

International Union of Speleology  
 Union Internationale de Spéléologie

*Commission on Volcanic Caves*



Rwanda 2007,  
 and the longest cave ....

*June 2007*

**50**

*The Newsletter is send free to members  
of the Commission, and others who are  
interested in lava-tube caves.  
It is not possible to subscribe – but news  
and information is always appreciated ...!*

Honorary President: Dr. W.R. Halliday  
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June 2007



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*(this is a temporary address – use it only for short notes  
NOT for heavy attachments).*

Snail mail please via P.O. Box 710

Village Market  
00621 NAIROBI / KENIA

or P.O. Box 218  
90121 EMALI / KENIA

About the previous issue (# 49):

*During the printing (= photocopy) process something  
went wrong with part of the issues – some text was  
missing. Just report – a new issue will be send.*

About John Pint:

*He is back in Saudi Arabia!!*

About Iceland:

*No address yet, but there is a new chairman for the ISS.  
Address later to be announced.*

Rwanda:

*See report in this issue – longest cave of Rwanda  
(Ubuwumo Bwibihonga) with a length of around  
4.5 km was mapped in February 2007.*

New president of the Icelandic Speleologic Society:

Björn Símonarson  
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Iceland  
[bjorn@industria.com](mailto:bjorn@industria.com)

## RWANDA 2007

Michael Laumanns, Germany

### Ubuwumo Bwibihonga – the new longest cave of Rwanda

Being planned as a “cleaning-up” trip Dutch caver J.P.G. van der Pas and the author spend again 3 weeks in the region of the Virunga volcano chain in northwest Rwanda (Central Africa) in February 2007. The area has been visited by a Belgian team in 1975 as well as by a Spanish group in 1977. The latter expedition has established Ubuwumo bwa Musanze as the longest cave of Rwanda at 4,560 meters. However, this large lava tube cave is segmented and requires on several occasions to leave the cave via roof collapses and walk on the surface of the lava stream before entering another tube segment by a collapse doline. Consequently, the cave consists in fact of a succession of independent lava tubes. The longest cave segment of Ubuwumo bwa Musanze has 1.6 km only.

At the end of the seventies six caves with a total of 6.8 km of passage were known from Rwanda. The latest phase of exploration of the volcanic caves of Rwanda started in 2003 with a Swiss-German team that added 42 caves and 10 km to the list – including the new longest non-segmented cave of Rwanda at that time (Ubuwumo Nyabikuri-Ruri, 3,384 meters). A subsequent US-Kuwaiti-Dutch-German expedition in 2004 extended the number of known caves to 65 with a total of 24.1 km of passages, and added several new long lava tubes to the “top ten” list of Rwandan caves (e.g. the new second longest cave of the country - Ubuwumo Manjari deux at 1,660 meters).

The 2007 expedition, despite being severely hampered by a total change of the administrative structures in Rwanda resulting in permit problems, was nevertheless able to survey 10 new caves with a total of 6 km of passages. The most remarkable finding was Ubuwumo Bwibihonga located in the Kanzenze secteur of the new Rubavu district (formerly: Gisenyi province). The cave is a complicated system of partly large and parallel running lava tubes on at least two distinctive levels. A number of roof collapses appear to segment the cave system at the first glance but all collapse holes can be circumvented by underground passage creating a non-segmented cave

system. Several very large colonies of fruit bats inhabit parts of the cave and make exploration unpleasant in places. The total number of bats is about 100,000 creating the most important cave bat roost found so far in Rwanda. After one week of survey work the total passage length of Ubuwumo Bwibihonga arrived at 4,530 meters – by far the longest non-segmented lava cave known in Rwanda. A couple of short descends, climbs, bat infested passages and crawls were not pushed to a conclusion by the small caving team. Hence, the length of Ubuwumo Bwibihonga may be moderately extended in the future.

The cave is located very close to the main tarred road from Ruhengeri to Gisenyi and is suitable for eco-tourism.

n o	Cave	Coordinates (GPS WGS 84)	Length
1	Ubuwumo Bibihonga	S 01°38'53,2" / E 029°22'42,5" / 2,341 m	4.530 m
2	Ubuwumo Nyabikuri-Ruri	S 01°25,914' / E 029°39,685' / 2,212 m	3.384 m
3	Ubuwumo Manjari deux	S 01°33'12,6" / E 029°32'06,6" / 2,250 m	1.660 m
4	Ubuwumo bwa Musanze (main segment)	S 01°30,212' / E 029°36,783' / 1,870 m	1.600 m
5	Ubuwumo bwa Nyirabadogo	“In the Bigowe area” (Spanish trip 1977)	1.500 m (not surveyed)
6	Ubuwumo Cyamazera	S 01°38'37,0" / E 029°22'25,8" / 2,295 m	1.484 m
7	Ubuwumo Ubuwumo Gacinyiro 2	S 01°27,697' / E 029°35,049' / 2,159 m	1.470 m
8	Ubuwumo bwa Musanze (south segment)	S 01°30,212' / E 029°36,783' / 1,870 m	ca. 1.200 m
9	Ubuwumo Nyiragihima	S 01°30'02,0" / E 029°33'12,2" / 2,215 m	1.116 m
10	Ubuwumo Rwego (Grotte des Commandos)	S 01°35'43,7" / E 029°22'54,7" / 2,314 m	cl.952 m

The ten longest caves of Rwanda (March 2007)

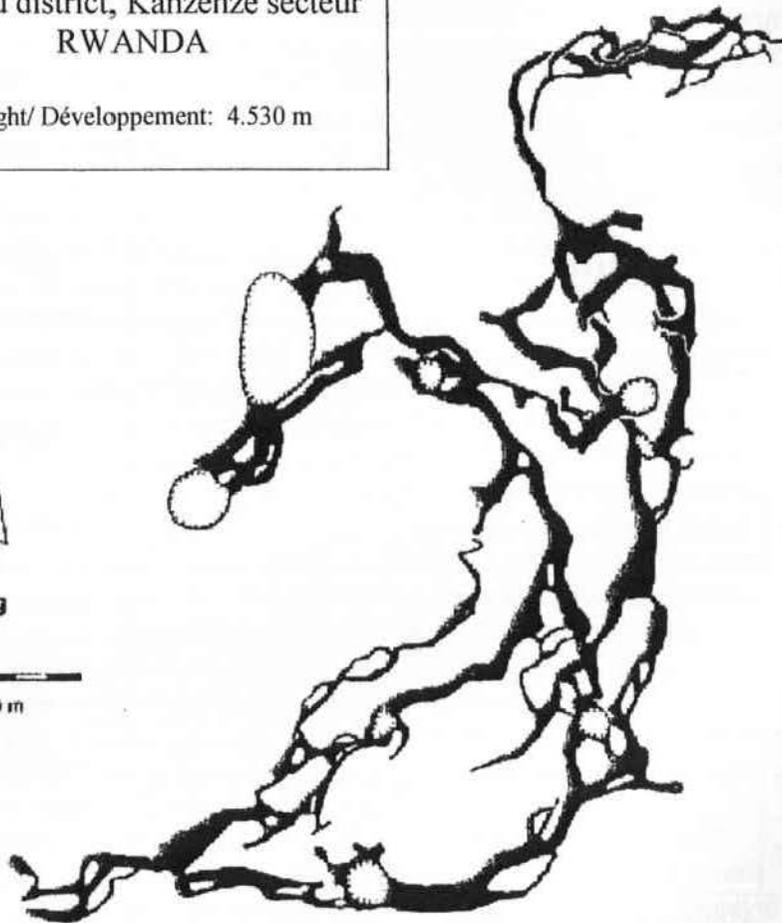
# Ubuwumo Bwibihonga

Rubavu district, Kanzenze secteur  
RWANDA

Lenght/ Développement: 4.530 m



100 m



RWANDA 2007

Jan Paul van der Pas

January 2007 Michael Laumanns organized a third trip to Rwanda, for this writer the second time to visit the country. Although preparations were very good, it started to look like the story of the 10 little man who went for an adventure, but loosing during the venture one after the other.

From the original participants one after the other dropped out due to financial reasons, due to a new job, due to too late visum application and so on. Not very funny for Michael who had already ordered lodging and transport. To try to start a speleological organization in Rwanda Michael had even offered free participation for two local persons. One we never saw or heard about, the other participated, but was not really interested in caves and was missing during the weekends.

In a Dutch speleo-magazine I had just read an article by Jos Burgers about expeditions and their problems - as when to abort this in case of too few participants. Well, in our case it was too late for such a thing anyhow and we ended with only two cavers, and the temporarily local. On the other hand with such a small group moving around is very easy.

The first problem: on arrival we still did not have the necessary permit(s). However, a new ministry, ORTPN, was responsible for this. It worked as a champ. The director received us, told they were working on tourist caves as a new source of income, and the permit was given without any problem. Good for us, since visits to the Virunga National Park cost a lot, some US\$ 300. Now for us free.

The first visit in this NP gave us a new entrance to a cave previously visited, but aborted due to lack of equipment, but now a new problem: knee deep pools of mud and bat-shit. It was decided to keep this to a later date when we had dreamed-up a way to cross this unfriendly obstacles. Actually, we did this on the last day, when we could leave all the very shitty dresses and so on behind us.

The start was actually with the Bwibihonga system, which we did not know it was a 'system'. A first visit yielded a big entrance. Mapping all day it was very clear we were not ready and would have to return next day. Our famous driver and companion, Francis, had found out in the mean time there was another "huge cave" very near. Next day later more or less the same story: not finishing mapping, and report of another "huge cave". After several days Michael draws temporarily all the caves, and finds they are connected.



In some of the caves there are bats, many of them. The noise is such that mapping with voice-shouted instructions is impossible – it has to be written down and carried to the next station. From some huge halls the ceiling is as far as visible completely covered with bats, and in our lights many, many thousands of eyes are looking at us. Of course it is continuously raining on us .....

As most of the time an armed man is with us. During the previous trip I had wondered if these AK-47's were really loaded, or just show. One day we have a friendly soldier with us, and as always we like to leave them outside to avoid the following of us by dozens of kids into the cave. This man goes with us but realizes our worry. When in the cave suddenly a deafening noise – he just fires to scare the kids.

Luckily it turns out he fires only dummy bullets, and has a lot of fun.

One of the last days we meet a common cave-problem when you are on the other side of the world: why are you rich man coming so far? Is there treasure? What are you looking for? You are here for the third time, why? Not very clear to us, but apparently they have also been looking in caves. Some questions for us: did we find caves with iron doors? No, we did not. But did they? And they found 'benchmarks', but is unclear to us what they mean with this. The officials (which we need for the permits) ask us to go to such a cave, ask us to make pictures and a report and come back next day to explain. So we go to the cave and get a local mayor to join (and probably watch us). The first thing in the cave is a terrible gasoline smell. The mayor leads us to a place with a 'benchmark'. With a pneumatic jackhammer (explains the smell) they have been drilling in the floor. Look he says and shows a flat piece of lava. This is concrete he says!

We try to explain this is just lava, which can be very flat, and layer on top of another layer. We will never know if he believes us. Further in the cave it is clear they have drilling on weird places in the floor, but of course in vain. When we go next day to the 'officials' to explain these are all for two days on 'businessstrip' .....

For exploration in Rwanda it is mandatory to have a permit from the highest authority, at this time from ORTPN (Office Rwandais du Tourisme et des Parcs Nationaux):

Mrs Rica RWIGAMBA – [rica@rwandatourism.com](mailto:rica@rwandatourism.com)

With this permit you have to go to the authorities of the area where you want to be.

Then you will have to travel to the caves! You need a car, a driver .....

In our case for this 3<sup>rd</sup> Rwanda trip this was always the same man:

Francis KARENZI – to be reached under [ecosafarie@yahoo.com](mailto:ecosafarie@yahoo.com)

Francis participated all the time with the three Rwanda lavatube explorations. He is the only person who has been at ALL the lavatube entrances. His expertise of the country, dealing with authorities, and driving in the most remote areas of Rwanda is unmatched.

#### References:

Laumanns, M., The Caves of Rwanda. ISSN 1617-8572. *Berliner Höhlenkundliche Berichte, Band 11. Berlin, 2004.*

Laumanns, M., The Caves of Rwanda – supplement 1. ISSN 1617-8572. *Berliner Höhlenkundliche Berichte, Band 15. Berlin, 2005.*

Laumanns, M., The Caves of Rwanda – supplement 2. *As above, to be issued later in 2007.*

For ordering these issues:

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This fascinating DVD was mentioned in NSS-News of Feb. 2007 (Vol. 65, nr. 2, page 29) .....

## Lava tubes on Mars

Virtually at the same moment two reports came in about lava cave(s) on Mars.

Greg Middleton mailed:

I don't know if you find this interesting, but here's a picture of a supposed cave entrance of a supposed cave entrance in Martian lava. Doesn't look like any lava cave entrance I've seen!

From <http://antwrp.gsfc.nasa.gov/apod/astropix.html>

In the NSS News from May 2007 also a note appeared by Dave Bunnell:

### CAVES ON MARS?

The journal *Lunar and Planetary Science* (38, 2007) reported the discovery of what appear to be a chain of seven lava tube skylights on Mars. These include pits up to 252m wide and 130m deep. This far surpasses anything known in the way of lava tube skylights on Earth. The largest puka known from Hawaii is less than 60m across, at best. Some of the big pit craters, which aren't skylights, can attain these sizes and depths. But the thermal data reported for pit "Annie" suggests that these are more likely skylights connected to cave systems than pit craters, so all the more intriguing about their size.

Specifically, "afternoon temperatures for Annie are warmer than the shadows of adjacent collapse pits, and cooler than sunlit

portions. Meanwhile, nighttime temperatures for this candidate are warmer than all nearby surfaces. Such is the behavior we would expect of a cavern floor that receives little or no daily solar insolation."

I'd conjecture that a planet with gravity .38 that of Earth might be able to sustain broader passage widths than our terrestrial caves, before collapsing under their own weight.

NASA has interest in caves as possible habitats. Clearly they will need a team of competent cavers on future manned expeditions.

*Dave Bunnell*

*The original article can be found at [www.lpi.usra.edu/meetings/lpsc2007/pdf/1371.pdf](http://www.lpi.usra.edu/meetings/lpsc2007/pdf/1371.pdf).*

NSS NEWS, May 2007

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## LAVA FLOWS AND LAVA TUBES

### WHAT THEY ARE, HOW THEY FORM

DVD, 75 minutes. Made in Hawaii by Volcano Video Productions, 2004. Available through their web site, [www.volcanovideo.com](http://www.volcanovideo.com), for \$30 which includes shipping.

I've spent many years trekking the volcanic landscapes of Hawaii enroute to lava tubes, and have always been fascinated with the variety of forms that flowing lava creates both above and below ground. Now along comes a video that explains a lot of these forms and shows it happening with nice, crisp footage that really makes you feel like you're right there...but without the heat. Put together by a team of three volcanologists, the footage and narration provide a wealth of information on volcanism in general and does a good job of relating the surface flows with what happens underground.

Indeed, there is a great deal to absorb from this presentation. We learn and see the differences between aa, pahoehoe, and an intermediate form termed slabby pahoehoe. We see how the ends of lava flows inflate and rupture. We learn how the crystal structure of the lava determines its flow behavior, something I hadn't seen presented before.

The chapter on lava tubes focuses almost exclusively on active tube formation, with some incredible footage that gives you the perspective of practically being in the tube. The formation of some common lava tube features such as tubular lava stalactites,

sharktooth stalactites, splatter stalactites, lavaballs, and curbs are all shown in actual video footage. Of the two main types of tube formation I've always had more trouble visualizing the idea of a lava channel slowly roofing over, but the footage on this video SHOWS it happening in a series of time lapses. They also show evidence for the more modern view of lava tube formation that includes downcutting into the bedrock by flowing molten lava, and how this accounts for some features like flow benches and grooves.

Aside from the main feature, which runs 45 minutes, there is a second 30-minute feature called "Kiluea, Close-up of an Active Volcano." While nice, it covers some of the same ground as the main feature, and not as well, and the footage is nowhere near as high-quality. For educational purposes, the main feature far outshines it.

Lava Flows and Lava Tubes is without doubt the best feature I've ever seen on flowing lava above and below ground, and will appeal to anyone with an interest in understanding the interplay of lava tubes and volcanic landscapes.

*Dave Bunnell*

In the previous issue Bill (Halliday) mentioned his explorations in the Kilauea Caldera (Hawaii), and some of the problems about permission(s).

Here he shows the reports issued about his work .....



**INVESTIGATOR'S ANNUAL REPORT**

United States Department of the Interior  
National Park Service

OMB # (1024-0236)  
Exp. Date (6/30/2007)  
Form No. (10-226)

If you are not using the automated system supporting this report process, please fill out this form and return it to the appropriate park. All or some of the information you provide may become available to the public.

Reporting Year: <b>2006</b>	Park: <b>Hawaii Volcanoes National Park</b>	Select the type of permit this report addresses: <input checked="" type="checkbox"/> Scientific Study <input type="checkbox"/> Science Education Activity	
Name of principal investigator or responsible official: [Dr. Ms. Mr. Mrs.] First name: <b>William</b> Last name: <b>Halliday</b>		Office Phone: <b>615 352-9204</b>	
Mailing address: <b>6530 Cornwall Court Nashville, TN 37205</b>		Office FAX: <b>n/a</b> Office Email: <b>wrhbna@bellsouth.net</b>	
Additional scientific study investigators (first name, last name): <b>n/a</b>			
Project Title (maximum 300 characters): <b>Analysis of Possible Carbonatite Lava in Fractured Tumulus Cave, Kilauea Caldera, Hawaii.</b>			
Park-assigned Study or Activity #: <b>HAVO-0204</b>	Park-assigned Permit #: <b>HAVO-2006-SCI-0010</b>	Permit Start Date: <b>19 Jan. 2006</b>	Permit Expiration Date: <b>27 Feb. 2006</b>
Scientific Study Starting Date: <b>15 Feb. 2006</b>		Estimated Scientific Study Ending Date: <b>31 Dec. 2007</b>	
For either a Scientific Study or a Science Education Activity, the status is (select one): <input type="checkbox"/> Completed <input type="checkbox"/> Continuing <input type="checkbox"/> Suspended <input type="checkbox"/> Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: <input checked="" type="checkbox"/> A final report <del>has been prepared</del> or will be provided to the park within the next two years <input checked="" type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type (select one): <input checked="" type="checkbox"/> Research <input type="checkbox"/> Inventory <input type="checkbox"/> Monitoring <input type="checkbox"/> Education <input type="checkbox"/> Other			
Subject/Discipline (maximum 60 characters): <b>Vulcanospeleology</b>			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

**Identification of unusual metallic erosive flowstone found in one room of Fractured Tumulus Cave**



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Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

I received and signed the permit 6 February 2006. It took a week to determine that none of the CO2 monitors required by the permit were currently for sale, rent or loan in Hilo or Honolulu, and to purchase two of them in New Hampshire. On 15 February, Don Swanson (USGS), Harry Shick (HSS), Cliff Forman (HSS) and I (HSS) entered the cave and proceeded to the inner room. En route, the USGS "CO2 Buddy" monitor read 0.0% CO2 (false negative). Also, I was unable to enter the inner room with the Telaire monitor on my body as required, and I had to push it ahead of me. Seeing this, Don Swanson elected to supervise collection of the specimens from the entrance crawlway. Samples were taken under his direction. One sample was submitted to Washington State University for analysis. I temporarily retained another as a precaution, and Don Swanson retained chips for the same purpose. The WSU report has not been received to date. I left Hawaii 28 February.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?  Yes  No  
If "Yes", identify where the specimens currently are stored: **See above.**

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount): \$ **0 - 0 -** Funding specifically used in this park this reporting year that was provided by other sources (enter dollar amount): \$ **= 3750 to date**

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:  
**US Geological Survey -0-**

**Paperwork Reduction Act Statement:** A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.

Here again a report by Bill Halliday.  
He is working on a complete book now of all this new caves.



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Reporting Year: <b>2006</b>	Park: <b>Hawaii Volcanoes National Park</b>	Select the type of permit this report addresses: <input checked="" type="checkbox"/> Scientific Study <input type="checkbox"/> Science Education Activity	
Name of principal investigator or responsible official: [Dr. <del>XXXXXXXXXX</del> ] First name: <b>William</b> Last name: <b>Halliday</b>		Office Phone: <b>615 352-9204</b>	
Mailing address: <b>6530 Cornwall Court Nashville, TN 37205</b>		Office FAX: <b>n/a</b>	
Additional scientific study investigators (first name, last name): <b>n/a</b>		Office Email: <b>wrhbna@bellsouth.net</b>	
Project Title (maximum 300 characters): <b>Completion of Inventory of Caves in the 1919 "Postal Rift" Lava Flow</b>			
Park-assigned Study or Activity #: <b>HAVO-00205</b>	Park-assigned Permit #: <b>HAVO-2006-SCI-0011</b>	Permit Start Date: <b>19 Jan. 2006</b>	Permit Expiration Date: <b>27 Feb. 2006</b>
Scientific Study Starting Date: <b>15 Feb. 2006</b>		Estimated Scientific Study Ending Date: <b>25 Feb. 2006</b>	
For either a Scientific Study or a Science Education Activity, the status is (select one): <input checked="" type="checkbox"/> Completed <input type="checkbox"/> Continuing <input type="checkbox"/> Suspended <input type="checkbox"/> Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: <input checked="" type="checkbox"/> A final report <del>has been provided to the park</del> or will be provided to the park within the next two years <input checked="" type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input checked="" type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type (select one): Research <input type="checkbox"/> Inventory <input checked="" type="checkbox"/> Monitoring <input type="checkbox"/> Education <input type="checkbox"/> Other <input type="checkbox"/>			
Subject/Discipline (maximum 60 characters): <b>Vulcanospeleology</b>			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

Completion of 12 Year transdisciplinary study of caves in 1919 Lava Flow, Kilauea Caldera, excluding caves discovered on or after 14 February 2006 as excluded by terms of this permit.

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Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

The five field days covered by this permit essentially completed the Hawaii Speleological Survey's project, identifying approximately 254 caves where only two were known in 1994. During these final days, 26 caves were visited. 8 caves were mapped and mapping of another was completed. Two caves were too steamy for the new CO2 monitors required by the permit. Four newly-discovered cave entrances (probably to 3 caves) were not entered because of permit restrictions. 59 pages of field data were submitted for these 5 field days together with 63 photos. These data also document inadequacies of both types of CO2 monitors approved and required by HVNP by this permit; obviously they had not been field tested in hyperthermal caves. Limited time and restrictive provisions of the permit precluded compliance with some retroactive demands specified on 2-2-06 (see attached).

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis? Y\_\_ N\_\_

If "Yes", identify where the specimens currently are stored: **n/a**

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount): \$ <b>0/0</b>	Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount): \$ * <b>3750.00</b>
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List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:  
**U.S. Geological Survey 0/0**

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An abstract from the 2006 National Speleological Society  
Convention, Bellingham, Washington (U.S.A.)

(Journal of Cave and Karst Studies – Dec. 2006)

CAVES OF THE 1919 LAVA FLOW IN KILAUEA CALDERA, HAWAII: A PRELIMINARY REPORT ON A 12 YEAR STUDY OF 200+ CAVES

*William R. Halliday*

*Hawaii Speleological Survey*

*6530 Cornwall Court, Nashville, TN 37205; nawrh@webtv.net*

A 12-year application of speleological techniques documented that the 1919 Postal Rift lava flow in Hawaii's Kilauea Caldera contains more than 200 caves. For this, 167 field trips were conducted in 22 field seasons. Only two caves had been identified here prior to this study. Most of this flow's caves were found to be drainage structures rather than classical lava tube conduits: hollow tumuli, drained flow lobes, tongues, breakouts, etc. Several melt holes were found to have integrated once-individual caves into compound caves. Many of these caves are hyperthermal, with 100% relative humidity. Some are notable for thermostratification and/or changing underground wind currents. These meteorological conditions required development of new exploration techniques. Noxious gas (probably HCl) was encountered only in one tiny cave on the edge of Halemaumau Crater. Two types of CO<sub>2</sub> monitors required for the last five field trips were found to be useless in hyperthermal caves. Hundreds of pages of raw data and individual field trip reports have been submitted to the National Park Service. Processing these data is expected to require many months. Systematic speleological studies are urged for other Kilauea lava flows, especially another 1919 flow in Hawaii Volcanoes National Park. Also, mineralogical studies of these caves begun by Bobby Camara in cooperation with the USGS Hawaiian Volcano Observatory should be completed.

An abstract from the 2006 National Speleological Society  
Convention, Bellingham, Washington (U.S.A.)

(Journal of Cave and Karst Studies – Dec. 2006)

LAVA CAVES OF SOUTHERN WASHINGTON

*Garry Petrie*

*19880 NW Nestucca Dr., Portland, OR 97229;*

*garry.petrie@resurgentsoftware.com*

The lava caves of southern Washington are mostly spread over four flows from two separate mountains. During the last decade, a concentrated effort to locate and map these caves has led to an understanding of the flow dimensions. The two sources are Mount Saint Helens and Lemei Rock. On Mt St Helens, the flow is over 8 km long with over 457 m of elevation change. Lemei Rock is in the Indian Heavens Volcanic Field and has three distinct flows from its center. On the west side is the Fall Creek flow, to the northeast is the Smokey Creek flow and to the southeast is the Trout Lake flow. Each of these flows can be traced over eight kilometers and probably represent many eruption events. Cavers have surveyed over 200 caves totaling nearly 80.5 km of passages. Approximately three quarters of these caves are located within the Gifford Pinchot National Forest. Cavers are working with the Forest Service to record locations, photograph, place monument markers, and incorporate cave survey data into their GIS for all of their significant caves.

An abstract from the 2006 National Speleological Society  
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(Journal of Cave and Karst Studies – Dec. 2006)

#### A BIOLOGICAL ASSESSMENT OF CAVES IN LAVA BEDS NATIONAL MONUMENT, CALIFORNIA

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Lava Beds National Monument contains more than 500 lava tube caves and features, with more than 28 miles of passages that are home to a variety of cave-adapted organisms. We studied cavernicolous invertebrates in 29 caves between 2 June and 4 August 2005. Most of these caves had a dark zone varying from just above freezing to about 12 °C, where relative humidity varied from about 85 to 100%. In 193 biological samples, 1,511 specimens were recorded. Of the animals recorded, 22.6% were flies (Diptera), 19.3% were springtails (Collembola), 16% were spiders (Araneae), 12.2% were millipedes (Diplopoda), 11.7% were mites (Acari), and 5.3% were diplurans (Diplura). A variety of other animal taxa make up the remaining 12.9%.

Two common, large troglobitic invertebrates are the millipede *Plumatyla humerosa* and the dipluran *Haplocampa* sp. Common and nearly ubiquitous springtails of the family Tomoceridae (probably *Tomocerus* spp.) are important members of the Lava Beds cave community, and account for more than half of all springtails. Woodrats (*Neotoma* spp.) and bats (Vespertilionidae) are especially important in bringing nutrients into these caves, and bacteria and fungi growing on their feces provide energy to other cave animals.

Notable taxa include a terrestrial troglobitic isopod (Trichoniscidae), which was rarely encountered, and a troglobitic pseudoscorpion (Arachnida), which is almost certainly new to science. Richness of the taxa showed no discernable patterns with respect to their association with different lava flows, vegetation zones, or elevation.

#### Map of the longest Lavatube Cave of Rwanda

