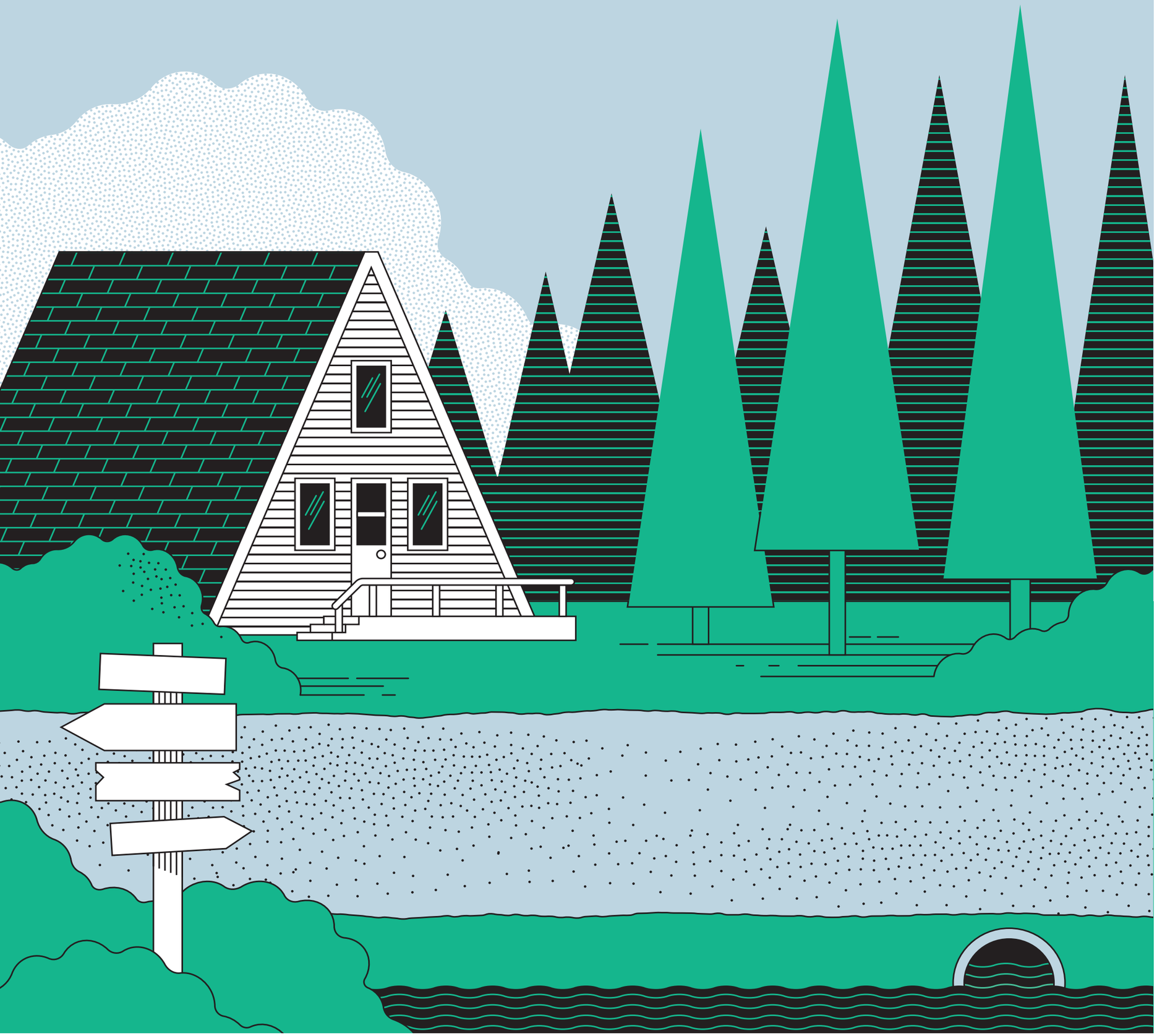


have *road*, will *gravel*

Sooner or later, your cottage road will have one of these 8 problems. Do some work now to keep it in shape and smooth out your ride

by MARTIN ZIBAUER
illustrations AXEL PFAENDER

When was it, that last *road trip you took* with Kate, Cindy, and Fred?

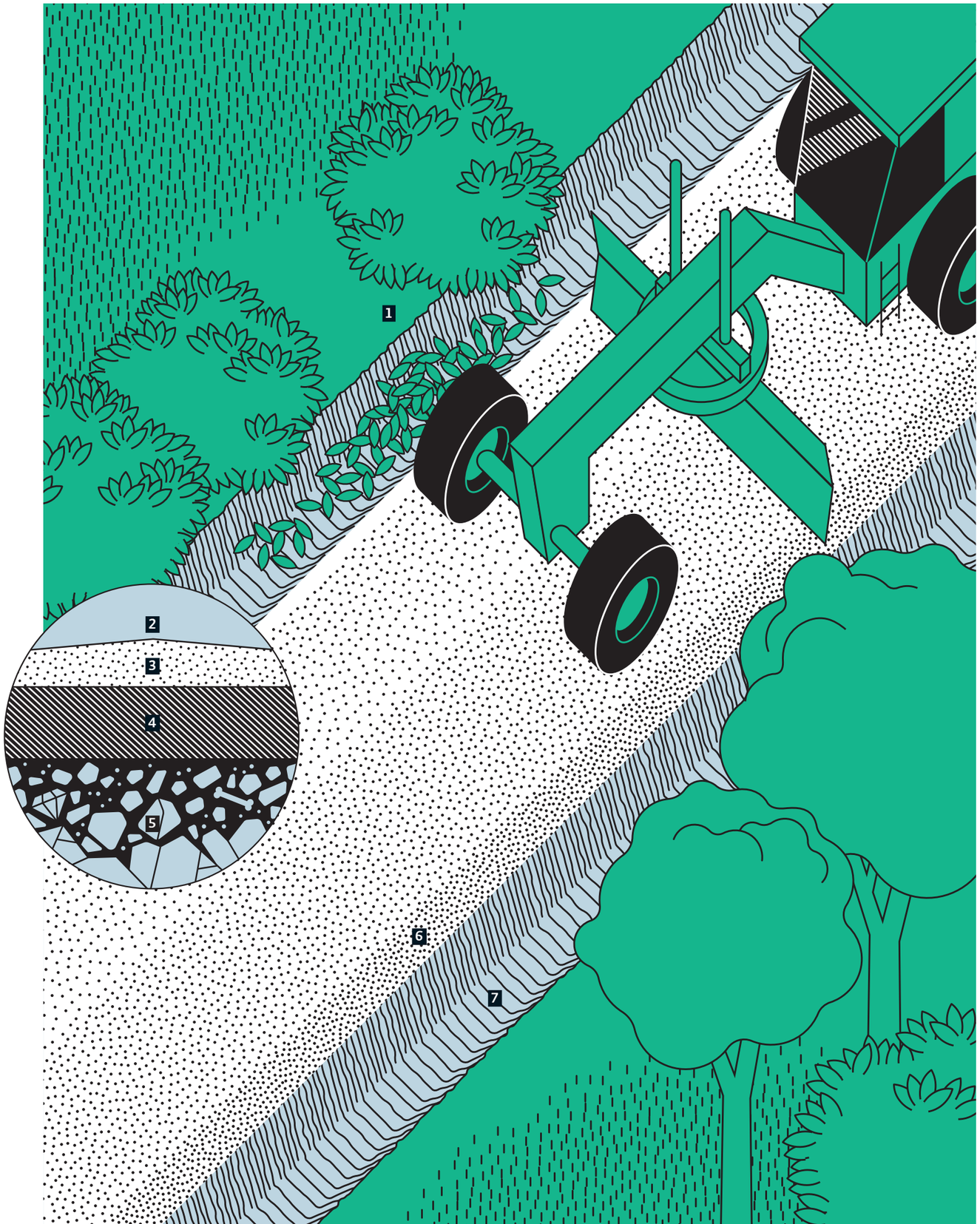
Heading down the Atlanta highway, maybe. The four of you are back in the car, sunroof open and tunes blaring. You're feeling nervous about revisiting the funky old shack—can it live up to all the crazy memories? After all, it's just a little place with a rusted tin roof, set way back in the middle of a field. As you turn off the asphalt onto gravel, you see a faded sign at the side of the road. Enough alligatored paint remains that it's still partly legible: 15 Miles to the—

Lost in thought, you don't feel how smoothly the big-as-a-whale Chrysler minivan rides over what had been a semi-permanent gully across the gravel road. You notice that the soft stretch, with ruts that used to steer for you, is now dry and smooth, and there are ditches where there used to be a mud bank. The brush is trimmed, especially at that dangerous blind curve. The van bounces in spots because of washboarding, and Cindy tells you to slow down, but the obstacle course of potholes is gone.

It throws you off a bit, because the stressful, uncomfortable drive down the cottage road used to bookend every weekend here. What happened?

The same thing that happened, in reality, to the 17 km gravel road maintained by an association of about 150 cottagers on Malachi Lake in Northwestern Ontario. "Over many, many, *many* years, we've upgraded our boggy old one-season logging road into a year-round serviceable road," says Al Campbell, the association's road manager and collaborator with Howie Adams, whose company, Devlin Timber, maintains the road. "In the beginning of May," says Campbell, "we cruise down the road together, and I tell Howie what our budget is for the year."

"And I tell him what should be done first," says Adams. The commitment to slow, steady improvements on this road—which sees about 200 cars on summer long weekends—has paid off. "When I was a kid, it was a muddy old track. Even 20 years ago, it was more like an ATV trail," says Adams. "Now it's almost a highway."



anatomy of a road

1 Overgrown brush can block sightlines. Keep it trimmed.
2 The crown, in the centre of the road, typically has a two per cent slope to the outer edge.
3 The top layer is made up of gravel (crushed rock) and fines.
4 A denser subgrade layer provides support and structure.
5 The original ground.
6 The shoulder slopes away from the driving surface.
7 A well-shaped road will drain into the ditches. ››

A grader good

Problem *Your road needs regular maintenance*
What will fix it *A grader*
Who to call *The pros (unless you buy your own grader)*

To keep the gravel where it belongs, Adams sends a grader out five or six times a year. The workhorse of road maintenance construction vehicles, graders have a curved, snowplow-like blade that mixes and distributes granular material. The grader brings gravel back from the shoulders, where it causes problems, to the road surface, where it protects the subgrade from wear and gives your tires something to grip. Although everyone calls it "gravel," most of it is not. True gravel is rounded, and this layer is primarily crushed rock, which has sharp corners that lock together. On most roads, the blend is A-Base (which costs, in Northwestern Ontario, for example, about $28 per tonne), a mix of ¾" crushed rock and "fines." Fines—the silt and clay particles that make up seven to 12 per cent by weight of a good road surface—bind crushed rock into a durable, driver-friendly crust.

By adjusting the attack angle and pitch of the grader blade, the operator can remix crushed rock with fines, especially when the road is moist. More aggressive grading can scour and repair washboards and potholes. After flooding or a washout, crews often use graders to save gravel by pushing it temporarily to one side while the backhoes and front-end loaders do their work.

How much does a grader cost? "How long is string?" says J.J. Lyons, the national equipment manager at Strongco, which sells, rents, and services equipment across the country. A new grader will cost more than $500,000, he says, while decent used ones run from $80,000 to $285,000. There are compact graders—"easier to operate, less intimidating"—which are meant for use on a private road or an unpaved parking lot.

"Twenty-some years ago, we purchased a used grader for about $20,000 from a company that was mothballing it. It certainly wasn't new, but it was an incredible deal," says Brian Jones, the unofficial spokescottager for the Kenogamissi Hydro Road Committee, which maintains part of a century-old road into Kenogamissi Lake, near Timmins, Ont. A few cottagers can operate the grader, saving the group 20 years' worth of contractor costs. But like any aging vehicle, the grader costs more to repair and run each year, so the group is weighing options. ››

A quote from a road maintenance company came in at $1,200 for a grader run in winter and $1,600 in summer (for the 40 km end-to-end trip down the road). The association voted to keep the grader going for at least another year.

Respect the crown

Problem *Water ponds on the road*
What will fix it *A grader, again*
Who to call *The pros*

"First thing with new students, I take them out to look at crowns and supers," says Kat Kachur, a retired road builder who trains heavy-equipment operators at Portage College's Boyle campus in northern Alberta. The crown is created by the slight slope down from the centre line to the shoulders; a "superelevation" is the gentle angle in the curve of a slow cottage road, where the outer edge of the road rises up slightly and the crown gently flattens. When a grader rolls down your cottage road, it's also restoring the crown. Too little crown allows water to pond in low spots, leading to potholes, ruts, and a soft subgrade. Too much (more than about two per cent slope) is unsafe, especially in wet or icy conditions, when a vehicle can easily veer into the ditch, says Kachur. With an exaggerated crown, gravel is quickly thrown into the ditch—exposing the subgrade to erosion and rounding the road's shoulders. Drivers on such a road will naturally straddle the centre line, risking head-on collisions and concentrating wear in two narrow, rut-prone tire tracks.

The gravel is like icing on a cake, a thin, soft topping that's easily reshaped and smoothed. Water that ponds on the road surface for too long seeps into and damages the denser, more durable "subgrade" below—the layer that provides support and structure. This layer should be compacted subsoil, says Kachur, not topsoil. Subsoil is the inorganic soil—

Road-friendly habits you should adopt

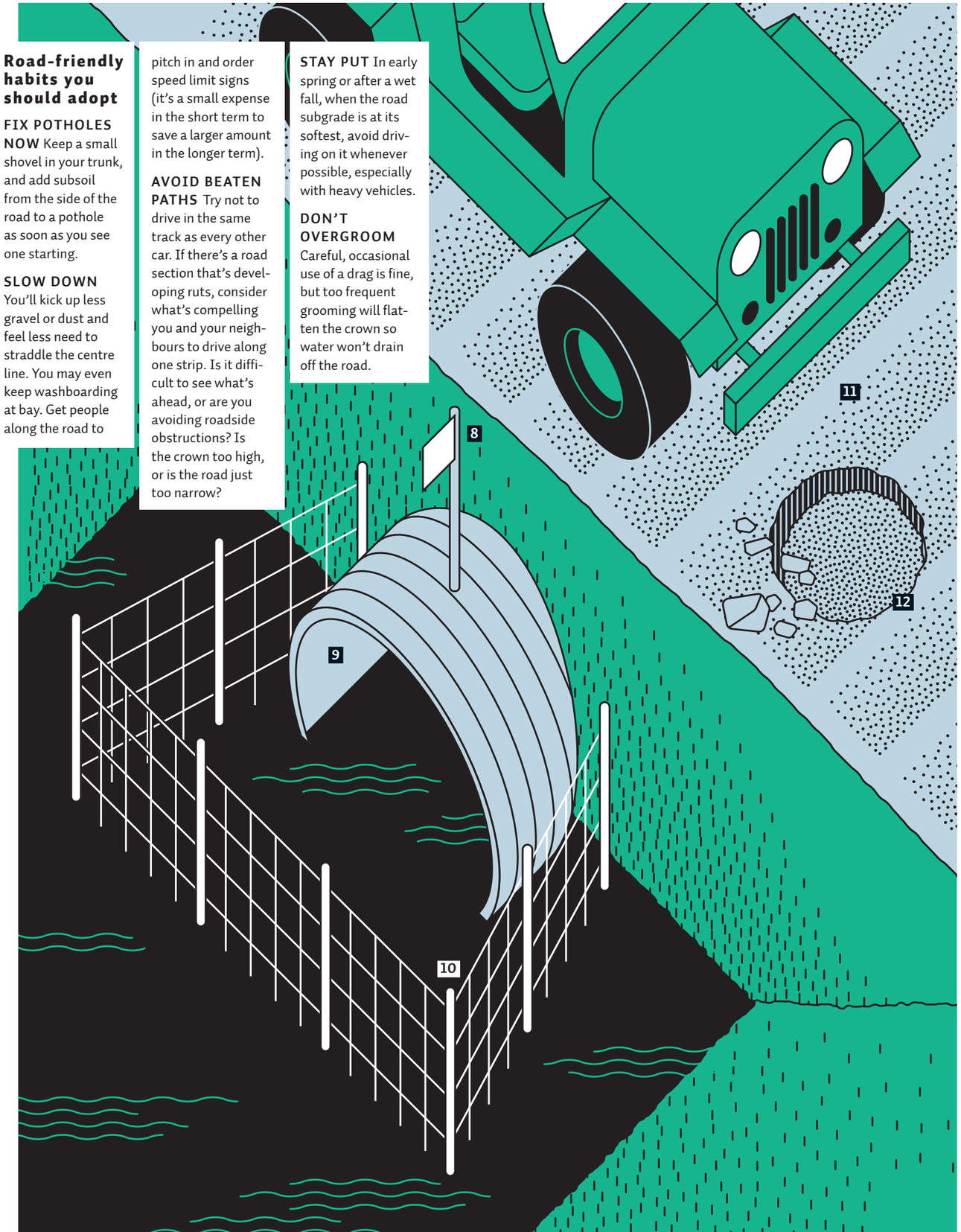
FIX POTHOLES NOW Keep a small shovel in your trunk, and add subsoil from the side of the road to a pothole as soon as you see one starting.

SLOW DOWN You'll kick up less gravel or dust and feel less need to straddle the centre line. You may even keep washboarding at bay. Get people along the road to pitch in and order speed limit signs (it's a small expense in the short term to save a larger amount in the longer term).

AVOID BEATEN PATHS Try not to drive in the same track as every other car. If there's a road section that's developing ruts, consider what's compelling you and your neighbours to drive along one strip. Is it difficult to see what's ahead, or are you avoiding roadside obstructions? Is the crown too high, or is the road just too narrow?

STAY PUT In early spring or after a wet fall, when the road subgrade is at its softest, avoid driving on it whenever possible, especially with heavy vehicles.

DON'T OVERGROOM Careful, occasional use of a drag is fine, but too frequent grooming will flatten the crown so water won't drain off the road.



8 A vertical flag will mark a culvert that is hidden under water.
9 The culvert allows water to flow under the road itself.
10 A wire fence "beaver deceiver" confuses and frustrates the dam builders.
11 Washboarding, a.k.a. corrugation, happens when vehicles travel faster than 5 km/h.
12 Potholes occur when the road isn't draining properly.

essentially eroded rock—that's lighter in colour and more structurally stable. At its "optimum moisture level," subsoil can be compacted tightly to resist water, directing it off the road and into the ditch. Topsoil, though, contains too much organic material to bind and softens dramatically when wet. "Then it's like driving on a waterbed," she says.

Edge of glory

Problem *The shoulders aren't letting water into the ditch*
What will fix it *A groomer and, eventually, a grader*
Who to call *The cottager with a pickup*

Traffic inevitably throws gravel to the roadside, where it often collects in a windrow-like ridge. When it rains, the ridge becomes a curb, and water can't drain. On level ground, the water seeps down and softens the subgrade; on a hill, water can scour out a "secondary ditch," a crooked channel, inside the shoulder, that can catch your tires.

Once the shoulders have grown too high, the best fix is calling in the grader. Before that becomes necessary, some cottagers tow various devices—road drags, drag bars, groomers, or box blades—behind vehicles to help sweep gravel back in from the edges. Light-duty driveway groomers are available for about $600 and can be used on roads, but an even simpler tool is a drag bar. Sometimes called the poor man's grader, a drag bar can be a heavy steel beam with each end chained to the tow hitch of the vehicle. If you use one, adjust the chain lengths so the bar is angled, just as a grader blade is angled at 30 to 45 degrees, to help pull gravel in and avoid spilling it off the drag's outside edge. Drive very slowly, working in multiple passes from the edge of the shoulders in to the centre.

These devices, though, only pull loose gravel from the top of the road surface; they don't remix gravel and fines as a grader does. They're imprecise, tending to reduce the crown instead of reshaping it, and they often spill gravel back onto the shoulders. Many road builders recommend against them. "Well, I might try one to save a buck," says Kat Kachur. She's joking.

The tragedy of the washboards

Problem *Road corrugations make your teeth chatter*
What will fix it *You guessed it, a grader*
Who to call *The pros*

Corrugations, or washboards, on gravel roads are not caused by water, car suspensions, two-wheel drives, or the diameter of tires, says Stephen Morris, a University of Toronto professor who researches pattern formation in nonlinear physics.

Blame the first vehicle on a newly graded road, bouncing imperceptibly on infinite tiny flaws and creating a wave-like impression in the surface. "The car subtly puts a kind of signal into the road," says Morris. The next car drives at roughly the same speed and bounces a little more along the signal. Each subsequent car slightly amplifies the wave.

We could prevent and even smooth washboards by driving at about 5 km/h. Good luck with that, {*Continued on page 95*}

{*Continued from page 83*}

says Morris, the roads scholar. We all zip along, even if we're damaging the road for the next car. "It's a tragedy-of-the-commons situation. Most people drive at a similar speed, a threshold of pain at which they're willing to endure the bumpiness of the road," he says. That shared speed, the one that gets the average driver to the cottage without quite feeling unsafe or uncomfortable, sets the wavelength of the corrugations.

A grader can smooth washboards, but the blade itself has a wee bounce, so it can cause them too. Some careful operators slowly grade each side of the road in two passes and in opposite directions, so any corrugations the blade causes cancel each other out. Smooth.

Later, crater

Problem *Potholes*
What will fix it *A shovel and a tamper*
Who to call *A tool rental company*

While cottagers can't realistically prevent washboards, they can fix potholes. A pothole starts when water collects in a little dip. The surface softens, a passing tire splashes out water muddied by fines and maybe a little gravel. More water collects in the slightly deeper dip. Each time a tire runs over it, the hole gets bigger, and soon the subgrade begins to erode. Filling the hole with loose gravel is a short-term fix to avoid bent tire rims, but there's still a bowl-shaped depression underneath that will continue to grow.

After setting aside any loose gravel, repack the subgrade with clean, damp subsoil. Fix a pothole when it's small and when the road is moist, says Kat Kachur. If it's dry, water the hole and the fill as you go. "If you fill a dry pothole with dry material, when the next car comes by—*poof!*—it's all gone."

When you're fixing more than one or two potholes, "rent a plate tamper with an 18-to-24-inch plate to vibrate and compact the road-crush gravel," adds Kachur's husband, Nick, also an experienced road builder. Tool rental companies and building centres offer small gas-powered plate compactors, weighing roughly 60 kg and looking like snub-nosed snow blowers, for about $50 a day, and they'll show you how to use it.

Brush regularly

Problem *The undergrowth is overgrown*
What will fix it *Brush cutters*
Who to call *Your neighbours*

A safe road needs good sightlines, especially on hills, curves, and driveway entrances. And, "if you don't keep the ditches clear of brush," says Howie Adams, "the road feels narrower. Everyone drives right down the centre." Thick vegetation clogging ditches also prevents the grader from reshaping the shoulders.

On the road to Malachi, Devlin Timber uses a backhoe to simultaneously clear ditch debris and take the brush out down to the roots, opening up about three to four metres from the edge of the road. Other companies use a brush saw mounted on a folding boom. A typical road needs extensive brush removal every six to seven years, says Adams, but in the meantime, a few cottagers with brush cutters can keep it trim.

Culvert operations

Problem *Beaver won't leave 'er*
What will fix it *Wire fencing*
Who to call *The neighbours, again*

Don't blame the beaver for damming culverts. The fault lies with us. And with society. We trigger the beaver when we divert running water through a culvert, says Stephanie Boyles Griffin, who studied beaver-roadway conflicts for the Virginia Department of Transportation and is now the senior scientist in the wildlife protection department of the Humane Society of the United States. "To a beaver," she says, "a road with a culvert is like a half-made dam. The pipe causes the sound of the water to resonate and increases the flow rate; the sound and feel of running water prompt damming."

Removing or breaking a dam won't work in the long term. "It's pretty uncommon that you're more tenacious than the beaver," says Boyles Griffin. Relocating or killing beavers is ineffective; when one family stops scent-marking its territory, nearby beavers quickly get wind of the empty lot with prime damming potential. "The problem with killing one beaver," she says, "is that 10 others show up for the funeral." Instead, confuse and frustrate them. One simple "beaver deceiver" is a trapezoid-shaped wire fence positioned in a stream so that the narrow end is at the culvert inlet. The fence forces beavers to build a long dam; as they do, the water's sound and flow rate become less seductive. A move-in-ready luxury home becomes a fixer-upper with no amenities, and the beavers move to a better neighbourhood.

In addition to beavers, rising water from an early spring thaw can get backed up if a culvert isn't yet clear of ice. It's easy for a road-maintenance contractor to steam it open, but the problem, says Adams, is that no one remembers where culverts under water are. "Spending hours looking for the pipe, that's a pain in the butt." Help the road crew out by installing culvert markers (vertical rods or flags available at building centres).

It's a washout!

Problem *The road's gone*
What will fix it *Serious construction equipment*
Who to call *The pros*

When a beaver dam breaks, or it's been a hundred years since the last hundred-year flood, a sudden rush of water can tear apart even the most carefully maintained road. Small washouts, especially if the road is still passable, can often be fixed in a couple of hours using a grader. "If we can, we just pull the gravel out of the ditch and put it back," says Nick Kachur. An emergency road repair job is usually priced by the hour, depending on the equipment needed. Hiring a grader in his part of northern Alberta, for example, costs about $200 per hour.

If the washout is too large and deep to drive around, the first step is to bring in crushed rock as temporary fill. Then the process of rebuilding begins. The road crew will reposition culverts (which are often where washouts flow), sloping them slightly for drainage. Backhoes and other heavy equipment will transfer subsoil deposited in the ditches back into the washed-out road bed, then compact it again into a solid base. The grader will spread recovered and new gravel overtop, remixing the finish layer into a smooth, durable surface and reshaping it with just the right amount of crown. For the next driver coming down the cottage road, it's almost as if the washout never happened.

Martin Zibauer was once stopped at gunpoint on a gravel road in Ethiopia.