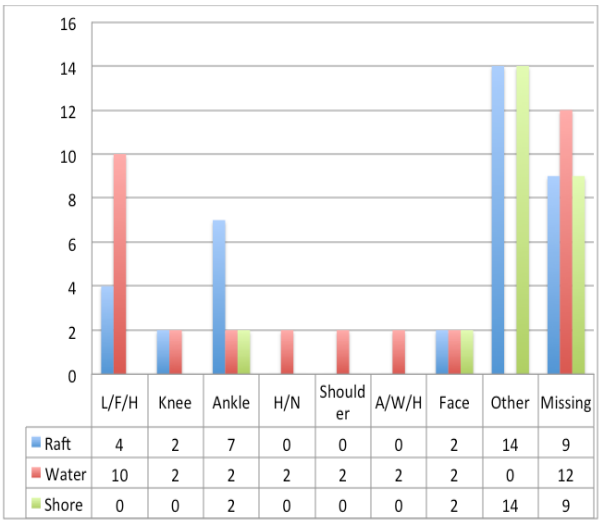
Injury Setting

Forty-five percent of the injuries sustained by commercial rafters during 2009 occurred in the raft. These injuries usually occur as a result of collisions between passengers in the raft, being struck by a paddle or other piece equipment, or entanglement of the extremities in parts of the raft. This was followed by injuries happening in the river after falling from the raft while running rapids (42%). Passengers ejected from a raft are subject to the forces of high volume; turbulent water in which they may encounter foot entrapments, impacts with rocks, floating debris, or other hazards. Seven percent of injuries

occurred while guests were on shore or were identified as other (9%) or went unreported (3%) (Figure 3).

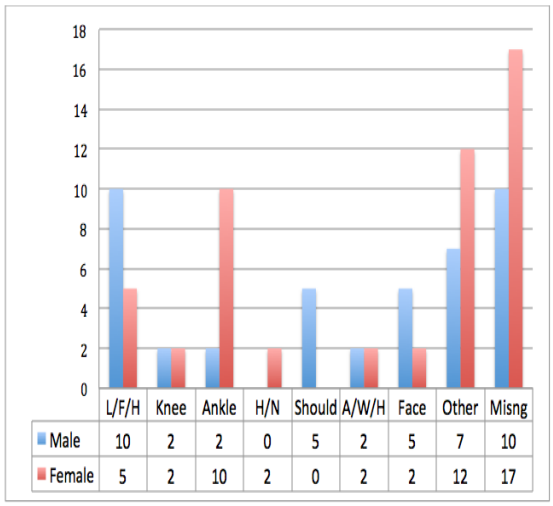
The large number of anatomical location categories was collapsed to facilitate cross tabulation in order to identify injury associations. Apparent injury associations were observed occurring in the raft more commonly were to the ankle, while injuries occurring in the water involved the leg/foot/hip. A limited number of injuries occurred to the ankle and face while on shore. Also note missing data (Figure 3).

Figure 3. Percent of Injured Anatomical Location and Setting of Occurrence



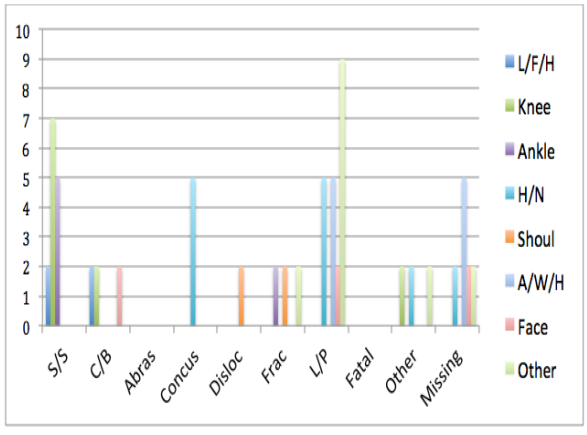
Injuries also appeared to vary by sex, with females more frequently sustaining ankle injuries, while males were more prone to leg/foot/hip, shoulder, and facial injuries. Both males and females received equal number of injuries to the knee and arm/wrist/hand (Figure 4).

Figure 4. Percent of Injuries by Sex



An association was observed between types of injuries and anatomical location: sprains and strains (S/S) occurred more often to the knee and ankle, dislocations involved the shoulder, and laceration/punctures more often involved the arm/wrist/hand (A/W/H) and head/neck (H/N) (Figure 5).

Figure 5. Percent of Anatomical Location and Type of Injury



First Aid Rendered

First aid was administered on-site for injuries and included the use of bandages

(26%), ice (26%), splinting or immobilization (16%), elevation of the extremity (11%), application of direct pressure (6%), and antiseptic (3%). One person (3%) received CPR.

Evacuations

Thirty two percent of injured rafters required evacuation to an outfitter base camp or medical facility, or otherwise prevented the injured from completing the raft trip. This finding was 10% lower than the 42% reported in 2008.

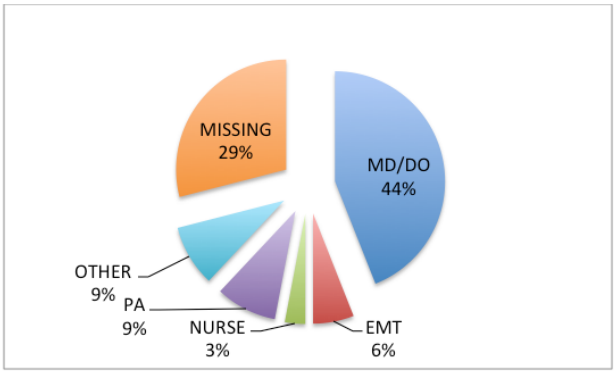
Treatment by Health Care Provider

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.

Only 44% of the injury reports submitted during 2009 indicated that injured individuals were evaluated by a medical or osteopathic doctor (MD or DO), 6% by an EMT or paramedic, 3% by a registered nurse (RN), and 9% by a physicians assistant (Table 3). Nine percent of reports indicated that evaluation of the injured was performed by persons with some other training (e.g., First Responder, Wilderness First Responder) who most likely were trip leaders or guides. Information was missing on 10 (29%) of the injury reports as to who treated the injured or if the injured were evaluated.

Over half of injury reports (58%) indicated that injured individuals received some form of treatment including stitches (22%), a splint or cast (11%), medication (16%), administered oxygen (11%), or other unspecified treatment (33%). Twenty two percent of reports indicated "diagnosis only."

Figure 5. *Professional Health Care Provider*



Summary

During the 2009 commercial rafting outfitters submitted a total of 31 injury reports. The mean age of injured persons was 37 years, 55% were male, and 37% had previous rafting experience. Over half (62%) of the injuries reported occurred on the New River. The overall injury incidence rate was 0.337 per 1,000 rafters for the year.

Predominant injury types included lacerations/punctures, sprains/strains, contusions and fractures. A large portion of injuries was either unspecified injuries or was noted as missing.

One-half (50%) of injuries occurred in the raft and were to the ankle. Injuries occurring in the water involved mostly the leg/hip/foot. Female rafters more frequently sustained ankle injuries, while males more frequently sustained injuries to the leg/hip/foot, and face. Sprains and strains occurred more often to the knee

and ankle, dislocations involved the shoulder.

Conclusions and Recommendations

The majority of injuries continue to occur in the raft. Preventive measures such as attaching face protection to helmets, wearing mouth guards to protect teeth, or carrying fewer passengers per raft. While these remedies make sense, they might not be cost effective or without undesirable consequences. Instead, guides should be encouraged to educate customers or make them aware on what, where, and why injuries occur on raft trips to reduce injuries, or at least to improve the customer's experience. This may be a more effective approach to reducing injuries.

Many Injury Report Forms had information "missing", or marked "other". This lack of information creates a void in the reporting system and should not be tolerated. As guide awareness about accidents, injuries, illnesses, and hazards improves, guides are more likely to report injuries.

Guides should be encouraged to do a better job of reporting injuries. Report only medically significant injuries or illnesses. Minor injuries such as abrasions or cuts that did not affect the raft experience should not be included. Also, report all injuries for customers and guides. This presents a more realistic view of injuries and how, when and where they occur. This information can help the WW industry in the event of a serious accident by showing diligence in collecting and analyzing injury data to successfully respond to potential lawsuits.

Tracking accidents, injuries, and illnesses can help prevent them in the future by allowing WV DNR and outfitters to help them properly identify and focus on accidents, injuries and illnesses in a particular area. By using this information outfitters may be better equipped to identify and handle problem areas. In addition, accurate record keeping can allow the commercial whitewater rafting industry in West Virginia to better administer safety. To accomplish this, accurate reporting and record keeping is essential. Currently this is not happening.

More effort is needed to verify injury rates and injury severity, and to document the magnitude of related medical costs. Collected data should reflect reported injuries. This information is accurate only to the extent that companies are conscientious about reporting injuries.

Finally, all invested parties must decide if the reporting of injuries is important; the need for monitoring; how monitoring should be carried out and by whom; and how to enforce compliance and penalties for not reporting. Unless these questions are addressed the reporting of injuries should not be continued.

As mentioned in previous reports, the number of injuries being reported under current reporting requirements may be questionable. This combined with the annual numbers of commercial rafters reported to WV-DNR should be considered suspect, since there is no independent system to verify the participant numbers provided by outfitters. These factors can lead to inaccuracies in annual injury rates.

Therefore, caution is advised when making annual comparisons of injury rates. Incomplete, illegible, missing, or "other" information on submitted injury report forms along with no oversight (e.g. who's responsibility is it to follow-up with the patient?) also creates suspect and questionable information. It is also suspected that the injury data is of questionable reliability. Inconsistent interpretation of the phrase "reportable injuries," and the thoroughness of outfitters in reporting injuries may affect the accuracy of the data. Combined, these factors are cause for concern since they have the potential to affect the actual incidence rates or the true characteristics of rafting injuries. Because of these concerns, no generalizations can or should be made about the commercial whitewater in West Virginia.

References

West Virginia Department of Natural Resources. (2009*). West Virginia Department of Natural Resources 2009 Commercial river usage report.* Unpublished report.

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