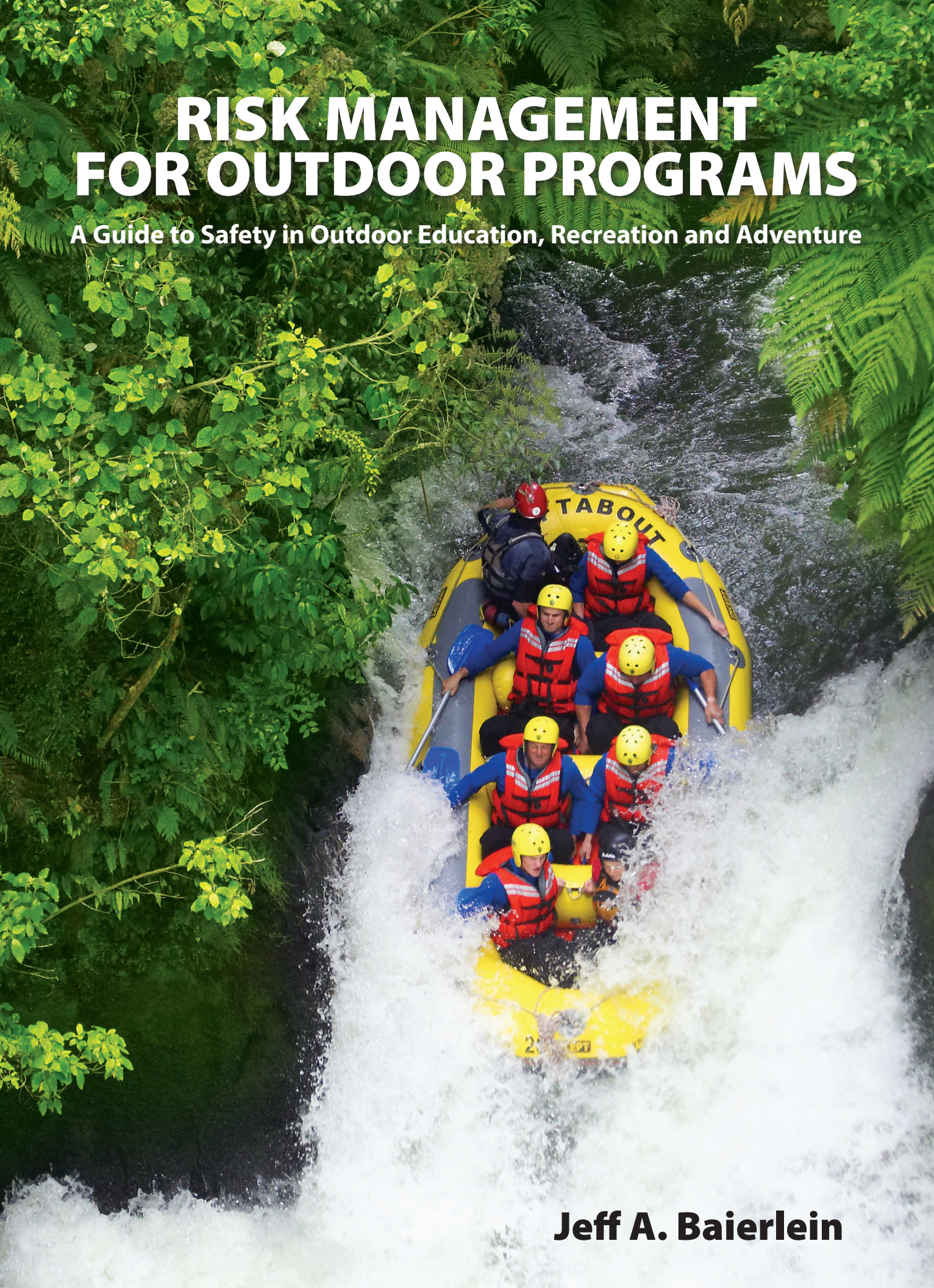
RISK MANAGEMENT FOR OUTDOOR PROGRAMS

A Guide to Safety in Outdoor Education, Recreation and Adventure



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A Guide to Safety in Outdoor Education, Recreation and Adventure

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Published 2019
Printed in the United States of America

BRIEF CONTENTS

SEEING SYSTEMS

LEARNING OBJECTIVES

1. The systemic nature of outdoor program incident causation
2. Direct causes (of incidents), indirect causes, and their interconnections
3. The management of risk as itself a complex systems issue
4. Underlying risks influencing direct risks which lead to incidents
5. Direct risk domains: Culture, Activities and Program Areas, Staff, Equipment, Participants, Subcontractors, Transportation, Business Administration
6. Underlying risk domains: Government, Society, Outdoor Industry, Business
7. Accident causation classifications systems and ongoing research
8. Interactions of risk domains
9. Considering direct and underlying risks, and their cumulative impact
10. The "pre-mortem" failure avoidance technique
11. Systems thinking in risk domains and risk management tools and systems
12. Strategic risks
13. Unintended consequences
14. Resiliency as a risk management tool

The 10 teenagers and their teacher hiked up the narrow steep-walled canyon on a rainy New Zealand afternoon, splashing through the stream that ran between towering cliff walls. The students, all 16 years old, had come with their 29-year old teacher from Elim Christian College to the Sir Edmond Hillary Outdoor Pursuit Centre, nestled in a wilderness area next to the Tongariro National Park, for a week of team-building and outdoor adventure. Scrambling or 'canyoning' through the Mangatepopo Gorge was an exciting opportunity to overcome fears and experience personal growth through adventure-based learning.

A group having fun canyoning.

The plan was for the group to walk, wade, and scramble perhaps 200 meters up the canyon, crisscrossing the stream, then turn around and return to the start. It had been raining throughout the day, at times heavily, but based on a reading of the morning's weather report, the canyon seemed safe to enter.

The water in the gorge was cold, and chest deep in places. Some students struggled. One student became frightened, began to cry, and wanted to turn back. Another student needed assistance; he had physical impairment from cerebral palsy, although this was not listed on his medical form. As they traveled, the current became stronger, and the water deeper. Near the turn-around point, one student was nearly swept away. In crossing deep areas of the stream, students had to jump in the water and catch the hand of someone who had already crossed.

Canyoning up a steep-walled gorge.

The water continued rising. It became brown and muddy. Travel became increasingly difficult. With the exit of the canyon—and safety—just about 135 meters away, the group took shelter on a ledge to wait out the flood.

But the water kept rising. It came over the ledge. It covered students' ankles, then tugged at their knees. The ledge was slippery, and students had to hold onto the rock face to avoid being swept away. The instructor, who has been at the center only three months and had not been fully briefed on gorge escape routes, had never seen the river in flood. She had no way of knowing if the water would continue to rise. She tried radioing for help, but the canyon walls blocked her call. The students were cold and uncomfortable. The instructor faced an extraordinarily difficult situation.

The water was now a roaring, raging torrent. The instructor explained her escape plan: she would jump in the river, swim downstream to safety, and every five minutes group members would follow, where from shore she would toss them a safety line with her throwbag and pull them to shore. The noise of the water was overwhelming, so she told her plan to nearby students, and tried to lip read as the teacher explained it to others farther along the ledge.

Some students were not confident in the water. The instructor knew some students would not make it alone, so she clipped them with webbing and carabiner to stronger swimmers, including herself.

The instructor courageously jumped into the water, floated through the torrent, and made it ashore just above a dam. A student soon followed, but came down the far side of the stream, out of reach of the instructor's throwbag. He was swept over the dam. He hit a log and rocks, lost his helmet, both boots, and a sock, but was able to get to shore.

Another student floated by, calling for help. But he was too far away to reach, and was thrown over the dam. His body was later found downstream. Others followed, but were unable to reach or keep hold of the throwbag. Within five minutes, six students and their teacher drowned. Bodies of two students were recovered more than two kilometers downstream.

How could this have occurred? The incident happened on April 15, 2008, and the organization had been providing outdoor programs since 1972. The Centre had safety management systems, risk assessments, and detailed safety policies in place. Safety procedures covered activities, staff training, emergency planning, rescue equipment, and more. The Centre repeatedly boasted of its "highly trained" instructors. They were led by a CEO with a PhD in Risk Management who had outdoor accident investigation experience and had been at the Center for over 20 years. On the surface, and on paper, things looked great.

But an external review and a coroner's investigation uncovered a complex system riddled with issues that contributed to the tragedy.

A partial list of findings and recommended areas of attention included the following:

Culture

1. The organization had a history of blaming staff for accidents, rather than addressing underlying issues.
2. Expectations to conduct activities "rain or shine" and to accept inexperienced, under-trained, and overworked staff leading potentially hazardous outdoor activities were not effectively addressed.
3. Management had an inappropriate over-confidence that safety systems were appropriate.

Activities & Program Areas

1. Participant swimming ability, required by Centre policy to be assessed, was not checked, nor was there any routine system to do so.
2. The Crisis Management Plan identified floods as a threat, but did not provide specifics or strategies to address the flood situation that occurred.
3. Managers noticed rising waters in the gorge, but did not at that point initiate or at any point effectively implement the Crisis Management Plan.
4. Rescue drills practicing rescue of groups in the gorge had not been conducted.

5. The philosophy of "challenge by choice" was not followed, where participants could choose to participate or not in the gorge trip.

Staff

1. Program management did not read the weather map supplied to the Centre by MetService (the national weather service), which would have alerted staff about heavy rain.
2. Program management did not access freely available updated weather forecasts, or subscribe to MetService's free Severe Weather Warning email notification service.
3. The instructor was not formally assigned a mentor, who could provide safety guidance, as described in the Centre's policies; the mentoring system did not appear to be in place.
4. Staff to participant ratios were inadequate. Solo instructing in challenging terrain was inappropriate. This had repeatedly been a problem with previous incidents but had not been addressed.
5. The instructor was permitted to lead the Gorge trip without having read and signed the Risk Analysis and Management System document describing Gorge risks and management strategies, as required.
6. The Centre's instructors in general were seriously inexperienced. The instructor had been working at the Centre for less than three months.
7. The instructor training and orientation (induction) system was too brief and was inadequate.
8. A map of the gorge with emergency escapes was available, but was never given to the instructor. Contrary to Centre policy, the instructor was never shown and familiarized with all the emergency escapes.
9. The group passed by a "high water escape" shortly before sheltering on the ledge, but due to inadequate instructor training and experience, did not take advantage of it.
10. In 1976 a girl on a Centre trip in the gorge was swept away and drowned. Over the years other incidents occurred where students were swept away by the current or trapped on a ledge due to rising water. However, these and other incidents were not effectively communicated to staff to be used as learning experiences.

Participants

1. Medical forms were not filled out completely, omitting the presence of cerebral palsy in one student.

Equipment

1. The radio was turned off, disassembled, and double-bagged, making communications to or from the group more difficult.
2. A radio communications system to eliminate spots of no radio reception in the canyon was not in place.
3. The throwbag was used in a manner and location in which it was ineffective.
4. Only one radio was present with the group, hampering communications when the group split up.
5. Radio procedures (regarding which channels to use) were unclear to rescuers, leading to confusion and inefficient communications.

Business Administration

1. Activity leader turnover was high. Activity leaders frequently reported feeling overworked and disillusioned with the organization.
2. Due to staffing issues, there was pressure to get new instructors into productive work mode as soon as possible.
3. The medical form did not ask about swimming competence.
4. The Centre boasted in its enrollment materials about its "highly trained instructors" with "extensive qualifications," but placed participants with an inexperienced instructor with insufficient knowledge of the program area. Parents were therefore unable to meaningfully give informed consent.
5. The Instructor Handbook was not sufficiently correlated with the Risk Analysis, and the Risk Analysis document was incomplete.
6. A documented history of problems with instructors with inadequate experience or program area knowledge, inadequate supervision ratios, and flood incidents was not addressed.
7. Competency-based assessments failed to ensure adequate knowledge of specific program areas.
8. The impact of financial pressure led to pressure to accept bookings even if suitable staff were not available.

Government

1. The weather report issued by MetService used by staff mistakenly omitted the word "thunderstorm," which could have alerted staff to heavy rains.
2. MetService did not follow up to address the error in its forecast.
3. The New Zealand government did not ensure safety standards for outdoor adventure programs were met, for example by a licensing scheme.

Outdoor Industry

1. An external safety audit was being conducted on the day of the tragedy. Despite the death and the many issues leading to it, those issues were not addressed in the audit.

About the Flood

The analysis noted that the flood was not unusual, happening on average every couple years. The rising water would have been predictable, if closer attention had been paid to MetService forecasts.

The water began receding just as the group left the ledge. Had the group stayed there—had the instructor had the training sufficient to know that was appropriate—it is very likely everyone would have survived.

23.1. INTRODUCTION

Incidents often have multiple direct causes. These causes themselves are brought about by other, underlying causes, or risk factors. All these elements interact with and influence each other in a complex system. To anticipate, understand, minimize and prevent these incidents, it's important to understand the systemic nature of the influences that bring them about.

Figure 23.1. Risk management systems are made of complex interconnected elements, just as are networks in the human brain.

We've left this important topic for the end of the book to emphasize its importance. It's easy—if wrong—to blame a single person when an incident occurs. The driver of the vehicle that crashed is at fault—or are they? Did the organization provide appropriate driver training? Did supervisors schedule the vehicle operator to drive late at night, through diminished conditions, after a long day of work? Was the expectation that drivers would speed, and take mobile phone calls from managers while driving? Was the roadway properly maintained and signed?

A more accurate approach to understanding the reasons an accident occurred is to look at the direct causes of the accident, the factors influencing those direct causes, and the interactions between all those elements. Our understanding of accident causation remains incomplete. Accidents will continue to occur. However, looking at incidents from a systems perspective helps us see a more full picture.

We've broken the contents of the book into chapters—in Part II, eight chapters for eight risk domains, and Part III, eleven tools for approaching the management of risks. This analytical approach helps us closely examine and better understand individual system elements.

However, incidents with complex causes and solutions cannot be understood and addressed in isolation. Systems thinking reminds us that the components of a system will act differently when separated from the rest of the system. Therefore, no chapter topic here should be considered in isolation.

We must now begin the crucial step of stitching these elements together into an integral whole. It's only as an entire, interconnected network that the elements of a risk management system can be correctly understood.

23.2. FROM AVIATION SAFETY TO OUTDOOR SAFETY

Some of the best work in risk management systems is done in aviation safety and accident analysis. The frameworks and lessons there translate relatively easily into outdoor program risk management.

Figure 23.2. Research into causes of aviation accidents informs outdoor program risk management.

Airplane crashes are usually the result of multiple factors. In October 2018, Lion Air Flight 610 dropped 1500 meters in one minute to nose-dive into the Java Sea at over 700 kph, killing all 189 on board. The almost-new Boeing 737 airplane had experienced repeated equipment problems before the fatal flight and was reportedly unairworthy. The airline had a poor safety record and a reputation for a profits-before-safety culture. Airline maintenance crews were accused of faking maintenance reports. Pilots reportedly complained of overwork. The 31-year old pilot may not have received adequate training on the new airplane model. There may have been design flaws and inadequate training documentation on the new model from the manufacturer. And global shortages of aircraft engineers, mechanics and air safety regulators were cited as potential factors.

An example of an investigation exploring multiple systemic failures leading to an incident in the outdoor industry is found in the examination of a ropes course incident in Victoria, Australia. When a 17-year old boy died from falling off a home-made giant swing at a ropes course after a carabiner unexpectedly opened, causing him to fall 10 meters onto his head, the investigation found causes ranging from improper use of carabiners, lack of back-up systems (as required by the Australian standard for amusement rides), the participant inappropriately being positioned upside-down, and failure of the Victorian WorkCover Authority to identify and prevent unsafe operation of the giant swing.

The coroner also noted that voluntary organizations like the Camping Association of Victoria, which accredited camping venues, were unlikely to be able to prevent similar incidents in the future, in the absence of legislative jurisdiction to perform routine surveillance and enforce safety issues.

Because the giant swing was manually operated, it was exempt from certain occupational health and safety regulations, and the coroner recommended a change in legislation to remove this exemption in order to allow the workplace safety agency better awareness of the giant swing's design and operation before it became operational.

Finally, the coroner recommended the government establish a mandatory certification-type scheme and inspection system for adventure activities.

To address a case of an unclipped carabiner, recommendations were made addressing participants, staff, equipment, the industry association, the regulatory body and the legislature.

Systems Thinking and the Business of Risk Management

Characteristics of complex problems requiring systems thinking include 1) difficulty in achieving widely shared recognition that a problem even exists, and agreeing on a shared definition of the problem; 2) difficulty identifying all the specific factors that influence the problem; 3) limited or no influence or control over some causal elements of the problem, 4) uncertainty about the impacts of specific interventions, 5) incomplete information about the causes of the problem and the effectiveness of potential solutions; 6) a constantly shifting landscape where the nature of the problem itself and potential solutions are always changing.

In this light, we can see the endeavor of outdoor program risk management itself, embedded in a complex business management system, itself embedded in complex social and governmental systems, as a systems issue. With limited budget and incomplete knowledge, where to you put your risk management priorities? How do you drive down the severity and rate of incidents, but also keep program quality high, customer satisfaction high, financial performance acceptable? What is the right balance, as standards, technologies, expectations are ever-shifting?

23.3. A MODEL OF THE OUTDOOR PROGRAM RISK SYSTEM

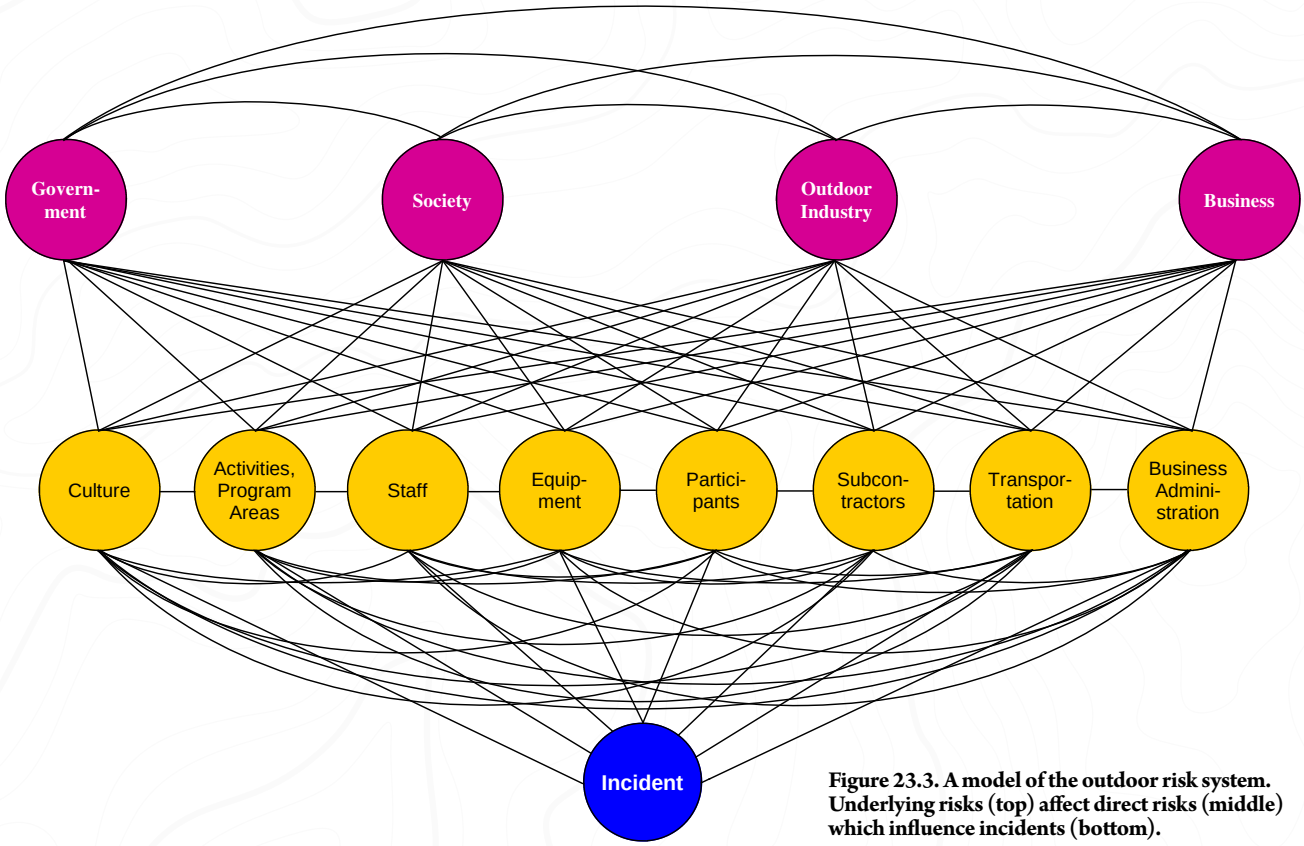

Figure 23.3. A model of the outdoor risk system. Underlying risks (top) affect direct risks (middle) which influence incidents (bottom).

Figure 23.3 illustrates an approach to understanding the components and interrelationships of domains that affect risk management in outdoor programs. This model is one of several (there is as yet no universally used standard), and shares some features with the well-respected Danish AcciMap accident analysis method (and its multiple variations) used in aviation incident analysis, outdoor safety, and elsewhere.

The model has three principal components:

1. Direct risk domains;
2. Underlying risk domains, and
3. The interconnections between them.

These three elements combine to influence the likelihood and severity of an incident causing loss.

Direct risks are found in the direct risk domains of Culture, Activities and Program Areas, Staff, Equipment, Participants, Subcontractors, Transportation and Business Administration. These proximate risks are also termed "operational risks" for their closeness to the operations of an outdoor program. Risk from multiple direct risk domains are typically factors in incidents.

(Terms here—such as 'proximate risk' or 'proximate cause'—are to be considered in the general outdoor safety context, not in specific legal and insurance contexts in which they might also occur.)

Underlying risks are also sometimes called root causes, or secondary, tertiary, etc. risks. Here they are found in underlying risk domains of Government, Society (such as in social norms and popular opinion), Outdoor Industry, and Business. These underlying risks influence direct risks, which in turn influence the nature of the incident.

Interconnections between the risk factors within the risk domains represent the ways in which the risk factors influence each other. These interdependencies show up, for example, when interventions designed to manage one risk have effects on other risk factors, sometimes unpredictably.

Ultimately, to understand why an incident occurred—and how its reoccurrence might be prevented—all of these elements must be considered, individually and together. Effective solutions must incorporate, rather than exclude, the complexity inherent in the system.

We'll now discuss each of these three elements in more detail.

23.3.1. Direct Risks

Direct risks arise from each of the direct outdoor program risk domains. Each chapter in Part II, Risk Domains, addresses one of these domains, and the discrete management of risks therein.

Examples of these direct risks well managed include (among many others):

1. **Culture:** just culture; culture of following safety rules
2. **Activities & Program Areas:** procedures to avoid falling down steep slope
3. **Staff:** good judgment
4. **Equipment:** safe camp stove operation
5. **Participants:** following directions
6. **Subcontractors:** adequately trained and equipped subcontractor staff
7. **Transportation:** defensive driving
8. **Business Administration:** accurate marketing materials

Direct Risks In Action. Let's consider the simple example of preventing ankle blisters while on a hiking trip. The formation of a blister is a relatively straightforward incident, but still benefits from systems thinking. Multiple direct risk domains can play a role:

1. **Culture:** Activity leaders foster a friendly, non-macho culture where it's okay to ask for help or stop to fix a problem rather than just push through pain and injury.
2. **Activities and Program Areas:** Activity leaders conduct a safety briefing including blister prevention before starting the hike. Leaders follow the procedure to do a "foot check" early on the first hours of the hike, checking for hot spots. The first days' route is planned to start with moderate distance and avoid rugged terrain.
3. **Staff:** Activity leaders have been thoroughly trained to understand and manage risk factors for blisters.
4. **Equipment:** Participant gear is inspected before departure, with attention to socks and hiking boots. A supply of extra gear or contingency plan is available if participants fail to bring the required equipment.
5. **Participants:** Hikers ensure their shoes and socks fit. They stop at the first signs of discomfort. Participants check for 'hot spots' that indicate rubbing and pressure that could lead to blisters.
6. **Business Administration:** Sales staff inform participants in enrollment materials how to select proper footwear, and to break in their boots before the outdoor program begins. Administrators ensure that program schedules and plans ensure activity leaders have sufficient time and resources to conduct safety briefings and foot checks.

With even a simple risk like that of contracting blisters from hiking, a system of multiple risk domains is clearly evident. With catastrophic failures such as fatalities, anticipate that a more complex network of risk domains will be involved.

23.3.2. Underlying Risks

Underlying risks, in this model, are divided into Government, Society, Outdoor Industry, and Business. Unlike as with direct risks, outdoor programs may have limited influence on these risk domains. However, they can have a profound influence on outdoor safety. Let's consider some examples:

Government. Examples of effective management of underlying risks relating to government can include, but are not limited to:

1. **Laws and regulations.** The presence of effective laws establishing and enforcing safety standards for outdoor programs.
2. **Funding priorities.** Sufficient funding for sustaining quality outdoor education and recreation programming.
3. **Emergency services.** Good access to search, rescue, emergency transport, and medical services.
4. **Economic models.** Economic models supporting equitable resource distribution rather than continued wealth accumulation of the already wealthy, leading to sufficient resources for education and recreation services.
5. **Enforcement of laws.** Effective enforcement of existing safety laws, leading to regular legal conformity.
6. **Corruption; rule of law.** Government priorities on enhancing social programs rather than enriching politicians and their allies.
7. **Governance effectiveness.** Skillful development and implementation of appropriate, effective policies.
8. **Availability of university-level training for outdoor professionals.** Well-developed intellectual and academic architecture in public universities to support quality and advancement in the industry.

Society. Examples of effective management of underlying risks relating to society can include, but are not limited to social values such as:

1. **Risk tolerance**. Appropriately reduced risk tolerance fostering managing risks more closely and minimizing major incidents.
2. **Education, recreation, health, personal growth.** Valuing these benefits of outdoor experiences leading to sufficient resources for well-managed outdoor programs.
3. **Valuing human life.** Prizing individual lives promoting incident prevention and close investigation of incidents.
4. **Character over superficial appearance.** Promoting the well-being of others and personal responsibility rather than self-interest and conspicuous consumption.

Outdoor Industry. Examples of effective management of underlying risks relating to the outdoor industry can include, among others, factors such as:

1. **State of industry collaboration.** Presence of extensive use of high-quality peer reviews, accreditation, conferences, and journals.
2. **State of industry standards.** Widely adopted high quality national-level standards (as seen in some areas of Oceania and Western Europe) with accompanying robust inspection regimes.
3. **Advocacy for support and professionalization.** Effective lobbying of government policy-makers for financial resources, regulatory uniformity, and compulsory safety standards.

Business. Examples of effective management of underlying risks relating to the corporate world, including large and politically powerful multinational corporations, can include, among others, factors such as:

1. **A strong "social contract"** leading to financially successful businesses giving back to the community rather than providing excessive compensation to executives and owners.
2. **Welcoming and support of appropriate business regulation** (in general), which can support the establishment (specifically) of regulations regarding outdoor program safety.
3. **Promotion of thrift and social investment** (in education and elsewhere) over ever-increasing consumption.
4. **Availability of university-level training for outdoor professionals.** Well-developed intellectual and academic architecture in private universities to support quality and advancement in the industry.

A Note on Classification. The division of global risk domains into Government, Society, Outdoor Industry and Business is one of multiple taxonomical approaches. Other valid constructions exist. Some might split out educational institutions, or address values promulgated by religious traditions, or call out the media (for example, regarding the role of a free press and investigative journalism). AcciMap, Systems Theoretic Accident Modeling and Processes model (STAMP) and the Human Factors Analysis and Classification System (HFACS) accident analysis models, and their variants, present other well-developed approaches, and research in this area continues. Overlaps and inter-relationships between risk domains, no matter their classification, are common.

23.3.3. Risk Domain Interactions

Examples of the interaction of factors in multiple risk domains may be clearly evident in the examples, such as the Mangatepopo Gorge tragedy (which has become a famous case study for systems issues in outdoor safety), provided earlier in this chapter.

In another example, explored in Chapter 16, Incident Review, a kayaking tragedy affected an entire country's outdoor programming. In March 1993, a group of schoolchildren set out on a two-hour guided kayaking trip along the shore of Lyme Bay in England. They became separated after encountering windy conditions. They were overdue, but the outdoor program management delayed calling for search and rescue for hours, and gave inaccurate information about the group when the call was made. After floating in cold water for hours, waiting for help that never came, four students drowned.

The kayak instructors were not highly experienced and emergency equipment was lacking. There were no governmental safety requirements for outdoor programs.

Following the incident, the United Kingdom passed legislating mandating licensing and safety audits for adventure activity providers. Outdoor businesses, staff, participants, government agencies, schools, and other groups were all affected.

23.3.4. Implications for Practice

How to put all this theory into practice? Here are ways to bring systems thinking alive in your outdoor program.

Consider Both Direct and Underlying Risks. In thinking about minimizing the probability and severity of incidents, address both direct and underlying risks. Direct risk issues are addressed in chapters in Part II. Approaches for addressing underlying risks might include:

1. Support mandatory outdoor safety standards developed collaboratively by industry and government
2. Support good information-sharing such as national or multi-national incident databases
3. Support professionalization of the industry through university-level training including advanced degrees, research, sustainable career pathways for outdoor activity leader professionals, and sufficient funding to support these initiatives

Consider the Cumulative Nature of Risks. In risk management planning, keep in mind that multiple small risks scattered throughout several risk domains can combine to make a significant incident much more likely to occur.

A camper at a nature-focused summer camp wandered into a wooded area in the middle of camp, and ate a handful of greenery from a plant growing by a stream. The plant was the deadly toxic poison hemlock (Conium maculatum), the same plant that killed Greek philosopher Socrates. The risk accumulation was:

1. The program area (summer camp) had a deadly hazard
2. Camp staff were not aware of the hazard or informed on what to do about it
3. Participants weren't alerted to the hazard. One participant made a silly decision to eat an unknown plant

If any of those factors hadn't existed, the incident wouldn't have occurred.

(We also see the cumulative nature of risk factors in other areas, such as health. If a person doesn't get appropriate exercise, have a healthy diet, maintain strong social connections, get sufficient sleep, minimize chronic stress, and avoid toxins such as nicotine, overexposure to sun, or urban air pollution, they are much more likely to get a serious illness.)

Employ Systems Thinking with Direct Risk Domains. Just Culture, covered in Chapter 5, Culture, reminds us to focus not on "good" workers and "bad" (unsafe) workers, but to see the systems that influence them.

In Activities and Program areas, another opportunity for systems thinking exists. When beginning a new program area or activity type (such as caving), avoid simply filling out a risk register (also known as a risk assessment) in order to think about direct risks of that activity (hitting one's head on a low ceiling) or area (the area is known to flood), and considering that your primary risk management tool.

Risk registers have their place, and they can be useful when planning for new activities or program areas. But they are not enough. A New Element Readiness Assessment (described in Chapter 6, Activities and Program Areas) and other tools can be used to address potential risks in all direct and underlying risk domains. Will we stress our Human Resources department staff and systems in attempting to hire and train new activity leaders for this new program? Is the business office able to generate accurate marketing materials and appropriately written risk acknowledgement forms? Do logistics staff know where and how to acquire and manage the new equipment? Are there authoritative, well-developed standards to help us develop appropriate activity procedures?

Visualize Catastrophe. The "pre-mortem" technique can bring a systems approach to risk management planning.

Visualizing Catastrophe

One systems-oriented approach to creatively anticipating and managing risks involves imagining the catastrophic failure of an outdoor program, or a component of an outdoor organization. A list of reasons why the disaster occurred is then generated—even though no such spectacular failure might have yet happened.

This project management technique is a form of prospective hindsight, popularized in business management literature as a "pre-mortem." This term is a twist on post-mortem, which is an analysis of the cause of death. The post-mortem provides an understanding of why the death occurred—helpful to everyone, except for the deceased.

The pre-mortem process uses structured brainstorming to reframe the perspective that risk assessments often take. A typical risk assessment asks what might go wrong. The

pre-mortem approach assumes failure and asks what did go wrong—and why. Research shows that this technique increases the likelihood of accurately identifying causes of failure.

The technique can be employed at the beginning of a new initiative (such as starting to work with a new participant population, or a new activity or activity area). It can also be employed to strengthen risk management in an existing and successful program, or in the context of an incident review or risk management review.

The individuals participating in the process can be outdoor program managers, activity leaders, or individuals from any other stakeholder group. The procedure can be conducted with a small number of participants in focus-group style, or en masse with all staff or other large groups.

The procedure typically follows these steps (Figure 23.4):

1. Individuals participating in the exercise are informed by the facilitator that the program or project has experienced a devastating failure (such as a fatality).
2. Participants are asked to individually brainstorm every r eason they can think of why this might have occurred. Participants individually write down their responses.
3. Each person shares their reasons with the group, and a master list of causes is generated. There is no discussion of solutions at this point.
4. The list of reasons is reviewed, assessed, and prioritized. This can be done immediately with the group, or at a later date by management team members.
5. The results are used to identify and make improvements to risk management systems.

Figure 23.4. Pre-mortem procedure.

A visualization of future catastrophe exercise was conducted by one outdoor program that had experienced a fatality. A group of activity leaders, in a process facilitated by the CEO, was asked to respond to the question, "Who will be the next person to die on our outdoor program, and why?" Responses included suggestions like adjusting activity leader compensation and moving from a seasonal to year-round model to increase the longevity and professionalism of field staff. Other potential issues that might be brought up range from loss of broad and enduring political support from organizational leadership for investments in risk management, to subtle and not widely known operational flaws such as cultural issues or time pressures leading to fatigue and error.

This retrospective hindsight activity has several benefits over standard risk assessments. It can:

1. Reduce the effect of over-confidence on individuals already psychologically invested in moving a project forward despite any obstacles
2. Raise awareness of valid concerns, despite peer pressure to express confidence in success
3. Help address the cognitive bias where individuals are overly optimistic about the probability of success (over-confidence bias)
4. Incentivize experienced, intelligent, and analytical individuals to speak up without fear of being perceived as overly critical or not a team player
5. Reduce reluctance to criticize programs or projects that have executive support
6. Shift organizational culture to pay greater attention to potential risks that may arise in the future

Employ Systems Thinking with Risk Management Tools and Structures. Risk management tools and structures are covered in the chapters in Part III. A classic systems thinking approach to incident review is root cause analysis, discussed in Chapter 16, Incident Review.

A systems approach is also evident when incident report raw data and synthesized information is distributed throughout all levels of an organization. This allows the entire organization to explore and learn from the incident. It is in contrast with a situation in which an incident report gets quietly filed away in a middle manager's office somewhere, with either no response to the reporting party, or a disjointed new procedure handed down later without context.

Consider strategic and emerging risks. Chapter 12, Business Administration, introduced us to strategic risks. How do we grapple with the fact that climate change is leading our activity areas to burn, or flood, while participants are present? Or that a changing climate causes more typhoons to occur in the areas in which we sail?

Likewise, changes in social risk tolerance and legal precedent, such as a large and precedent-setting financial judgment for an incident that might not have previously been brought to court, represent complex strategic risks.

From the perspective of evolutionary biology, humans are programmed to see immediate threats such as a lion in the grass. It's not as easy for us to act on long-term threats like those from a poor diet or climate change. In the outdoor program context, an example could be social forces that lead to underfunding of human development activities like outdoor programming, and thereby increase risk.

A scenario planning approach, in which long-term potential futures are considered, is an option for addressing these uncertainties.

Consider Unintended Consequences. Actions in complex systems often result in unanticipated responses. Examples in outdoor programming include:

1. A campaign to reduce incident rates leads to a perverse incentive where activity leaders suppress the writing of incident reports in order to (fraudulently) meet the rate reduction goal.
2. The establishment of a conservative immobilization and evacuation protocol for potentially spine-injured participants leads to large increases in dangerous airborne evacuations of patients without apparent medical benefit.

Beyond the outdoor program context, an example from foreign policy might be arming and training a rebel group to overthrow an undesired government, but then having the group turn around and attack the country that armed and trained it.

Build in Resiliency. This advice may sound obvious; however, many outdoor programs run on lean budgets, and institutional resiliency can be an elusive goal. Investigators cited a lack of staffing and other resources as contributing factors in the Mangatepopo Gorge tragedy. Backup systems and redundancy establish resiliency. An example is the presence of multiple ways to identify emerging safety issues—program debriefs, incident reports, risk management reviews, and participant feedback.

For some organizations, it's easier said than done, but sufficient staff, equipment, financial and resources for the inevitable period of increased demand or reduced supply can provide a buffer that reduces the risk of a serious incident.

23.4. CONCLUSION

Complex systems share certain characteristics:

1. Incidents have multiple causes
2. It is hard to predict when next incident will occur
3. Personnel may not have complete control over all risk factors
4. Interventions may have unpredictable consequences

These circumstances apply to complex problems such as outdoor program fatalities, just as they apply to issues such as homelessness, global refugee flows, climate change, and corruption in government.

In addressing safety problems that occur in the context of complex systems, interventions that take into account the nature of the system of influences are most likely to be effective.

23.4.1. Return to Mangatepopo: Systemic Changes Since the Tragedy

What happened in the years following the Mangatepopo Gorge tragedy in New Zealand?

The Centre discontinued running programs in Mangatepopo Gorge, put new effort into its safety systems, created and hired for a new Safety Manager position, re-named itself, and continues providing outdoor programs. MetService now includes severe weather warnings in forecasts, provides the time of forecast production in forecasts, and sends updates in case of forecast errors.

Following the drowning of a 21-year old woman on a commercial whitewater river trip on New Zealand's South Island just two weeks after the Mangatepopo tragedy, the New Zealand government in 2009 began a review of the

country's outdoor adventure sector. National Health and Safety at Work (Adventure Activities) Regulations were passed requiring safety audits and establishing safety standards.

The New Zealand outdoor industry, with funding from the government, created 'SupportAdventure,' a central resource for outdoor safety information, and created Activity Safety Guidelines outlining activity-specific good practice information.

These and other systemic changes have helped make New Zealand's outdoor adventure risk management systems among the best in the world.

Despite progress being made, outdoor professionals around the world still generally lack the training, career sustainability, and access to financial and other resources afforded to professionals such as professors or lawyers. Nevertheless, the example set by the New Zealand outdoor adventure sector can be a model of positive systemic change for outdoor programs world-wide.

Chapter Summary

1. Incidents have multiple direct causes.
2. Those causes are brought about by underlying factors.
3. Interconnections and interactions between those direct causes and underlying factors affect incident occurrence.
4. Effectively managing outdoor risks requires understanding how these three elements work in together in a system.
5. We don't yet fully understand why accidents occur.
6. The business of outdoor program risk management is itself a complex system.
7. A model of outdoor incident causation involves factors in underlying risk domains influencing factors in direct risk domains, leading to an incident.
8. Direct risks are found in the direct risk domains of Culture, Activities and Program Areas, Staff, Equipment, Participants, Subcontractors, Transportation and Business Administration.
9. Underlying risks are found in underlying risk domains of Government, Society, Outdoor Industry, and Business.
10. Other accident models, including AcciMap, STAMP, HFACS, and their variants, exist.
11. Systems-informed management approaches include:
    a. Considering both direct and underlying risks
    b. Avoiding accumulations of risk factors
    d. Applying systems thinking to direct and underlying risk domains
    e. Applying systems thinking to risk management tools and systems
    f. Considering strategic risks and unintended consequences
    g. Building institutional resiliency