LEVERAGING REMOTE SENSING DATA IN SUPPORT OF WILDLAND FIRE
Two companies speaking as advocates for the community of companies that partner for wildfire solutions.
We are Wildland Fire Technologists
Wildfire problems are growing faster than we can apply solutions.

We are laser-focused on speeding up solution adoption.

- Technical Friction – standards, silos, interoperability
- Social Friction – clients that communicate, data sharing, #NoBullies
- Adoption Friction – ‘pilot project’ vs ‘sustained program’ paradox
What we both bring together

• Operational Expertise – understanding intel, ops and outreach
• Technology Expertise – we live your wildfire needs
• Science Expertise – operationalizing fire science
• Social Expertise – we help build your wildfire community
What Can YOU Do.

• Technology Interoperability – software and data integration, standards, APIs
• Company Interoperability – how do companies think, how can they work as a team?
• Agency Interoperability – policies, standards setting, training systems
• Effectiveness Interoperability – mitigation to ops, fireline intel, risk/resiliency/response, all-hazards
Technology to connect Firefighters and Communities
Interra

- Formed in 2010
- Initial focus was COP for Wildfire Incident Management
- Linking Operations, Remote Sensing, and Preplanning
- Expanded to all-hazard (2013) and data analytics (2017)

Intterra Applications

- PrePlanning – Wildfire / Structure / All-Hazard / Active Shooter
- Operations – Realtime resource and incident status, tracking, and sensor systems
- Incident Management – Realtime incident mapping, alerting
- Analytics – Reporting and Analysis of data for outcome improvement

Integrated Partners

- Bode
- MAXAR
- Courtney
- Overwatch
- AeVex
- Churchill

Sensors/Systems
**Company Interoperability**

Interra enables technology + partnerships

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We foster collaboration across the ecosystem
Intterra was founded on data connectivity

Since 2010, Intterra, Local Agencies and the US Forest Service have worked to bring two perspectives together:

Local Agency

Federal Agency

what's going on

interoperable & actionable intel

Intterra brings both sides together through a common data infrastructure, fostering collaboration through actionable intelligence
Idea Interoperability

• Let’s learn from each other
  • FIRIS + Colorado MMA + Oregon
  • Example = San Diego ‘Fire School’
Effectiveness Interoperability

- Preplan -> Mitigation -> Response -> Preplan
- Response -> Preplan -> Mitigation -> Response
Case Study: Oregon Mitigation Tools

- Intterra developed a mitigation tool for Oregon’s agencies, working with local governments to collate parcel-based risk assessments
- Over 34,000 structure assessments completed for local agencies and the State
- In Ashland, a WiRē Team (USFS RMRS) used the data to integrate local social science into wildfire education and mitigation programs
- Damage assessments and risk reports are available on-demand
- All in the cloud

Intterra’s Oregon mitigation efforts have been replicated in other jurisdictions as they improve accountability and effectiveness
WHAT WE DO

We Operationalize Wildfire Science
WHO WE ARE

About Technosylva

❖ We are wildland fire.
❖ Leon, Spain office was established in 1997.
❖ San Diego, CA office was established in 2013.
❖ We provide advanced fire behavior analysis products & services supporting operations and planning.
❖ We are 70+ people dedicated to wildland fire.
❖ We are a science & technology company, participating in 29 peer reviewed papers in the last two years, 10 as main authors
❖ JV Agreement with Missoula Fire Lab and founder of the SJSU WIRC

Incident Management
Multi-agency software for all hazard incident management, situational awareness, and data sharing and collaboration.

Wildfire Risk Forecasting
Advanced weather and fire spread prediction for on-demand incident analysis, what-if scenario analysis, and for short and long term risk forecasting.

Wildfire Protection Planning
Tools for planners, decision makers, and the public to utilize risk assessment outputs for mitigation planning and preparedness.
WHO’S USING OUR TECHNOLOGY

Technosylva US Software Deployments & Technical Services

fiResponse™
fiResponse™ – Tactical Analyst
Wildfire Analyst™ Enterprise
Wildfire Analyst™ Desktop
Wildfire Risk Assessments
Activity Tracking
The Operational Technology Triangle

RESULTS

DATA

Seamless Integration of best information

MODELS

Field Tested, Accepted, and Trained

Right Amount of Actionable Information
STUDY CASE: CALIFORNIA

WILDFIRE MODELING TECHNOLOGY SOLUTION.
FireCast
Wildfire Risk Forecasting & Monitoring

FireSim
On-demand Wildfire Spread Prediction

Tactical Analyst
All Hazards Incident COP & DSS
Integration with CAL FIRE dispatch system & FireGuard provides automatic predictions for each fire.
Integration with CAL FIRE dispatch system & FireGuard provides automatic predictions for each fire.
Real-time fire spread predictions in seconds.
Automatic analysis of possible impacts to people and buildings.
Automatic assessment of initial attack success potential for each fire.
Integration with detection technologies facilities verification of predictions & on-going calibration.
View wind forecasts & animations in conjunction with fire spread predictions.
View wind forecasts & animations in conjunction with fire spread predictions.
Wildfire risk forecasts are derived daily, providing a 3+ day forecast of fire conditions.
Real-time tracking of air and ground resources in 3D.
2020
- 12,326 sims
- 6,955 IRWIN Incidents
- 463 FireGuard
- 38.9 billions risk sims in 2020

2021
- 22,244 sims
- 11,954 IRWIN Incidents
- 665 FireGuard
- 56.2 billions risk sims in 2021
Monthly Total Fire Radiative Power (megawatts/px) in California from VIIRS sensor

Hotspots Validation of 4 days Wildfire Risk Model

- LNU Lightning Complex
- CZU Lightning Complex
- SCU Lightning Complex
- Bluejay Complex
- W-S Cold Springs Complex
- Gold Springs
- Sheep
- Loyalton
- August Complex
- 20 Fire Perimeters
- 2020 Incidents

January 2012
- January 2013
- January 2014
- January 2015
- January 2016
- January 2017
- January 2018
- January 2019
- January 2020

July 2012
- September 2012
- September 2013
- September 2014
- September 2015
- September 2016
- September 2017
- September 2018
- September 2019
- September 2020
WFA-E FireCast Risk vs VIRRS Active Hotspots
Simulations Calibration with Fireguard
First burning period (until 8 hours)

Validation of operational fire spread models in California

Adrián Cardil, Santiago Monedero, Miguel Angel Navarrete, Sergio de-Miguelez, Phillip SeLegue, Geoff Marshall, Tim Chavez, Carlos A. Silva, Scott Purdy, Raúl Quilez, Joaquin Ramirez

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Simulations Calibration with FireGuard
First burning period (until 8 hours)

Statistical Analysis

**FUEL TYPE**
- The histogram plots analyze the ROS deviation (FG ROS - FIRESIM ROS) for the different fuel types.

**WIND SPEED AND FUEL TYPE**
- The histogram plots analyze the ROS deviation (FG ROS - FIRESIM ROS) for the different fuel types and wind speed thresholds.
Deep Learning with FireGuard data

Deep Learning

- Observed VS Predicted ROS to adjust the model
- Long Short-Time Memory (LSTM) Neural Network for regression analysis.
- Random Forest and Support Vector Machines to analyze the relevance of different input parameters

ML Based Improved Wildfire Models
Herbaceous & Woody Live Fuel Moisture Model

**Woody LFMC Model**
- Machine Learning Algorithms
- Random Forest & Remote Sensing

**Input Data**
- National WFAS Database
- 245 LFMC Sampling Sites
- 37,000 Field Observations
- 8-day MODIS Reflectance Bands
- Weather Data – SPEI Drought (6 months)
- Variable Extraction (Date, Location)

**Model Variables**
- Numbers represent their relative importance in the model

**Outputs**
- Model Prediction in Pure Plots
- 250m pixel resolution
- Pure Woody Plots (LF16)
- Model Prediction in Pure Plots
- Weekly Continuous WLFM
- Validation with field samples
- Validation in wildfires

**Model Prediction**
- WFA Enterprise
- Weekly product

**Phenology (Les)**
- Plant Species
- NDVI, MODIS
- Drought (SPEI)
- Ecoregion
Multiscale Lidar fuels yearly update

DRONE Lidar

AIRBORNE Lidar

GEDI Lidar
Technology + Power Users  Better Future
RDS2 - Intel Summit Santa Rosa 2022
Technology That Supports Frontline Change

- Using technology tactically
- Scale and tempo of decision-making
- Automating alerts, evacuation, locations
- Using remote sensing routinely
- Connecting mitigation with operations
• Interoperability
• Collaboration
• Integration
• Data Sharing