

Estimating Calorie Needs for a Backpacking Trip

Lucas M

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To Keep Itself Warm...

- Your body uses an immense amount of energy, even at room temperature, but especially at colder temperatures or in wet/insufficient clothing. About **1,000** calories per day are burned to keep warm.
- In addition to keeping warm, you body must:
 - Repair itself and make new cells
 - Digest food (about 10% of energy is spent turning food into energy)
 - Maintain cells and produce everything the body needs

- <https://opentextbc.ca/anatomyandphysiology/chapter/24-6-energy-and-heat-balance/>
- <https://thehappyscientist.com/content/calories-measuring-energy>

Effects of Food Deprivation

- Constant feelings of hunger can distract a person, and lead them to make poor decisions. A lack of sugar also impairs thinking skills
- Furthermore, irregular food consumption, such as missing or having a poor meal can throw off blood sugar levels, leading to headaches, irrationality, and trembling
- Obviously, fatigue will be a problem without food
- Injuries, sores, and cramps are more likely when you don't eat enough
- The risk of infection is a good deal higher because of a lack of energy

<https://healthyeating.sfgate.com/immediate-effects-food-deprivation-12170.html>

Baseline Calorie Consumption

These are calories spent standing around,

Mifflin-St Jeor Equation:

For men: $BMR = 22W + 2.5H - 5A + 5$
For women: $BMR = 22W + 2.5H - 5A - 161$

W: weight in pounds

H: height in inches

A: age

A sixteen year old, 150 pound guy standing at 5' 10" would need a minimum of 1,840 calories, assuming he doesn't do any physical activity. On a backpacking trip, you have to do a lot more than just hiking, so you use a lot more. The figure for moderately active teen is **2,800** calories. Furthermore, because cold weather makes the body spend more energy, multiply the baseline by **1.25** if the temperature will be low for most of the trip or if it will rain, and **1.5** if it will be both cold and wet.

<https://www.calculator.net/bmr-calculator.html>

Calorie Needs from backpacking

- Obviously, backpacking itself takes a lot of energy itself
- Rough trail surfaces (or no trail), heavier packs, and most severely, **inclines**, increase the number of calories needed

Formula: $n(W + L)(1.5V^2 + 0.35VG)$

First: weight (kg) + weight of pack (kg)

Then: $1.5 \times \text{hiking speed (m/s)} + 0.35 \times \text{hiking speed (m/s)} \times \text{grade (\%)}$

Finally: multiply the first output by the second, and then by the coefficient of terrain (1 for paved surfaces, 1.2 for gravel, 1.5 for mud or snow, and up to 3.5 for marsh)

Hiking 2.5 miles per hour with a 35 pound pack, the guy from before would burn 103 calories per mile on a flat trail, but would burn 163 per mile on a trail with a 1.8% grade.

The Outside Online article titled, The Ultimate Backpacking Calorie Estimator, provides a calorie need calculator where you can plug in values to get a count.

<https://www.outsideonline.com/2315751/ultimate-backpacking-calorie-estimator>

Pacing

- The optimal speed on flat terrain is between two and three miles per hour, a figure usually achieved anyway
- The same goes for uphill hiking, where one to one and half miles per hour is preferable, something usually maintained naturally
 - The fastest comfortable pace is the best; your body knows what it's doing
- Don't rush, or slow down just to be more efficient
 - It usually wastes time, or is counterproductive

What Types of Food to Bring

- Obviously, it needs to be backpacking food (durable, dry, compact)
- Try to aim for variety; you need to eat it after all
 - You don't want one hundred and fifty Clif bars
 - Dried fruit or jams, **various** types of bars, crackers, etc.
 - Vegetables exist
 - I.e. Wasabi peas and carrots
- Sugar is not evil - neither are snacks
 - Glucose is fine for snacks, and readily burned as energy
 - Starch is preferable for large meals, as a slow burning source of energy
- Proteins and fats should be brought in bulk
 - Nuts, jerkies, cheeses, peanut butter
 - Saturated fat (greasy foods) in excess can be unhealthy

Calorie Needs From Backpacking - Illustration

Below is an illustration of how a meal plan would be developed for our 13-member Dolly Sods Crew for Day #2 of the trip:

Example Calorie Estimation For Dolly Sods Backpacking Trip, Day #2

		(W)	(L)	(V)	(G)	(n)						
		Weight, lbs	Pack Wgt, lbs	Speed (mph)	Grade Incl.	Terrain	Kcal/Hour	Kcal/Mile	Miles Per Day	Approx. Hiking Calories	Approx. Calories At Rest	Approx. Calories Per Day
1	Eric X.	110	25	2.5	1.8%	Wet clay/ice	301	120	9.00	1,084	2,380	3,464
2	Justin M.	110	25	2.5	1.8%	Wet clay/ice	301	120	9.00	1,084	2,380	3,464
3	Andrew B.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
4	Evan H.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
5	James M.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
6	Lucas M.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
7	Michael S.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
8	Brandon E.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
9	Joshua B.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
10	Jimmy F.	150	30	2.5	1.8%	Wet clay/ice	402	161	9.00	1,447	2,380	3,827
11	Rob C.	175	35	2.5	1.8%	Wet clay/ice	469	188	9.00	1,688	2,380	4,068
12	Edward M.	175	35	2.5	1.8%	Wet clay/ice	469	188	9.00	1,688	2,380	4,068
13	Scott R.	175	35	2.5	1.8%	Wet clay/ice	469	188	9.00	1,688	2,380	4,068
							Total Calories For Crew of 13, Day #2					49,750
							Avg. Calories Per Person, Day#2					3,827

Notes:
 • - Kcal/Hour and Kcal/Mile calcs courtesy of <https://www.outsideonline.com/2315751/ultimate-backpacking-calorie-estimator#close>

Example Meal Plan For Dolly Sods Backpacking Trip, Day #2

Meal	Per Person			For Crew of 13		
	Food (quantity)	Weight (oz)	Calories	Food (quantity)	Weight (oz)	Calories
Breakfast	Instant Oatmeal (2 Pkgs)	3	240	Instant Oatmeal (26 Pkgs)	39	3,120
Breakfast	Dried Fruit	4	300	Dried Fruit	52	3,900
Breakfast	Pop Tarts or Breakfast Bars (x2)	2	400	Pop Tarts or Breakfast Bars (x26)	26	5,200
Breakfast	Instant Hot Chocolate Pouch (x1)	2	120	Instant Hot Chocolate Pouch (x13)	26	1,560
Snack A	Trail Mix or Honey Bun	3	400	Trail Mix or Honey Bun	39	5,200
Lunch	Greenbelly Meal	5.6	650	Greenbelly Meal	72.8	8,450
Snack B	Kind Protein Bar (x2)	3.5	500	Kind Protein Bar (x26)	45.5	6,500
Dinner	Dried Chicken and Rice	4	500	Dried Chicken and Rice	52	6,500
Dinner	Dried Veggies (carrot, pea, etc)	6	132	Dried Veggies (carrot, pea, etc)	78	1,716
Breakfast	Dried Fruit	4	300	Dried Fruit	52	3,900
Dessert	Oreos (x5)	4	265	Oreos (x65)	52	3,445
Total		41.1	3,807		534.3	49,491

Small .5% difference vs. calorie per day calc is immaterial.

Questions