



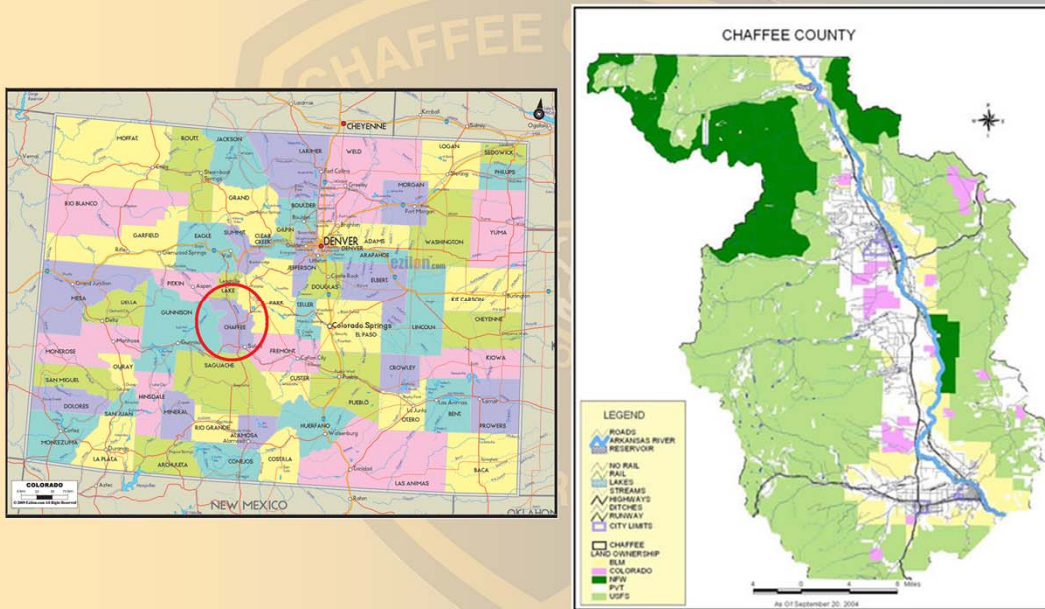
Central Colorado Humanist

Content

Where are we and why do people visit our county
Who authorizes us
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Closing

We provide medical treatment and are bound by the privacy rule of HIPAA.
We will not provide the identity nor the medical condition of those we treat.
Individual members are not to provide mission details to the media.
The sheriff's office and members specially trained in public information will provide this interface.
Both North and South teams have Face Book pages and websites that are maintained by our public information member and frequently have post about recent missions.

82% of Chaffee County Colorado is Public Land



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82% of Chaffee county is public land – lots of places to play and to search

The valley floor is private (white) and state land (magenta) and also there is some state land above the valley

Above the valley floor land that does not have timber resource is Bureau of Land Management (yellow)

Above the valley floor land that does have timber resources and also land that lies above timberline is US Forest Service (green and dark green)

Land that did not have roads or that has had it's roads closed may be designated USFS Wilderness (dark green)

With the designation of Browns Canyon National Monument along the Arkansas River in 2015 National Park Land now lies within the county (dark green)

Within the government land are numerous small in-holdings of private land. Most are old mining claims with a few still in production

Salida Lies in the SE Corner of the County



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Salida lies at the southeast corner of the Upper Arkansas River Valley where the river exits the valley (salida is Spanish for exit but it does not use the Spanish pronunciation)
The view above is from the southeast corner of the county looking northwest

Outdoor Recreation Destination

Our Chaffee County environment

- Elevation varies from 7,000 feet to 14,000 feet, typically 30 degrees colder on peaks than in the valley
- Terrain varies from Class V rapids to vertical cliffs above 14,000 feet
 - Thousands of people boating the Arkansas River each summer
 - Thousands of people climbing peaks, hiking, and mountain biking
- Weather varies from warm summer afternoons with thunderstorms to 20 below on six feet of snow in a blizzard



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Boating regulations

Commercial boats are regulated with training standards for the guide and equipment standards and in addition commercial boats are not allowed on certain sections of the river at extremely high water flow

Private boating is not regulated

14er climbing on the next slide

Average about one injured mountain biker carry out per year

Pictured rapid is Seidel's Suckhole class IV V

Pictured mountain in center is Shavano 14,235

Notice the snow inside the circle forming the Angel of Shavano – a part of our insignia

Peak Bagging

Sawatch Range	Best Est: 95,500
Mount Elbert	20,000-25,000*
Mount Massive	7,000-10,000
Mount Harvard	5,000-7,000
La Plata Peak	5,000-7,000*
Mount Antero	3,000-5,000
Mount Shavano	5,000-7,000
Tabogauche Peak	
Mount Belford	7,000-10,000
Mount Oxford	
Mount Princeton	7,000-10,000*
Mount Yale	7,000-10,000
Mount Columbia	3,000-5,000
Missouri Mountain	5,000-7,000
Mt. of the Holy Cross	5,000-7,000
Huron Peak	7,000-10,000*

Elbert, Massive, and Holy Cross
are in Lake County

Chaffee County has twelve peaks over 14,000 ft – the most of any Colorado county

- 66,000 climbs per year in the county, rescue 1 out of 2,000
- The majority of our rescues are lost or injured people climbing these peaks
 - May take an hour to drive to a trail head
 - Three hours to carry a wheeled litter to the subject
 - Five hours to carry subject to trailhead
 - Off trail night searches for the lost

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There are about 54 or 58 recognized 14,000 foot peaks in Colorado

People from all over the country come to Colorado to climb the peaks

Climbing routes are rated Class 1 to 5.14

Class 1 is a trail that does not require the use of hands

Class 2 may require the use of hands for balance

Class 3 requires the use of hands to cling to the rock but not for propulsion

Class 4 requires the use of hands for propulsion, safety ropes recommended

Class 5 technical climbing

Some climbers take the easiest route but others seek more difficult routes

Some accidently wonder off of the recommended route or leave the route to expedite returning to tree line during lightning storms

All twelve 14ers in our county have class 2 routes

Our peaks have low trailheads requiring more than 4,000 vertical feet to the summit – 8 to 12 hour round trip times are common

Other counties have class 3 and 4 and are often called upon to perform searches and rescues in difficult terrain on technical routes

The statewide economic impact of hiking Colorado 14ers in 2021 was \$82.2 million based on past 14er hiking use expenditure studies

Based on 12 peaks in Chaffee county that is \$18.3 million for the county

Colorado Search and Rescue

By Colorado law each county's sheriff is responsible for SAR in the county

3,600 search and rescue missions in Colorado in 2020

- More than any other state

Each county has one or more SAR organizations

- Members are unpaid volunteers
- Members, while on duty, are covered by the county's medical insurance and worker's compensation
- 54 backcountry SAR teams statewide

When to call out SAR

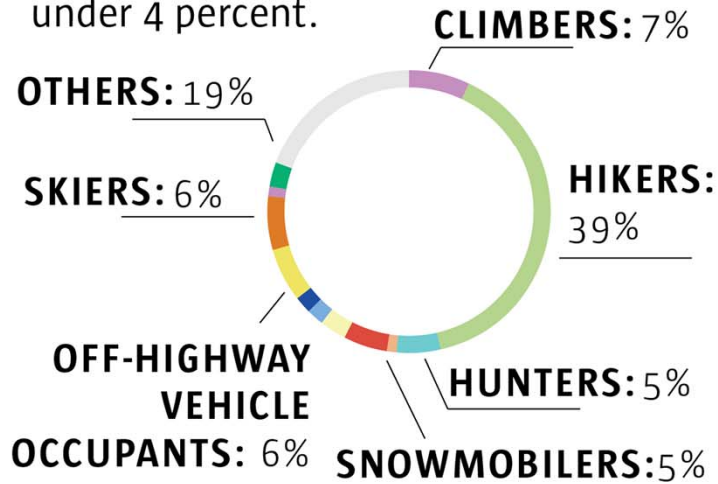
- To go where the sheriff's vehicles cannot go
 - Off-road vehicles or on foot
- Specialized skills and equipment
 - High angle ropes, avalanche, swiftwater, drone
- Need for additional personnel



Colorado Search and Rescue Mission Activity

2016 SAR missions

Incidents involving campers, horseback riders, water enthusiasts, bicyclists and anglers were each under 4 percent.



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Last year statewide statistics were published online

Mission Reports 2016 - 2022



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Before the middle of 2018 mission reports were only created if the mission qualified for team financial reimbursement from the state for equipment expended. This would be for subjects with a state license such as fishing, hunting, OHV or a COSAR card.

An average of 26 missions per year.

Although not reported as missions the team will deploy at events

- Render aid to mountain bike and foot racers on mountain trails

- Receive donations for deploying medical teams at races

- Throw ropes to recover Hooligan racers and their craft

- The last race may be a radio call of more than a dozen craft and 80+ riders

Missions Per Month 2016 - 2022



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70% of missions occur during the four warm months of June, July, August, and September when the most number of people are recreating in the outdoors.

December Night Mission



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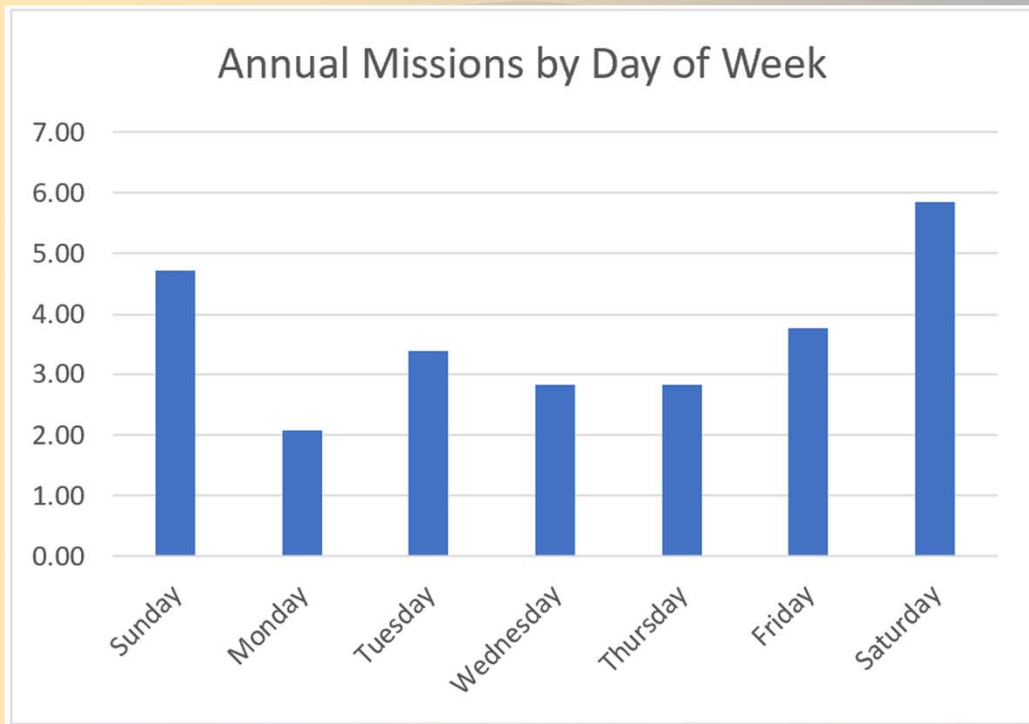
Photo is of a meet up online, split up, on mountain search

Non standard route, off trail ascent on snowshoes, with snow storm in the forecast

Parties summited Shavano at 3PM, one lady wanted to return to trailhead other lady went to Tabeguache and did not find first lady when she returned at 10 PM to where they left their snowshoes

Followed tracks in snow crossing Colorado Trail for two hours and found missing lady at 3AM

Mission by Day of Week 2016 - 2022



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40% of missions occur on the weekends when more people have time off to recreate.

Missions by Starting Hour 2016 - 2022



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Noon to 8PM is the most likely time for the team to be called out with 2PM the most likely.

Missions by Operational Hour 2016 - 2022



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Three in the afternoon is the most likely time for the team to be deployed. However, one third of our deployed time is done under a headlamp and while most people would prefer to be sleeping.

Missouri Mountain Night Mission



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Photo is of an all night carry out on Missouri Mountain from 13,300 feet of a 195 lb subject with an injured knee

- Three hour hike up with equipment and five hour carry down

- Numerous running creek crossings

- Three people on each side of the wheeled litter, two on front and one on back with the brake handle

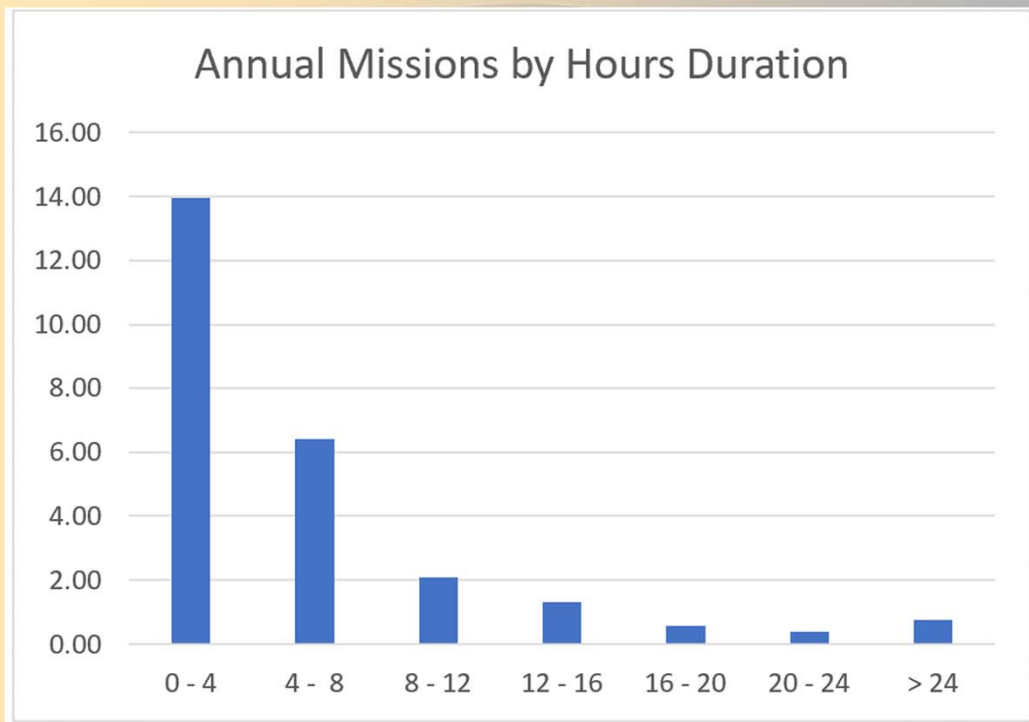
 - Rotate out with others who are clearing the trail of large rocks and limbs

- North Chaffee as command with mutual aid from Chaffee South and Lake county

- Chaffee EMS provided medical assessment, IV and pain medication

- Medical helicopter unable to respond due to thunderstorms in the area

Missions by Hours Duration 2016 - 2022



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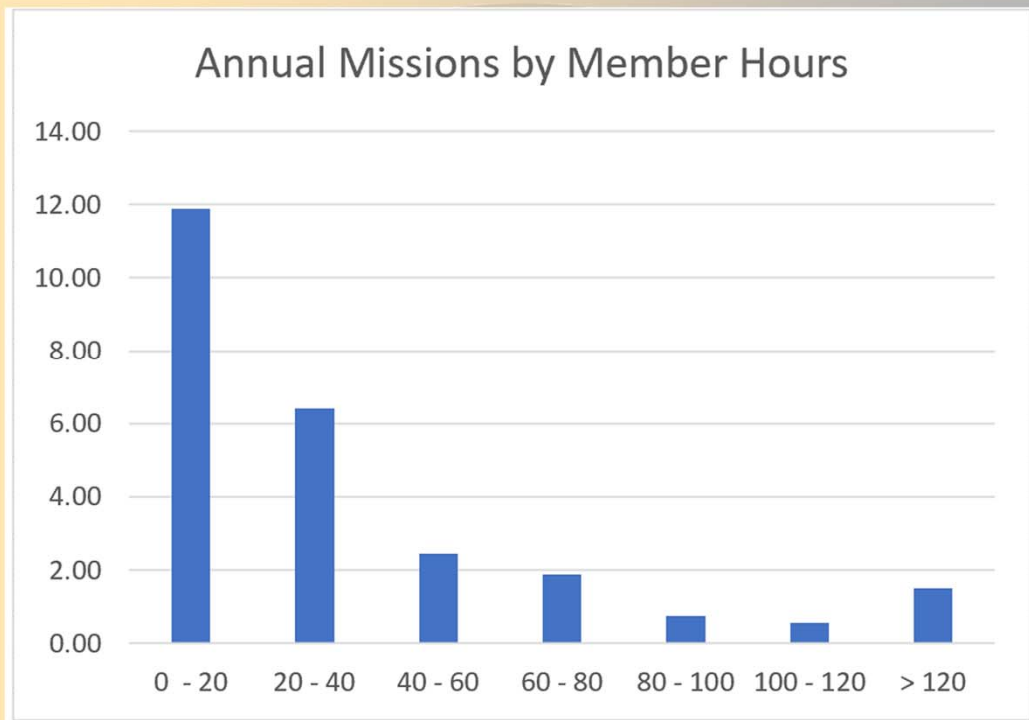
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50% of our missions can be concluded in under 4 hours but about one a year will require multiple days.

20% of the missions require more than 8 hours and can be very fatiguing on members if they cannot be relieved by fresh members.

Missions by Member Hours 2016 - 2022



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45% of missions can be completed with less than 20 member hours but a couple of missions a year require more than a 100 hours.

Value of Volunteer Labor

On-call labor is harder to source than working a set shift

- Paying people to be on call awaiting a call out like fire fighters could increase the labor cost to many times the time spent responding

Annual time invested by SAR South volunteers

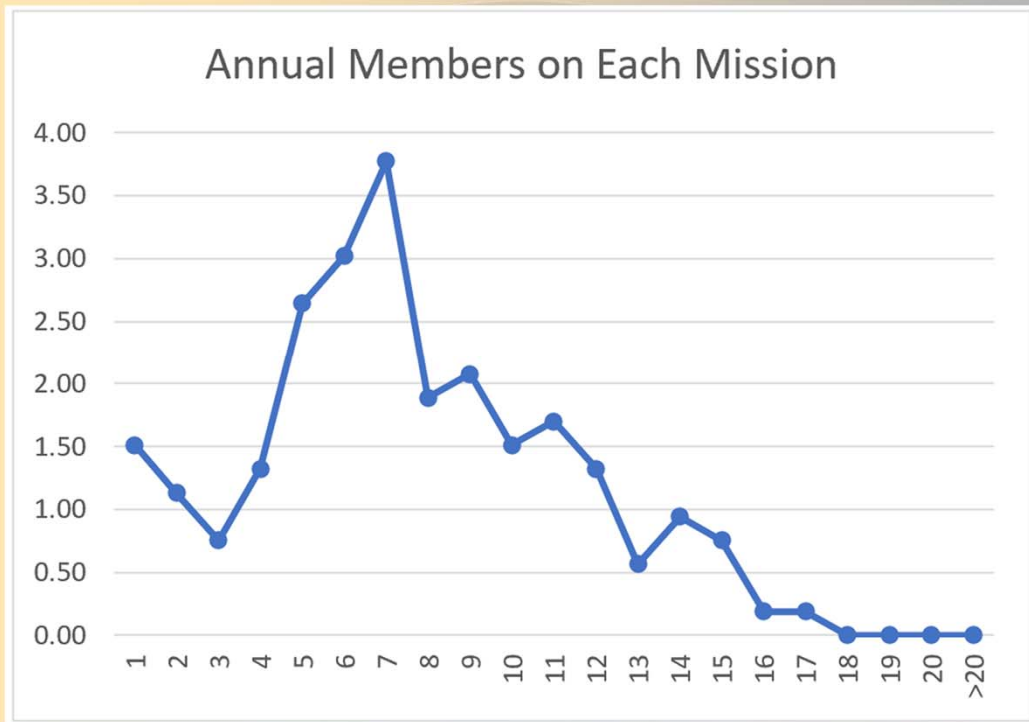
- Mission time of a little over 1,000 hours a year
- Training and meetings 1,500 hours a year
- Fund raising and community outreach 800 hours a year

Assume a firefighters wage of \$45,000 per year

- Time on missions - \$22,500
- Training and meetings - \$33,750
- Fund raising and outreach - \$18,000
- Total of \$74,200 a year if just counting time on task and no employee benefits

So for every dollar donated to SAR four dollars of labor is volunteered

Members on Mission 2016 - 2022



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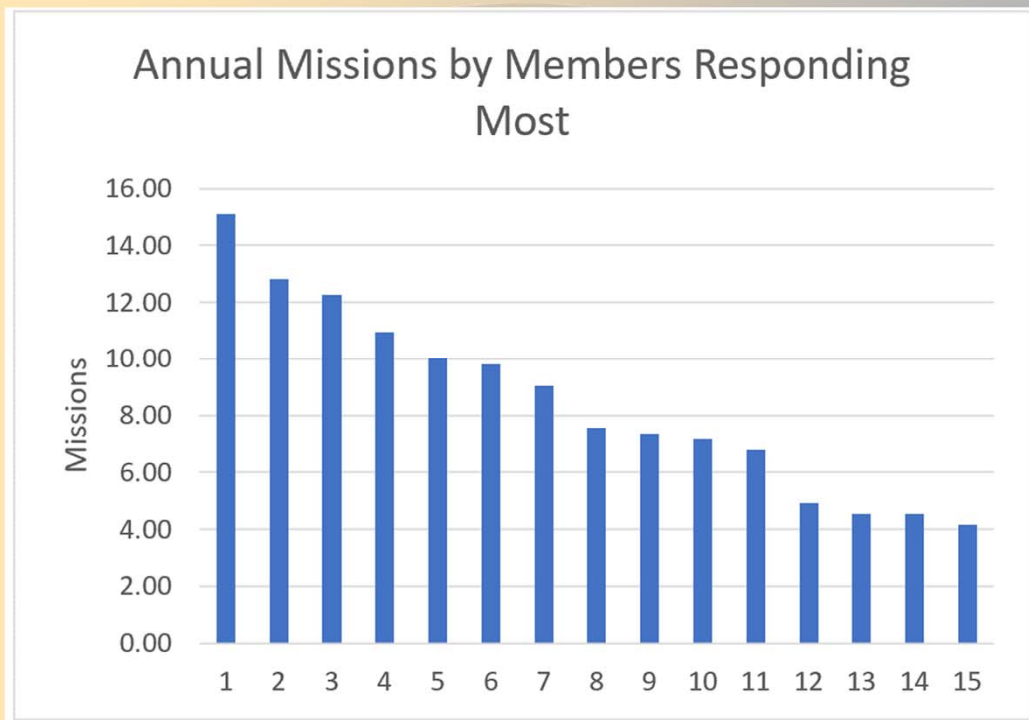
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A typical mission turn-out over the seven years is 5 to 9 members. This has increased in recent years as membership has increased.

Conditions that limit turnout are: Members unable to leave work, adverse weather, wee hours of the morning.

Conditions that may increase turnout are: Knowing that the mission will require a lot of members for a response such as a large search or a carryout.

Members Responding Most 2016 - 2022



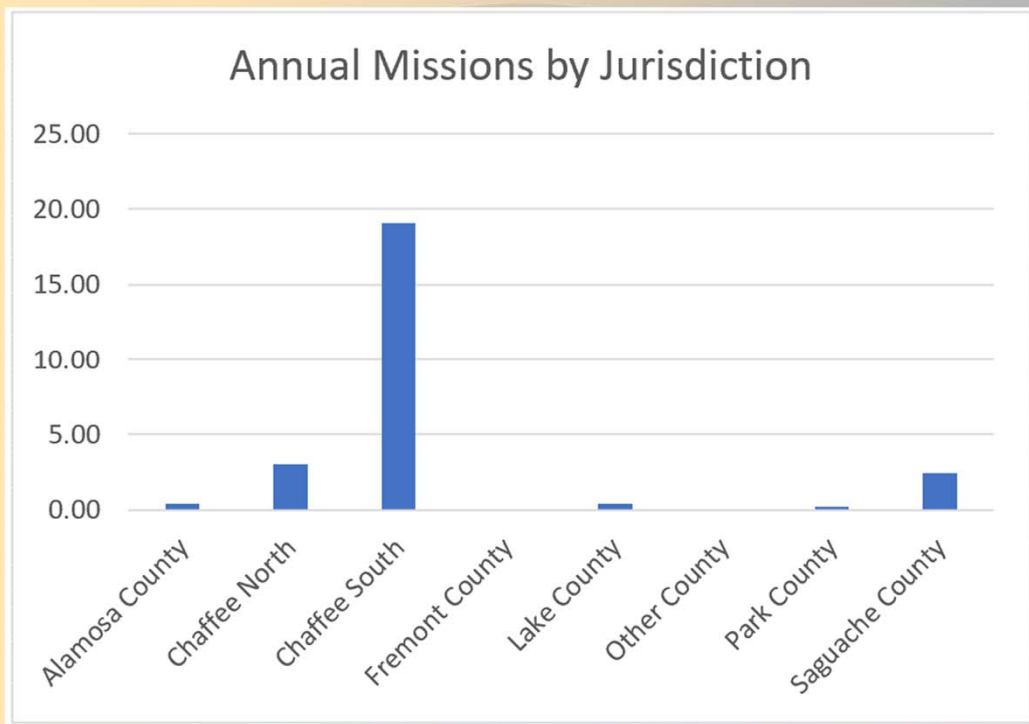
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Have you ever heard that in volunteer organizations 90% of the work is done by 10% of the members? SAR requires team work and often a lot of manpower. Perhaps, 70% of the mission work is done by 30% of the members.

Missions by Jurisdiction 2016 - 2022



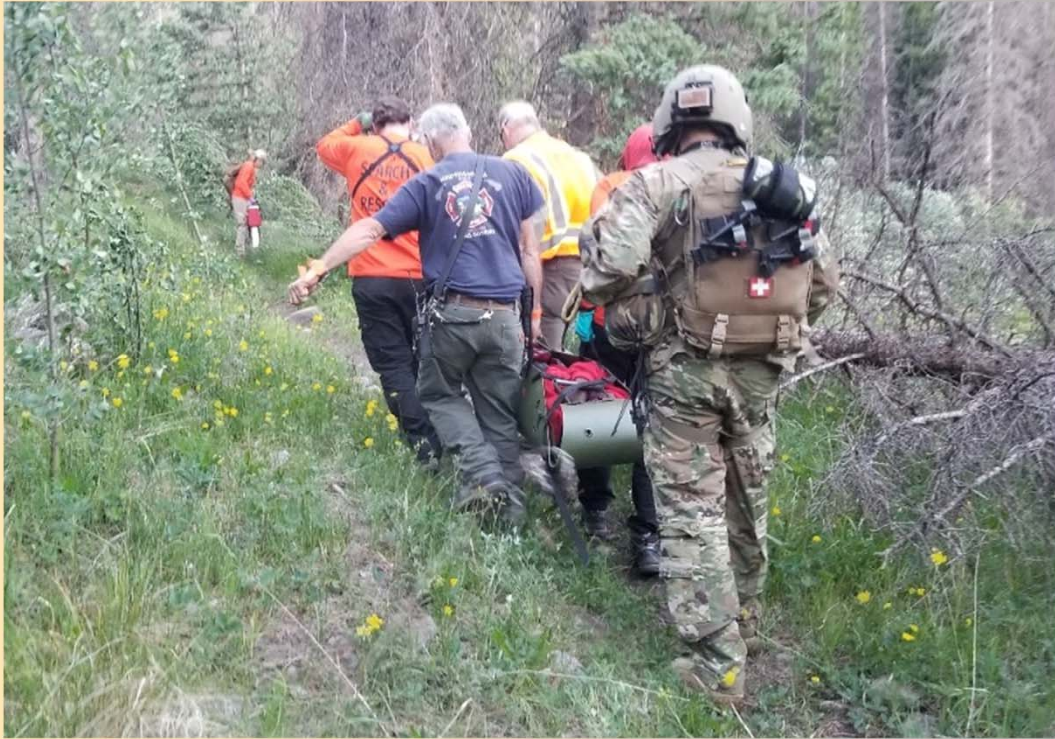
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30% of SAR South missions are done outside of the south end of the county. About three missions a year we assist Chaffee North (they assist us about same number) and about three missions a year we assist Saguache County who has a small team.

Saguache Carry to Clearing for Helo Hoist



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Photo is of military litter carry to an opening where the Black Hawk can do a cable lift

Saguache Black Hawk Hoist



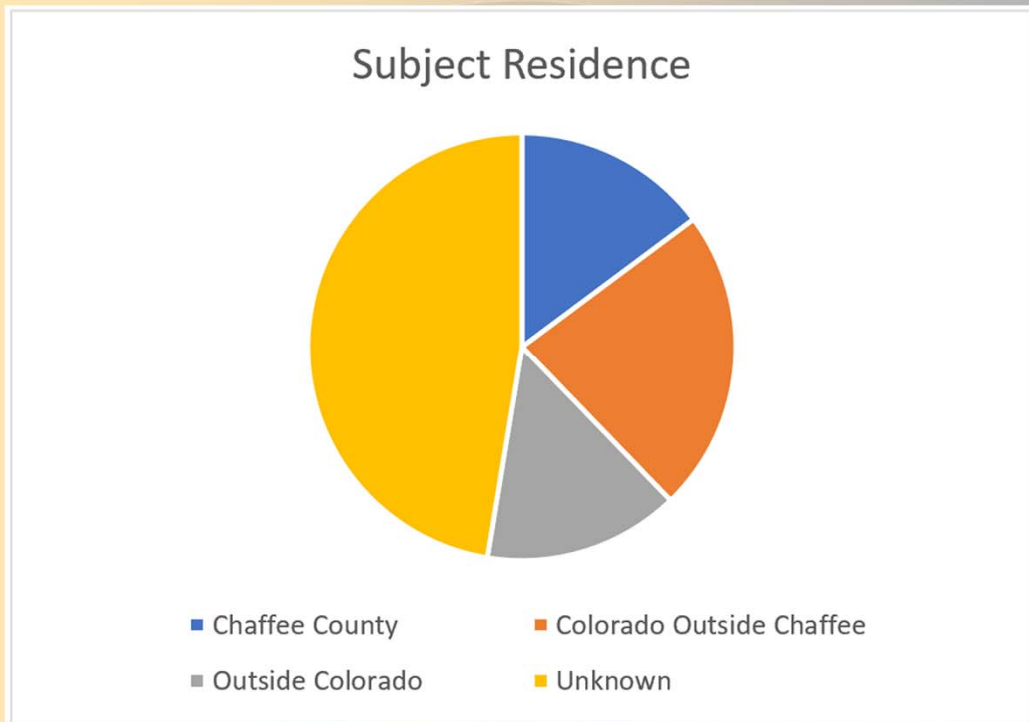
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The Sargent and the military litter rode the cable down in a nearby clearing
The Black Hawk left the area to reduce noise and rotor wash
The Sargent and the subject rode the cable back up
The helicopter delivered the subject to a hospital

Subject Residence 2016 - 2022



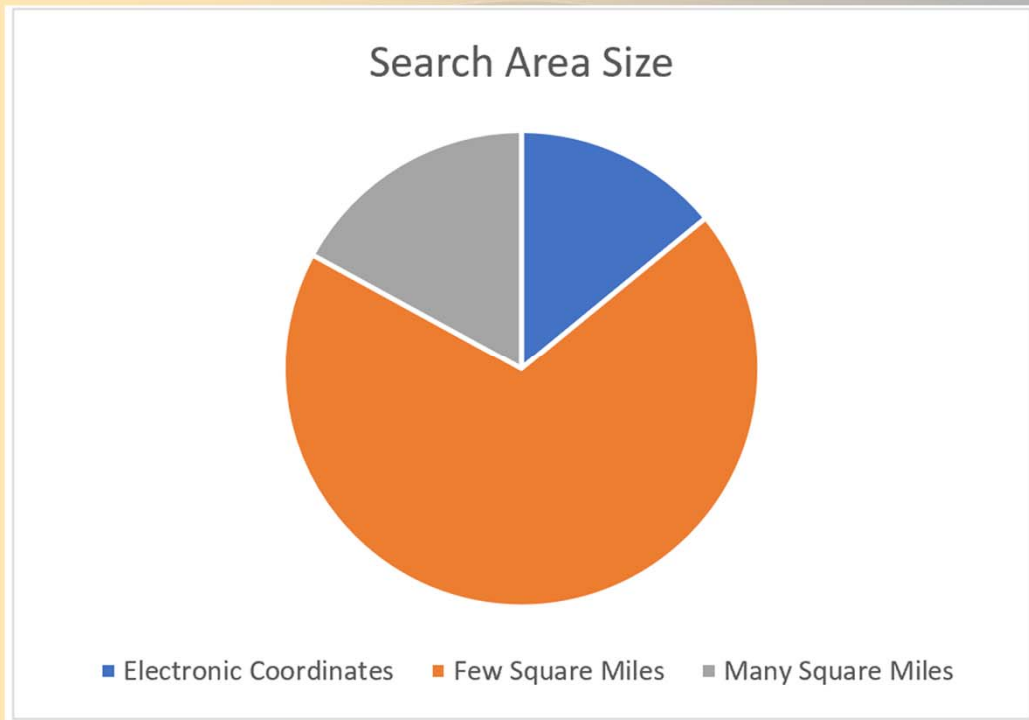
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About half of the time we do not have a record of the residence of the subject
Half of the known residences are Colorado outside Chaffee County. A quarter each of the know
residences are Chaffee County and out of state.

Search Area Size 2016 - 2022



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Most missions are limited to less than a few square miles of area to search and the majority of these are less than a square mile.

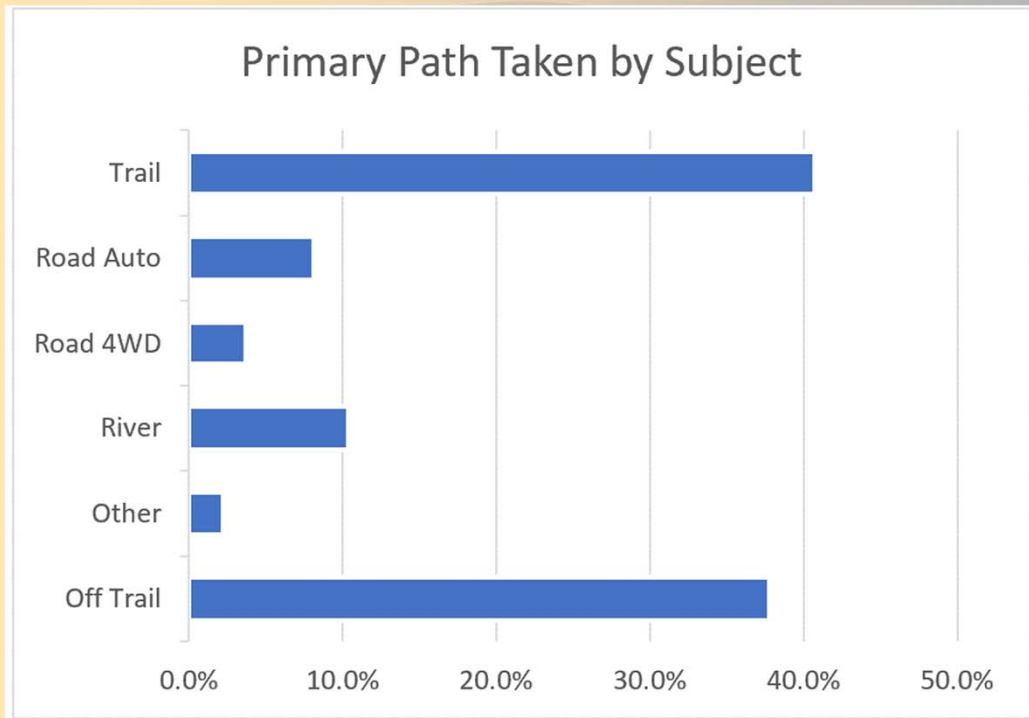
Cell phones without a GPS, that are able to receive more than one cell tower, can normally provide a fix of better than a fraction of a mile. Phones with a GPS can be accurate to within a few feet.

Satellite texting devices all have GPS and can be accurate to within a few feet.

In the next few years most cell phones may have the ability to send text messages through satellites.

A fraction of the missions have search areas covering many square miles and may consume a large number of resources for a long time. Giving a detailed description, preferably written, of your planned activity to a responsible party can narrow the search area and allow us to find you sooner.

Path Taken by Subject 2016 - 2022



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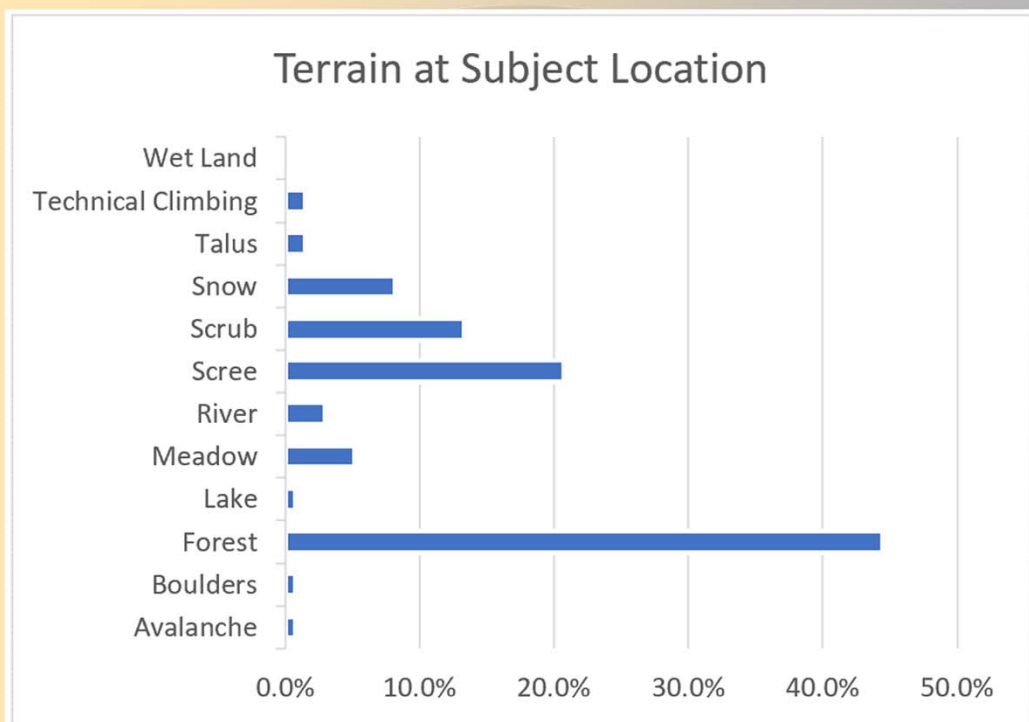
Most subjects needing our services are on a trail reducing our time to respond to them.

A third of the time we must travel off trail to reach our subject, often in the dark because many do not think they need help until night approaches.

10% of our missions are to assist boaters who have become separated from their boat, stopped because of darkness, or attempted a trip with insufficient water flow.

We retrieve people with vehicles stuck in the snow, have a flat with no spare, or other breakdowns.

Terrain at Subject Location 2016 - 2022



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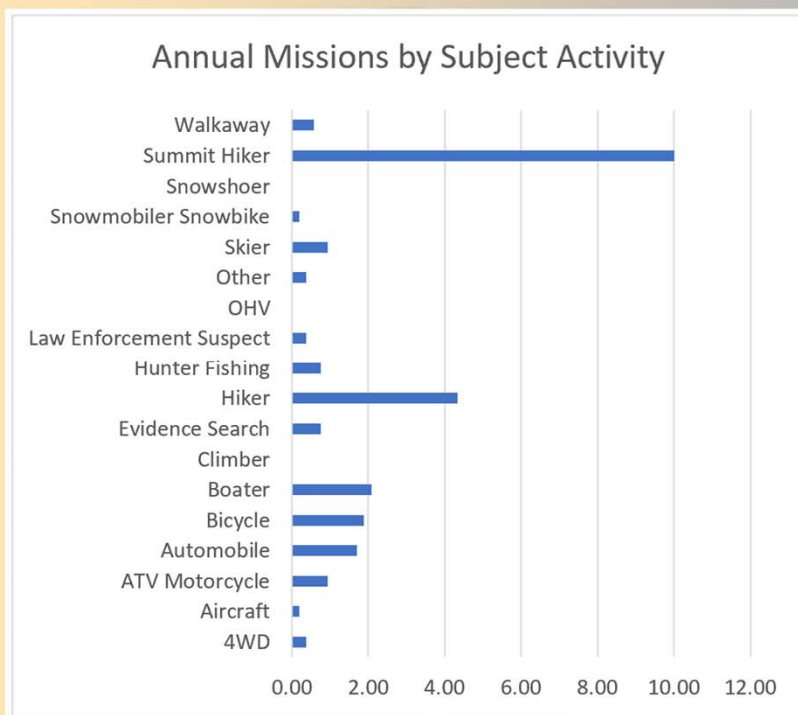
Most of the time subjects are found among the trees.

20% of the time they are found in loose rock above timberline – we wear helmets for these.

A couple of missions a year occur on snow.

Responding to an avalanche burial puts rescuers at risk. We have special protocols in place to assess if it is safe for a team to enter an avalanche area.

Missions by Subject Activity 2016 - 2022



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40% of our missions are responding to summit hikers. Rarely is this anyone intentionally attempting a technical route. But occasionally our rescue does involve our technical ropes team.

About 4 missions a year involve hikers not attempting a peak.

A couple of missions a year involve boaters and a couple of missions a year involve injured mountain bikers.

A couple of mission a year are to stranded motorist.

Our annual ATV/motorcycle mission usually involves a roll over or a missed high speed turn followed by a ride in an ambulance.

Our annual backcountry skier is usually injured.

Our annual hunter is usually injured but occasionally a non GPS savvy one will become lost.

The other activities are rare but they do happen every few years: Snowmobile, law enforcement suspect search with drone, evidence search, downed aircraft, 4WD vehicle.

Sked Carry (sled) Out

Skier broke leg at 14,000 feet just before snow storm

- Helicopter transport to mountain top just before storm began
- Place subject in sked and lower by ropes to valley
- Pull sked four miles to trail head
- All night mission – back to trail head mid morning



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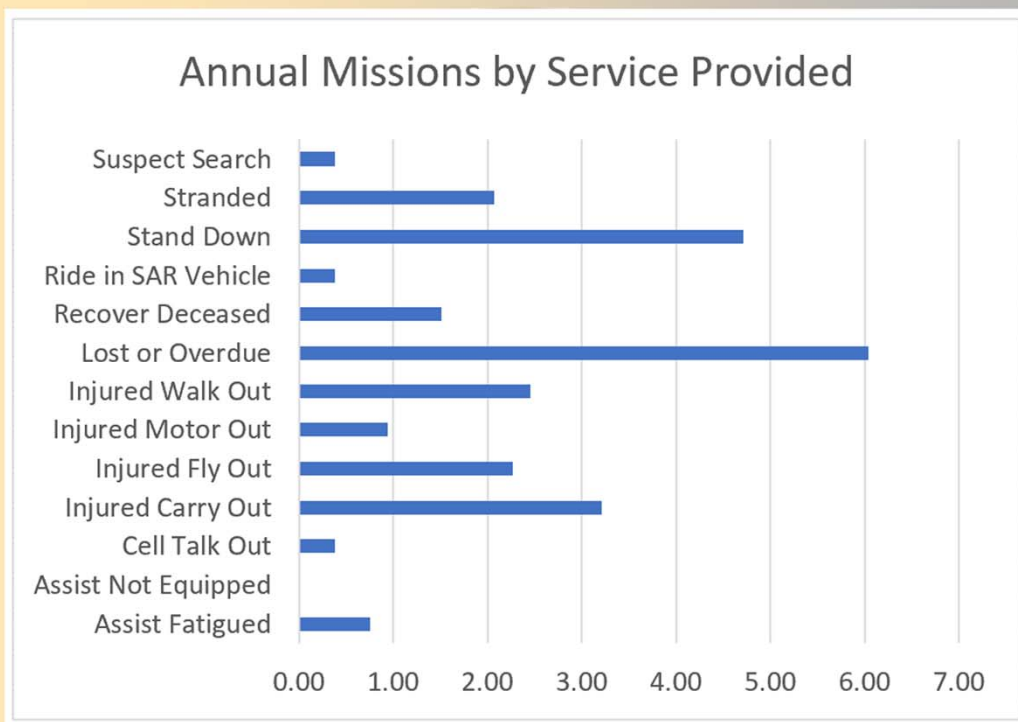
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Photo shows team pulling a sled containing a backcountry skier who broke his leg near the summit of a 14er

Both snowshoes and back-country (cross-country) skis are used for snow travel

Missions by Service Provided 2016 - 2022



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Our largest service provided category is searching for the lost or overdue which accounts for 25% of our missions.

Several each year are overdue hikers and climbers that had not checked in recently with family and friends

Often the result of a dead cell phone battery or no cell phone coverage

Many subjects surprised when we find them because they are not in need of assistance – deputy talks to them about being more precise in establishing deadlines for family or friends to call for help

Afternoon thunderstorms can pin down climbers above timberline, who started late in the morning or are slow, they may not have rain gear, and may be out of water and snacks

Often they leave trail and run down the mountain to drainages without trails that contain impassable cliffs or large areas of fallen timber

Not uncommon for our over 50+ age members to hike up to a 20 year old and escort them out – many older members remain in incredibly good shape and are fast hikers and climbers

A little over three times a year we will carry out an injured subject.

A little over twice a year the subject is flown out in a medical helicopter.

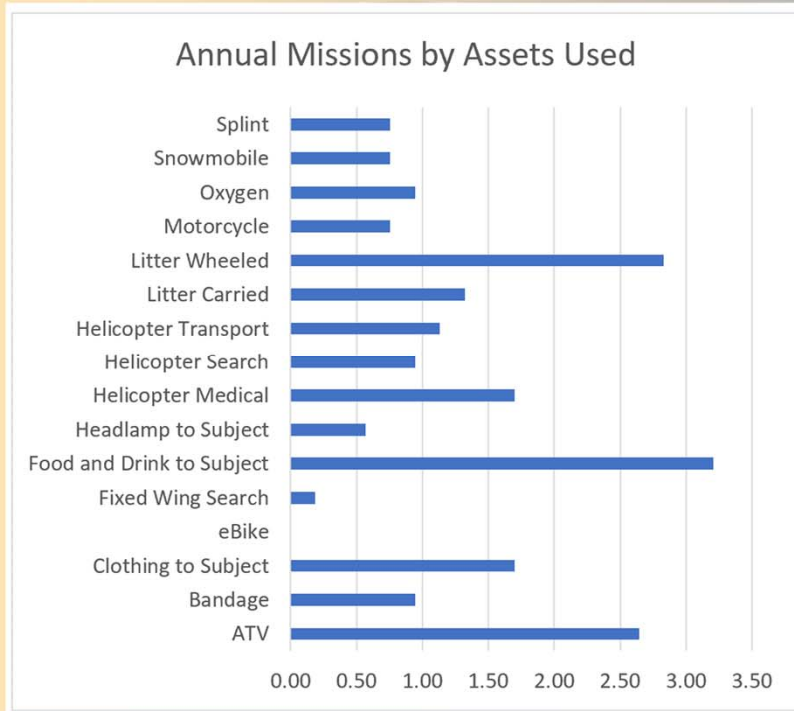
Two or three injured subjects a year that pass the “road test” are walked out with a shoulder or two of ours to steady them. Or put a climbing harness on them and one member on either side puts a hand in the harness and provides lift as they walk, usually hopping on the good leg.

Once or twice a year we are able to get a SAR vehicle or an ATV to a subject to give them a ride out on the back seat or in our patient trailer.

Once or twice a year we recover a deceased subject to the county corner. Must get corner’s permission to move a body.

And every other year we have the easiest mission of all. The Incident Commander interprets the coordinates from the cell phone and gives the subject directions, often progressively over time.

Missions by Assets Used 2016 - 2022



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Many people underestimate the time to climb a peak and we provide them food and water before we lead them out. Caffeine, chocolate, and high carb snacks help people you find at 3AM make it to the trailhead. It is also common for us to carry extra clothing for the subjects on night and winter missions. Sometimes we get called out just to provide a light to someone who did not bring one. Two thirds of the time when we need to carry someone we can use the wheeled litter which is faster and less strenuous than a hand carry.

The team has 4 ATVs, 2 trail motorcycles, and 2 eBikes that can be used for search and member transport. Two of the ATVs can seat two and be used to transport a subject. The eBikes are new and our mountain bike riding members are eager to take them on a mission. The team has two snowmobiles that can be used to rescue people with vehicles stuck in the snow or injured near a snow trail.

We can administer oxygen, split broken bones, and bandage cuts and abrasions. We have some carbon fiber oxygen tanks to cut the weight in half to speed the carry up the mountain.

Orion Trailer



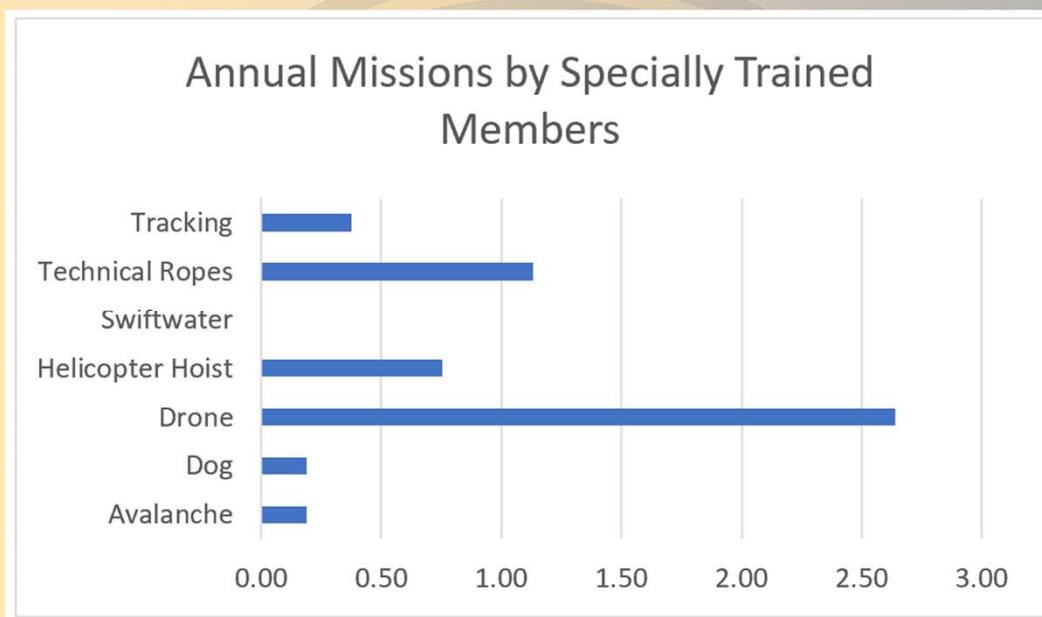
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Photo is of Orion trailer heading up to transport injured mountain biker from Salida Mountain Trails

Missions by Specially Trained 2016 - 2022



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Some members of the team receive special training and vetting to become members of specialty teams.

We rely on teams from other counties to provide tracking and dog resources. Trackers can locate a track near the subjects car and follow them. Dogs can be trained for air scent or ground scent tracking after smelling a vehicle or object from the subject as well as for cadaver searches.

Our drones are flow about three missions a year.

Our technical rope team can extract mobile or non ambulatory subjects from technical terrain. It is not uncommon for off trail hikers to get “cliffed out” and not be able to descend or go back up the way they came down. McCoy Gulch to the south of the Shavano – Tabegauche ridge gets a lot of repeat business from this team.

Helicopter hoist is provided by the Army in Black Hawk or Lakota helicopters. Three SAR teams in the state have undergone special training to ride the hoist down to the subject, treat and package them, and ride back up with them. No charge for this service.

We have members trained and certified in swiftwater rescue. The AHRA rangers deploy more quickly from their headquarters than we can and also the fire department is qualified for this work and deploys more quickly than we do. We do work along the river during searches and it is good to know we have members trained in swiftwater rescue if we need them while we are deployed.

COSAR

Colorado Outdoor Recreation Search and Rescue

No charge to rescued parties by SAR

- Medical helicopter and ambulance will charge if they provide medical treatment or transport subject
- Military and state aircraft do not charge

COSAR will reimburse SAR for expenses if subject has a card

- Included in fishing and hunting licenses, and off-road vehicle permit
- Others can purchase one year for \$3, or five years for \$12
- Not an insurance card – everyone will be rescued without cost even if they do not have a card



In Colorado may charge to rescue skiers who have gone out of bounds

Chaffee County SAR - South

SAR South is responsible for the south half of the county

- South has about 26 missions a year with North having about 50

SAR South is a non-profit 501.c3 organization

- County provides building, utilities, and fuel for vehicles
- Typical \$18,000 annual operating cost, extra for large purchases
- Donations by individuals, organizations, and companies
- Annual car show sponsors are largest funding source
- Grants from public and private organizations



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Salida sits near the south edge of the county and Buena Vista is more near the center. Browns Creek is about an equal distance between the two and is the normal division dispatch uses to assign missions to the two teams. This makes North responsible for more of the county. Saving lives in the mountains is in the hands of volunteers funded by donations. The dedication of the members to training, going out on missions, and soliciting donations makes it work.

Call To Service

911 Dispatch is used to summon SAR

Dispatch contacts Sheriff or Undersheriff to discuss need for SAR

- Consultation with SAR IC may occur to determine to call-out SAR
- 911 dispatch will activate IC members phone app with text message
 - SAR IC member will follow the dispatch message with more details in a phone text and email message to all members

Members report to the SAR building

- Members arriving after the SAR vehicles have departed will find a board describing location to drive to in the remaining SAR vehicles or their personal vehicles
- Members may remain in the bay to act as command
- Members are assigned to teams and each team has a satellite tracker to send their location each 10 minutes
 - Team locations are tracked on a digital map at the bay
 - All members have a phone app to see the same map on their cell phones when in cell phone coverage

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Phone 911

Subject may call directly on cell phone

Other people may call from the scene or the nearest place their phone worked

May be overdue and reported by a party that they arranged to call dispatch if they did not report in by a designated time

EMS may be dispatched based on level of medical treatment expected

Since they are on call at their bay they may depart before us

Dispatch will ask questions from a checklist

If you are part of a party needing assistance and are sending someone to get help give them details about where you are, your level of preparedness and what services you need

SAR will call subject or reporting party if they have phone coverage and ask more questions, give them time estimates of our arrival, and provide advice

Satellite texting devices and personal locator beacons when activated in an emergency are received by a national call center

The call center will call the county sheriff provide the coordinates, device registration, and will link us to the text communication

IC is Incident Command

About eight members have been trained to serve as Incident Command

IC team members sign up for days of the month to be available to immediately respond to a dispatch and call out the team

I am Responding software is used on cell phones

Distinctive sound when incident message is received

Can reply with estimated arrival time at bay

Can see members cell phone location on map

Member Provided Personal Equipment (1)

Go-pack contents are packed and ready to go

- 24 hours food and water
 - Water filter in summer, stove to melt snow and thaw water in winter
- Layers of clothing for 35 degree colder night than day, and storms
 - All synthetic clothing to provide warmth when wet – cotton kills
 - Spare dry socks and gloves
- Sleeping bag rated for season, insulated pad, and bivy for overnight
- Headlamp good for all night
- Personal medical kit
- Tubular webbing, harness, rope and hardware
- Map, GPS, compass and loud whistle
- Fire starting tools and knife
- Spare batteries for headlamp and GPS
- Rescue blanket and/or tarp
- Numerous other smaller items

You may not need all of this equipment for your hikes but having it and knowing how to use it could eliminate most of our non injury rescues

Look online for the hiking ten essentials – read a few as they vary in their top ten items

Member Provided Personal Equipment (2)

Pack weight varies from 25 lbs in summer to 40 lbs in winter

In addition, members may need to carry mission specific equipment

- Half of a break down litter, oxygen, medical kits
- 300 foot climbing rope, hardware and webbing



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SAR Provided Equipment (1)

SAR equipment is acquired by donations and grants

On-Road Motorized Transportation

- Vehicles have lights and sirens
- Vehicles have VHF and 800 MHz trunked mobile radios
- Three four wheel drive, four passenger trucks
 - Numerous compartments containing equipment
 - Pull trailers with ATVs, snowmobiles, and equipment
- One SUV



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SAR Provided Equipment (2)

Off-Road Motorized Transportation

- Only allowed into designated wilderness to the extent necessary to save a life
- Four two-person 4WD ATVs
 - Small trailer to transport injured person and equipment behind ATV
- Sold the motorcycles
- Two snowmobiles
 - Sled to transport injured person and equipment behind snowmobile



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SAR Provided Equipment (3)



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Clockwise from top left

Snowmobiles in enclosed trailer

Rokon 5 hp two wheel drive motorcycle with trailer hitch

Orange sled for human pull, brown sled for pull by snowmobile

Blazer – litter and other tools on top along with more equipment inside

Orien trailer for tow behind ATV or Rokon

SAR Provided Equipment (4)

Human Powered Transportation

- Hand carry stretchers
- Stretcher with a mountain bike tire and brake
- Winter sleds
- 300 foot coils of rope with pulleys, brakes, carabiners, etc.



Wheeled Litter Being Carried In

One person carries the litter and one carries the wheel

To cross the log bridge with the subject

- Remove the wheel and slide the litter over the logs
- One person on each side wades the water to steady the litter



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Wheel is Lifted Over Bumps



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Subjects with fractures and breaks are in pain so we lift the litter over bumps to minimize jolts
If the subject is know to be in great pain EMS can provide IV pain medications

SAR Provided Equipment (5)

Medical Equipment

- Splints, Bandages, Oxygen
- Medicines
- Chemical Heat Blanket
- Sleeping Bags and Warm Clothing for the Subject



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SAR Provided Equipment (6)

Member Wearable

- Reflective vests
- Helmets – climbing, swift water, motor vehicle
- Personal Flotation Devices and throw ropes
- Climbing harness
- Avalanche beacon, probes and shovel
- Two way radios
- GPS with detailed maps and paper maps
- Spotlights



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Communication – VHF and DTR

Written communication logs may be kept at bay and mobile command sites when personnel are available

800 MHz trunked radios common with sheriff and EMS

- Excellent coverage in the valley and slopes with view of the valley

VHF for direct

- Reflects from terrain better than 800 MHz for communication over ridges but may not work even two or three miles over a ridge
- Mobile vehicles may be stationed at the head of a drainage to relay communication between teams and between team and command
- May need to have a hand held operator climb to a ridge or station at a pass to relay communications

800 and VHF base stations at bay and sheriff's dispatch

Mobile 800 and VHF in vehicles and VHF on ATVs – 5/8 wave VHF antennas on vehicles

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Normally communicate directly from radio to radio on VHF

Good for communicating within the team, between teams, and to the trail head

800 MHz trunked radios

Digital modulation like cell phones

Normally through a repeater

Specific channels (talkgroups) for different counties

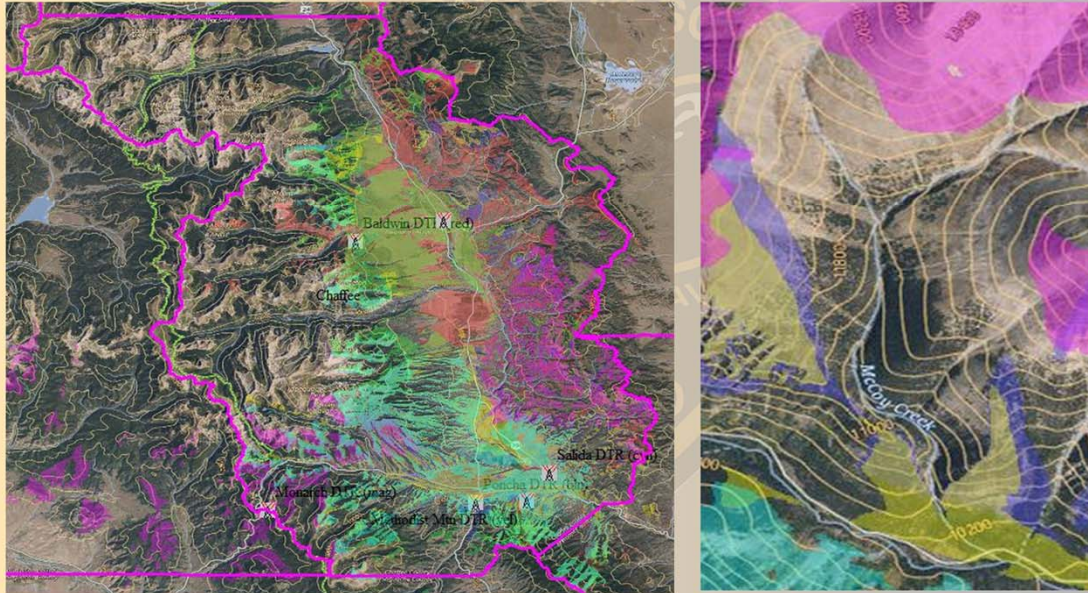
Can link state wide

Can communicate directly from radio to radio on simplex channels

Communications - 800 DTR Coverage

Two towers in north and four in the south

- Baldwin Mt (red), BV Correctional Facility (grn)
- Monarch (mag), Poncha Spgs (blu), Methodist Mt (yel), Salida (cyn)



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Coverage is optimized for where law enforcement, fire departments and EMS can drive
Coverage maps are on the bay computer for use by IC and for teams to study before missions
Also a map for cell phone coverage

Communication – Bay and Handheld



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On left base station in the SAR bay – Two VHF and one 800 MHz trunked
On right handheld radios in the chargers

Communication - Mobile

One 800 MHz hand held for every two people and one VHF hand held with each person on foot team

- Never less than two on a team – large teams may split into multiple teams as needed allowing each team to have an 800 MHz radio

Amateurs may carry amateur radios – no formal plan for use

- Numerous mountain top 2M and 440 repeaters in the county



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On left is VHF and 800 MHz trunked radio in vehicle

Buttons below control siren and lights

VHF radio on ATV is in splash proof container

Communications - Satellite

Garmin inReach satellite communication

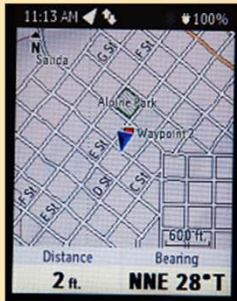
- Receive GPS satellites for navigation
- Transmit and receive text via Iridium satellites

Track points

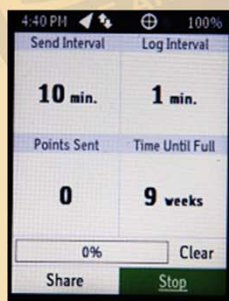
- Sent every ten minutes via satellites for viewing on an online map
- Log of points kept in unit

Text messaging

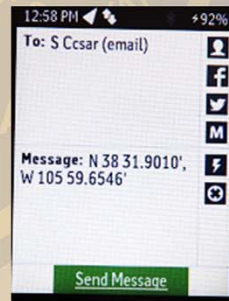
- To/from another inReach, SMS (cell phones), email



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inReach is an excellent personal locator technology

\$400 device

Two way messaging

Iridium gives best coverage

Requires subscription - \$12/month and up

Ever growing providers of satellite texting devices for emergencies

Bivystick, ZOLEO, Somewhere, SPOT, SatPaq

New cell phones with satellite texting may be game changer

PLB – Personal locator beacon

No subscription

Technology used in aircraft and ships

One way transmit

New have unique identifier

May have internal GPS

Can locate with direction finding equipment in aircraft and by hand

iPhone 14 SOS via Satellite

Began November 15, 2022 for the US

- Free first two years after purchase of new phone, later price TBD
- Slow speed texting only, no voice



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Must point the phone at the satellite as shown on the screen - uses Globalstar LEO satellites

Transmission may take from 15 seconds to a few minutes

Non emergency usage

Can practice for emergency by sending simulated SOS

Can share location with friends

SOS interface ask questions commonly asked by dispatchers and sends the answers in initial message

GPS location, battery level, and other parameters

Will go directly to local dispatcher if they are equipped to receive text directly otherwise to a relay center who will call the dispatcher on the phone

If selected will send the conversation to phone's emergency contact list

Other cell phone manufacturers and service providers are working to provide this feature in future products – Android products are expected in second half of 2023 using Iridium satellites

T-Mobile has partnered with SpaceX to use Starlink satellites

Verizon is working with Amazon's Project Kuiper

Air Assets

Aircraft may not fly at night in the mountains or in high winds or low clouds or low visibility or if lightning is in the vicinity

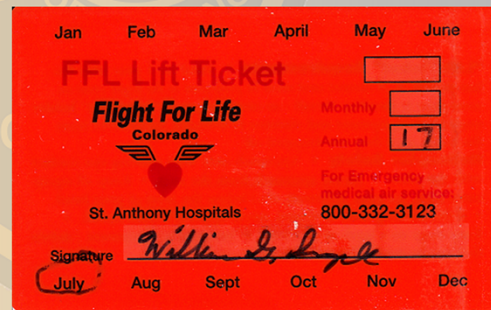
Medical helicopters will transport trained members

- Usually fly up, load patient and hike down – take your go-pack

Military helicopters will transport members and subject

Canon City helitac civilian Huey available if not on fire

PC 12 airplane with high resolution visual and infrared cameras



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Aerospatiale A-Star helicopter pictured has good high altitude performance

Seats for pilot, two medical crew and stretcher for patient

No rope haul of people

Suspended object in picture if an avalanche beacon receiver used to locate buried victims who are wearing an avalanche beacon

Helicopters can speed a search dramatically and when a suitable landing zone is available may expedite responders arrival at a scene and the evacuation of subjects

Military helicopters have cable hoist to raise and lower persons and equipment

No charge for military

Only available if needed to preserve life

Medical helicopters are primarily for transport to a hospital, but can be used to transport the disabled that do not need medical treatment. This will generally exceed the annual medical insurance deductible.

The state of Colorado leases two civilian Huey Bell 205 helicopters during the fire season for use by the hot shot fire teams. If they are not on a fire they assist us with transportation of team members and subjects along with search. No charge for these.

The state has two multiuse single engine turboprop Pilatus PC 12 aircraft that have high resolution visual and infrared cameras. They are used for fire surveillance and can be used to search for people when they are not on a fire. Teams must be in tight groups of two or more to be distinguished from the lost. No charge for these. Some team members are pilots and can fly their aircraft for search on a mission.

Unmanned Aerial Vehicles - Drones

Two DJI Matrice 210's with two 30X zoom visual cameras and one infrared camera – can fly two cameras at once

- Can install a payload drop mechanism in place of one camera

Two DJI Mavic 2 Enterprise with a 2X zoom camera, a spot light and a loud speaker – lightweight, folds compact, backpackable

Trailer with two 40 inch monitors, deep cycle batteries with inverter, generator to run equipment and charge batteries for continuous flight, custom flight maps have imagery and topo



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25 to 35 minute flight time on a set of batteries

Up to 40 mph flight speed

Up to five mile control signal and video feed

Must maintain line of site between UAV and controller / pilot

FAA rule for pilot to maintain unaided visual contact with UAV

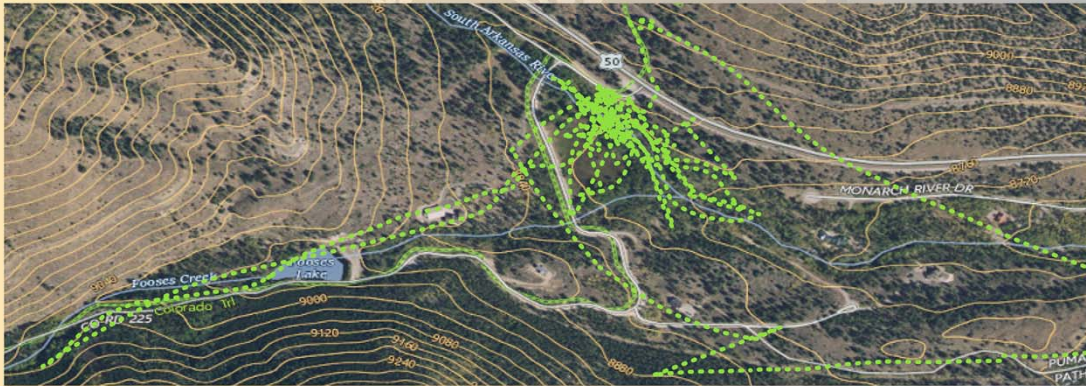
UAV will return to point of takeoff if radio contact is lost

UAV Use Cases

UAV's are aerial robots – Robots excel at their three D's of dangerous, dirty, and drudge

- Search cliffs, rivers, avalanche and other dangerous areas
- Search marsh and muddy areas
- Cover large open areas at speeds much faster than a foot team

Realtime flight video on large monitor in trailer, record high resolution video and photos to camera SD card for later review



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Can fly manually or autonomous with up to 99 waypoints

30x zoom can see a person at 1.5 miles

IR camera can see people and animals in winter and in summers late at night and early morning before the sun warms the ground

Custom map created from USGS The National Map Imagery Topo

Raspberry Pi computer programed as a WiFi hotspot map server

Vehicle is shown on the map during flight with an icon that shows the direction it is facing

Image shown has the tracks flown during a mission

40 inch Monitors in Trailer



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Using a cable or wireless link of the pilot's display to a large monitor in a shaded area may result in detecting objects that the pilot did not detect
A quick shout to the pilot can get the pilot to stop or backup the UAV for a closer inspection
Left monitor is custom map with drone icon of drone location, right monitor is copy of pilot's display

Movie With Subtitles



UTC:2020-05-11T14:47:06.0Z,Trk:---tvHdg:286m,hSpd: 0mph,vSpd: -0fpm
vLat: 38.542436,vLon:-106.242292,vGnd: 8793ft,vAGL: 211ft,vMSL: 9005ft
cLat: 38.5430,cLon:-106.2430,cGnd: 8808ft,cRng: 367ft,cHdg:304m,cPit:-51

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Image is the proper 250 foot field of view for a search for high contrast subject

Two people in the image are searchers wearing high contrast clothing

Movies can be created with SRT subtitle files containing time, coordinates and other information

Photos have coordinates in the EXIF area of the photo that can be read with a computer

These subtitles were created with custom software that takes information from the flight log

records and a USGS digital elevation model, color and font size of text can be changed in the player during playback

Date and time

Vehicle magnetic track in degrees

Vehicle magnetic heading in degrees

Horizontal speed in mph

Vertical speed in feet per minute

Vehicle latitude and longitude in decimal degrees

Elevation of ground below vehicle in feet

Vehicle height above ground in feet

Vehicle height above mean sea level in feet

Center of camera view coordinates in latitude and longitude in decimal degrees

Center of camera view elevation of ground in feet

Center of camera view from vehicle in feet

Camera magnetic heading in degrees

Camera pitch in degrees

Play Movie With Subtitles



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Chaffee County Search & Rescue South
DRONE TEAM

Training from External Resources (1)

SAR may reimburse some of the costs for these

Minimum for Membership

- National Incident Management System IS 100 and IS 700 (online)
- First Aid and CPR (8 hour)

Additional Medical

- Wilderness First Aid (2 day)
- Wilderness First Responder (7 day)
- Emergency Medical Technician (54 credit hour college course)



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Chaffee County Search and Rescue South has a 140 page Wilderness Medical Protocol

All members must review and accept the responsibility for knowing and practicing as an EMS provider in accordance with the protocol

Medical Director has determined Acts Allowed for each certification level

An extensive list of medical conditions with step-by-step procedure to be followed and what certification level is required to administer each step

Training from External Resources (2)

Technical Rescue

- High angle ropes
- Swift water



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Training from Internal Resources (1)

Most training repeats annually by season

- One hour training at each monthly meeting
- Half day training classes several weekends a year



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Backcountry travelers are encouraged to wear avalanche beacons, carry snow probes and shovels, and know how use them

The beacons transmit pulses on 457 KHz and should be on during travel

If someone becomes buried the beacons are switched to search mode

A trained user can pinpoint a burial to a lateral distance of about 25% of the burial depth

Probes look like undersized aluminum tent poles and are typically 3 meters in length

An expanding spiral pattern is used with a 10 inch spacing

Once a body is located more than a ton of snow may need to be moved

Digging is done beginning down hill so as not to compact the snow over the victim and to allow the snow to be moved horizontally and not lifted

At 15 minutes the survival rate is 50%, some have survived up to 6 hours

Left photo is probe line training for when a beacon was not worn

Right photo is team shoveling out a Ski Patrol member who volunteered to be buried with a large air pocket, beacon and a two way radio

Beacon and probe search took less than 5 minutes

Wedge shaped team of seven took a little over 5 minutes to shovel to him

Training Photos



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- Top left, Chaffee county has been the scene of several civilian and military aircraft crashes
 - High elevation decreases engine power needed for climb combined with downdrafts from winds over undulating terrain lead to crashes
 - SAR has hand held radio direction finders for the 121.5 MHz emergency locator transmitters that are activated on impact and transmit using internal batteries for a few days
 - New moving map displays in aircraft have greatly reduced the number of crashes in the mountains
- Top center picture is a member in a Stokes litter being carried up a moderate slope during training
 - There are an equal number of members at the top keeping tension on the rope to keep the litter team from tumbling back down the slope
- Right photo is low angle rappel rope descent training
- Lower left photo is training for "Live Bait" swimmer rescue
 - Rope is attached to a ring on the rescue swimmers rescue Personal Floatation Device
 - A quick release can be pulled by the rescue swimmer if the rope is pulling towards danger
 - The rescue swimmer dives-in to capture the swimmer
 - Two rescuers on shore control the rope to direct the swimmers to shore
 - Dry suits are worn to protect against the water that is cold even in summer

Training from Internal Resources (2)

Training subjects

- Climbing harness, ropes, knots, and low angle rescue
- Avalanche beacon searching, probing and shoveling
- Scene assessment and subject assessment
- Patient packaging and transport
- Lost person behavior and tracking
- Location in vehicles of SAR gear and it's usage
- Radio usage
- River safety and rope rescue
- Oxygen protocols
- GPS usage
- Off-road vehicle operation



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Carry webbing, short length of climbing rope and hardware in case you need to do a short steep descent to reach a subject

Know how to operate your beacon so well that you can do it under stress in poor conditions

Practice finding buried beacons at a training area found at many ski resorts or have someone bury one for you to find

Is the scene safe for you, ask the victim if there are others in the party

Stop bleeding, splint broken bones, insulate if cold, cover if raining

Proper technique to move into stretcher, strapping to stretcher, carry procedure

Lost persons behave differently based on age, state of mind, and many other criteria

Statistics from thousands of rescues provide insight into behavior

Radio operation, frequencies to use, phraseology and terms, discipline

Dress for a cold fast water swim when working near a river – no packs or equipment or apparel that could snag and pin

Know how to attach the regulator to the oxygen tank and what flow to use – ruptured tanks can kill – no flames near oxygen

Use of different GPS and map datums and coordinate formats can lead fellow rescuers to the wrong location – know how to obtain your coordinates and how to navigate to coordinates that you are given – use the map in the GPS database to find roads, lakes, trails, streams, ridges, and other features

Off-road vehicles may kill or injure in rugged terrain

Drivers and passengers required to wear helmets on off-road vehicles

Be aware of what terrain can roll the vehicle

Control speed to not exceed your view distance

Beacon photo shows multiple burial with strongest signal 4.0 meters ahead and to right

Command and Paper Work

Sheriff deputy may be on scene, at trail head, in bay or on radio

Command at bay, at trail head or a member in the field

All members sign in and out

Mission report filed with sheriff for each mission

Sheriff may provide press release and we may post mission information on our web site

Colorado Department of Local Affairs

COLORADO SEARCH AND RESCUE FUND MISSION REPORT – PRIORITY TIERS I, II AND III

[Attach sheet if additional narrative is required]

ACTIVITY	SITUATION	Response Type	(if lost) Search Techniques Used	Rescue/Recovery Techniques Used
<input type="checkbox"/> Climber	<input type="checkbox"/> Aircraft	<input type="checkbox"/> Standby	<input type="checkbox"/> Confinement	<input type="checkbox"/> Assist/Own Power
<input type="checkbox"/> Hiker	<input type="checkbox"/> Walkaway	<input type="checkbox"/> Responded	<input type="checkbox"/> Attraction	<input type="checkbox"/> Carry-Out by Foot
<input type="checkbox"/> Fisherman	<input type="checkbox"/> Evid. Search	<input type="checkbox"/> Search	<input type="checkbox"/> Hasty Search	<input type="checkbox"/> Rock/Scree Evac
<input type="checkbox"/> Skier	<input type="checkbox"/> Other	<input type="checkbox"/> Rescue	<input type="checkbox"/> Visual Tracking	<input type="checkbox"/> Evac. By Animal
<input type="checkbox"/> Boat	<input type="checkbox"/> Lost/Overdue	<input type="checkbox"/> Recovery	<input type="checkbox"/> Search Dogs	<input type="checkbox"/> Watercraft Evac
<input type="checkbox"/> OHV	<input type="checkbox"/> Stranded	<input type="checkbox"/> Other	<input type="checkbox"/> Line Search	<input type="checkbox"/> Vehicle Evac
<input type="checkbox"/> Snowmobile	<input type="checkbox"/> Injury	<input type="checkbox"/> Land	<input type="checkbox"/> Air Search	<input type="checkbox"/> Aircraft Evac
	<input type="checkbox"/> Illness	<input type="checkbox"/> Air	<input type="checkbox"/> Other	<input type="checkbox"/> Other
	<input type="checkbox"/> Public Service	<input type="checkbox"/> Water		
	<input type="checkbox"/> Other			

G. RESULTS

Subject(s) Found/Rescued: _____ Date: _____ Time: _____

By SAR Effort By Self Not Found/Rescued

By Public (non/SAR) Never Needed Help Other

Reason Terminated: _____ (if lost) Found In: _____ Clues Found By: _____ Subject Found By: _____ As result of SAR effort- Total number of persons FOUND: _____

Successful Primary Search Interception

Search Urgency Worksheet (1 of 3)

Eleven questions answered with 1 through 4 rating

- The lower the number the more urgent the response
- If any of the eleven is answered with a 1 the search may require an immediate response
- A total of 10 – 15 Urgent Response
- A total of 16 – 27 Measured Response
- A total of 28 – 41 Evaluate and Investigate

Some example responses

- Routine IAR call-out with brief description of mission
- IAR call-out describing need for more than the usual turn-out
- In addition to IAR, request for aerial assets, specialty teams (dogs, technical ropes, tracking) from other SAR teams, etc.
- Request deputy to go to trailhead(s) to confirm subjects vehicle is present – IAR team but hold at bay until vehicle located
- Send IAR message to expect a call-out at 0530 next morning
- Direct subject to trailhead using cell phone

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Call out the full team and begin a mission now? Wait until daylight? Send out a small number of resources? Do more investigation and then decide?

IC can often do urgency decision in their head without completing the form

The form can show others, such as the RP or relative, how we are following nation wide search urgency criteria – due the paper work to document rational if delaying the mission, not needed if not delaying, could also document the rational for limited (measured) immediate response

Search Urgency Worksheet (2 of 3)

Date: _____	SEARCH URGENCY CHART		Remember that the lower the number the more urgent the response
Time: _____			
A. NUMBER OF SUBJECTS	B. AGE		
1 Person ----- 1	Very young ----- 1		
2 People ----- 2	Other ----- 2-4		
3 or more ----- 3 <i>(Unless separation suspected)</i>	Very old ----- 1		
----->			
C. MEDICAL CONDITION			-----
Known illness requiring medication -----			1
Suspected illness or injury -----			2
Healthy -----			3
Known fatality -----			4
Potential vision impairment -----			1
D. TIME			-----
Reliable, punctual, <i>(being late is out of character)</i> -----			1
Usually reliable, on time -----			2
Reliability, punctuality questionable -----			3
Completely unreliable -----			4
E. CIRCUMSTANCES			-----
At risk for any reason -----			1
Adequate information, low risk -----			2
Questionable information -----			3
High probability not in the area -----			4
F. EXPERIENCE PROFILE			-----
Not experienced, not familiar with the area -----			1
Not experienced, knows the area -----			2
Experienced, not familiar with area -----			3
Experienced, knows the area -----			4

Work through an example at the current time for a typical call from dispatch
 Circumstances – Why does the reporting party think they are missing

Search Urgency Worksheet (3 of 3)

<p>G. PHYSICAL CONDITION</p> <p>Unfit ----- 1</p> <p>Fit ----- 2</p> <p>Very fit ----- 3</p>	<p>H. CLOTHING PROFILE</p> <p>Inadequate or insufficient- 1</p> <p>Adequate----- 2</p> <p>Very good ----- 3</p>
<p>I. WEATHER PROFILE</p> <p>Existing hazardous weather ----- 1</p> <p>Hazardous forecast (8 hours or less) ----- 2</p> <p>Hazardous forecast (more than 8 hours) ----- 3</p> <p>No hazardous weather forecast ----- 4</p>	<p>J. TERRAIN & HAZARDOUS PROFILE</p> <p>Known hazards ----- 1</p> <p>Difficult terrain ----- 2</p> <p>Few hazards ----- 3</p> <p>Easy terrain, no known hazards ----- 4</p>
<p>K. EQUIPMENT PROFILE</p> <p>Inadequate for activity/environment ----- 1</p> <p>Questionable ----- 2</p> <p>Adequate ----- 3</p> <p>Very well equipped ----- 4</p>	<p>TOTAL _____</p>

If any of the eleven categories are rated as (1), regardless of the total, the search may require an immediate response.

10-15	16-27	28-41	TOTAL _____
URGENT RESPONSE	MEASURED RESPONSE	EVALUATE AND INVESTIGATE	

*** The total should range between 11 and 41 with 11 indicating the greatest urgency.***

Describe planned response from completion of worksheet

Missing and Lost Person Behavior

Use local data from previous searches if it is available

Use International Search and Rescue Incident Database

- Select appropriate categories
 - Mental status of the subject
 - Subjects age
 - Subjects primary activity – hunter, hiker, climber, dementia, ...
 - Eco-region
- Probability rings of found distance from IPP (Initial Planning Point)

Use Lost Person Behavior Book

- Much information from interviews of found subjects
- 41 different subject types
- Overall traits of subject type
- Helpful descriptive information
- Available as book or phone app

Phone app is apple, google, and amazon - \$10

Subject Profile

Physical and mental description

Name(s)

Physical resources carried by the subject

Known activity at the time of the loss

PLS (Point Last Seen) or LKP (Last Known Point)

Personality Traits

Interest and activities – outdoor pursuits, hobbies, vocation, etc.

Experience – novice vs. seasoned veteran

Subject lost before?

Predetermined emergency strategies or options discussed with other party members

Personal tragedies – possible influences to behavior

Contact known friends, family, associates for advice on profile

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Personality Traits – aggressive, despondent, confident, low self esteem, happy-go-lucky, stable, etc. Early in a mission may not know many of these but a good investigation will discover more

Reflex Tasking

Very little planning or thought process before assigning and carrying out these tasks

Coordinating and executing a search in a way that worked well in the past

Initial rapid deployment of resources on-scene to likely spots

Resource to begin investigation steps

Establish IPP (Initial Planning Point)

Resources to begin containment

Begin search of immediate area around IPP

Resources to travel corridors – trails, ridges, drainages

Resources to other high probability tasks

For 95+% of the time this is all that is executed on a mission

While reflex tasking is taking place be working plans for tasks and resources beyond reflex tasks in case they are needed

Inland Search Function - Why Math

Origin is Operations Research to find WWII German submarines

- Highest probability of success with limited resources

Don't try to be exact – use to compare one option to another

Use to distribute or redistribute resources

- As the search progresses the numbers change

Increase or decrease the size of the search area

Decide when to end the search

- Difficult decision – do it with data and minimize emotion
- Sherriff will make the decision to end the search

Rationalize actions to family, media, or higher authority

Use as potential justification in litigation

First five slides are tools for managing a large multi operational period search with large number of resources

Last seven slides are things that can be used on all searches

Search Planning Formula

Conventional Search Planning Formula

$$\text{POS} = \text{POA} \times \text{POD}$$

Search Success
is Based on Two
Factors

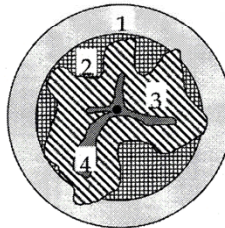
=

Looking in
the Right
Place,

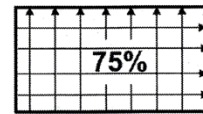
X

.. and Being Able
to Detect What is
Being Looked For

SUCCESS =



X



Probability
of Success

=

Probability
of Area

X

Probability
of Detection

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Story of searching for keys on dark street

This formula does not include time but it is often imperative to find the subject before weather, injury, etc. does the subject harm

Also must consider safety, difficulty, time to search an area, and need for special resources before deciding order of which areas to search

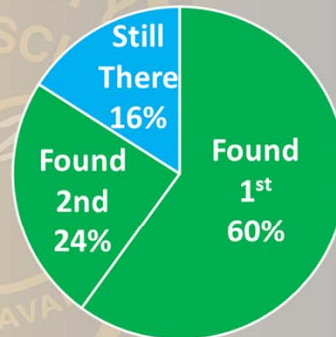
Searchers often overestimate their ability for probability of detection so don't be surprised if the IC uses a lower value than you gave them

Cumulative Probability of Detection

After First Pass with
60% POD



After Second Pass with
another 60% POD



Searching the area a second time only has a 24% probability of finding the subject

- 40% chance still there after first search
- 60% chance of finding them in the 40% remaining
- $0.24 = 0.40 \times 0.60$

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Search an area a second time?

Less chance they are there if not found the first time

Formula for cumulative POD when area searched multiple times

Think of a pie that is being eaten – the pie remaining in the pan is odds the subject is still in the search area

Each pass takes out their POD percentage of the remaining pie

First pass with 60% POD results in 40% chance still in area

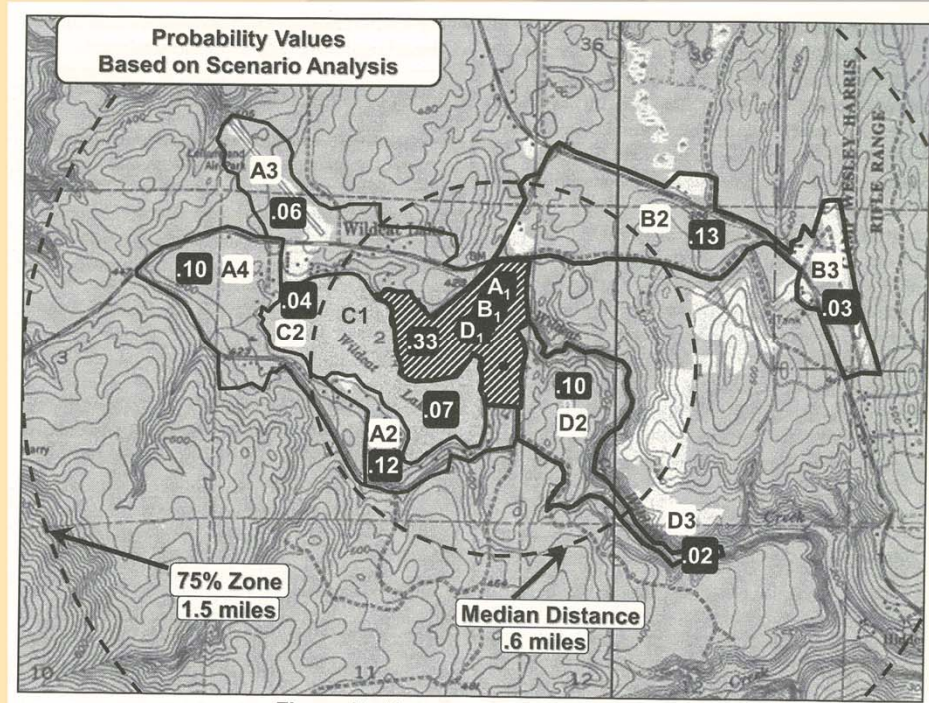
Second pass with another 60% POD is applied to the remaining 40% resulting in

40% 1st pass remaining minus 60% 2nd POD x 40% 1st pass remaining

40% - 24% = 16% remaining after second pass, or $1 - 16\% = 84\%$ POD after 2nd pass

For the mathematically inclined use reciprocal of the sum of the reciprocals on the POD numbers

Probability of Area Values



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Areas are sized so that each can be searched by a single team in a single operational period
Probabilities are updated at least at the end of each operational period as the probability of the subject being in an area is reduced once it is searched

Rings show statistics for similar missions

- Median is 50% found within this ring

- 75% found within the 75% ring

Probabilities of marked areas on the map should add up to less than 100%

Rest of the World concept is that the subject is out of the mapped area

- Faked disappearance

- Not lost but left the area

- Other possibilities

Consensus Worksheet - Never Plan Alone

	Scenario A	Scenario B	Scenario C	Scenario D	
Evan	100	30	25	50	
Don	10	50	100	75	Ref
Tracey	25	75	100	25	Value
Dick	10	50	100	12	100
Jinan	30	100	75	25	
					Sub Across
Sub Down	175	305	400	187	1067
Consensus	0.16	0.29	0.37	0.18	
Date:	1/20/2019	Mission:	2 Op Period: 2nd	Time:	06:55

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Scenarios (what the subject may have done and where they may have gone) can contain multiple search areas

A search area may be incorporated into multiple scenarios

Worksheet can be used for scenarios and then applied to areas or applied directly to areas if only a single scenario is assumed

Reference value is given to each persons pick for the most probably area or scenario

Often use 100 or 10

Smaller numbers are then applied relative to the reference for each scenario

Team members don't enter percentages just relative values

A members total of assigned numbers does not have to equal anything

After the math, percentages are found on the bottom line

Danny finds this mission as IC to be an "interesting" one

Great turn out of resources including other IC's

At least four scenarios brought forward by fellow IC's

Evan is sure of scenario A

Don, Tracey, and Dick all lean to C

Jinan favors B but also sees merit in C

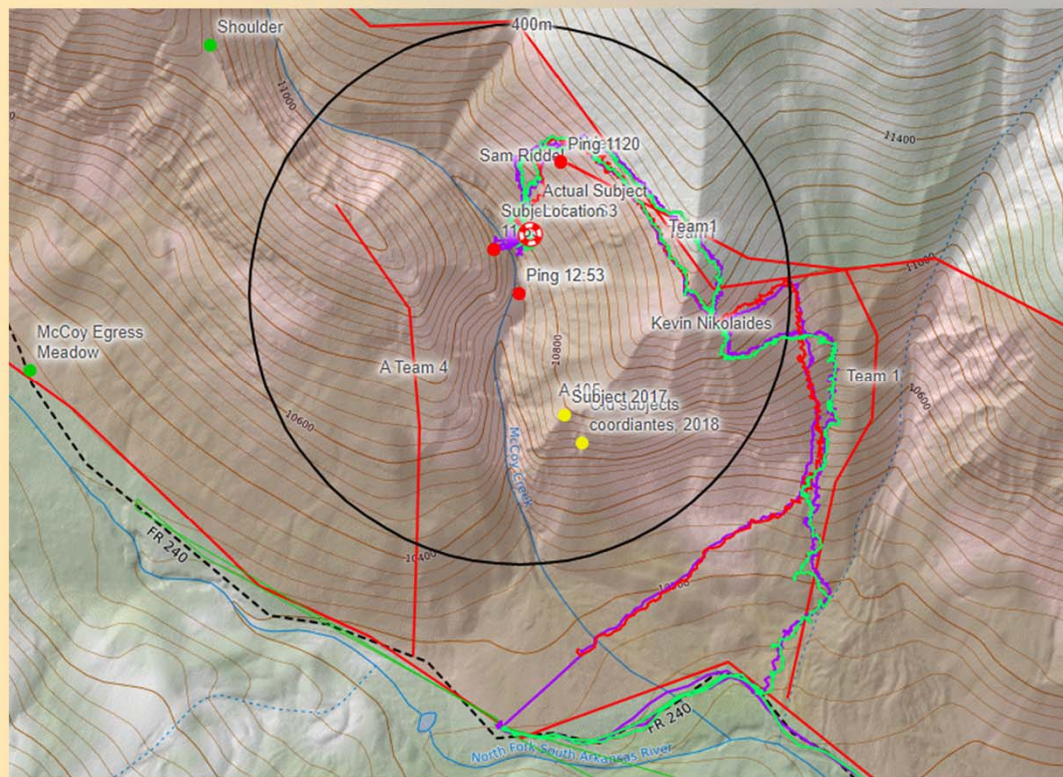
Danny hands them the worksheet and says work it out and come back to me

Ten minutes later with worksheet in hand Danny quickly assigns resources to C and then B

Evan pleads his case for the remaining resources – Danny says 0.16 is close enough to 0.18 and gives Evan a small team of the remaining resources

Teams hit the field all feeling like good decisions were made

SAR Topo Computer and Phone App



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July 2022 Forest Service Rd 240 McCoy Gulch technical ropes team rescue.

Map is displayed on computer in the bay and on members cell phones that have cell signal.

Green dots McCoy Egress Meadow and Shoulder are route for rescues further up McCoy Gulch
Light red shaded areas with red solid lines are search areas.

Yellow dots are locations of previous rescues

Bright green, blue and read lines are GPS tracks of teams.

Tracks are updated ever 10 minutes through the inReach satellite devices.

Red dot Ping 11:20 is coordinates of initial phone call to dispatch

Red dot Ping 12:53 is coordinates of second phone call it has a 400 meter circle around it to
indicating it expected accuracy

Life saver ring is actual location of the subjects when they were reached by the team

McCoy Drone Video



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Technical Ropes Team in McCoy Gulch

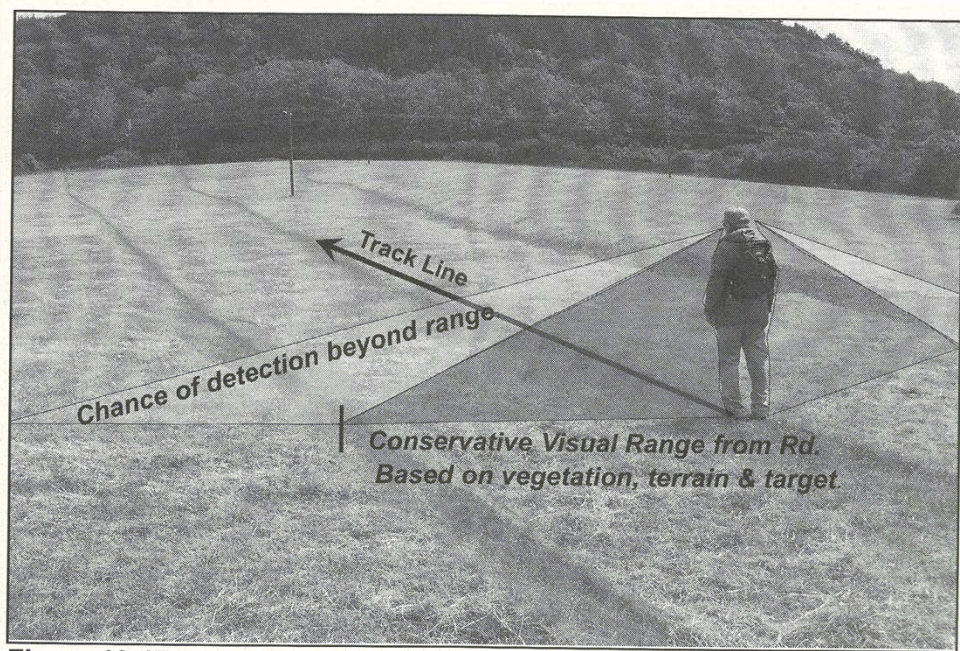


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Effective Sweep



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Let's leave the command station and enter the field of search

The sweep width and travel speed are adjusted based on environment

Field tests have been conducted to determine sweep width for objects of various sizes, shapes and colors on flat ground

Can do a quick test in the field by placing a similar object on the ground and walking towards it from several directions to get a sweep width value

Rolling terrain can hide things unless you occasionally move laterally to observe into the dips

Might do a wide sweep width on initial search and come back later with more resources for a narrow sweep width

If searching an area additional times do the search differently to observe new perspectives

- If a grid search do the second search lines 90 deg to the first search lines

- If a linear search such as along a trail, drainage or ridge, or around a lake – do the second search in the opposite direction

Searchers Effectiveness

Tools

- Binoculars, bright head lamps, spot lights, GPS, maps, flagging, etc.

Speed

- Slow enough to be effective – stop to look behind and to sides

Track

- Go to the edges and end of your segment – don't assume the adjacent team will check the edges

Visual Expectations

- You only see what you expect to see – expand your expectations
- Have description of subject – especially clothing color
- Does subject have lights, whistle, signal mirror, fire starting capability

Use radio to coordinate sound and light sweeps

- Every few minutes all blow whistles at same time and then listen
- Every few minutes all go dark to better see lights from subject
- Helicopter may request all lights out to look for light from subject

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Use flagging tape to mark points, routes and areas and collect it on the way out if no longer needed

When travelling off trail flagging will help other teams follow your route and may help you on your return

Flagging may mark the boundaries of an area that has been searched – write things like SAR, date, and other descriptive words on the tape when appropriate like on a multi-day search

Agree on whistle blast patterns to distinguish subjects whistle blasts from searchers whistle blast

Patterns of three are international distress standard – reserve these for the search subject

Some teams never blow their whistle unless they need assistance

Medical and military helicopter has night vision goggles that are thousand times more sensitive to light than your eyes

See the light from a lighter at two miles

Optimize your night vision on a night search

It takes 15 to 25 minutes for the eyes to adapt to darkness

Use a minimum of light to keep you eyes adapted

Using red light preserves night vision

DO NOT shine your light into the eyes of another team member

This ruins there night vision and is easy to do with your headlamp

Older eyes take longer to adapt and do not see the faint lights that may be seen by the more youthful members of the team

Will the subject hide from you? i.e. young child – have parents given you the safe word

Will the subject be in a sheltered location?

Will the subject be laying down or up and moving?

Clues

Novice searchers may look only for the subject and not for clues

Clues are found not only in the field but outside of it

- Example is team member calling family, friends, co-workers, etc. to interview them to gain clues

Priming is having a mental list of what clues are possible

- Brief team before deploying them
- Discuss with fellow team members what they are looking for

Document clues and report them

- Photograph or sketch – put an object of known size in the photo for scale – your radio, a coin, etc.
- Record map coordinates
- Call in on the radio, repeat what was found at debrief

Don't jump to conclusions based on a single clue

- Other teams may have other clues that combined with yours give a more probable conclusion

Person remaining with vehicle at trailhead may be able to do investigation from there if they have cell coverage

Please coordinate investigative phone calls with IC so this is not duplicated

When relatives get same questions from multiple team members we appear disorganized and they lose confidence in us

Also coordinate information given to family – conflicting information really makes us look disorganized

Types of Clues

Physical or Events

- Footprints, sign, disturbance, discarded items, lights, shouts, smoke, phone or radio calls, whistle, mirror flash, flare, noise or loud sound

Recorded or Documented

- Summit log, receipts, notes, letters, trail registers, permits, maps, guide books

People or Testimony

- Witnesses, relatives, friends, vendors, bystanders, companions, sales persons, other people on the trail or in the area

Analytical

- Previous behavior, previous searches, deductive reasoning
- Distances from local or international data

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Many groups out in the winter carry BCA and other brands of radios that operate in the UHF FRS/GMRS bands

If you own one bring it on the search and monitor the channel informally designated for our area or one that the subject is known to use – occasionally call to see if the subject is listening
Many radios can be programmed to scan channels to allow listening to many channels at a time
Our new VHF/UHF radios have all of these channels programmed and can scan them

Obtain from Clues

Location and Elevation

- Map coordinates, for tracks - subjects direction of travel

Time

- How long ago
- When was the last rain or snow as this can help date tracks

Direction and Speed

- Direction of travel and how fast

Corroboration and Ownership

- Conclusively human, belong to subject

Intent

- Activity, intentions or purpose

Character

- What is it

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Report clues to IC before moving on

They may have questions about the clue that you can investigate

Document clues with photos, coordinates, flag if cannot or should not be moved, ask if should collect and bring back

Tracking (1)

Not limited to just tracks in the dirt – look for all signs that may be left from the passage of your subject

- Disturbances of pebbles in rocky areas, trampling of grass, broken twigs, discarded articles, etc.

Shadows make tracks stand out

- Face the sun when looking for tracks to see the most shadow
- Shadows are best seen at low sun angles and are worst at noon
- Put a point source, focused light on a pole to keep at ankle height for night tracking

Preserve tracks

- Don't allow people to walk over the tracks around the subjects vehicle
- Tracks may be found under the vehicle in the trunk area
- Walk beside tracks when following them; not on them
- Put flagging tape around tracks to make them easier to return to and to keep others from walking over them, record GPS coordinates

Tracking (2)

Use multiple teams to do a binary search

- One team stays with the last sign and proceeds slowly from sign to sign
- Other teams walk an arc ahead looking for sign to allow the teams to leap frog ahead
- Look ahead for sign in probable routes of least resistance

Carry and use tracking cards and a measuring device

Tracking classes and certifications are available from organizations

Universal Tracking Services, Inc.
uttrackingservices.com

TIME: _____ *LOCATION: _____
DATE: _____

*SUBJECT HEADING: _____
*BASIC TYPE: _____
*PATTERN: _____

DIMENSIONS - OVERALL:
*L _____ W _____
HEEL:
*L _____ W _____

STRIDE (TOE TO HEEL): _____

GROUND SURFACE: _____

REMARKS:

*REPORT TO BASE

Closing

Volunteer does not mean sub standard

- Members are passionate about their duties and spend significant amounts of time and money in training

Members miss work and miss sleep on missions

Members risk their lives in dangerous situations to help others

- High angle rope rescues
- Swift water rescues
- Avalanche terrain rescues
- Lightning strikes above timberline
- Frostbite and hypothermia in winter

Members of the community will often stop to thank us for what we do when they see our insignia on our vehicles or equipment

Buy a COSAR card

Donations are always welcome and are tax deductible

If you would like to learn about volunteering, talk to a member or attend a meeting