

Introduction

This report is an overview and analysis of the injuries reported to the West Virginia Whitewater Commission by the commercial rafting industry for year (FY) 2006. 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 as to whether reported injuries followed the criteria for reporting established by West Virginia Legislative Rule §58-12-11. Therefore, all injury reports submitted by licensed outfitters are included.

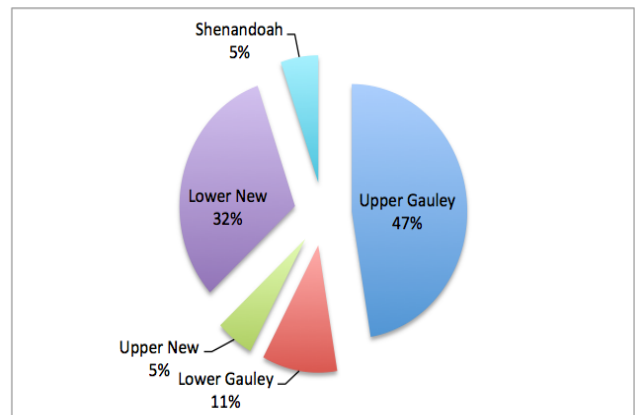
Demographics

A total of 19 individuals were injured during commercial raft trips FY 2006. The number of injured reported FY 2006 is 3.6 times less than the number reported FY 2005 and 4.5 times less than the number of reports received FY 2004. This suggests limited reporting or significantly less injuries for the year. The age of injured persons remains consistent over previous years. Ages ranged from 17 to 68 years, with an average age of 35.7 years. One-half (50%) were between the ages of 17 to 39 years or were over age forty (50%). Five percent were less than 20 years of age. Over half (53%) of the injured were female. Much like year 2005, the majority of the injured (58%) indicated previous rafting experience, meaning they had taken at least one commercial rafting trip prior to the trip on which they were injured.

River Where Injury Occurred

Fifty-eight percent of reported injuries occurred on the Gauley River, followed by the New with thirty-seven percent. Nine injuries (48%) were reported on the Upper Gauley, which accounted for 15% of river use. The Lower New recorded six injuries (32%), and accounted for 52% of use. One injury report (5%) was submitted for the Shenandoah River, which received 10% of use FY 2006 (Table 1). No injuries were reported for the Cheat or Tygart Rivers (Figure 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 2006 was 201,358 (West Virginia Department of Natural Resources, 2006). *IPTRD* rates FY 2006 ranged from 0.004 on the Shenandoah to .300 on the Upper Gauley. The overall *IPTRD* for all rivers was 0.094. These *IPTRD* rates vary little from rates reported from previous years.

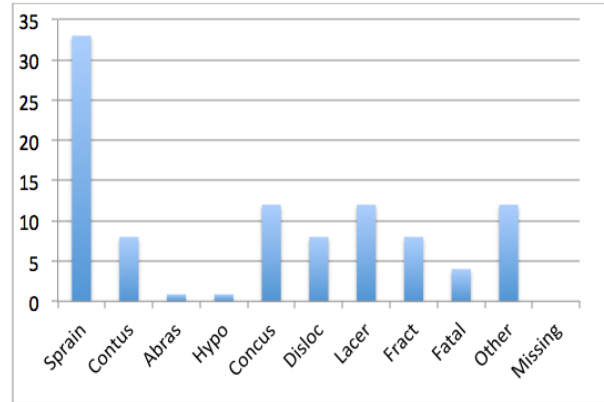
Table 1. *Reported Injuries and Injury Incidence Rates by River*

River	Number Injured	Percent	<i>IPTRD</i>
Upper Gauley	9	47	0.300
Lower Gauley	2	10	0.112
Upper New	1	5	0.041
Lower New	6	32	0.057
Shenandoah	1	5	0.004
Total	19	100	0.094

Injuries

Types of injuries reported in 2006 included sprains/strains (33%), concussions (12%) lacerations (12%) fractures (8%), dislocations (8%), and contusions (8%). The remaining injuries included other unspecified injuries (8%) (Figure 2). The proportion of concussions was higher FY 2006 than in years past.

Figure 2. Type of Injury by Percent



Twenty three percent of injuries involved the knee, hand (11%), head (11%), and foot (7%). Injuries (11%) also involved some part of the face, including the eye (4%), nose (4%), and teeth (3%). No injuries were reported to the shoulder or face. The anatomical region of the injury was not specified on 19% of reports (Table 1).

Table 1. *Percent of Injuries by Anatomical Region*

Anatomical Location	%
Lower Leg	3.8
Knee	23.0
Ankle	3.8
Foot	7.6
Neck	3.8
Arm	3.8
Hand	11.5
Head	11.5
Eye	3.8
Mouth	3.8
Teeth	3.8
Missing	19.2

Injury Setting

Over one-half (54%) of the injuries sustained by commercial rafters occurred in the water. This finding is a departure from previous years where most injuries were found to occur in the raft. Passengers ejected from a raft are subjected to a variety of river hazards. Some of these include the forces of high volume, turbulent water, hydraulics, undercut rocks, strainers, foot entrapments, impacts with rocks, floating debris, or other hazards. Forty-six percent of the injured received injuries while in the raft. Injuries received in the raft usually occur when passengers collide with one another, are struck by a paddle or other piece equipment, or entanglement of extremities in parts of the raft. No guests were injured while on shore.

Anatomical region categories were collapsed to facilitate cross tabulation in order to identify injury associations. Injury associations were observed occurring in the raft more commonly were to the knee and arm/wrist/hand (A/W/H). Injuries received while in the water most often involved the head/neck (H/N), arm/wrist/hand (A/W/H), and leg/foot/hip (L/F/H). Unlike past years, no injuries were reported to the face (Figure 3).

Injuries also appeared to vary by sex. Males sustained more injuries to the ankle. Injuries to the knee and arm/wrist/hand (A/W/H) were equal for males and females. Females sustained more injuries to the leg/foot/hip (L/F/H), and head and neck (H/N) (Figure 4).

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

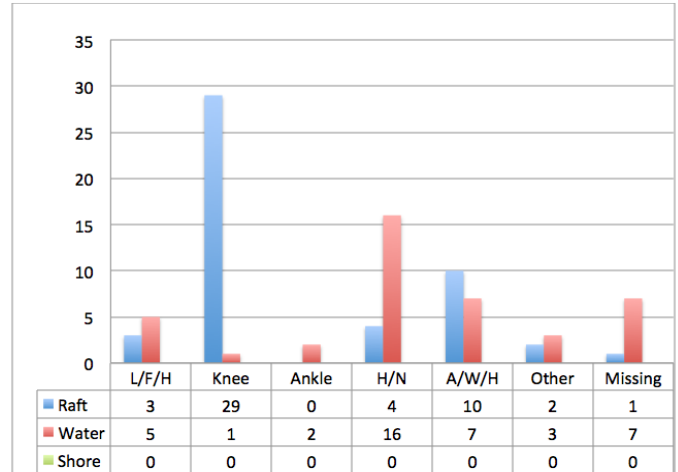
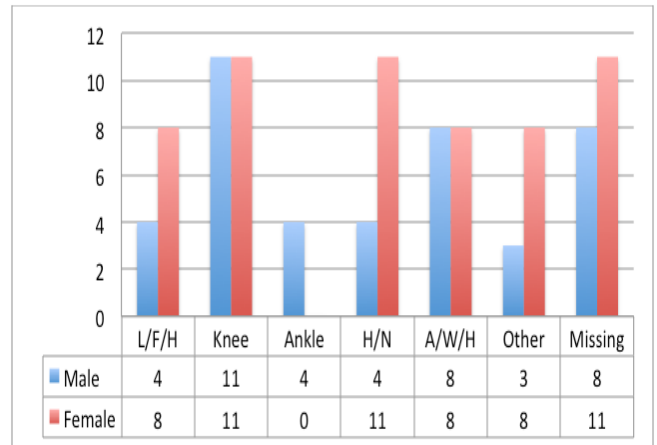
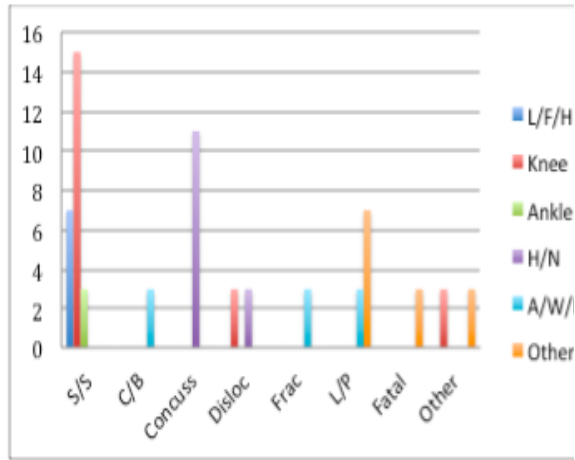


Figure 4. Percent of Injuries by Sex



An association was observed between types of injuries and anatomical region: sprains and strains occurred more often to the knee and leg/foot/hip. The arm/wrist/hand was the primary location for contusions/bruises (C/B) lacerations/punctures (L/P) and fractures (Figure 5).

Figure 5. Percent of Injury and Anatomical Region



First Aid Rendered

First aid was administered on-site for injuries and included the use of bandages splinting or immobilization (36%), ice (36%), elevation of the extremity (21%) application of bandages (16%), direct pressure (10%), and the use of antiseptic (5%).

Evacuations

Eighty-one percent of the injured required evacuation to a medical facility or outfitter base camp, or otherwise prevented the injured person from completing the raft trip. This finding was 7% higher than the rate reported FY 2005.

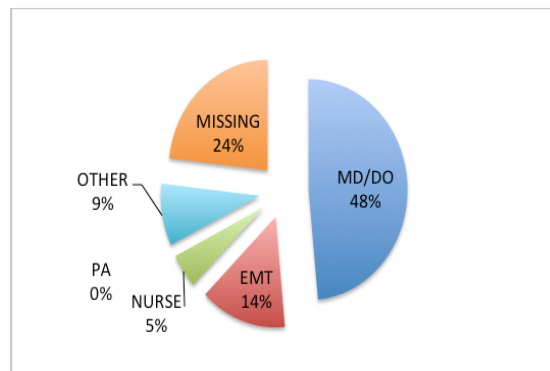
Treatment by Health Care Provider

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.

Of the injury reports submitted during 2006, less than one-half (48%) indicated that injured individuals were evaluated by a medical or osteopathic doctor (MD or DO), EMT or paramedic (14%) and five percent by a registered nurse (RN). Nine percent of reports indicated evaluation was performed by persons with some other training (e.g., First Responder, Wilderness First Responder) who most likely were trip leaders or guides. No response was given by whom or if the injured were evaluated on one-fourth (24%) of injury reports (Figure 6). Almost nine out of ten injury reports (89%) indicated that injured individuals received some form of treatment including a splint or cast (35%), surgery (17%), or stitches (8%). Twenty nine percent of reports indicated “diagnosis only.”

Figure 6. Professional Health Care Provider



Summary

During the 2006, commercial rafting outfitters submitted a total of 19 injury reports. The average age of injured persons was 35.7 years, 53% were

female, and 58% had previous rafting experience. Half (50%) of the injuries reported occurred on the Gauley River. The overall injury incidence rate was 0.094 per 1,000 rafters for the year. Injuries continue to remain consistent from year to year. The most frequently injured regions of the body were the knee, hand, and head. Prevalent injuries included sprains/strains lacerations/punctures, and concussion. On-site administration of first aid included application of bandages, ice, direct pressure splinting/ immobilization, elevation, and the use of antiseptic. Fifty-seven percent of 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 knee, leg/foot/hip, and to the face. Injuries occurring in the water involved the arm/wrist/hand, and shoulder. Females more frequently sustained head injuries, while men sustained more injuries to the ankle and eye. Sprains and strains occurred more often to the knee and arm/wrist/hand. The arm/wrist/ hand was the primary region for lacerations/punctures and fractures.

Conclusions and Recommendations

Encourage guides to educate or make customers aware on what, where, and why injuries occur on raft trips to reduce injuries, or at least to improve the customer's experience and may be a more effective way to reduce 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.

No response was given by whom or if the injured were evaluated on one-fourth (24%) of injury reports. This suggests that guides or the outfitter representative accompanying the injured for medical treatment is not recording this information and some sort of mechanism should be put into place to prevent this from occurring.

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, all injuries should be reported for all 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 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. To accomplish this, accurate reporting and record keeping is essential. Currently this is not

happening. Overall, accurate record keeping can allow the commercial whitewater rafting industry in West Virginia to better administer safety.

Better 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 over site (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. (2006). *West Virginia Department of Natural Resources 2006 commercial river usage report*. Unpublished report.

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