

## Dive Logistics of the Turner to Wakulla Cave Traverse

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### Abstract

Since its official inception in 1990, the mission of Global Underwater Explorers' Woodville Karst Plain Project (WKPP) has been to explore, survey, and protect the underwater cave systems of North Florida's Woodville Karst Plain. On December 15 2007, the WKPP exploration team of Jarrod Jablonski and Casey McKinlay conducted a seven mile underwater traverse between Turner Sink (Leon Sinks Cave System) and Wakulla Springs to verify the connection the team made between the two systems earlier in the year. With no possible exit to the surface along the way, the journey took 6.5 hours at a depth of 300 ffw (91 mfw) followed by approximately 14 hours of decompression. An estimated 50 international team members were present to support this dive, with tasks including equipment staging, decompression monitoring, and surface management. Following established WKPP protocol, two-person support teams worked in three hour shifts over a 24 hour period. All WKPP equipment, gasses and procedures are standardized to maximize efficiency and flexibility. Roles and experience levels vary, but support teams are broadly interoperable because project members share common equipment, gasses, and training. Continuous support was present in the water and on the surface to handle potential injuries or problems, food, drink and additional gas supplies. Using this standardized approach, the WKPP successfully completed the traverse and set two world records, including the longest cave dive between two entrances and the longest traverse in a deep cave. The connection of the two cave systems yields the Wakulla-Leon Sinks Cave System, currently the longest underwater cave in the United States and the fourth largest in the world at a total of 28 miles of surveyed passages.

Keywords: cave diving, exploration, rebreather, trimix

### Introduction

#### Project History

The Woodville Karst Plain (WKP) is a 270 mi<sup>2</sup> (700 km<sup>2</sup>) region stretching from the southern edges of Tallahassee, Florida to the Gulf Coast (Figure 1). Characterized by a layer of unconsolidated sands overlying a thick sequence of carbonate deposits (Hendry and Sproul, 1966), the WKP is distinguished by the presence of sinkholes, karst windows, sinking streams and large springs (Werner, 1997). The WKP contains seven of Florida's 27 first magnitude springs, defined as those that discharge at least 100 cubic feet of water per second (cfs), or about 64.6 million gallons per day (mgd). These first magnitude springs include Wakulla Springs, Spring Creek, Indian Springs, and Shepard Springs (Rupert and Spencer, 1988) (Figure 2).

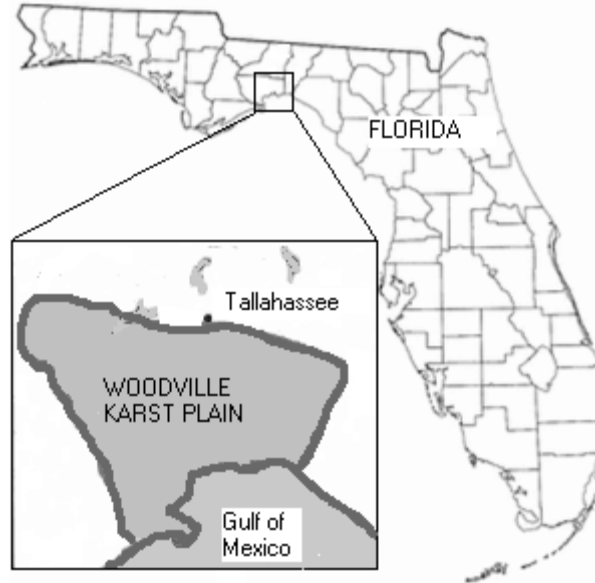


Figure 1. Woodville Karst Plain Geological Area

Underwater cave exploration has taken place within the WKP since the 1950s; however, it was not until the mid 1980s that substantial progress was made. Technological advances, improved team organization, and a better understanding of decompression physiology had to be reached in order to overcome the impedances experienced by past exploration teams given the depth and horizontal extent of the caves. In 1985, a team of divers undertaking exploration at Sullivan Sink cave started what is currently known as the WKPP. Implementing a standardized equipment configuration and team-oriented system, these divers were able to explore new cave at an increased rate.

The WKPP received official project status recognition from the National Speleological Society in 1990. Project members have since continued to expand on the initial efforts of the Sullivan Sink group through the development of new technology (i.e., extended range diver propulsion vehicles), decompression procedures, and exploration protocol. Between 1990 and 2007, approximately 300 volunteers have participated as members of the WKPP. International participants from Germany, Singapore, Japan, Italy, Sweden, France, Australia and the United Kingdom have frequently attended project events. At any given time the team roster has included exploration and support divers, surface management personnel, medical consultants, videographers, photographers, and scientific collaborators. A standardized approach to equipment, training, and on-site procedures has been established within the team in order to maximize efficiency and safety.

The average WKPP exploration dive from 1990 through the end of 2007 required a total of 15 hours (bottom time plus decompression), with the longest dive exposure running 26.5 hours. With these exposures, a substantial time, financial, and physical commitment was necessary for everyone involved. Team personnel have invested a total of 300,000 person-hours on a volunteer basis over the course of 300 scheduled events. Financially, an estimated total of US\$4,500,000 has been personally contributed by project members stemming from direct costs incurred and equipment purchases. In addition to diving labor, an average of 15,000 lbs (6,818 kg) of equipment has been moved in and out of the water during a single team event (McKinlay, 2007).

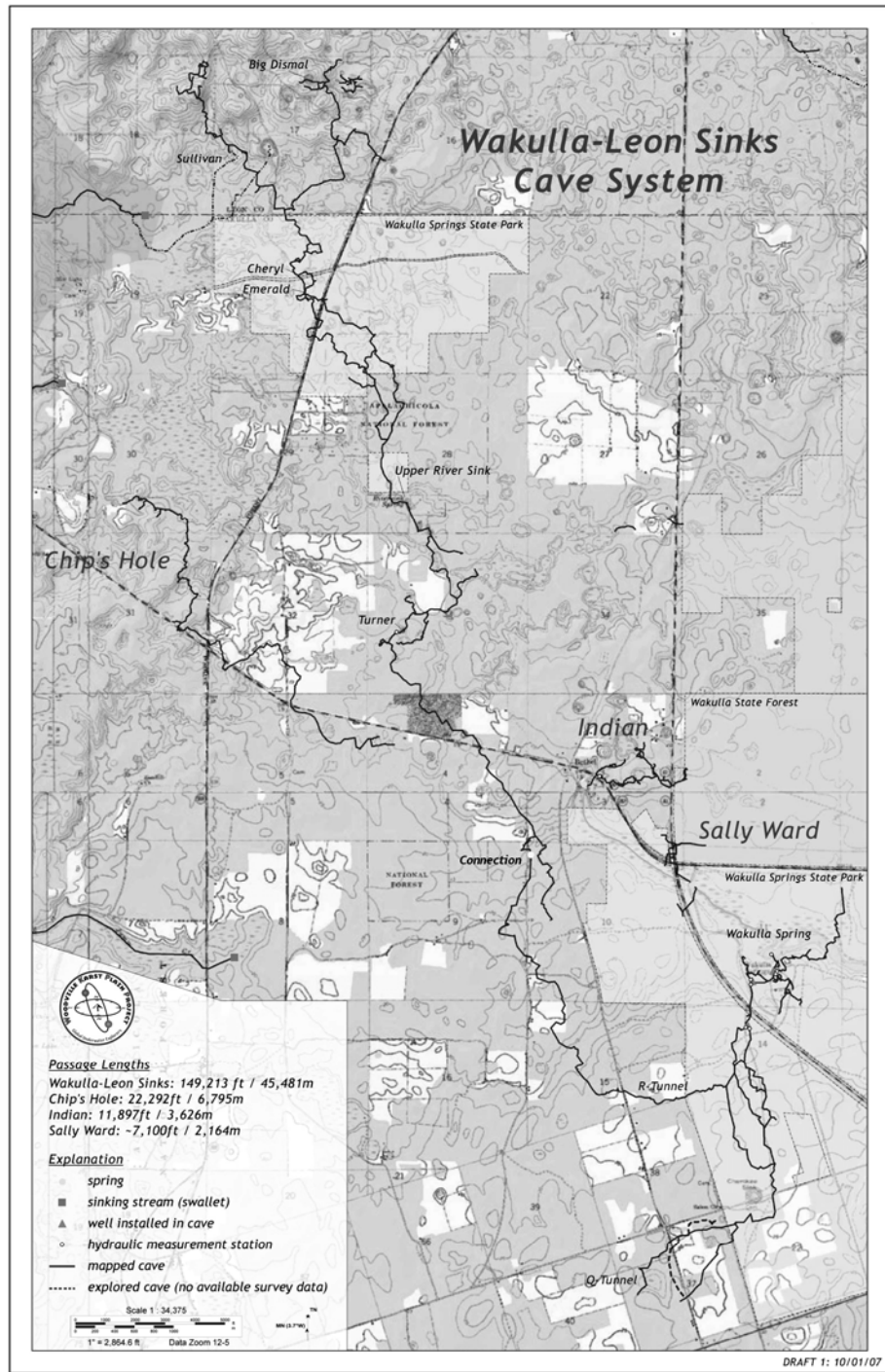


Figure 2. Wakulla-Leon Sinks Cave System

A non-profit affiliate of Global Underwater Explorers (GUE), the WKPP established an ongoing mission to explore, survey, connect, and protect the flooded cave systems located within the WKP. Through partnerships with state, federal, and private landowners, the project has been positioned to promote public awareness, education, and scientific discovery through research support. Using

information collected by the WKPP, resource managers, policy makers, landowners, and researchers have been able to formulate necessary and responsible land use decisions to protect these invaluable water resources for future generations (McKinlay, 2007).

### The Turner-Wakulla Connection

Nearly two decades of exploration led up to the final connection of the Wakulla Springs and Leon Sinks cave systems. Following a number of successful exploration dives at Turner Sink (one of the entrances to the Leon Sinks cave system) during 2006, the team returned there in May 2007 to attempt a Wakulla-Turner connection. Unexpectedly, the cave passage ended in every direction that the divers attempted to explore. Saturday June 23, 2007, the team of Jarrod Jablonski and Casey McKinlay pushed beyond the end of the "R Tunnel" line of Wakulla Springs cave (starting 16,500 ft (5,029 m) from the entrance). Their effort resulted in the exploration of 7,120 ft (2,170 m) of new cave passage. In addition to significantly lengthening the amount of surveyed cave passage at Wakulla Springs, project hydrogeologist Dr. Todd Kincaid also saw that the new passage was trending towards the Leon Sinks cave system and close to a connection.

Saturday July 28, 2007, McKinlay and Jablonski entered the Leon Sinks cave system through Turner Sink. According to the map, the plotted intersection between Wakulla Springs and Leon Sinks was located approximately one mile from the end of the surveyed passage of downstream Turner. If the survey data was correct, the exploration team would encounter the connection tunnel 11,000 ft (3,353 m) away from the entrance of Turner.

Exploration diver Casey McKinlay described the dive leading up the actual connection to Wakulla Springs (McKinlay 2007):

"Approximately 11,200 ft (3,413 m) downstream of Turner Sink Jarrod and I entered a massive room with floor to ceiling relief of 120 ft (37 m) + and wall to wall distance in excess of 100 ft (30 m) . The floor was 300 ft (91 m) + and the line was positioned on the left side of the room. I held the line while Jarrod scouted a large opening on the right wall behind a large silt bank. A few minutes later he returned and with a calm sort of confidence indicated it looked reasonable for perhaps the first of several attempts to locate the incoming R-Tunnel from Wakulla. The map indicated it was in this general vicinity somewhere but what would it look like? Would it be passable? All good questions with nothing taken for granted after the May 19th, 450 minute trip to the end of the line where the cave shut down. I switched on the video camera and 50 watt light as Jarrod tied in and headed for the dark spot on the wall. The tunnel looked reasonable and quickly turned left around a corner and into another massive room with openings right and left. Too many options in my opinion as both anxiety and anticipation began to build. With a fresh stage (bottle) plugged in and two extras clipped off, we were committed to spending as much time as necessary to find the way. We made another left into a medium sized room that did not look good as I held back to look at the large, dark opening to the right. Too many left turns already. I was concerned we would end up intersecting the Turner line in some sort of loop. Jarrod backed up and went right into another massive room and the tunnel began to take shape. We took another right as Jarrod wrapped on a huge rock center conduit and continued on. This was good, keep making right turns. It was difficult to check the compass on my left arm because holding the camera steady with the scooter took both hands. I started thinking out loud that the line was here somewhere. Perhaps over the next rise or around the next corner? Where was it, the anticipation was killing me. It would be tied off on the right wall at a corner with a large rock outcropping and it could not be much farther unless the survey was totally off. As we rounded the next corner and looked at the right wall I saw something that did not look natural hanging down from a rock outcropping. It was a loop of line. If there was a blue arrow on the other side of that rock with "Wakulla Springs" on it we had done it. The arrow was right where we had left it a month earlier on

the 580 min, 23,810 ft (7,257 m) ride from the Wakulla entrance. The long awaited physical connection between the Wakulla Springs and Leon Sinks cave systems was established Saturday, July 28 at 12:20 pm. After 17 years the WKPP had finally connected Wakulla Springs to Leon Sinks. The team would be pleased. I could feel the pressure that had been building over the years begin to release. It was a good day for the WKPP."

## Methods

### Pre-Dive Planning

Following connection of the Wakulla and Leon Sinks cave systems, team personnel started making plans to verify the connection by traversing from Turner Sink to Wakulla Springs. Based on decompression logistics, the exploration team of Jablonski and McKinlay decided to start the dive at Turner and exit at Wakulla. The conditions at Wakulla Springs were significantly more favorable for running decompression due to in-water and surface conditions. Approximately four weeks prior to the scheduled day of the traverse (Saturday December 15, 2007), team members were notified of the plan through the WKPP's official email list. At that time, all personnel started making the necessary preparations depending on their position within the project (Table 1).

Table 1. Pre-Dive Task List

<b>Pre-Plan</b>	<b>Individuals Responsible (total number)</b>	<b>Comments</b>
Draft exploration plan	Casey McKinlay (1)	Review with Jablonski and coordinators
Request for team availability	Todd Leonard, Mark Messersmith (2)	Build roster for event
Submit dive plan to Florida DEP	Casey McKinlay (1)	
Make travel arrangements	Team Individuals (50)	Friday through Sunday
Place media on notice	Casey McKinlay, Jarrod Jablonski (2)	TV, WEB, Newspapers, Partners
Gas fills	Team Individuals (50)	Arrange for tank filling and gas supplies
Equipment	Team Individuals (50)	Inventory equipment, burn test batteries
Video and Photos	Jarrod Jablonski (1)	Coordinate video equipment, draft video and photo plan
Research Support	Dr. Todd Kincaid, Dr. Chris Werner (2)	Coordinate with researchers

### Gas and Equipment

Exploration and support personnel individually completed equipment preparation and gas fills appropriate for their diving assignments during the week leading up to the traverse. All WKPP divers followed the team's protocol for bottle marking and breathing gasses, which designates specific mixes according to depth and purpose (Table 2). The standardized gasses represented the maximum allowed oxygen and minimum allowed helium percentages. Each bottle was marked by maximum allowable depth measured in feet, horizontally on opposing sides of the bottle, in three inch high numbers. Since a "20" and "70" foot bottle can look similar, the oxygen bottles were horizontally marked

"OXYGEN." Gases were analyzed immediately after filling and again on-site. Bottles were also marked with a label at the neck of the tank, logging oxygen and helium percentage, the analyzer's initials and date of analysis.

Table 2. WKPP Standard Gas for the Turner-Wakulla Traverse

<b>Depth Range (ft (m))</b>	<b>Maximum O<sub>2</sub> %</b>	<b>Minimum He %</b>
<b>Exploration and Setup Diver Bottom Gas</b>		
190 (58) + (Exploration)	10	85
190 (58) + (Setup)	12	70
<b>Exploration Diver Decompression Gas</b>		
130-190 (40-58)	21	70
80-120 (24-37)	35	60
30-70 (9-24)	50	0
<b>Support Diver Bottom Gas</b>		
190 (58) +	12	70
0-190 (0-58)	18	45
<b>Support and Setup Diver Decompression Gas</b>		
200-240 (61-73)	16	45
130-190 (40-58)	21	35
80-120 (24-37)	35	25
30-70 (9-24)	50	0
100% oxygen at 30 ft ONLY When dry, out of the water and in the habitat		
0-20 (0-6)	100	0
<b>Back Gas Breaks during Decompression</b>		
Setup Diver	16	45
Exploration Diver	12	25
Breaks done at stop prior to gas switch (e.g., 130, 80, 30 ft (40, 24, 9 m)) Cycle during 100% oxygen decompression: 12 min O <sub>2</sub> / 6 min break gas Extended bottom times: Break gas at 50 ft for 20 min		
<b>Drysuit Inflation Gas: 100% Argon</b>		

Support and exploration divers adhered to the team's equipment protocol during every team dive. Standard gear configuration included a drysuit, undergarments, argon inflation system, backplate and harness, primary regulator on a seven foot hose, backup regulator attached to a bungee cord worn around the neck, primary light, two backup lights, and double back-mounted tanks. Divers used 80 ft<sup>3</sup> (11 L) stage bottles (tanks configured with a regulator and a pressure gauge) which were clipped off to the harness, keeping the back gas in reserve. The WKPP's standardized approach to equipment choice and configuration allows maximum flexibility and interoperability among team members.

Additional equipment used over the course of the weekend included Gavin scooters and Halcyon RB80 semiclosed-circuit rebreathers. Gavin scooters were used by both WKPP support and exploration divers to maximize in-water efficiency. The Halcyon RB80 was used by the primary exploration team, the long-range setup team, and the Turner support team.

#### Accident Management Plan

Prior to the traverse weekend, the local hyperbaric treatment facility and emergency response units were notified of the team's scheduled event so the appropriate staff could be placed on call. The

WKPP's medical coordinator, Mr. Gene Hobbs, was also on call to provide medical histories to treatment facilities in the case of an emergency.

Medical oxygen and first aid kits were set up at both sites before divers entered the water. The surface management teams verified that emergency contact numbers were entered into multiple mobile phones at both Turner and Wakulla.

### Support Logistics

The project weekend started with placement of decompression equipment the Friday before the traverse, including decompression bottles and accessories (Table 3). At Turner and Wakulla, setup divers staged the equipment by clipping it off to established lines or habitats at their appropriate depths (Table 6). Although the exploration team planned to exit and decompress at Wakulla, decompression bottles had to be available at Turner in case the exploration team had to abort the traverse and return to Turner. Equipment placement continued into Saturday morning, with delivery of the Halcyon decompression rebreathers, food, water and electric heat packs to their staging depths. Troughs and habitats were also filled with air and checked for proper placement.

The first support team in the water escorted the long range setup team (Team 2) to 190 ft (68 m). Meanwhile, other members of the team assisted with moving gear into the water and monitoring the initial descent of Team 2 from the observation tower. After Team 2 started their dive, the Turner support crew moved from Wakulla to start setting up for the dive.

The surface managers at Wakulla and Turner stayed in frequent communication by cell phone to update support schedules. The traverse team (Team 1) started their dive with the company of escort and video teams. After these support teams returned to the surface at Turner, a group of surface and in-water support remained at Turner. If the traverse team turned the dive early for any reason, the entire operation would have to move to Turner Sink. The in-water support crew at Turner made scheduled checks at 120 ft (37 m) for the possible return of the exploration team; this schedule continued until the Wakulla surface manager called with the news that the traverse was successful.

Support teams continued to rotate through three hour diving shifts at Wakulla Springs (Table 3). The first several shifts were given the task of supporting Team 2 through their decompression. After greeting the team at depth and taking superfluous gear away from the divers to make their decompression easier, support divers monitored the team for signs of oxygen toxicity or other issues which might arise. They also provided a mode of communication between the decompressing divers and the surface by passing waterproof notes between the two groups. At the end of each support shift, the divers brought used equipment (scooters, bottles, rebreathers which were no longer necessary) with them so the gear could be removed from the water by the surface team.

The weather provided an added complexity to the weekend. The day of the traverse was characterized by a misty rain. As night time approached, a line of severe storms loomed on the horizon to the west. Tornado warnings were announced as dangerous winds, frequent lightning, and heavy rain moved into the area. The surface support crews at both sites covered exposed equipment while maintaining the necessary personnel to continue monitoring diving activity.

The long-range setup team was preparing to exit the habitat and begin their ascent to the surface at 1930, so a three-person team was sent in so each decompressing diver had an individual monitor. At 2000, a deep support team also entered the water to begin checking for the appearance of the traverse team's lights at 190 ft (68 m). On their first check, there was no sign of the team. Approximately 45 minutes later, they returned for a second look but once again there was no sign of the traverse team.

They surfaced again and waited until 2140 for a third check. This time was a success, and the deep support team returned to the surface with the news that the team had arrived at Wakulla along with a cache of used bottles and scooters. After receiving verification that the team was decompressing at Wakulla, surface manager Todd Leonard called Turner surface manager Dawn Kernagis to pass along the information. The Turner crew proceeded to pull the remaining decompression equipment out of the cave, clean the site, and return to Wakulla Springs at 0100 on Sunday to continue support duties.

Table 3. Support Diver Plan and Schedule

<b>Task</b>	<b>Personnel</b>
<b>Friday PM Setup at Wakulla: Setup team to place gear in advance of dive</b>	
100% oxygen and accessories at 30 ft (9 m) on habitat	Shallow: John Kendall, Richard Walker
50% nitrox at 70 ft (21 m)	
35/25 trimix at 120 ft (37 m)	Deep: Scott Cox, Doug Mudry
21/35 trimix at 190 ft (68 m)	
Habitats filled with air and checked	
Accessories at 120 and 50 (37 and 15 m)	
Decompression Halcyon rebreathers at 120 ft (37 m)	
Electric heat packs at 120 ft (37 m)	
<b>Saturday AM Setup</b>	
Surface Manager at Wakulla	Todd Leonard, Shellie Foss
Surface Manager at Turner Sink	Dawn Kernagis, Kell Canty
Escort divers into Wakulla	Richard Lundgren, Doug Mudry
Escort divers into Turner Sink	Scott Cox, Marc Singer
Video team at Wakulla - surface, underwater	Anthony Rue
Video team at Turner Sink - surface, underwater	Anthony Rue, Richard Lundgren, Doug Mudry
Sherpa at Wakulla	Adam Gonzales, Curtis Baldwin
Sherpa at Turner Sink	Curtis Baldwin, Claudia Milz, Antonio Giorgetti
Tower Monitor at Wakulla	Adam Gonzales, Curtis Baldwin
<b>Wakulla Support Schedule Saturday-Sunday</b>	
Surface Managers	Todd Leonard, Shellie Foss, Sonya Tittle
1100-1440 Meet Team 2, pull gear	David Doolette, Gideon Liew
1450-1815 Team 2 into habitat	Dean Marshall, John Bailey
1930-2135 Escort Team 2 to surface	Claudia Milz, Bill Oigarden, Antonio Giorgetti
2000-2345 Meet Team 1	Doug Mudry, Chris Werner
2315-0232 (Sunday) Support Team 1	Gideon Liew, Mario Arena
0250-0602 Support Team 1	Antonio Giorgetti, John Kendall, Paul Gore
0754-0945 Escort Team 1 to surface	Richard Lundgren, John Bailey, Mario Arena
<b>Turner Sink Support Schedule Saturday-Sunday</b>	
Surface Managers	Dawn Kernagis, Kell Canty
Decompression equipment placement; all day until Team 1 arrival at Wakulla has been confirmed	Scott Cox, Marc Singer, Todd Kincaid



Support dives continued through the night at Wakulla until the traverse team entered the habitat at 30 ft (9 m). At this time, the divers worked on moving the used gear out of the cavern to the surface. Personnel pulled the equipment out of the water, and other team members helped load the pieces of gear into their respective vehicles in order to minimize post-dive exertion by the exploration team. At 0745, the final support team entered the water to escort the traverse divers through the final stages of their decompression out of the habitat. McKinlay and Jablonski surfaced at 0900 on Sunday December 16, 2007 after a total in-water time of 20.5 hours. The support team removed the last pieces of equipment from the water and cleaned the dive site as they concluded the weekend's events.

### Setup Team Logistics

The first task of the day was to have the long-range setup team (Mark Garland, Mark Messersmith, David Rhea) place extra bottles and scooters 6,500 ft (1,981 m) from the entrance of Wakulla for the traversing divers to pick up on their way out. The traverse could not be completed until their delivery was confirmed. Their planned bottom time was estimated between 150-200 min at a depth of 300 ffw (91 mfw), with a total decompression time of 700 min (Table 4).

Richard Lundgren and Doug Mudry escorted the rebreather team through their initial descent to 190 ffw (58 mfw) before returning to the surface for additional support work. The setup team then successfully delivered the cache of equipment and replaced a malfunctioning flow meter in the cave, returning to Wakulla after a total bottom time of 180 min.

Table 4. Setup Team (Garland, Messersmith, Rhea) Dive Plan

<b>Tasks</b>	<b>Comments</b>
Transport equipment for exploration team into Wakulla Springs	Carry 1 scooter and 1 stage bottle for each exploration diver
Place equipment at 6,500 ft (1,981 m) depot	Total estimated time at depth: 150-200 min
Remove malfunctioning flow meter in D-Tunnel	Total estimated decompression: 700 min
Install new flow meter in D-Tunnel	Alternate diver: Marc Singer

### Exploration Team Logistics

The exploration team (Casey McKinlay, Jarrod Jablonski) drove from Wakulla to Turner to continue preparing for their dive after the setup team left the surface. They waited to receive word that the setup team successfully delivered the bottles and scooters. Wakulla surface manager Todd Leonard contacted the Turner Sink crew to give them the news that the setup team was successful, and Jablonski and McKinlay entered the water to begin the traverse.

Table 5. Exploration Team (McKinlay, Jablonski) Dive Plan

<b>Task</b>	<b>Comments</b>
Traverse from Turner Sink to Wakulla Springs	Distance: 7 miles Estimated time at depth: 360-450 min Estimated decompression: 660-780 min Target surface time at Wakulla: Sunday, 0800 Required departure time from Turner: Saturday, 1400 Requires confirmation that setup team has delivered equipment on Wakulla side and visibility inside cave is acceptable
Use single stage and single scooter to 7,000 ft (2,134 m)	Carry scooters 2, 3, 4 and stages 2, 3, 4
Leave stage 1 and scooter 1 at 7,000 ft (2,134 m)	Retrieve on cleanup dive
Use scooter 2 for 1 hour	Switch estimate at 13,000 ft
Point of No Return to Turner Sink	Estimate at 13,000-15,000 ft (3,962-4,572 m)
Use scooter 3 for 1 hour, switch stages	Switch estimate at 20,000 ft (6,096 m)
Use scooter 4 for 1 hour	Switch estimate at 27,000 ft (8,230 m)
Pickup scooter 5 and stage 5 for exit	Switch estimate at 31,000 ft (9,449 m); 5,000 ft (1,524 m) to Wakulla basin
Exit at Wakulla Springs basin	Begin decompression
<b>Exploration Logistics</b>	
Time and Distance per stage tank at 300 ft (91 m)	2 hours, 2 miles each stage; 3 stages for the 7,000-31,000 ft (2,134 -9,449 m) section allows for the possibility of losing 1 stage per diver without abort
Safety tanks	Turner: 3 at 3,000 ft (914 m); 3 at 6,000 ft (1,828 m); 3 at 10,500 ft (3,200 m)
	Wakulla: 2 at 9,000 ft (2,743 m); 2 at 7,000 ft (2,134 m); 3 at 6,500 ft (1,981 m); 3 at 3,500 ft (1,067 m); 3 at 2,200 ft (671 m)
No-Turnaround Point	13,000-15,000 ft (3,962-4,572 m) downstream from Turner Sink
Scooters	155 min and 15,000 ft (4,572 m) range each
	3 scooters each for the 7,000-31,000 ft (2,134 -9,449 m) section allows for the possibility of losing 1 scooter per diver without abort
Speed	Estimate 100-150 ft (30-46 m) per min
Halcyon Rebreathers	Estimate 10-12 hours run time before breakthrough
<b>Traverse Time Points</b>	<b>Minutes</b>
Sink to 190 ft (68 m) drop and switch	35
190 ft (68 m) drop to Switch 1 at 7,000 ft (2,134 m)	60
7,000 ft (2,134 m) to Switch 2 at 13,000 ft (3,962 m)	50
13,000 ft (3,962 m) to Switch 3 at 19,000 ft (5,791 m)	50
19,000 ft (5,791 m) to Switch 4 at 25,000 ft (7,620 m)	60
25,000 ft (7,620 m) to Switch 5 at 30,000 ft (9,144 m) (or Wakulla 6,500 ft (1,981 m))	60
31,000 ft (9,449 m) to Wakulla Springs Basin	80
<b>Total</b>	<b>395</b>

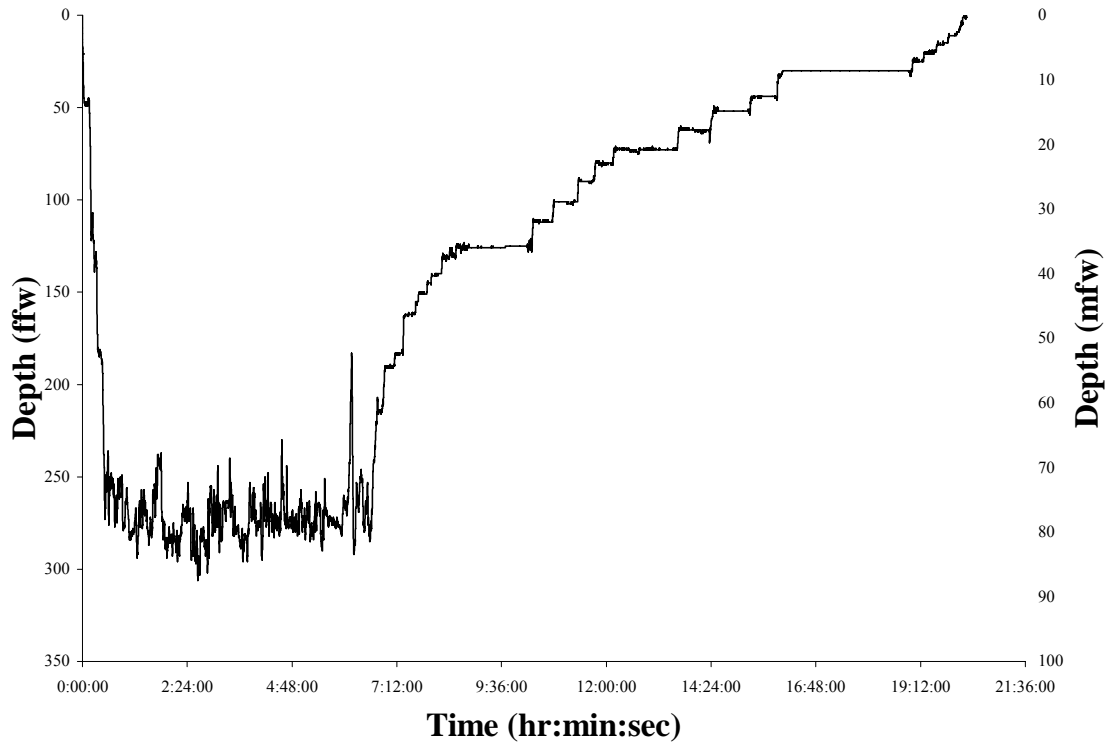


Figure 3. Turner to Wakulla traverse and decompression profile for McKinlay and Jablonski

On Saturday December 15, 2007 at 13:20, Jablonski and McKinlay started their dive from Turner Sink to Wakulla Springs. The journey covered approximately seven miles of underwater cave passage, at an average depth of 300 ffw (91 m). Initially carrying four stage bottles and four scooters each, the exploration team planned a timeline for when they would switch their use of each bottle and scooter (Table 5). The first bottle and scooter used by each diver was clipped off to the line 7,000 ft (2,134 m) from the Turner entrance; these bottles would be taken out of the cave on a future dive. As the team followed their switch timeline, they came upon the gear cache that was delivered earlier in the day by the setup team. An extra bottle and scooter was picked up by each diver, and they continued on their way to the basin of Wakulla Springs. The total bottom time for the traverse was 6.5 hours, with a total decompression time of approximately 14 hours (Figure 3).

## Discussion

On the weekend of December 15-16, 2007, the WKPP successfully completed the traverse between Turner Sink and Wakulla Springs. The connection of the two cave systems yielded the Wakulla-Leon Sinks Cave System, the longest underwater cave in the United States and the fourth largest in the world at a total of 28 miles (45 km) of surveyed passages. Through the completion of this dive, the team also set two world records for the longest cave dive between two entrances and the longest traverse in a deep cave.

The WKPP immediately set its sights on future exploration possibilities after the Wakulla-Leon connection was made. The team's proposed plans included searching for a connection to the Gulf of Mexico, while continuing their research and conservation efforts within the WKP.

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