Ground Attack Retardant Delivery

“It’s time to deliver 24 hours a day”

Cary E. Gloeckner - May 2025

Ground Attack Retardant Delivery Systems

Presenter Background

- Cary Gloeckner - Retired Fire Captain and Vegetation Management Spec.
- 27 Years with Southern Marin Fire District
- 17 Years with Gold Ridge Fire District
- Owner of Firescape Wildfire Mitigation Services (25 years)
- Firescape has **NO** financial or business interest in this project
- I am only interested in improving the Fire Service response to wildfires by helping fire agencies build out a robust G.A.R.D. program in Sonoma County.

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Presentation Goals

- Introduce G.A.R.D. specifications
- History of retardant use
- Success stories
- G.A.R.D. benefits
- Local Application
- Question and answer session

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What is a G.A.R.D. Unit?

Ground Attack Retardant Delivery Systems

Defined:

- G.A.R.D. Units apply fire retardant from the ground
- California Emissions Compliant Cab and Chassis:
  - Peterbilt, Kenworth and Freightliner
- Two or four wheel drive
- Tank capacities range from 1500 to 6000 gallons

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Example Vehicle Specifications

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Example Vehicle Specifications

- Model Year 2019
- Peterbilt 348
- 450 HP diesel powered motor
- Allison 6 speed automatic transmission
- PTO driven 500 gpm pump
- Custom tank with rear discharge chute and rear hose reel
- Price - $500,000 (Unit plus comm.’s, CAD, thermal imaging and specialized nozzles)

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2019 Vehicle Example

History of Aerial Retardant Use

Fixed-Wing Aerial Retardant Delivery

History of use

- In 1955, a bi-plane was used to make a water drop on a wildfire in the Mendocino National Forest
- In 1956, the Mendocino Air Tanker Squadron was formed
- 2006 - DC-10 (VLAT) was used for the first time in CA (Gloria Fire)
- 2023 - CALFIRE added a refurbished C-130 Hercules to the fleet (4,000 gallon capacity)
- 2025 - CALFIRE added a 2nd C-130 to the aerial fleet
- Our worst wildfires ground fixed-wing aircraft due to high winds
- Recently seen in 2017, 2019, 2020 and 2025 Palisades and Eaton Fires
- Fixed-wing aircraft are used in daylight hours with good visibility and winds <30mph

Fixed Wing Aircraft

- VLAT - Very Large Air Tanker
- C-130 Hercules

Retardant Delivery

Historical Situation

- In 1955 we put a tank on a bi-plane and dropped water on a fire deep in the forest!
- We've had occasional use of Ground Delivery Systems since 2003 by Private contractors
- Since the 2006 VLAT, no real tactical changes in aerial retardant application
- Yet, 16 of the "Top 20 Most Destructive Wildfires" are Post 2006
- **FOUR of those occurred in Sonoma County!**
- Killing 29 people, destroying 10,466 structures and burning 234,740 acres

2025 Wildfire and Retardant Delivery Situation

Season Start - January 7, 2025

2025 Aerial Retardant Situation

- 70 years ago a bi-plane with a tank dropped water on a fire in the Mendocino National Forest
- Fixed-wing aircraft only operate in daylight hours, with good visibility and winds <30mph
- Some rotary-wing aircraft are now night operation capable
- CALFIRE has added two C-130 aircraft capable of dropping 4,000 gallons of retardant per drop

2025 Current Situation

- As of May 2025, wildfires have already killed 30 people, destroyed 18,000 structures and burned more than 58,000 acres!
- The Fire Service has not yet embraced G.A.R.D. systems that can deliver 24-7 retardant under any conditions.
- Cost of 4,000 gallon G.A.R.D. unit is $500,000 or $125 per retardant gallon increase.
- The C-130 Hercules can deliver 4,000 gallons of retardant.
- The cost to refurbish the two C-130 Hercules is $45.5 million each.
- $90 million has increased day time retardant capacity by 8,000 gallons.
- Or…..$11,250 per retardant gallon increase.

Current Retardant Delivery Situation

Summary

- Adding the C-130 Hercules is a fantastic addition to the aerial fleet.
- C-130 bolsters our ability to deliver large volumes of daytime retardant.
- The Palisades and Eaton Fires emphasized the value of night capable rotary-wing aircraft.
- These fires also revealed an unfilled need to rapidly deliver retardant 24 hours a day under any condition.
- This can be achieved from the ground at a relatively cheap cost!

Local Response to Wildfires

Accomplishments and Needs

Our Local Response to Wildfires

Accomplishments

- Consolidated fire agencies
- Bought new apparatus
- Added paid staff and volunteers
- Increased our training
- Implemented home hardening standards and vegetation management programs
- But we have not yet solved the 24-hour, all-weather retardant application problem
- **UNTIL NOW !!!**

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We Need Wildfire Tactical Options

1. All conditions, day and night retardant application
2. Apply retardant directly upon structures from the ground
3. Apply retardant to support shaded fuel breaks and evacuation routes
4. Support prescribed fire and firing operations
5. Pump hose lays with fire retardant increasing firefighter safety on the line
6. Filling of remote retardant dip stations for rotary wing aircraft

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Needs: Other Tactical Options

1. Prevention: Apply *Phos-Chek Fortify* suppressing new roadside starts ***

    A. Gehricke Road, Norbom Road, Sonoma Highway, Loval Valley Road, Wood Valley Road, etc.

2. Enhance existing fuel breaks with long lasting retardant (Fortify)

3. Increase water flow as traditional 4,000 gallon tenders

4. Water source: Tanker Truck/Trailer fires, Aircraft Crash Response, Mass Cas. Decon., post earthquake fire response

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Increase Water Flow - Butte Co. Volunteer WT 25

Preventing Roadside Ignitions Case Study

San Diego County F.P.D. - Deputy Chief Dave Nissen

Preventing Roadside Ignitions Case Study

San Diego Co. Fire Case Study

- 2017 to present, San Diego County Fire applies Phos-Chek Fortify to 50 miles of roadside vegetation.
- Nearly eliminating roadside fire ignitions.
- 30 wildfire ignitions in treated areas all 0.5 acres or less in size.
- 1 tote mixed with 1800 gallons of water yields 2 miles of coverage at 10’ depth.
- 1 tote - 260 gallons of retardant concentrate. $15,000
- Application life - 6 months or 2” of rain.
- Post application appears slightly frosty white.

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Roadside Treatment (Phos-Chek Fortify)

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Roadside Treatment (Phos-Chek Fortify)

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Example of a 260 gallon “tote”

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Private Contractor & Fire Service Directed Applications

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Water tenders pumping retardant is not new!

- 2003 Old Fire. Contractors applied Thermogel saving 2100 homes in Running Springs. Captain Gloeckner, Gold Ridge Fire District
- 2019 Pier Fire. OES tenders effectively applied retardant to support a firing operation. Chief Schepley, Gold Ridge Fire District
- 2020 Walbridge Fire. Retardant applied by ground units to save communications on Mount Jackson. Battalion Chief Gino Degraffenreid, Gold Ridge Fire District
- 2021 Dixie Fire. Private contractors applied roadside retardant saving Collins Pines Mill and Chester, CA. CAL FIRE Battalion Chief Jason Novak
- 2020 to present. Private contractors apply retardant on fires taking days to implement. CAL FIRE and U.S.F.S.

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2021 Dixie Fire - Saved Collin's Pines Mill & Chester, CA.

Needs Assessment & Use Plan

Proposed Sonoma County G.A.R.D. Units

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Why does Sonoma County need G.A.R.D. Units?

- Fixed-wing aircraft is limited by daytime hours, visibility and wind
- Private retardant contractors do excellent work but …
- Wildfires move hours if not days faster than our ability to mobilize private contractor retardant applicators
- Ordering, Response, Travel, Rest and Op. Deployment time takes 12-48 hours minimum.
- We need this resource immediately (15 to 30 minutes)
- **With Fire Service G.A.R.D. units we can meet this need!**

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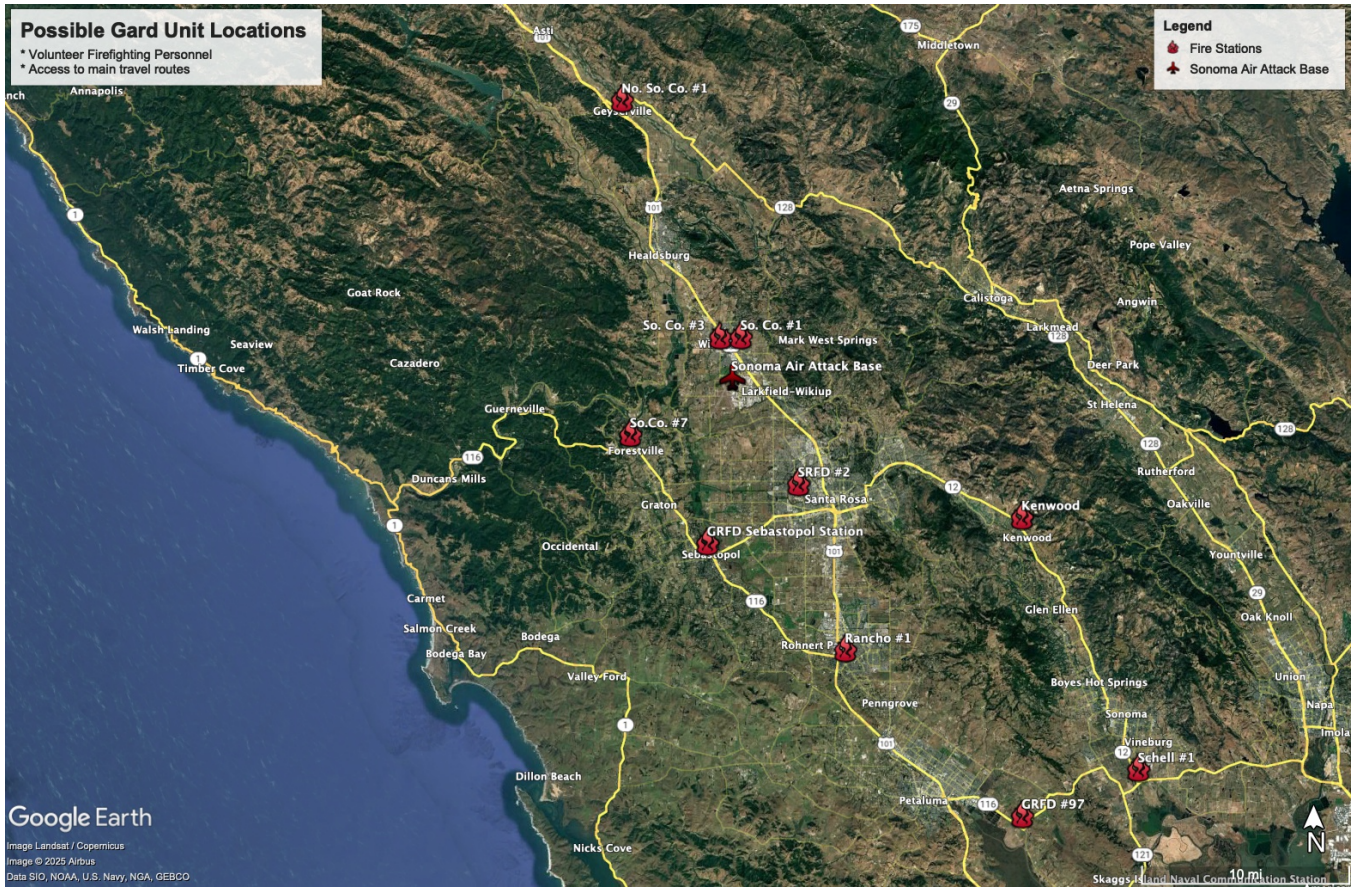
Possible G.A.R.D. Locations



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How can G.A.R.D.'s be used?

- Pre-Fire Season - Reinforce roadside fuel breaks, roadside applications and Prescribed Fire.
- Traditional water tenders. Reducing number of water tenders needed for all fires.
- Priority during wildfire season as G.A.R.D. Units within Sonoma County.
- Upstaffing for Fire Weather Events - Excellent Opportunity for Volunteers
- Mutual Aid Resource - Water tender and/or G.A.R.D. Potential income source.
- Minimum two personnel - Engineer and Officer

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Who can operate G.A.R.D.'s?

1. **G.A.R.D. - Trained and Certified Personnel (Completed Task Book)**
2. Full-Time and Volunteer Engineers and Officers
3. Licensed Operators - Fire Department Exempt or CDL with tank endorsement
4. Recruit Seasonal Volunteer Engineers to fit their skill set: Timber Operators, Water Truck Operators, Logging Industry.
5. Already being used. Most resources on eastern flank of the Walbridge Fire had been operating in the fire area prior to fire service control. Battalion Chief Chris Jacobsen, Gold Ridge Fire District.
6. Seasonal Volunteers Complete: G.A.R.D. Training Certifcation Taskbook, Seasonal Update Training and CAL FIRE Incident Safety Awareness for Hired Vendors Class (8hrs).

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Sonoma County G.A.R.D. Units Summary

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Summary of G.A.R.D. benefits.

1. Local fire agencies can apply fire retardant day or night and during high winds
2. Local fire agencies can respond with retardant in minutes
3. Prevention - Support Prescribed Fire, Decrease Roadside Ignitions, Reinforce Fuel Breaks and Create Deceleration Zones
4. Recruits, Incorporates and Promotes Volunteerism doing critically important work
5. Improves fire flow in rural areas
6. Increases firefighter safety with in-cab stream controls
7. Saves lives, property and the environment
8. IT ANSWERS THE MEDIA'S FAVORITE QUESTION ……

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What have you done to improve your wildfire response?

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Commonly Asked Questions

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Commonly asked questions or concerns.

Public perception of retardant?

Retardant application will follow 2022 “USFS Record of Decision Policy for Use”. Protecting known waterways, endangered species, etc. unless use is critical in saving lives and property during an emergency.

Public perception of roadside application for ignition prevention?

Retardant is 14% of the overall mixture with water being 86%. Retardant is mostly salt and magnesium. Roadside application for ignition prevention can replace areas where CAL TRANS normally spray herbicides.

Our budgets are already stretched or being cut?

In 2017, Sonoma County faced a $21 million dollar budget shortfall due to the Tubb’s Fire. Property losses alone were $5 to $7 Billion ! This plan is primarily focused on gathering private donations for its funding.

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Commonly asked questions or concerns.

Public perception of not implementing G.A.R.D.'s?

The public is now critically aware that retardant dropping aircraft get grounded during wind-driven wildfire events. When you are standing in front of camera crews, how nice will it be to talk about how you implemented G.A.R.D.'s to address this problem?

These G.A.R.D. Units are much bigger than current water tenders. Are they safe to drive?

Proposed G.A.R.D. units **are safer to drive** than two axle 1,500 gallon water tenders. Current water tenders range from 19,501 to 26,000 pounds GVWR. Leaving 7,001 to 13,500 pounds for the entire weight of the build and equipment after accounting for water weight. Current water tenders have under-sized braking systems and NO exhaust brake.

G.A.R.D. units on Peterbilt 548 have up to 66,000 GVWR. Accounting for 4,000 gallons of retardant mixture at 33,360 pounds leaves 32,640 pounds of build and equipment weight. These units have heavy duty braking systems and tremendous exhaust brake systems. The driver position and mirror compliment gives much better visibility around the vehicle.

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Commonly asked questions or concerns.

Private donations - Will G.A.R.D.'s be sent to a donor property first?

NO. G.A.R.D. units will be deployed through the use of our Incident Command System in the same way as any emergency resource dispatched to an incident.

What happens when my house is covered with retardant but the fire never gets to me? Who pays for the clean-up?

Applying retardant to structures is controlled through the incident command system. Insurance companies have plans for the clean up of firefighting efforts authorized by the incident command system during an emergency.

What about the safety of "Seasonal Volunteer Operators"?

In nearly all of the past devastating wildfires the County of Sonoma has seen private contractors either working on their own to help and/or have been field commissioned to do work for our I.C.'s, Op.'s Chiefs, Branch Directors and Divisions. We have a great opportunity to bring them into our training program for G.A.R.D. Units. We can capitalize on their experience, train them to work safely, equip them with safety gear providing us with much needed help during these disasters.

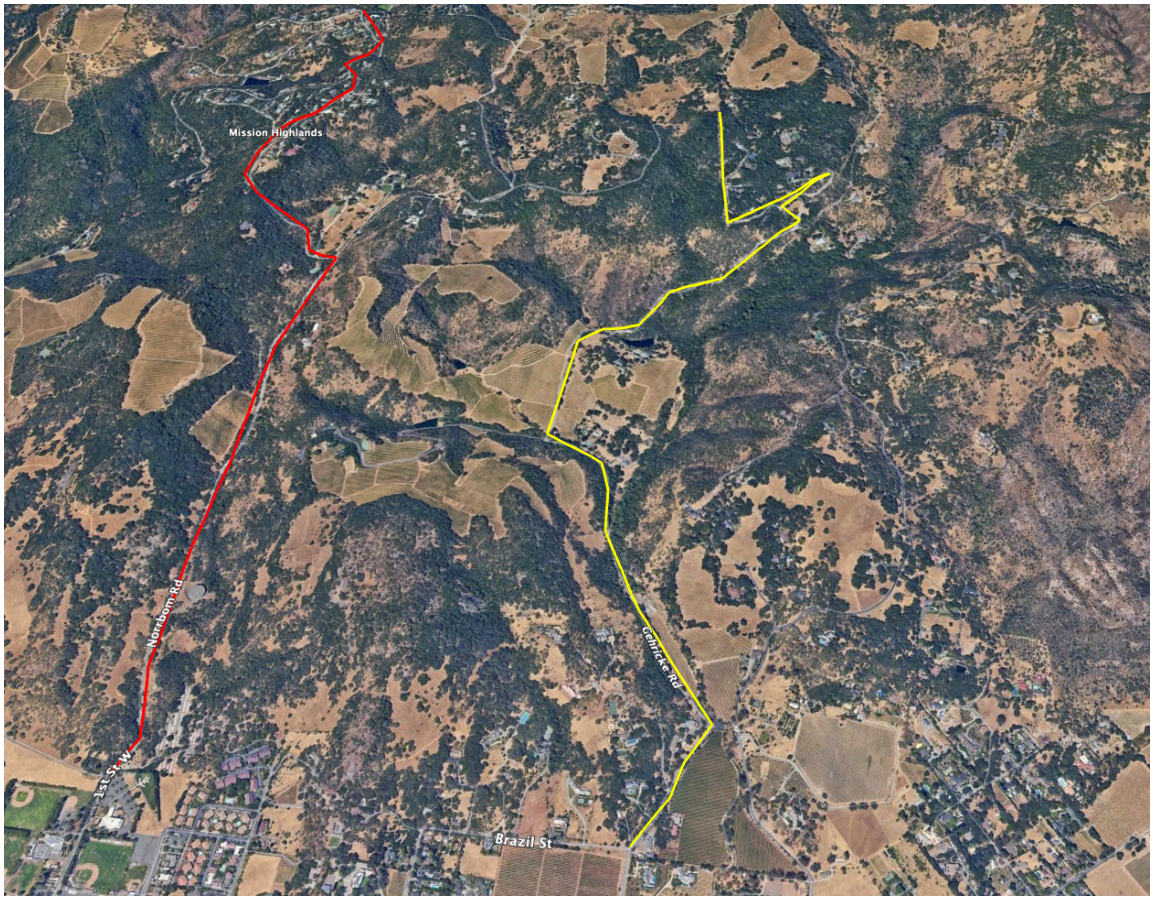
Sonoma County G.A.R.D. Units - 2019 Peterbilt 348 Example

Sonoma County G.A.R.D. Units - 2025 Peterbilt 548 Example

Purchase / Build Plan Options

- Buy and upfit brand new $500,000 and 18 months build to arrival.
- Buy excellent condition used $220,000 and 1-2 month radio upfitting.

Sonoma Area Discussion Map



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Sonoma County G.A.R.D. Units

"It is time to deliver 24 hours a day!"

Captain Cary E. Gloeckner (Ret.)