

# ULTIMATE 4X4 OFF-ROAD DRIVING GUIDE

TECHNIQUES, SETUP, RECOVERY & CHECKLISTS  
FOR JEEP & TRUCK & OFF-ROAD OWNERS

BY PARTS REBEL



# **Ultimate 4x4 Off-Road Driving Guide**

**Techniques, Setup, Recovery & Checklists  
for Jeep, Truck & Off-Road Owners**



**By Parts Rebel**

# Your Trail-Ready 4x4 Playbook

Whether you're new to off-road driving or leveling up your trail skills, this guide turns guesswork into confidence. We'll show you how to set up your 4x4 the smart way, drive different terrain with control, recover safely when things get spicy, and pick gear that actually solves problems—without wasting money.

## What you'll get in this guide

### **Real-world techniques**

for rock, sand, mud, snow, hills, off-camber, and water crossings.

### **Clear setup guidance**

on tires/PSI, suspension & geometry, armor & angles, lighting, drivetrain & lockers.

### **Recovery fundamentals**

with step-by-step rigging cards and winching basics.

### **Glovebox printables:**

pre-trip & post-trip checklists, PSI matrix, lighting aim template, spotter signals, dune flag rules, radio script, inspection map, break/fix flowchart, and more.

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- **Recovery fundamentals** with step-by-step rigging cards and winching basics.
- **Glovebox printables:** pre-trip & post-trip checklists, PSI matrix, lighting aim template, spotter signals, dune flag rules, radio script, inspection map, break/fix flowchart, and more.
- **Shop-smart pointers** that map lessons to the exact gear categories you need (compressors, coilovers, bumpers, light bars, recovery kits, lockers, GMRS radios, flags).
- **Trail Truth:** The one thing you forget is the one thing you'll need. This book helps you remember—and brings the right tools.

# Welcome & How to Use This Guide

You don't need to memorize a thousand specs to drive well off-road. You need a few repeatable habits, the right pressure in your tires, and gear that earns its weight.

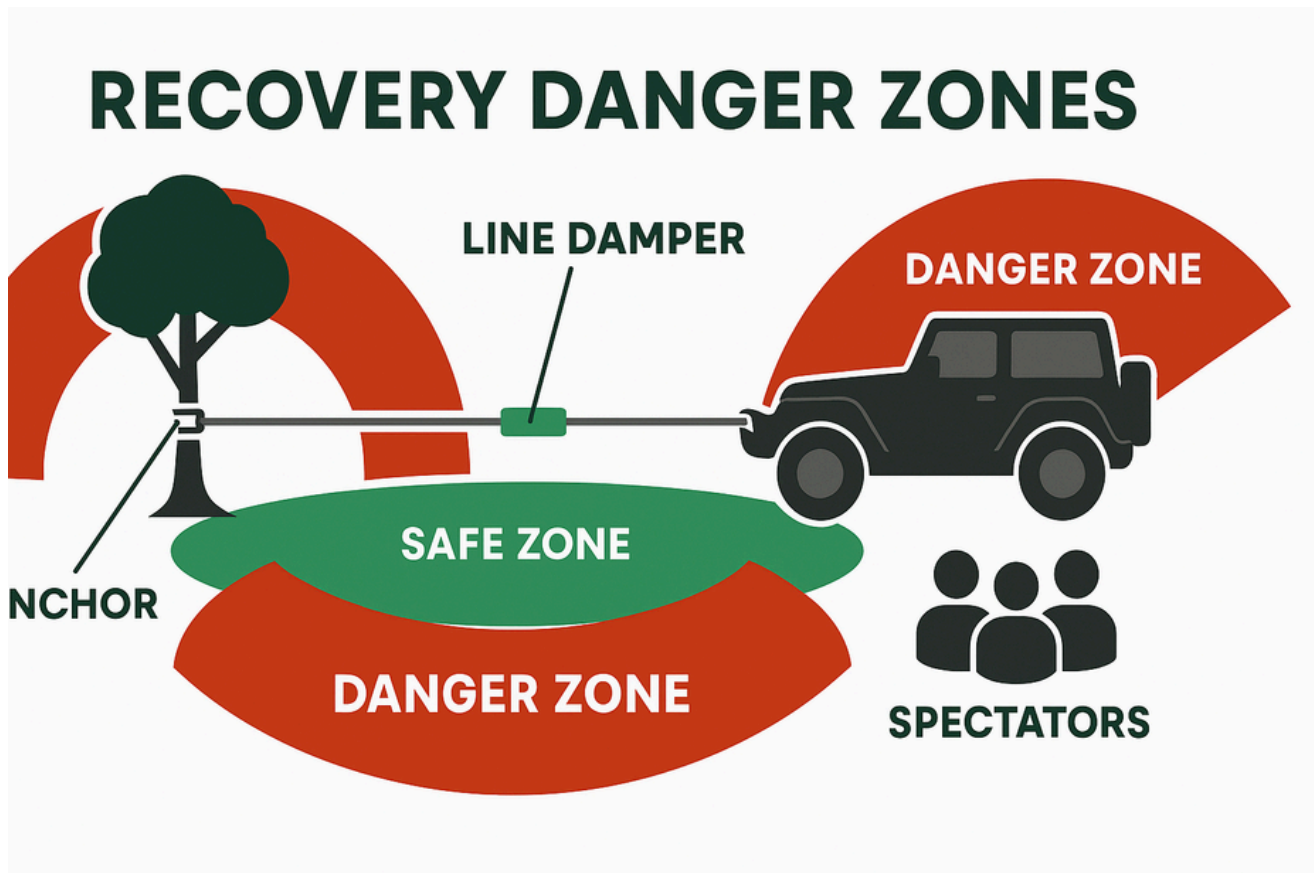
## How to read this book

- **Skim the quick-start pages** before every trip: Pre-Trip Checklist and Always-Carry Mini Kit.
- **Dial in your setup** with Tires & PSI, Suspension & Geometry, Armor & Angles, and Lighting That Works.
- **Learn by terrain:** Rock, Sand & Dunes, Mud, Snow & Ice, Hills & Off-Cambers, Water Crossings. Each chapter includes a line-choice diagram, a "wrong vs right" photo pair, and a 6-step technique card.
- **Recover safely** with the Rigging Recipe cards and Winching Basics.
- **Print the glovebox pages** and actually use them (your future self will high-five you).
- **When you see "Shop This Kit,"** that's a shortcut to parts that match the lesson—compressors for air-down, recovery bundles for rigging, lighting stacks for dust and night runs, etc.

**Parking-Lot Drill (10 minutes):** Plug a tire (old carcass works), swap a fuse, air up from trail PSI to road PSI, stow tools securely. Massive confidence for almost zero time.

# Safety First (Read This Before You Hit the Dirt)

Off-roading is **controlled risk**. The plan is to come home bragging about the trail—not the tow bill.



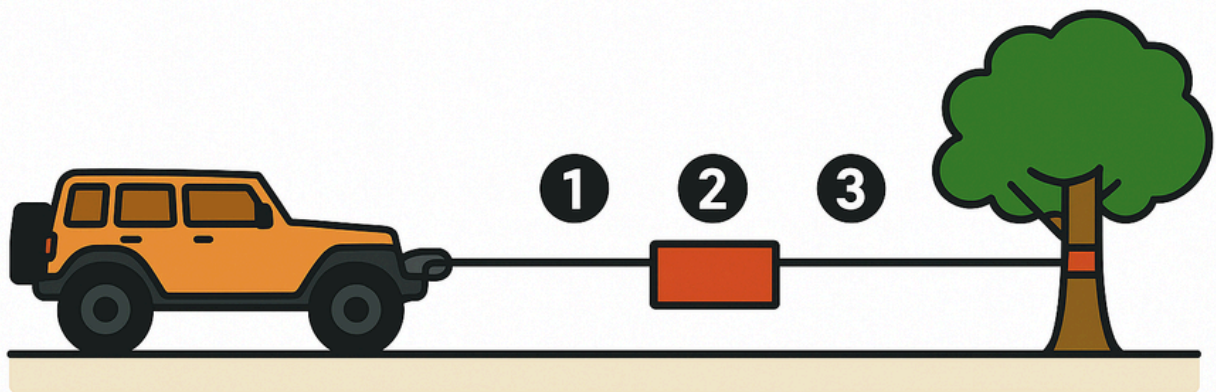
## Do this

- Use rated gear only. Look for WLL/MBS on straps and shackles.



- Wear gloves for recovery; place a line damper on winch or kinetic lines.

## LINE DAMPER PLACEMENT



Place damper on live line, roughly at midspan between vehicle and anchor.

- Keep spectators out of the line of fire (never straddle a live line).
- Air down for traction; air up before highway speeds.
- Walk water crossings (depth, base, current) before you commit.
- Communicate: one spotter, clear hand signals, radios on the same channel.

### Don't do this

- Don't yank blindly or stack random tow points.
- Don't stand near anchors, snatch blocks, or the bight of a line.
- Don't lock differentials on high-grip pavement or while turning tightly.
- Don't "send it" over blind crests—especially in dunes without a flag.

Common-Sense Rule: If it smells expensive, pause. Reassess anchor, angle, and plan. The right setup is safer—and cheaper.



# About Parts Rebel

We're off-roaders and habitual "one-last-mod" people. Our mission is simple: sell trail-tested gear at fair prices and teach you how to use it so you buy once and wheel more.

## What we believe

- Clarity beats hype. You shouldn't need a translator to pick shocks or straps.
- Real upgrades solve real problems. Lift for clearance, air down for grip, armor for impacts, lighting for visibility, lockers for traction.
- Safety isn't optional. Rated hardware, sane angles, proper comms.

## Where to start (reader favorites)

- Air-Down Kit: compressor, deflators, gauge
- Recovery Bundle: strap, soft shackles, D-rings, snatch block, damper, boards
- Lighting Stack: combo bar + pods + wiring harness
- Armor Essentials: front bumper with recovery points, sliders, skid plates

Look for "Shop This Kit" tiles at the end of chapters—each maps directly to the lesson you just learned.



# Setup That Actually Works (buying clarity)

Below is the full, drop-in chapter copy for your ebook. It's written to be skimmable, SEO-friendly, and action-oriented—so readers learn fast and know exactly what to buy.

## Tires & PSI (Air-Down Science)

Your tires are 90% of your traction. Air is your cheapest suspension upgrade. Airing down grows the contact patch, smooths the ride, and helps your rig “float” over sand and bite on rock.

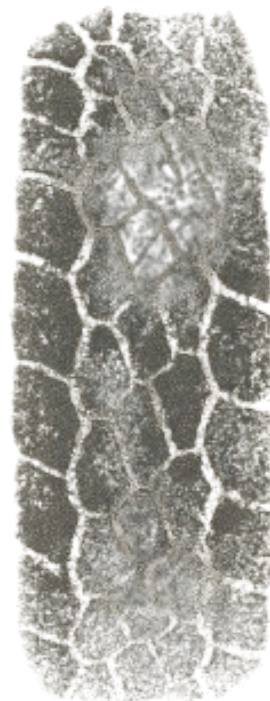
Trail Truth: Air down for grip; air up before highway so you don't overheat or damage a tire.



**36 PSI**



**18 PSI**



**12 PSI**

# PSI Matrix (weight × tire size × terrain)

Use these as starting points, then fine-tune ±2 PSI for your rig, temperature, and wheel/tire combo.

**Pro Tip:** If you're on beadlocks, you can safely go 2–4 PSI lower in rock and sand. If you're not, don't push it—unseating a bead mid-trail is a buzzkill.

## PSI MATRIX — Weight × Tire Size × Terrain

| Tire size                                    | Rock  | Sand/Dunes | Mud   | Snow/Ice |
|--|-------|------------|-------|----------|
| <b>Weight Class A — Light (≤ 4,500 lb)</b>   |       |            |       |          |
| 31-33"                                       | 16-18 | 12-15      | 18-20 | 14-18    |
| 33-35"                                       | 15-17 | 11-14      | 17-19 | 13-17    |
| 35-37"                                       | 14-16 | 10-13      | 16-18 | 12-16    |
| 37-40"                                       | 12-15 | 9-12       | 15-17 | 11-15    |
| <b>Weight Class B — Mid (4,500-5,500 lb)</b> |       |            |       |          |
| 31-33"                                       | 18-20 | 13-16      | 20-22 | 16-20    |
| 33-35"                                       | 16-18 | 12-15      | 19-21 | 15-19    |
| 35-37"                                       | 15-17 | 11-14      | 18-20 | 14-18    |
| 37-40"                                       | 14-16 | 10-13      | 17-19 | 13-17    |
| <b>Weight Class C — Heavy (≥ 5,500 lb)</b>   |       |            |       |          |
| 31-33"                                       | 20-22 | 14-17      | 22-24 | 18-22    |
| 33-35"                                       | 18-20 | 13-16      | 21-23 | 17-21    |
| 35-37"                                       | 16-18 | 12-15      | 20-22 | 16-20    |
| 37-40"                                       | 15-17 | 11-14      | 19-21 | 15-19    |

**Weight Class A — Light ( $\leq 4,500$  lb curb,  
e.g., 2-door rigs, compact trucks)**

| <b>TIRE SIZE</b> | <b>ROCK</b> | <b>SAND/DUNES</b> | <b>MUD</b> | <b>SNOW/ICE</b> |
|------------------|-------------|-------------------|------------|-----------------|
| 31-33"           | 16-18       | 12-15             | 18-20      | 14-18           |
| 33-35"           | 15-17       | 11-14             | 17-19      | 13-17           |
| 35-37"           | 14-16       | 10-13             | 16-18      | 12-16           |
| 37-40"           | 12-15       | 9-12              | 15-17      | 11-15           |

**Weight Class B — Mid (4,500–5,500 lb curb,  
many 4-door Jeeps, midsize trucks)**

| <b>TIRE SIZE</b> | <b>ROCK</b> | <b>SAND/DUNES</b> | <b>MUD</b> | <b>SNOW/ICE</b> |
|------------------|-------------|-------------------|------------|-----------------|
| 31-33"           | 18-20       | 13-16             | 20-22      | 16-20           |
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| 37-40"           | 14-16       | 10-13             | 17-19      | 13-17           |

**Weight Class C — Heavy ( $\geq 5,500$  lb curb,  
full-size trucks/armored builds/overland  
loads)**

| <b>TIRE SIZE</b> | <b>ROCK</b> | <b>SAND/DUNES</b> | <b>MUD</b> | <b>SNOW/ICE</b> |
|------------------|-------------|-------------------|------------|-----------------|
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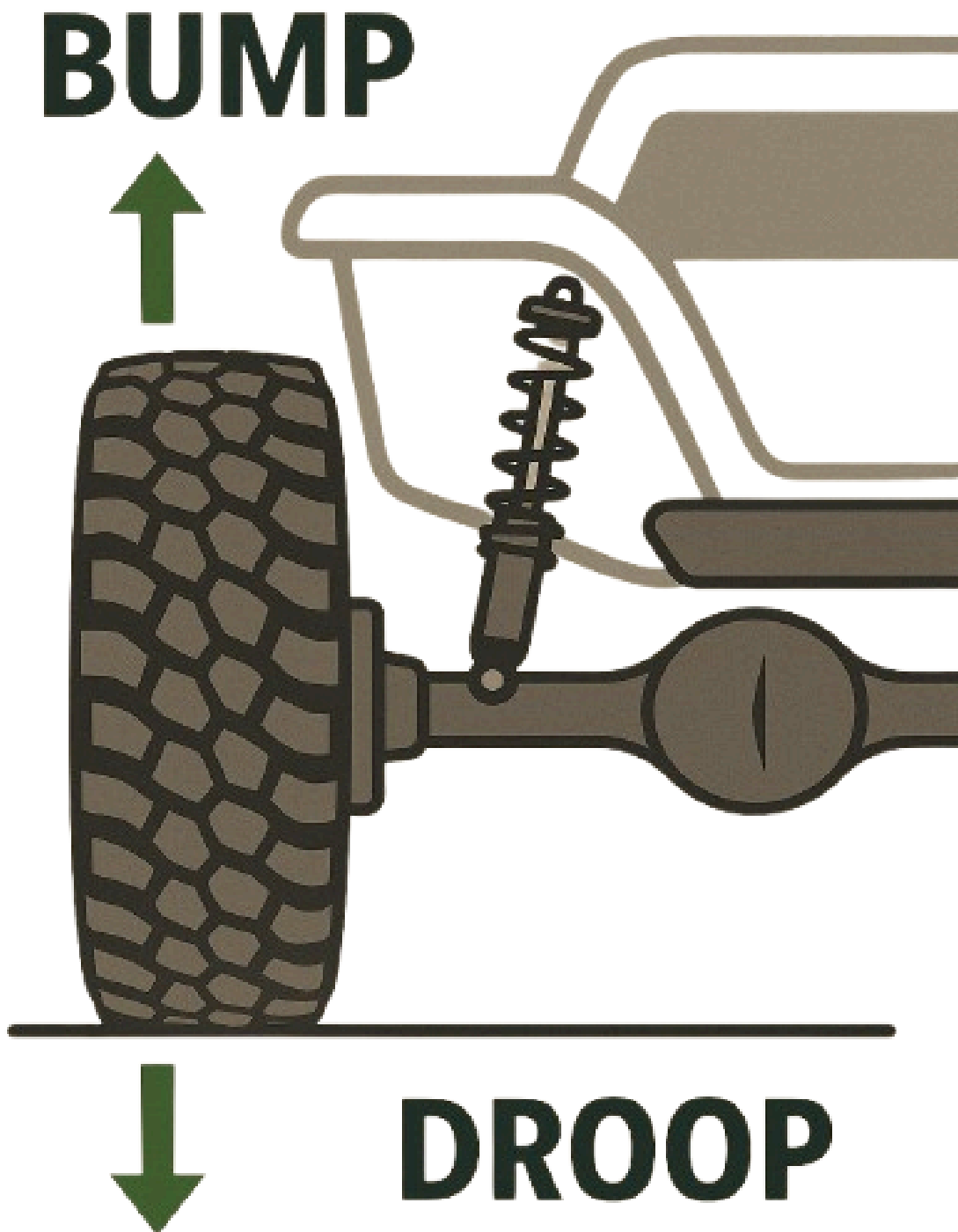
# Mini Calc – Find Your Starting PSI

1. Pick your **weight class** (A/B/C).
2. Pick your **tire size** (nearest band).
3. Pick **terrain** → that cell is your **starting PSI**.
4. Adjust  $\pm 2$  PSI for comfort, traction, and sidewall feel.
5. Write your **road PSI** on blue tape inside the fuel door so you always air up properly.



# Suspension & Geometry (Ride Quality Without Mystery)

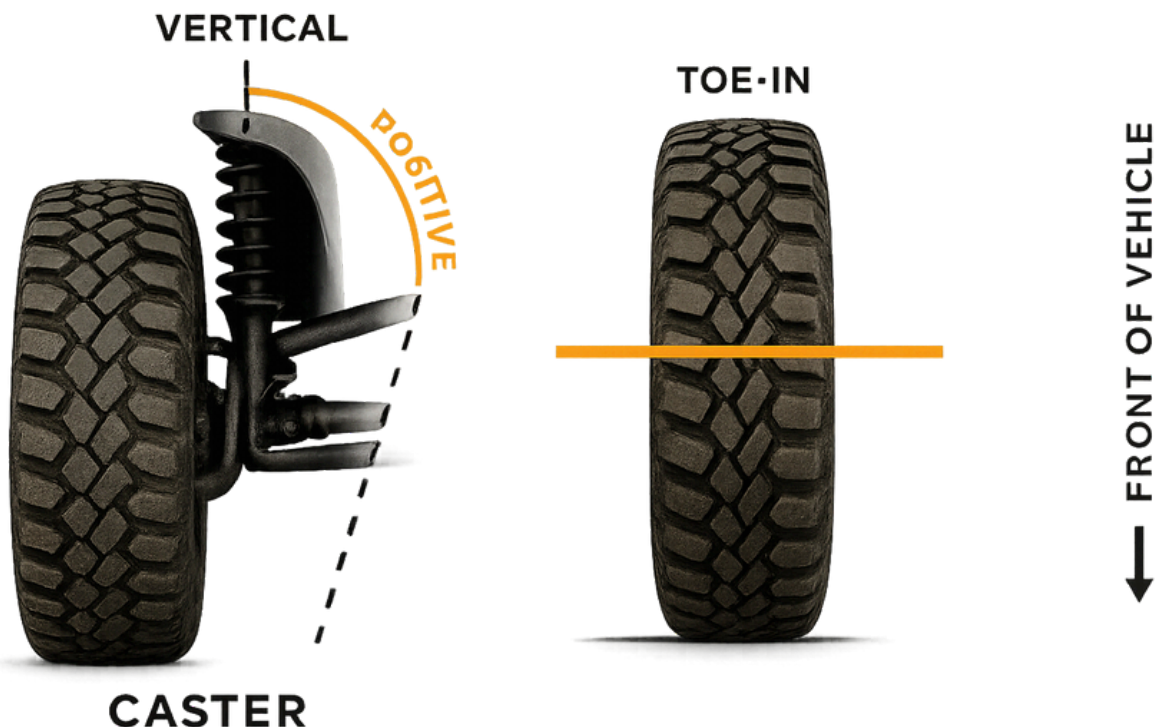
A lift isn't magic; geometry is. Get caster and bump/droop right and your rig tracks straight, rides better, and flexes where it counts.



## Key concepts (quick)

- **Caster:** More positive caster = better straight-line stability after a lift. Target 4.5–6.5° on many solid-axle rigs.
- **Toe:** Tiny toe-in helps stability. After any front-end work, get an alignment.
- **Bump vs Droop:** You need **bump-stop** spacing to keep tires/shocks from smashing, and **droop** so tires stay on the ground.
- **Shocks:** Heat kills damping. Quality shocks improve control and comfort.

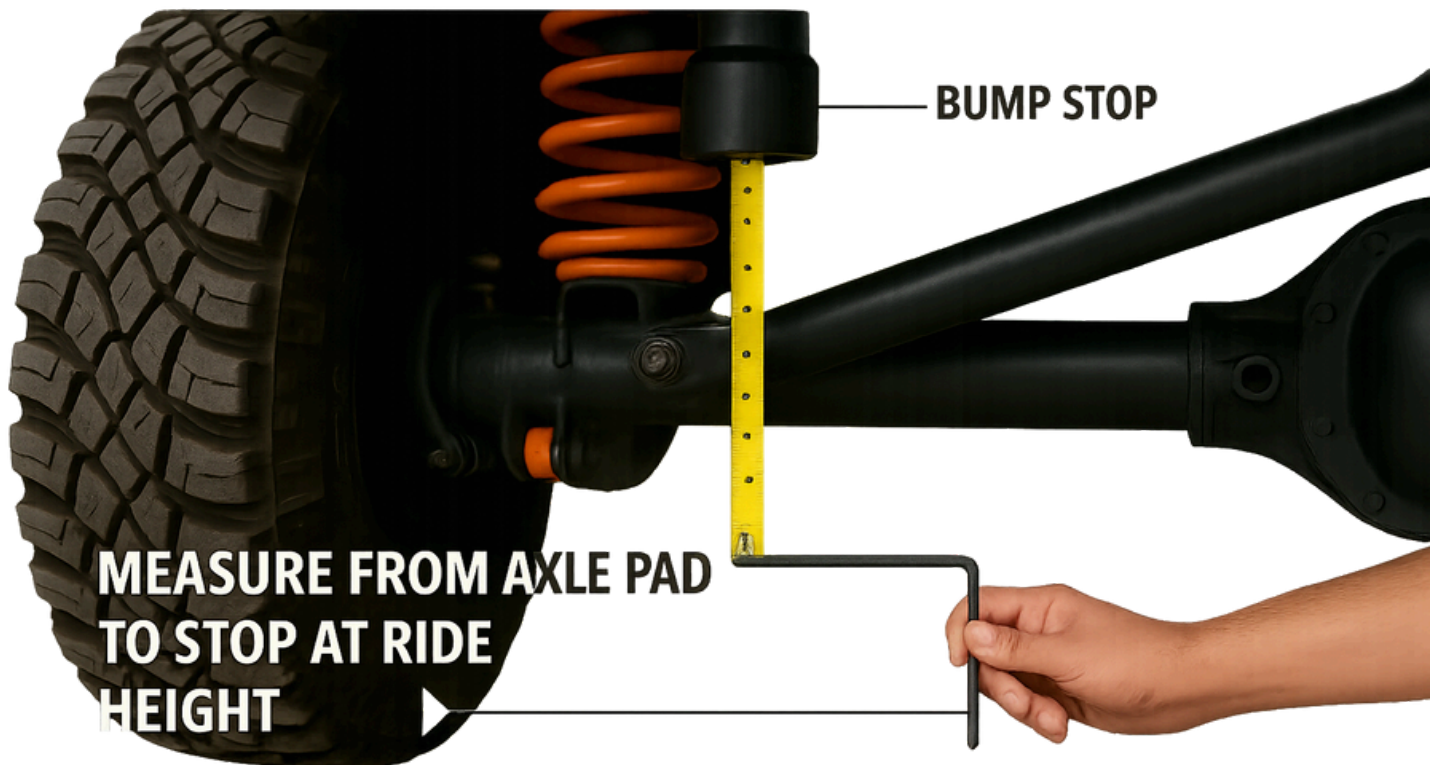
# CASTER & TOE



## Diagram callouts

- **Bump vs Droop** (side view with travel arrows)
- **Caster & Toe** (front/side schematic)
- **Bump-stop spacing** (measure from axle pad to stop at ride height)

# BUMP-STOP SPACING



# Which lift is right? (spacer vs coilover vs long-arm)

| System   | Cost        | Ride Quality | Articulation | Alignment Needs   | Install Time | Notes   |
|----------|-------------|--------------|--------------|-------------------|--------------|---|
| Spacer   | \$          | Low-Med      | Low          | Minimal           | Short        | Budget height; stock shocks/geometry limits remain. |
| Coilover | \$\$-\$\$\$ | High         | Med-High     | Caster/toe adjust | Medium       | Tunable damping + spring rate = big upgrade.        |
| Long-Arm | \$\$\$      | High         | High         | Full setup        | Long         | Best geometry & flex; serious install & cost.       |

## Flow fix

**Wanders at 60?** → Check **caster** → Verify **toe** → Confirm **tire pressure**  
(too high = skatey).



Still wandering? Inspect bushings, ball joints, steering box/play.  
and tire wear.

# Armor & Angles (Approach / Departure / Break-Over)

Armor buys you time to learn and keeps your trip fun. Know your angles and protect the parts that hit first.

**Measure your angles** (simple phone-inclinometer works):

- **Approach:** front tire contact to lowest front point.
- **Departure:** rear tire contact to lowest rear point.
- **Break-over:** frame height vs wheelbase (crest without belly hanging).

## Starter upgrade path

1. **Front bumper** with **rated recovery points** (+ winch plate)
2. **Rock sliders** (save doors and rocker panels)
3. **Skid plates** (oil/trans/transfer case)
4. **Rear bumper** if you drag tail often

## ANGLES – Approach • Departure Break-Over



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## ANGLES — Approach • Departure • Break-Over



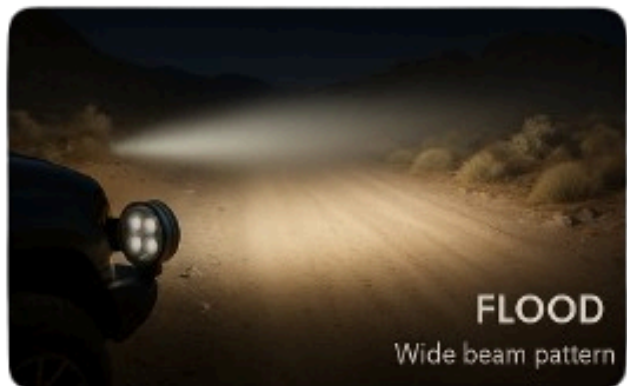
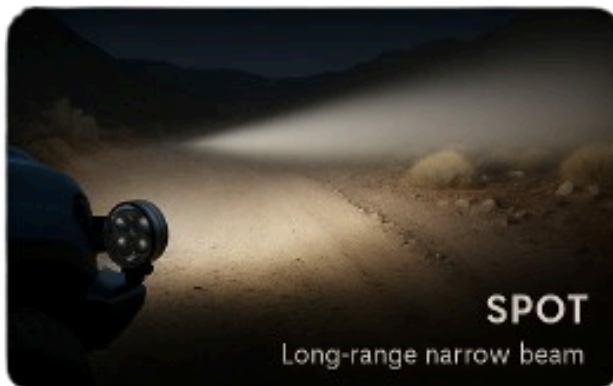
# Lighting That Works (Beams, Aiming, Amber vs White)

1. **Front bumper** with **rated recovery points** (+ winch plate)
2. **Rock sliders** (save doors and rocker panels)
3. **Skid plates** (oil/trans/transfer case)
4. **Rear bumper** if you drag tail often

## Beam basics

- **Spot:** throws far (narrow)—great for speed.
- **Flood:** wide foreground—great for technical trails.
- **Combo:** spot + flood = best of both.
- **Amber:** cuts backscatter in dust/snow/fog.

## BEAM PATTERNS



## Aiming template (garage door)

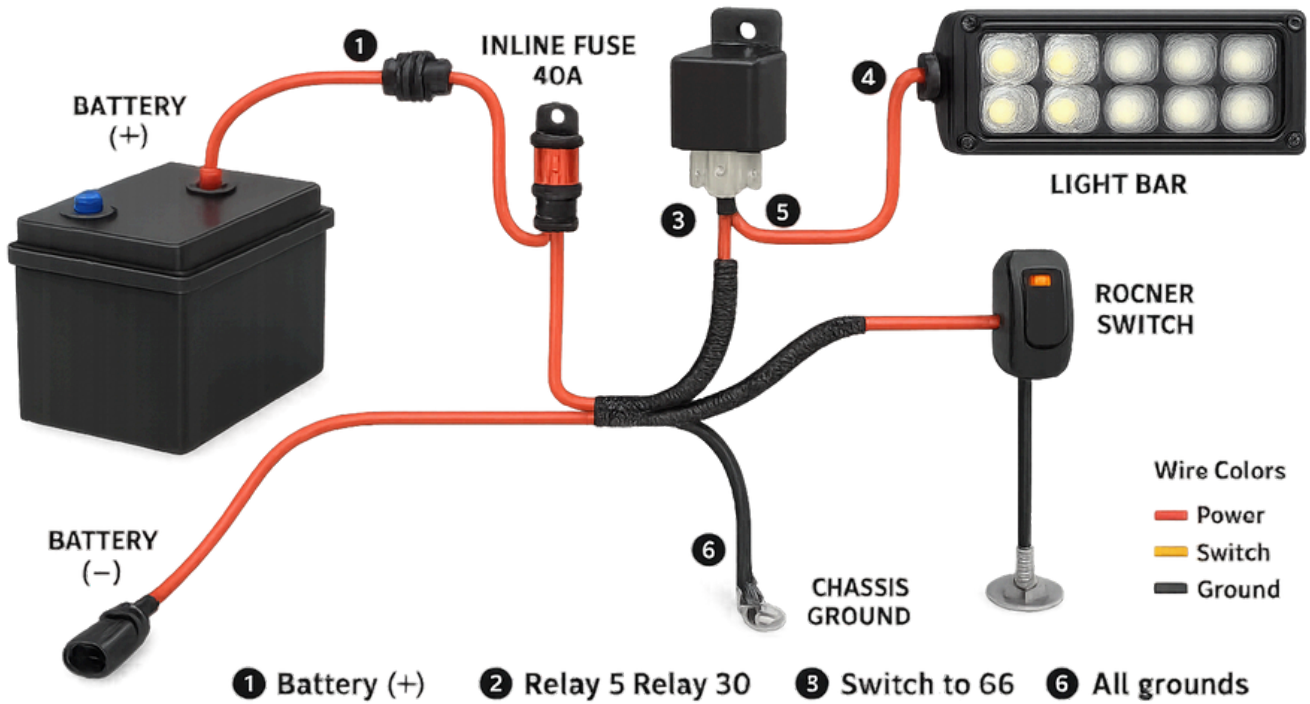
1. Park **25 ft** from a flat wall, level ground, normal load.
2. Measure headlight center height (**H**).
3. On the wall, put a tape line **2 inches below H**.
4. Aim low beams so cutoff is on that line; aim aux lights to sit **below** stock cutoff.



# Wiring mini-diagram

Battery → **fused** power → **relay** → light → **ground**; switch triggers relay. Neat harnesses = fewer gremlins.

## WIRING DIAGRAM – AUX LIGHT HARNESS (DE-SCARY)



# Drivetrain & Lockers (4H/4L, Open/LSD/Locker)

Use **4H** for speed/traction; **4L** for control/torque. Lockers make both axles drive—amazing off-road, awkward on high grip.

## OPEN vs DIFFERENTIAL



Power follows least resistance – one wheel spins



Good for: rocks, ruts

## LOCKED DIFFERENTIAL



Both wheels turn together – traction restored: avoid tight turns on high grip



Caution: binding on high grip

## Locker rules (quick)

- **Engage** when a tire is light or off the ground; **disengage** before tight turns on grippy surfaces.
- Don't bind a locked axle on pavement—parts don't love that.

## Crawl ratio (no headaches)

- *Lower crawl* ratio = more torque at the tire and slower, smoother control.
- If you ride the clutch or stall a lot in rocks, you want **more crawl** (lower gearing or 4L usage).

### HIGHER CRAWLRATIO (e.g. 100:1)



More torque • Slower wheel • Easier control

### LOWER CRAWL RATIO (e.g. 35:1)



Less torque • Faster wheel • Stalls/spins

# Recovery Essentials (What to Pack & Why)

*Recovery is about rated gear, smooth pulls, and good angles. Pack smart, don't overpack.*

## Core kit

- **Soft shackles** (or forged D-rings) with WLL markings
- **Tree saver** strap (protects anchors)
- **Tow/recovery strap** (non-kinetic) or kinetic rope (elastic)
- **Snatch block** (for redirects or mechanical advantage)
- **Line damper & gloves**
- **Traction boards & shovel**
- **Air system** (compressor/CO<sub>2</sub>) & accurate **gauge**

**Tip:** Stow heavy gear low and forward. Label bags so you can build a rigging plan fast.

| Item                     | Good Rule of Thumb  |
|--------------------------|---|
| <b>Shackles (WLL)</b>    | Choose WLL $\geq$ <b>rig's gross weight</b> $\div$ 2 per connection point.                              |
| <b>Static tow strap</b>  | <b>2<math>\times</math>–3<math>\times</math></b> vehicle weight <b>MBS</b> (minimum breaking strength). |
| <b>Kinetic rope</b>      | <b>2.5<math>\times</math>–3.5<math>\times</math></b> vehicle weight MBS; use on soft, open ground.      |
| <b>Snatch block</b>      | <b>MBS <math>\geq</math> winch line MBS</b> ; check sheave size for rope diameter.                      |
| <b>Winch line damper</b> | Always on the <b>live line</b> mid-span.  |
| <b>Angles</b>            | Bigger angles amplify load—keep lines as straight as practical.   |



# Driving Techniques by Terrain

## ROCK

**What matters:** *crawl ratio, precise tire placement, and calm throttle.*

*Lockers help, spotters make heroes.*

### Line-Choice

- Green path keeps tires on the high points (ledges/stackable rocks).
- Diffs & belly ride the gaps, not the crowns.
- Avoid diagonal binds; keep the chassis as level as practical.

### Wrong vs Right

- Wrong: Wheels spin, diffs hang; driver chases throttle.
- Right: Tires placed on high points; crawl ratio used; spotter hand-off clear.

## 6-Step Technique Card

- Air down to your rock PSI (see Part 2 matrix).
- Engage 4L; pick locker(s) only when a tire goes light.
- First gear, feet quiet—idle or tiny throttle; let gears do the work.
- Set your line to stack tires up ledges; aim for two-tire contact whenever possible.
- Spotter hand signals only (no shouting). Small inputs; no sawing the wheel.
- If you spin, stop. Back 6–12", reset, build a tiny ramp with rocks/boards.

Practice Drill: On a mild rock garden, drive the same line three ways—open diffs, rear locked, both locked. Feel steering tightness and how lockers change line choice.

# Driving Techniques by Terrain

## Rock — Crawl Ratio, Tire Placement, Spotter Hand-off

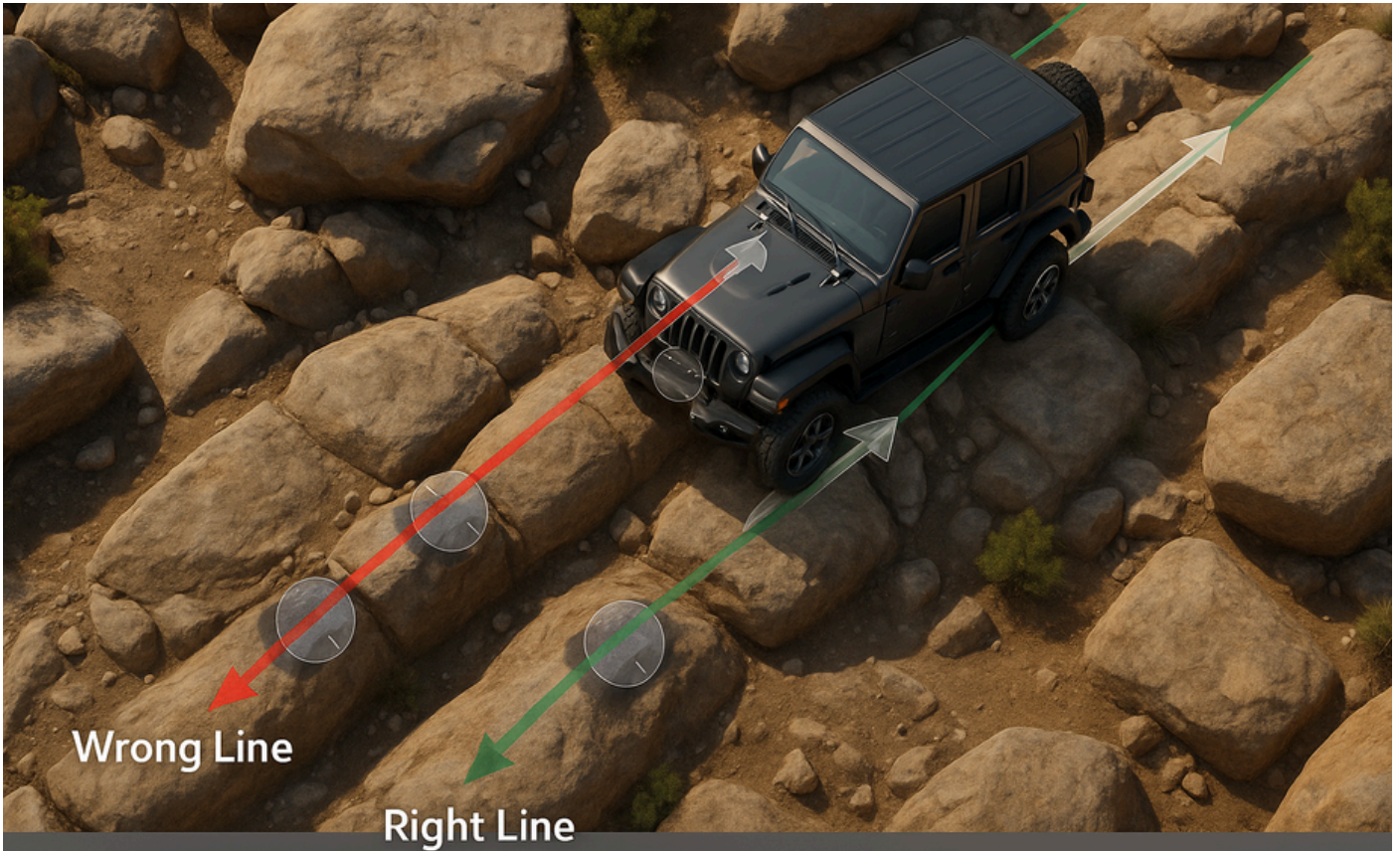
**What matters:** *Rocks punish low clearance and sloppy throttle. The win is slow control: crawl ratio + tire placement + one spotter.*

### 6-Step Technique

1. **4L + Locker Strategy:** *Engage 4L early; use lockers only when traction breaks, then disengage for turns.*
2. **Pick the High Points:** *Aim tires on rock "crowns"; keep diffs over gaps.*
3. **Crawl Ratio = Control:** *First gear low; let the drivetrain do the work.*
4. **Feather, Don't Jab:** *Constant, tiny throttle; no wheelspin.*
5. **Spotter = Single Source:** *One person. Driver's mirrors = confirmation, not guidance.*
6. **Bail-Out Rule:** *If you lose the line twice, back down, reset, and re-line.*

**Practice Drill:** On a mild rock garden, drive the same line three ways—open diffs, rear locked, both locked. Feel steering tightness and how lockers change line choice.

Right line keeps tires on high points and diffs off the rocks.



green line rides high points; red line drops the diff onto ledges.

**Wrong**



**Wrong**

front diff hung; wheels spinning.

**Right**



**Right**

tires on crowns; slow crawl; spotter hand signal visible.

# ROCK: 6-STEP TECHNIQUE

Quick card

- 1 4L + Locker Strategy
- 2 Pick the High Points
- 3 Crawl Ratio = Control
- 4 Feather, Don't Jab
- 5 Spotter = Single Source
- 6 Bail-Out Rule

PARTS REBEL

# Sand & Dunes – Momentum, Cresting Safely, Flags

**What matters:** Sand rewards float and flow. Air down, keep revs in the torque band, and crest with finesse so you glide instead of dig.

## 6-Step Technique (card content)

1. **PSI** – Air down per your matrix; go a bit lower for soft/hot sand.
2. **Goal:** grow the footprint and keep the vehicle “floating.”
3. **4H + Momentum** – Stay in 4H; keep a light, steady throttle. No sharp inputs on side slopes.
4. **Read the dune** – Climb the windward side (gentle slope); avoid cutting the slip face (steep lee side).
5. **Cresting** – Ease off at the lip, level the chassis, and roll over—don’t jump.
6. **Spacing & comms** – Stagger lines, agree on a GMRS channel, call crests and drops.
7. **Heat cycles** – Give the trans, diffs, and intake temps time to cool between runs.

**Trail Truth:** If the engine is screaming but you’re not gaining, you’re plowing—stop, back down in your own tracks, and try a cleaner line with more PSI control.

# Quick “Do / Don’t”

## Do

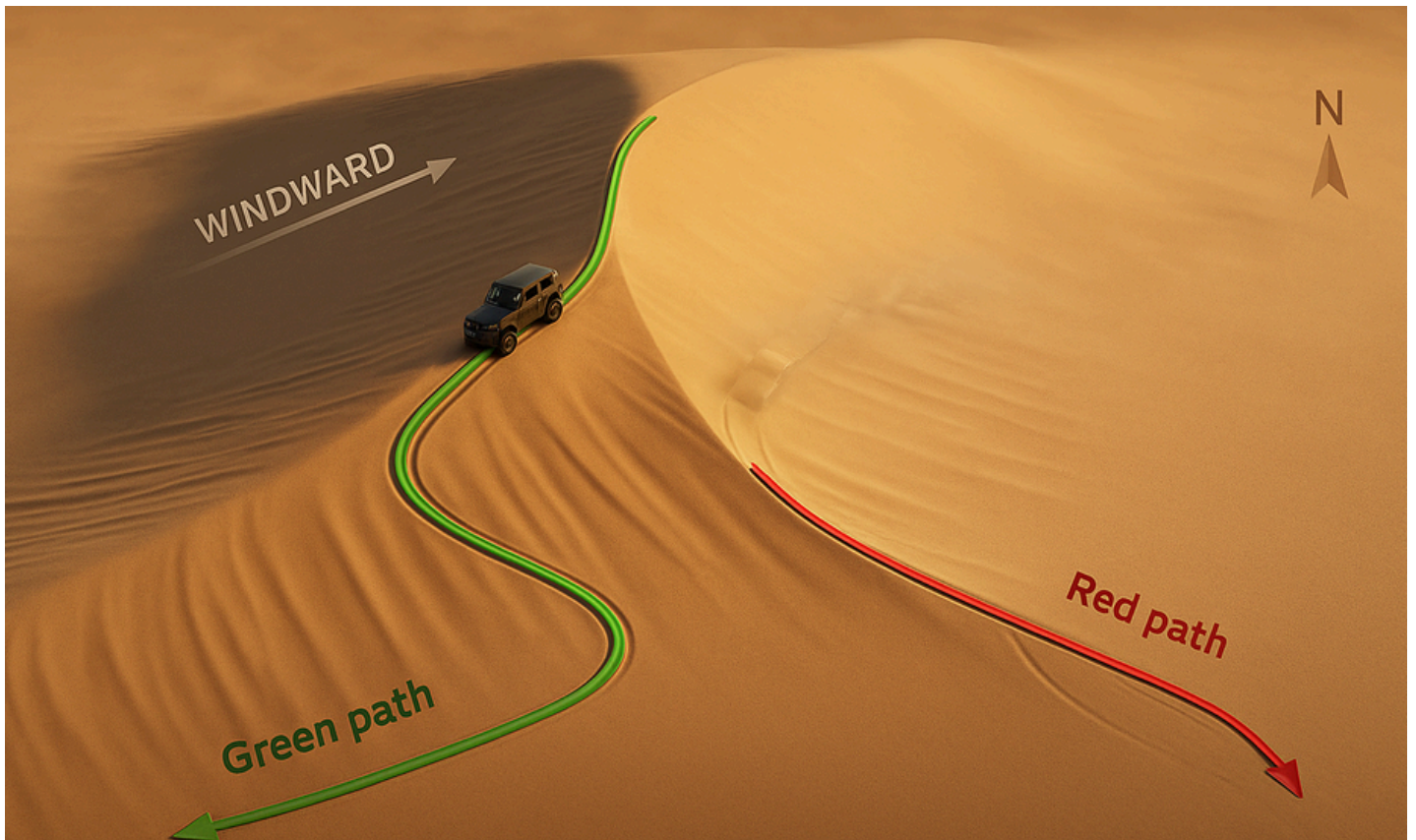
- Air down **before** you leave the lot; confirm road PSI is written inside the fuel door for airing up.
- Approach crests straight; feather throttle at the top.
- Keep wheels mostly straight on sidehills; tiny inputs only.
- Run a tall, day-glow **flag** on the rear-most point.

## Don’t

- Cut across the slip face at speed.
- Follow directly in another rig’s tracks on the same line—stagger to keep visibility.
- Turn sharply or stab the brakes near the crest.
- Sit and spin—stop, reset, and try again.

## Practice Drill (10 minutes)

- Find a small beginner dune. Do three ascents: (1) too little momentum, (2) too much, (3) just right.
- Note the throttle feel when it “floats” vs. “digs.”
- Radio callout practice: “**Cresting... Over... Clear.**”



**green path** rides the windward slope and gently eases off the crest;  
**red path** cuts the slip face and noses in.

# WRONG



**Crest too fast; nose  
dives over the lip; no  
bow wave control.**

# RIGHT



**Momentum held;  
throttle feathers at the top;  
angle straight**

# SAND & DUNES: 6-STEP TECHNIQUE

Quick card

- 1 PSI**: Air down per matrix; add more deflation for sohrp sc side slopes.
- 2 4H + Momentum**: Smooth throttle; no sharp steering on side slopes.
- 3 Read the Dune**: Climb the windward side; avoid cutting the slip face.
- 4 Cresting**: Ease off at lip; level the chassis; roll over, don't jump.
- 5 Heat Cycles**: Cool transmission and IATs between runs.

**Parts Rebel**

## **Dune Flag Rules — Check Before You Ride**

*Common standards (check boxes):*

- Flag color: Day-glow orange (no patterns).
- Mount location: Rear-most point of vehicle.
- Height: Mast tip visible above roof (often 8–10 ft total; confirm locally).
- Night use: Whip light required/allowed (color rules vary).
- One rig, one spotter when stuck/recovering.
- Comms: GMRS/FRS channel agreed by group.

*Local rules (fill-ins):*

- Glamis / ISDRA: \_\_\_\_\_
- Oregon Dunes (OR): \_\_\_\_\_
- Silver Lake (MI): \_\_\_\_\_
- Little Sahara (UT/OK): \_\_\_\_\_
- St. Anthony (ID): \_\_\_\_\_
- Other: \_\_\_\_\_

*Footer note (tiny): Regulations change. Always verify with the managing agency before you ride.*

### **Common mistakes**

- *Under-aired then over-throttled: digs instantly.*
- *Turning on the crest: side loads + sudden drop = bad day.*
- *Following too close: blindness in dust + crest surprises.*
- *Skipping cooldowns: heat-soaked trans loses you a run.*

# Mud – Steady Throttle, Straight Wheels, Avoid Traps

**What matters:** *Mud multiplies load on every component. Smooth power, straight steering, and quick decision-making keep you moving—and keep recovery safe.*

## 6-Step Technique

1. **Scout Depth** – Walk the edges; probe with a stick. Look for buried ruts, logs, and frame-deep holes.
2. **PSI & Mode** – Air down a bit (per matrix); engage 4H; keep revs in the torque band (no redline).
3. **Commit Straight** – Enter with constant throttle and minimal steering. Let the tires self-clean.
4. **Don't Dig Holes** – If you bog, stop. Reverse out in your own tracks and try a shallower line.
5. **Use Boards & Strap** – Lay traction boards to build a path; use a kinetic rope for gentle assists.
6. **Aftercare** – Rinse brakes/radiator; inspect wheel bearings, diff breathers, and mud-packed wheels.

**Trail Truth:** Spinning tires = digging anchors. Save the hole-making for fence posts.

# Quick “Do / Don’t”

## Do

- Enter straight; pick the shallow shoulder of ruts when possible.
- Short, steady throttle—avoid big stabs.
- Stage recovery gear **before** the attempt (boards unstrapped, strap reachable).
- Call lines and status on GMRS.

## Don’t

- Turn steering lock-to-lock in the soup.
- Keep throttling once stationary—stop, reset.
- Hook to sketchy tow points; use **rated** shackles/soft shackles only.
- Walk deeper than your boots—probe first.

## Practice Drill (10 minutes)

Find a safe, shallow mud section. Do three passes:

- **Too timid:** note where momentum dies.
- **Too spicy:** feel the wheelspin start to dig.
- **Just right:** straight wheels, steady rpm; exit clean.

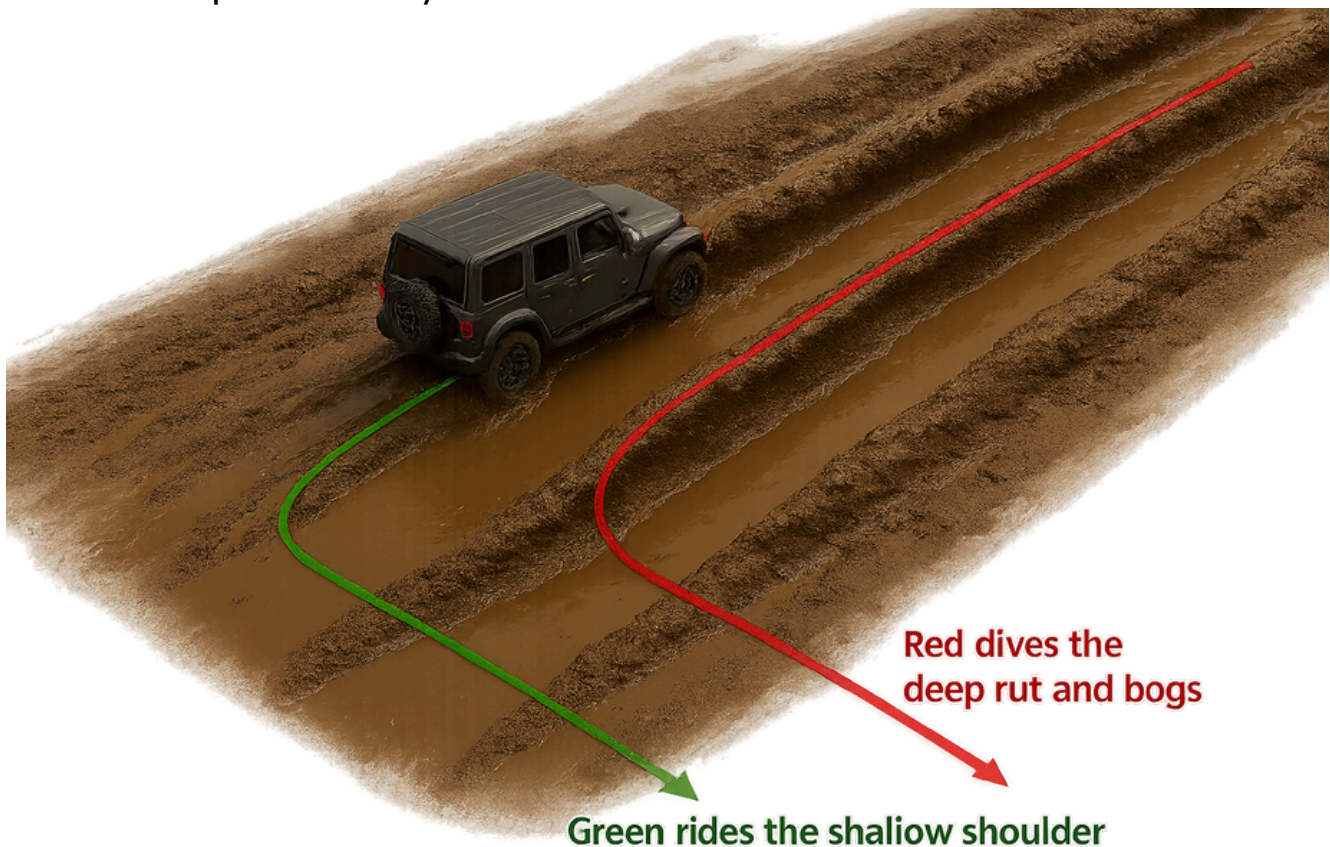
Lay boards and repeat the same section—compare effort vs. control.

## Recovery Mini-Recipe (when stuck)

1. Stop immediately—preserve the hole.
2. Air down 2–4 PSI more if safe; clear tread blocks.
3. Boards under tires in direction of travel.
4. Kinetic rope to a rated point; smooth pull, not a yank.
5. Reverse out in your tracks; reassess line.

## Recovery Mini-Recipe (when stuck)

- Rinse radiator/condenser and brake calipers.
- Clean mud from wheels (imbalance) and diff/axle seals.
- Inspect wheel bearings, u-joints, and brake pads.
- Check diff breather lines; look for water ingress.
- Re-torque recovery hardware after use.



Shallow shoulder carries momentum; deep center robs it.

**✘ WRONG**



Wheelspin + turned wheels = trench.

Straight wheels, steady throttle, boards staged = clean exit.

**✔ RIGHT**



# MUD: 6-STEP TECHNIQUE

Quick card

- 1 PSI & MODE:** Air down a bit: 4H; keep tevs in torque band.
- 2 SCOUT DEPTH:** Walk edges; look for buried ruts/logs.
- 3 COMMIT STRAIGHT:** Constant throttie: minimal steering.
- 4 DON'T DIG HOLES:** If bogged, stop—reverse in your own track.
- 5 USE BOARDS & STRAP:** Stage traction boards; kinetic rope assist.
- 6 AFTERCARE:** Rinse brakes/radiator; check wheel bearings.

Parts Rebel

# Snow & Ice – Gentle Inputs, Longer Braking, ABS Behavior

**Why it matters:** Winter grip is low, patchy, and sneaky. Smooth inputs keep the tires hooked up, longer braking distances keep the nose off the snowbank, and knowing how ABS behaves on loose surfaces keeps your heart rate in the “fun” zone.

## 6-Step Technique

1. **PSI** – Air down modestly (2–6 PSI below road). Keep bead safety; cold shrinks pressure further.
2. **Mode** – **4H** for stability. Use lockers sparingly to avoid plowing straight in turns.
3. **Inputs** – Be gentle with **throttle / brake / steer**. Feather, don’t jab. If the wheel is a DJ turntable, you’re scratching too hard.
4. **Braking** – Expect **longer distances**. ABS may buzz and extend stops on loose snow/ice; use engine braking + early, light pedal.
5. **Vision** – **Amber** lighting reduces glare/backscatter. Keep lenses, windshield, and camera eyes clean (snow paste hides everywhere).
6. **Stuck protocol** – Don’t spin. **Pack** snow under tires, set **boards**, use a **gentle pull** or reverse into your own tracks.

**Trail Truth:** If you’re sliding into a decision, it’s the wrong decision.

Slow first—then steer.

**Safety note:** Chains beat overconfidence. If conditions warrant, use them and keep speeds low.

## Practice Drill (5 minutes, parking lot)

- In an empty, plowed lot, feel ABS pulsing at **5–10 mph** stops on packed snow vs. ice.
- Do a **gentle slalom**: hands smooth, constant throttle. If stability control intervenes, your inputs were too spicy.

## Common Mistakes to Avoid

- **Over-airing down** → beads at risk + vague steering.
- **Lockers in turns** → instant snow-plow behavior.
- **Braking late** → ABS skates; start earlier and lighter.
- **White-out vision** → wipe lights/windshield often; use amber.





# Wrong

Turned front wheels mid-corner → visible understeer push toward ditch/drift; mild snow rooster tails; no spotter; red path cutting the slick crown. Small caption strip at bottom: “Turned + throttle = push on ice.” (vector text baked onto the card panel)



# Right

Straight wheels, gentle throttle, riding the packed track with a green line; amber lights on; spotter safely off the line. Bottom caption strip: “Gentle inputs on the packed track.”

# Hills & Off-Cambers – Ascents/Descents, Side-Hill Limits, Bail-Out Rules

**Why it matters:** On hills, gravity shifts weight downhill and slashes available traction. Control comes from straight approaches, engine braking, and disciplined line choice—not throttle.

## 6-Step Technique

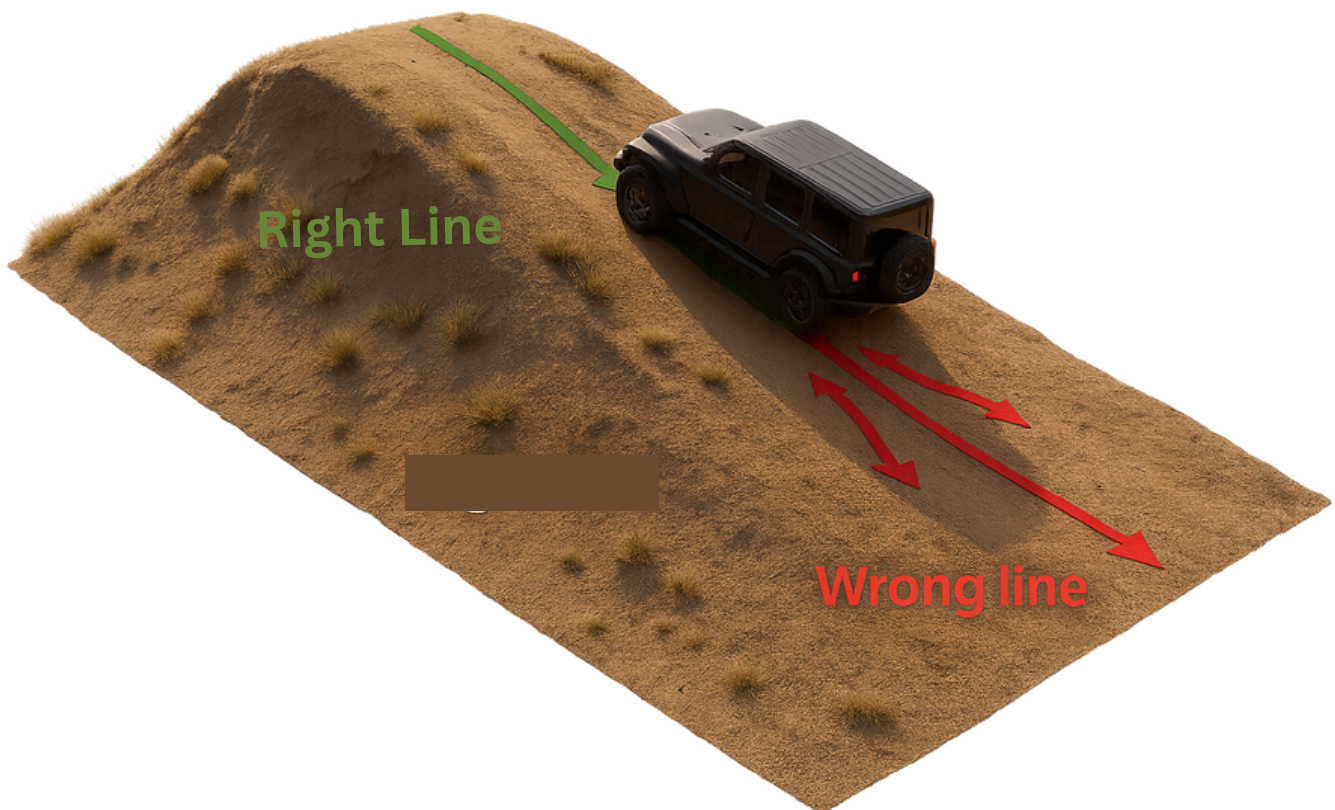
1. **Approach Straight** — Take ascents/descents in a straight line along the fall line. Set steering straight before the climb/descent; no last-second turns.
2. **Gearing** — Use 4L/1st for descents. Let engine braking do the work; add light, steady brake only as needed. (Autos: slight left-foot brake can settle the chassis.)
3. **Side-Hills** — Read body roll early. Keep uphill tires loaded (slow, smooth; no sharp steering). If it feels tippy, reduce angle or re-line.
4. **Bail-Out** — If a slide starts, steer gently downhill to regain control. Unlock lockers if engaged and straighten wheels; avoid stabbing the brakes.
5. **Spotter on Crest** — Place spotter slightly off to the side, eyes on belly/bumper drop and departure. Use simple, agreed hand signals only.
6. **Reset if Unsure** — Stop. Back straight down in 4L/1st with wheels straight; reset and pick a cleaner line.

## Practice Drill (5 minutes, parking lot)

On a mild hill, run three laps: straight up/straight down; controlled side-hill at low angle; blind-crest with spotter. Note how engine braking and steering inputs change weight transfer.

### Common Mistakes (avoid):

On a mild hill, run three laps: straight up/straight down; controlled side-hill at low angle; blind-crest with spotter. Note how engine braking and steering inputs change weight transfer.



Green path crests straight and controlled; red diagonal unloads weight and risks a slide/roll



Wrong - vehicle crosses the crest at a diagonal; visible lean, unloaded downhill tires, slight slide marks



Right - vehicle crests dead straight, pauses level, then descends in 4L/1st; spotter visible off to the side

# HILLS & OFF-CAMBERS: 6-STEP TECHNIQUE

Quick card

- 1 APPROACH STRAIGHT:** Ascents/descents in a straight line, wheels straight.
- 2 GEARING:** Use 4L / 1st for descents; favor engine braking over pedal.
- 3 SIDE-HILLS:** Feel roll; keep uphill tires loaded—avoid sudden inputs.
- 4 BAIL-OUT:** If a slide starts, steer downhill to regain control.
- 5 SPOTTER ON CREST:** Eyes on belly & bumper angles.
- 6 RESET IF UNSURE:** Back down safely, re-line and try again.

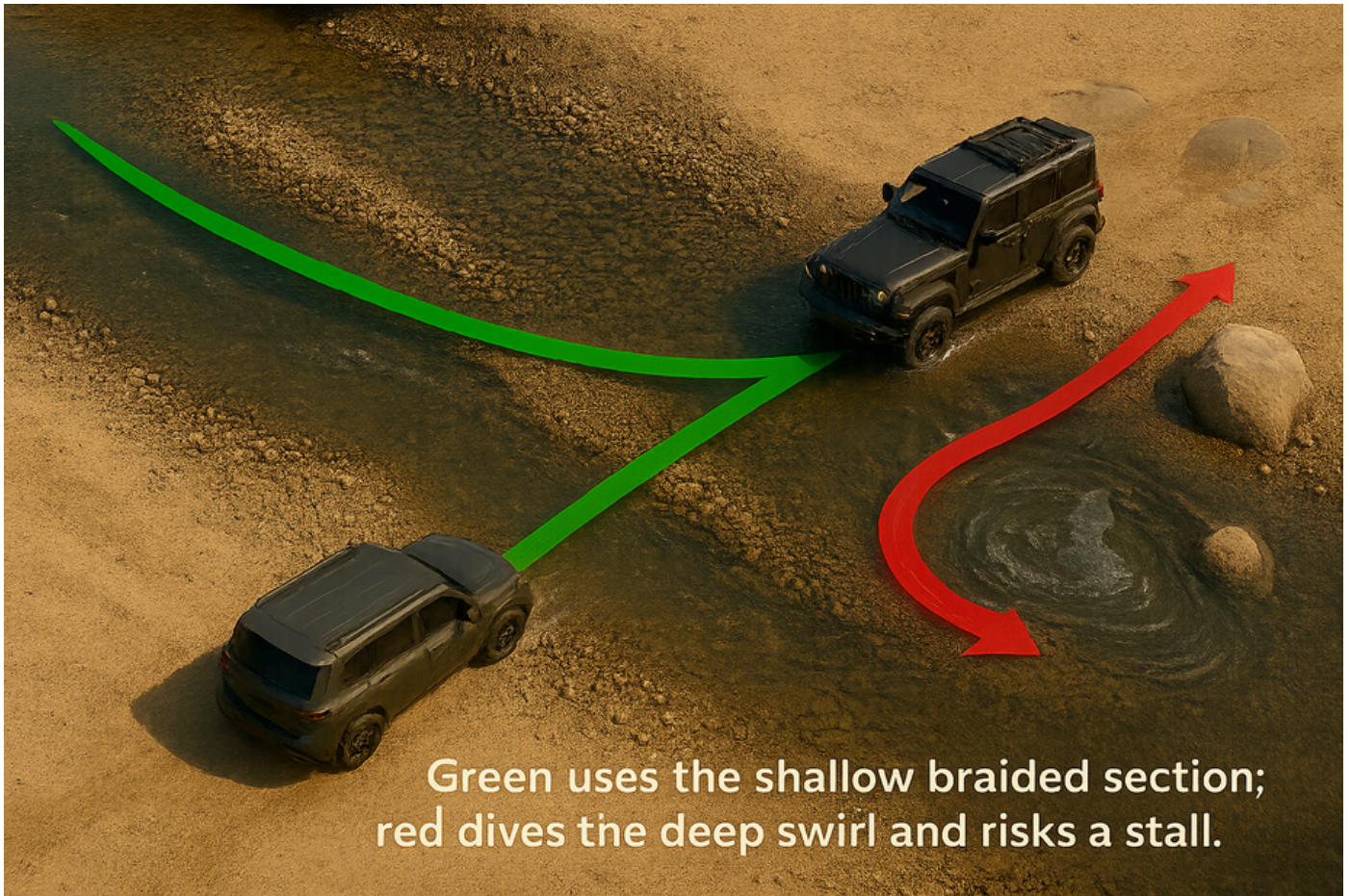
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# Water Crossings — Depth Check, Bow Wave, Drying Brakes

**Why it matters:** Water hides rocks, holes, and current. Hydro-lock an engine or float a rig and the day's over. Win with scouting, a steady bow wave, and brake drying on exit.

## 6-Step Technique

1. **Scout** — Check **depth**, bottom (**hard/soft**), **current**, and **exit**. Use a stick/wading staff; walk it only if it's safe and below knee depth.
2. **Prep** — Raise/extend **diff & t-case breathers**; verify **intake** is sealed (snorkel or stock airbox intact). Select **4L / 1st** (or manual 1st-low). Windows cracked; recovery points ready.
3. **Entry** — Roll in **slow** and build a **small bow wave** (steady 1–3 mph). Hold a constant RPM; **don't slip the clutch**.
4. **Steer Straight** — Follow the scouted line; avoid sudden inputs/wakes; cross **perpendicular** to current.
5. **Exit + Dry Brakes** — Ease up the far bank; while rolling, apply **light brake pressure** for 10–20 seconds to **dry pads/rotors**.
6. **After** — Inspect **air filter**, check **oils** (milky = water), blow out winch fairlead/line and **re-lube** as needed.



Green follows the shallow braid to a firm exit; red cuts a deep swirl and risks a stall.  
Green follows the shallow braid to a firm exit; red cuts a deep swirl and risks a stall.



# Wrong

Fast splash entry, water over hood, nose diving; driver off-line; spotter absent.

Fast splash entry, water over hood, nose diving; driver off-line; spotter absent.



# Right

Slow, straight, small bow wave; steady RPM; spotter on the far bank; driver dries brakes on exit.

Slow, straight, small bow wave; steady RPM; spotter on the far bank; driver dries brakes on exit.

# WATER CROSSINGS: 6-STEP TECHNIQUE

Quick card

- 1 **SCOUT:** Depth, base (hard/soft), current, exit. Walk it if safe.
- 2 **PREP:** Diff breathers high; intake sealed; select 4L/1st.
- 3 **ENTRY:** Slow; build a small bow wave; keep it steady.
- 4 **STEER STRAIGHT:** Avoid sudden inputs; don't siip the clutch.
- 5 **EXIT:** Gentle throttle; test brakes to dry pads.
- 6 **AFTER:** Check oils/filters; look for water ingress.

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# PART 4 – Recovery, Safety & Comms (the “oh-no” playbook)

**Why it matters:** Recoveries add load, risk, and confusion. Slow down, rig cleanly, control angles, and communicate clearly.

## Assess Before You Pull

**Goal:** Decide if and how to recover—safely.

- **1) Scene safety:** Engine off (if needed), hazards on, chock when possible, spectators behind the vehicle and well off the line path.
- **2) Load & anchor:** Estimate stuck load; choose a primary anchor with equal or higher rating (tree/vehicle/ground anchor). Use a tree-saver on live trees only.
- **3) Line path & angles:** Keep line as straight as possible; if you must redirect, use a rated pulley and keep the redirect angle  $\geq 60^\circ$  (wider = lower side load).
- **4) Gear check:** Rated soft shackles, snatch block, line dampers, gloves, recovery points (no hitch balls).
- **5) Comms plan:** One spotter in charge. Radio check. “STOP STOP STOP” is the universal emergency call.
- **6) Dampers:** Place 1–2 line dampers midway on each loaded span.

# STRAIGHT PULL

**Hardware:** Winch line, tree-saver/anchor strap, 2× soft shackles, rated recovery point, 1–2 line dampers.

## Steps

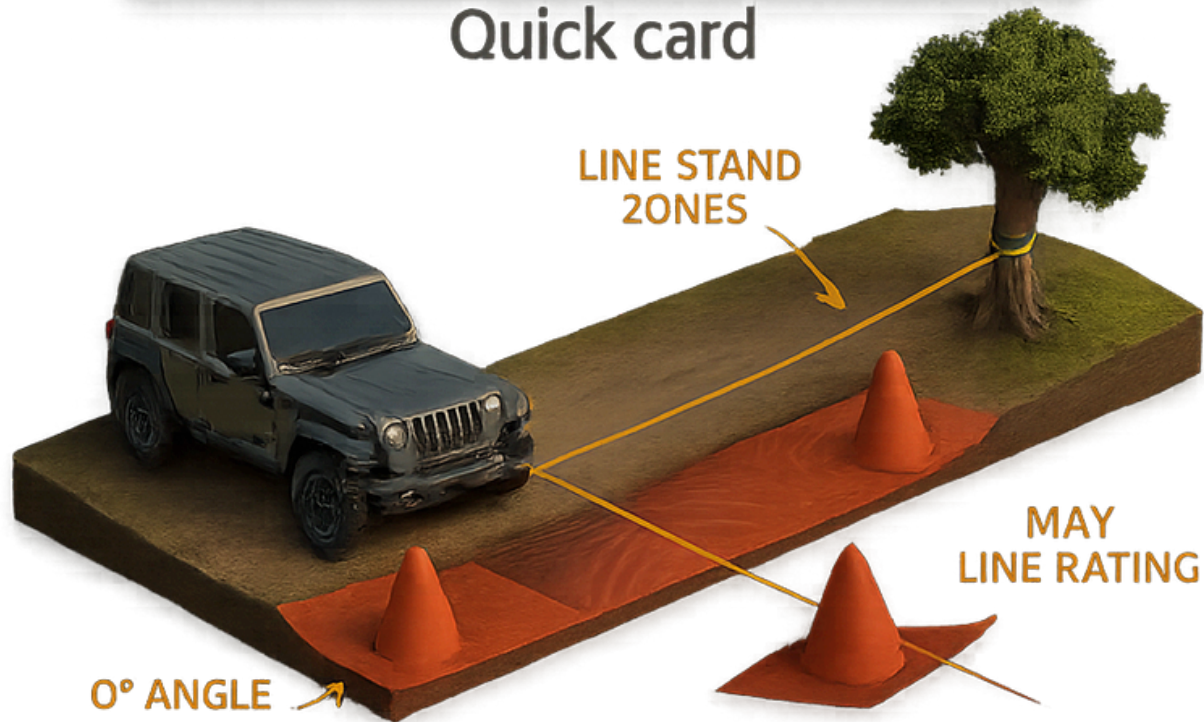
- Align recovery vehicle straight to the load.
- Wrap tree-saver low on trunk; shackle winch line to strap.
- Add damper(s); clear people from the zone.
- TAKE UP tension—inspect everything.
- CREEP PULL: smooth, no jerks.
- Secure vehicle; re-spool neatly under light load.

**Do:** Keep  $\geq 10$  wraps on drum; engine running.

**Don't:** Straddle the line or step over it.

# RIGGING RECIPE: STRAIGHT PULL

Quick card



## HARDWARE

- Winch + fairlead
- Tree-saver (wide strap)
- Soft shackle (or bow shackle)
- Line damper (x 1)
- Gloves + GMRS spotter

## DON'T

- Use hitch balls or weak points
- Step or drive over live line

## DO

- Use hoe straight ancor inline with the load
- Use tree-saver around anchor, connect with soft shackle
- Place damper at midline; clear 1,5'± line length on both sides
- Keep engine running spool under tension, check wraps
- Shock-load: no jerks

These diagrams are simplified, follow rated gear and manufacturer guidance

# DOUBLE-LINE (Mechanical Advantage)

**Hardware:** Snatch block/pulley (rated  $\geq$  line MBS), tree-saver, 3× soft shackles, 2× dampers.

## Steps

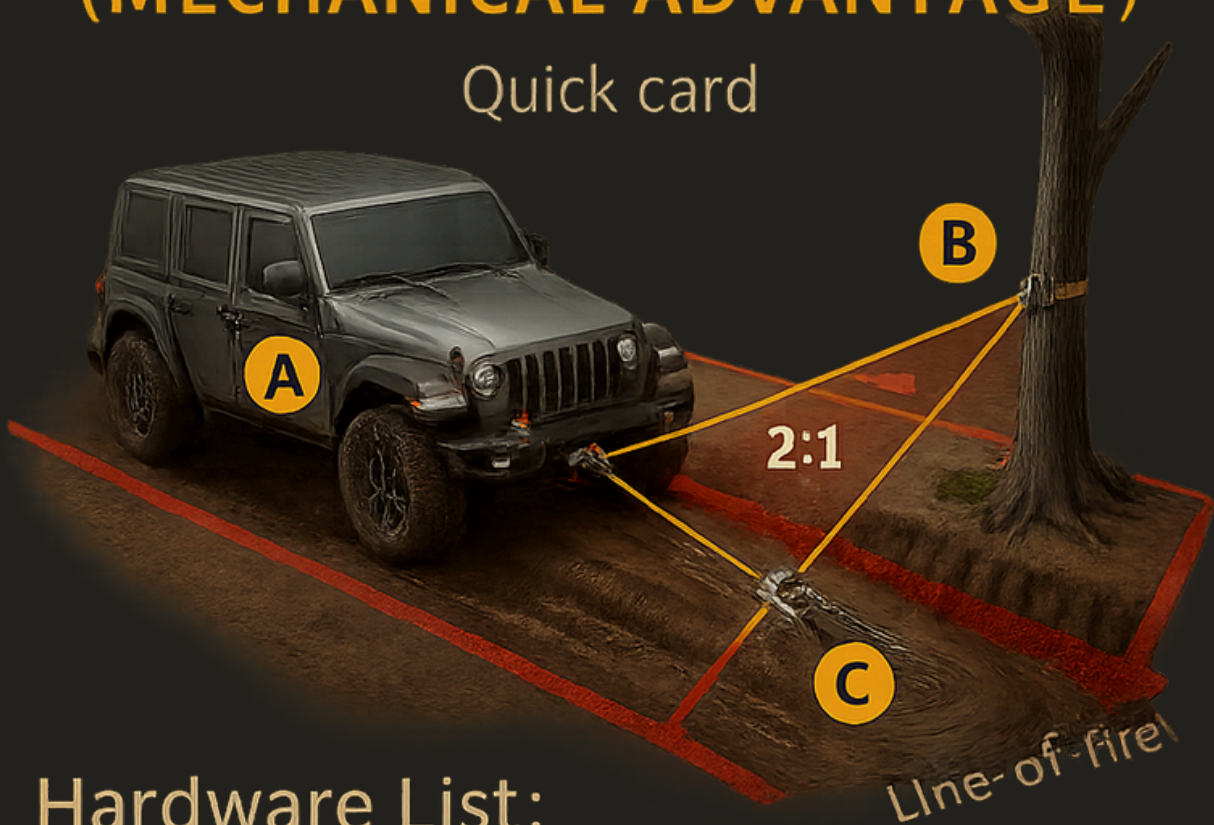
- Anchor snatch block to tree-saver.
- Line goes **winch** → **pulley** → **back to vehicle** recovery point.
- Dampers on **both** spans.
- **TAKE UP**; check for twist or side-loading.
- Pull smoothly; expect **half speed / double force**.
- Re-spool under tension when finished.

**Do:** Keep pulley and shackles **rated** for the system.

**Don't:** Let the pulley run at a sharp edge or cross the spans.

# RIGGING RECIPE: DOUBLE-LINE (MECHANICAL ADVANTAGE)

Quick card



## Hardware List:

- Winch
- Tree Saver (8-10 ft)
- Soft Shackle x2
- Snatch Block/Sheave (Rated)
- Line Damper
- Gloves

Edges; disclaimers simplified

## DO:

- Wrap low on anchor
- Damper mid-span
- Point wheels straight
- Light tension check wraps

## DON'T:

- Straddle line
- Use ball hitch
- Shock-load edge

# REDIRECT (Side Pull)

**Hardware:** Snatch block, tree-saver, 3× soft shackles, 2× dampers.

## Steps

- Place a redirect anchor to create the **widest feasible angle**.
- Route line **winch** → **pulley at redirect** → **stuck vehicle**.
- Dampers on the winch span **and** outgoing span.
- **TAKE UP**; verify anchor stability.
- Pull slow; watch pulley alignment.
- Reposition if angle narrows **<60°**.

**Do:** Use redirects to clear obstacles and keep the fairlead straight.

**Don't:** Wrap trees without a tree-saver.



# Winching Basics

- **Wraps & layers:** Always keep  $\geq 10$  wraps on the drum; lower layers carry more load.
- **Spooling:** Gloves on; use a hook strap; re-spool under tension, even side-to-side.
- **Power:** Engine on; light throttle for alternator support.
- **Hand signals (spotter):** 🖐️ STOP • 🖖 TAKE UP • 🖏 PAY OUT • 🖐️ HOLD • 🖐️/🖐️ Move Right/Left (point, then tap chest to confirm).
- **People:** One spotter only; everyone else outside the danger zones.
- **Hardware sanity:** Rated recovery points; no hitch balls.

## WINCHING BASICS: 6 QUICK RULES

- 1 **Wraps & layers:** Always keep  $\geq 10$  wraps on the drum, lower layers carry more load.
- 2 **Spooling:** Gloves on, use a hook strap; re-spool under tension, even side-side.
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- 5 **People:** One spotter only; everyone else outside the danger zones.
- 6 **Hardware sanity:** Rated recovery points; no hitch balls.

# Traction Boards & Hi-Lift

## Boards

- Clear the tire path; dig ramps.
- Boards flat, lugs toward tires; **gentle** throttle—no wheelspin.
- Leapfrog forward as needed; stow clean.

## TRACTION BOARDS



## Hi-Lift + Base

- Use a **base** on soft ground; lift from sliders/wheel points designed for jacking.
- Lift only as high as necessary to build a path; **never** place body parts under a Hi-Lifted vehicle.
- Humor tag: **“Hi-Lift: respect the bite.”**

**HI-LIFT  
+ BASE**



# Radios & Convoy



# Radios & Convoy

- **GMRS basics:** Agree on **channel + code**; short calls, no overtalk.  
Lead and Sweep roles set before rolling.
- **Spacing:** **Dust** gap on trail; **3–5 sec** on road; keep visual contact off-road.
- **Priority calls:** Anyone can call **“STOP, STOP, STOP.”**

## Radios & Convoy Basics



### **GMRS basics:**

Agree on channel + code;  
short calls, no overtalk.  
Lead & Sweep set before  
rolling.



### **Spacing:**

Dust gap on trail; 3–5 sec  
on road; keep visual contact  
off-road.



### **Priority calls:**

Anyone can call **“STOP, STOP,  
STOP.”**

## Convoy Radio Script

- **Check-in:** "Lead to convoy, radio check **GMRS 16 / code 18.**"
- **Roll-out:** "Convoy roll—order: Lead, Bravo, Charlie, Delta, **Sweep.**"
- **Hazard:** "Lead: washout right—slow to **10.**"
- **Regroup:** "Lead: hold at junction, count by callsign."
- **Emergency:** "STOP, STOP, STOP — Delta flat tire, pulling left."

## Convoy Radio Script

- Check-in:** "Lead to convoy, radio check GMRS 16 / code 18."
- Roll-out:** "Convoy roll—order: Lead, Bravo, Charlie, Delta, Sweep."
- Hazard:** "Lead: washout right—slow to 10."
- Regroup:** "Lead: hold at junction, count by callsign."
- Emergency:** "STOP, STOP, STOP — Delta flat tire, pulling left."

# PART 5 — Planning, Etiquette & Rules

**Why it matters:** Good trips are built before the key turns and radios on. Plan tight, travel light, leave places better than you found them.

## Trip Planning

### What to include

#### Route Sheet

- Start → End • Distance (mi/km) • Moving time • Fuel range needed
- Surface mix (pavement/gravel/4x4 low) • Gates/permits • Bail-outs
- Key risks (weather, water, wildfire, seasonal closures)

#### Permit & Access Checklist

- Land manager / permit # / phone
- OHV tags / flags / insurance
- Camping rules (fire, ash, pack-out)
- Cultural/environmental sensitivities
- Emergency contact logged / shared

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## WEATHER WINDOW — 3 DAYS

Fill values for each day: precip %, wind, temp spread, freezing level, streamflow not

| METRIC                 | DAY 1 (MM/DD)   | DAY 2 (MM/DD)   | DAY 3 (MM/DD)   |
|------------------------|---|---|---|
| PRECIP (%)             | —  | —  | —  |
| WIND (avg / gust)      | —  | —  | —  |
| TEMP SPREAD (low-high) | —  | —  | —  |
| FREEZING LEVEL (ft)    | —  | —  | —  |
| STREAMFLOW NOTE        | —  | —  | —  |

If two or more red flags, shift dates or re-route.

## TRIP CARD

- Date: \_\_\_\_\_ Group size / rigs: \_\_\_\_\_
- Area / Route: \_\_\_\_\_
- Meet Time & Location: \_\_\_\_\_
- Primary GPX: \_\_\_\_\_
- Bail-out GPX: \_\_\_\_\_
- Fuel Plan (miles between fuel): \_\_\_\_\_
- Water Plan (gal/person/day): \_\_\_\_\_
- Check-in Contact + Time: \_\_\_\_\_
- Radio (GMRS channel / tone): \_\_\_\_\_
- Convoy order: \_\_\_\_\_
- Notes / Closures: \_\_\_\_\_

# Trail Etiquette & Spotter Signals

## Etiquette One-Pager

- Tread Lightly: Stay on route, no bypasses; avoid wet meadows and cryptobiotic crust.
- Yield Rules: Uphill has right-of-way; bikes to horses; vehicles to both.
- Passing & Pull-outs: Communicate on GMRS; keep dust spacing; idle speeds near camps.
- Gates & Camps: Leave gates as found; quiet hours; pack out trash + micro-trash.
- Photos & Social: Don't geotag sensitive locations; no trespass content.
- Humor footer: "Spin less, smile more."

### TRAIL ETIQUETTE — QUICK GUIDE

#### Tread Lightly

- Stay on designated routes; skip illegal bypasses.
- Avoid wet meadows/cryptobiotic soil; turn around if it's a mess.
- Pack it out — including micro-trash.

#### Right of Way

- Uphill traffic has the right of way.
- Bikes yield to horses; vehicles yield to both.
- Idle near camps; dust spacing on trail.

#### Passing & Pull-Outs

- Call passes on GMRS; use turnouts.
- Keep line-of-sight; don't tailgate in dust.
- Announce group size (e.g., "2 more behind").

#### Gates, Camps & Fires

- Leave gates as found; respect private land.
- Quiet hours after dark; no light bars in camp.
- Follow fire restrictions; use ash pans where required.

#### Photos & Social

- Skip geotagging sensitive locations.
- No trespass or illegal content.
- Ask before filming others.

#### Spotter Basics

- One spotter. Everyone else: quiet.
- Standard hand signals (see poster).
- "STOP STOP STOP" is for everyone, anytime.

## Spotter Signals Poster

- **Stop** 🖐️ — palm toward driver.
- **Creep Forward** — hands together, slow rolling motion.
- **Driver/Passenger Turn** — point to headlight, sweep in direction.
- **Straighten** — palms vertical, slide inward.
- **Climb/Tire Up** — index finger circling upward.
- **Reset/Back Out** — thumb back over shoulder.
- **Engine Off / Brake** — X-arms, then palm down.
- **One Spotter Only** — caption banner: “Single voice. Everyone else: quiet.”



# Dune Flags & Local Regulations

**How to use:** Provide a summary table with common standards + blanks for local rules. Keep a bold note: "Regulations change—verify locally before you ride."

Starter rows to fill locally (leave values blank if unknown; staff can populate):

- Glamis / ISDRA (CA) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ —  
\_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_
- Oregon Dunes (OR) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_  
— \_\_\_\_\_ — \_\_\_\_\_
- Silver Lake (MI) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ —  
\_\_\_\_\_ — \_\_\_\_\_
- Little Sahara (UT) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ —  
\_\_\_\_\_ — \_\_\_\_\_
- Little Sahara (OK) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ —  
\_\_\_\_\_ — \_\_\_\_\_
- St. Anthony (ID) — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ — \_\_\_\_\_ —  
\_\_\_\_\_ — \_\_\_\_\_

## **Standards callout (top of page):**

- Daylight: day-glow orange flag at mast tip.
- Height: Top of mast above roofline; local minimum varies (fill table).
- Mount: Rear-most point of vehicle.
- Night: Whip light where required; dim in camp.



# Winching Basics (one-pager or 5×7 quick card)

- Layer Strength Matters: First wraps strongest; avoid pulling off last wrap.
- Good Wraps: Under tension, even spool, no cross-overs.
- Hardware: Rated shackles/soft shackles; tree saver; snatch block sized to line.
- Dampers & No-Stand Zones: On live line(s); nobody inside the triangle.
- Hand Signals & Comms: Spotter = single voice; standard Stop/Slack/Power-in/out.
- Aftercare: Let motor cool; re-spool tight; inspect line and hook.

**WINCHING BASICS — Quick card**

Fundamentals for safe, effective pulls

**Layer Strength Matters:**  
The first wraps are strongest. Never pull off the last wrap.

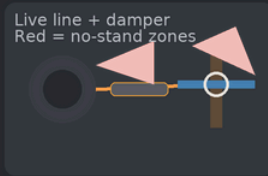
**Good Wraps:**  
Spool under tension with even, side-to-side layers—no cross-overs.

**Hardware:**  
Use rated shackles/soft shackles, a tree-saver, and a snatch block sized to your line.

**Dampers & No-Stand Zones:**  
Place dampers on live line(s). Keep people out of the triangle of force.

**Hand Signals & Comms:**  
One spotter only. Standard calls: STOP, SLACK, POWER IN/OUT.

**Aftercare:**  
Let motor cool, re-spool tight under light load, inspect rope/hook/fairlead.



Live line + damper  
Red = no-stand zones

Never use a tow ball. Keep ≥10 wraps on the drum. Everyone else: out of the line of fire.

# Traction Boards & Hi-Lift

## Left card — Traction Boards (4:5)

- Placement: Ahead of tires, seated and staggered; light throttle.
- Do/Don't: Do clear mud/snow from lugs; don't straddle a single board.
- Wear: Let cool; inspect lugs/bridges

## Right card — Hi-Lift + Base (4:5)

- Base: Use wide base on soft ground; foot under center.
- Points: Steel bumpers/rock sliders only; never under body panels.
- Hands: One hand on handle; respect the bite; keep face clear.

