

Accident Report

Fatality

Kayak

13 January 2007

Class A



GLOSSARY

TERM	DESCRIPTION
Bank scouting	When a kayaker gets out of boat to visually examine a rapid. Used to identify safe routes through the rapid, hazards and places to position other paddlers for safety cover.
Boat scouting	Visually inspecting a rapid while sitting in your kayak. Usually done from an eddy above a rapid or from a 'ferry glide' position above the rapid.
Cag Deck	A combined one piece paddling dry jacket and spray deck.
Cumecs	A measure of river flow; cubic metres of water per second.
Eddy	A horizontal recirculation of water behind a rock, other feature, or inside of a bend created by the flow of water being impeded.
Forward Ferry Glide	A manoeuvre to move your kayak across the river without losing distance downstream. The kayak is facing upstream at a slight angle to the current and is paddled across the river.
Pinned	When a kayak becomes trapped amongst rocks, trees or other objects and is held there by the force of the water. A potentially very dangerous or fatal position.
Portaging	Carrying your kayak and equipment around a rapid. Usually done when a rapid is too difficult or dangerous to paddle.
Reverse Ferry Glide	A manoeuvre to move your kayak across the river without losing distance downstream. The kayak is facing downstream at a slight angle to the current and is back paddled across the river.
Sieve	A rock or group of rocks which have gaps between allowing water to flow through but not larger objects such as kayaks or swimmers.
Strainer	A tree, branches, wire or other objects, which allow water to flow through it but not larger objects such as kayaks or swimmers.
Throwbag	A small bag, often nylon, containing between 10-20 metres of polypropylene rope of between 8-10mm in diameter. The rescuer holds the rope end of the bag. As the bag is thrown the rope feeds out of the bag.
True left	The left hand side of the river, seen as you are facing downstream.
True right	The right hand side of the river, seen as you are facing downstream.

SUMMARY

On January 13 2007, while kayaking on the Waikaia River in Northern Southland, Mr Dennis Squires of the USA became entrapped underwater in his kayak by a tree strainer. He died of traumatic injuries sustained during the entrapment process.

The language barriers between Dennis and his kayaking companion compromised the strength of their paddling as a team.

The strength of their paddling team was also compromised by there being only two people.

The low flow exposed the full extent of log jams and sieves, increasing the objective dangers

NARRATIVE

1. On Saturday 13 January 2007 at approximately 1150 hours NZ Daylight Time (NZDT) a party of two kayakers, Mr Dennis Squires (the deceased, hereinafter referred to as Dennis) and his travelling companion (hereinafter referred to as his companion) put onto the Waikaia River, in Northern Southland, at the Canton Bridge (*See Appendix 1, Map 1*). The river is a grade 4-5 small volume technical river which, during low flows, is characterised by few clean waterfalls, several messy rock choked jumbled rapids and several log jams.
2. Dennis and his companion commenced paddling down the river using standard, river running protocol. They used a mixture of boat scouting, bank scouting and portaging to make their way down the river.
3. At the second of the larger waterfalls Dennis and his companion stopped on the true left of the river to bank scout the rapid. As they were standing on the bank Dennis noticed his kayak in the water. The kayak slid off the bank into the river and was floating downstream. Dennis ran upstream to a point where he could dive into the river and swim after his kayak.
4. As Dennis swam towards the waterfall he disappeared from his companions view behind a large boulder. He reappeared in the calm water below the waterfall and swam to the bank with his kayak. Dennis's companion kayaked over the waterfall, meeting Dennis on the bank below.
5. Dennis explained to his companion how he had swum over the waterfall and had become briefly entrapped at its base, with his feet and lower legs wedged amongst rocks. He had then managed to free himself without difficulty and make his way to shore.
6. Dennis complained of sore buttocks and thighs, and some scratches were evident on his legs. He rested on the river bank and ate a banana as he waited. After 5 – 10 minutes he felt ready to **continue**.
7. Dennis and his companion continued paddling down the river until they came to the rapid where the accident occurred at approximately 1500 hours. They both stopped in a small eddy on the true river right (*Plate 1, Accident site - point A*) from where they could boat scout and see the top of the rapid. The rapid was a Grade 4 rapid (*See Appendix 2*) characterised by numerous rocks with water flowing over and around them down a moderate gradient, and two obvious lines to either side of a pair of rocks (*Plate 1, Accident site - points B & C*).
8. Dennis's companion could see a clear line down the hard right of the rapid (*Plate 1, accident site - point B*). While he couldn't see all the detail of the rapid, he could see that the line he was looking at exited safely into a pool below the rapid (*Plate 1, Accident site - point D*). Based on the character of the river so far he felt confident that he could successfully negotiate any obstacles that came into view as he paddled the rapid.

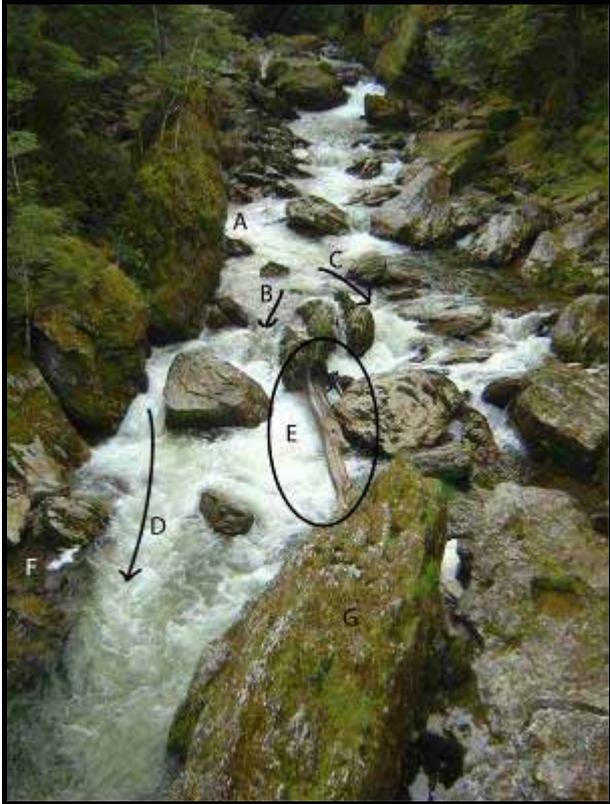


Plate 1
Accident Site Rapid

The water level at the time of the accident was approximately 300mm higher.

9. Dennis's companion paddled out of the eddy and down the right hand side of the rapid. As he paddled down the rapid he became aware of a tree creating a significant strainer hazard (*Plate 1, accident site - point E*) in the line on the left of the river. He was unsure at exactly what point he became aware of the tree.
10. At the bottom of the rapid he stopped in an eddy on the right (*Plate 1, Accident site - point F*). He indicated to Dennis that he could proceed, but not that there was a strainer hazard in the rapid. Dennis's companion could see the tree strainer from where he was sitting in the eddy.



Plate 2
Accident Site (Point E)

The water level at the time of the accident was approximately 300mm higher.

11. Dennis paddled out of the eddy and into the beginning of the rapid. As Dennis's companion watched, Dennis's kayak appeared to bounce off a rock (*Plate 3, point B: Point A the line Dennis's companion paddled*) and move quickly to the true left of the river, towards the line with the tree. At this point Dennis disappeared from his companions view behind rocks. His companion did not see Dennis again.

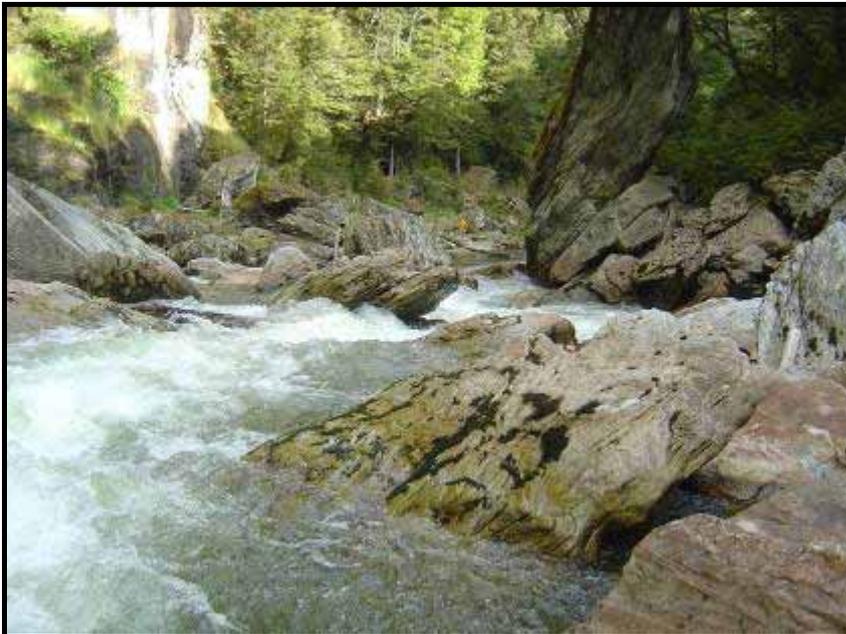


Plate 3
View of the rapid looking downstream from the eddy where Dennis and his companion began.

The water level at the time of the accident was approximately 300mm higher.



Plate 4

Accident Site showing rock (Point B) which Dennis bounced off and headed to centre left channel

The water level at the time of the accident was approximately 300mm higher.

12. When Dennis did not appear out the bottom of the rapid his companion ferry glided to the true left of the river to look for Dennis. As he paddled across, Dennis's paddle floated out from under the log. His companion grabbed the paddle and continued to the true left side of the river. He scrambled onto a large rock on the true left (*Plate 1, Accident site - point G*) so he could look down onto the rapid. His companion continued running over the boulders searching for Dennis and blowing his whistle. He clambered down until he could look directly into the water adjacent to the tree, but could see no sign of Dennis. His companion searched for 30 minutes, then decided to go for help and began paddling downstream.



Plate 5

View of the rapid looking upstream from the true left.

The water level at the time of the accident was approximately 300mm higher.

13. His companion continued paddling downstream alone. He was very nervous and stopped often to bank scout and portage rapids. At approximately 1730 he encountered some fishermen who walked out to raise the alarm. He continued paddling out to Piano Flat where his car was parked.
14. On the evening of the Saturday 13 January members of the Riversdale police and members from the Alpine Cliff Rescue team flew by helicopter into the accident site. They were unable to locate Dennis. A further rescue party comprising similar members flew by helicopter into the accident site on Sunday 14 January. The river level had increased and they were again unable to locate Dennis.
15. On Wednesday 17 January the Queenstown Whitewater Rescue Team accompanied by a Police diver, found Dennis's body, still in his kayak. This was after they were able to move the tree slightly, allowing Dennis's body and kayak to come free from where it was pinned under the tree. Dennis's body was still in the kayak and the cag deck (*See Glossary*) was still in position on the rim of the kayak cockpit.

COMMENT & ANALYSIS

1. Dennis was a fit, experienced, competent kayaker. He lived in New York State in the USA where he lived a lifestyle based on kayaking; he worked as required to fund his passion for kayaking. He was very interested in exploring new rivers and pioneering new river runs, often in difficult to access areas. He had become known as 'The Whitewater Outlaw' because of his penchant for seeking out challenging, difficult to access rivers.
2. Dennis was 48 and had been kayaking for approximately 15 years, most of them on Grade 4 and 5 rivers. He had published two kayaking guide books of New York State (*See Appendix 3*).
3. He was described as a very technically competent kayaker, as well as being highly proficient in the use of a throw bag (*See Glossary*) and would practice regularly.
4. This was Dennis' first kayaking trip outside continental North America. He had kayaked extensively all over the United States and had journeyed once to Canada to kayak.
5. Dennis and his companion had met first in Murchison on 6 December 2006. They didn't paddle together at this time.
6. Dennis's companion had been staying at the NZ Kayak School in Murchison for a month prior to the accident. He was hoping to train as a kayak instructor on his return to Japan and was accompanying the Kayak Schools' staff on instruction trips to gain some insight and experience. During this time the Kayak School staff found it very difficult to communicate with Dennis's companion because of his limited English language skills.
7. Dennis and his companion met again on 31 December 2006 at The Old Church Backpackers near Kakapotohi, on the West Coast of the South Island. Dennis's companion didn't have a car so they decided to team up and continue kayaking their way around the South Island. After that, they kayaked together on the Hollyford River – Marion Creek section (Grade 5), Shotover River – Gorge section (Grade 4), Routeburn River (Grade 4), Mararoa River (Grade 4), Kawarau River – Dog Leg section (Grade 3), Citrean section (Grade 4) and Nevis Bluff section (Grade 5+). (*See Appendix 2 for descriptions of river grading*).
8. On the evening prior to the accident, Dennis and his companion visited the pub in Cromwell. Dennis had consumed 2 ciders and his companion 2 beers. They had eaten a substantial dinner and both had a good night's sleep. On the morning of 13 January both Dennis and his companion had consumed a modest breakfast. Neither of them ate lunch before putting on the river.
9. The Waikaia River was flowing at approximately 10.5 cumecs at the time of the accident (*see Appendix 4*). When Dennis and his companion put on, the river was at approximately 11 cumecs. It had been dropping steadily during the morning, but began to rise quickly later in the afternoon. Dennis and his companion had checked the river flow gauge the evening before the trip. It was 14 cumecs; towards the low end of the paddleable range of 10 – 50 cumecs according to the guide book they carried - *New Zealand Whitewater – 120 Great Kayaking Runs*, Graham Charles, 1999 (see Appendix 5). They were also aware that fine weather was expected for the next few days and they expected the river would continue to drop below a paddleable level. From the time of the accident until Dennis's body was recovered the river rose to approximately 20 cumecs and then dropped back down to below 10 cumecs.
10. Dennis was paddling a Bliss-Stick Mystic Creeker. This is a kayak specifically designed for steep, technically difficult rivers. The kayak had been hired from Alpine Kayak Guides in Wanaka. It was a new kayak and was in an 'as new' condition.
11. Dennis was wearing clothing and equipment in good condition. He was wearing a thermal top, a Cag deck paddling jacket, kayaking shoes, elbow pads, shorts, a Kevlar composite helmet, and a buoyancy aid

12. Dennis was using a four way split paddle which he had purchased in New Zealand. He was carrying a throw bag and had a rescue sling around his waist. His companion also carried a spare split paddle, a throw bag and some technical rescue equipment.
13. Dennis's companion preferred kayaking large volume rivers. He had little experience with kayaking steep, technical rivers and seemed to be unaware of some of the significant hazards that were present. On a previous occasion he had been prevented by other kayakers from paddling a rapid on the Glenroy River, near Murchison, which had an extremely hazardous tree strainer in it. At that time he appeared to be unaware of the hazard that trees posed. After this he had been taught a signal for a tree hazard. When he signalled to Dennis to kayak down the rapid where the accident occurred, he only signalled that Dennis should proceed, not that there was a tree hazard present on the left side line of the rapid
14. Dennis' body was eventually located when his kayak was released from having been pinned deep in the water underneath the tree. The Whitewater Rescue Team used a camera on a three metre long pole to search under the tree for his body. They were able to get the pole approximately two metres under the water. There was very limited visibility and they could see no sign of Dennis or his kayak.
15. With the combined use of a chain saw, mechanical hoisting devices, ropes and leverage the tree was moved slightly. Dennis' body and kayak were released from underneath the tree. The kayak shot out of the water, at speed, bow first approximately four metres downstream from the log. Dennis was still in the kayak and his cag deck was still fitted to the rim of the cockpit of the kayak.
16. The kayak had sustained severe damage. There was a dent in the front of the kayak (*Plate 5*), a large dent in the rear underside of the kayak (*Plate 6*) and the kayak had folded and split behind the cockpit (*Plate 7*). Both of the foam structural pillars were displaced, particularly the rear one. The bottom of the rear pillar had slid out sideways and the top had popped free of its plastic bracket allowing the kayak to bend longitudinally. The seat had twisted and was out of place



Plate 6

Dent on right side in front of cockpit



Plate 7
The dent in the rear underside of kayak



Plate 8
The fold behind the cockpit

17. The post-mortem showed that Dennis died from traumatic injuries, specifically a severed spinal cord, sustained in the accident. He had a broken spine and transected spinal cord between vertebrae T2 and T3, his third, fourth and fifth ribs on his left side, and his third rib on his right side were fractured. He also had significant bruising to his face and forehead which was sustained at the time of the accident. The pathologist who performed the post-mortem indicated that this type of spinal injury was typical of a person having their lower trunk held while their head or upper back was bent violently forwards.
18. The pathologist considered that Dennis would have died instantly.

Analysis

1. Dennis was adequately equipped for this trip. Dennis's buoyancy aid was a Lotus Lola model. This buoyancy aid is not designed as a specialist kayak rescue PFD. However its buoyancy rating is comparable to other rescue PFD's. It's unknown how old his buoyancy aid was but it showed signs of wear and substantial fading of the outer fabric. Despite this, his buoyancy aid does not appear to have been a factor in his death. Specialist Rescue PFD's are the predominate style of PFD used by kayakers paddling on harder rivers, as the release belt and integral harness features provide options for rescue and recovery.
2. Dennis was wearing a cag deck (*See Glossary*). Cag decks are considered by some kayakers to be inappropriate for use on difficult rivers. With a normal spray deck if a kayak is pinned by a an object across the cockpit preventing the paddler from being able to release their spray deck from the cock pit rim the paddler may be able to push and slide their lower body and legs out of the waist opening of the spray deck. With the use of a cag deck the only way to exit the kayak is if you can release the cag deck from the rim of the cockpit. If an object is preventing the cag deck from being released from the cock pit the paddler will not be able to get out of the kayak.
3. Dennis and his companion had researched this trip. They had used the NZ whitewater guide book, and had checked the flow gauge and the weather forecast. They were well rested and had put onto the river with plenty of time to complete the trip. The river was flowing at the lower range of flows. At this low level, the full extent of sieves and log jams become more apparent. Although using the guide book provides some useful trip planning information it does not account for the variability of flows or provide any detailed guidance. Current local knowledge is invaluable in providing additional specific guidance.
4. Dennis and his companion had been paddling together for two weeks. This length of time had been insufficient for Dennis and his companion to form a cohesive paddling team because they were hampered by language barriers. While his companion could converse in English, it was often difficult to communicate with him and he often didn't understand the English that was being spoken to him. Their communications were potentially inadequate to undertake the trip. After noticing the strainer his companion did not signal to Dennis that there was a strainer hazard on the left side of the rapid. His companion had done relatively little paddling on steep, technical rivers and this may have contributed to his failure to communicate to Dennis that the tree hazard was there.
5. It is unknown why Dennis paddled down the left line of the rapid after his companion had successfully negotiated the right line. He may have been off line and bounced off rocks at a point which put him further to the left, resulting in him inadvertently running the left line. It is also possible that he had decided to paddle down the left line but then saw the tree further down the rapid. He may have then attempted to move back to the right but failed to complete the move, bouncing off rocks and being forced down the left hand line.
6. When the tree was moved and the kayak was released, the angle and speed of the kayak's exit indicated that the kayak was pinned deep underwater, upright, with a nose-up attitude. This allowed the kayak to accelerate towards the surface when it was released.
7. The exact, mechanism of Dennis's injuries are unknown. From the nature of the injuries that Dennis sustained, it is probable that when his kayak entered the left line chute he was forced against the log. It is also probable that he lent forward in the kayak and toward the log. His kayak likely hit the log at a reasonable speed and was fairly quickly forced underwater. If Dennis leant forward in the kayak as he was being forced underwater the back of his head and neck may have impacted with the log or a branch in a manner which created a forced unnatural forward movement. The front of the kayak appears to have impacted with the tree or a rock, causing the dent in the front. As the kayak was forced under the log it is probable that as it travelled its course under water the inherent buoyancy of the kayak caused the bow of the kayak to rise. The kayak was pinned in a bow high position. The back of the kayak has been forced down under the water until it struck something, resulting in an upright, bow high, pinned position. The kayak is likely to have been pinned in this

position with Dennis's body being forced forward by the force of the water and being buffeted from side to side

8. If Dennis's body was held by the force of the water in a forward leaning position this may account for the fact that his cag deck did not implode by the force of the water. His torso was restricting the force of the water against the cag deck.
9. The severe bruising to Dennis's face and cheek, which was sustained at the time of death may have been caused by his face being buffeted against the front deck of the kayak. Dennis's rib fractures may have resulted from being forced from side to side as he was being forced under the log and by being buffeted against the rim of the kayak cockpit
10. It is probable that the prolonged exposure to the constant force of water against Dennis's body created a gradual lateral torque being transferred through to the kayak seat resulting in seat and pillar displacement. The displaced foam pillars and the constant pressure on the back deck of the kayak gradually resulted in the structural integrity of the kayak being compromised and the kayak being folded behind the cockpit. The manufacturer indicated that directly behind the cockpit is the weakest part of the top deck of the kayak. In the event of a severe pin the kayak is less likely to fold through the cockpit, or front deck therefore reducing the potential for entrapment in the kayak.

CONCLUSIONS

1. For reasons unknown, Dennis paddled down the left line of the rapid in which there was a significant tree strainer hazard.
2. Dennis and his kayak became submerged and trapped under the tree.
3. Dennis died from traumatic injury sustained during the submergence and entrapment process.
4. Dennis's cag deck did not implode and his buoyancy aid was not displaced. Dennis's body was positioned in the upright, nose high kayak in a forward leaning position and the force of the river impacting the back torso.
5. Dennis's body was entrapped underwater in his kayak from the afternoon of the 13 January through to 17 of January, approximately 3.5 days. The volume of the river fluctuated up to 20 cumecs during this time. The constant force of water on an entrapped person and pinned kayak results in substantial pressure. The prolonged exposure to the force of the water resulted in the kayak being folded.
6. Language barriers between Dennis and his companion compromised their ability to function as a team.
7. Failure to communicate the presence of the strainer in the rapid meant that Dennis was inadvertently unaware of the consequences of paddling the left line of the rapid.
8. A paddling team of two is severely compromised in rescue response and in the ability to obtain additional emergency assistance.
9. On the day of the accident there was an increased risk of pinning and entrapment because the river was running at a low flow and the full extent of the sieves and log jams would have been present.
10. At the time of the accident Dennis's confidence and focus may have been compromised from the after affects of the earlier mishap which resulted in him swimming a waterfall drop and being momentarily entrapped.
11. Dennis's kayak, although not his own, was appropriate for the grade and nature of the river.

RECOMMENDATIONS

1. Kayakers must ensure that their team is cohesive and well-functioning before commencing a trip. A clear communication system must be understood by all the paddlers in the team, and every paddler's strengths and weaknesses must be clearly understood by all team members.
2. When functioning as a team language barriers can compromise the overall team performance. This should be considered in the planning stages of a trip and the difficulty of the trip to be undertaken should be relative to the function ability of the paddling team.
3. On harder rivers, where there is an increased chance of a mishap occurring, having only two paddlers as a team provides very limited rescue capabilities. On difficult whitewater if a paddler gets into trouble the ability to assist the person is often compromised by accessibility and time. Having paddling teams of at least four, provides more opportunities in a rescue situation.
4. When a hazard is noticed, its presence must be communicated as soon as possible to every other member of the team.
5. If a safe line down a rapid is evident from the top, this must be the line of choice until other lines through the rapid are shown to be paddable. If any other line cannot be fully seen, it must be scouted to ascertain its character before attempting it.
6. When scouting, paddlers need to be conscious of visual angles of opportunity. Often to see a rapid in its entirety, viewing it from different angles is required.
7. Communication strategies are critical. Kayakers must be able to clearly communicate with each other using commonly accepted river signals. Communicating using river signals requires practice and conscious use. The pre trip planning must ensure that the use of signals is common to all participants
8. The communication strategy must also consider what the team will do in the event of an emergency. The priority in a mishap is rescue. The first response rescuers are the paddling team. Having completed rescue attempts, if outside assistance is required a communication strategy is essential. Having one person paddling by themselves on remote access, difficult rivers to the take out point to raise the alarm may further compromise the personal safety of the lone kayaker.
9. Thorough trip planning includes having an overdue strategy where paddling teams are well equipped for being overdue. This should also include someone being aware of the river trip, party numbers, and estimated time of return. The person aware of the trip details needs to have the ability to notify emergency services if the trip is overdue.
10. Having the ability to communicate in an emergency situation from remote access rivers should be considered by kayakers. The technology is available in distress beacons, however the use of distress beacons would be compromised in deep gorged environments because of the reduced range of signal detection by passing satellites. Users of these devices in gorged environments would need to move to more open areas for the devices to function effectively. There is a growing use of distress beacons in land and water based adventure activities. The Rescue Coordination Centre has responded to several distress signals from trampers and mountaineers in the back country of New Zealand. The efficiency of response for distress beacons has increased with the use of the 406 beacon as these are signature capable. When the device is registered the users contact details are matched to a unique signal code for that device. From 2009 only 406 distress beacons will be monitored. In times of small party emergencies the use of a distress beacon may provide the opportunity to stay with the casualty rather than leave the casualty while help is sought.
11. In remote access river kayaking the potential always exists that if a communication device is carried it may be inaccessible due to being a submerged, pinned or lost kayak or it may even fail in the immediate locality of the accident site due to the deep gorged nature of the river environment. These considerations should form part of the overall communication strategy.

APPENDIX 1

Topographic map, Part of NZMS 260 series, F43, Garvie. Waikaha River



APPENDIX 2

International Scale of River Difficulty

(Sourced from American Whitewater Association -

http://www.americanwhitewater.org/content/Wiki/safety:start#vi._international_scale_of_river_difficulty).

Grade 1 Rapids

Fast moving water with riffles and small waves. Few obstructions, all obvious and easily missed with little training. Risk to swimmers is slight; self-rescue is easy.

Grade 2 Rapids: Novice

Straightforward rapids with wide, clear channels which are evident without scouting. Occasional manoeuvring may be required, but rocks and medium-sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful, is seldom needed. Rapids that are at the upper end of this difficulty range are designated "Grade 2+".

Grade 3 Rapids: Intermediate

Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe. Complex manoeuvres in fast current and good boat control in tight passages or around ledges are often required; large waves or strainers may be present but are easily avoided. Strong eddies and powerful current effects can be found, particularly on large-volume rivers. Scouting is advisable for inexperienced parties. Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids that are at the lower or upper end of this difficulty range are designated "Grade 3-" or "Grade 3+" respectively.

Grade 4 Rapids: Advanced

Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast manoeuvres under pressure. A fast, reliable eddy turn may be needed to initiate manoeuvres, scout rapids, or rest. Rapids may require "must" moves above dangerous hazards. Scouting may be necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong eskimo roll is highly recommended. Rapids that are at the lower or upper end of this difficulty range are designated "Grade 4-" or "Grade 4+" respectively.

Class 5 Rapids: Expert

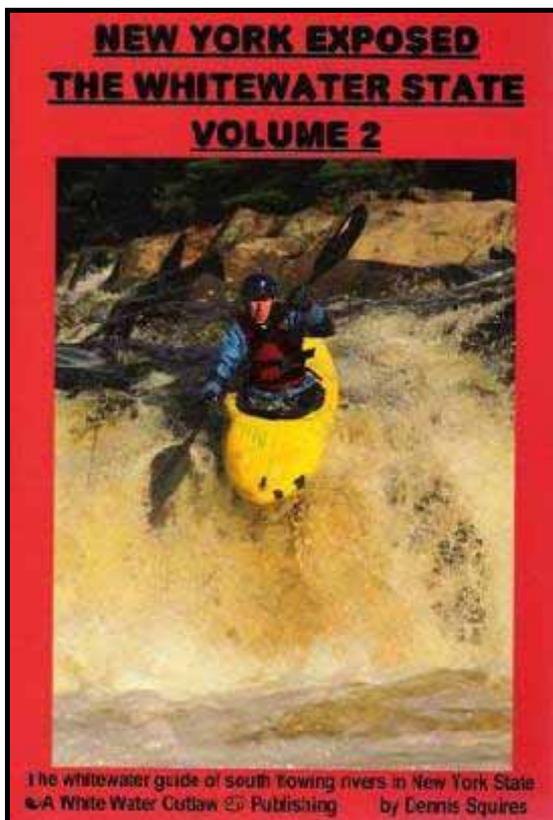
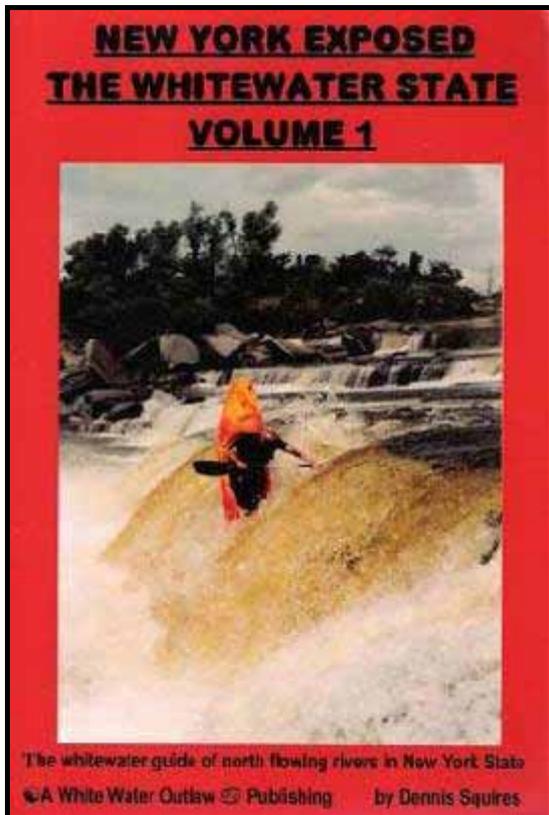
Extremely long, obstructed, or very violent rapids which expose a paddler to added risk. Drops may contain large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. What eddies exist may be small, turbulent, or difficult to reach. At the high end of the scale, several of these factors may be combined. Scouting is recommended but may be difficult. Swims are dangerous, and rescue is often difficult even for experts. A very reliable eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential. Because of the large range of difficulty that exists beyond Grade 4, Grade 5 is an open-ended, multiple-level scale designated by class 5.0, 5.1, 5.2, etc... Each of these levels is an order of magnitude more difficult than the last. Example: increasing difficulty from Grade 5.0 to Grade 5.1 is a similar order of magnitude as increasing from Grade 4 to Grade 5.0.

Grade 6 Rapids: Extreme and Exploratory Rapids

These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability and danger. The consequences of errors are very severe and rescue may be impossible. For teams of experts only, at favourable water levels, after close personal inspection and taking all precautions. After a Grade 6 rapid has been run many times, its rating may be changed to an appropriate Grade 5.x rating.

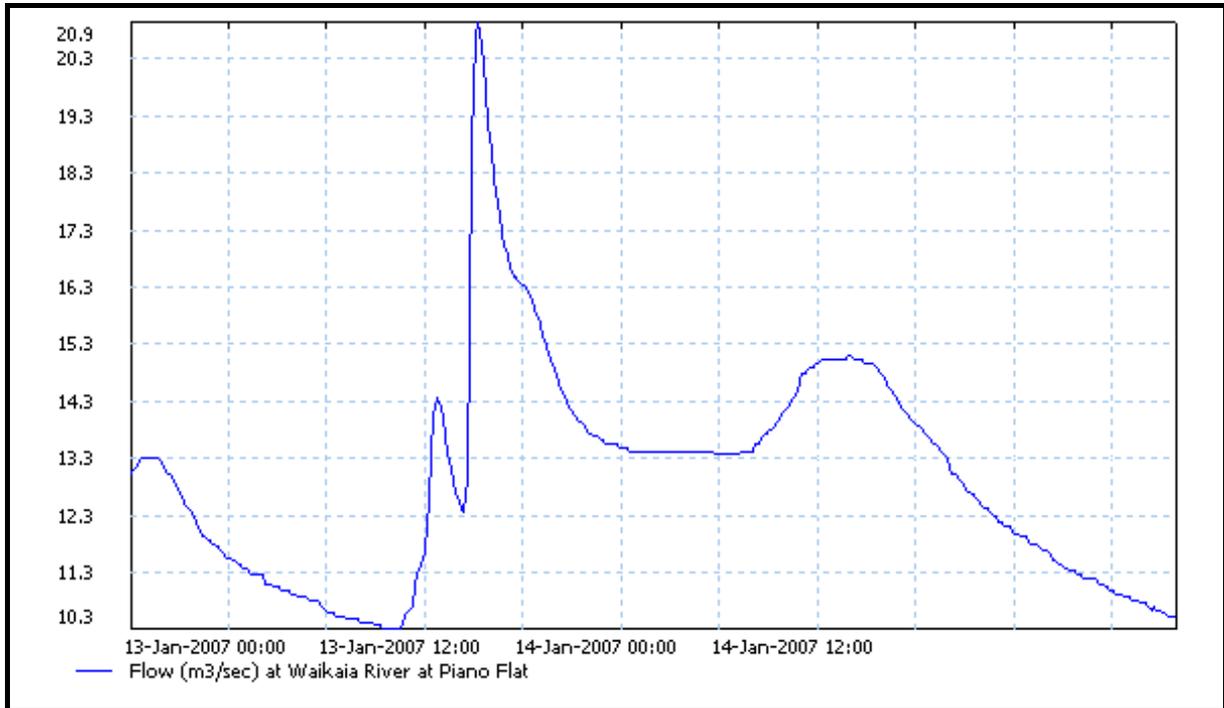
APPENDIX 3

Dennis's Guide Books

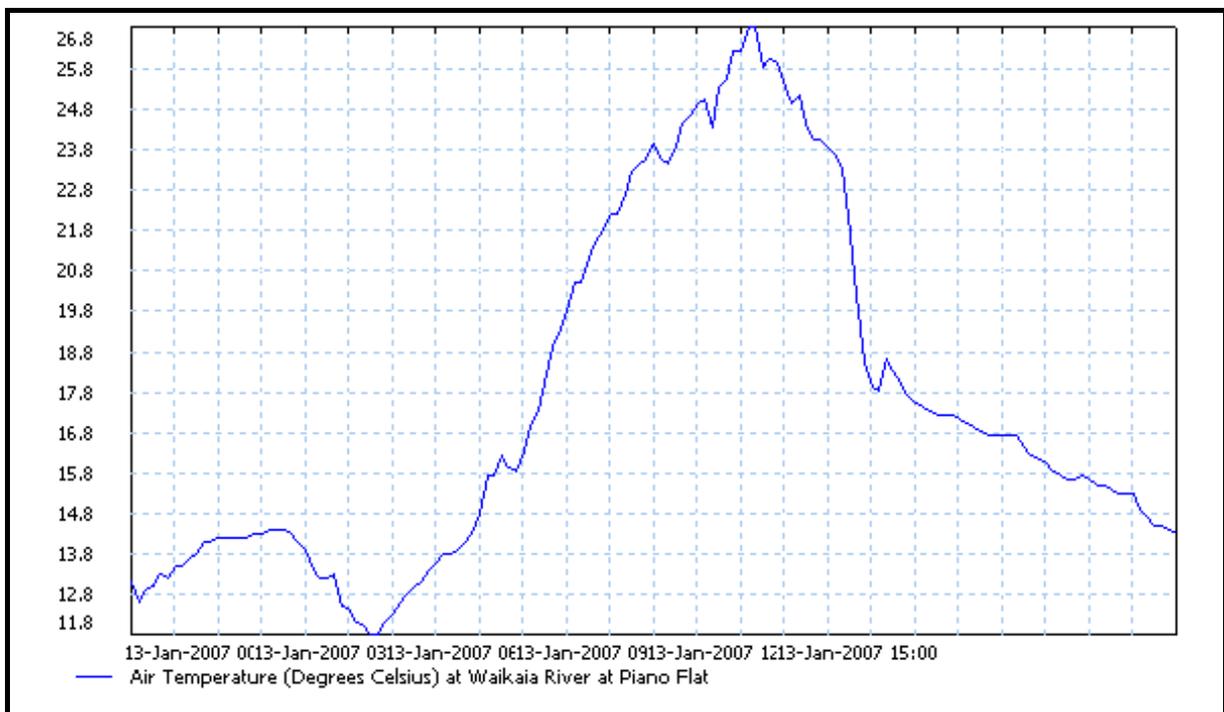


APPENDIX 4

River and Weather Data



River Flows recorded at Piano Flat on the Waikaia River on 13 and 14 January 2007.



Air Temperature recorded at Piano Flat on the Waikaia River on 13 and 14 January 2007.

APPENDIX 5

New Zealand Whitewater – 120 Great Kayaking Runs, Graham Charles, 1999 Text from the 'Waikaia River' Page

WAIKAIA

Class:	IV-V
Level:	10-50 cumecs
Gauge:	0750-1300mm. Waikaia Flow Phone 03 202 7891. The river is a little harder but much nicer at higher flows.
Length:	12km
Gradient:	60m/km
Time:	3-8 hours
Put in:	Canton Bridge
Take out:	Piano Flat Camp Ground
Shuttle:	14km
Maps:	NZ Topo F43, F44
Character:	steep segmented rapids
Hot Tip:	watch out for logs

Central Southland is not renowned for its classic whitewater runs, perhaps due to their complete absence—at least that was the case until the 1994 discovery of the Waikaia gorges. Words and pictures have spread far and wide now and their reputation is as good as the rumour.

The Waikaia originates in the Garvie Ranges between Roxburgh and Kingstown, and flows north-south onto the Southland Plains. The lower section between Post Office Creek and Piano Flat has long been used by the Southland Canoe Club and is a good but short class-II run with a handful of rapids, heaps of eddies, clear pools and nice scenery. To put in for this run, park at the small clearing 300m before the Post Office Creek bridge, then it's a very short walk down to the river.

For a lot more river and as much excitement as you can handle, try the upper Waikaia. From the put in to Piano Flat takes between 3 and 7 hours. The river is characterised by plenty of rapids and short segments of flat water, all set within a deep, beautifully green (and slippery) gorge. The first rapid pretty much sets the scene for the rest of the trip. When things first start to gorge up, run a few small drops, catch the big eddy on the left, clear a few sticks out of the unlikely looking void, drop into the tunnel and prepare for some good honest air time. From here on the river drops at 40m/km with a huge variety of class IV-V rapids, including the classic 'Waterfall of Death' and 'Spears Falls'. All the drops are runnable at varying flows, as well as scoutable and portagable—perfect!

Then, like a TV infomercial, just when you thought you'd had enough, 'wait there's more, for no extra money...' head back to the Canton Bridge for the west branch of the Waikaia. One of the most exciting pieces of whitewater in the country, the only detraction being the 2-3 hour walk to the get to the put in. Dropping at 70m/km for 2 km, this STEEP run out-steeps the steepest on the Coast so far. It has countless drops, all big and clean, with not much space between them. Yet all are surprisingly runnable, portagable and scoutable. The river gradient eases significantly after the east branch confluence. From there to the take out at Canton Bridge takes about an hour. The entire trip takes about 5 hours with just above normal flow (0800mm) being ideal.

To get to Piano Flat from Queenstown: head towards Invercargill on SHW 6, turn left at Lumsden on SHW 94 to Riversdale, from here you turn left again onto the road signposted 'Waikaia'. Do not cross the bridge at the Waikaia township, but continue straight ahead to Piano Flat Camp Ground. All sections of the river can be accessed by continuing along the same road.

To get to upper Waikaia: continue up the road for half an hour to the normally locked gate beside the DOC 'Fragile Area' sign at the top of the gorge rim. The road to this point is steep but most kayak wagons will get through, 4WD is not a prerequisite. From the gate, walk the 20 minutes down to the Canton Bridge and put in.

To get to the west branch: from the Canton Bridge, slog up the hill on the right-hand side. Head across the tussocky plains making a bee line for the gorge/stream confluence. The topography makes it fairly clear where this is, but don't confuse it for the east Waikaia confluence.

VESSEL INFORMATION

Ship Type:	Whitewater kayak
Built:	2006
Construction Material:	Plastic
Length Overall (m):	243cm
Accident Investigator:	Glenn Murdoch