

**Introduction**

This report is an overview and analysis of the injuries reported the West Virginia Whitewater Commission by the commercial rafting industry for year (FY) 2005. 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 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 69 persons were injured while commercial rafting for year (FY) 2005. The age of injured persons remains consistent over the previous years. The age of persons for whom injury reports were submitted ranged from 12 to 78 years, with an average of 35.7 years. Approximately one-half (49%) were between the ages of 18 to 35 years or were over age forty (39%). Sixteen percent of the injured were less than 20 years of age. Almost half (46%) of injured persons were female. As in the past year the majority of those injured (73%) had taken at least one commercial rafting trip prior to the trip on which they were injured.

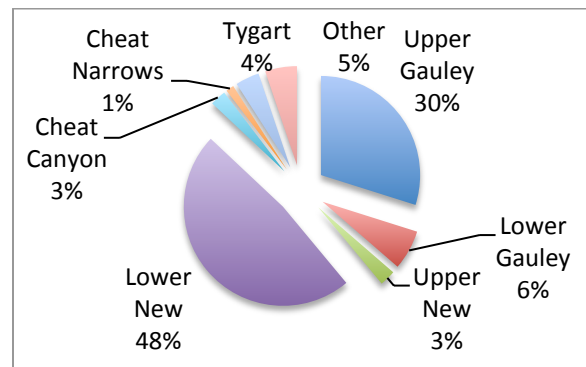
**River Where Injury Occurred**

One-half (51%) of reported injuries occurred on the New River, followed by the Gauley with thirty six percent. These proportions are similar to year 2004 when almost half (47%) of reported

injuries occurred on the New River, followed by the Gauley with forty two percent.

Thirty-seven injuries (52%) were recorded for the Lower New River, which accounted for 55% of commercial river use. Twenty-three injuries (32%) were reported for the Upper Gauley, which accounted for 14% of use. Three injury reports (3%) were submitted for the Cheat River (10% of use). The Tygart also received injury reports, however there were no WV DNR visitor count data for the Tygart River (Figure 1).

Figure 1. Reported Injury Rates by River



Reports were also received for “other rivers” that are not identified in Legislative Rule §58-12-11 for reporting. 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).

This rate is calculated by dividing the number of reported injuries by the total number of rafting participants for a given river and multiplying by 1000. The total number of rafting participants FY 2005 = 210,362 (West Virginia Department of Natural Resources, 2005). *IPTRD* rates FY 2005 ranged from 0.085

continue to remain consistent with previous year's reports.

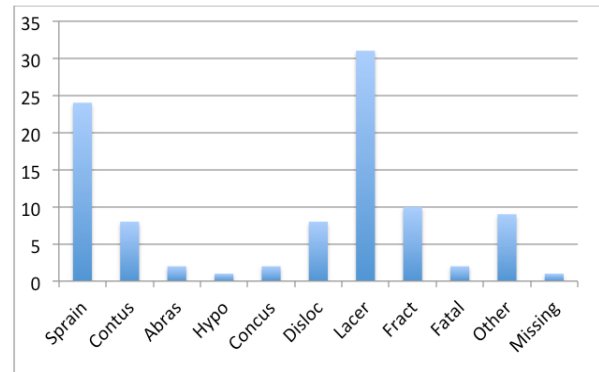
Twenty five percent of injuries involved some part of the face (6%), including the eye (3%), nose (4%), mouth (6%) and teeth (6%). Knee injuries (19%) and ankle (5%) accounted for almost one-fourth of anatomical regions for injuries.

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

River	Number Injured	Percent	<i>IPTRD</i>
Upper Gauley	23	30	0.756
Lower Gauley	5	6	0.370
Upper New	2	2	0.085
Lower New	37	48	0.320
Cheat Canyon	2	2	0.144
Cheat Narrows	1	1	0.461
Tygart*	3	4	0.000
Other	4	5	0.000
Total	42	100	0.019

\* No data were available for the Tygart River in the *West Virginia Department of Natural Resources 2005 Commercial river usage report*.

Figure 2. Type of Injury by Percent



Injuries to arm/wrist/hand (15%), included injuries to the hand (11%), arm (2%), and wrist (2%). Ten percent of injuries involved the shoulder (Table 2).

for the Lower New River to 0.320 for the Upper New River. The overall *IPTRD* for all designated whitewater zones was 0.019.

**Injuries**

Types of injuries reported in 2005 included lacerations (31%) sprains/strains (24%), fractures (10.0%), dislocations (8%), and contusions (8%). The remaining injuries included other unspecified injuries (9.3%), (Table 1). The types of injuries reported FY 2005

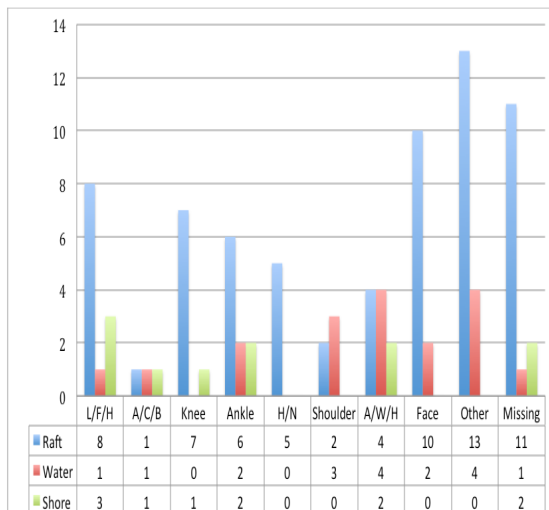
Table 2. *Injuries by Anatomical Region*

Anatomical Location	%
Upper Leg	2.0
Lower Leg	6.0
Knee	19.0
Ankle	5.0
Foot	5.0
Hip	1.0
Abdomen	1.0
Chest	2.0
Back	1.0
Neck	1.0
Shoulder	10.0
Arm	2.0
Wrist	2.0
hand	11.0
Head	2.0
Face	6.0
Eye	3.0
Nose	4.0
Mouth	6.0
Teeth	6.0
Other	1.0
Missing	4.0

**Injury Setting**

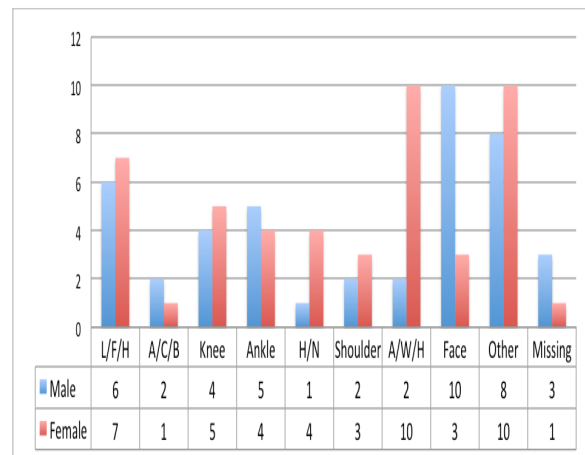
As in previous years, over half (67%) of the injuries sustained by commercial raft customers occurred in the raft. These injuries are usually a result of collisions between passengers in the raft, being struck by a paddle or other piece equipment, or entanglement of extremities in parts of the raft. Injuries in the raft were followed by injuries sustained in the water (18%). Passengers ejected from a raft are subjected to a variety of river hazards. Some of these include, but are not limited to the forces of high volume, turbulent water, hydraulics, undercut rocks, strainers, foot entrapments, impacts with rocks, floating debris, or other hazards. The remaining 14% of injuries occurred while guests were on shore (11%), or were identified as other (3%) (Figure 3). A significant number of injuries are missing or are categorized as “other”.

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



The anatomical region categories were 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 face, leg/foot/hip (L/F/H), knee, ankle, head and neck (H/N). Injuries occurring in the water involved the arm/wrist/hand (A/W/H), and shoulder. A limited number of injuries occurred while on shore especially to the L/F/H (Figure 3). Injuries also appeared to vary by sex. Females more frequently sustained injuries to the arm/wrist/hand (A/W/H), leg/foot/hip (L/F/H) knee and other anatomical regions. Males sustained more injuries to the face and ankle (Figure 3).

Figure 4. Percent of Injuries by Sex



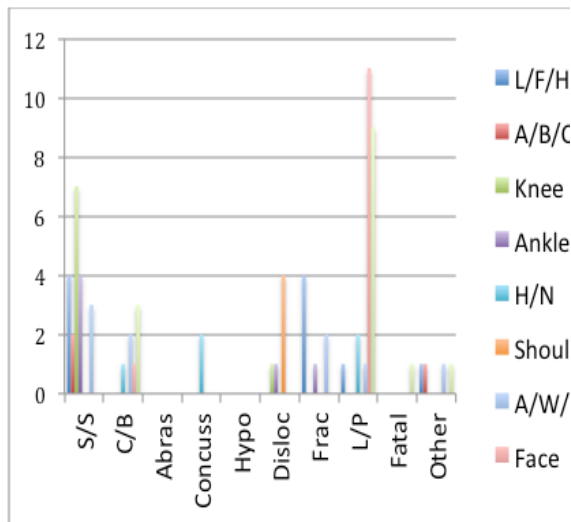
An association was noted between types of injuries and anatomical region. Sprains and strains (S/S) occurred more often to the ankle and knee,

dislocations involved the shoulder, and lacerations involved the face (Figure 3).

**First Aid Rendered**

First aid was administered on-site for injuries and included the use of bandages (38%), ice (38%), splinting or immobilization (32%), application of direct pressure (21%), and elevation of the extremity (12%). Additional first aid required treatment for shock, administration of CPR, and the use of antiseptic.

Figure 5. Percent of Injury and Anatomical Region



**Evacuations**

Three-fourths (74%) of those injured were evacuated to a medical facility or outfitter base camp, or were prevented from completing the raft trip. This finding was 32% higher than the rate reported FY 2004.

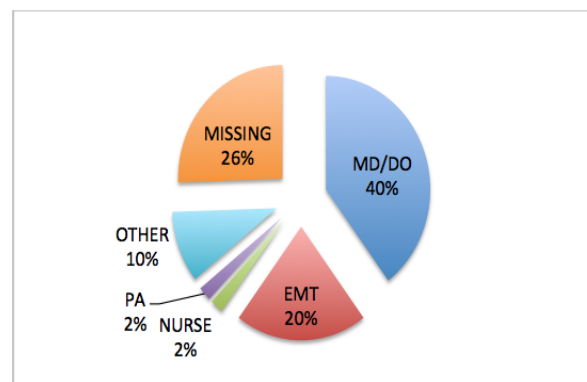
**Treatment by Health Care Provider**

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 2005, only 40% indicated that injured individuals were evaluated by a medical or osteopathic doctor (MD or DO), 20% by an EMT or paramedic, 2% by a registered nurse (RN), and 2% by a physicians assistant (Table 3). Ten 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. No response was given by whom or if the injured were evaluated on 20 (26%) of the injury reports (Figure 6).

Figure 6. Professional Health Care Provider



Three-fourths of injury reports (72%) indicated that the injured received some form of treatment including a splint or cast (29%), stitches (27%), or other unspecified treatment (29%). Eight percent received medication and

one individual underwent surgery. Nineteen percent of reports indicated "diagnosis only."

### Summary

During 2005, commercial rafting outfitters submitted a total of 69 injury reports for individuals who sustained injuries. The average age of injured persons was 35.7 years, 46% were female, and 73% had previous rafting experience. Half (51%) of the injuries reported occurred on the New River. The overall IPTRD rate was 0.019 per 1,000 rafters for the year, which was lower than the previous year (*IPTRD* = 0.195).

The most frequently injured parts of the body were the face, knee and ankle. Prevalent injuries included lacerations and punctures sprains/strains, followed by fractures, dislocations, and contusions/bruises.

On-site administration of first aid included application of bandages, ice, direct pressure splinting/immobilization, elevation, and the use antiseptic.

Six out of ten injuries (67%) occurred in the raft as a result of collisions among passengers, being struck by a paddle or other equipment, or entanglement of extremities. Common injuries that occurred in the raft 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 knee and arm injuries, and damaged teeth, while males more sustained injuries to the face, knee and ankle. Sprains and strains occurred more often

to the knee and ankle dislocations involved the shoulder, and lacerations/punctures involved the face.

### 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 should be considered. While these remedies take a common sense approach to injury prevention these preventative measures might not be cost effective or without undesirable consequences. Instead, guides should be encouraged to educate or make customers aware on what, where, and why injuries occur on raft trips to reduce injuries, or at the very least to improve the customer's experience and may be a more effective approach to reducing injuries.

Many of the 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. Accurate record keeping can also allow the commercial whitewater rafting industry in West Virginia to better administer safety.

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 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.

More effort is needed to verify injury rates and injury severity, and to document 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 injuries in commercial whitewater in West Virginia.

#### References

West Virginia Department of Natural Resources. (2005). *West Virginia Department of Natural Resources 2005 Commercial river usage report*. Unpublished report.

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