An Inventory of Hazards and Risk Conditions in the National Parks

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CONTENTS

1.0 Introduction

In this report we describe the methods and results of an inventory of hazards and risk conditions in 30 National Park units. The inventory is based on the analysis of a sample of park records on visitor accidents and input from park and program managers at each of the 30 parks.

This section describes briefly the methods of data collection and analysis that were used to develop the inventory. Sections 2.0-31.0 present brief summaries of the results of the analysis for each individual park. Section 32.0 presents a framework that may be used to examine the "anatomy" of hazards and risk conditions, and to identify possible hazard management interventions. Section 33.0 presents a brief set of conclusions.

1.1 Developing Lists of Activities, Hazards, and Other Contributory Factors

Lists of activities, hazards, and other contributory factors were developed from a review of the literature that was conducted as part of the current project.[1] The lists were modified with input from Park Service personnel, and based on the knowledge gained during an extensive examination of visitor accident data at the 30 parks.[2]

1.2 Rating Activities, Hazards, and Contributory Factors

Each activity, hazard, and other contributory factor was rated in terms of its contribution to the proportion of visitor injuries and illnesses arising out of accidents.[3] Ratings were conducted by staff at each of the 30 parks who were most knowledgeable about visitor safety, and by members of the project team.

Contacts at each of the 30 park units were asked to respond to a short questionnaire (see Appendix A). The individuals contacted were those originally suggested by Dick Powell (Program Manager, Risk Management Division) and Gary Machlis (NPS Visiting Chief Social Scientist), and with whom the project had been working in regard to the risk analysis. They included safety officers, park rangers, and other park staff familiar with visitors and visitor accident characteristics. Of the 30 parks contacted, 22 responded to the survey.[4] We attempted to increase the response rate by contacting staff at each park unit at least three times via email. Inspite of our efforts, eight parks did not respond to our questionnaire.

In the survey, park contacts were first asked to rank the sources of visitor injuries and illnesses as low, medium, and high, based on their experience and professional judgment. **Low hazard (L)**

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[1] See the report entitled *A Review of the Literature for a Comprehensive Study of Visitor Safety in the National Park System.*

[2] See the report entitled *An Analysis of Visitor Accident Risk in the National Park System.*

[3] Visitor accidents exclude those associated with criminal activities and park and concession employees.

[4] 25 individuals responded, because three people at LAME completed the questionnaire.

activities were defined as those that resulted in less than 5% of all injuries and illnesses. **Medium hazard (M)** activities were defined as those that resulted in 5% to 25% of all injuries and illnesses. Activities with **high hazard (H)** were defined as those that resulted in 25% or more of all injuries and illnesses.

In a second question, respondents were asked to rate the importance of various contributory factors to visitor risk associated with various activities at the park. Respondents were asked to rate as low, medium, or high those factors that, in their view, were substantial contributors to visitor accidents *over the last five years*. The questionnaire asked park respondents to rank the importance of 38 risk conditions. Risk conditions were divided into six categories, based on our review of relevant research literature and the visitor risk analysis. Thus, the six categories and 38 conditions share similarities with other taxonomies that have been developed (e.g., Canadian Park Service 1996). Respondents were told that factors of **low importance (L)** were those factors that played, in their opinion, a *substantial* role in less than 5% of all visitor injuries and illnesses. Of **medium importance (M)** were those factors that played, in their opinion, a *substantial* role in 5% to 25% of all visitor injuries and illnesses. Factors with a **high level of importance (H)** were those that played, in their opinion, a *substantial* role in 25% or more of all visitor injuries and illnesses.

For each of these two questions, respondents were also asked to rate their level of confidence in the estimates and judgments they made. With a high level of frequency respondents indicated that they had high levels of confidence in their ratings. No respondent indicated a low level of confidence in his or her ratings. Most of those indicating a medium level of confidence did so on just a few items. In some cases, respondents also indicated "don't know".

In a third question the park contacts were asked to identify what, in their judgment, were the *three* visitor activities associated with the largest proportion of visitor injuries and illnesses and to list the three most important factors that contributed to visitor accidents in each activity.

In all questions, the respondents were asked to base their responses on events in the park over the last five years.

The project team rated each of the activities, hazards and other contributory factors based on an examination of the visitor accident data collected under Task 3 of the project. The visitor accident database developed by the project provides information on the frequencies of visitor injuries and illnesses in relation to a set of factors, including:
- type of activity;
- individual characteristics (e.g., age, gender);
- contributory factors (e.g., primary initiating event, driver related factors, etc.); and
- characteristics of the accident (e.g., time of accident, type of injury).

The results from these rating exercises are presented for each park separately in the following sections. Parks that did not respond prior to the deadline have been rated by the project team

according to the information available in the accident database. The park summaries also indicate where a particular activity, hazard, or other contributory factor is not relevant.

2.0 Assateague Island National Park

2.1 Overview
The inventory assessment for the Assateague Island National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

2.2 Park activity hazards
Table 2.1 shows the degree of hazard associated with visitor activities at Assateague Island National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Assateague Island National Park the activities that resulted in the most accidental injuries and illnesses were:
1) swimming and other water-related activities;
2) walking outdoors; and
3) biking.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) swimming and beach use;
2) off-road vehicle use and backcountry activitie; and
3) wildlife viewing and interactions.

In the database, motor vehicle use and wildlife-related accidental fatalities, injuries, and illnesses each accounted for less than 5% of the total during 1993-1998.

Visitor activities classified as "other" or "unknown" resulted in 20% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 2.1
Degree of hazard associated with visitor activities at
Assateague Island National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	M	L
Boating (motorized)	Y	L	M
Boating and rafting (non-motorized)	Y	L	M
Camping (e.g., car camping, backcountry camping)	Y	L	L
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	M	L
Horse, mule riding	Y		L
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[5]	Y	M	L
Motor vehicle operation	Y		L
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	Y	H	H
Technical climbing and mountaineering	D	L	
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	L
Wildlife viewing (e.g., birds, bears)	Y	L	L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.

N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).

D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

2.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[5] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 2.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor injuries and illnesses. Most are related to visitor characteristics. As identified by the staff, the risk conditions associated with these accidents were:

1) swimming and beach use: under-estimation of dangers, inattentiveness, and youthful exuberance,
2) off-road vehicle use and backcountry activities: misunderstanding of equipment use and dangers, unfamiliarity with resource dangers (e.g., insects, sun), youthful exuberance and
3) wildlife viewing and interactions: ticks and other disease carriers, failure to use common sense and follow signs and directions, and over-abundance of animals in developed areas.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, infrastructure hazards, environmental hazards, social hazards, and technological hazards. However, some environmental hazards (i.e., floral hazards and insects, etc.), social hazards (i.e., peer pressure), and infrastructure hazards (i.e., maintenance and operational hazards, swimming facility conditions) played moderate roles.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, age received a rating of high. On the other hand, the park respondent rated age as having low importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 25% of injuries and illnesses resulting from those activities are driver-related, 10% result from environmental conditions, 5% result from road-related factors, and 5% are a result of equipment failure.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 2.2
Ratings of risk conditions at Assateague Island National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)			M
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)			M
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		H	M
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	M
Meteorological conditions (e.g., snow, fog)		L	L
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)	X		
Topographical conditions (e.g., steep slope, drop-offs)	X		
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 2.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	L
Behavioral (e.g., playing, running)			M
Drug/alcohol			M
Gender		L	M
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		L	M
Stress related (e.g., time pressure, fear of heights)	X		
Level of visitor experience in activity			M
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			M
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			L
Other (please list)			

U == Respondent rated as unknown

3.0 Badlands National Park

3.1 Overview
The inventory assessment for the Badlands National Park is based on a sample of the park's visitor accident data for the years 1993 to 1996 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.[6]

3.2 Park activity hazards
Table 3.1 shows the degree of hazard associated with visitor activities at Badlands National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Badlands National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) hiking;
2) walking; and
3) motor vehicle operation.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) climbing and scrambling;
2) hiking and off trail exploration; and
3) motor vehicle accidents and operation.

In the database, climbing-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1996.

Visitor activities classified as "other" or "unknown" resulted in 30% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) ; and c) differences in subjective evaluations.

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[6]   Data were not available for 1997 and 1996, except for limited information about 4 fatalities in 1997.

Table 3.1
Degree of hazard associated with visitor activities at Badlands National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	N		
Boating and rafting (non-motorized)	Y		L
Camping (e.g., car camping, backcountry camping)	Y		L
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	H	H
Horse, mule riding	Y	L	L
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[7]	Y	M	L
Motor vehicle operation	Y	M	M
Skiing, etc.	Y		L
Snowmobiling	N		
Swimming, surfing, and wading	D	L	
Technical climbing and mountaineering	Y	L	M
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

3.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[7] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 3.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) climbing and scrambling: unfamiliarity with environmental and terrain factors, improper clothing, foot gear, and equipment, lack of experience,
2) hiking and off trail exploration: unfamiliarity with environmental and terrain factors, improper clothing, foot gear, and equipment, and personal fitness and health issues, and
3) motor vehicle accidents and operation: traveling too fast for conditions (i.e. weather, wildlife, and road conditions), failure to comply with traffic regulations (i.e. speed, seat belts), and alcohol.

Overall, for all visitor activities, the park staff rated infrastructure and visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, environmental hazards, social hazards, and technological hazards. However, some environmental hazards (e.g., topographical conditions) and technological hazards (e.g., lack of use or failure of appropriate safety related equipment) played substantial roles.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In a few cases the ratings differ from those made by the park staff responding to the questionnaire. For example, the database contains records indicating that faunal hazards played a moderate role in accidents, while the park staff respondent rated faunal hazards as not relevant. Performance error is rated as playing a minimal role in the database and as playing a moderate role by the park respondent.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 3.2
Ratings of risk conditions at Badlands National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)			M
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)			M
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)	X	M	
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		M	L
Meteorological conditions (e.g., snow, fog)			L
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			H
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 3.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			M
Drug/alcohol			L
Gender		M	L
Non-compliant behaviors (e.g., off-trail hiking)			H
Performance (human) error		L	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction			L
Other vehicle malfunction (e.g., bike, boat, snowmobile)			L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

4.0 Big Bend National Park

4.1 Overview
The inventory assessment for the Big Bend National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

4.2 Park activity hazards
Table 4.1 shows the degree of hazard associated with visitor activities at Big Bend National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Big Bend National Park the visitor activities that resulted in the most accidental injuries and illnesses were
      1) hiking;
      2) motor vehicle operation; and
      3) walking.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
      1) motor vehicle operation; and
      2) hiking.

Visitor activities classified as "other"or "unknown" resulted in 35% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) ; and c) differences in subjective evaluations.

Table 4.1
Degree of hazard associated with visitor activities at Big Bend National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	M	L
Boating (motorized)	Y	L	L
Boating and rafting (non-motorized)	Y	L	L
Camping (e.g., car camping, backcountry camping)	Y	L	L
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	H	H
Horse, mule riding	Y	L	L
Hunting	D	L	
Indoor activity (e.g., walking or viewing inside visitor center)[8]	Y	M	L
Motor vehicle operation	Y	M	H
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	D	L	
Technical climbing and mountaineering	Y	L	L
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

4.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[8] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table SS.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) motor vehicle operation: speed, inattention to road/wildlife; failure to maintain control, falling asleep and
2) hiking: inattention to surroundings/footing, environmental conditions (e.g., heat/cold), failure to be prepared, and terrain (e.g., cliffs, cactus, snakes, lack of water sources in backcountry).

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did infrastructure hazards, communication hazards, environmental hazards, social hazards, and technological hazards. However, technological hazards (e.g., lack of use or failure of appropriate safety related equipment) played some role. Infrastructure and communication hazards were identified as "not relevant" by the respondent for most items in the table.

The respondent also indicated that "medical conditions" are an important factors in visitor injuries and illnesses. They arise from: aging population, unfit population, and isolation of park and inability to readily treat or medicate these conditions.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 29% of injuries and illnesses resulting from those activities are driver-related and18% result from road-related factors.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 4.2
Ratings of risk conditions at Big Bend National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions	X		
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)	X		
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)	X		
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)	X		
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)	X		
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)	X		
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)	X		
Environmental Hazards			
Faunal hazards (e.g., bears)		L	
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		L	L
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 4.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	M
Behavioral (e.g., playing, running)			M
Drug/alcohol			L
Gender		L	L
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			M
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)	X		
Size of group (e.g., individual, small, large)	X		
Visitor crowding (e.g., # of people on trail)	X		
Type of group (e.g., family groups, tour groups)	X		
Technological Hazards			
Motor vehicle malfunction	X	L	
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	U
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			M
Other (please list)			

U == Respondent rated as unknown

5.0 Blue Ridge Parkway

5.1 Overview
The inventory a5essment for the Blue Ridge Parkway is based on a sample of the park's visitor accident data for the years 1993 to 1998.

5.2 Park activity hazards
Table 5.1 shows the degree of hazard associated with visitor activities at Blue Ridge Parkway.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Blue Ridge Parkway the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) walking;
3) hiking; and
4) biking.

Motor vehicle operation accounted for 80% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 5% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is not significant ("low hazard").

Table 5.1
Degree of hazard associated with visitor activities at Blue Ridge Parkway

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	D	L	N/A
Hiking (e.g., day hiking, backpacking)	D	L	N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[9]	D	M	N/A
Motor vehicle operation	D	H	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	N		N/A
Technical climbing and mountaineering	D	L	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)			N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

5.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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.[9] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 5.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however, in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 61% of injuries and illnesses resulting from those activities are driver-related, 20% are road-related, and 5% are a result of equipment failure.

Table 5.2
Ratings of risk conditions at Blue Ridge Parkway

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		M	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)			N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 5.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		M	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		H	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction		L	N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

6.0 Carlsbad Caverns National Park

6.1 Overview
The inventory assessment for the Carlsbad Caverns National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

6.2 Park activity hazards
Table 6.1 shows the degree of hazard associated with visitor activities at Carlsbad Caverns National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Carlsbad Caverns National Park the visitor activities that resulted in the most accidental injuries and illnesses were
1) walking;
2) hiking; and
3) motor vehicle operation.

Walking accounted for 68% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 22% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Table 6.1
Degree of hazard associated with visitor activities at
Carlsbad Caverns National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	N		N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	N		N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	D	L	N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[10]	D	H	N/A
Motor vehicle operation	D	L	N/A
Skiing, etc.	N		N/A
Snowmobiling	D	L	N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	L	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	H	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

6.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In

[10] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 6.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however, in the database.

Table 6.2
Ratings of risk conditions at Carlsbad Caverns National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		M	N/A
Meteorological conditions (e.g., snow, fog)		L	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 6.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		L	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction		L	N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

7.0 Cape Hatteras National Seashore

7.1 Overview
The inventory assessment for the Cape Hatteras National Seashore is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

7.2 Park activity hazards
Table 7.1 shows the degree of hazard associated with visitor activities at Cape Hatteras National Seashore.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Cape Hatteras National Seashore the visitor activities that resulted in the most accidental injuries and illnesses were:
1) swimming;
2) walking; and
3) boating (motorized).

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) swimming and other water-related activities;
2) motor vehicle operation; and
3) walking.

In the database, injuries resulting from motor vehicle operation accounted for less than 5% of the total during 1993-1998. In the database, boating related accidental injuries and illnesses accounted for just under 5% of the total number; a slightly higher percentage than that for motor vehicles, but still ranked as a "low hazard."

Visitor activities classified as "other" or "unknown" resulted in 22% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 7.1
Degree of hazard associated with visitor activities at
Cape Hatteras National Seashore

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	Y	L	L
Boating and rafting (non-motorized)	Y	L	L
Camping (e.g., car camping, backcountry camping)	Y	L	L
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	L	L
Horse, mule riding	Y	L	L
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[11]	Y	M	M
Motor vehicle operation	Y	L	H
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	Y	H	H
Technical climbing and mountaineering	N		
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	H
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

7.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery.

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[11] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 7.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) swimming and other water-related activities: environmental conditions, alcohol, bad judgment, and lack of knowledge;
2) motor vehicle operation: inattention of operator, bad judgment of the operator, and environmental conditions (e.g., weather); and
3) walking (tripping): uneven surfaces, inattention to surroundings, and improper footware.

Overall, for all visitor activities, the park staff rated infrastructure hazards, environmental hazards, and visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, social hazards, and technological hazards.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of low. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 27% of injuries and illnesses resulting from those activities are driver-related, 13% are road-related, and 13% are a result of equipment failure.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the

respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 7.2
Ratings of risk conditions at Cape Hatteras National Seashore

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)			H
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			M
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		M	L
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		L	M
Hydrological conditions (e.g., strong surf, flooding)			H
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 7.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			M
Drug/alcohol			M
Gender		L	L
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		L	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			L
Level of visitor preparedness for activity			L
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)			L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			L
Other (please list)			

U == Respondent rated as unknown

8.0 Canyonlands National Park

8.1 Overview
The inventory assessment for the Canyonlands National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

8.2 Park activity hazards
Table 8.1 shows the degree of hazard associated with visitor activities at Canyonlands National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Canyonlands National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
  1) hiking;
  2) biking; and
  3) boating (non-motorized).

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
  1) mountain biking;
  2) hiking; and
  3) white water rafting/kayaking.

Visitor activities classified as "other" or "unknown" resulted in 18% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) ; and c) differences in subjective evaluations.

Table 8.1
Degree of hazard associated with visitor activities at Canyonlands National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	H	H
Boating (motorized)	Y	L	L
Boating and rafting (non-motorized)	Y	M	L
Camping (e.g., car camping, backcountry camping)	Y	L	L
Caving	N		
Fishing	N		
Hiking (e.g., day hiking, backpacking)	Y	H	M
Horse, mule riding	Y		L
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[12]	Y	L	L
Motor vehicle operation	Y	M	L
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	D	L	
Technical climbing and mountaineering	Y	L	L
Walking outdoors (e.g., parking lots, interpretive trails)	Y	L	L
Wildlife viewing (e.g., birds, bears)	Y	L	L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

8.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[12]   The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 8.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) Mountain biking: failure to maintain control of bike, riding too fast for conditions, and exceeding personal level of expertise,
2) Hiking: inattention to footing, failure to carry enough water during hot weather, and no headlamp or flashlight, and
3) White water rafting/kayaking: lack of knowledge about swimming in white water conditions, improper dress for cold water swims after capsizing, and lack of helmet.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing more prominent role in visitor accidents than did communication hazards, infrastructure conditions, environmental hazards, social hazards, and technological hazards. However, social hazards (e.g., type of group), environmental hazards (e.g., topographical conditions). infrastructure hazards (e.g., trail conditions), and communication hazards (e.g., trail signs) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 38% of injuries and illnesses resulting from those activities are driver-related, 13% result from environmental conditions, 9% result from road-related factors, and 6% are a result of equipment failure.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the

respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 8.2
Ratings of risk conditions at Canyonlands National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			M
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)		L	L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		M	L
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)		L	L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 8.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			M
Drug/alcohol			L
Gender		M	L
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			M
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			M
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)			L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			L
Other (please list)			

U == Respondent rated as unknown

9.0 Curecanti National Recreation Area

9.1 Overview
The inventory assessment for the Curecanti National Recreation Area is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

9.2 Park activity hazards
Table 9.1 shows the degree of hazard associated with visitor activities at Curecanti National Recreation Area.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Curecanti National Recreation Area the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) swimming and other water related activities; and
3) boating (motorized).

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) motor vehicle operation;
2) boating; and
3) fishing.

In the database, the category of "fishing" accounted for less than 5% of the total number of accidental injuries and illnesses during 1993-1998, while "other-water" related accidental injuries and illnesses accounted for 11%.

Motor vehicle operation accounted for 47% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 18% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 9.1
Degree of hazard associated with visitor activities at
Curecanti National Recreation Area

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	Y	M	M
Boating and rafting (non-motorized)	Y		L
Camping (e.g., car camping, backcountry camping)	Y	M	L
Caving	N		
Fishing	Y		M
Hiking (e.g., day hiking, backpacking)	Y	L	L
Horse, mule riding	Y		L
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[13]	Y	L	L
Motor vehicle operation	Y	H	H
Skiing, etc.	Y	L	L
Snowmobiling	Y		L
Swimming, surfing, and wading	Y	M	L
Technical climbing and mountaineering	Y		L
Walking outdoors (e.g., parking lots, interpretive trails)	Y	L	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

9.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In

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[13] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

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some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 9.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) motor vehicle operation: excessive speed, inattention, and heavy traffic;
2) boating: lack of proper safety equipment, weather, inexperience; and
3) fishing: lack of proper safety equipment, inattention, and weather.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did infrastructure hazards, communication hazards, environmental hazards, social hazards, and technological hazards. However, environmental hazards (e.g., meteorological and hydrological conditions) and technological hazards (e.g., lack of use or failure of appropriate safety related equipment) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, road conditions received a rating of high. On the other hand, the park respondent rated road conditions as having low importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 19% of injuries and illnesses resulting from those activities are driver-related, 25% are road-related, and 6% are from environmental conditions.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 9.2
Ratings of risk conditions at Curecanti National Recreation Area

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			L
Boat launch and dock conditions			L
Camping and picnic site conditions			
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		M	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)		L	L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		L	M
Hydrological conditions (e.g., strong surf, flooding)			M
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 9.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			M
Drug/alcohol			M
Gender		H	M
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		M	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			M
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

10.0 Cuyahoga Valley National Recreation Area

10.1 Overview
The inventory assessment for the Cuyahoga Valley National Recreation Area is based on a sample of the park's visitor accident data for the years 1994 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.[14]

10.2 Park activity hazards
Table 10.1 shows the degree of hazard associated with visitor activities at Cuyahoga Valley National Recreation Area.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Cuyahoga Valley National Recreation Area the visitor activities that resulted in the most accidental injuries and illnesses were:
1) biking;
2) walking; and
3) hiking.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) biking;
2) snow play (i.e., sledding); and
3) motor vehicle operation.

In the database, snow-related accidental injuries and illnesses accounted for just under 6% of the total during 1994-1998, while hiking accounted for just over 6% of the total during 1994-1998. In the database, motor vehicle

Biking accounted for 50% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 21% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1994-1998) differ from those on which the

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[14] The data for 1993 were missing or unavailable.

respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 10.1
Degree of hazard associated with visitor activities at
Cuyahoga Valley National Recreation Area

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	H	M
Boating (motorized)	N		
Boating and rafting (non-motorized)	Y	L	L
Camping (e.g., car camping, backcountry camping)	D	L	
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	M	L
Horse, mule riding	Y	L	L
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[15]	Y	M	L
Motor vehicle operation	Y	L	H
Skiing, etc.	D	M	
Snowmobiling	N		
Swimming, surfing, and wading	N	L	
Technical climbing and mountaineering	D	L	
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y	L	L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.

N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).

D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

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[15] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

10.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 10.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire. Some additional but limited data about factors that contribute to visitor accidents are available in the database.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) biking: human error and behavior;
2) sledding: behavior, age, environmental and topographical conditions; and
3) motor vehicle operation: inattentiveness to surroundings, backing vehicle, environmental and meteorological conditions.

Overall, for all visitor activities, the park staff rated infrastructure hazards, social hazards, technological hazards, and visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards and environmental hazards. However, environmental hazards (e.g., meteorological conditions) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, age received a rating of low. On the other hand, the park respondent rated age as having high importance. In the database, the rating for gender as a factor in visitor accidental injuries and illnesses is high, whereas the park staff rated this factor as low.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, biking-related activities 61% of injuries and illnesses are driver-related and 13% are road-related.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1994-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 10.2
Ratings of risk conditions at Cuyahoga Valley National Recreation Area

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			M
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			H
Maintenance and operational hazards (e.g., snow removal vehicles)			H
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)		M	H
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			H
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			M
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)	X	L	
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		M	L
Meteorological conditions (e.g., snow, fog)		L	M
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 10.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	H
Behavioral (e.g., playing, running)			H
Drug/alcohol			M
Gender		H	L
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		H	H
Stress related (e.g., time pressure, fear of heights)			M
Level of visitor experience in activity			M
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			M
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			M
Size of group (e.g., individual, small, large)			M
Visitor crowding (e.g., # of people on trail)			H
Type of group (e.g., family groups, tour groups)			M
Technological Hazards			
Motor vehicle malfunction		L	M
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	H
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

11.0 Denali National Park and Preserve

11.1 Overview
The inventory assessment for the Denali National Park and Preserve is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

11.2 Park activity hazards
Table 11.1 shows the degree of hazard associated with visitor activities at Denali National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Denali National Park and Preserve the visitor activities that resulted in the most accidental injuries and illnesses were:
1) climbing/mountaineering;
2) hiking; and
3) motor vehicle operation.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) mountaineering,
2) walking, and
3) camping

Walking-related accidents are often caused by slips, trips, and falls. In the database, camping-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1998, while motor vehicle use accounted for about 8% of the total.

Climbing accounted for 57% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 10% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) ; and c) differences in subjective evaluations.

Table 11.1
Degree of hazard associated with visitor activities at Denali National Park and Preserve

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	N		
Boating and rafting (non-motorized)	N		
Camping (e.g., car camping, backcountry camping)	Y	L	M
Caving	N		
Fishing	N		
Hiking (e.g., day hiking, backpacking)	Y	M	M
Horse, mule riding	Y	L	
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[16]	Y	M	L
Motor vehicle operation	Y		L
Skiing, etc.	Y	L	L
Snowmobiling	Y		L
Swimming, surfing, and wading	N		
Technical climbing and mountaineering	Y	H	H
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y	L	L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.

N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).

D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

11.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[16] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 11.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) mountaineering: lack of experience, unprepared for elements, and fatigue,
2) walking: age of visitor, inattention to footings, and inappropriate footwear, and
3) camping: inattention to surroundings, inexperience at activity, and improper use of equipment.

Overall, for all visitor activities, the park staff rated environmental hazards, infrastructure hazards, and visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, social hazards, and technological hazards. However, technological hazards (e.g., lack of use or failure of appropriate safety related equipment) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of low. On the other hand, the park respondent rated performance error as having high importance. For the accidents recorded in the database gender received a rating of high, while the park staff rated gender as playing a minimal role in accidental injuries and illnesses.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 11.2
Ratings of risk conditions at Denali National Park and Preserve

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)			M
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	M
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		H	M
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			M
Topographical conditions (e.g., steep slope, drop-offs)			H
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 11.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	H
Behavioral (e.g., playing, running)			H
Drug/alcohol			L
Gender		H	L
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		L	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction			L
Other vehicle malfunction (e.g., bike, boat, snowmobile)			L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			M
Other (please list)			

U == Respondent rated as unknown

12.0 Delaware Water Gap National Recreation Area

12.1 Overview
The inventory assessment for the Delaware Water Gap National Recreation Area is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

12.2 Park activity hazards
Table 12.1 shows the degree of hazard associated with visitor activities at Delaware Water Gap National Recreation Area.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Delaware Water Gap National Recreation Area the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) hiking; and
3) swimming.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) motor vehicle operation;
2) hiking/climbing; and
3) swimming/boating.

In the database, motorized and non-motorized boating-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1998.

Visitor activities classified as "other" or "unknown" resulted in 24% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) ; and c) differences in subjective evaluations.

Table 12.1
Degree of hazard associated with visitor activities at
Delaware Water Gap National Recreation Area

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	Y	L	L
Boating and rafting (non-motorized)	Y	L	L
Camping (e.g., car camping, backcountry camping)	Y	L	L
Caving	N		
Fishing	Y	L	L
Hiking (e.g., day hiking, backpacking)	Y	M	M
Horse, mule riding	Y	L	L
Hunting	Y	L	L
Indoor activity (e.g., walking or viewing inside visitor center)[17]	Y	M	L
Motor vehicle operation	Y	H	H
Skiing, etc.	Y	L	L
Snowmobiling	N		
Swimming, surfing, and wading	Y	M	M
Technical climbing and mountaineering	Y	L	M
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	L
Wildlife viewing (e.g., birds, bears)	Y	L	L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

12.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[17] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 12.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) Motor Vehicle Operation: driving too fast for conditions, failure to give full time and attention, and road conditions (e.g., wet, icy, snowy, slushy),
2) Hiking/Climbing: inattention to footing and surroundings, over-estimating ability, and unfamiliar with terrain, and
3) Swimming/Boating: over estimating ability, unfamiliar with river currents, and alcohol/drugs.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, infrastructure hazards, environmental hazards, social hazards, and technological hazards. However, technological hazards (e.g., lack of use or failure of appropriate safety related equipment) and environmental conditions (e.g., meteorological conditions) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 49% of injuries and illnesses resulting from those activities are driver-related and 19% result from road-related factors.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the

respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 12.2
Ratings of risk conditions at Delaware Water Gap National Recreation Area

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)	X		
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		M	L
Swimming facility conditions (e.g., pool, beach)			L
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			L
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)		L	L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		L	M
Hydrological conditions (e.g., strong surf, flooding)	X		
Other natural hazards (e.g., avalanche, fire)	X		
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 12.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	U
Behavioral (e.g., playing, running)			M
Drug/alcohol			L
Gender		M	U
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			U
Level of visitor experience in activity			M
Level of visitor preparedness for activity			L
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			M
Other (please list)			

U == Respondent rated as unknown

13.0 Everglades National Park

13.1 Overview
The inventory assessment for the Everglades National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

13.2 Park activity hazards
Table 13.1 shows the degree of hazard associated with visitor activities at Everglades National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Everglades National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking;
2) biking; and
3) fishing; and
4) boating (motorized).

Visitor activities classified as "other" or "unknown" resulted in 51% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Table 13.1
Degree of hazard associated with visitor activities at Everglades National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	M	N/A
Boating (motorized)	D	L	N/A
Boating and rafting (non-motorized)	D	L	N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	D	L	N/A
Hiking (e.g., day hiking, backpacking)	N		N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[18]	D	M	N/A
Motor vehicle operation	D	L	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	N		N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

13.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[18] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 13.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

Table 13.2
Ratings of risk conditions at Everglades National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)			N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		M	N/A
Floral hazards (e.g., poison ivy, mushrooms)		L	N/A
Insects, spiders, and scorpions		M	N/A
Meteorological conditions (e.g., snow, fog)		L	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 13.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		L	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error			N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

14.0 Fort Sumter National Monument

14.1Overview
The inventory assessment for the Fort Sumter National Monument is based on a sample of the park's visitor accident data for the years 1993 to 1998 (excluding 1996) and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.[19]

14.2 Park activity hazards
Table 14.1 shows the degree of hazard associated with visitor activities at Fort Sumter National Monument.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Fort Sumter National Monument the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking; and
2) swimming.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) boating (i.e., loading/unloading tour boat);
2) walking/touring historic structures; and
3) stairways.

Walking/touring historic structures and stairways are combined in the database within the category on "walking." In the database, boating-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1998.

Walking (indoors and outdoors) on paved surfaces accounted for 72% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 19% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the

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[19]   Data for 1996 were unavailable.

respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 14.1
Degree of hazard associated with visitor activities at
Fort Sumter National Monument.

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y		L
Boating (motorized)	Y		L
Boating and rafting (non-motorized)	Y		L
Camping (e.g., car camping, backcountry camping)	N		
Caving	N		
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	N		
Horse, mule riding	N		
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[20]	Y	H	L
Motor vehicle operation	Y		L
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	D	M	
Technical climbing and mountaineering	N		
Walking outdoors (e.g., parking lots, interpretive trails)	Y	H	H
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

14.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement

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[20] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 14.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) boating (i.e., loading/unloading tour boat): inattention, slippery surface, and age of visitor,
2) Walking/Touring Historic Structures: inattention, uneven surfaces, and failure to obey/follow safety warnings, and
3) Stairways: inattention, surface condition, age of visitor.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, environmental hazards, social hazards, and technological hazards. However, environmental hazards (e.g., topographical conditions) and infrastructure hazards (e.g., paved area and trail conditions) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, gender received a rating of medium. On the other hand, the park respondent rated gender as not relevant.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 14.2
Ratings of risk conditions at Fort Sumter National Monument.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)			L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)	X	M	
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)	X		
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)	X		

Table 14.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	M
Behavioral (e.g., playing, running)			M
Drug/alcohol	X		
Gender	X	M	
Non-compliant behaviors (e.g., off-trail hiking)	X		
Performance (human) error			M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			L
Level of visitor preparedness for activity			L
Social Hazards			
Peer pressure	X		
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)	X		
Size of group (e.g., individual, small, large)	X		
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)	X		
Technological Hazards			
Motor vehicle malfunction	X		
Other vehicle malfunction (e.g., bike, boat, snowmobile)	X		
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)	X		
Other (please list)			

U == Respondent rated as unknown

15.0 Gettysburg National Military Park

15.1 Overview
The inventory assessment for the Gettysburg National Military Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

15.2 Park activity hazards
Table 15.1 shows the degree of hazard associated with visitor activities at Gettysburg National Military Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Gettysburg National Military Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking;
2) motor vehicle operation; and
3) biking.

Walking accounted for 64% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 18% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Table 15.1
Degree of hazard associated with visitor activities at Gettysburg National Military Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	M	N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	D	L	N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	D	L	N/A
Hiking (e.g., day hiking, backpacking)	D	L	N/A
Horse, mule riding	D	L	N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[21]	D	H	N/A
Motor vehicle operation	D	M	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	L	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	H	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

15.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[21] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 15.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 56% of injuries and illnesses resulting from those activities are driver-related and 12% are road-related.

Table 15.2
Ratings of risk conditions at Gettysburg National Military Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		M	N/A
Meteorological conditions (e.g., snow, fog)		L	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 15.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		M	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

16.0 Grand Teton National Park

16.1 Overview
The inventory assessment for the Grand Teton National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

16.2 Park activity hazards
Table 16.1 shows the degree of hazard associated with visitor activities at Grand Teton National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Grand Teton National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) climbing; and
3) hiking.

Visitor activities classified as "other" or "unknown" resulted in 22% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Table 16.1
Degree of hazard associated with visitor activities at Grand Teton National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	D	L	N/A
Boating and rafting (non-motorized)	D	L	N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	D	M	N/A
Horse, mule riding	D	M	N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[22]	D	M	N/A
Motor vehicle operation	D	M	N/A
Skiing, etc.	D	L	N/A
Snowmobiling	D	L	N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	M	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does
      not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted
      or sanctioned by park).

16.3   Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can
increase or decrease the risk associated with a particular visitor activity. For example, inclement
weather can increase the risk of hiking or driving by creating surface conditions that are slippery.
Trailhead information can increase the awareness of visitors and therefore decrease risk. In
some cases risk conditions may increase or decrease levels of risk. For example, greater

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[22] The database does not distinguish between walking indoors and walking outdoors on paved
surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 16.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 68% of injuries and illnesses resulting from those activities are driver-related.

Table 16.2
Ratings of risk conditions at Grand Teton National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)		L	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 16.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		L	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		M	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

17.0 Lake Mead National Recreation Area

17.1 Overview
The inventory assessment for the Lake Mead National Recreation Area is based on a sample of the park's visitor accident data for the years 1995 to 1998.[23]

17.2 Park activity hazards
Table 17.1 shows the degree of hazard associated with visitor activities at Lake Mead National Recreation Area.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Lake Mead National Recreation Area the visitor activities that resulted in the most accidental injuries and illnesses were:
1) boating (motorized);
2) motor vehicle operation; and
3) swimming.

Visitor activities classified as "other" or "unknown" resulted in 14% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

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[23] Injury data for 1995 and 1994 were unavailable.

Table 17.1
Degree of hazard associated with visitor activities at
Lake Mead National Recreation Area

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	D	H	N/A
Boating and rafting (non-motorized)	D	L	N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	D	L	N/A
Horse, mule riding	D	L	N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[24]	D	L	N/A
Motor vehicle operation	D	H	N/A
Skiing, etc.	D	L	N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	M	N/A
Technical climbing and mountaineering	D	L	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	L	N/A
Wildlife viewing (e.g., birds, bears)	D	L	N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

17.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In

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[24] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

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some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 17.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 53% of injuries and illnesses resulting from those activities are driver-related.

Table 17.2
Ratings of risk conditions at Lake Mead National Recreation Area

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)		M	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 17.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		H	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction		L	N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

18.0 Little Bighorn Battlefield National Monument

18.1 Overview
The inventory assessment for the Little Bighorn Battlefield National Monument is based on a sample of the park's visitor accident data for the years 1993 to 1998.

18.2 Park activity hazards
Table 18.1 shows the degree of hazard associated with visitor activities at Little Bighorn Battlefield National Monument.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Little Bighorn Battlefield National Monument the visitor activities that resulted in the most accidental injuries and illnesses was walking. This activity accounted for 50% of the total sample.

Visitor activities classified as "other" or "unknown" resulted in the other 50% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Table 18.1
Degree of hazard associated with visitor activities at
Little Bighorn Battlefield National Monument

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	N		N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	N		N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	N		N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[25]	D	H	N/A
Motor vehicle operation	N		N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	N		N/A
Technical climbing and mountaineering	N		N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	H	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D		N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

18.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In

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[25] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

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some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 18.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

Table 18.2
Ratings of risk conditions at Little Bighorn Battlefield National Monument

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)			N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		M	N/A
Meteorological conditions (e.g., snow, fog)			N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 18.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error			N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

19.0 Lowell National Historic Park

19.1 Overview
The inventory assessment for the Lowell National Historic Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

19.2 Park activity hazards
Table 19.1 shows the degree of hazard associated with visitor activities at Lowell National Historic Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Lowell National Historic Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking;
2) motor vehicle operation;
3) swimming; and
4) boating (motorized).

Walking (indoors and outdoors) accounted for 50% of the accidental injuries and illnesses in the sample. Visitor activities classified as "other" or "unknown" resulted in 41% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Table 19.1
Degree of hazard associated with visitor activities at Lowell National Historic Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	N		N/A
Boating (motorized)	D	L	N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	N		N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	N		N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[26]	D	H	N/A
Motor vehicle operation	D	L	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	N		N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	H	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

19.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

[26] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 19.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

Table 19.2
Ratings of risk conditions at Lowell National Historic Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)			N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)			N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)		L	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 19.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		M	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error			N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

20.0 Mesa Verde National Park

20.1 Overview
The inventory assessment for the Mesa Verde National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

20.2 Park activity hazards
Table 20.1 shows the degree of hazard associated with visitor activities at Mesa Verde National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Mesa Verde National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking;
2) motor vehicle operation; and
3) hiking.

Visitor activities classified as "other" or "unknown" resulted in 51% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 20.1
Degree of hazard associated with visitor activities at Mesa Verde National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	D	L	N/A
Camping (e.g., car camping, backcountry camping)	D	M	N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	D	M	N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[27]	D	M	N/A
Motor vehicle operation	D	M	N/A
Skiing, etc.	D	M	N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	L	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	H	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

20.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[27] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 20.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 38% of injuries and illnesses resulting from those activities are driver-related and 33% are road-related.

Table 20.2
Ratings of risk conditions at Mesa Verde National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		M	N/A
Meteorological conditions (e.g., snow, fog)		M	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 20.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		L	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

21.0 Mt. Rainer National Park

21.1 Overview
The inventory assessment for the Mt. Rainer National Park is based on a sample of the park's visitor accident data for the years 1996 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.[28]

21.2 Park activity hazards
Table 21.1 shows the degree of hazard associated with visitor activities at Mt. Rainer National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Mt. Rainer National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
    1) hiking;
    2) motor vehicle operation; and
    3) climbing and walking.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
    1) motor vehicle operation;
    2) climbing & mountaineering; and
    3) hiking.

Visitor activities classified as "other" or "unknown" resulted in 20% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1996-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

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[28]   The data for 1993, 1994, and 1995 were unavailable.

Table 21.1
Degree of hazard associated with visitor activities at Mt. Rainer National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	N		
Boating and rafting (non-motorized)	Y		L
Camping (e.g., car camping, backcountry camping)	Y	L	M
Caving	Y		L
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	H	H
Horse, mule riding	Y		L
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[29]	Y	M	L
Motor vehicle operation	Y	M	H
Skiing, etc.	Y	M	M
Snowmobiling	Y		L
Swimming, surfing, and wading	Y		L
Technical climbing and mountaineering	Y	M	H
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

21.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[29]	The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 21.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) motor vehicle operation: road conditions (ice, snow, debris,), faulty equipment, and alcohol use;
2) climbing & mountaineering: inadequate basic mountaineering and climbing skills, lack of proper equipment, and unprepared for sudden weather changes; and
3) hiking: lack of basic outdoor skills, including map/compass/orienteering, unprepared, and attitude, lack of respect for wilderness and rules and regulations.

Overall, for all visitor activities, infrastructure, visitor, environmental, and technological characteristics as playing a more prominent role in visitor accidents than did communication hazards and social hazards. However, communication hazards (e.g., trail signs) played some role.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 67% of injuries and illnesses resulting from those activities are driver-related, 10% result from road-related factors, and 10% are a result of equipment failure.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, age received a rating of low. On the other hand, the park respondent rated age as having high importance. In the database gender had a high importance as a factor in visitor injuries and illnesses, whereas the park staff rated gender as having low importance.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1996-1998) differ from those on which the

respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 21.2
Ratings of risk conditions at Mt. Rainer National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			M
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)		L	M
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			H
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			M
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	M
Meteorological conditions (e.g., snow, fog)		L	H
Hydrological conditions (e.g., strong surf, flooding)	X		
Other natural hazards (e.g., avalanche, fire)			M
Topographical conditions (e.g., steep slope, drop-offs)			H
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 21.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	H
Behavioral (e.g., playing, running)			M
Drug/alcohol			H
Gender		H	L
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		M	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	M
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

22.0 Mt. Rushmore National Memorial

22.1 Overview
The inventory assessment for the Mt. Rushmore National Memorial is based on a sample of the park's visitor accident data for the years 1993 to 1997 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.[30]

22.2 Park activity hazards
Table 22.1 shows the degree of hazard associated with visitor activities at Mt. Rushmore National Memorial.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Mt. Rushmore National Memorial the visitor activities that resulted in the most accidental injuries and illnesses were:
1) walking;
2) motor vehicle operation; and
3) hiking.

The park staff responding to the questionnaire indicated that walking on interpretive trails was associated with the largest proportion of accidental injuries and illnesses during the last five years.

Walking (indoors and outdoors) accounted for 49% of accidental injuries and illnesses in the sample. Visitor activities classified as "other"or "unknown" resulted in 40% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

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[30] The data for 1998 were unavailable.

Table 22.1
Degree of hazard associated with visitor activities at
Mt. Rushmore National Memorial

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	
Boating (motorized)	N		
Boating and rafting (non-motorized)	N		
Camping (e.g., car camping, backcountry camping)	N		
Caving	N		
Fishing	N		
Hiking (e.g., day hiking, backpacking)	Y	L	L
Horse, mule riding	Y		L
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[31]	Y	H	M
Motor vehicle operation	Y	M	L
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	D	L	
Technical climbing and mountaineering	Y	L	L
Walking outdoors (e.g., parking lots, interpretive trails)	Y	H	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.

N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).

D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

22.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In

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[31] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table SS.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified walking on interpretive trails as being associated with the largest proportion of visitor injuries and illnesses. As identified by the staff, the risk conditions associated with walking on interpretive trails was inattention to irregular walking surfaces.

Overall, for all visitor activities, the park staff rated visitor characteristics and environmental hazards as playing a more prominent role in visitor accidents than did communication hazards, infrastructure hazards, social hazards, and technological hazards. However, some infrastructure hazards (i.e., trail conditions) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, insects, etc. received a rating of low. On the other hand, the park respondent rated insects, etc. as having medium importance.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 22.2
Ratings of risk conditions at Mt. Rushmore National Memorial

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions	X		
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	M
Meteorological conditions (e.g., snow, fog)		L	L
Hydrological conditions (e.g., strong surf, flooding)	X		
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)			U

Table 22.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	L
Behavioral (e.g., playing, running)			M
Drug/alcohol			L
Gender		H	U
Non-compliant behaviors (e.g., off-trail hiking)			U
Performance (human) error		M	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			U
Level of visitor preparedness for activity			U
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			U
Size of group (e.g., individual, small, large)			U
Visitor crowding (e.g., # of people on trail)			U
Type of group (e.g., family groups, tour groups)			U
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			U
Other (please list)			

U == Respondent rated as unknown

23.0 Natchez Trace Parkway

23.1 Overview
The inventory assessment for the Natchez Trace Parkway is based on a sample of the park's visitor accident data for the years 1993 to 1998.

23.2 Park activity hazards
Table 23.1 shows the degree of hazard associated with visitor activities at Natchez Trace Parkway.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Natchez Trace Parkway the visitor activities that resulted in the most accidental injuries and illnesses were:
1) Motor vehicle operation;
2) walking; and
3) biking.

Motor vehicle related accidental injuries and illnesses accounted for 98% of the total number recorded in the database. Visitor activities classified as "other" or "unknown" resulted in a fraction of 1% of all accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is low ("low hazard").

Table 23.1
Degree of hazard associated with visitor activities at Natchez Trace Parkway

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	N		N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	N		N/A
Horse, mule riding	N		N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[32]	D	L	N/A
Motor vehicle operation	D	H	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	N		N/A
Technical climbing and mountaineering	N		N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	L	N/A
Wildlife viewing (e.g., birds, bears)	N		N/A
Other (please list)	D	L	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

23.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[32] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 23.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 65% of injuries and illnesses resulting from those activities are driver-related and 7% are road-related.

Table 23.2
Ratings of risk conditions at Natchez Trace Parkway

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		M	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)			N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions			N/A
Meteorological conditions (e.g., snow, fog)			N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 23.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol		L	N/A
Gender		M	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		H	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction		L	N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

24.0 Olympic National Park

24.1 Overview

The inventory assessment for the Olympic National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment questionnaire from park staff about visitor-related accidents during the last five years.

24.2 Park activity hazards

Table 24.1 shows the degree of hazard associated with visitor activities at Olympic National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Olympic National Park the activities that resulted in the most accidental injuries and illnesses were:
1) hiking;
2) motor vehicle operation; and
3) walking outdoors.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) hiking (day and overnight);
2) snow play (skiing, snowboarding, and tubing; and
3) motor vehicle operation.

In the database, snow-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1998.

Visitor activities classified as "other" or "unknown" resulted in 22% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 24.1
Degree of hazard associated with visitor activities at Olympic National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	M	
Boating (motorized)	Y		L
Boating and rafting (non-motorized)	Y	L	L
Camping (e.g., car camping, backcountry camping)	Y	M	L
Caving	Y		L
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y	H	M
Horse, mule riding	Y	L	L
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[33]	Y	M	L
Motor vehicle operation	Y	M	M
Skiing, etc.	Y	L	H
Snowmobiling	N		
Swimming, surfing, and wading	Y	L	L
Technical climbing and mountaineering	Y	M	M
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	L
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

24.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[33] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 24.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) Hiking (day and overnight) activities: weather, off-trail hiking, and human error.
2) Snow related activities (e.g., skiing, snowboarding, tubing): non-compliant visitor behaviors, level of experience, and visitor crowding;
3) Motor vehicle operation: weather, speed, and human error.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, infrastructure hazards, social hazards, environmental hazards, and technological hazards. However, some environmental hazards (i.e., meteorological and topographical conditions) and technological hazards (e.g., lack of use or failure of appropriate safety related equipment) played moderate roles.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 51% of injuries and illnesses resulting from those activities are driver-related, 11% result from environmental conditions, 16% result from road-related factors, and 11% are a result of equipment failure. Although social hazards are not significant when all visitor accidents are taken into account, visitor crowding was identified by the staff as having played an important role in snow-related visitor accidents.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited.

In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 24.2
Ratings of risk conditions at Olympic National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)			L
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)	X		
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)	X		
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)	X		
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)		L	L
Insects, spiders, and scorpions		M	L
Meteorological conditions (e.g., snow, fog)		L	M
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)	X		

Table 24.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			M
Drug/alcohol		L	M
Gender	X	M	
Non-compliant behaviors (e.g., off-trail hiking)			H
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)	X		
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			M
Other (please list)			

U == Respondent rated as unknown

25.0 Ozark National Scenic Riverways

25.1 Overview
The inventory assessment for the Ozark National Scenic Riverways is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

25.2 Park activity hazards
Table 25.1 shows the degree of hazard associated with visitor activities at Ozark National Scenic Riverways.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Ozark National Scenic Riverways the visitor activities that resulted in the most accidental injuries and illnesses were:
1) boating (non-motorized);
2) walking; and
3) swimming.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) floating (non-motorized boating, including canoe and tube use);
2) motor vehicle operation; and
3) social partying accompanied by activities such as swimming, diving, driving, and floating.

In the category of "swimming" the respondent noted that he included rope swings and cliff diving, which are both illegal to do in the park. In the database, snow-related accidental injuries and illnesses accounted for less than 5% of the total during 1993-1998.

Visitor activities classified as "other" or "unknown" resulted in 27% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 25.1
Degree of hazard associated with visitor activities at
Ozark National Scenic Riverways

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	Y	L	H
Boating and rafting (non-motorized)	Y	H	H
Camping (e.g., car camping, backcountry camping)	Y	L	M
Caving	Y		L
Fishing	Y		L
Hiking (e.g., day hiking, backpacking)	Y		L
Horse, mule riding	Y	L	M
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[34]	Y	M	L
Motor vehicle operation	Y	M	L
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	Y	M	H
Technical climbing and mountaineering	Y	L	L
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list) a) "Other" category in database b) social partying	D Y	M	H

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

25.3 Risk Conditions for All Activities
Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery.

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[34] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 25.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:

1) floating (non-motorized boating, including canoe and tube use): excessive alcohol use, lack of knowledge of river conditions (e.g., current, obstruction or rootwads), water safe practices (e.g., the danger of tying canoes and tubes together), and failure to use safety equipment (e.g., personal floatation devices),

2) motor vehicle operation: alcohol, speed (high and low), and road conditions (e.g., poor maintenance, alignment, very curvy roads, short site distance, and small shoulders, and

3) social partying accompanied by activities such as swimming, diving, driving, and floating: alcohol, lack of knowledge or common sense (e.g., knowing or losing inhibitions to the dangers water can have), and risk taking/peer pressure use of excessive alcohol, jumping from high places into unknown hazards, lack of swimming skills and stamina, and dangerous stunts on land and in the water.

Overall, for all visitor activities, the park staff rated visitor characteristics, social hazards, technological hazards, and environmental hazards as playing a more prominent role in visitor accidents than did communication hazards or infrastructure hazards. However, communication hazards (e.g., brochures, maps, and other information) and infrastructure conditions (e.g., paved area and roadway conditions) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the

database. For example, in boating, biking, and motor vehicle operation 34% of injuries and illnesses resulting from those activities are driver-related and 9% result from environmental conditions.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 25.2
Ratings of risk conditions at Ozark National Scenic Riverways

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)			M
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			M
Environmental Hazards			
Faunal hazards (e.g., bears)		M	M
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	M
Meteorological conditions (e.g., snow, fog)			L
Hydrological conditions (e.g., strong surf, flooding)			H
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 25.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	M
Behavioral (e.g., playing, running)			H
Drug/alcohol			H
Gender		M	M
Non-compliant behaviors (e.g., off-trail hiking)			M
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			H
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			M
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			M
Type of group (e.g., family groups, tour groups)			H
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

26.0 Padre Island National Seashore

26.1 Overview
The inventory assessment for the Padre Island National Seashore is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

26.2 Park activity hazards
Table 26.1 shows the degree of hazard associated with visitor activities at Padre Island National Seashore.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Padre Island National Seashore the visitor activities that resulted in the most accidental injuries and illnesses were:
1) swimming;
2) walking; and
3) motor vehicle operation.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) swimming and other water-related activities;
2) motor vehicle operations; and
3) walking.

Swimming and water-related activities often lead to stings by man of war or stingray. Hazards from walking are caused by slips, trips, and falls.

Swimming accounted for 72% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 14% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 26.1
Degree of hazard associated with visitor activities at Padre Island National Seashore

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y		L
Boating (motorized)	Y		L
Boating and rafting (non-motorized)	Y		L
Camping (e.g., car camping, backcountry camping)	Y		M
Caving	N		
Fishing	Y	L	M
Hiking (e.g., day hiking, backpacking)	D	L	
Horse, mule riding	N		
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[35]	Y	M	L
Motor vehicle operation	Y	L	H
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	Y	H	H
Technical climbing and mountaineering	N		
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	M
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

26.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[35] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 26.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) swimming and other water-related activities: visitor awareness, environment that cannot be controlled (i.e., warm polluted water generates more jellyfish, murky conditions so you can't see your feet),
2) motor vehicle operations: alcohol, age, not using proper personal protective equipment in vehicle (i.e., seatbelts), and speed, and
3) walking: poor lighting in facilities or outdoor area, improper footwear of visitor, uneven walkways, pavement, etc. that can cause slips, trips, and falls

Overall, for all visitor activities, the park staff rated visitor characteristics, environmental hazards, and technological hazards as playing a more prominent role in visitor accidents than did communication hazards, social hazards, and infrastructure hazards. However, social conditions (e.g., type of group), infrastructure conditions (e.g., boat launch and dock conditions), and communication hazards (e.g., brochures, maps, and other printed information) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of low. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 29% of injuries and illnesses resulting from those activities are driver-related and 25% result from road-related factors. The park staff also indicated that while overall infrastructure hazards did not play a prominent role in visitor related accidents, they were an important factor in accidents during walking related activities.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 26.2
Ratings of risk conditions at Padre Island National Seashore

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			M
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)	X		
Cultural resources (e.g., statue, historic house)	X		
Maintenance and operational hazards (e.g., snow removal vehicles)	X		
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)			L
Swimming facility conditions (e.g., pool, beach)			
Trail conditions (e.g., washed-out path, obstacles, loose footing))	X		
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)	X		
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			M
Environmental Hazards			
Faunal hazards (e.g., bears)		H	L
Floral hazards (e.g., poison ivy, mushrooms)	X		
Insects, spiders, and scorpions		L	M
Meteorological conditions (e.g., snow, fog)		L	H
Hydrological conditions (e.g., strong surf, flooding)			H
Other natural hazards (e.g., avalanche, fire)	X		
Topographical conditions (e.g., steep slope, drop-offs)			
Viral, bacterial, parasite hazards (e.g., giardia)			H

Table 26.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		H	H
Behavioral (e.g., playing, running)			H
Drug/alcohol			H
Gender		M	M
Non-compliant behaviors (e.g., off-trail hiking)			H
Performance (human) error		L	H
Stress related (e.g., time pressure, fear of heights)			U
Level of visitor experience in activity			M
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			U
Size of group (e.g., individual, small, large)			U
Visitor crowding (e.g., # of people on trail)	X		
Type of group (e.g., family groups, tour groups)			M
Technological Hazards			
Motor vehicle malfunction			M
Other vehicle malfunction (e.g., bike, boat, snowmobile)			M
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			H
Other (please list)			

U == Respondent rated as unknown

27.0 Point Reyes National Seashore

27.1 Overview
The inventory assessment for the Point Reyes National Seashore is based on a sample of the park's visitor accident data for the years 1993 to 1998.

27.2 Park activity hazards
Table 27.1 shows the degree of hazard associated with visitor activities at Point Reyes National Seashore.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Point Reyes National Seashore the visitor activities that resulted in the most accidental injuries and illnesses were:
1) hiking;
2) horseback riding; and
3) biking.

Visitor activities classified as "other" or "unknown" resulted in 23% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Table 27.1
Degree of hazard associated with visitor activities at Point Reyes National Seashore

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	M	N/A
Boating (motorized)	N		N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	N		N/A
Hiking (e.g., day hiking, backpacking)	D	H	N/A
Horse, mule riding	D	M	N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[36]	D	M	N/A
Motor vehicle operation	D	M	N/A
Skiing, etc.	N		N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	M	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	D	L	N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

27.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[36] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 27.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 29% of injuries and illnesses resulting from those activities are driver-related and 25% are road-related.

Table 27.2
Ratings of risk conditions at Point Reyes National Seashore

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		L	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)		M	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 27.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		L	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		M	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		M	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction		L	N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

28.0 Rocky Mountain National Park

28.1 Overview
The inventory assessment for the Rocky Mountain National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

28.2 Park activity hazards
Table 28.1 shows the degree of hazard associated with visitor activities at Rocky Mountain National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Rocky Mountain National Park the activities that resulted in the most accidental injuries and illnesses were:
    1) hiking;
    2) motor vehicle operation; and
    3) horseback riding.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
    1) motor vehicle operation;
    2) hiking (day and overnight); and
    3) climbing, mountaineering.

In the database, climbing/mountaineering accidental injuries and illnesses accounted for 5% of the total during 1993-1998, while horseback riding accounted for 6% during the same period.

Visitor activities classified as "other" or "unknown" resulted in 40% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 28.1
Degree of hazard associated with visitor activities at Rocky Mountain National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	L	L
Boating (motorized)	N		
Boating and rafting (non-motorized)	N		
Camping (e.g., car camping, backcountry camping)	Y	L	M
Caving	N		
Fishing	Y	L	L
Hiking (e.g., day hiking, backpacking)	Y	H	H
Horse, mule riding	Y	M	M
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[37]	Y	M	L
Motor vehicle operation	Y	M	H
Skiing, etc.	Y	L	M
Snowmobiling	Y	L	L
Swimming, surfing, and wading	Y		L
Technical climbing and mountaineering	Y	M	M
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	L
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	H	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

28.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[37] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 28.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor injuries and illnesses. Although environmental conditions were not rated as highly significant factors for all accidents, they played an important role in these three activities. As identified by the staff, the risk conditions associated with these accidents were:

1) motor vehicle operation: exceeding posted speed limits for curvy mountain roads, not giving due time and attention to driving, parking, and backing, and environmental conditions (e.g., weather and road conditions),
2) hiking (day and overnight): environmental conditions (e.g., snow, ice, fog, lightening, high elevations), lack of preparation (e.g., equipment, planning, and physical conditioning), and lack of experience, skill, and ability, and
3) climbing, mountaineering: environmental conditions (e.g., snow, ice, fog, lightening, high elevations), lack of preparation (e.g., equipment, planning, and physical conditioning), and lack of experience, skill, and ability.

Overall, for all visitor activities, the park staff rated visitor characteristics as playing a more significant role in visitor accidents than did communication hazards, infrastructure conditions, environmental hazards, social hazards, and technological hazards. However, communication hazards (e.g., brochures, maps, and other printed information), infrastructure conditions (e.g., trail conditions), and environmental conditions (e.g., meteorological conditions) were moderately important for some factors.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of medium. On the other hand, the park respondent rated performance error as having high importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 48% of injuries and illnesses resulting from those activities are driver-related and 5% result from road-related factors.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 28.2
Ratings of risk conditions at Rocky Mountain National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			M
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)			L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		M	M
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 28.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			L
Drug/alcohol			M
Gender		L	L
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		M	H
Stress related (e.g., time pressure, fear of heights)			M
Level of visitor experience in activity			H
Level of visitor preparedness for activity			H
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			L
Other (please list)			

U == Respondent rated as unknown

29.0 Saguaro National Park

29.1 Overview
The inventory assessment for the Saguaro National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

29.2 Park activity hazards
Table 29.1 shows the degree of hazard associated with visitor activities at Saguaro National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Saguaro National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) biking; and
3) horseback riding.

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
4) motor vehicle operation;
5) horseback riding; and
6) biking.

Motor vehicle operation accounted for 54% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 6% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 29.1
Degree of hazard associated with visitor activities at Saguaro National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	Y	M	M
Boating (motorized)	N		
Boating and rafting (non-motorized)	N		
Camping (e.g., car camping, backcountry camping)	Y		L
Caving	N		
Fishing	N		
Hiking (e.g., day hiking, backpacking)	Y	M	L
Horse, mule riding	Y	M	M
Hunting	Y		L
Indoor activity (e.g., walking or viewing inside visitor center)[38]	Y	M	L
Motor vehicle operation	Y	H	H
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	N		
Technical climbing and mountaineering	D	L	
Walking outdoors (e.g., parking lots, interpretive trails)	Y	M	L
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	M	

Y == Visitor activity at park, as indicated by respondent.

N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).

D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

29.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[38] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 29.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) driving: drugs/alcohol, driving behavior (e.g., speed, inattentiveness, fauna on or crossing roadway;
2) horseback riding: experience level of rider, inexperience of horse (e.g., young horse), and environmental hazards (e.g., wildlife, wind); and
3) biking: bicyclist behavior (e.g., speed, inexperience), topography of roads, and vehicles on road.

Overall, for all visitor activities, the park staff rated no factors as having high importance and relatively few as having medium importance. Some environmental hazards (i.e., topographical), visitor characteristics (i.e., performance error, level of visitor preparedness for activity), and infrastructure hazards (i.e., trail conditions) played moderate roles.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of high. On the other hand, the park respondent rated performance error as having medium importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 48% of injuries and illnesses resulting from those activities are driver-related and 5% are road-related.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 29.2
Ratings of risk conditions at Saguaro National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions	X		
Camping and picnic site conditions			L
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)	X		
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			L
Paved area conditions (e.g., walkways, parking lots)			L
Road conditions (e.g., bridges, potholes)		L	L
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			M
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			L
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)		L	L
Floral hazards (e.g., poison ivy, mushrooms)		L	L
Insects, spiders, and scorpions		L	L
Meteorological conditions (e.g., snow, fog)		L	L
Hydrological conditions (e.g., strong surf, flooding)	X		
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			M
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 29.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	L
Behavioral (e.g., playing, running)			L
Drug/alcohol			L
Gender		H	N/A
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		H	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			L
Level of visitor preparedness for activity			M
Social Hazards			
Peer pressure			L
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			L
Type of group (e.g., family groups, tour groups)			L
Technological Hazards			
Motor vehicle malfunction		L	L
Other vehicle malfunction (e.g., bike, boat, snowmobile)		L	L
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			L
Other (please list)			

U == Respondent rated as unknown

30.0 Statue of Liberty and Ellis Island National Park

30.1 Overview
The inventory assessment for the Statue of Liberty and Ellis Island National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998 and a response to our Inventory Assessment Questionnaire from park staff about visitor-related accidents during the last five years.

30.2 Park activity hazards
Table 30.1 shows the degree of hazard associated with visitor activities at Statue of Liberty and Ellis Island National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Statue of Liberty and Ellis Island National Park the activities that resulted in the most accidental injuries and illnesses were:
1) indoor activities and walking outside;
2) motor vehicle operation; and
3) biking.

Some hazard is associated with boating, as access to the park is via ferrys from New York and New Jersey. While some activities are rarely performed by visitors, they have been associated with visitor accidents. These include: biking, horseback riding, and motor vehicle operation. For example, a visitor fatality in 1998 was a result of a motor vehicle accident that involved a concession employee. Some accidents have occurred during activities that are not officially sanctioned or permitted by the park (e.g., swimming).

The park staff responding to the questionnaire indicated the following three activities were associated with the largest proportion of accidental injuries and illnesses during the last five years:
1) indoor activities;
2) walking outdoors; and
3) boating (motorized).

In the database, motorized boating-related accidental fatalities, injuries, and illnesses accounted for less than 5% of the total during 1993-1998.

Walking (indoors and outdoors on paved surfaces) accounted for 50% of visitor injuries and illnesses recorded in the database. Visitor activities classified as "other" or "unknown" resulted in 36% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is significant ("high hazard").

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons, such as: a) the database comprises a *sample* of all activities and visitor accidents; b) the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years); and c) differences in subjective evaluations.

Table 30.1
Degree of hazard associated with visitor activities at
Statue of Liberty and Ellis Island National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	
Boating (motorized)	Y	L	L
Boating and rafting (non-motorized)	D	L	
Camping (e.g., car camping, backcountry camping)	N		
Caving	N		
Fishing	N		
Hiking (e.g., day hiking, backpacking)	N		
Horse, mule riding	D	L	
Hunting	N		
Indoor activity (e.g., walking or viewing inside visitor center)[39]	Y	H	H
Motor vehicle operation	D	L	
Skiing, etc.	N		
Snowmobiling	N		
Swimming, surfing, and wading	D	L	
Technical climbing and mountaineering	N		
Walking outdoors (e.g., parking lots, interpretive trails)	Y	H	H
Wildlife viewing (e.g., birds, bears)	Y		L
Other (please list)	D	H	

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

30.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[39] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 30.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. They are based primarily on information provided by the park staff responding to our questionnaire.

As noted above, the park staff identified the three activities associated with the largest proportion of visitor accidental injuries and illnesses. As identified by the staff, the risk conditions associated with these accidents were:
1) indoor activities: dim lighting, visitor age, and visitor behavior;
2) walking outdoors: visitor age, visitor behavior, and walkway conditions; and
3) boating (motorized): conditions of concessions, hydrological conditions, lack of use of safety related equipment.

Overall, for all visitor activities, the park staff rated infrastructure and visitor characteristics as playing a more prominent role in visitor accidents than did communication hazards, environmental hazards, social hazards, and technological hazards. However, some social hazards (i.e., visitor crowding) played some role.

Some additional but limited data about factors that contribute to visitor accidents are available in the database. In several cases the ratings differ from those made by the park staff responding to the questionnaire. For example, for those accidental injuries and illnesses recorded in the database, performance error received a rating of low. On the other hand, the park respondent rated performance error as having medium importance.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 57% of injuries and illnesses resulting from those activities are driver-related and 10% result from road-related factors.

Differences between ratings from the CIRs database and park respondent may arise from a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the Risk Analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

Table 30.2
Ratings of risk conditions at Statue of Liberty and Ellis Island National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			L
Camping and picnic site conditions	X		
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			L
Cultural resources (e.g., statue, historic house)			L
Maintenance and operational hazards (e.g., snow removal vehicles)			M
Paved area conditions (e.g., walkways, parking lots)			M
Road conditions (e.g., bridges, potholes)	X	L	
Swimming facility conditions (e.g., pool, beach)	X		
Trail conditions (e.g., washed-out path, obstacles, loose footing))			L
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			H
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			L
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			L
Environmental Hazards			
Faunal hazards (e.g., bears)	X	L	
Floral hazards (e.g., poison ivy, mushrooms)	X		
Insects, spiders, and scorpions		M	L
Meteorological conditions (e.g., snow, fog)		M	L
Hydrological conditions (e.g., strong surf, flooding)			L
Other natural hazards (e.g., avalanche, fire)			L
Topographical conditions (e.g., steep slope, drop-offs)			L
Viral, bacterial, parasite hazards (e.g., giardia)			L

Table 30.2 continued.

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	M
Behavioral (e.g., playing, running)			H
Drug/alcohol			U
Gender		H	U
Non-compliant behaviors (e.g., off-trail hiking)			L
Performance (human) error		L	M
Stress related (e.g., time pressure, fear of heights)			L
Level of visitor experience in activity			L
Level of visitor preparedness for activity			L
Social Hazards			
Peer pressure			U
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			L
Size of group (e.g., individual, small, large)			L
Visitor crowding (e.g., # of people on trail)			M
Type of group (e.g., family groups, tour groups)			U
Technological Hazards			
Motor vehicle malfunction	X		
Other vehicle malfunction (e.g., bike, boat, snowmobile)	X		
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			U
Other (please list)			

U == Respondent rated as unknown

31.0 Yosemite National Park

31.1 Overview
The inventory assessment for the Yosemite National Park is based on a sample of the park's visitor accident data for the years 1993 to 1998.

31.2 Park activity hazards
Table 31.1 shows the degree of hazard associated with visitor activities at Yosemite National Park.

Low hazard activities are those that resulted in less than 5% of all accidental injuries and illnesses. **Medium hazard** activities are those that resulted in 5% to 25% of all accidental injuries and illnesses. Activities with **high hazard** are those that resulted in 25% or more of all accidental injuries and illnesses.

According to our sample of visitor accidents for Yosemite National Park the visitor activities that resulted in the most accidental injuries and illnesses were:
1) motor vehicle operation;
2) hiking; and
3) walking.

Visitor activities classified as "other" or "unknown" resulted in 22% of the accidental injuries and illnesses recorded in the database. Thus, the cumulative hazard associated with these unidentified activities is moderately significant ("medium hazard").

Table 31.1
Degree of hazard associated with visitor activities at Yosemite National Park

Activity	Status as a visitor activity	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Biking (e.g., trails and roads)	D	L	N/A
Boating (motorized)	D	L	N/A
Boating and rafting (non-motorized)	N		N/A
Camping (e.g., car camping, backcountry camping)	D	L	N/A
Caving	N		N/A
Fishing	D	L	N/A
Hiking (e.g., day hiking, backpacking)	D	M	N/A
Horse, mule riding	D	L	N/A
Hunting	N		N/A
Indoor activity (e.g., walking or viewing inside visitor center)[40]	D	M	N/A
Motor vehicle operation	D	H	N/A
Skiing, etc.	D	M	N/A
Snowmobiling	N		N/A
Swimming, surfing, and wading	D	L	N/A
Technical climbing and mountaineering	D	M	N/A
Walking outdoors (e.g., parking lots, interpretive trails)	D	M	N/A
Wildlife viewing (e.g., birds, bears)	D	L	N/A
Other (please list)	D	M	N/A

Y == Visitor activity at park, as indicated by respondent.
N == Not a visitor activity at park (i.e., not indicated as an activity by the respondent and it does not appear in the database).
D == Activity contributed to injuries in database (but it is unknown whether activity is permitted or sanctioned by park).

31.3 Risk Conditions for All Activities

Risk conditions are the environmental, infrastructure, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. For example, inclement weather can increase the risk of hiking or driving by creating surface conditions that are slippery. Trailhead information can increase the awareness of visitors and therefore decrease risk. In some cases risk conditions may increase or decrease levels of risk. For example, greater

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[40] The database does not distinguish between walking indoors and walking outdoors on paved surfaces. Thus, "indoor activity" is rated at the same level as "walking outdoors."

experience may make visitors more vigilant, but it may also encourage them to be more complacent and/or take more risks.

In Table 31.2 the risk conditions for all activities are rated. Factors rated as having **low** importance are those risk conditions that played a *substantial* role in less than 5% of all accidental injuries and illnesses. Of **medium** importance are those risk conditions that played a *substantial* role in 5% to 25% of all accidental injuries and illnesses. Risk conditions with **high** level of importance are those that played a *substantial* role in 25% or more of all accidental injuries and illnesses. Data for these ratings are limited, however. Very limited data about factors that contribute to visitor accidents are available in the database.

The ratings of the factors that contribute to visitor injuries and illnesses are based on all accidents recorded in the database. For some activities particular factors can play a substantial role in injuries and illnesses, even if they do not play a substantial role in all accidents recorded in the database. For example, in boating, biking, and motor vehicle operation 42% of injuries and illnesses resulting from those activities are driver-related and 24% are road-related.

Table 31.2
Ratings of risk conditions at Yosemite National Park

Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Infrastructure Hazards			
Boat launch and dock conditions			N/A
Camping and picnic site conditions			N/A
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)			N/A
Cultural resources (e.g., statue, historic house)			N/A
Maintenance and operational hazards (e.g., snow removal vehicles)			N/A
Paved area conditions (e.g., walkways, parking lots)			N/A
Road conditions (e.g., bridges, potholes)		M	N/A
Swimming facility conditions (e.g., pool, beach)			N/A
Trail conditions (e.g., washed-out path, obstacles, loose footing))			N/A
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)			N/A
Communication Hazards			
Road signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)			N/A
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)			N/A
Environmental Hazards			
Faunal hazards (e.g., bears)		L	N/A
Floral hazards (e.g., poison ivy, mushrooms)			N/A
Insects, spiders, and scorpions		L	N/A
Meteorological conditions (e.g., snow, fog)		M	N/A
Hydrological conditions (e.g., strong surf, flooding)			N/A
Other natural hazards (e.g., avalanche, fire)			N/A
Topographical conditions (e.g., steep slope, drop-offs)			N/A
Viral, bacterial, parasite hazards (e.g., giardia)			N/A

Table 31.2 continued.

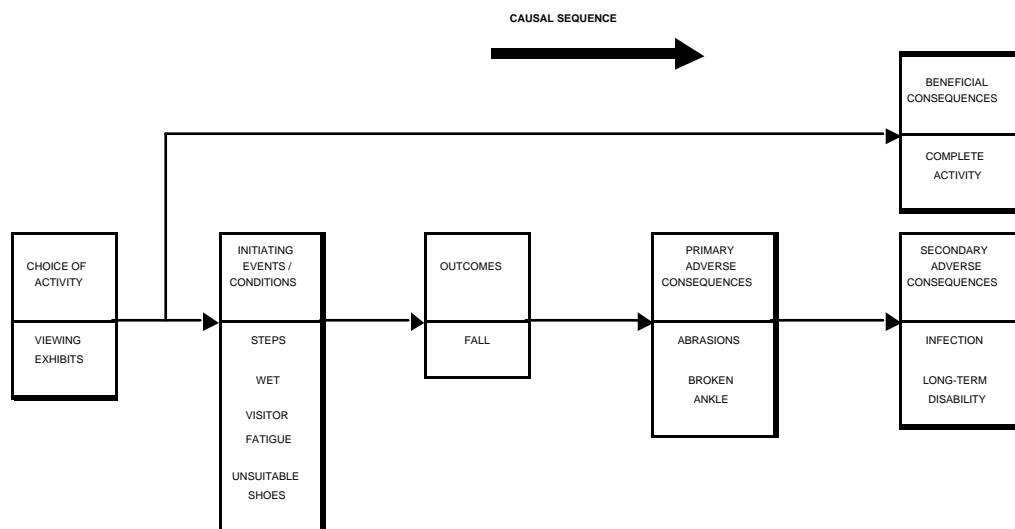| Factors that can contribute to visitor accidents	Not relevant	Rating of hazard from CIRs database	Rating of hazard from questionnaire respondent
Visitor Characteristics			
Age		M	N/A
Behavioral (e.g., playing, running)			N/A
Drug/alcohol			N/A
Gender		M	N/A
Non-compliant behaviors (e.g., off-trail hiking)			N/A
Performance (human) error		M	N/A
Stress related (e.g., time pressure, fear of heights)			N/A
Level of visitor experience in activity			N/A
Level of visitor preparedness for activity			N/A
Social Hazards			
Peer pressure			N/A
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)			N/A
Size of group (e.g., individual, small, large)			N/A
Visitor crowding (e.g., # of people on trail)			N/A
Type of group (e.g., family groups, tour groups)			N/A
Technological Hazards			
Motor vehicle malfunction			N/A
Other vehicle malfunction (e.g., bike, boat, snowmobile)			N/A
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)			N/A
Other (please list)			N/A

U == Respondent rated as unknown

32.0 Hazard Management Framework

While taxonomies and inventories are important tools for making sense of hazards that exist in park settings, it is also important to examine the underlying structure of the different kinds of hazards. In this section we illustrate the use of one framework for identifying hazards, risk conditions, and hazard management interventions with "real examples" to demonstrate how it can be applied to identify risk management opportunities
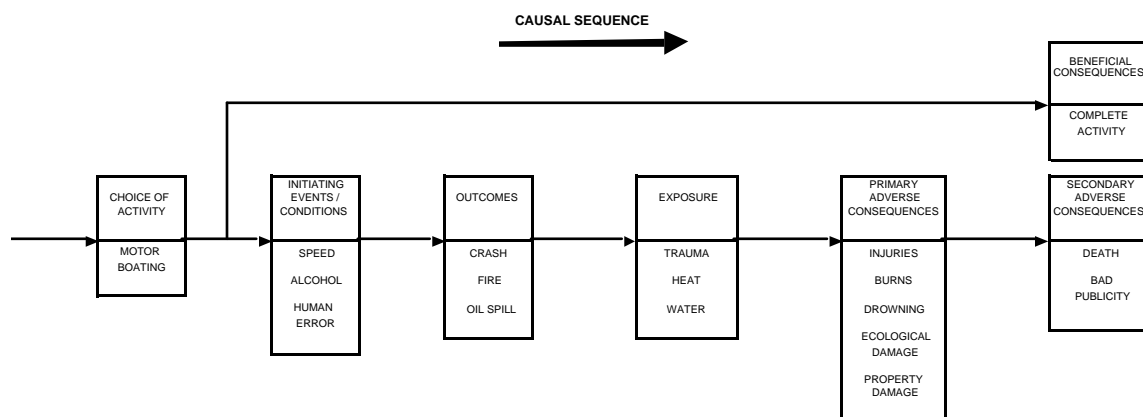
The "causal chain model" developed at Clark University draws on previous research in natural hazards (Kates 1970). It has also been used to study other hazards, such as the hazards of automobiles, nuclear power, airborne mercury, and the Bhopal chemical accident (Kasperson, Kates, and Hohenemser 1985, Bowonder, Kasperson, and Kasperson 1985). This framework enables the mapping of the causal sequence of individual hazards (Kates, Hohenemser, and Kasperson 1985). Most importantly, the causal model assists in the identification of alternative management interventions to control hazards and their consequences.

A visitor who became injured by falling down steps, though a common occurrence in the National Parks, illustrates how the causal model may be used to tease apart a sequence of events that may lead to an accident (see Figure 32.1). The diagram begins with the "choice of activity" on the left side and ends with a set of consequences on the right. In this case the choice of activity is "viewing exhibits." Most visitors will complete their visit to the park without adverse consequences (i.e., the pathway at the top of the diagram). For some small fraction of visitors, however, there are several necessary and sufficient initiating events or conditions (i.e., wet steps, visitor fatigue, and inappropriate foot-ware) that lead to an outcome (i.e., a fall) with a set of adverse consequences (i.e., abrasions and a broken ankle). Without appropriate intervention and medical treatment, these primary consequences could lead to secondary consequences, such as an infection and long-term disability. This describes the primary causal sequence.

Figure 32.1 illustrates a fairly simple hazard sequence. The model can be expanded extensively to accommodate more complicated hazard sequences. For example, Figure 32.2 illustrates another hypothetical example involving a boating accident. In this case, the release of energy (kinetic and thermal) and materials (oil and smoke) may lead to adverse consequences for humans and environmental resources, depending on the route of exposure. Thus, it is useful to add a "stage" for exposure. The exposure stage highlights the pathways by which humans, flora, fauna, and other parts of the environment may be exposed to the energy and materials released. Humans involved in the crash may suffer traumatic injuries from the kinetic energy of the crash and burns from the ensuing fire. They may also be drowned by inhalation of water. Flora and fauna may suffer adversely from oil released into the water. People nearby may suffer adversely from inhalation of smoke in the air.

CAUSAL SEQUENCE

CHOICE OF ACTIVITY	INITIATING EVENTS / CONDITIONS	OUTCOMES	PRIMARY ADVERSE CONSEQUENCES	SECONDARY ADVERSE CONSEQUENCES	BENEFICIAL CONSEQUENCES
VIEWING EXHIBITS	STEPS WET VISITOR FATIGUE UNSUITABLE SHOES	FALL	ABRASIONS BROKEN ANKLE	INFECTION LONG-TERM DISABILITY	COMPLETE ACTIVITY

Figure 32.1: Causal Sequence of Events Associated with Falling on Steps

CAUSAL SEQUENCE

CHOICE OF ACTIVITY	INITIATING EVENTS / CONDITIONS	OUTCOMES	EXPOSURE	PRIMARY ADVERSE CONSEQUENCES	SECONDARY ADVERSE CONSEQUENCES	BENEFICIAL CONSEQUENCES
MOTOR BOATING	SPEED ALCOHOL HUMAN ERROR	CRASH FIRE OIL SPILL	TRAUMA HEAT WATER	INJURIES BURNS DROWNING ECOLOGICAL DAMAGE PROPERTY DAMAGE	DEATH BAD PUBLICITY	COMPLETE ACTIVITY

Figure 32.2: Causal Sequence of Events Associated with a Boating Accident

Figures 32.1 and 32.2 illustrate how the causal model can be used to map the sequence of hazardous events and the multiplicity of contributory factors that may be involved. The causal model framework can also be used to highlight how management interventions can be used to limit, eliminate, or mitigate undesirable outcomes at each step.

Attempts to improve safety and reliability in the performance of activities and tasks (e.g., vehicle driving, rock climbing, canoeing) are fundamentally linked to the elimination or control of factors that may contribute to accidents (Kasperson, Kates, and Hohenemser 1985, National Research Council 1988). In general, exposure to a risk can be limited or eliminated and consequences of the risk can be mitigated or controlled (Kasperson et al. 1985, Bick et al. 1985). Activities can also be structured so that they are less sensitive to errors and by providing

opportunities for activity participants to correct errors before an accident occurs. All of these options are important for promoting visitor safety in the national parks.

Considerable research has shown that it is possible to control factors that may contribute to accidents. Mismatches may occur at any time. The best way to decrease the effects of mismatches is to design systems that remove the opportunities for weaknesses to matter. Such systems provide a "buffer zone" for human variability in performance (Pitz 1992, Rasmussen and Goodstein 1987). These controls can be achieved by removing the contributing factor, by making the "activity system" less sensitive to errors, and by providing opportunities to correct errors before they result in an accident. The Canadian Park Service (1995, 2) identifies a similar breakdown of options: eliminating the hazards; imposing barriers between visitors and hazards; regulating visitor behavior and access; and using persuasive safety messages. These are all options that can be important to the promotion of NPS visitor safety. They are important in both normal "routine" conditions and unexpected or emergency situations (e.g., backcountry avalanche).

Kasperson (1985, 43) defines *hazard management* as "the purposeful activity by which society informs itself about hazards, decides what to do about them, and implements measures to control them or mitigate their consequences." Hazard management comprises several functions, as shown in Figure 32.3. Hazard assessment and control analysis are processes of data gathering to determine the nature of the hazards and the options for controlling them. Implementation, evaluation, and strategy selection are management actions that can be undertaken once the hazards are understood.

Hazard assessment begins with the identification of the hazards of concern. In the NPS, this might involve an analysis of past accident data, as well as an inventory of current conditions. Once identified, quantitative estimates of the magnitude and likelihood of the risks are necessary to allow priorities to be set. Priority setting, however, is seldom simply a matter of ordering risks from the highest to the lowest since there are often conflicting values and objectives. For example, some hazards may result in a relatively few injuries or fatalities, but command considerable public attention (e.g., wildlife attacks). Some hazards may be ranked relatively high in terms of risk, but it is either technically, socially, or financially difficult for the hazard manager to do much about them (e.g., consuming alcohol while operating a boat).
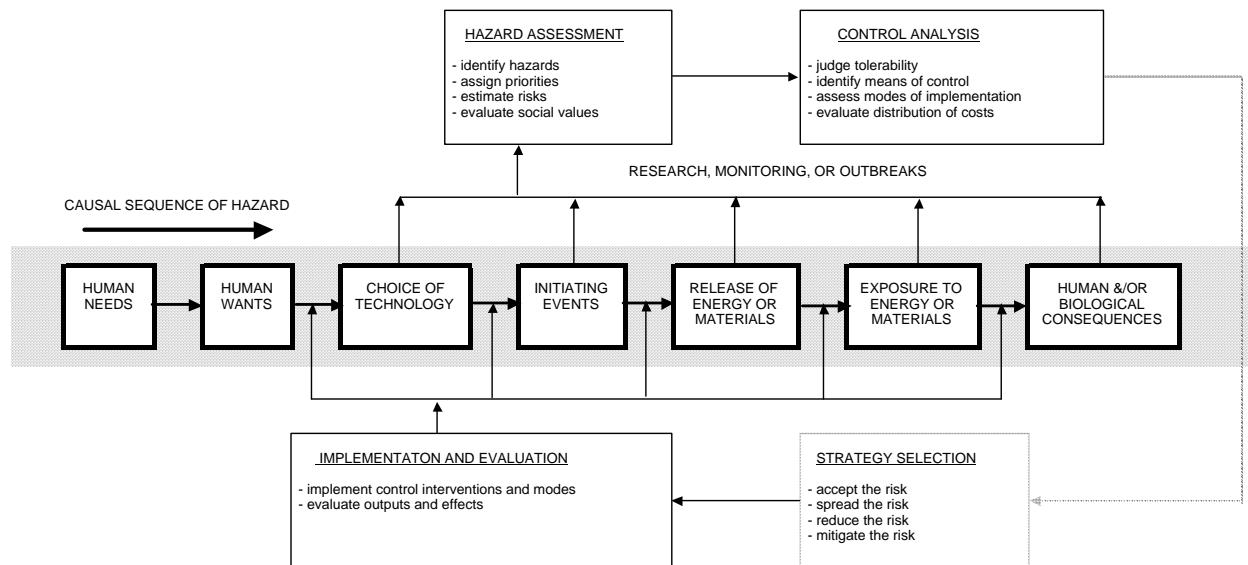
Figure 32.3: Flow Chart of Hazard Management (Source: Kasperson, Kates, and Hohenemser 1985)

In theory, the control analysis follows hazard assessment, although in reality many of the steps in the model become more convoluted and the process of hazard management is often iterative. Having assessed the risks of the various hazards in question, a judgment has to be made as to whether a particular risk is tolerable. If it is tolerable then there is no need for further effort aside from monitoring for future changes. If a risk is deemed to be intolerable, then the risk manager must examine the control options. Determining tolerability or acceptability of risk can be a difficult problem (Kasperson 1983) and has been the subject of enormous debate within the risk community (Covello, Menkes, and Mumpower 1984, Schwing and Albers 1980, Wilson 1984). Suffice it to say here that determining tolerability involves making tradeoffs between different kinds of risks, risks and benefits, and risks and costs.

If certain risks are deemed intolerable, the risk manager will need to identify their means of control. In the causal chain model, the means of control are the points of intervention that break the sequence of events. Figures 32.4 and 32.5 illustrate points of control and that can be implemented to reduce the risks associated with walking (Figure 32.1) and boating (Figure 32.2).

Figure 32.4 illustrates possible management interventions to prevent or remedy subsequent consequences from a fall while walking on stairs. In this example, replacing the steps with a ramp, improving lighting, and adding warning signs may help to prevent the initiating events and block the causal sequence, thus pushing the sequence of events to the upper branch. Adding a handrail may not prevent the initiating events, but it may prevent the outcome (i.e., a visitor falling). Redesigning the steps and changing the materials may help to minimize the adverse consequences if someone does fall. Prompt and appropriate responses by park personnel may help to prevent secondary consequences. For completeness, we include compensation of the injured party as the management option of last resort.

Figure 32.5 illustrates possible management interventions to prevent or remedy subsequent consequences from a boating accident. In this example a stage related to "exposure" was added to the causal sequence to highlight additional management interventions that may be possible. For example, to minimize inhalation exposures to the smoke people can be evacuated from the immediate area of the accident. Finally, one management option available here that was not available in Figure 32.4 is the possibility of banning the activity in question.

There are three primary modes of implementing these controls: mandate, encourage, and inform. For example, the NPS might control a risk by banning a particular activity, such as the use of personal water craft (PWCs), or it might regulate a particular activity by requiring permits. In laying trails that avoid obvious hazards the NPS attempts to lessen visitor risk, but this requires voluntary compliance. Alternatively, the NPS may encourage compliance with posted speed limits by issuing fines for speeding. One of the primary methods for controlling visitor risk, however, is providing information. In risk parlance, this is called risk communication.

To complete the picture of hazard management (Figure 32.3), the risk manager must devise a strategy that incorporates a package of controls (means and modes of intervention). This strategy may accept some risks, attempt to reduce others, and mitigate their consequences (e.g., through prompt medical attention). Spreading the risk does not really apply in the case of the NPS, since it refers to the strategy of diluting pollution in larger amounts of air or water to reduce the risk, or the use of insurance to spread the costs. Finally, the strategy must be implemented and periodically evaluated.
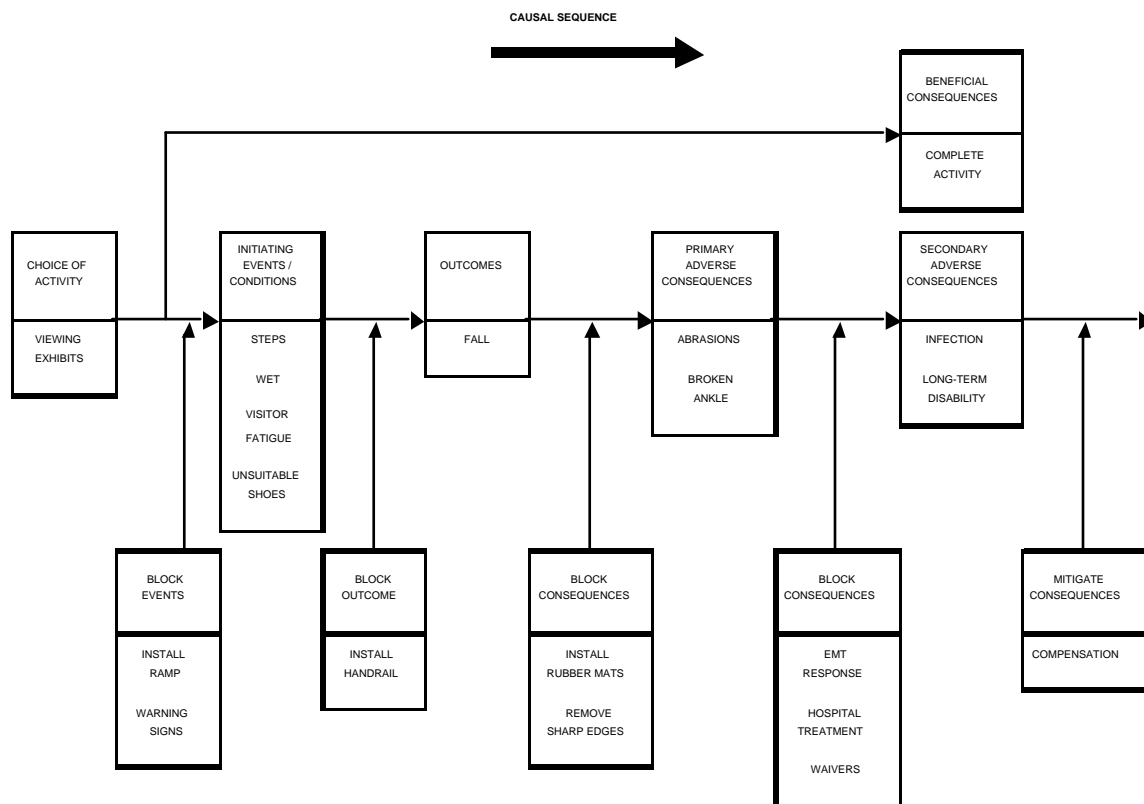
CAUSAL SEQUENCE →

BENEFICIAL CONSEQUENCES

COMPLETE ACTIVITY

CHOICE OF ACTIVITY	INITIATING EVENTS / CONDITIONS	OUTCOMES	PRIMARY ADVERSE CONSEQUENCES	SECONDARY ADVERSE CONSEQUENCES
VIEWING EXHIBITS	STEPS / WET / VISITOR FATIGUE / UNSUITABLE SHOES	FALL	ABRASIONS / BROKEN ANKLE	INFECTION / LONG-TERM DISABILITY

BLOCK EVENTS
INSTALL RAMP
WARNING SIGNS

BLOCK OUTCOME
INSTALL HANDRAIL

BLOCK CONSEQUENCES
INSTALL RUBBER MATS
REMOVE SHARP EDGES

BLOCK CONSEQUENCES
EMT RESPONSE
HOSPITAL TREATMENT
WAIVERS

MITIGATE CONSEQUENCES
COMPENSATION

Figure 32.4: Management Interventions to Prevent Falling on Steps

CAUSAL SEQUENCE →

BENEFICIAL CONSEQUENCES

COMPLETE ACTIVITY

CHOICE OF ACTIVITY	INITIATING EVENTS / CONDITIONS	OUTCOMES	EXPOSURE	PRIMARY ADVERSE CONSEQUENCES	SECONDARY ADVERSE CONSEQUENCES
MOTOR BOATING	SPEED / ALCOHOL / HUMAN ERROR	CRASH / FIRE / OIL SPILL	TRAUMA / HEAT / WATER	INJURIES / BURNS / DROWNING / ECOLOGICAL DAMAGE / PROPERTY DAMAGE	DEATH / BAD PUBLICITY

BAN ACTIVITY
BAN MOTOR BOATING

BLOCK EVENTS
SPEED LIMITS
WARNINGS
TRAINING

BLOCK OUTCOME
BOAT TYPE/DESIGN

BLOCK EXPOSURE
EMERGENCY RESPONSE

BLOCK CONSEQUENCES
EMERGENCY RESPONSE
PFDs

BLOCK CONSEQUENCES
EMERGENCY RESPONSE
HOSPITAL TREATMENT
WAIVERS
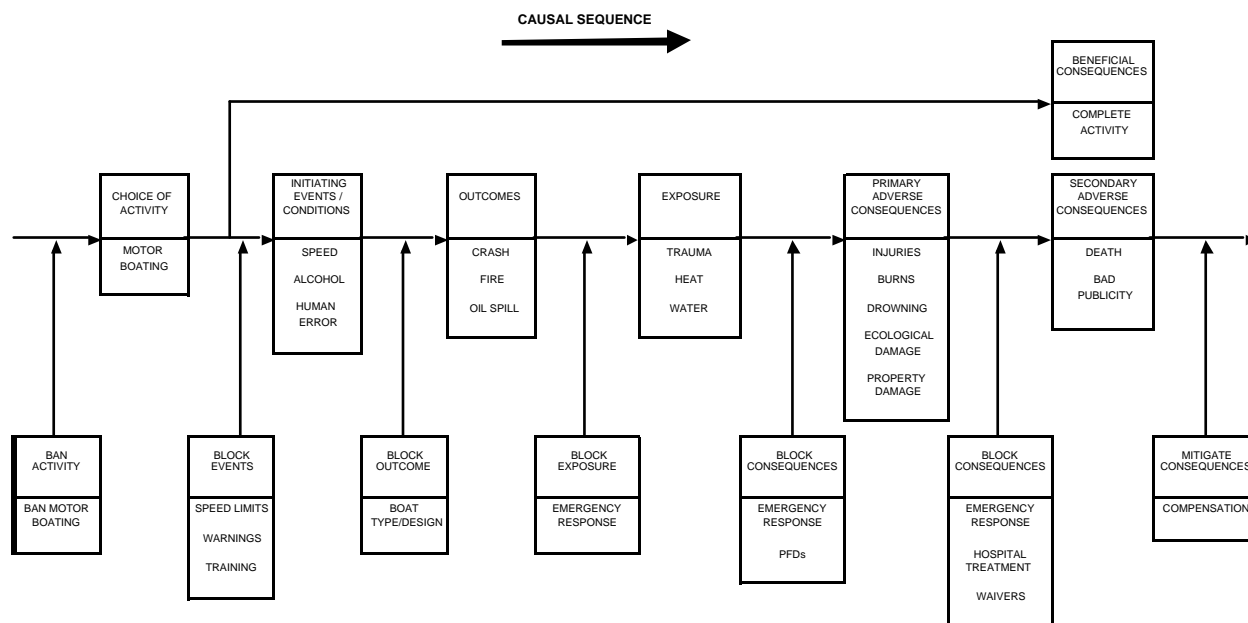
MITIGATE CONSEQUENCES
COMPENSATION

Figure 32.5: Management Interventions to Prevent Boating Accidents

33.0 Conclusions

The National park Service has an enormous amount of data on visitor accidents at each of its park units. In this report we have provided an inventory of the hazards and risk conditions that cause visitor injuries and illnesses for thirty of the park units in the National Park System. *Risk conditions* are the environmental, infrastructural, social, and visitor characteristics that can increase or decrease the risk associated with a particular visitor activity. The inventory is based on the analysis of park records on over 19,000 visitor accidents and input from park and program managers at each of the 30 parks.

Lists of activities, hazards, and other contributory factors were developed from a review of the literature that was conducted as part of the current project. The lists were modified with input from Park Service personnel, and based on the knowledge gained during an extensive examination of visitor accident data at the 30 parks. Clear patterns begin to emerge from these data and these patterns are illustrated in the previous sections.

First, there is substantial consensus between ratings by park personnel based on their knowledge and experience and ratings by project personnel based on the risk analysis data. Differences between ratings from the visitor accident database and park respondent may arise for a variety of reasons. For example, the database comprises a *sample* of all activities and visitor accidents. As discussed in the risk analysis report, data on contributory factors are very limited. In addition, the years covered by the database (i.e., 1993-1998) differ from those on which the respondent based judgments (i.e., during the last five years) and differences may arise in subjective evaluations.

The general consistency between ratings on the database and those provided by park staff suggests that the park personnel surveyed have a good understanding of the nature of visitor accidents and the contributory factors. It also suggests that the risk analysis database provides a good representation of the breadth of activities during which visitors are injured and the factors that contribute to those accidents. Future research might involve more in-depth surveys of and interviews with park personnel to glean more information about the causes and contributing factors in visitor accidents that would supplement the information available in park records and sampled in the accident database.

Second, relatively small numbers of activities tend to dominate among visitor accidents, though the set of activities varies from park to park (e.g., MVAs in many parks and especially in parkways, trips and falls while walking at national monuments, and hiking in the "crown jewel" parks).

Third, relatively few risk conditions play substantial roles in visitor injuries and illnesses. This suggests that targeted hazard management programs to eliminate, limit, or control the effects of these factors may have relatively large pay-offs in terms of visitor safety.

Fourth, the absence of ratings for many of the hazards and risk conditions in the preceding sections indicates the absence of information rather than a lack of significance. Many of the hazards and risk conditions may play an important role in visitor accidents, but we lack readily available information to assign ratings. Park records contain relatively little information about many of the risk conditions identified in the literature. Generally, there is more information about the risk conditions associated with accidents involving motor vehicles because of the nature of the forms that have to be filed. Requiring similar levels of detail to be filed on other accidents, however, could be extremely burdensome for park personnel. Research targeted to the collection of data about selected hazards might be a more efficient and effective strategy to identify additional information about the risk conditions associated with other kinds of accidents.

In spite of these gaps and limitations much important knowledge can be gained from an inventory of hazards and risk conditions at units within the National Park System. The knowledge can be useful for the NPS and park unit management efforts to better understand visitor safety and to improve visitor safety management programs.

34.0 References

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Appendix A

INVENTORY ASSESSMENT OF PARK HAZARDS AND RISK CONDITIONS

Park Activities

Based on your experience, please indicate in Table 1 how much you believe the following visitor activities contributed to the *total* number of visitor accidents at Park Name *during the last 5 years*.

Low hazard (L) activities are those that you believe resulted in less than 5% of all accidents. **Medium hazard (M)** activities are those that you believe resulted in 5% to 25% of all accidents. Activities with **high hazard (H)** are those that you believe resulted in 25% or more of all accidents. If the activity is not conducted at Park Name, then please indicate this response in the appropriate column.

Also, in the final column please indicate how confident you are about your estimate. **Low confidence (L)** means that you are uncertain about your estimate. **Medium confidence (M)** means that you are somewhat certain about your estimate. **High confidence (H)** means that you are very certain about your estimate.

Table 1:

Activity	Not activity at park	Contribution to # of accidents (L, M, H)	Confidence in your estimate (L, M, H)
Biking (on trails and roads)			
Boating (motorized, including houseboats, jetskis, etc.)			
Boating (non-motorized, including rafts, canoes, etc.)			
Camping (including car and backcountry camping)			
Caving			
Fishing			
Day hiking and backpacking			
Riding horses, mules, etc.			
Hunting			
Indoor activities (e.g., visitor center, viewing exhibits)			
Motor vehicle operation			
Skiing (downhill and cross-country)			
Snowmobiling			
Swimming, surfing, and wading			
Technical climbing, boulder scrambling, and mountaineering			
Walking outdoors on paved/prepared walkways (e.g., parking lots, interpretive trails, outdoor exhibits)			
Wildlife viewing (e.g., birds, bears)			
Other (please list)			

Factors Contributing to Accidents in All Activities

Based on your best judgment, please estimate how important each of the factors listed in the Table 2 has been as a contributor to visitor accidents *over the last 5 years.* Visitor accidents exclude those associated with criminal activities and park and concession employees.

Of **low importance (L)** are those factors that played a *substantial* role in less than 5% of all visitor accidents, in your opinion. Of **medium importance (M)** are those factors that played a *substantial* role in 5% to 25% of all accidents, in your opinion. Factors with a **high level of importance (H)** are those that played a *substantial* role in 25% or more of all accidents, in your opinion. If the factor is not relevant in Park Name or you do not know, then please indicate this response in the appropriate column.

Also, in the final column please indicate how confident you are about your estimate. **Low confidence (L)** means that you are very uncertain about your estimate. **Medium confidence (M)** means that you are somewhat certain. **High confidence (H)** means that you are very certain.

Table 2:

Factors that can contribute to visitor accidents	Not relevant	Importance as factor (L, M, H)	Don't know	Confidence in your estimate (L, M, H)
Infrastructure Hazards				
Boat launch and dock conditions				
Camping and picnic site conditions				
Conditions at concessions and services (e.g., food service, tour boat operations, grocery stores, bathrooms)				
Cultural resources (e.g., statue, historic house)				
Maintenance and operational hazards (e.g., snow removal vehicles)				
Paved area conditions (e.g., walkways, parking lots)				
Road conditions (e.g., bridges, potholes)				
Swimming facility conditions (e.g., pool, beach)				
Trail conditions (e.g., washed-out path, obstacles, loose footing))				
Visitor center and other indoor facilities (e.g., poor lighting, steep stairs, wet floors)				
Communication Hazards				
Road signs (e.g., missing, misinterpreted, not seen, seen too late)				
Trail signs (e.g., missing, misinterpreted, not seen, seen too late)				
Brochures, maps, and other printed information (e.g., unavailable, misinterpreted, not found, received too late)				

Table 2 continued.

Factors that can contribute to visitor accidents	Not relevant	Importance as factor in accidents (L, M, H)	Don't know	Confidence in your estimate (L, M, H)
Environmental Hazards				
Faunal hazards (e.g., bears)				
Floral hazards (e.g., poison ivy, mushrooms)				
Insects, spiders, and scorpions				
Meteorological conditions (e.g., snow, fog)				
Hydrological conditions (e.g., strong surf, flooding)				
Other natural hazards (e.g., avalanche, fire)				
Topographical conditions (e.g., steep slope, drop-offs)				
Viral, bacterial, parasite hazards (e.g., giardia)				
Visitor Characteristics				
Age				
Behavioral (e.g., playing, running)				
Drug/alcohol				
Gender				
Non-compliant behaviors (e.g., off-trail hiking)				
Performance (human) error				
Stress related (e.g., time pressure, fear of heights)				
Level of visitor experience in activity				
Level of visitor preparedness for activity				
Social Hazards				
Peer pressure				
Recreational conflict among visitors (e.g., mountain bikers vs. hikers)				
Size of group (e.g., individual, small, large)				
Visitor crowding (e.g., # of people on trail)				
Type of group (e.g., family groups, tour groups)				
Technological Hazards				
Motor vehicle malfunction				
Other vehicle malfunction (e.g., bike, boat, snowmobile)				
Lack of use or failure of appropriate safety related equipment (e.g., PFDs, seatbelts, safety ropes)				
Other (please list)				

Factors Contributing to Accidents in Key Activities

Based on your best judgment, what *three* visitor activities are associated with the largest proportion of visitor accidents *during the last 5 years* at Park Name. For each activity please list what you believe to be the three most important factors that contributed to visitor accidents in the activity.

Activity 1: _____

  The three most important factors contributing to accidents during this activity are:
  a)
  b)
  c)

Activity 2: _____

  The three most important factors contributing to accidents during this activity are:
  a)
  b)
  c)

Activity 3: _____

  The three most important factors contributing to accidents during this activity are:
  a)
  b)
  c)