

"*Training Essentials for Ultrarunning* is a breakthrough work that brings together sound scientific principles and years of coaching experience to create the definitive training manual of our time."

—DEAN KARNAZES, AUTHOR OF *ULTRAMARATHON MAN*



HOW TO  
TRAIN SMARTER,  
RACE FASTER,  
AND MAXIMIZE YOUR  
ULTRAMARATHON  
PERFORMANCE

TRAINING ESSENTIALS FOR  
***ULTRARUNNING***

JASON KOOP

WITH JIM RUTBERG

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# ***THE ULTRARUNNING REVOLUTION***

There is nothing like the experience of finishing an ultramarathon. As the final miles click by, there's a lot of time to think about how far you've come, not just over the past day or two but also through the months of training and lifetime of experiences that led to that moment. As a runner, I have been fortunate to experience the final rush of emotion that seems to sweep us over the finish line, and as a coach, I have had the privilege of experiencing it again and again with the athletes I work with.

The beauty of ultrarunning is its accessibility; ours is a sport that is open to everyone. But the sheer magnitude of 50- and 100-mile races is intimidating to many, and for a long time information about preparing for ultramarathons has been hard to find and largely based on "it worked for me" anecdotes. This is the problem I set out to address when I started coaching ultrarunners more than a decade ago.

What I've learned, and what I hope to teach in the following pages, is: Training for ultrarunning isn't as complicated as it may seem, and there's a logical progression that yields measurable and meaningful improvements regardless of your starting point. I'm not here to make ultrarunning easy; it's not. Instead, I've devoted my career to applying sound sports science and effective coaching methods to the unique demands presented by ultradistance running so you can push yourself farther and have more fun every step of the way.

## THE BIG IDEAS

Before I explain more about my history and what led me to develop a unique coaching philosophy and training system for ultrarunning, I want to give you a preview of some of the main ideas you'll find in this book.

- **Fitness makes everything better.** This seems like an obvious statement, but when you look at how most ultrarunners train, by simply running as many miles as possible, you see that improving cardiovascular fitness isn't their priority. Being more fit isn't just about going faster or being more competitive, either. Fitness enables you to run more comfortably, with more control, and with better technique. It not only gives you the ability to get yourself out of trouble if things go wrong but also keeps you out of a lot of trouble in the first place.
- **Structured training is the best way to build fitness.** "Just go run" works for a little while, but you quickly reach a plateau where progress stops. More mileage alone isn't the answer, but unfortunately it's the default solution for most athletes. In order to make progress, your training has to have structure, with workouts that target specific energy systems, purposeful recovery periods, and a progression that applies the correct amount of training stress.
- **It takes more than fitness to reach the finish line.** What separates ultrarunning from other endurance sports is the impact of everything else beyond fitness in determining whether or not you will reach the finish line. If you have successfully finished a marathon, you have the physical capacity to finish a 50K, 50-mile, or even a 100-mile race. But ultramarathons are not simply longer marathons. Your limiting factor isn't your physical capacity but rather your habits, nutrition and hydration strategies, gear selection, knowledge of the course, decision-making capabilities, and forged toughness.
- **Your mind is your greatest weapon.** Ultrarunning is hard. The training is difficult, and the events are even more so. The conditions, the course, and your body will conspire against you. Ultrarunning is an intellectual sport; you have to think your way through the challenges. In events that last up to (and

sometimes beyond) 30 hours, there's a lot of time for plans to go awry as well as a lot of time to right the ship. You have to find solutions to the puzzle, often when you're tired, hungry, wet, and cold. To be successful, you need to train your mind just as much as you train your body.

## STARTING FROM SCRATCH

I have been a coach for nearly as long as I've been an athlete. At the age of 16, I got my first gig coaching a summer track team, the Texas Stars Track Club. Twice a day, every day, in the searing Texas summer heat, I herded dozens of kids through simple drills and conditioning regimens. Although it would be a stretch to say I was a legitimate “coach” at that point, one thing was certain: I fell in love with seeing people improve. Helping an athlete “get” the Fosbury Flop (a high-jumping technique), spring out of the blocks properly, or run a personal record (PR) captivated me. As you can imagine, tangible improvement came easily for these young teens. Many of them had never run before. No matter what they did, they were almost sure to do it better, faster, or higher the next day. But what also captivated me was seeing how a logical approach to training helped them understand the “why” behind what we were teaching. You can't simply tell 12-year-old high jumpers to “get your butt over the bar” and magically expect them to flop over the bar like a pro. You have to logically introduce each aspect of the high jump before they get how to flop. You need to establish their run-up, their penultimate step, and how their shoulders should line up while they are in the air. I discovered that summer that if you do this methodically and in the right order, they get it. Tell them to simply “get your butt over the bar,” and it's a disaster. Coaching had a wonderful logic: You instructed an athlete on a series of tasks, they accomplished those tasks, and they became better athletes.

Fast-forward to 2001. I accepted a coaching internship at Carmichael Training Systems (CTS) in Colorado Springs, Colorado, and began to work with cyclists, triathletes, and marathon runners of all levels. I was surprised to find that the coaching process I had fallen in love with as a teenager still applied: Have an athlete perform a series of workouts in a logical order, and he or she improves. But instead of standing in 100-plus-degree Texas heat watching kids run around in

circles, now I was coaching mostly from behind a computer and by telephone. Maneuvering an athlete into starting blocks gave way to analyzing training files. The series of tasks morphed into structured workouts that built up into weeks and phases of endurance training.

When I started coaching cyclists, triathletes, and marathon runners, I had been a runner, and only a runner, for my entire life. I knew very little about the sports of cycling and triathlon and had no practical experience in either sport. Early in my coaching career, I did not fully understand the nuances of power profiling, drafting, or how to run off the bike. But as strange as it sounds, that initial lack of knowledge proved crucial to how I ultimately developed an effective coaching philosophy for ultramarathon runners.

Because I knew nothing, I was forced to learn everything. Rather than relying on my own experiences, I was forced to look at things from an unbiased, unobstructed, and unfiltered point of view. I had to break the demands of the sport down to their component parts, so I examined and analyzed the aerobic system, muscular function, race tactics, heat stress response, and myriad other components. This process—breaking down a sport, figuring out the key components, and optimizing those components to make a better athlete—molded my coaching. As the years went on, I worked with every kind of athlete in nearly every endurance sport save one: ultramarathon. Initially, I found this strange. The most complicated sports benefit the most from the guiding hands of a professional coach. To me, ultramarathons seemed arduous and complicated enough to make ultramarathon runners good candidates for coaching. The events are long, and there are myriad physiological, tactical, and nutritional considerations to take into account. Some ultras have success rates of only 50 percent. Yet virtually no ultrarunners had coaches or even a semblance of a structured training plan. If I went to the local criterium or road race, nearly all the cyclists had a coach, logged their training in some program, could chart out their peak heart rate values, and knew every nuance of their power profile. Triathletes took it to an even higher level. They trained, used proper periodization methods, absorbed every aerodynamic advantage they could find, ate right, and planned their race tactics at a level normally reserved for a military operation.

But when I went to an ultra event, it was as if I had been transported back in time. Training logs, if they existed at all, were paper. Nutrition was water and a quartered PB&J sandwich. I would ask ultrarunners what they did for training, and the resounding answer was “Run.” I likened this response to my previous experience as a teenaged track coach: “Get your butt over the bar.” While nearly all other endurance sports accepted coaching and the application of sound sports science principles, in ultrarunning these ideas were met with a lukewarm reception at best. In fact, many elites in the sport were proud and vocal that they trained by feel and that their training had no structure. In social settings, I often found myself defending coaching within the sport, something that doesn’t happen in any other endurance sport. Though I coached a handful of ultrarunners at the time, I concluded that ultrarunning was not ready for coaching.

Nearly 10 years later, I read a profile of Dakota Jones in which he mentioned wanting to find a coach. I asked if I could help with his training, and he agreed.

I began the coaching process as I had hundreds of times before. Dakota’s next race was Transvulcania, a notorious early-season kickoff for many elite ultrarunners. I put him through a fairly standard round of lactate threshold work (the kind I’ll talk about in detail throughout this book), anticipating that Transvulcania would demand that system be tuned to its max. The race went very well, and this happy-go-lucky kid from Durango won, beating some of the best runners in the world, including the incomparable Kilian Jornet. To give credit where credit is due, Dakota was a fine athlete before I started working with him. He has a great engine and is tough as nails. The two months that I spent coaching him probably had a marginal impact. Nonetheless, he won, and ultrarunners started to take notice.

Since that time, I have never had to convince an ultraunner that coaching is a good idea. The awkward moments in which I defended coaching have been replaced by question-and-answer sessions on training, nutrition, and physiology. Runners come to me from many different athletic backgrounds and experiences: fledgling athletes on the cusp of something great, others at the top of the sport, and still others looking for a fresh approach. Some want to be fast as hell and win races; others just want to do what they can to ensure they cross the finish line.

## //// DAKOTA JONES MY FIRST ULTRA

While I was still in high school, I volunteered at the Hardrock 100, which gave me my first and best look at the type of outdoor adventure that has captivated me for nearly a decade. Hardrock is an event that has changed the lives of many people, and I was lucky to start there. I was 17, and I watched 140 people complete an extraordinary feat in an extraordinary place. They made me think that I could do something similar—indeed, that I could do anything I wanted. And instantly, all I wanted to do was Hardrock. So I signed up for a 50K that fall and, having no idea how to train for it, just proceeded to run. A lot.

And it went well. Despite my inexperience, I had big hopes for the race. No matter that it was a poorly attended first-year race in the desert—when I finished in third place, that performance spurred me to think that maybe I could be good at this sport, which in turn made me want to try all the harder. I immediately went back into training mode, working furiously to reach a standard that I hadn't quite divined yet. I wanted to be a successful athlete, whatever that meant, and to reach that goal I ran long and hard all through the winter, training alone and on a plan I patched together from reading blogs and websites and thinking things like “Well, if I want to run really far, I should probably just do that a lot in training.” It apparently worked well enough because at my next race—a more competitive 50K—I took fourth place. This fueled my passion even more, and I began to consider going bigger.

Fast-forward nearly three years, to December 2011. In that year I had won a 50K in Moab, taken fourth at an extremely competitive 100K in California, won a 50-mile race in Idaho, and finished second in the Hardrock 100. That fall I trained intensely for the year's most competitive 50-mile race, the North Face Endurance Challenge Championships, which attracts all the fastest runners, largely because of its prize purse of \$10,000. I had run the race twice before, taking 14th in 2009 and then 4th in 2010, and I wanted to do even better this time. I was attending college in Fort Collins, Colorado. I spent my mornings running, my days in school, and my evenings sleeping. And for the first time in

my ultrarunning career, I made a point to incorporate speed training into my regimen. I had enough race experience amassed by now to know I could run the distance, but I also knew that the North Face race would be fast and that the key to doing well would be maintaining a fast pace for the whole distance.

With this mind-set, I was part of a small vanguard of people who were no longer running ultras just to finish. Of course, these events had always been “races,” and races by definition delineate who wins from who doesn’t. But my segue into the sport came from Hardrock, which is so difficult that the first runner is often almost 20 hours faster than the last. Hardrock has a strict policy of calling the event a “run” rather than a race, and this mind-set gives the event a unique character, a camaraderie that has begotten a self-styled “Hardrock family.” I wasn’t changing the world or anyone’s concept of sport by trying to compete in ultramarathons, but the fact is that ultramarathoning was not a professional sport for most of its history. This began to change for some of the more competitive races, and by the fall of 2011 I found myself very much a part of this transition to competitive-minded ultramarathoning.

While I had experienced some success to that point, I still had no clear concept of how to train. The problem was that as the sport got faster and I wanted to keep up with it, the stakes became much higher. In a desperate attempt to stay relevant, I did random sets of tempo runs. Twice a week or so I’d go out for fast sprints on hilly roads and see how long I could keep up the pace. I worked off of logic, trying to balance speed work and distance runs with enough rest to make each workout count. But my plan was vague, and I had little confidence in it because my training did not have a scientific foundation. When the race arrived, I ran well enough, but I wasn’t satisfied. I knew I could do better. I could feel deep inside that my knowledge of training, rather than my experience or fitness, was now my limiting factor. I needed to continue to improve but had no idea how. How do you get better when you’ve already done everything you know how to do?

Well, apparently you wait until the perfect thing falls into your lap. Early the next year I had made no progress toward finding a coach when one >

day, out of the blue, I received a call from a guy named Jason Koop. I had only vaguely heard of him, but after some conversations and Googling, I decided that it was worth a shot. So I agreed to work with him for a few months.

He immediately sent me out on a dirt road doing 3-minute intervals. For those of you who haven't run 3-minute intervals, just think about how fast you can run an 800-meter race, then keep going again and again. They're short enough that you can run really fast but long enough that you can hardly believe time hasn't slowed down when you look at your watch after forever, only to find that you have several more minutes to go. Jason made me do about five of these workouts over the first two weeks, and they confirmed my impression that I had a lot of improvement ahead of me. They really hurt.

Soon we started working up to longer intervals. The idea sounded simple. You pick a goal race (for me, it was Hardrock 2012) and then start by running workouts the least like that race (for me, 3-minute intervals). As the race approaches, you transition into training that is more similar to the goal race, until the month or so before the race you're running almost exactly like you will be during the race. There is a lot of science behind this, and all that science will be detailed in other parts of this book. But as an athlete, this was all I needed to know. Jason made sense, I believed him, and I followed his plan.

I have now been working with Jason for nearly four years. I have run a lot of races in that time, and I have been proud of most of them. Not every race has been a spectacular success. The reasons for success are as varied as the courses we run on. I don't know why some days are good and some days aren't. I simply know that when I line up for a race, I'm going to run as well as I possibly can, and that I have worked really hard to be prepared for the event.

At Hardrock in 2012 I lived the experience that had coursed through my dreams since volunteering at the race years earlier. My body was strong and my mind stronger, and I moved through the huge mountains that constitute the course with an efficiency that will always make me proud. In the end I finished in third place, in one of the race's then top-five times.



In the years I have been involved in ultrarunning, it has been great to see sports science and coaching gain acceptance at all levels of the sport and yield improved performances for athletes of all abilities. I am truly humbled by the athletes I've been able to work with and the opportunities I have been given, including the opportunity to publish this book and help you achieve your goals.

### CRACKING THE CODE ON ULTRARUNNING TRAINING

As I began working with ultrarunners (even before working with Dakota), my process started as it always had in other sports. I looked at the demands of the sport, dissected the critical components, and sought out the research to guide me in how to improve athletes. This time, however, there was a big problem: Minimal literature and practice existed to quantify the unique demands of an ultramarathon. There were no power files, few heart rate files, and relatively little academic research to draw upon. The content that did exist was rooted in blogs, personal anecdotes, hundreds of N's of 1 (see page 11), and strategies based on an ultramarathon simply being a longer marathon. Everyone had an opinion on how best to train for an ultra, but no one actually knew. No one *knew* the relative intensity one could run at for a 50-mile mountainous race because no one was really looking at it. No one *knew* what your aerobic power should be because no one was looking at it. Few people truly *knew* how to make you a better climber or train you to tolerate thousands of feet of descending because no one was looking at it. Trying to find answers, I searched, scoured, and rifled through the content that did exist. Initially, I was not satisfied. I failed to find unbiased, unobstructed, and unfiltered information on what it took to be a successful ultramarathoner. So I sought to create what I could not find. As I had done before in other sports, I broke down ultramarathon racing into its component parts. I looked at these parts and found ways to make better ultra athletes.

At first, it was an educated guessing game. While the first few athletes I worked with saw success out on the racecourse (always the most important indicator), I did not have proof that I was, in fact, helping them improve. Yes, they raced well and were satisfied with their performances, but I wanted concrete evidence

that their success was the result of applying the correct training principles. With a cyclist or triathlete, improvements are easy to mark. You look at the athlete's power (on the bike) or speed (on the run) profiles week to week and month to month, and the evidence is right there in front of you. The training formula is relatively simple. Apply a training stimulus, track week-to-week training, determine how the training is impacting the athlete in terms of fitness and fatigue, adjust the training appropriately, and the athlete improves. When I spoke with cyclists and triathletes, they intuitively felt they were improving, and I could back up that intuition with training data. After a race, we could look back at their training and say, "Yes, that performance makes sense." With ultrarunners, however, it was different. The early ultrarunners I worked with would tell me that they felt faster, better, and stronger. But often I could not definitively show that they were.

Over the years, I have pored over thousands of heart rate and GPS files to find correlations I could use for ultrarunners. I wanted something I could look at and say, "Yup, you are better because of X, Y, and Z." Unfortunately, there is no discrete data source that ultramarathon runners (specifically trail ultramarathon runners) can rely on to track training, like cyclists (who use power) and triathletes (who use power and speed) can. For ultrarunners, speed is a useless tool unless running on roads (something ultrarunners rarely do with any consistency). Even the same section of trail can change with the seasons and over time. Heart rate varies too much with temperature, time of day, and fatigue. Running power is still an emerging, fledgling technology. The fact is, there are few good ways to mark improvements with an ultrarunner. So how do you know if what you are doing in training is, in fact, working?

The question of how to measure improvement is still difficult to answer, so I developed some tools that bring light to the subject. I've tested ultrarunners to see how their  $\text{VO}_2\text{max}$  and lactate threshold (LT) improve over time. I've analyzed GPS files, normalized graded pace, and graded adjusted pace over multiyear time frames to better understand how ultrarunners respond to training. I have analyzed race performances as the ultimate test of whether the training process is

successful. By breaking down the sport into its component parts and then tracking how athletes improve, I developed an ultramarathon coaching method that consistently delivers improved performance for athletes of all ability levels.

## THE TOP FOUR TRAINING MISTAKES IN ULTRARUNNING

The world of ultrarunning is changing. People are starting to pay far more attention to their training and are realizing that if they do the right things leading up to the event, they will give themselves the best chance at success. Still, there are many misconceptions and errors in current training methodologies for ultrarunners. Time and time again, I see ultrarunners making the same mistakes. They unnecessarily prioritize mileage over focused training. They train too slow. They do not train for the specific demands of a particular event. Correct training methodology not only fixes these problems but will also optimally prepare the athlete for success.

Later in the book I will dive deep into the whys and hows of best training practices. For now, let's take a 10,000-foot view of the top mistakes I see in training.

### MISTAKE 1: THE N OF 1

I have my share of personal ultramarathon experience. I have finished a lot of ultras and competed in some of the toughest races in the world. I've had both great days and very bad ones. I've DNFed when I shouldn't have, and I've finished races when I should have dropped out. I've trained for speed, vertical, endurance, and every other aspect I preach to my athletes. And I've improved tremendously as an ultrarunner. Despite all this, I use very little of my personal experience when coaching an athlete. In research papers, the number of subjects in an experiment is referred to as the  $N$ , and the best studies benefit from a large  $N$ . I acutely realize that I am my own  $N$  of 1. If I ever use an "I" statement in my coaching, I consider it a flaw. A coach should certainly take his or her own experience into account. However, *relying* on that experience, the  $N$  of 1, is the ultimate coaching flaw. Yet it's one I see over and over again. I have seen dozens of athletes fail to improve because they

are relying on an N of 1 to guide them. Ultrarunning coaches routinely regurgitate their personal training for their athletes. And runners who coach themselves tend to insert too much of their own bias into the process. Others ask their peers what they have done, relying on small likelihood that the N of 1 will also work for them.

### **MISTAKE 2: TOO MUCH FOCUS ON VOLUME**

Ultramarathons are long, sometimes taking a day or even two to complete. Athletes often look at the prospect of locomoting for hours on end and feel overwhelmed, thinking, “If I’m going to be out there forever, I better run and hike in training as much as possible.” They make the classic sacrifice of substituting more volume in place of intensity. They train low and slow, and they do it all the time. While this type of training does produce limited benefits for the ultramarathon athlete, it carries significant risk, and the point of diminishing returns is reached quickly. Quite simply, you run more miles but don’t get enough out of them.

### **MISTAKE 3: NOT ENOUGH INTENSITY**

Athletes often think, “I’ll be running slowly during my race, so I don’t need to run fast during training.” This thinking is not entirely flawed. It’s not that you need to run spectacularly fast but rather that you need to focus on a range of different intensities. Developing specific parts of your physiology, through focused intensity during different parts of the year, produces a more fit and ready athlete, regardless of your background and goals. For those of you reading this book who do in fact incorporate some sort of intensity, I applaud you and encourage you to give yourself a pat on the back. However, even when athletes incorporate intensity, I have often found it to be sporadic and unsystematic. They do different intensities during the week (say, a speed session on Tuesday and a tempo run on Thursday) or not enough of the same intensity all at once. Yes, some intensity is better than none, but focused and concentrated intensity, applied systematically over a period of weeks, is the best way to become a complete athlete.

#### **MISTAKE 4: LACK OF SPECIFICITY**

It's easy to generalize that all ultramarathons are long and done at a low intensity. Although this is oftentimes the case, you can train and prepare for specific elements within individual races. How steep are the climbs? How hot is the race? How far apart are the aid stations? What is the terrain like? These are elements of specificity you can train for. For example, consider trail versus road. Athletes understand that if the goal event is on trail, they need to train predominantly on trail. Simple, right? Yet many athletes, even the best, make the mistake of changing their terrain specificity in the weeks leading up to a critical race. There is fantastic track in Chamonix, France, just next to the starting line of the Ultra-Trail du Mont-Blanc (UTMB). It's a picturesque setting, with the stunning Alps framing the background. For some odd reason, when thousands of athletes descend upon Chamonix every August for the 100-mile UTMB and its companion races, many of them feel the need to do mile repeats and 5K time trials around the pristine, smooth track surface. The last time I checked, there's not one speck of track surface on any of the trails around Chamonix.

The concept of specificity extends beyond the surface under your feet. You can, and should, extend that concept to every aspect of the race. The degree to which you can apply specificity to training makes you better prepared for all the elements on race day, including the intensity, duration, environmental conditions, and whatever other troubles and tribulations you might encounter.

#### **BOILING IT DOWN: WHAT YOU NEED TO GET IT RIGHT**

I'm often asked, "What is your training philosophy?" Athletes ask about it. The media ask about it. Our CTS coaches learn it. As you are reading, you are probably wondering about it, too. So just what is it? Though it is difficult to express in a sound bite or elevator pitch, my training philosophy encompasses physiology, psychology, emotional support, communication, personal values, risk-taking, and a host of other aspects. It has taken me over a decade to flesh out a comprehensive

coaching philosophy, and I continue to do so as I evolve as a coach. Several books would be needed to explain it down to the minutiae, which I will spare you. But for the purposes of this book, it can be broadly divided into two components: a philosophy around relationships and a philosophy around how to comprehensively prepare an athlete for success.

### **CARE MORE ABOUT THE PERSON THAN THE PERFORMANCE**

One of the best coaches I know is Adam Pulford. If you are an ultrarunner, chances are you have never heard of him. But if you have been anywhere near a mountain bike race in the United States in the past several years, you surely have. Adam came to CTS not as an endurance athlete but as a collegiate wrestler (with the cauliflower ears to prove it). He was chunky, almost doughy, and had a lot to learn—far more than even I did. In fact, some of our senior coaches wanted to let him go because his knowledge gap seemed just too big. He had to learn *all* the nuances of the different endurance sports. During his internship, he meticulously analyzed the critical components of cycling, triathlon, and running. About the same time, he snagged an entry into the Leadville 100 mountain bike race. It was one of his first personal endurance events, and it was a complete cluster. Before the race, he broke his bike. During the race, he had four flats, almost broke his bike in half, and was a complete train wreck less than halfway through. I worked one of the latter aid stations and noted when Adam came crawling in, dehydrated, bonking, and in a very bad mood. I silently gave him little chance of finishing. Worse than having a rough day on course, he clearly wasn't following any of the advice he would regularly dish out to his athletes. He was a new coach who was not able to talk the talk or walk the walk. He did miraculously finish the race under the 12-hour cutoff, but not without a tremendous amount of suffering and unnecessary duress.

Despite watching Adam implode at the Leadville 100, I had no reservations about hiring him as a coach. The mistakes he made as a novice endurance athlete were correctable. He was clearly smart and resourceful, and we could fix the knowledge gap. Most importantly, though, he already possessed a quality I have found to

be unteachable—a quality that is far more important than suffering through any race or being able to run a lactate threshold test: He cares. He cares for his athletes and about his work with more passion and fervor than anyone I know. Since I hired Adam, he's expanded his knowledge base and is one of the smartest coaches we have. But what still sets him apart, what makes him a truly great coach, is that he cares about the athletes he works with as people first and athletes second. He embodies the often-quoted idea: “Your athletes will not care how much you know until they know how much you care.”

I care about performance deeply, but I care about people first. Conversations start with questions about my athletes' lives, not about their training. I do not coach “clients”; I coach athletes, and they are not machines or a collection of data points. The people I have the privilege of working with are athletes, fathers, mothers, breadwinners, the soccer coach, and my personal friends. They are the people I will travel to far-flung races for and stay up with at all hours of a cold, shivering night simply to hand them a gel and give them a hug when they need it most. It is why I don't deliver static “training plans,” and you will not find one in this book. Coaching goes far beyond a training plan that is packaged, delivered, and then blindly followed. Training plans cannot care. By starting from a perspective of caring for the person first, I can deploy strategies necessary to make that person a better athlete. All athletes should remember that point. Before you are an athlete, you are a person. You play many different roles in life, including your role as an athlete. Training needs to take those roles into account. Training should encompass you as a father, mother, breadwinner, and soccer coach as well as an athlete. Remember that as you work through your own training process, regardless of whether you work with a coach, follow a training program, or coach yourself.

### **FITNESS MATTERS THE MOST**

If you focus on just one thing in your training, it should be it your fitness. For purposes of this book, I define fitness as cardiovascular fitness, or the total amount of oxygen your body can utilize and the economy with which it does so. I always strive

to put the most fit athlete on the starting line of an ultramarathon. This means organizing training in a strategic way to maximize the gains that an athlete can make during the season. I think all athletes would agree that being more fit is better than being less fit on the starting line, yet I can definitively say that most training plans do not meet the objective of producing maximum fitness. Rather, many athletes choose to focus on other aspects in lieu of developing their cardiovascular fitness. They hit the weight room to improve their strength. They pound the downhills to season their quads. They restrict carbohydrate to burn more fat. As I'll discuss in more depth in Chapter 2, these training techniques, though well intended, are actually likely to hinder you from achieving your best cardiovascular fitness—and ultimately your best race-day performance.

You may be dubious. After all, one of the greatest things about ultrarunning is its accessibility, and you don't have to be incredibly fit or talented to participate. Most races have generous cutoffs, aimed at encouraging more participation. Take the Javelina Jundred 100 in Fountain Hills, Arizona, where the cutoff is 30 hours (a common cutoff time for many 100-mile events), or 18 min/mi. The preferred walking speed for humans is 19:21 min/mi (Levine and Norenzayan 1999; Mohler et al. 2007; Browning et al. 2006). Let that sink in for a moment. This means that if you observe people walking by, chances are they are walking at approximately 19 minutes and 21 seconds per mile. If you stop reading this book, put it down, and walk to the fridge (or the coffeepot to stay awake), you are probably walking at around 19 min/mi, merely 5.6 percent slower than the necessary speed to beat the cutoff for the Javelina Jundred. I use this as an illustration of how accessible ultramarathoning is and how most people have the fitness to locomote at the required speed for an ultramarathon finish. They need not improve their fitness to simply run at that speed. Compare that scenario with running a 30-minute 5K, which is an admirable goal for many runners (median finishing times for the 5K are 28:46 for men and 34:53 for women according to a Running USA state-of-the-sport report for 2014). Not all people are able to run a 9:40 mile, the necessary pace to run a 30-minute 5K. To do so, one would need to become more fit so the body

could handle that pace, even for 1 mile. Not so for most ultramarathons. Just about everyone toeing the line for an ultramarathon has the fitness to run 1 mile, or even many miles, at or significantly faster than the cutoff pace. Why, then, focus on becoming more fit if you already have the fitness to complete an ultramarathon? The reason is that there is a difference between merely participating in an ultramarathon and working to assure your success in a race.

Being as fit as possible gives you the best chance for success. Fitness gives you options and allows you to fix problems you encounter on the trail. Fitness enables you to comprehensively address many of the stresses you are likely to encounter during an ultramarathon. When you are more fit, you spend less time on your feet, finish faster, and reduce the risk of injury. You spend less time between aid stations, are exposed to the elements for a shorter duration, and have the capacity to run faster at certain points to avoid inclement weather. If you are fit, you can afford to spend extra time at an aid station, and you have a buffer against getting lost and losing time; heck, maybe you can even have a little more fun out there. Your cardiovascular fitness is the key to unlocking your best ultramarathon running, and thus it is a central focus of this book.

In order to keep focus on your fitness, it is important that training be oriented toward the fundamentals. Athletes and coaches are quick to add extraneous stuff to training programs. They want to try the latest equipment, experiment with the newest diet, or start sleeping in an altitude tent before actually focusing on nailing down the basics of training. But it's a fool's errand to chase marginal gains on the fringes while neglecting the fundamental and known principles for improving endurance performance. Don't misunderstand me: I am a proponent of innovation in training, gear, and nutrition. I use advanced protocols for altitude training and heat acclimatization. But innovations should enhance sound training, not attempt to circumvent it.

To arrive at the starting line completely prepared for an event, you must maintain a tight focus on eight fundamental areas. When I coach an athlete, all decisions about training, nutrition, racing, and equipment are filtered through this list of eight. Simply put, if an activity doesn't address and enhance your performance in

at least one of these fundamental areas, it isn't going to make you a faster, stronger, or better runner.

1. **Develop the cardiovascular engine.** The more oxygen you can take in, deliver, and process in working muscles, the better. The workouts necessary for this are not complicated or particularly sexy. Some could even be called boring, yet I don't apologize for that. Gimmicks sell but fade out; sound training principles will never let you down.
2. **Improve lactate threshold climbing speed.** You spend a lot more time going uphill than downhill, and that's where you can most dramatically improve your pace and your race-day performance. Lactate threshold is also one of the most trainable aspects of performance, which means that LT work yields the greatest improvements for the amount of effort you put toward it in training.
3. **Concentrate your workload.** Training stimulus has to be sufficient to cause an adaptation, and as athletes get more fit, a bigger and more concentrated stimulus is needed. In practical terms, this means creating training blocks and maintaining focus on one area of training long enough to squeeze as much adaptation from it as possible.
4. **Train the gut.** The best cardiovascular engine in the world won't help you if you overheat, fall short on calories, run out of fluids, or suffer from gastric distress. How, what, when, and how much you eat and drink can all be trained so you can supply your body with the fuel and fluid it needs.
5. **Do the most specific things last.** Each event has its unique nuances, and preparing for them is important. The most effective way to do that is to start with the broadest aspects of training (aerobic endurance, time on your feet, etc.) and gradually work your way to the most specific aspects, such as event-specific intensity, environmental adaptations, and terrain and grade specificity, closer to your event.
6. **Race with a purpose.** Ultramarathons are too hard, long, and difficult to race on a whim. When the going gets tough—and it will—it is purpose that will help drive you forward. Why are you doing this? It does not have to be a

world-changing purpose. In my experience, athletes with deeply personal reasons for racing are able to better leverage their purpose than those with grander but perhaps less personal reasons.

7. **Rest with purpose and intensity.** It is all too easy to run yourself into the ground. Have confidence that past a certain point, the amount of running you can do does not correlate with an increased chance of finishing an ultramarathon or improving your finishing time. Training is a balance of stress and recovery. Recovery is a part of training, not the absence of it.
8. **Comprehensively prepare for all the stresses you will face on race day.** To paraphrase Scottish poet Robert Burns, “The best-laid plans of mice and men often go awry, and leave us with nothing but grief and pain.” Some race-day stresses are easily visualized and anticipated, like the chill of the night or the distance between aid stations. Others will present themselves at inopportune times and in the worst places imaginable. Such is the nature of the sport. Everyone faces tough moments in ultramarathons, and you have to be prepared to deal with those you can predict and be ready to think your way through the ones you didn’t see coming.

The methods I have developed are for anyone wishing to complete or improve at the ultramarathon distance. There is a lot of information to cover in the coming pages about training, the science of ultrarunning, and proper periodization. My ultimate goal, however, is to inspire athletes. By giving you the tools to correctly apply sound methodology to your ultramarathon preparation, I hope to inspire you to take on bigger, badder, more audacious goals.

### **WHY THE 0.5 PERCENT MATTERS TO THE 99.5 PERCENT**

The “schedule review” is a frequently used coaching education exercise at CTS. The approach is simple: Throw your athlete’s training plan up on a computer monitor, provide a brief background on the athlete, and listen to what the other coaches in the room tell you is right and wrong about the plan. We banter, philosophize, criticize, delve into physiology, and generally (but not always) engage

in a civil discussion. I have participated in hundreds of these schedule reviews over the years, but I vividly remember one in particular. One of our younger coaches had just started working with a national-caliber athlete. He loaded up that athlete's training plan on the big screen and gave an overview of the training phase. The training plan had the normal small flaws you'd expect from a young coach. Usually, we simply discuss these flaws and how to correct them. However, I could tell early on that this was likely to be a more heated discussion, one in which people's feelings could get hurt and a few four-letter words might come out (there's a big difference between "I don't understand what you are doing" and "I don't understand what the hell you are doing"). The crux of the actual problem was small, revolving around the proper length of interval to use for a particular adaptation. To put it in perspective, the amount of workload we were at odds over amounted to 12 minutes in one particular workout in one particular phase of training. The athlete was training nearly 40 hours, or 2,400 minutes, during that phase, yet here we were arguing over 12 of those 2,400 minutes, or just 0.5 percent of the total training for the month. We spent a heated two hours arguing about whether those 12 minutes were right or wrong. The young coach dug in his heels. Our more seasoned coaches ripped him apart. Finally, the young coach asked in desperation, "It's 12 minutes; why does it matter?" Arguing over a mere 0.5 percent of the total training load seemed ludicrous. After a painful pause from the group, the simple retort was, "When you are working with elite athletes, you better get it right."

For elite athletes, 0.5 percent matters. The United States Olympic Committee's physiologists have calculated the difference between a gold medal and *no medal* to be about 0.5 percent (Pyne, Trewin, and Hopkins 2004; Hopkins 2005; Saporito 2012). This means that, in any Olympic-level competition, the athlete at the top of the podium listening to her national anthem is only 0.5 percent better than the athlete who finished in fourth place and is sitting in the stands. This fact is not lost on seasoned coaches who work with Olympic-caliber athletes, which is why they're willing to spend two hours making that point to a more junior coach.

So what does this 0.5 percent matter to the average runner? Do elites have something to teach us, or are they part of a unique club to which only the gifted need apply? The truth is, you can do a lot wrong while coaching novice or amateur athletes, and they'll still improve. Usually there's so much space between their current level and their ultimate potential that even a poorly designed plan will nudge them in the right direction. Some coaches rely on that ambiguity. They don't know how what they're prescribing will actually improve performance, or to what extent, but then again neither do the athletes.

The reason coaching elite athletes matters is that it teaches us what actually works and what doesn't. Elite athletes are closest to the limits of human performance. They have already optimized and wrung all the improvements out of many aspects of training, nutrition, recovery, and race-day strategy. While they are reaching for that last 0.5 percent, they do so from a foundation made strong by proven training methods that worked not once but consistently over a period of years. That's the piece that is most relevant to amateurs, and it is the reason my work with elite athletes improves the training methods I utilize with athletes of all ability levels.

## A CAST OF CHARACTERS

Much of this book is based on my practical coaching experience with ultramarathon runners. It is a smorgasbord of science, philosophy, practical application, and coaching intuition. It is a representation of what I do day-to-day as a coach and what my athletes do to succeed. The athletes I work with live and breathe the coaching practices detailed in this book. It seems fitting, then, that they offer their own perspectives on the process. In that spirit, throughout this book they have provided their own anecdotes of their training experiences. These accounts were carefully chosen so they can be applied to a variety of runners, from the front of the pack to the back and everyone in between. You may recognize some of these athletes; others you may not. Either way, I hope you find the input from this cast of characters inspirational and informative.

**DAKOTA JONES (aka “Young Money.”)** I hope I have the opportunity to work with Dakota until he’s “old, used, and out of circulation” money. That’s how much I enjoy seeing him succeed. Fortunately, he’s got a long, long time to reach that point. A runner in high school, Dakota found ultrarunning through his love of the mountains and the tight-knit ultrarunning community in Durango, Colorado.

Dakota began working with me when he was an aspiring elite ultrarunner, having won several races and looking to further improve his abilities. Since then, Dakota has taken his happy-go-lucky approach all over the globe, racing and running in some of the most high-profile ultra events. Make no mistake: When the gun goes off, he is a fierce competitor. He cares about the preparation and training he does in advance of an event. If you ever get the chance to meet him, ask him for some of his world-famous baked goods. The walnut chocolate chip cookies are my favorite.

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#### **RUNNING HIGHLIGHTS**

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##### **2015**

Transvulcania 83K—4th place, 7:28

##### **2014**

North Face Endurance Challenge, San Francisco 50-mile championships—2nd place, 6:12 | Moab Trail Marathon—1st place, 3:02

##### **2013**

San Juan Solstice 50 Mile—1st place and course record holder, 7:35 | Ultra Race of Champions 100K—2nd place, 9:32

##### **2012**

Lake Sonoma 50—1st place, 6:17 | Transvulcania 83K—1st place, 6:59 | Hardrock 100 Endurance Run—3rd place, 25:45

##### **2011**

Grand Canyon Rim-to-Rim-to-Rim—6:53 | North Face Endurance Challenge, San Francisco 50-mile championships—2nd place, 6:21 | Hardrock 100 Endurance Run—2nd place, 27:10 | Pocatello 50—1st place, 8:17 | Moab Red Hot 55K—1st place, 4:02

##### **2010**

North Face Endurance Challenge, San Francisco 50-mile championships—4th place, 7:01:55 | White River 50 Mile Endurance Run—2nd place, 6:49:20 | San Juan Solstice 50 Mile—8:13:00 | Desert R.A.T.S. 50 mile—1st place, 7:15:17

**DYLAN BOWMAN (aka “DBO.”)** The master of stoke and a true bro’s bro. Life is good for Dylan as long as he has a buttery singletrack trail to run and a burrito to devour afterward. Originally from Boulder, Colorado, Dylan had an unconventional path to ultrarunning from a college lacrosse career at Colorado State University. Although lacrosse is not a traditional endurance sport, his role as team “hustler” paid dividends for him as an elite ultrarunner. He works hard, communicates well, is disciplined and tough, and is a first-class person through and through. His nickname, “DBO,” comes from his passion for the Denver Broncos and their former quarterback Tim Tebow.

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### **RUNNING HIGHLIGHTS**

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#### **2015**

Tarawera Ultramarathon 100K—1st place, 7:44:58 | North Face 100K, Australia—1st place, 8:50:13 | North Face Endurance Challenge, San Francisco 50-mile championships—2nd place, 6:20:28

#### **2014**

Sean O’Brien 50 Mile—1st place, 6:23:17 | North Face Endurance Challenge, New York 50 Mile—1st place, 6:51:52 | Western States 100—3rd place, 15:36:41 | North Face Endurance Challenge, San Francisco 50-mile championships—5th place, 6:23:48

#### **2013**

Ray Miller 50 Mile—1st place, 6:47:36 | Miwok 100K—1st place, 4:49:56 | Western States 100—5th place, 16:32:18 | North Face Endurance Challenge, San Francisco 50-mile championships—5th place, 6:37:48

#### **2012**

Bandera 100K—4th place, 8:40:07 | Leona Divide 50 Mile—1st place, 6:00:38 | Western States 100—7th place, 16:03:24 | Speedgoat 50K—8th place, 5:47:39 | Run Rabbit Run 100 Mile—2nd place, 19:56:45 | North Face Endurance Challenge, San Francisco 50-mile championships—7th place, 6:02:48

#### **2011**

Moab Red Hot 55K—4th place, 4:15 | Antelope Island Buffalo Run 50 Mile—1st place, 6:15 | Collegiate Peaks 50 Mile—2nd place, 6:57:54 | San Diego 100—1st place, 18:00:15 | Leadville Trail 100—2nd place, 17:18:59

#### **2010**

Desert R.A.T.S. 50 mile—7th place, 8:20:54 | Quicksilver 50K—4th place, 4:04:01 | Ultimate Direction Dirty Thirty 50K—2nd place, 4:55:20 | Silver Rush 50—2nd place, 6:52:45 | Leadville Trail 100—3rd place, 18:36:16 | Run Rabbit Run 50 Mile—4th place, 7:50:00

#### **2009**

Run Rabbit Run 50 Mile—6th place, 8:51:00 | Silver Rush 50—7th place, 7:45:56

**KACI LICKTEIG (aka “the Pixie Ninja.”)** If niceness, humbleness, and tenacity could be bottled, I’d label it “Pixie Ninja Potion.” Kaci found ultrarunning after running for the University of Nebraska at Kearney. This collegiate running background has given her the physical fundamentals to excel at ultradistance events. Kaci is also what I affectionately refer to as “vertically deprived.” Her training ground in Omaha, Nebraska, is about as flat as it gets, yet she has tackled many of the toughest mountain ultras, including the Western States 100-Mile Endurance Run. The terrain she has available and how she successfully works around that limiter is a lesson for many ultrarunners. Aside from being an elite ultrarunner, Kaci is an even better human being. She is also a physical therapist, which helps her better understand the training demands that I put her through.

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#### **RUNNING HIGHLIGHTS**

##### **2015**

Lake Sonoma 50—5th place, 8:04:14 | Silver State 50—2nd place, 8:01:48 | Western States 100—2nd place, 19:20:31 | Ultra Race of Champions 100K—3rd place, 10:56:22

##### **2014**

Rocky Raccoon 100 Mile—2nd place, 15:45:32 | Lake Sonoma 50—3rd place, 7:37:42 | Ice Age Trail 50—1st place, 6:41:39 | Western States 100—6th place, 20:07:10 | Psycho Psummer Run Toto Run 50K—1st place and course record, 4:14:51 | The Bear Chase 100K—1st place, 8:40:45 | Market to Market 50K—1st place and course record, 3:27:33 | Javelina Jundred 100 Mile—1st place, 15:40

##### **2013**

Kettle Moraine 100K—1st place, 9:47:12 | Black Hills 100—1st place and course record, 19:12:01 | Psycho Psummer Run Toto Run 50K—1st overall, 4:19:35 | Lean Horse 50K—1st place and course record, 3:43:50 | Hawk Hundred 50 mile—1st overall and course record, 7:25:38 | The Bear Chase 50 mile—1st overall, 6:54:15 | Market to Market 50K—1st overall, 3:38:02 | G.O.A.T.z 50K—1st place and course record, 3:54:17

**MISSY GOSNEY.** A badass momma, Missy is a tough-as-nails mountain woman living in Durango, Colorado. Throughout my coaching relationship with Missy, I know I can count on one thing—she will set outrageous, audacious goals. Whether it is the Hardrock 100, the 200-mile Tor des Géants, or the Nolan’s 14 line, I’m never

lacking for a new problem to help her solve. Before working with me, Missy had two decades of Outward Bound wilderness experience, which translates perfectly to rugged mountain courses and is an illustration of her spirit of adventure. She's a helluva mom, a helluva competitor, and a helluva inspiring person to work with.

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## **RUNNING HIGHLIGHTS**

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### **2015**

Zane Grey 50 Mile—2nd place, 11:18:36 | Hardrock 100 Endurance Run—4th place, 33:22:21 | Part of a duo who were the first women to complete the Nolan's 14 line in under 60 hours

### **2014**

Cedro Peak 45 miles—3rd place, 9:04:43 | Bighorn Trail 100—1st place, 24:30:40 | North Face Endurance Challenge, San Francisco 50-mile championships—26th place, 9:41:09

### **2013**

San Juan Solstice 50 Mile—4th place, 11:01:09 | Jemez Mountain 50 mile—5th place, 10:57:22 | Tor des Géants 330K—122nd place, 5 days, 3 hours, 16 minutes, and fun the whole way

### **2012**

Zane Grey 50 Mile—6th place, 11:37:36 | Jemez Mountain 50K—2nd place, 6:14:54 | Bighorn 100—2nd place, 24:46:51 | Speedgoat 50K—10th place, 7:51:17 | Cascade Crest 100—1st place, 23:48:30 | Durango Double 50K—3rd place, 6:21:00

### **2011**

Moab Red Hot 55K—12th place, 6:06:59 | Zane Grey 50 Mile—6th place, 13:13:48 | Jemez Mountain 50 mile—12:18:49 | San Juan Solstice 50 Mile—2nd place, 11:32:49 | Speedgoat 50K—3rd place, 7:20:03

### **2010**

Jemez Mountain 50K—4th place, 7:06:37 | San Juan Solstice 50 Mile—10th place, 12:44:15

**ERIK GLOVER.** I first began working with Erik when he was a triathlete. At a certain point, the Ironman® distance was just too easy, so he decided to take a crack at an ultra. Eventually he got the bug for 100-milers and completed his first in no-drama fashion at the 2015 Lean Horse 100. Erik is usually the smartest person in the room, with a degree from the Massachusetts Institute of Technology. Despite his intelligence, he's still an ultrarunner. Erik is as entertaining as they come, always the life of the party. Yet at his core, he is a down-to-earth father and always puts his

family first. Originally from Anchorage, Alaska, Erik now lives and trains in New York City, so I can always count on a good story from him about dodging roller-bladers in Central Park.

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### **RUNNING HIGHLIGHTS**

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#### **2015**

American River 50 Mile—25th place, 7:55 | Vermont 100K—6th place, 11:16 | Lean Horse 100 Mile—5th place, 21:17

#### **2014**

American River 50 Mile—174th place, 9:40 | North Face Endurance Challenge, New York 50 Mile—77th place, 10:56

#### **2013**

American River 50 Mile—145th place, 9:09 | North Face Endurance Challenge, Washington, D.C. 50 Mile—18th place, 5:16

#### **2012**

American River 50 Mile—116th place, 8:45

## **COME JOIN THE REVOLUTION**

Ultrarunning is ready for a revolution. The old methods of training have reached their natural limitations; athletes can no longer simply run more and treat ultramarathons as longer marathons in order to perform better. A performance revolution happens in every sport, and the time has come for it to happen in ultrarunning.

As Leadville Trail 100 founder Ken Chlouber is famous for saying, each one of us has an “inexhaustible well of grit, guts and determination.” If you do an ultramarathon, it is guaranteed that you will have to dig into that well at some point. When that point comes, it is important to be tough. But well-trained ultrarunners are more than tough. They are also fit, confident, and prepared for success. I want you to be all of these things, and I have the plan to get you there. So let’s get going!

## ABOUT THE AUTHORS



PHOTO BY JIM RUTBERG

**Jason Koop** walks the walk—or runs the run, as the case may be—when it comes to ultras. His journey from a cross-country runner at Texas A&M to ultra coach started with a postgraduation internship at CTS in the summer of 2001. A runner in a company of predominantly cycling coaches, Koop was quickly drafted and trained to be the company’s lead running coach. In 2006 he traveled around the United States coaching and supporting Dean Karnazes as the “Ultramarathon Man” ran 50 marathons in 50 states in 50 days. Karnazes again tapped Koop’s expertise in 2011 for “Regis and Kelly’s Run Across America with Dean Karnazes,” a nearly 3,000-mile cross-country run.

As the director of coaching for CTS, Koop coaches runners, cyclists, and triathletes in his role as a CTS premier coach. He also oversees the recruitment, education, and ongoing evaluation of more than 30 full-time endurance coaches and has developed CTS’s quality assurance system for coaching as well as the CTS Coaching College. His personal ultrarunning resume includes two top-10 finishes at the Leadville Trail 100 Run and finishes at some of ultrarunning’s most formidable events, including the Western States Endurance Run, the Badwater 135, the Wasatch 100, and the Hardrock 100.

**Jim Rutberg** is the media director and a coach for CTS and is coauthor, with Chris Carmichael, of *The Time-Crunched Cyclist*, *The Time-Crunched Triathlete*, *The Ultimate Ride*, *Chris Carmichael’s Food for Fitness*, *Chris Carmichael’s Fitness*

*Cookbook, The Carmichael Training Systems Cyclist's Training Diary, 5 Essentials for a Winning Life*, and innumerable web and magazine articles. His work has appeared in *Bicycling, Outside, Men's Health, Men's Journal, VeloNews, Inside Triathlon*, and more. A graduate of Wake Forest University and former elite cyclist, Rutberg lives in Colorado Springs with his wife, Leslie, and their two sons, Oliver and Elliot.

## A TRAINING REVOLUTION IS COMING TO *ULTRARUNNING*.

Ultramarathons are not just longer marathons, and you can't train for them by simply doing more running. Ultrarunning presents unique training and nutrition challenges and requires a totally new approach to preparation.

*Training Essentials for Ultrarunning* is your best guide to preparing for ultramarathon. Unlike so many "it worked for me" training books, Coach Jason Koop's race-proven program is based on sound sports science, the most up-to-date research, and years of experience coaching the sport's star runners to podium performances.

### WHAT YOU'LL GAIN

- The science behind maximizing ultramarathon performance
- How to plan your season for better racing
- The ADAPT method for solving a race-day crisis
- Common failure points and how to fix them
- Interval training to focus workload, make bigger improvements, reduce injury risk, and race faster
- Simple, effective fueling and hydration strategies
- How to reach your goal, whether it's to finish or to win!

Featuring stories and advice from ultrarunning stars, plus an **invaluable guide to 10 of North America's most iconic ultras**, *Training Essentials for Ultrarunning* is a must-read for first timers and ultra veterans alike.

"Everyone has an inexhaustible well of grit, guts, and determination, but great training helps, too. If you want to come to Leadville and succeed, *Training Essentials for Ultrarunning* is a book you need to read."

—KEN CHLOUBER, founder of the Leadville Trail 100 Run

"Jason has helped me to be the best athlete I can be, which has involved mental and emotional training as much as physical."

—DAKOTA JONES, professional ultrarunner

"Coach Koop is quietly one of the most influential people in the sport of ultrarunning."

—DYLAN BOWMAN, 3-time top-10 finisher at Western States 100

"Jason Koop communicates complex science in a way that everyone can understand. If you're looking for a technical guide to ultras, look no further than *Training Essentials for Ultrarunning*."

—BRYON POWELL, founder of iRunFar.com, author of *Relentless Forward Progress*

**JASON KOOP** is director of coaching for CTS. He is ultrarunning's preeminent coach for elite athletes such as Dakota Jones, Alex Varner, Tim Olson, Jen Benna, Mike Foote, Dylan Bowman, and Kaci Lickteig.

