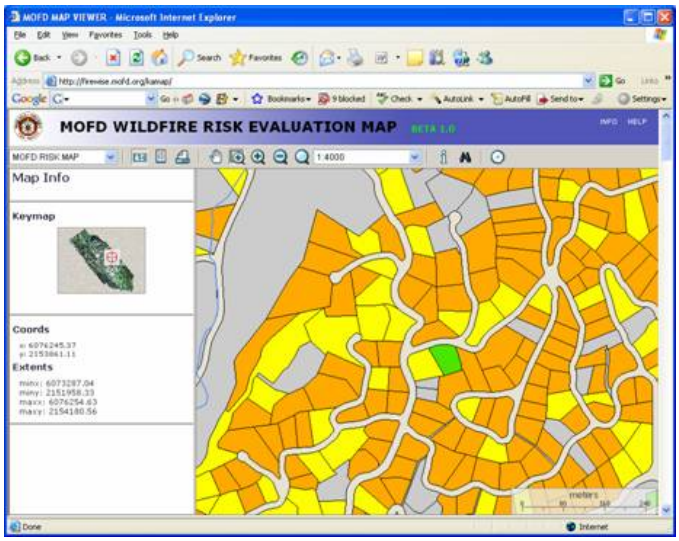
Community Fire Risk Assessment and Mitigation

SRA has executed two community wildfire risk assessment projects for the City of Colorado Springs, CO and the Moraga-Orinda Fire District, CA. The projects focused on identifying fire risk within the wildland-urban interface and assisting communities in the active mitigation of their fire risk through fire prevention programs and direct public interaction.



These projects represent the application of several key SRA business areas including advanced remote sensing planning and data analysis, modeling and simulation, and risk assessment and planning.

Project Overview

Wildland-Urban Interface fire assessment and mitigation is an interactive activity involving community emergency services, property owners, and federal/state/city stakeholders such as the US Forest Service or the Bureau of Land Management. The standard of good practice for communities to address their Wildland Fire Risk is through a Community Wildfire Prevention Plan (CWPP).

CWPPs contain five main functional areas:

- Establishing Community Stakeholder Interaction.
- Identifying Hazards.
- Assessing Vulnerability and Risk.
- Setting Community Mitigation Priorities and Strategies.
- Implementing an Action Plan and Assessment Process.

SRA's Fire Risk Assessment approach focuses on applying advanced remote sensing and GIS technology in an effort to improve interactive engagement across the community. This approach was developed to assist community Fire Prevention Officers (FPOs) in addressing the three key factors that can contribute to the success or failure of community-wide mitigation programs:

- Developing and maintaining a common view of the environment.
- Increasing the speed of information update.
- Maintaining a consistent level of accuracy across community.

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Project Phases

The SRA Team approached these projects as five distinct activities. By breaking these projects into distinct activities, SRA has been able to tailor the approach to different communities across the Western United States.

- Risk Assessment Model – developing a community definition of high/medium/low risk
- Collection Strategy – identifying all required data inputs and determining the most efficient mechanism for collection
- Data Collection and Analysis – collecting data and extracting needed attributes through analysis
- GIS Implementation – combining environmental attributes to identify hazards/risks and creating a common view of the environment
- Continual Update – ensuring that the risk assessment reflects on-going, planned, and completed mitigation efforts as well as changes to the environment

WUI Fire Risk Model

The heart of these projects was a community-vetted WUI Fire Risk Model that combines core environmental and social inputs regarding properties in the WUI and develops a parcel-based assessment of wildland fire risk. The models are science-based models which include tailored weighting factors developed through interaction between FPOs and their communities. They share a common set of attributes but differ in the weighting of those attributes as well as the selection and level of detail of the attributes. The common classes of attributes include:

- Fire Behavior (fuels, slope, aspect, etc)
- Landscape (veg density, defensible space)
- Water (hydrant, sources)
- Access (response time, road conditions)
- Construction (roof, siding, utilities, etc)

Collection Strategy

Once SRA and the customer developed and accepted a Risk Model, SRA coordinated a Data Collection Plan to support the collection of data required to execute the model. The purpose of this plan was to ensure that all available data sources were reviewed and the appropriate data sources were identified as inputs for the model. The strategy included a review of available GIS and demographic data, potential remote sensing data sources (ranging from aerial photography to hyperspectral and LiDAR), and potential field work for either data collection or validation.

For these two projects, aerial hyperspectral and LiDAR collection was proposed in order to take advantage of their dense data value (ie - collect lots of data that can be mined for many attributes) as well as their specific feature extraction capabilities:

- Hyperspectral – capable of supporting rapid, automated, accurate identification of specific materials and features. Data extracted included attributes such as roof type, wildland fire fuel model, invasive species, ground permeability, vegetation density and type.
- LiDAR – provides accurate elevation and slope data, vegetation canopy structure information, and identification of the boundaries of man-made structures. The remaining data was gathered from municipal GIS data holdings. This included data such as fire station locations, road data, fire hydrant data, and structure/parcel maps.

Data Collection and Analysis

SRA maintains a comprehensive remote sensing data analysis capability. Once the collection strategy was completed, the project team utilized it to determine specific sensor and analysis requirements. We acquired aerial and satellite imagery as needed and performed the data analysis.

The SRA Team utilized airborne hyperspectral data in order to reduce man-hours of collection, maintain a consistent level of accuracy, and extract many attributes in single collect. The specific attributes we extracted included:

- Roof Types
- Vegetation Density
- Permeable Surfaces
- Road Materials
- Wildland Fire Fuels
- Water Bodies
- Invasive Species

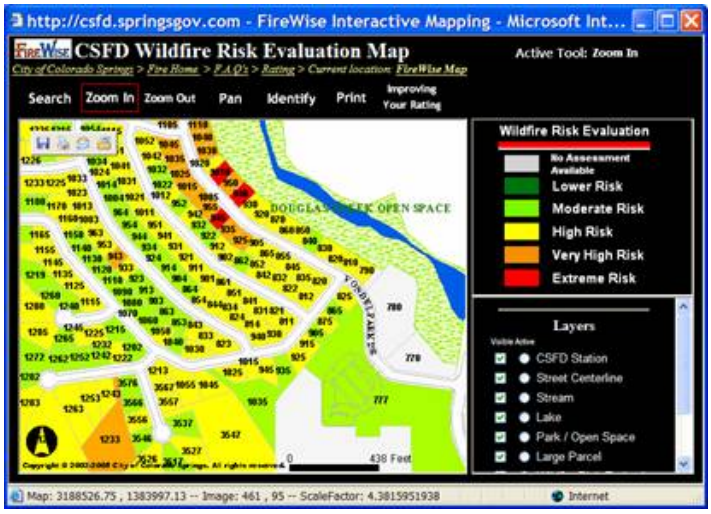
GIS Implementation

The ability of today's GIS systems to synthesize and depict large amounts of data makes them ideally suited for projects of this type. Fire Departments and Emergency Response Agencies are developing good GIS capabilities and databases which can either be leveraged by the Project Team or be linked to the resulting project data for follow-on activities.

The key GIS tasks for both the Colorado Springs and Moraga-Orinda projects included:

- Assembling all attributes within a single GIS system.
- Combining the attributes within the Risk Model to assess each parcel.
- Displaying the results on a Web-based GIS system and generating maps for community interaction.

Continual Update



Finally, these projects start by inviting the entire community to engage in wildfire risk mitigation. As a result, they initiate a process which must be sustained by the FPOs and the Fire Marshal. The resulting risk assessment must be updated and shared with the community anytime the environment changes based on fire, weather, or planned mitigation strategies (such as the installation of fire breaks or the execution of controlled/prescribed burns). In addition, the model must be updated to reflect the mitigation activities of home and property owners based on their review of the fire risk that their property is exposed to (such as installing a non-combustible roof or clearing defensible space).