Calforests

CALFORESTS.ORG

Merritt Jenkins
CEO
Kodama

Andy Miller
CEO
Loamist

Carsten Brinkschulte
Co-founder & CEO
Dryad Networks

Scott Holmquist
Principal Consultant
Perimeter Solutions

New and Emerging Technologies & Innovations


Kodama
Systems

KODAMA THANKS CAL FIRE & US FOREST SERVICE FOR THEIR SUPPORT

Kodama
Systems

Problem:

JOBS IN THE FOREST INDUSTRY ARE OFTEN DIFFICULT TO STAFF

Logging

Wildfire Suppression

Mill Yards

Kodama Systems

Problem:

JOBS IN THE FOREST INDUSTRY ARE OFTEN DIFFICULT TO STAFF

Needs to scale 2X

Persistent staffing shortages

Needs to scale 2X

Kodama Systems

Productivity Enabler:

SUPERVISED AUTONOMY

Source Employees:
find employees from far away

No Travel:
eliminate the cost of 3hr commutes

Safer:
lower workers' comp costs

Productivity Multiplier:
enable multiple shifts & multiple machines per operator

Kodama Systems


Kodama
Autopilot™

First Product:

SKIDDER TELEOPERATION & AUTONOMY

- Partnered with WEILER, a forestry equipment OEM
- Operating on the site of the Park Fire near Red Bluff, CA
- All connectivity is via STARLINK

Kodama Systems

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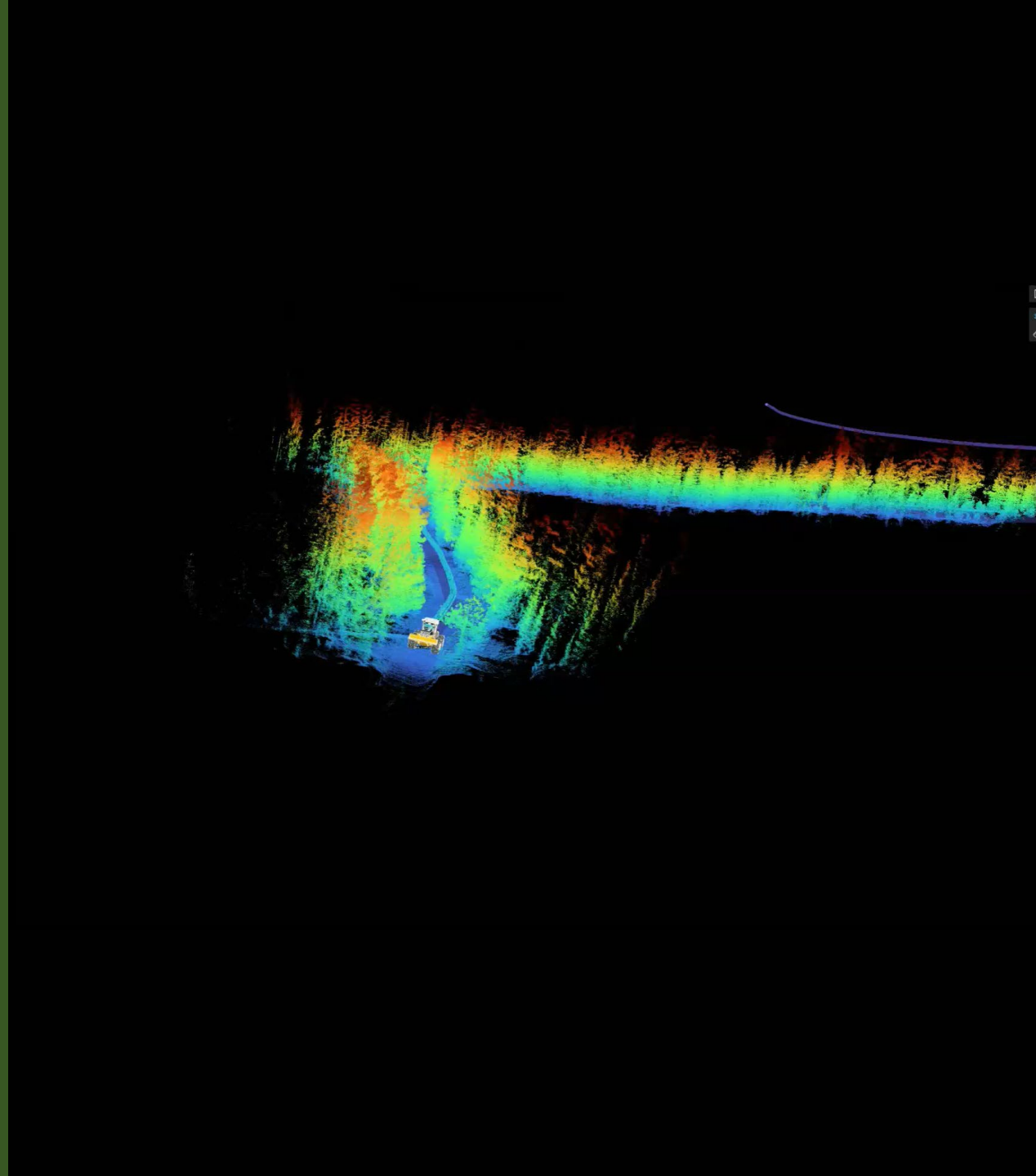
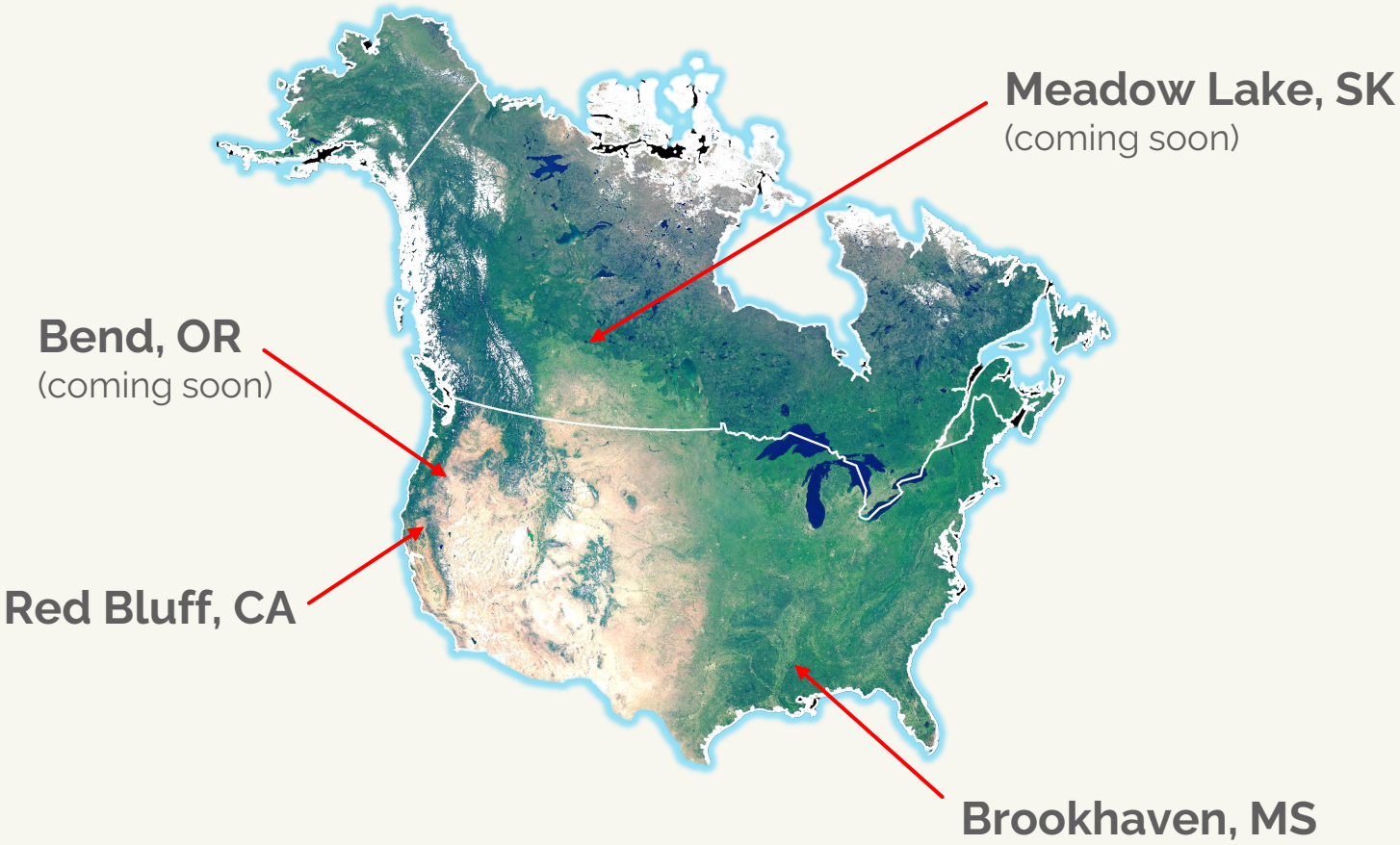


Kodama Systems

Commercial Deployments

KODAMA IS EXPANDING OPERATIONS ACROSS NORTH AMERICA



Kodama Systems

The Future

KODAMA PLANS TO EXPAND TO MILL OPERATIONS & FIRE SUPPRESSION

Kodama Systems

The Future

KODAMA PLANS TO EXPAND TO MILL OPERATIONS & FIRE SUPPRESSION

WE WANT YOUR INPUT!

Kodama Systems

Kodama
Systems

CONTROL MACHINES FROM ANYWHERE

Loamist

Biomass Management Platform

Andy Miller
Co-Founder & CEO

Jan 2025
www.loamist.com

Andy Miller
CEO & Co-founder

Pete Christensen
COO & Co-founder

Chelsea Samuelson
Head of Operations

VoLo Earth

GIGASCALE CAPITAL

Third Sphere

WovenEarth VENTURES

Activate

Collab Fund

Breakthrough Energy

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
CAL FIRE
SINCE 1885

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
STATE OF CALIFORNIA

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

PG&E

Waste biomass is the lowest (CO2e) footprint feedstock for chemicals, fuels and materials.

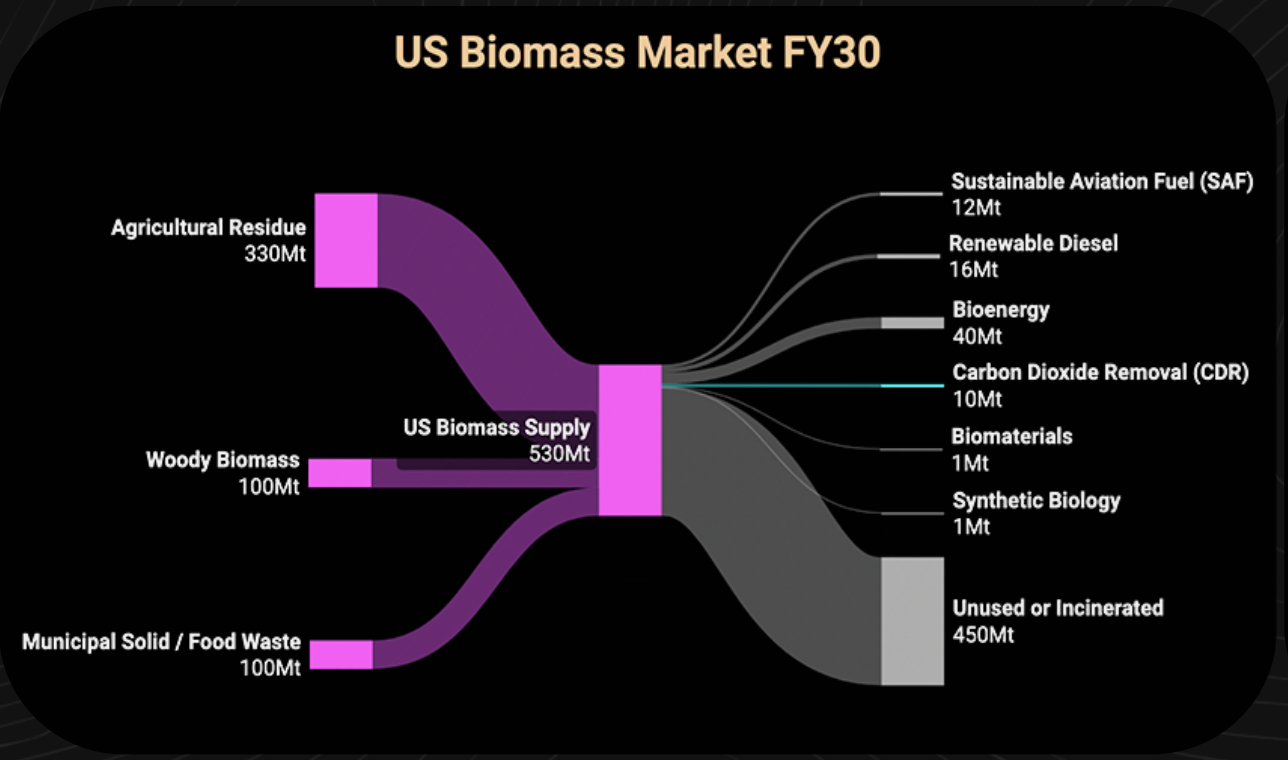
- Forest Residues
- Agricultural Residues
- MSW

Wildfire prevention and recovery requires biomass management.

- Treating 1M acres in CA will produce 10-15M tons of biomass
- Post-fire debris must be cleared to plant new forests

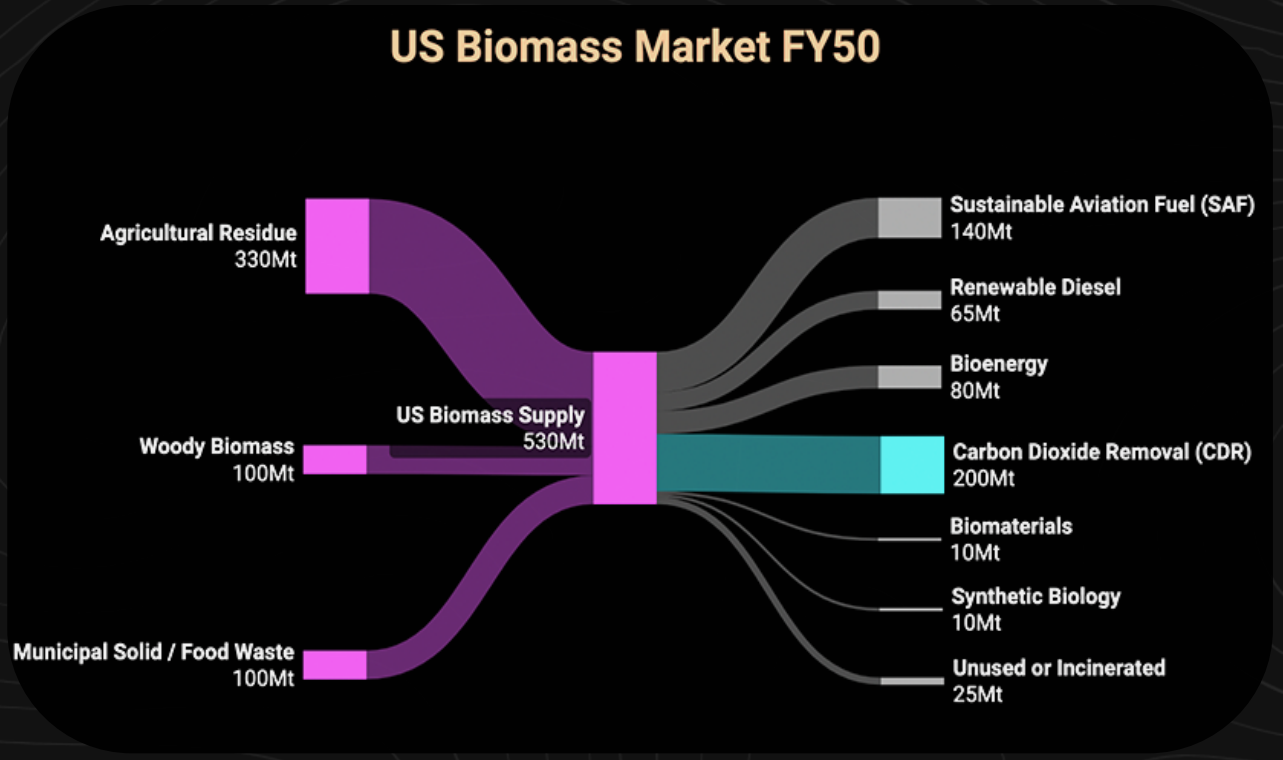
Biomass is waste management.

Demand Constrained



10% of
Biomass is Used
2025 - 2030

Supply Constrained



100% of
Biomass is Used
2035 - 2050

In 2025, biomass is an expensive waste management problem

$10B

Vegetation Management

With software, Loamist reduces biomass management costs and optimizes value creation.

Biomass Supply

is a cost center

>$10B annually

Biomass Demand

is growing to

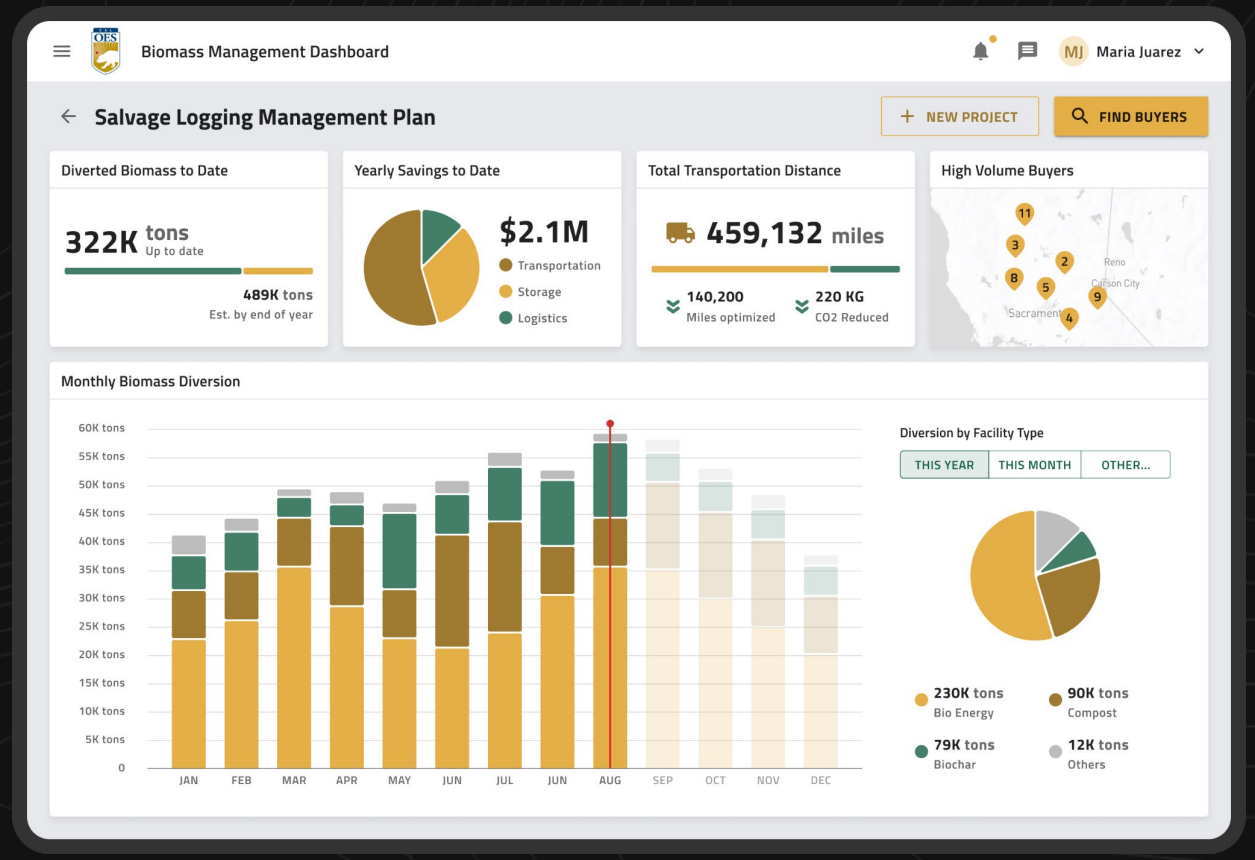
$20B by 2035

Loamist

The Biomass Marketplace

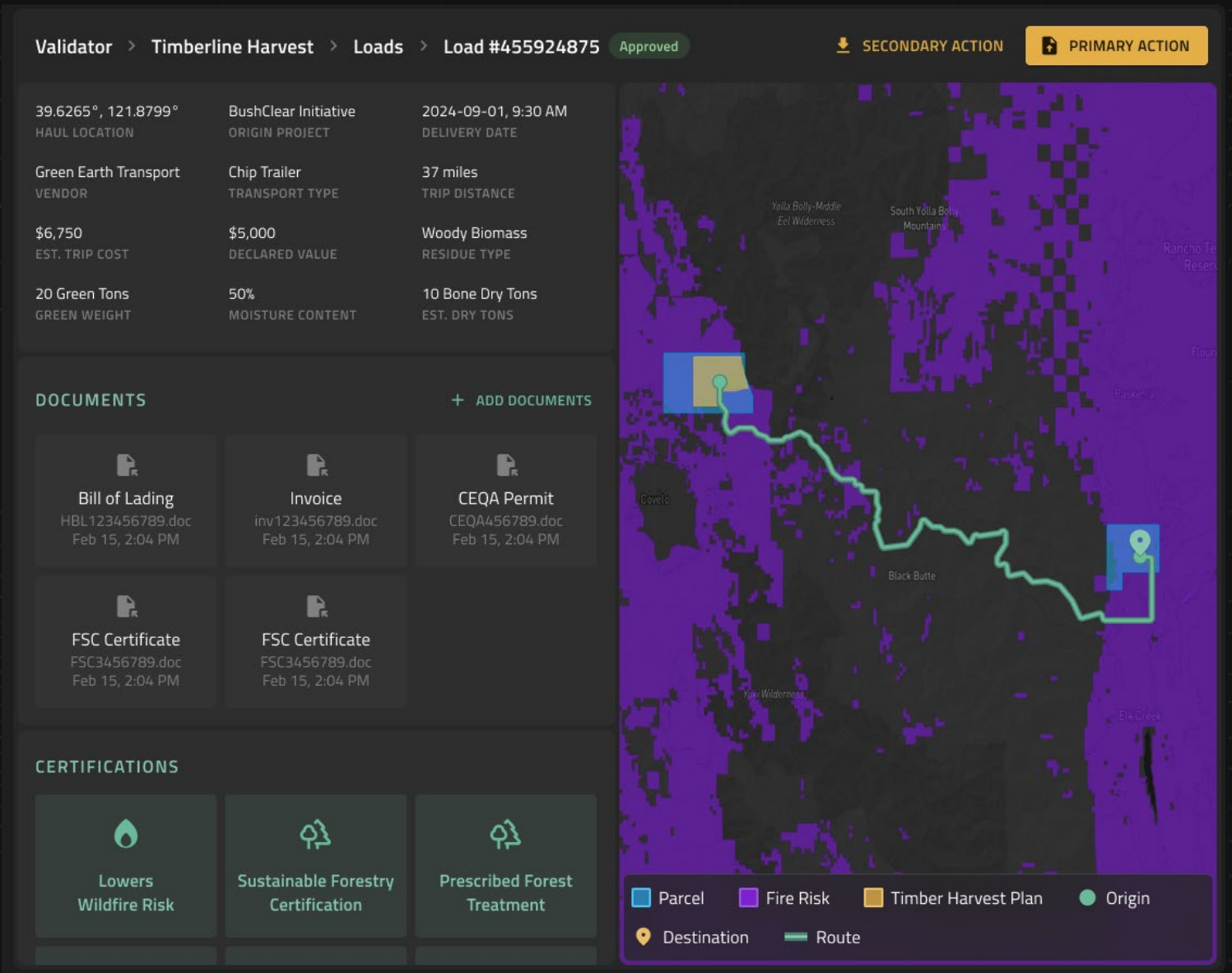
Measure, Coordinate, Transact

Measure - For land managers, we track and quantify where the biomass goes and how much it costs.



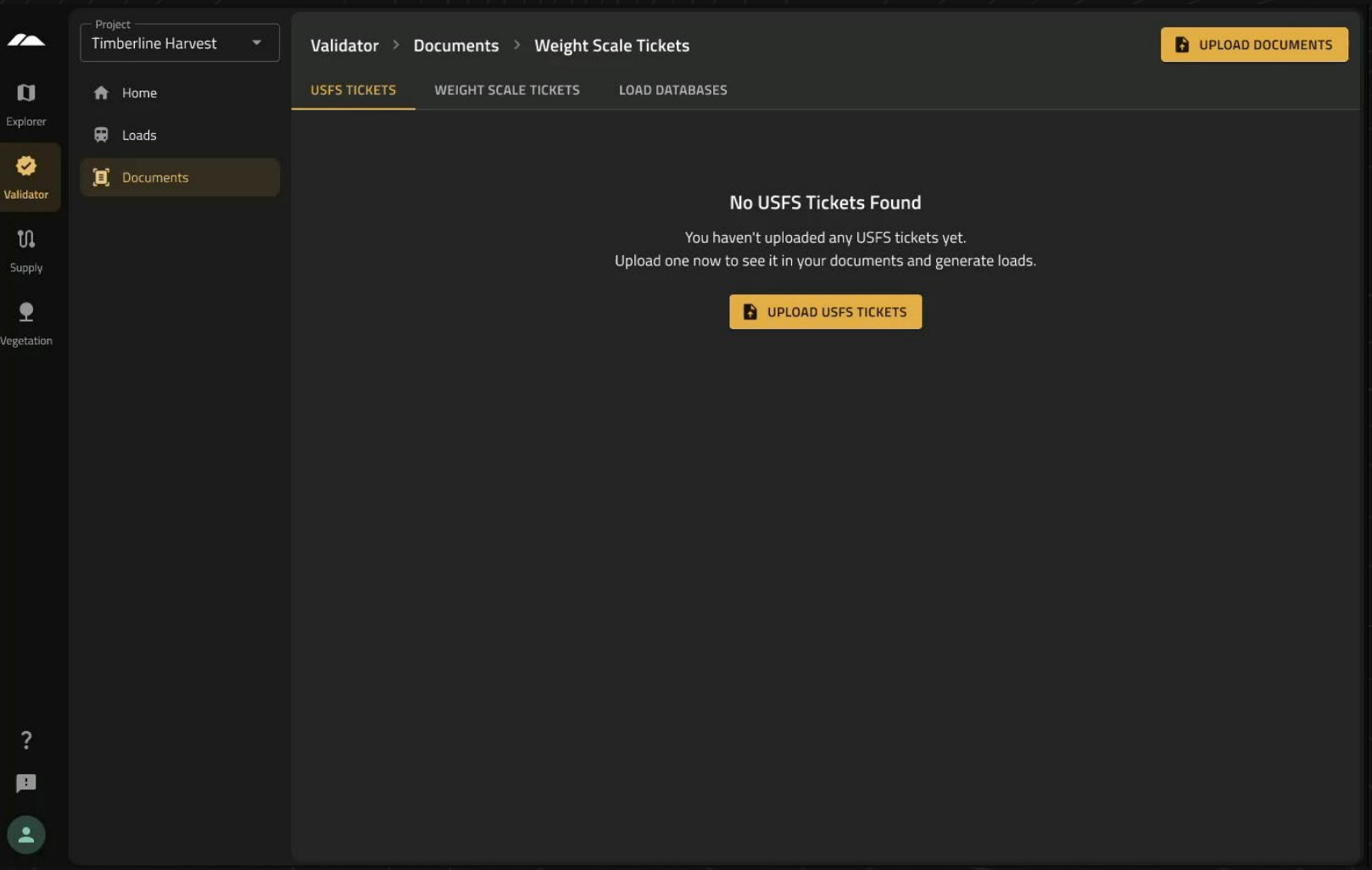
- Truck miles, labor hours, tip fees.
- Meet compliance requirements.
- Establish baseline to optimize for fire risk, safety, and transportation.

Measure - Chain of Custody software



- Transportation Subsidies
- Wildfire Risk Reduction
- Certificates of Compliance
- VCM Registries

Measure - Chain of Custody software



Transportation Subsidies

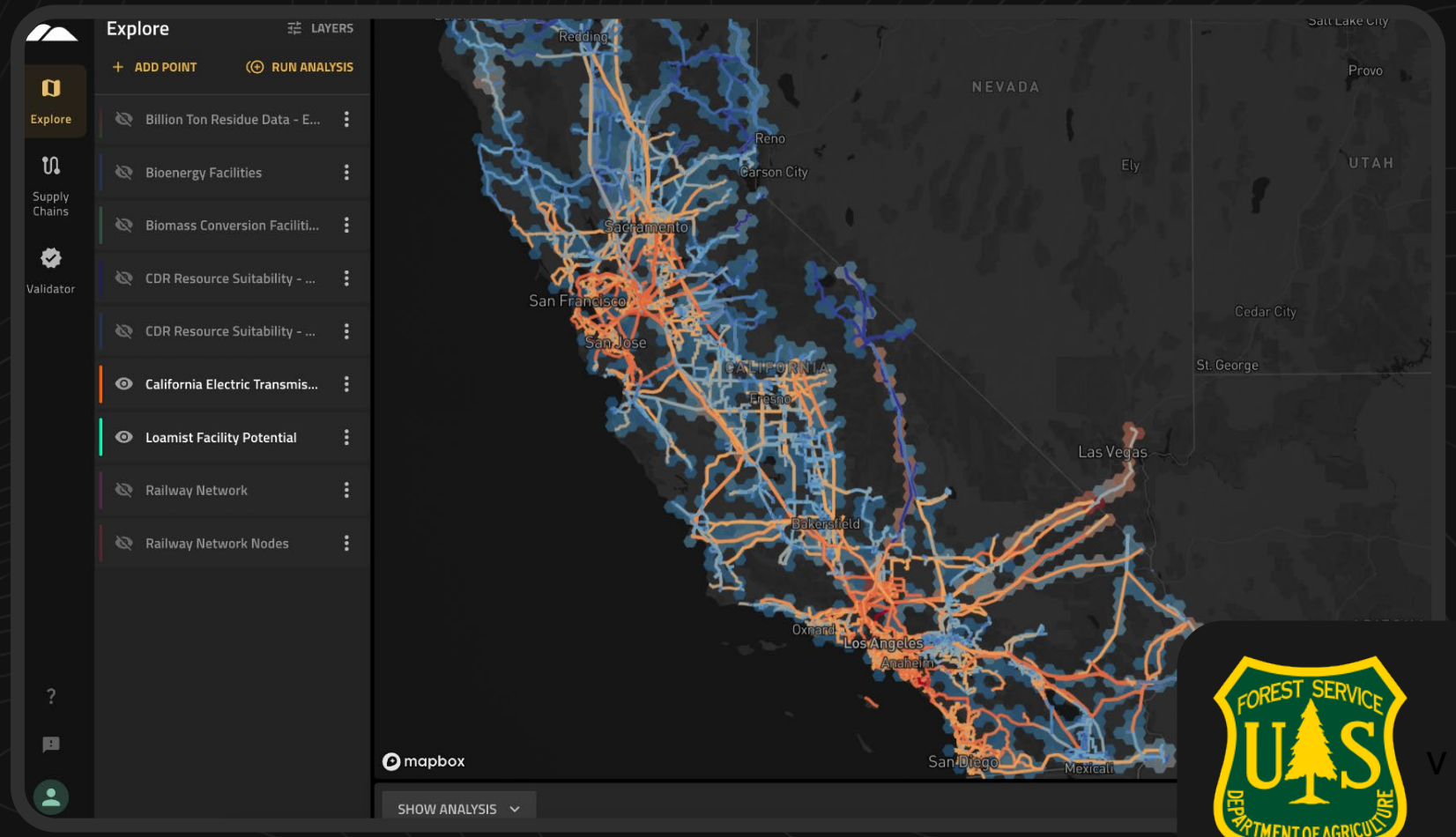
Wildfire Risk Reduction

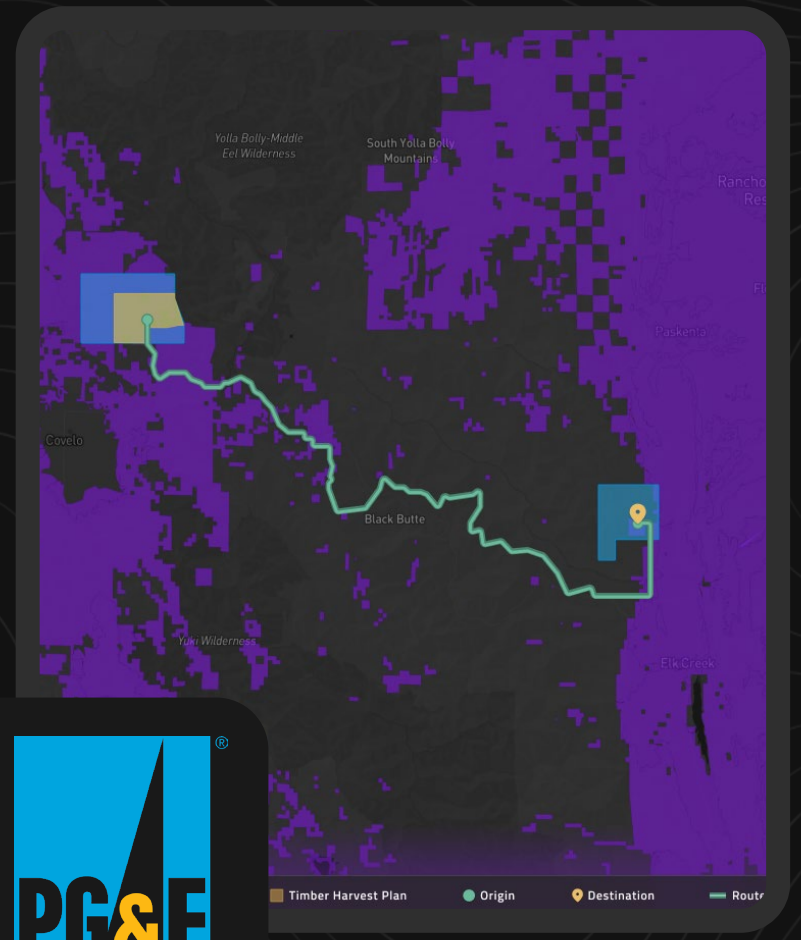
Certificates of Compliance

VCM Registries

Measure, Coordinate, Transact

Coordinate - AI-enabled operational planning for utilities and land managers.





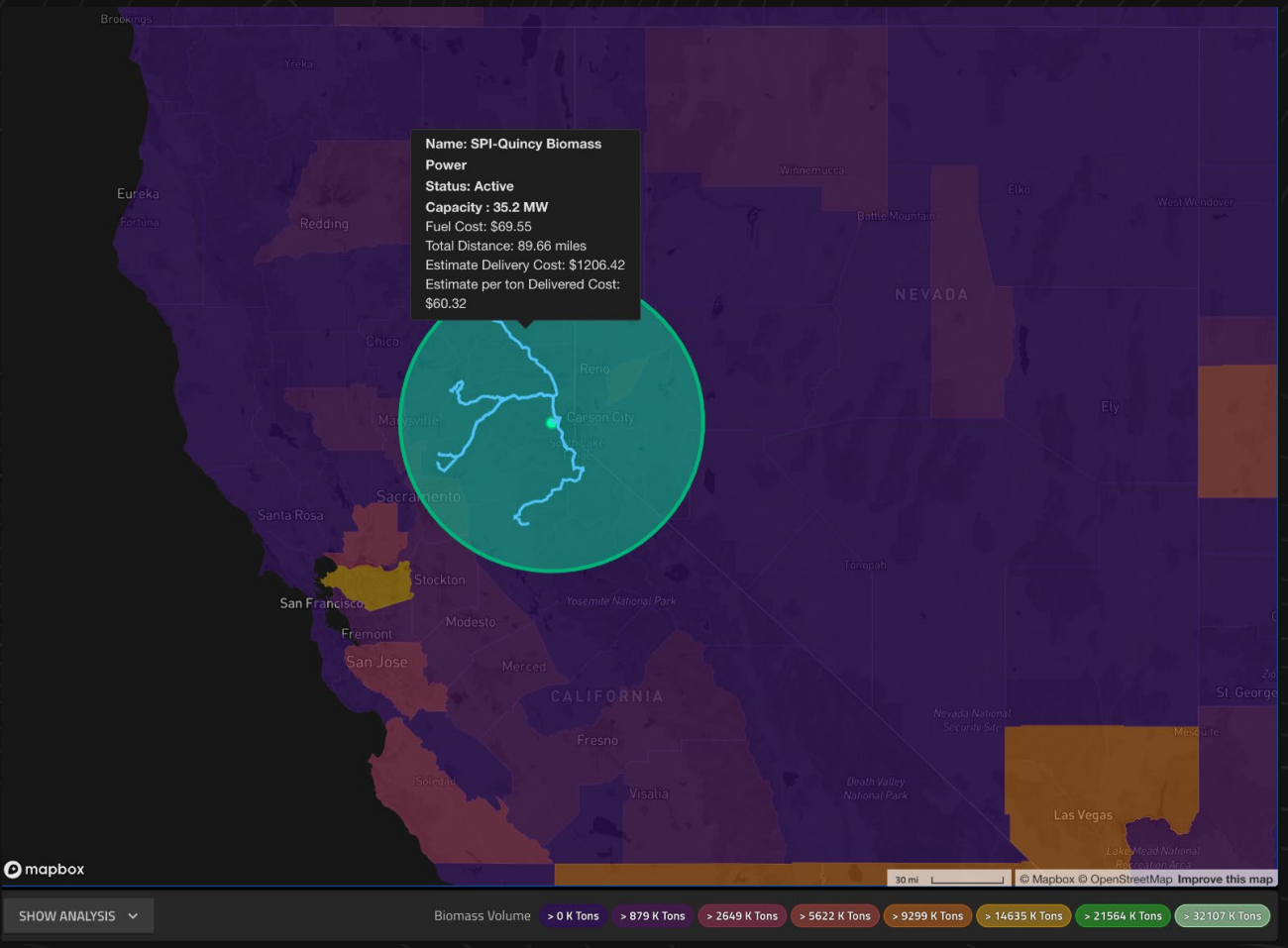
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

V

PG&E

Measure, Coordinate, Transact

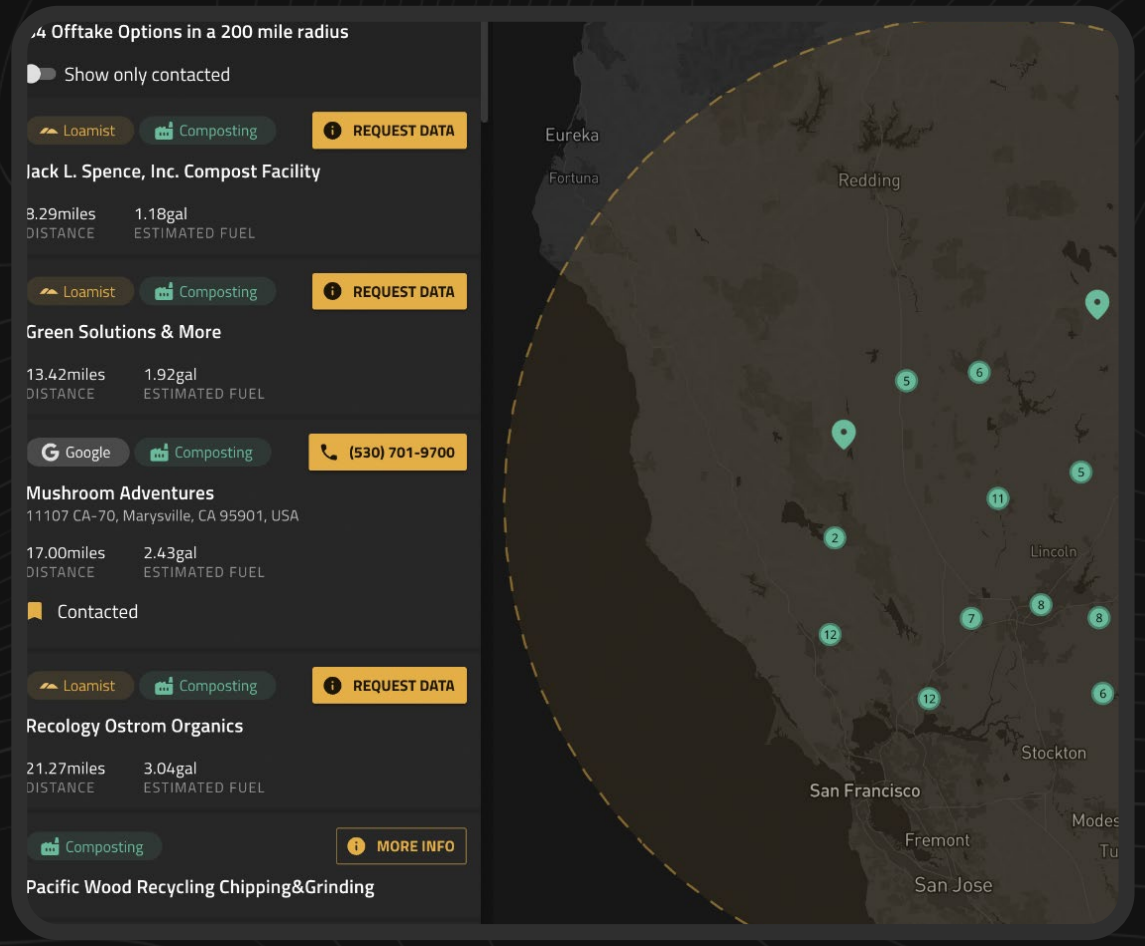
Coordinate - Leverage hundreds of data layers to support your biomass optimization strategy.



- Instant Feedstock analysis
- Transportation Studies
- Competitive Use
- Land Change with FIA data
- Pricing

Measure, Coordinate, Transact

Transact - Secure low-risk feedstock agreements from Loamist.



- Supply aggregation
- Options
- Spot purchases
- Long term offtake

Coming 2025

Please reach out

- Customers / Partners
  - Supply of Biomass and want to lower your waste management costs
  - Demand for biomass and want to:
    - Understand feedstock TAM, Competition, Local Dynamics
    - Secure Biomass feedstock for your project

THE END

andy@loamist.com

DRYAD

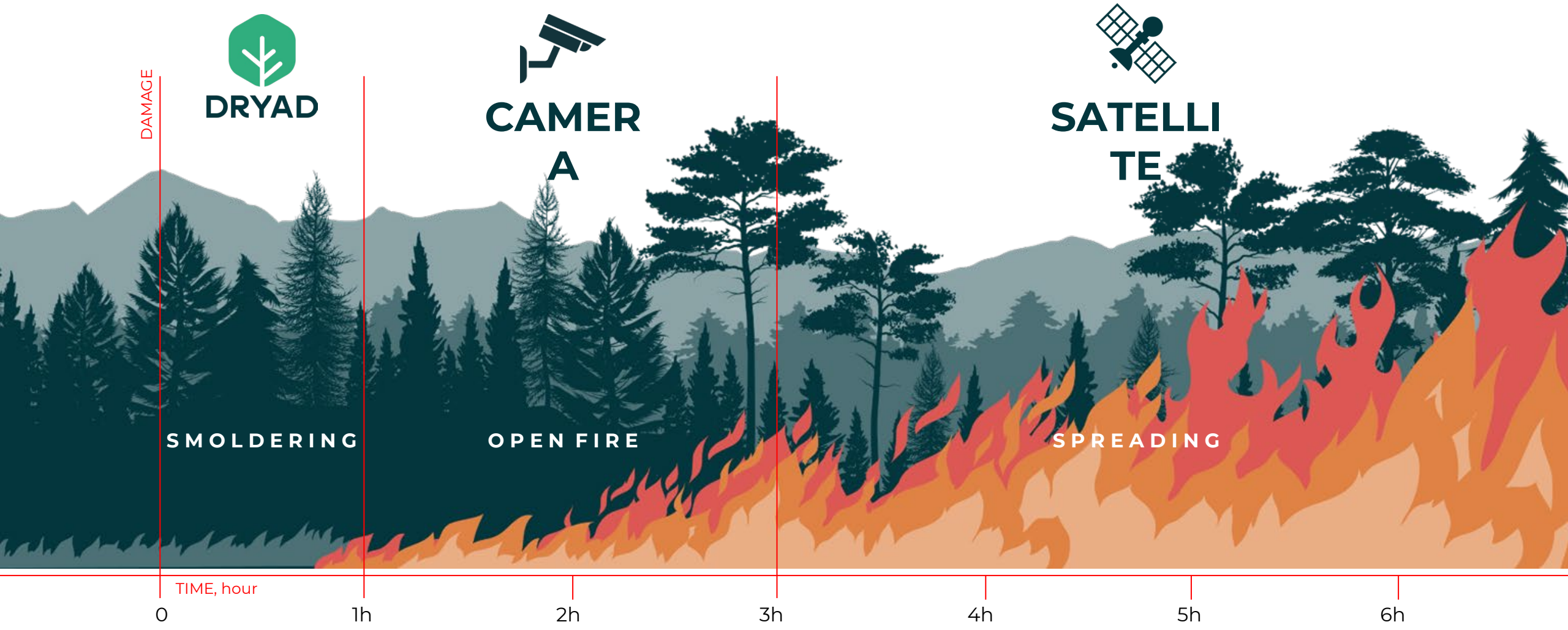
CONNECTING THE NATURAL WORLD

Ultra-Early Wildfire Detection

February 2025

Time is of the Essence

DRYAD

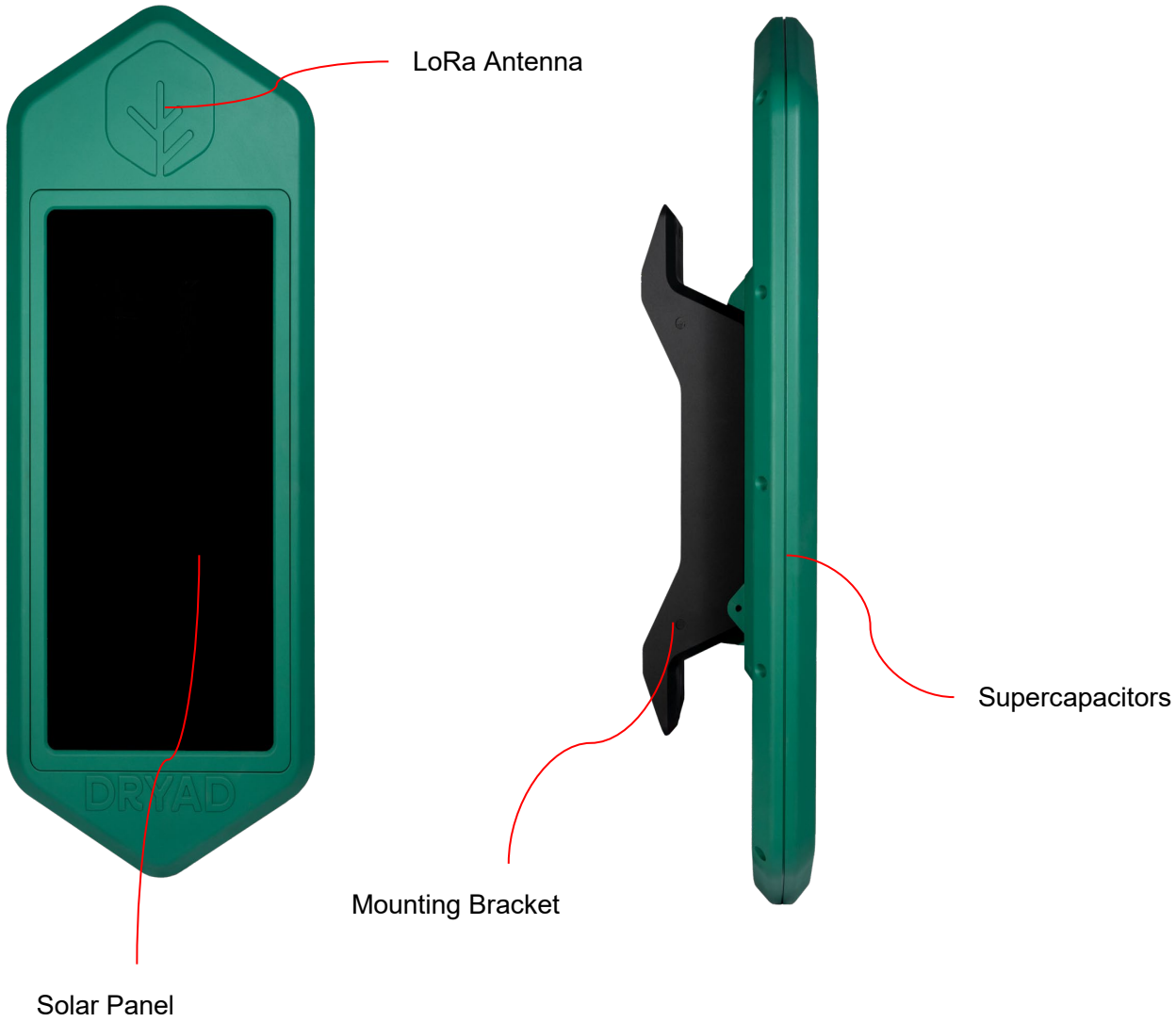


Silvanet Wildfire Sensor

Solar-powered gas sensor **‘smells’** fires within minutes from ignition

- Detects fires at smoldering phase
- Runs on solar power & supercapacitors
- **Low cost, high volume** deployments
- 10-15-year lifespan maintenance-free
- AI powered EDGE computing
- IP67 waterproof

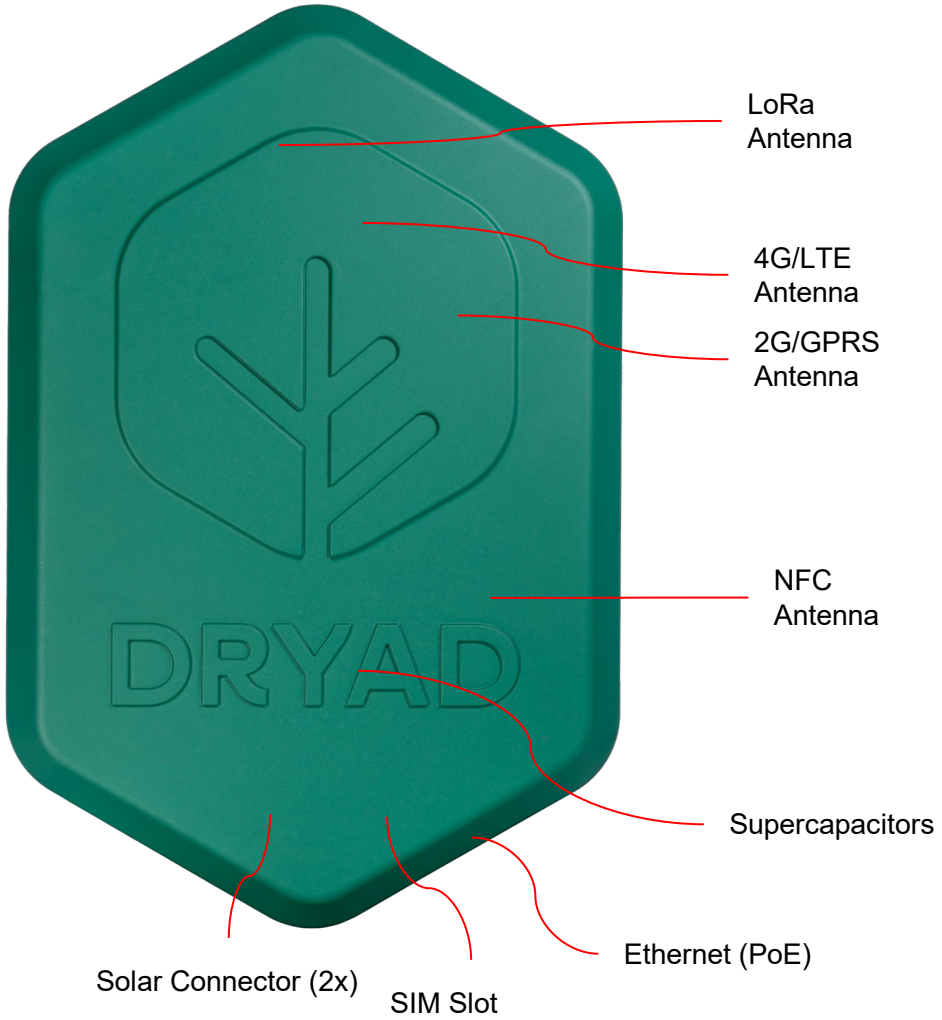
Silvanet Mesh Gateway



Network Range Extender

- Mesh Gateways cover 2-3km radius
- Multiple gateways can extend the range
- Up to 10 hops to Border Gateway
- **100 sensors per Mesh Gateway**
- Solar-powered, no lithium-ion batteries
- Supercapacitors for energy storage
- IP 67 waterproof

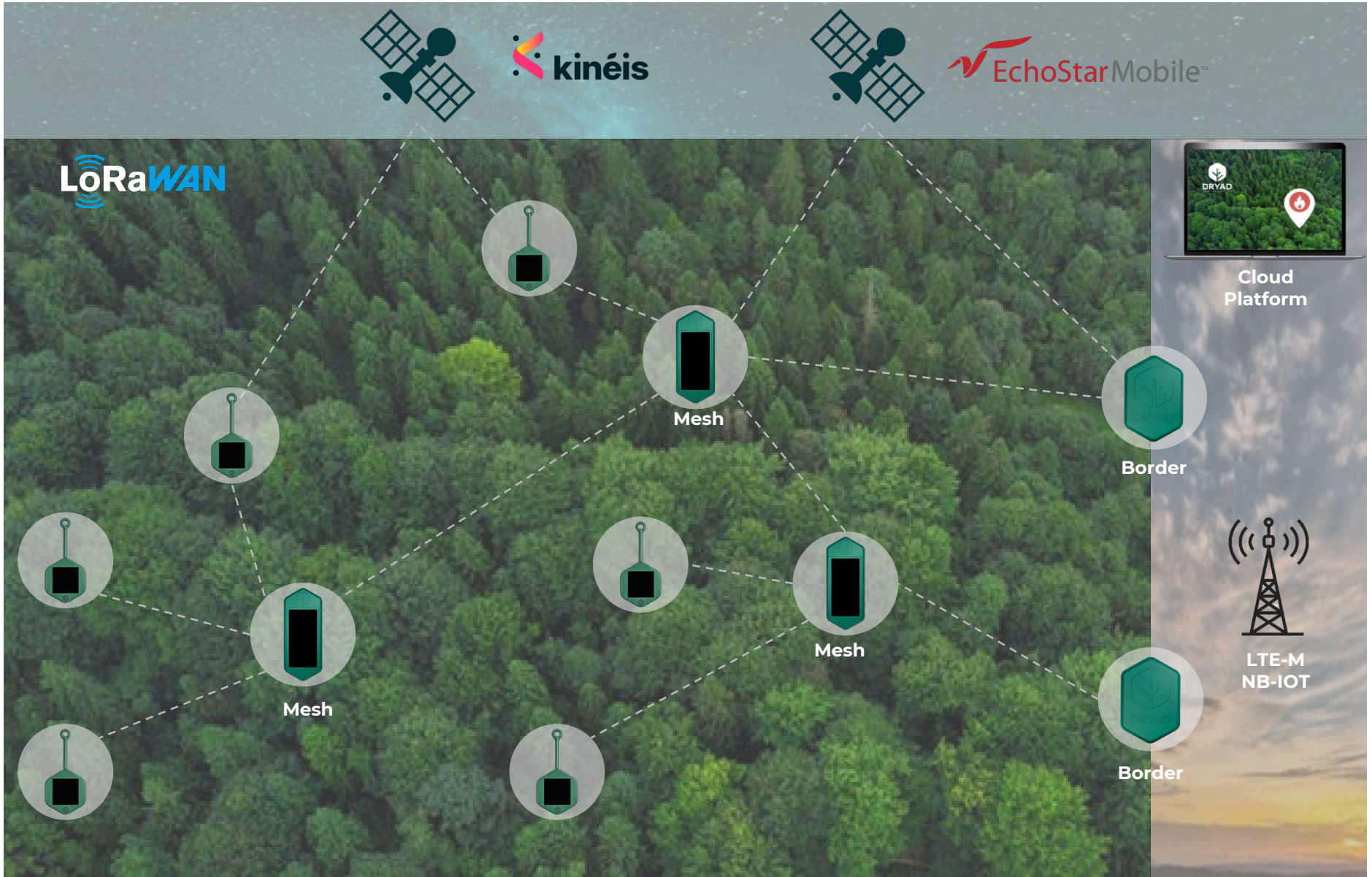
Silvanet Border Gateway



Connectivity for the Network

- 4G/LTE with GPRS fallback
- Built-in satellite connectivity
- Ethernet (POE) for wired connectivity
- Up to 10.000 sensors per network
- Solar-powered, no lithium-ion batteries
- Supercapacitors for energy storage
- IP 67 waterproof

Silvanet is the Internet of Trees



Optimizing Wildfire Sensor Deployments

DRYAD

Go to Market

TRACTION

20+ active Resellers
in EU, USA and Asia

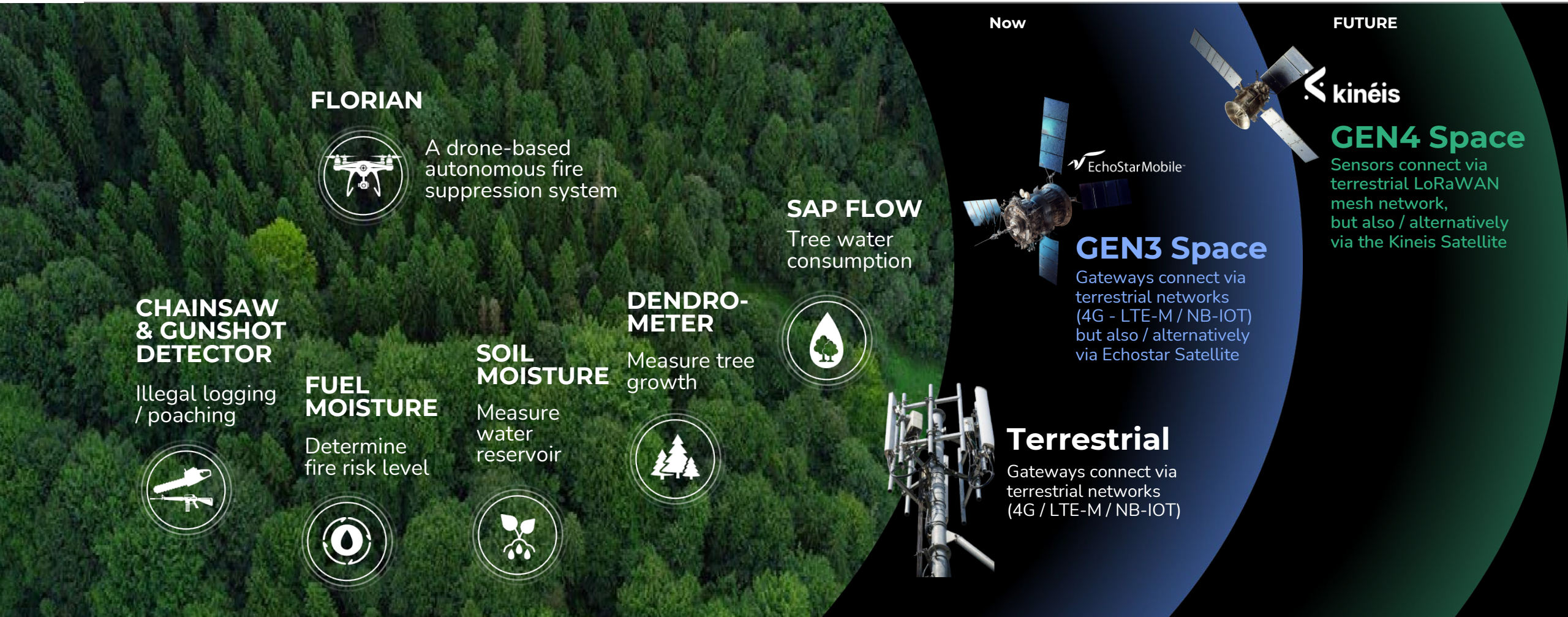
vodafone STIHL® BOSCH

50+ Paid-for POC / Pilots
100.000 sensors contracted for
Thailand and South Africa

20.000 sensors sold to-date
€4.9m contracted revenue

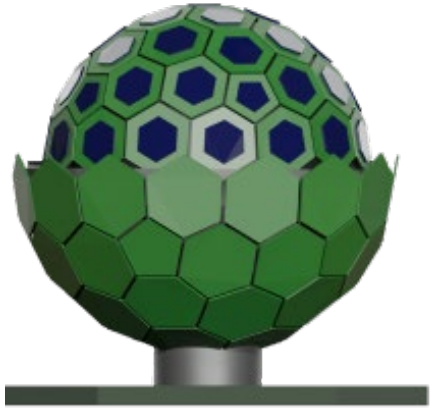
Roadmap: H/W in development

Dryad is building a **scalable communications infrastructure for forests and nature,** for health and growth monitoring, fire risk, illegal logging and poaching detection.



Roadmap: Observation & Suppression

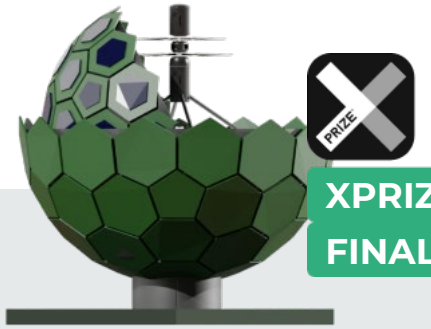
DRYAD



Autonomous drone system embedded in the forest

Receiving **$4m** EU Grant for R&D

Live Demo to investors and media end of March

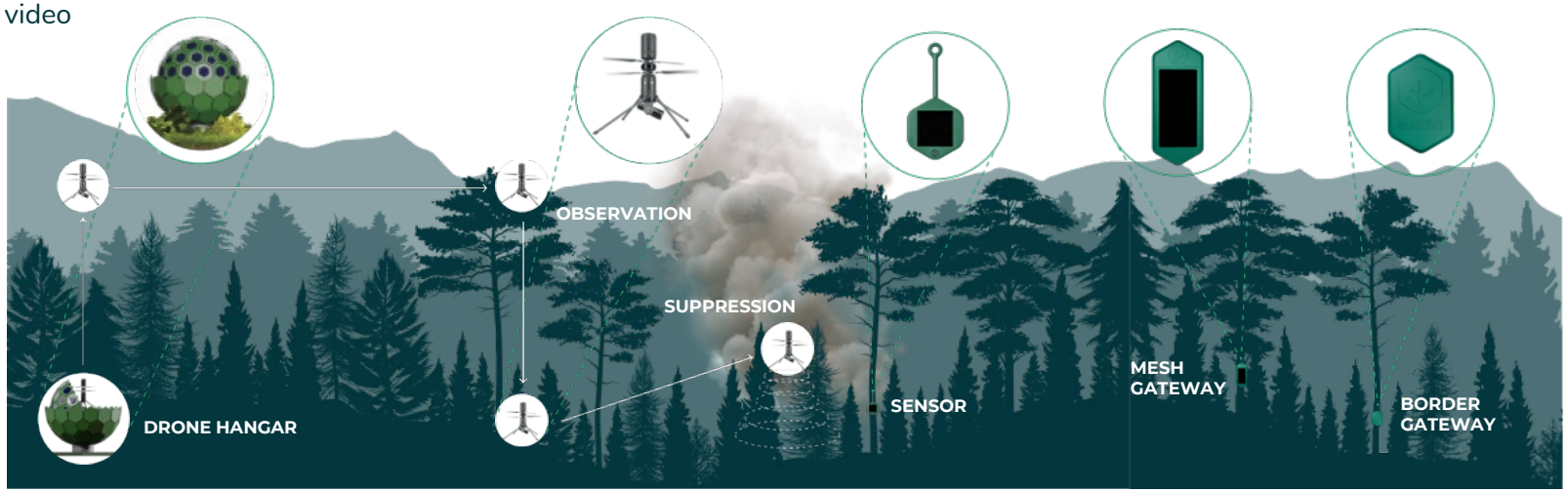


Observation

Phase 1: Solar-powered hangar and autonomous drone, detecting fire and delivering live optical and infrared video

Suppression

Phase 2: Descend into forest, navigate through trees, attempt to suppress fire



Unique approach

- Fully Autonomous Operation
- Acoustic Fire Suppression
- Solar-Powered Drone Hangar
- Event Cameras for Obstacle Avoidance

DRYAD

CONNECTING THE NATURAL WORLD

BERLIN-BRANDENBURG
GERMANY WWW.DRYAD.NET

IoT Evolution. LPWAN EXCELLENCE 2023

SOLAR IMPULSE EFFICIENT SOLUTION LABEL

EUROPEAN UNION
European Regional Development Fund

Gartner COOL VENDOR 2021

THANK YOU!

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Perimeter SOLUTIONS
Quality Products. Exceptional Response.

California Fire Problem

Effective Use of Long-Term Fire Retardants

Trusted. Solutions That Save.

calforests
California Forestry Association

Scott Holmquist

Consultant Regulated Asset Protection

February 12, 2025

Fire Problems and Technology

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- Large Complex – Note Worthy Fires – Longer In Duration
- Year Around Fire Potential
- Wildland – Timber – Interface – Urban Fuel Models (recent Fire in LA, Dixie (Greenville), Camp Incident, Tubbs Incident, Weed Boles & Mill Fires)
- Wicked Fire Problem (can not change the weather, topography)
- All About The Fuel Reduction
- Summary of Large Damaging Fires Needs to Up The Game
- Technology
- Utility Hardening

Agency Issues with Technology

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- Agencies are still doing many things same way they have done for many years.
- In the event new technology come forth; challenges to research, testing approval, adopt and funding.
- Late to technology.
- Wait and see innovators.
- Example the DC-10 – Since 2006 to **Adopt a VLAT CW Exclusive Use Contracts.**
- Helicopter in the Early 1940's 1946 a Bell 47, **Heavy Lift Copters use in the 1980's Now the NORM.**
- Now flying night operations with NVG
  - Heavy CH47's
  - Firehawks and other Ships
  - SCE – ORC, LAC, VNC

Early Days of Airtankers 1959 –1973

The TBM Avenger, a Grumman TBF manufactured by General Motors, began being used as a firefighting air tanker in 1958. The first TBM to drop retardant on a fire was Paul Mantz's TBF near Lake Elsinore, California. The TBM was well-suited to the role of air tanker because it was built to withstand the rigors of war.

To Current Aviation Assets

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Utilities & Private Company's

- Utilities in the Fire Business [Protection & Prevention]
  - SDG&E
  - SCE
    - Cooperative effort with [QRF] ORC, LAC, VNC
- PG&E
  - Using Class “A” Wildland Foam to now using LTR on Utility Poles
  - SIPT 45 Type 6 engines with plans going to 60 Type 6 engines
  - Siskorsky Rotary Aircraft –Construction & Maintenance [Coop. in Marin & Butte County prepositioned]
- Private Insurance
- Private Fire Businesses

Forest Timber Industry

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Since logging the Forest Timber industry has been fighting fire

- Dozers, Skidders, Water Tenders and other equipment
- Logging Industry Crews
- Coop – Fire Positions
- Aerial Patrols

Types of Suppressants

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WATER: HEAT is absorbed during evaporation.

FOAM: expands water, increases insulation, penetrates deeper into the fuel layer, remains on fuel surface longer, and increases visibility. **PHOS-CHEK® WD881, PHOS-CHEK® WD881C, PHOS-CHEK® First Response, FIRE-TROL 103**

GEL – (Water Enhancer): increases amount of water reaching and clinging to fuel. HEAT is absorbed during evaporation. **Insulate LC & Aqua-Gel K Powder**

Retardant can be applied as a suppressant – **PHOS-CHEK® LCE20-Fx, LCE20-W, PHOS-CHEK® MVP-Fx, PHOS-CHEK® 259-Fx**

Perimeter SOLUTIONS
Quality Products. Exceptional Response.

Proven to be more effective than plain water

This appears to be due to:

- Increased drain time
- More effective penetration into fuels
- Insulating effects
- More effective knockdown

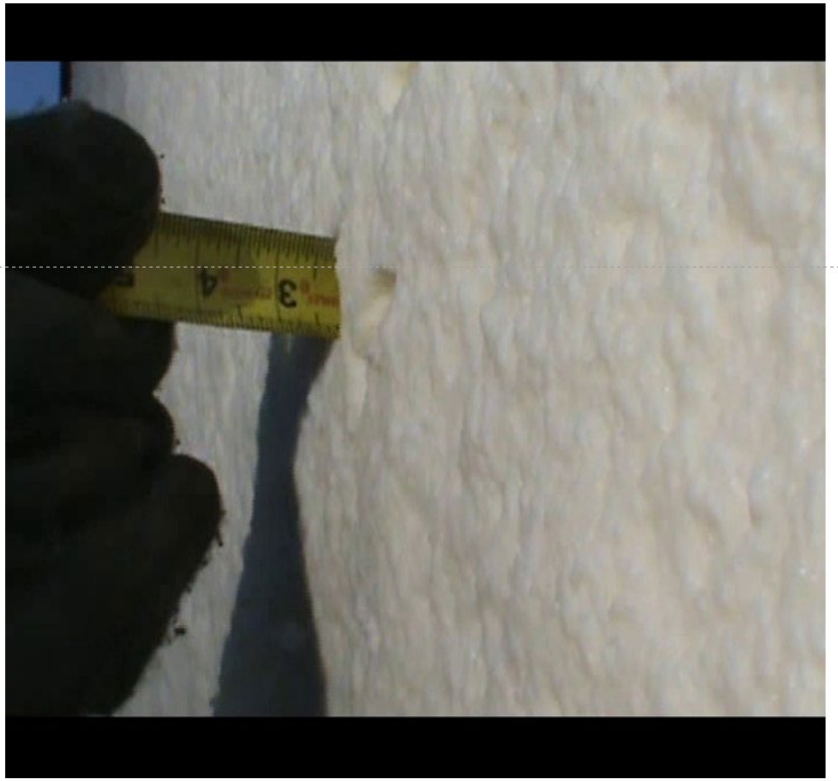
Characteristics and Properties

Typically, all Water Enhancers (Gels) consists of:

- Polyacrylate
- Polyacrylamide

These are known as the “active” ingredient.

PHOS-CHEK® Insul-8 Vertical Adherence Trial



Long-Term Fire Retardant

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A formulation that has the ability to create a chain reaction which reduces & inhibits combustion (burning).

Even after the water it originally held has evaporated.

Perimeter SOLUTIONS

Demonstration

A lot of science – and a little bit of magic

Trusted. Solutions That Save.

Vegetation Decomposition Process

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1 Molecule Cellulose = $C_6H_{10}O_5$

CELLULOSE + LT Fire Retardant + FIRE

Results: = 6 Atoms "C"
= 5 Molecules "H_2O"

Fuel Modification

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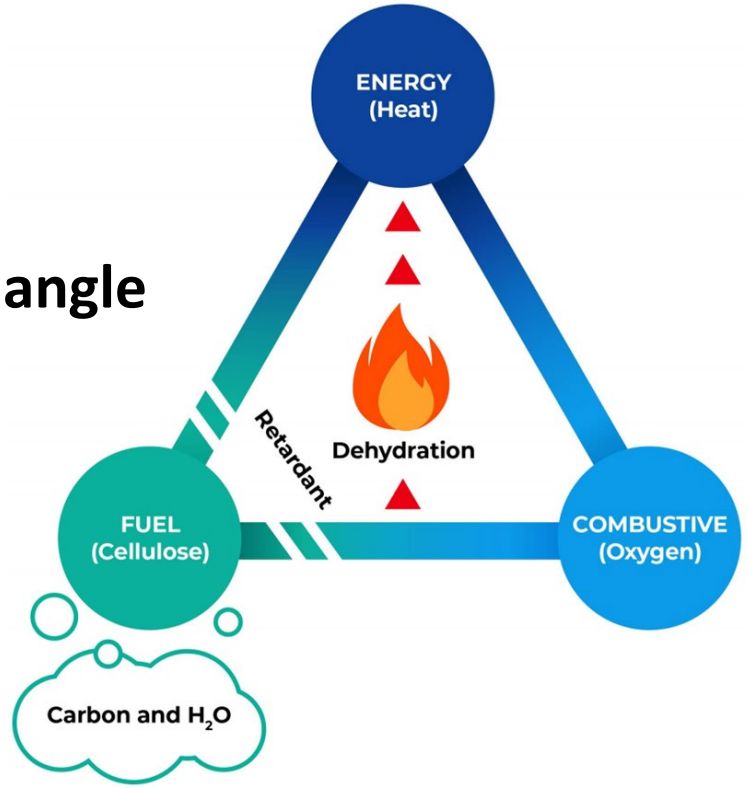
Modifying the fuel to prevent the ignition of the vegetation – ground, ladder and canopies

- Long-Term Fire Retardant applied to make the fuel

NON-Flammable cation of Long-Term Fire Retardant

Fire Triangle



Recommended Retardant Coverage Levels

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NFDRS FM	Behavior FM	Coverage Level	Flow Rate gal./sec	Fuel Description
A,L,S	1	1	100-150	Annual & perennial Western Grasses, Tundra
C H,R E,P,U	2 8 9	2	151-200	Conifer w/ Grass Short needle Closed Conifer, Spring Hdwd Long needle Conifer, Fall Hardwood
T N F K	2 3 5 11	3	251-400	Sagebrush with Grass Sawgrass Intermediate Brush (Green) Light Slash
G O F,Q	10 4 6	4 6	401-600 601-800	Short needle Conifer(heavy dead litter) Southern Rough Intermediate Brush(cured); Alaska Blk Spruce
B,O J I	4 12 13	Greater than 6	Greater than 800	California Mixed Chaparral; High Pocosin Medium Slash Heavy Slash
Adjust Coverage Level based on fire behavior, i.e., for smoldering fires decrease by 1				

Coverage Level – Relative Comparison

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Coverage Level 1 = 1 gallon equally spread over 100 square feet (2, 3, 4, - 8, 9, etc.)

Approx. Thickness	
Coverage Level 2	Speckled measles = (1/32 in.)
Coverage Level 4	.0625 in thick (1/16 in.)
Coverage Level 6	.096 om (3/32 in.)
Coverage Level 8	.125 in (1/8 in.)

Fire Chemical Tactical Effectiveness Guide

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Fire Chemical Effectiveness by Application

	Long-Term Retardant	Gel	Class A Foam	Water
Indirect Attack	✓✓✓✓	✓✓	✓	
Direct & Parallel Attack	✓✓✓✓	✓✓✓	✓✓	✓
Interior Structure Attack		✓✓	✓✓✓✓	✓
Structure Protection Indirect Application	✓✓✓✓	✓✓✓	✓✓	✓
Structure Protection Direct Application		✓✓✓✓	✓✓✓	✓
Mop-Up	✓✓	✓✓	✓✓✓✓	✓
Prescribed Burn Control	✓✓✓✓	✓✓✓	✓✓	✓

✓✓✓✓= Best ✓✓✓=Better ✓✓=Good ✓=Baseline Effective

Environmental Information

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Fire Chemicals

- Forest Service approved products must go through rigorous environmental testing by the US Forest Service WFCS Missoula.
- Only approved products are listed on the Qualified Products list (QPL).
- Products are tested for fish toxicity, mammalian toxicity, & an entire comprehensive list of potential effects.

http://www.fs.fed.us/rm/fire/index.htm

United States Forest Service (USFS) Qualification Testing

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Testing Includes:

- Mammalian and fish toxicity
- Initial and final corrosion (surface and intergranular)
- Viscosity stability/Product stability
- Pumpability
- Abrasion
- Temperature cycling
- Microbial growth
- Color properties and visibility (opacity, fading, field visibility)
- Air drop characteristics
- Operational field evaluation
- Burn testing - effectiveness

Wildland Fire Chemical Qualification & Testing

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Determine that potential wildland fire chemicals meet the performance requirements

- Defined in Forest Service Specification
- Performance based
- Common to all products if handled & used in same way

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Agencies

Getting Agencies to adopt the paradigm shift from aerial application and ground applied operations.

Getting Forestry & Timber Industry to use Long-Term Fire Retardants

- Protecting Timber
- Plantations
- Equipment & Landings
- Log Decks
- Finished Lumber Inventory
- Co-Gen Chip Piles
- Mills
- Infrastructure

Benefits of PHOS-CHEK Ground Applied LTR

Perimeter SOLUTIONS
Quality Products. Exceptional Response.

- ✓ ***Improving the safety of firefighters and the public.***
- ✓ ***Protection of identified Safety Zone(s), Temporary Refuge Area(s) and escape route(s).***
- ✓ Can be applied 24/7 no worries of inversions, weather conditions or night.
- ✓ Mixes easily to blend to be ready to apply.
- ✓ Can be applied with a variety of fire apparatus, water tenders and equipment.
- ✓ Can be applied days, weeks months in advance (Prevention/Protection).
- ✓ Easy to apply; Pinpoint accuracy of application from apparatus & hose lines.
- ✓ Once the product is applied it works wet or dry and remains effective until product is washed off.
- ✓ Can be used for critical infrastructure, utility assets, power lines, communications sites [Agency & Cellular], water supply.

Benefits of Ground Applied LTR [Cont]

Perimeter SOLUTIONS
Quality Products. Exceptional Response.

- ✓ Structure protection, within or outside the burn area thus reducing the number of resources assigned for structure and/or asset protection.
- ✓ Could reduce the quantity of apparatus assigned to improvements, structure protection by pretreating vegetation ahead of the fire.
- ✓ Establish anchor point(s).
- ✓ Firing out around structures and assets.
- ✓ Establish or reinforce control lines on active fires, prevent fire escape (wet line).
- ✓ Reduce fire intensity, check line.
- ✓ Used in conjunction prior to a firing operation(s) by treating fuels (Once treated can conduct firing operations when conditions allow), reduce or eliminate ignition, limiting spotting and fire intensity.

Benefits of Ground Applied LTR [cont.]

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- ✓ Protection of Machinery and Equipment
- ✓ Pre-treating vegetation to reduce chances of ignition {welding, grinding, etc.]
- ✓ Establishing and maintaining egress routes
- ✓ Apply prior to control and/ or prescribed fire projects
- ✓ Environmental, air quality

Forest Timber Industry Usage

- Protect their own assets ahead of the Agency
- Have used some in the last 5 – or more years
- Dixie Incident
- And a few others

Working cooperatively with agencies on portable base operation on incidents that the copters are pulling from. Ground applied portable base operations assigned to incidents for ground applied water tenders and other apparatus.

Application – Equipment

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Applications Water Tender

Perimeter SOLUTIONS
Quality Products. Exceptional Response.

Perimeter SOLUTIONS

A global business with a track record of innovation

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