

A scenic view of a mountain range with snow patches and a lake in the foreground. The mountains are rugged and rocky, with patches of snow nestled in the crevices and along the ridges. The sky is a clear, deep blue. In the foreground, there are large, light-colored rocks and a calm lake reflecting the surrounding landscape. A tall, thin evergreen tree stands on the left side of the frame.

Lightweight Backpacking – A Journey to Higher Adventure

Chris Knaus
Meridian District Roundtable
April 2018

Objectives, Disclaimer and Reminder

■ Objective: Awareness

- Share experiences to help you and your Scouts learn about lightening-up and the possibilities offered, and
- Describe a process to help you lighten-up.
- Highlight some gear choices and ways to think about gear.

■ Disclaimer:

- Views are mine only. BSA officialdom and the High Adventure Team do not necessarily endorse all of what I describe here.

■ Reminder: Be Prepared. **Scout safety is your prime responsibility.**



Emigrant Lake. July 2006

Note frame pack, before my lightweight journey began.

Slides available on District website. Add'l questions? Contact me at chris.knaus@chevron.com

Introduction - Who am I?

- **Backpacking since age 12**
- **Cub Scout, Boy Scout & Explorer**
- **Troop 236 (Danville)**
 - Both sons are Eagle Scouts
 - Numerous 50-milers & Philmont
- **Current Scouting Roles**
 - Various HAT Staff
 - Former Meridian District Committee Chair & MDSC Board Member
- **Currently enjoy backpacking with “ex-Scout Dads” including John Muir Trail (2013), High Sierra Trail (2015) and Tahoe Yosemite Trail (2018).**

A young man with a large red backpack is standing on a mountain trail. He is wearing a white t-shirt, blue shorts, and brown boots. The background shows a vast mountain range with green and brown peaks under a clear sky. The man is looking towards the camera with a slight smile.

*Either Telluride, Colorado (July 1977)
or Wind River Range, Wyoming (Aug 1978)
with Explorer Post 23, Baton Rouge, Louisiana.*

Old school - does this look like fun?



*Emigrant Wilderness.
Aug 2004*

Lightweight backpacking is not universally accepted. Arguments include...

For lightening-up

Less wear and tear on body

Heightened enjoyment

Ability to go farther each day

Capacity for other goals

Against lightening-up

Thinner margin for error

May push your experience

Miss creature comforts

Cost

Goal: To strike a **safe balance between extremes.**

Bottom Line: It is almost impossible to enjoy a trail like this with a heavy pack.



*Mather Pass &
Palisade Lakes—
John Muir Trail
Sept 2013*

How to think about lightening-up

- **Establish your trip objective...**
 - Trekking or thru-hike vs. traditional backpacking?
of miles/day? Peak bagging?
 - Recreation? Fishing? Scenery? Photography?
 - Young Scout introduction?
 - Build leadership? Training?
 - Combination?
- **... then factor in...**
 - Participants' Skill, Abilities
 - Time of year: Weather, Mosquitoes
- **... and think about...**
 - Systems, necessity & redundancy
 - **Safety**
- **...then consider range of options and trade-offs:**
 - Weight, Cost, Functionality
 - Personal preference & judgment



Bigelow Lake Pass. Emigrant Wilderness. Aug 2004

Program Tip:

- Set-up during PLC planning outing.

*For an excellent discussion of different trip objectives see:
<http://sectionhiker.com/thru-hiking-vs-backpacking/>*

See Appendix: Andrew Skurka's "Seven Steps to Lighten-up"

Terminology used...

■ Base Weight:

- Everything but consumables (food, water, fuel)

■ Total Pack Weight:

- Adds food, water & fuel carried

■ Skin-out Weight:

- Adds clothing and footwear worn plus items carried in hand (e.g. trekking poles, altimeters, watches)

■ Lightweight:

- Base weight < 20 lbs.

■ Ultra light:

- Base weight < 10 lbs.

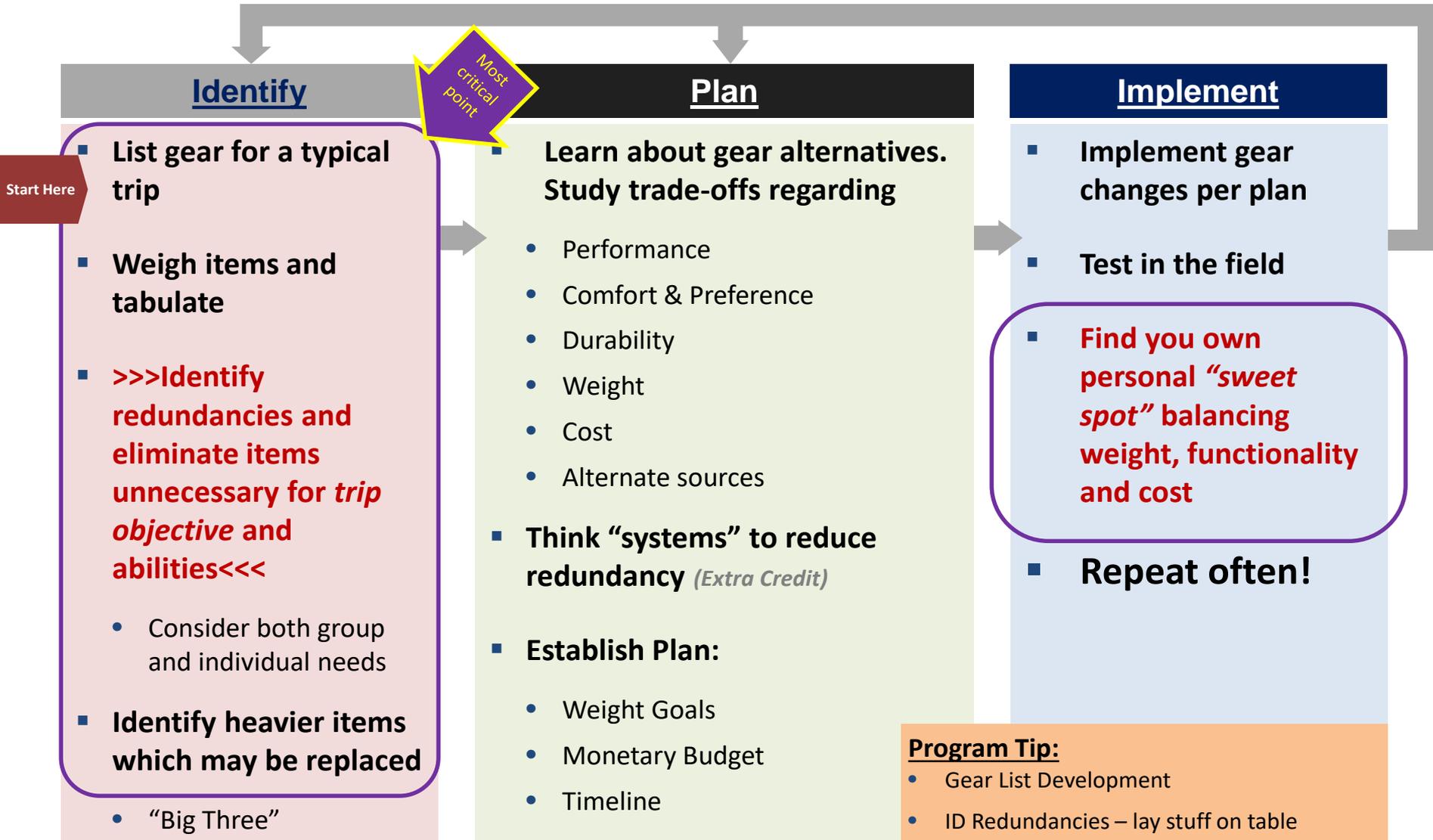
■ Superultralight:

- Base weight <5 lbs.

■ Stupid light:

- Andrew Skurka's term for when *“desperate weight savings can have adverse effects.”*

Key Takeaway: An ongoing process to find what works for you



See Appendix: Andrew Skurka’s “Seven Steps to Lighten-up”

Scale and spreadsheet help understand weight, identify redundancies and consider trade-offs.

Summary				Weight lb. oz.	Comments	Weight lb. oz.
1	Summary:	lb.	Sum lb			
2	Pack, Sleeping & Shelter (lbs)	6.7	6.7	Essential	1	3.8
3	+ Essential w/ 1st Aid, Emer & Toiletries (lbs)	2.4	9.0	Hydration, 2L P'pus w/ Hose		3.4
4	+ Kitchen Gear (lbs)	1.0	10.0	Hydration, 1L Nalgene Kanteen		2.0
5	+ Clothing Carried (lbs)	3.8	13.8	Water Treat, Micropur Tablets.		0.5
6	+ Optional incl: digital SLR & bear can (lbs).	4.3	18.1	Flashlight Mammot S-Flux Headlamp		1.7
7	+ Food, Fuel Consumed	5.3	23.4	Knife: Knife: Swiss Army		1.8
8	+ Water	1.1	24.5	Compass		1.3
9	= Total Carried (lbs)		24.5	Whistle		0.2
10	+ Clothing Worn (lbs)	4.1		Maps, Notepad, Med Forms, Pen		1.0
11	= Total "Skin-out" (lbs)		28.7	Poop Trowel, Ti.		0.6
12				TP & Purl (in Ziploc)		1.0
13		Weight lb. oz.	Comments			
14	Pack, Sleeping & Shelter	6	10.5	Garbage Bags (2)		
15	Backpack, Osprey Eaos 58	2	8.0	Bandana		0.9
16	Pack Cover: Compaator Trash bag (inside)		0.8	Mosquito Head Net (Sea to Summit)		1.1
17	Shelter, Tarptent Contrail	1	12.0	Rx, Glasses & Cloth Case		1.4
18	Ground Cloth: Tyvek sized for Contrail		5.1	Wallet (incl C Cards, Cash, DL and Insurance)		1.4
19	Bag: 30F Vest Mtn Summerlite (& Stuff Sack)	1	5.0	Thermometer		0.7
20	Stuff Bag + Fleece Pillow (Delta from regular So)		1.0	Towel (Pack Towel)		0.8
21	Pad: Therm-o-Rest Neo Air (Small)		10.1			
22	Ear Plugs, Nose Strips & Eye Shades		0.5	First Aid & Emerg Kit (Subtotal, incl in Essential)	0	12.4
23				Silnylon Pouch		1.3
24	Kitchen		15.5	Band Aids & Gauze Pads		1.0
25	Silnylon Pouch		0.5	Antibiotic Packs (4)		0.2
26	Stove, Soto OD-IR Micro Reg. (& case)		3.0	Medical Tape (1/2")		
27	Windscreen (Al Foil)		1.2	Leukotape		0.5
28	Pot: Kettle - 0.85L Ti REI (& Bag) Pair		5.0	Duct Tape		0.4
29	Bowl, Ti		1.9	Tincture of Benzoin (3/4 oz.)		0.6
30	Cup, Sierra Ti		1.7	Ace Bandage		1.5
31	Spoon, FireLite SUL Long Handled Ti		0.5	Meds: Imodium, Peptol Bismol, Sudafed		0.5
32	Campsums (1 oz vial)		1.1	Meds: Ibuprofen Vial		0.5
33	Lighter (mini Bic)		0.5	Foot Care, Moleskin & scissors in Sw Ar		0.5
34	Fuel Canister, 1 empty GP-110 cans!		3.1	Meds: Tums		
35	Fuel Canister, 0 empty GP-220 cans!			Emerg Blanket		1.8
36				Emerg Matches (REI)		0.8
37	Food & Consumables	5	4.7	Flint Steel		
38	Days (from Summary table, above) >>	3	days	Sewing Kit (needle, thread & safety pins)		0.2
39	Guideline: 1.5-1.75 lb/person/day	1.68	Calculated on	Therm-a-Rest Repair Kit		1.0
40	Fuel only, 1 GP-110 cans!		3.9			
41	Fuel only, 0 GP-220 cans!			Toiletries (Subtotal, incl in Essential Gear)	0	6.1
42				Toothpaste		0.5
43	Optional Gear	4	5.0	Toothbrush		0.4
44	Camera: Camera, Nikon D7000 w/ 18-55 mm	2	6.0	Prescriptions		0.6
45	Fishing: Telescopic rod & protective tub			Chapstick		0.4
46	Fishing Reel			Sunscreen		0.9
47	Fishing Tackle			Dr. Bronner's Soap (1 oz)		1.1
48	Cell Phone (BlackBerry)			Deodorant (Mitchum Unscented)		1.2
49	iPod Nano			DEET (3/4 oz.)		0.8
50	Lantern, Snow Peak			Hand Cream		
51	Bear Protection Bearikade Weekender MKII	1	15.0	Giide		
52				Small Tinlock		0.7

Program Tip:

- Meeting where Scouts weigh their gear, input data into a *simple* spreadsheet. (Competition?)
- Patrols develop mutual gear plans

Concepts in thinking about gear – extra credit!

Functionality

- Explicitly determine what functions you need
- Determine the function a piece of gear is to perform.
- Simplify to a **“verb noun”** combination:
 - *“retain warmth”*
 - *“boil water”* vs. *“cook food”*
 - *“deflect rain”* or *“shed water”*
 - *“illuminate objects”*
- Equipment may perform multiple functions

Systems

- Gear systems work together to meet functionality
- **Example: Sleep system**
 - Shelter, pad, sleeping bag or quilt, jacket, long-johns & knit cap all work together to *“retain warmth”*
- **Consider if a system meets functionality at less weight.**
 - e.g. 20°F bag vs. 35°F bag vs. quilt with jacket
 - **Other examples?**

Program Tip:

- Introduce concepts of function and systems

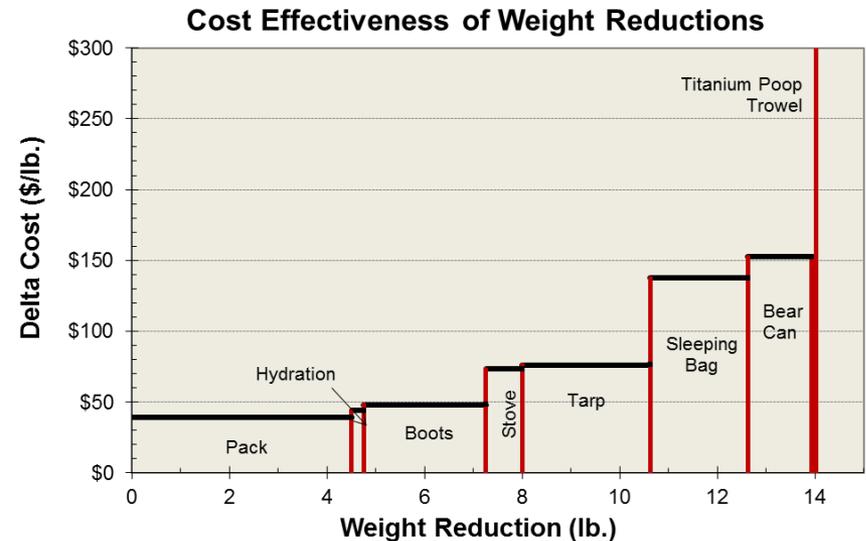
“The Scout motto ‘Be Prepared’ is often misinterpreted as ‘Be Equipped.’”

- Michael Ray. Terre Haute, Indiana

Prioritizing Weight Reductions.

What makes economic sense?

- Lightweight equipment can be costly!
Make a budget.
Consider:
 - “Bang for buck”
 - Scout families’ budgets
 - Increase families’ awareness of weight trade-offs.
 - Can use less expensive sources without buying junk.



Reference: “Lightweight Backpacking, Wal-Mart Style.”

http://www.backpackinglight.com/cgi-bin/backpackinglight/lightweight_backpacking_wal-mart_style.html.

Dec 2010.

Prioritizing Weight Reductions.

The Big 3: Pack, Bag & Shelter

Illustrative Weights for the “Big-3”

	Traditional	Light	Ultra Light
→ Backpack (lb.)	6	3	1.5
→ Sleeping (lb.)	6	3	1.5
→ Shelter (lb.)	6	3	1.5
Total Big Three Weight (lb.)	18	9	4.5

Source: Mike Dubrall. www.50miler.com

Backpacks *(Carry Stuff)*

	Traditional Frame Pack (Kelty Super Tioga)	Basic, Internal Frame (Osprey Aether 85)	Minimal Internal Frame (Osprey Exos 58)	Frameless (Gossamer Gear, others)
				
Features	Frame, pockets for lots of gear.	Internal frame	Internal frame Advanced fabrics	Generally no frame (use closed cell pad)
Weight	~6-7 lb	4 lb something	2 lb something	1 lb something
Pros	Carries a ton Comfortable - frame eases burden of extra weight.	Great pack, comfortable	Minimal frame helps get (light) weight on hips.	Lightweight. Pack doesn't need as much support or capacity if truly lightened-up.
Cons	Weights a ton. Capacity more than needed.	Still bigger and heavier than necessary		Doesn't work until load is lightened! Weight on shoulder
Cost	\$150 or so	\$225	\$225 REI Flash: \$169-125	\$100-\$200

Sleep Systems *(Retain Warmth)*

	Light Synthetic Bag	Light Down Bag (Western Mountaineering Alpinlite)	Lighter Down Bag (Western Mountaineering Summerlite)	Quilt (Enlightened Equipment, Z-packs)
				
Features		20 °F Full zipper	30 °F Full zipper	Wrap around, works with pad.
Weight		2 lb 5 oz.	1 lb 9 oz.	13 oz or so
Pros	Synthetic OK if wet	Wider Girth Useful in Winter	Narrower Girth	Lightweight System use with insulating garments.
Cons	Heavier	Down useless if wet		Unfamiliar
Cost		\$400 Sub-Kilo: \$169-200	\$350	\$125+++?

Beware of temp ratings!

Shelter *(Shelter Body, perhaps Exclude Mosquitoes)*

Program Tip: Meeting where alternatives are demonstrated.

	2 man tent Solo (REI Half Dome)	2 man tent Shared (REI Half Dome)	TarpTent (Tarptent Contrail)	Ultralight (Six Moon Designs Skyscape X)	Tarp
					
Features	Double Wall	Double Wall	Single Wall with Ventilation Uses trekking Poles	Uses lightweight Cuben fiber. Hybrid double wall Uses trekking poles.	Open. Uses trekking poles. Bivvy for add'l protection.
Weight	6 lb 5 oz. (now lower!) incl ground cloth	3 lb 2.5 oz incl ground cloth	1 lb 8 oz	15 oz	Between 6 oz and 1 lb. +
Pros	Roomy Newer models use lighter fabrics & weigh less.	Roomy No condensation	Lightweight, Length, Bug Protection, Ventilation	Ultra lightweight, Bug Protection,	System: uses trekking poles
Cons		Privacy. Partner's flatulence & snore	Not free standing	Costly Not free standing	Bug exposure Bivvy cramped Not free standing
Cost	\$190		\$200	\$565 Ouch!	\$75 + \$75-200 for Bivvy

Other Gear Considerations

- **Pots (*Cook food, boil water*)** – Philmont issued pots are heavy.
- **Plates & Mess Kits (*Hold food*)** – Mess kits are heavy & superfluous. Plastic bowl & spoon is all you need.
Extra credit: Mug only
- **Group Tarp (*Deflect water and wind, protect body*)** – Philmont nylon tarp (4 lbs) vs. similar sized Silnylon (<2 lbs)
- **Flashlights (*Illuminate objects*)** – Maglites of various sizes vs. headlamp vs. “keychain” LED
- **Clothes (*Minimize exposure, retain warmth*)** – How much spare clothing is a Scout going to wear anyway?

Clothing –

A culprit in making packs unnecessarily heavy

- **Easy to slip in an extra something – just in case!**
- **Necessary functions:**
 - “Retain Heat”
 - “Deflect Sun”
 - “Deflect Rain”
 - “Protect Feet”
- **Breathable & wicking fabrics (Nylon, Merino wool, polypro, etc.) rather than **evil** cotton.**
- **Layering: Base, Insulation & Shell**

My Sierra Summer Clothing System:

- *One complete set of clothes!*

■ Worn on trail

- Poly or Merino Wool T-shirt
- Compression boxer underwear (Doubles as swimsuit*)
- Convertible pants (Doubles as shorts)
- Socks & sock liners
- Tilley hat & sunglasses
- Trail Runners (*Controversial!*)

■ Packed:

- L/S shirt layer (Sun shirt or Smartwool)
- Long-johns. Silk, polypro or merino wool. Bottom & (perhaps) top (Bonus function: *"Protect bag"*)
- Insulation: Down jacket
- Shell: Rain jacket and pants (breathable)
- Beanie, glove liners & trail mittens
- Extra socks - my only duplicate items



Donahue Pass. Yosemite. Aug 2011

How much spare clothing will a Scout actually wear?

* Circumstances may call for swimsuit or spare shorts rather than swimming in boxers (e.g. Coed Venture Crew).
Ref. Guide to Safe Scouting)

Footwear

	Boots + Tevas or Keens	Boots + Crocs	Boots only Asolo Fugitive GTX	Trail Runners
				
Features			Rugged, durable, waterproof	Some GoreTex, some not. Some people get non-H ₂ O proof and dry “on the foot.”
Weight	Boots + 1 lb 6 oz.	Boots + 10 oz.	~4 lbs	~1 ½ - 2 lb
Pros	Flexibility for stream crossings. Comfort around camp.		Ankle & toe protection Winter warmth	Lightweight, comfortable.
Cons	Heavier than necessary. 2 nd pair not always needed.		Heavy. Does “protection” provide false sense of security?	Scouts’ risk of injury increased during horseplay. Sufficient protection for fragile, old feet?
Cost	Boots + \$45-80	Boots + \$20-40	~\$125-200+	~\$80-120

Insulating Layer *(Retain Warmth)*

	Legacy Down Jacket (Camp 7 from High School days)	Fleece (REI Muir Wood)	Light Down Jacket (First Ascent)	Ultra light Down Jacket (Mont Bell UL Inner)
				
Weight	2 lb 1 oz	1 lb 1.7 oz	13 oz	7.3 oz
Pros	Available		Available in "tall" size	
Cons	Old Bulky	Bulky		Fragile fabric No Pockets
Cost	already have	\$80 sale \$35 already have	\$189 sale \$109	\$150

Raincoat (*Deflect Water*)

	Legacy Gore Tex Parka (REI 15 yrs ago)	Lighter (Marmot Precip)	Lighter still (Marmot Nano)	Dri Ducks Frog Togs
				
Weight	1 lb 12 oz	14 oz	8oz.	6 – 7 oz.
Pros	Long/coverage Still waterproof, but age is beginning to show.	Lightweight, breathable. Good balance between weight, durability and functionality	Gore Tex “Paclite” Lightweight, breathable	Great value. Lightweight, breathable OK for occasional use.
Cons	Bulky & heavy		\$\$\$ No Pit zips, pockets	Fragile No Pockets
Cost	already have \$125	\$90 sale \$70	\$250 sale \$175	\$15-\$25

Consider fabric weight vs. durability, laminated coating and breathability, zippers

“Your Heaviest Gear: You!”

- **Wherever carried, extra weight impacts your body and thus affects your experience.**
- **Suggestion:**
 - Find balance between weight, exercise, diet, fitness, lifestyle, change, realistic goals, etc.
 - Complement your trek training program
- **Bottom line:**
 - Less costly than new gear
 - Added benefit of improved health!
 - Requires self discipline



Reference:

“Lighten Your Heaviest Gear: You!” by Jeremy Pendrey
www.backpackinglight.com

Involving Scouts in the quest to “lighten-up”

- **Think about the impact of “30% of body weight” rule of thumb on a growing 12 year old Scout.**
 - What if lighter? What if heavier?
 - Seek to build a Scout’s enthusiasm, not turn them off.
- **Considerations:**
 - Risk of injury to growing body
 - Cost
 - Wait until 15? No!
 - Ability and skill level must be developed
- **Ways to accomplish:**
 - Meeting program
 - Demonstrations and practice hikes
 - Sharing & borrowing gear. Distribution of group gear.
 - Senior Scouts help/lead young-uns
- **Lead by your example!**



Summary Reference

Process Takeaways

- Trip Objective
- List, Weigh, Tabulate
- ID redundancies & eliminate items not supporting trip objectives and safety
- Incorporate systems thinking

+++++

- Learn about gear alternatives & study trade-offs
- Prioritize and establish plan (incl weight goals, cost & timeline)
- Consider yourself

- **Test & enjoy!**

Program Tips

- Set trip objective during PLC planning
- Gear List Development:
 - Weigh-in meeting. Input data into a simple spreadsheet. (Competition?)
 - ID Redundancies – lay stuff on table
 - Introduce concepts of function and systems
 - Demonstration of range of alternative equipment choices
 - Patrols develop mutual gear plans: Sharing & borrowing gear, group gear.
- Demonstrations during practice hikes
- Senior Scouts help/lead young-uns

In Conclusion...

- **Lightening-up can and/or will...**

- ... increase your enjoyment of backpacking

- ... open-up a whole new world

- ... be expensive, but costs can be managed

- ... test your abilities

- ... be a journey

Headwaters of Lyell Fork, Tuolumne River. Yosemite. Aug 2011

Thanks for your attention!

Questions?



*Whitney Portal.
Terminus of John Muir Trail.
September 2013*

Slides available on District website. Add'l questions? Contact me at chris.knaus@chevron.com

Appendix: Resources

▪ High Adventure Team, Peers

▪ Dozens of websites. Google...

- www.backpackinglight.com
 - Equipment reviews, gear tests, stories, blogs, reader's forum, gear shop. Gear lists from "typical" weekend outing through Philmont.
 - Owner Ryan Jordan involved in Scouting (Montana Council) and has developed LW B'packing Scout training. www.backpackinglight.com/montanabsa
(see welcome kit and gear list)
 - Requires subscription for good stuff (~\$25/yr)
- www.50miler.com
 - Run by local Scouter, Mike Dubrall.
 - Emphasizes general Scouting applications, Sierras.
- www.backpackgeartest.org - Gear reviews.
- SectionHiker.com - Video Series from Capitol Area Council (Texas)
http://feedproxy.google.com/~r/Sectionhikercom/~3/945uZgs3QnU/?utm_source=feedburner&utm_medium=email
YouTube Links

▪ Books:

- **"Beyond Backpacking - Ray Jardine's Guide to Lightweight Hiking"** Ray Jardine.
Advocates "Ray's way" - a systems based approach. May seem extreme, but shows what is possible. www.rayjardine.com/
- **"The Ultimate Hiker's Gear Guide: Tools & Techniques to Hit the Trail"** Andrew Skurka.
From experiences on multiple treks (e.g. 6000+ miles around Alaska). Concepts from trekking based system focus may be broadly applied. Guards against *"stupid light."*
www.andrewskurka.com
- **"Ultralight Backpackin' Tips"** Mike Clelland.
153 practical & inexpensive 'tips' – easy read.

▪ Retailers, Stores (REI, Sunrise, others...), Internet & Catalogs

- Ultra light gear generally not mass marketed. Cottage industry suppliers on internet include:
 - www.tarptent.com, www.gossamergear.com, www.sixmoondesigns.com, www.zpacks.com, www.mountainlaureldesigns.com, www.enlightenedequipment.com, www.titaniumgoat.com, www.rutalocura.com

Appendix: “Seven Steps to Lighten-up”

- Andrew Skurka

Andrew spends most of his day **walking**, so he optimizes his pack for on-trail ecstasy by keeping it light. However, he doesn't go “**stupid light**” by sacrificing too much functionality, durability, comfort etc. for the sake of saving a few grams. Here are seven tips to lighten up:

- 1. Create a gear list.** In a spreadsheet list the gear you may take on an upcoming trip, and weigh each item with a postal scale. Never guess the weight or trust the manufacturer's specs. The gear list allows you to compare options, identify excessively heavy items, and track your progress over successive trips.
- 2. Take less stuff.** Research the conditions (e.g. temps, precip, remoteness, and natural hazards) you will encounter so that you do not justify items on the baseless “what if” and “just in case” scenarios or on unfounded personal insecurities. Be realistic about your true needs and wants; if want to take a luxury item, make sure that it has a high luxury-to-weight ratio. After a trip, identify items you did not use or need and consider leaving them at home next time.
- 3. Take lighter gear.** Consider a tarp or tarptent instead of a double-wall tent. Make an ultralight alcohol stove from a cat food can. Take one high-loft insulated jacket instead of multiple fleece layers. And learn to use a map and compass so you can ditch your GPS. These decisions have a multiplier effect: a lighter load allows you to wear trail shoes instead of boots, to carry a lighter and smaller backpack, and to carry less food and water because you will cover distances between resupply points and water sources more quickly.
- 4. Use versatile gear and eliminate redundancies.** Pitch your shelter with your trekking poles. Wear your clothing at night and carry a lighter sleeping bag. Use a sleeping pad as a “virtual frame” in your frameless pack. Replace your raingear, shelter and pack cover with a poncho/tarp. And put soft-sided Platypus water bottles and extra clothing inside a stuff sack to make a pillow.
- 5. Increase the caloric density of your food.** One ounce of fat contains 240 calories; one ounce of protein or carbohydrates, just 100. The most weight-efficient diet, then, would consist solely of butter or some other pure fat. Of course, that would be gross – instead, bulk up on chocolate, nuts, Fritos, peanut butter and similarly fatty foods. Aim for a caloric density of 125-150 calories/ounce.
- 6. Optimize your hydration.** Learn how much water you need per hour under certain conditions (e.g. temperatures, elevation gain/loss, shade, etc.), and only take enough to reach your next water source.
- 7. Eliminate all extraneousness.** Remove ice axe loops, daisy chains, extra webbing and/or hydration sleeves from your pack. Ditto for shirt tags, guidebook margins, and pot handles. And chop toothbrushes, foam sleeping pads, and lexan utensils to make them lighter and more packable. This step is intentionally listed last – the weight savings are negligible compared to the steps above.

Water Container *(Hold Water)*

	Nalgene Bottle (Traditional)	Hydration Kit (Platypus 2L Hoser)	Nalgene "Canteen"	Used Gatorade Bottle
				
Features	Holds Water	Holds Water Dispenses water	Holds Water	Holds Water
Weight	6 oz.	3.4 oz.	2 oz.	2 oz.
Pros	Wide Mouth Durable Mixing	Hydration hose convenient. Collapses. Encourages more drinking.	Wide Mouth. Collapses.	Wider mouth Cheap
Cons	Heavy BPA free.	Narrow mouth Mixing difficult	More leak prone?	Concerns over reusing plastic.
Cost	\$9	\$20	\$10	\$0

Water Treatment (*Treat Water*)

	Pump Filter (Wide variety; e.g. MSR MiniWorks EX)	Gravity Filter (Platypus GravityWorks)	UV (e.g. SteriPEN Adventurer Opti Water Purifier)	Tablets: Iodine or chlorine dioxide.
				
Weight	15+ oz.	11 oz.	~3.8 oz. incl Bat.	Negligible
Pros	Long proven; Generally durable. Share w/ patrol.	Lighter weight. Passive. Share w/ patrol. Relatively quick.	Immediate.	Lightweight. Simple.
Cons	Time consuming. Active pumping req'd. Maintenance of filter element.	Quicker, but still not immediate. Maintenance of filter element.	Batteries. Finicky.	30 minute wait. Some object to taste of I. Can mix-up neutralizer & I pills.
Cost	\$90 (over 1000s of L)	\$120 (over 1000s of L)	\$50-90 (UV bulb for 8000 L, bat. for 50 L.	PA: \$11/50 tabs/25L MP: \$14/30 tab/30L

Each has different effectiveness against different bugs.

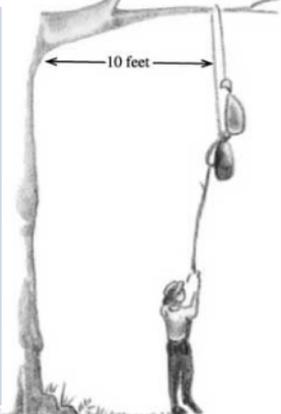
Also:

- Alcohol (Beer can stove verboten per *Guide to Safe Scouting*)
- Wood Fire

Stoves (*Heat food/water*)

	Svea 123	MSR Whisperlite	Remote Canister (MSR WindPro)	Attached Canister (Snow Peak Gigapower)	Jet Boil
					
Features	Sentimental Favorite! White Gas	White Gas Separate Fuel Bottle Widely used by Troops	Iso-Butane & Propane Detached Canister	Iso-Butane & Propane Upright Canister Piezo sparker.	Integrated stove w/ high efficiency pot.
Weight	1 lb 3 oz.	11 oz.	6.8 oz.	2 – 4 oz.	8 – 12 oz. <i>(Incl pot!)</i>
Pros	Rugged, dependable, powerful	Cold weather performance. Durable. Simple.	Inverted models have improved cold weather performance.	Light, simple & powerful	Fast. Efficiency minimizes fuel use. Weight savings pays-out for long trips.
Cons	Separate fuel bottle (+5.1 oz.) Priming	Separate fuel bottle (+5.1 oz.) Priming Temperamental – bring field repair kit	Canister weight & disposal (+5 oz empty)	Need windscreen Canister weight & (+5 oz empty) Poor performance if < 20° F.	Expensive. Boils water well but hard to cook or simmer.
Cost	\$110	\$65	\$90	\$25-60	\$75 - 150

Bear Bags or Cans *(Protect food & bears)*

	Bear Bag in Tree	Ursack w/ Al Liner	Traditional Bear Can	Berikade Weekender
				
Features		650 in ³ Spectra Fiber + Aluminum Liner	650 in ³ (Garcia) 700 in ³ (BV500)	650 in ³ Composite Materials
Weight	3 oz.	8 oz + 11 oz.	2 lb 9 oz.	1 lb 15 oz.
Pros	Easy, cheap, lightweight	Lightweight	Effective	Effective. Lighter than Garcia & BV
Cons	Often ineffective due to user error and smart bears. Girdles trees.	User error: knots. <i>Not allowed in Yosemite, plus parts of Kings Can & Sequoia.</i>	Heavy Bulky	Over the top \$\$ Bulky
Cost	Trivial for rope, biners.	\$65 + \$20	\$65 (buy) \$5/wk (rent)	\$275 <i>Rental rates for Scouts.</i>

What if desired functionality includes *repair stove & pack*?
 Could a plastic utility knife or razor blade perform desired functionality?

Knife (*Cut cheese, salami & moleskin*)

	Leatherman (or hard-core Swiss Army knives)	Traditional Swiss Army Knife	Leatherman Micra or Squirt	Swiss Army Classic SD
				
Features	All but kitchen sink	Large blade, Awl, Tweezers	Pliers (Squirt) Scissors (Micra)	Scissors Tweezers
Weight	6 oz +	1.9 oz +	1.9 oz.	0.7 oz
Pros	Could repair the space shuttle	Two blades, Can opener & awl are useful. Corkscrew?	Good functionality & weight balance Pliers for stove repair.	Light Sharp scissors don't get cheese goo on them
Cons	Unnecessary functions, heavy	No scissors	Small, easily lost.	Small Blade
Cost	\$40 +	\$20	\$40 Squirt \$25 Micra	\$10