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Cascade Caver

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Inside this issue:

COVER PHOTO: Webber Creek Canyon. Photo by Jake Earl.

The Cave Ridge Diet: How many calories do I really burn?

By Tom Evans (Puppy, King of the Beetles)

Every time I set foot outdoors I promise myself that I will get in shape. Does it ever happen: NO! However I always find myself wondering how many Calories I am burning in the activities I am engaged. After a marvelous trip up Cave Ridge I promised myself that I would do the math and figure it out. I vaguely remember doing this calculation at some time in my college days, woefully far in my past. After digging up my old physics book I realized the problem was more difficult than I thought, however the exercise would be useful to get a minimum value.

First we must frame the question in a way that can be answered. The original question I had was: How many calories do I burn walking to the top of Cave Ridge? As it turns out this is nearly impossible to answer for two reasons. First it is nearly impossible to get values for the various ways we burn energy, and second I would have to find units that can be used in calculations and can be related to the calories listed on food labels. Lets first tackle the question of how we burn calories, and secondly what units to use.

Everyone burns calories just by maintaining our bodies. This is our resting metabolic rate, or the amount of energy we burn keeping our cells alive. Some people burn more calories this way than others, and hence it's nearly impossible to quantify without sophisticated testing equipment. Similarly when one exercises their metabolism speeds up. The amount it increases depends on the person, and is also impossible to estimate accurately without expensive equipment. Energy expended to maintain homeostatsis, or thermoregulation is also impossible to determine and will also be neglected in this treatment of the problem. Then there is the amount of energy used to perform work. By work I mean work as defined in physics as force acting over a distance. This portion of the equation we can actually measure since we have a distance and we can get at force in some cases. So where does this lead us? By neglecting the amount of energy we use in basic biological functions we may be able to calculate energy used purely acting on the mass we are moving a distance. With this approximation we generate a theoretical MINIMUM number of calories we burn performing a task.

The second problem we face is picking units we can use in the calculations and can be related to the calories on food labels. For all calculations I will use SI (Systema International) units, or the metric system since it makes understanding the math easier. The SI unit for work is the Joule (J). This unit can be converted to calories, which is a unit of work. However calories are not the same as the 'calories' you read about on your cereal box. 1 'calorie' on a cereal box is equal to 1000 calories in SI units. In other words 1 food calorie is equal to 1 kilocalorie of work. To generate numbers that make sense to use I will calculate the work performed in Joules, then convert to Kilocalories, and then restate that number in calories, or the food calories we see on a food label.

To perform these calculations we need two equations:

$$F = MA$$

Where F= Force (Newtons), M=Mass (kg), A=Acceleration (m/s^2); and,

$$W = FD$$

Where W=Work (Joules), F=Force (Newtons), D=Distance (meters).

By substituting the value of F from equation 1 into equation 2 we get:

$$W = MAD$$

(This leads us to the obvious conclusion that anyone who performs any physical work is MAD. I tend to agree…)

With a brief perusal of this equation we see two things. First we can measure the distance we travel and the mass we move over that distance. What is difficult is the middle term, or the acceleration of that mass. When walking we are constantly accelerating at variable rates with a positive or negative sign. This means that this middle value varies a great deal during each step all the way up a trail. How can we overcome this problem? We can make our question slightly more specific. Since we are not able to determine our instantaneous acceleration, maybe we should ask the work we are performing in opposition to gravity. In other words neglect the acceleration we add to the mass being carried up the hill and focus only on the work we perform counteracting gravity. This means that, once again, we are making an estimate that underestimates the total value of calories used in walking up the hill. However it simplifies the math considerably since we can look up the acceleration due to gravity of any mass. Lastly we need the distance over which we overcome gravity. Cave Ridge is 5270 feet tall, while the parking lot is at 3120 feet. That yields a difference of 2150 feet. However we must convert from feet to the SI unit of meters.

$$\left(\frac{2150\,ft}{1}\right)\left(\frac{12in}{1\,ft}\right)\left(\frac{2.54cm}{1in}\right)\left(\frac{1m}{100cm}\right) = 655.32m$$

Consequently we get the following equation for hiking up Cave Ridge given the average gravitational acceleration of 9.8m/s^2 and an elevation gain of 655.32m

$$W = M\left(9.8\frac{m}{s^2}\right)\left(\frac{655.32m}{1}\right)$$

Taking in to account the conversion from Joules to food calories, and mass in pounds to kilograms the equation becomes:

$$W = (M\,(.4536)(9.8m/s^2)(655.32m)(4.184))\ /1000\ 1kg/2.2046\ lb$$

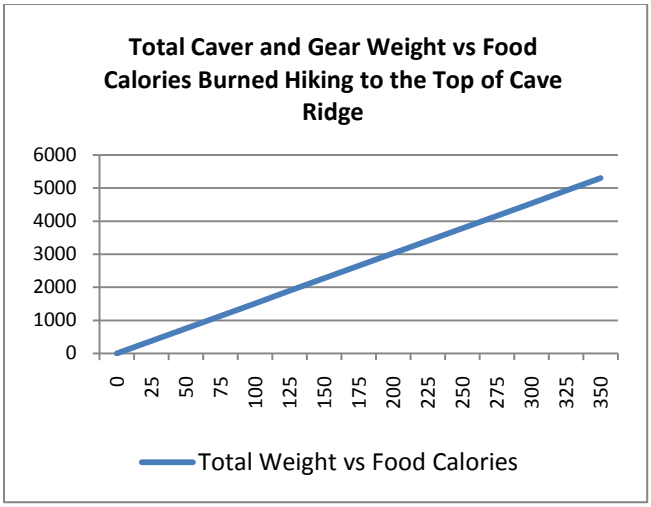
This simplifies to:

$$W = (15.14)\,M$$

Where W is in food calories and M is in units of pounds. To determine how many calories you burn overcoming gravity while walking to the top of Cave Ridge simply multiply your mass in pounds (body weight and pack weight) by the conversion factor of 15.14. The number produced will be the number of food calories you burned in the process. As a guide I made a simple chart with a number of values just to illustrate the sort of calories one burns on the trip.

Total Weight (lbs)	Calories burned
100	1514
150	2271
200	3028
250	3785
300	4542
350	5299

What is important about this rough table is not the absolute numbers, since it is an under estimate of the number of calories burned, but the order of magnitude of the calories burned. If I weigh about 180 lbs, and I carry 50 lbs of equipment up the ridge I will have burned around 3500 food calories overcoming gravity alone. This means that in reality I have burned many more calories. If my plans for the next few days include caving in strenuous or cold caves I must replace these calories and then add some for the strenuous nature of the activities I will be engaging in. The inevitable conclusion is that one must bring many more calories to consume per day than one is accustomed to since the hike up consumes as many calories as we normally eat in a day. To most outdoor enthusiasts this is already known, however it is nice to understand the physical underpinnings of what is going on.



I hope this basic analysis was useful for others beside me. I find that running the numbers helps me truly understand what I am doing, and better prepare myself for the challenges I will be facing. Please note that this analysis is not intended to be a thorough treatment of the math or science of physiology, but a back of the envelope calculation that should give the reader an order of magnitude of the number of calories one will burn in a particular task. The actual number will be higher than the number calculated with this formula. However, I hope this low estimate will help others plan their meals and pace up Cave Ridge in the future. Take care all and safe caving!

Marla Pelowski, Aaron, Stavens, and Tom Evans recouping some calories after burning on the hike up. Photo by Lane Holdcroft.

Day Off Talus Cave – Trip Report

By Jake Earl

On my day off of work I decided to go for a hike to Little Si, and as I remembered from a previous hike there was a lot of talus and big rocks on the valley between Little Si and Mt. Si.

I arrived up to the talus area in the valley and began looking around in each crook and cranny. After 15 to 20 of hopping from rock to rock and up and down between boulders I came to a small triangle shaped opening. Low and behold I found a cave! Got my survey gear out and it took 2 shots and I had a whopping 25 feet of passage! Just inside the entrance is a small room you can stand up in, and from there it drops down a couple feet and continues to a boulder choke.

While in the cave there were numerous moths on the ceiling and one packrat living in a nest in the cave.

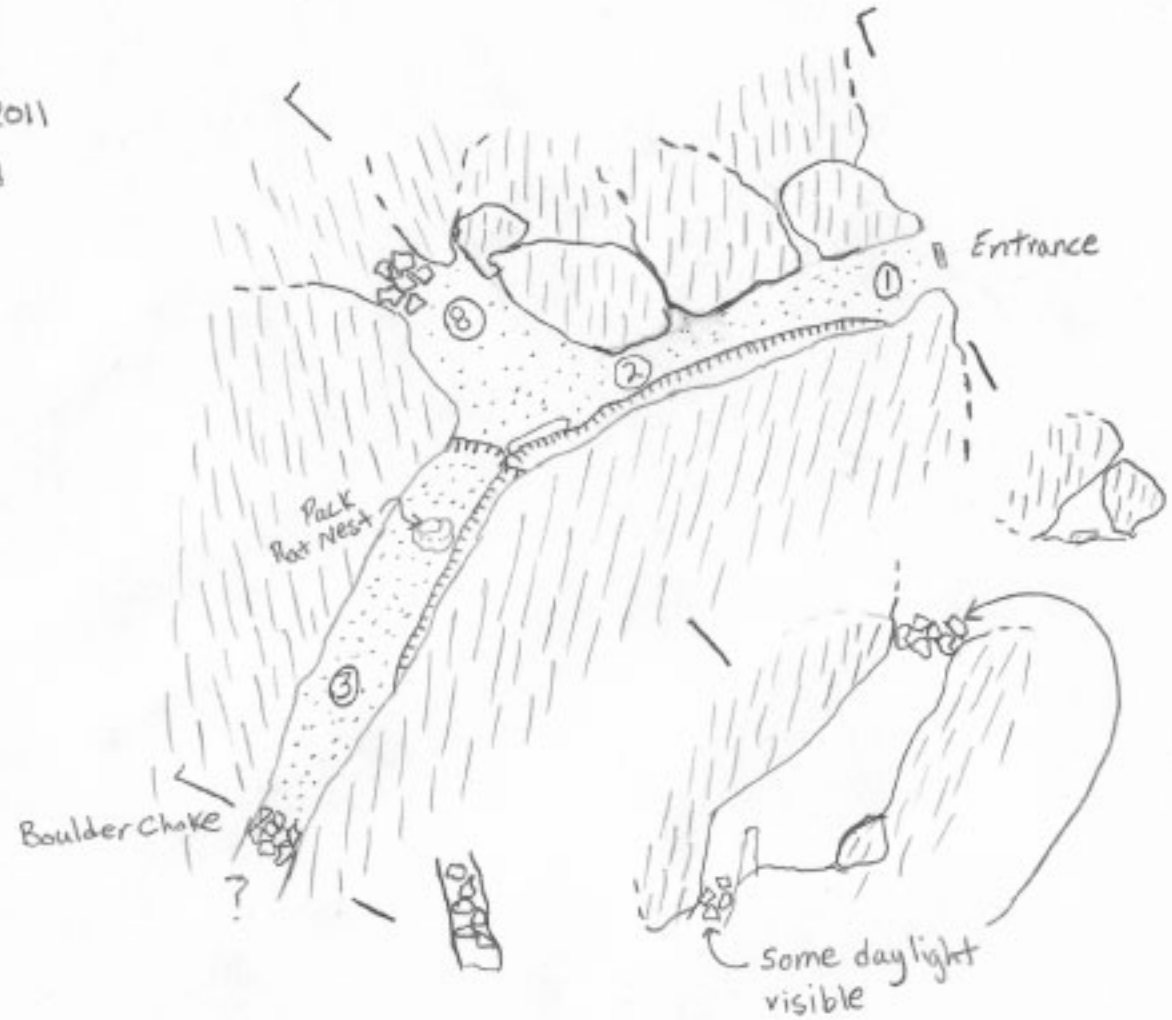
All in all it was a good day, and a fun area to explore just outside of North Bend where I live.

Day Off Talus Cave

King County, Wa.

Surveyed & drawn
by: Jacob Earl; 3-22-2011
Suunto clino, compass and
steel tape

Total surveyed
length: 25'

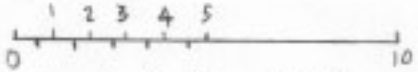


Legend

= Dirt floor

= Small rocks

= Big Rocks



Scale 1"=5'

Neelie Creek Cave – Trip Report

By Jake Earl

Attendance: Edd Keudell, Jacob Earl

It all started on Tuesday when my boss told me to take Wednesday off. The first thing that popped into my mind was we need to go and finish the survey on Neelie Creek Cave. I called up Edd and asked if he wanted to go up and get the survey done. We agreed on a time and he met me at my place in North Bend.

We drove up to the Denny Creek trailhead and started on our fairly short hike to the Quarry to look at the "rain room" a small room at the base of a limestone cliff with water running down from the ceiling through some very nice blue/white marble.

Looking into the "rain room" at the quarry. Photo by Jacob Earl

We then headed up to the entrance of Neelie Creek Cave to suit up and finish our survey.

We crawled in with our cave packs and rope for the first 25 foot drop. We got in and just above the tight squeeze we rigged the rope to a knob, and proceeded to go down the squeeze. Edd was having trouble for a few minutes so I had to show him how to slide though and down to the corkscrew. We got to the top of the pit and got our vertical gear on, and as I got on rope I looked down and flicked the rope out and saw that it was just short of touching the bottom. I got off rope, crawled back up through the corkscrew and up the squeeze just a little ways to up loop the rope from the knob. I crawled back down and Edd had the rope rigged to "Herkimer the wart" and down we went using the Muenter hitch.

We got to the bottom and Edd spotted a neat little formation of a red type of mineral that was deposited as a stalagmite. We crawled over some big rocks and Edd spotted the bone chute which was where we needed to start our survey. It was just a little ways down from the bottom of the 25 foot drop. We took a few shots down to a small little duck under spot and then we were looking down a very nice carved out dome. It was a steeply sloping pit with the limestone carved out into a somewhat half-bowl like shape. I headed down after we fixed a hand line for the first part as it was vertical for about 8 feet then at a little bit of a slope. I got to the bottom and set a station for our next shot. Edd took the shot and it was 40 feet down to the bottom! We looked around at a couple of passages and took a few shots. They didn't go too far but they added to the map. Just behind the Bone Shute was a crawlway which lead to the "breakdown pit" which looked pretty unstable, we didn't have any more rope for a hand line so we didn't attempt to go down.

Looking up at the face of the quarry where the "rain room" is at. Photo by Jacob Earl

After taking the last few shots at the bottom we went to look at a dome that was somewhat next to the bone chute. I started climbing up and it began to get pretty slippery and sketchy. I took my time and made it up quite a ways. Edd took a shot up to where I was and then I estimated the last little bit of passage going up and then proceeded to climb back down very carefully. It looked like it ended not too much farther up from where I was at. We headed back up the bone chute and out to the bottom of the 25 foot pit. Got our vertical gear back on and I headed up the pit. Once we both got to the top we had one last spot to check out. It was across on the other side of the pit, but it was an easy step over for Edd. He looked up and determined that it didn't go anywhere. So we rolled up the rope and took the vertical gear off and up through the corkscrew and through the tight squeeze. I crawled and first and then grabbed our packs. We called it a day, as it was already 4 o'clock. We headed down and back to the truck after a successful trip to Neelie and got the survey done.

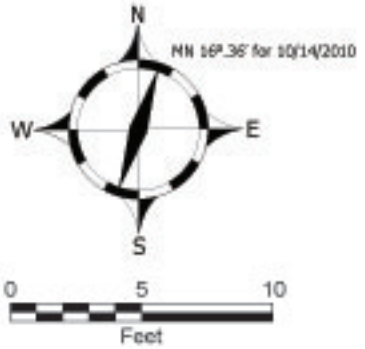
Entrance to Neelie Creek Cave. Photo by Jacob Earl

Neelie Creek Cave

King County, WA
A DistoX Survey

Surveyed: 3/19/10 & 10/14/10
Surveyed by: Edd Keudell, Jake Earl
Surveyed Length = 325.5 Feet
Depth = 103.06 Feet

Plotted using WinKarst v12.5
Drafted using Adobe Illustrator CS4



Map Legend

- = Breakdown
- = Ceiling height
- = Ceiling transition
- = Floor transition
- = Gravel / Small cobbles
- = Ledge height / Pit depth
- = Slope contour
- = Mud
- = Stalactite
- = Floor channel

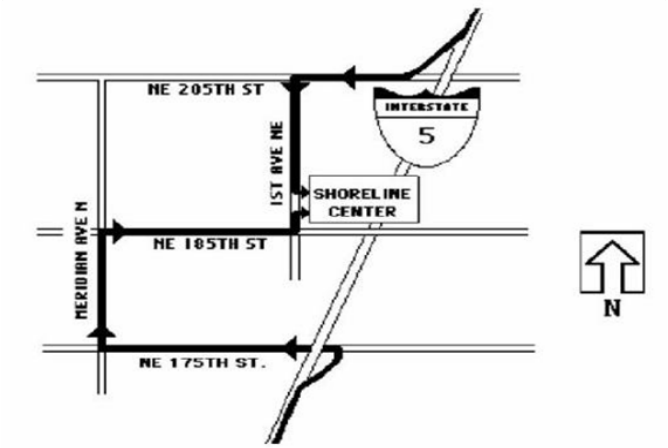
MEETINGS:

Regular grotto meetings are held every odd month (Jan, Mar, May, etc.) and on even months on a TBD basis at 7:00 pm on the third Friday at the Shoreline Community Center, Hamlin room. 18560 1st Ave NE in Shoreline.

To get to the Community Center from Seattle:

Take Exit 176 on Interstate 5 (175th St. N) and turn left at the light. At the next traffic light (Meridian Ave. N) turn right. Turn right at 185th St. N (the next light). Turn left on 1st NE, which again is the next light.

The Community Center is on the right. Enter the building on the southwest corner and find the Hamlin Room.



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