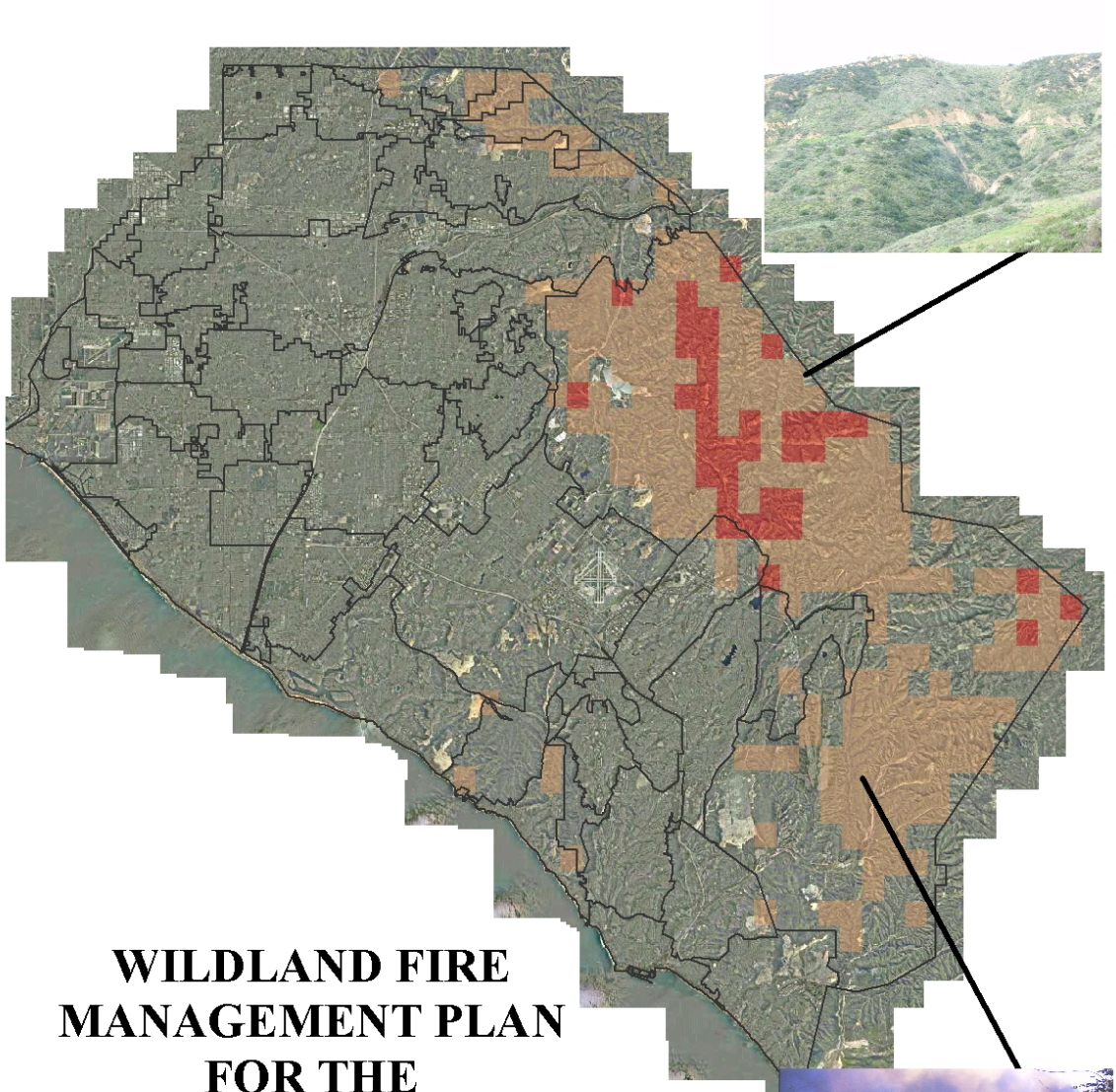


WILDLAND FIRE MANAGEMENT PLAN FOR THE ORANGE COUNTY FIRE AUTHORITY 2005

EXECUTIVE SUMMARY I

INTRODUCTION 1

WILDLAND FIRE PROTECTION ASSESSMENT 2

WEATHER 2
ASSETS AT RISK 4
FUELS 26
LEVEL OF SERVICE 31

W.A.F.L. (WEATHER, ASSETS AT RISK, FUELS, LEVEL OF SERVICE) 33

STAKEHOLDERS 39

PRIVATE AND QUASI-PUBLIC STAKEHOLDERS 39

ISSUES AND RECOMMENDATIONS 40

GLOSSARY 43

EXECUTIVE SUMMARY

Fire has shaped ecosystems throughout time; people and ecosystems have evolved with the presence of fire. For many years fire was aggressively excluded to protect both public and private investments and to prevent what was considered the destruction of forest, savannahs, shrublands and grasslands. Fire exclusion, both wildland and prescribed, sometimes favors non-native species in some fire-dependent areas.

Orange County Fire Authority personnel have prepared this *Wildland Fire Management Plan* with the intent to satisfy State mandates and provide a fire plan for State Responsibility Areas (SRA) within Orange County. The plan is dynamic in nature and has a field driven planning process.

The goal of the *Wildland Fire Management Plan* is to reduce total government costs and citizen losses from wildland fire in Orange County. To accomplish this the OCFA must develop a process to address such factors as firefighter and public safety, wildland urban interface issues, prescribed fire, suppression, preparedness, protection priorities and cooperation. Throughout the process the plan must continually consider and incorporate the cooperative interdependent relationships of wildland fire protection providers, provide for public stakeholder involvement, and create a fiscal framework for policy analysis.
The Wildland Fire Management Plan defines and assesses four (4) components. They are (1) Weather, (2) Assets at Risk from wildland fire, (3) Fuels and (4) Level of Service. These assessments will aid in developing and monitoring long term changes of the wildland fire protection currently being provided.

Finally, a Wildland Fire Strategy will be developed to foster partnerships and gain concurrence on plan implementation. The strategy, among other things, will (1) include alternatives to reduce total costs and increase fire protection effectiveness, (2) allow wildland fire service providers to focus on meaningful solutions for identified problem areas, (3) identify cost-effective pre-fire management investments to reduce taxpayer and citizen losses from wildland fire.

INTRODUCTION

Within the Orange County Fire Authority (OCFA) there is a growing recognition that past land-use practices and urban growth, combined with the effects of fire exclusion, have resulted in a variety of changes. These changes are demonstrated by:
Heavy accumulations of dead vegetation
Altered fuel arrangements
Changed vegetation structure and composition throughout the County.

However, the general population of Orange County either cannot or does not understand that without fire, encroachment of non-native or competing species has been occurring in some areas of the local ecosystems. Likewise, the public does not understand that vegetation modification resulting from wildland fire exclusion can cause a shift toward species that are not adapted to fire (some of which are not native) and are therefore more susceptible to damage from fire.

Fire is inherently neither good nor bad, but it is the most powerful natural force that people have learned to use. Fire has shaped ecosystems throughout time, long before humans arrived in North America there was fire, therefore people and ecosystems have evolved with the presence of fire.

The intent of this plan is to satisfy State mandates to the California Board of Forestry to provide a fire plan for State Responsibility Areas (SRA) included in Orange County. It is founded on a computer based geographical information system (GIS) to aid in the on going analysis of the hazard and assets at risk within Orange County. The acquisition of new data from internal OCFA sources and California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (CDF FRAP), new computer tools and application programs require periodic re-analysis and changes in the future. The plan primarily addresses SRA lands within Orange County; however, the principles can be applied to all wildlands and open spaces within the County.

The goal of the Wildland Fire Management Plan is to educate the public of the benefits and risks of planned and unplanned wildland fire. It is also intended that OCFA will use this plan to reduce total government costs and citizen losses from wildland fire in Orange County by protecting assets at risk through focused pre-fire management prescriptions and continued initial attacks success. To do this the OCFA must:

Develop a process to address such factors as firefighter and public safety, planning, wildland urban interface issues, prescribed fire, suppression, preparedness, protection priorities, and cooperation. Naturally, there are other factors that when considered as a whole, also play an important role in the overall plan and decision process.

Reintroduce prescribed fire and a variety of other practices into both management goals and protection goals of the Orange County Fire Authority. Prescribed fire is any fire ignited by management actions under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement, as opposed to "unplanned wildland fire" that defines any type of nonstructural fire, which occurs in undeveloped (wildland) areas of the county.

Throughout the planning process, the plan must consider and incorporate the cooperative interdependent relationships of wildland fire protection providers, provide for public stakeholder involvement.

This cooperation will allow us to incorporate the use of prescribed fire (the planned wildland fire ignition), fuelbreaks, vegetation manipulation (thinning, crushing, etc.) into management goals and planning efforts that will restore ecosystems and provide protection from the loss of human life or property. The current conditions on thousands of acres of wildlands, within Orange County, increase the probability of large, intense fires. These severe fires will in turn increase the risk to humans, to property, and to the land that we wish to enhance ecologically.

The magnitude of this plan and subsequent action items cannot be accomplished by any one single agency. It is paramount that the Orange County Fire Authority works in concert with stakeholders to encourage, gain consensus and to accomplish action items that will benefit the publics and provide for firefighter safety.

WILDLAND FIRE PROTECTION ASSESSMENT

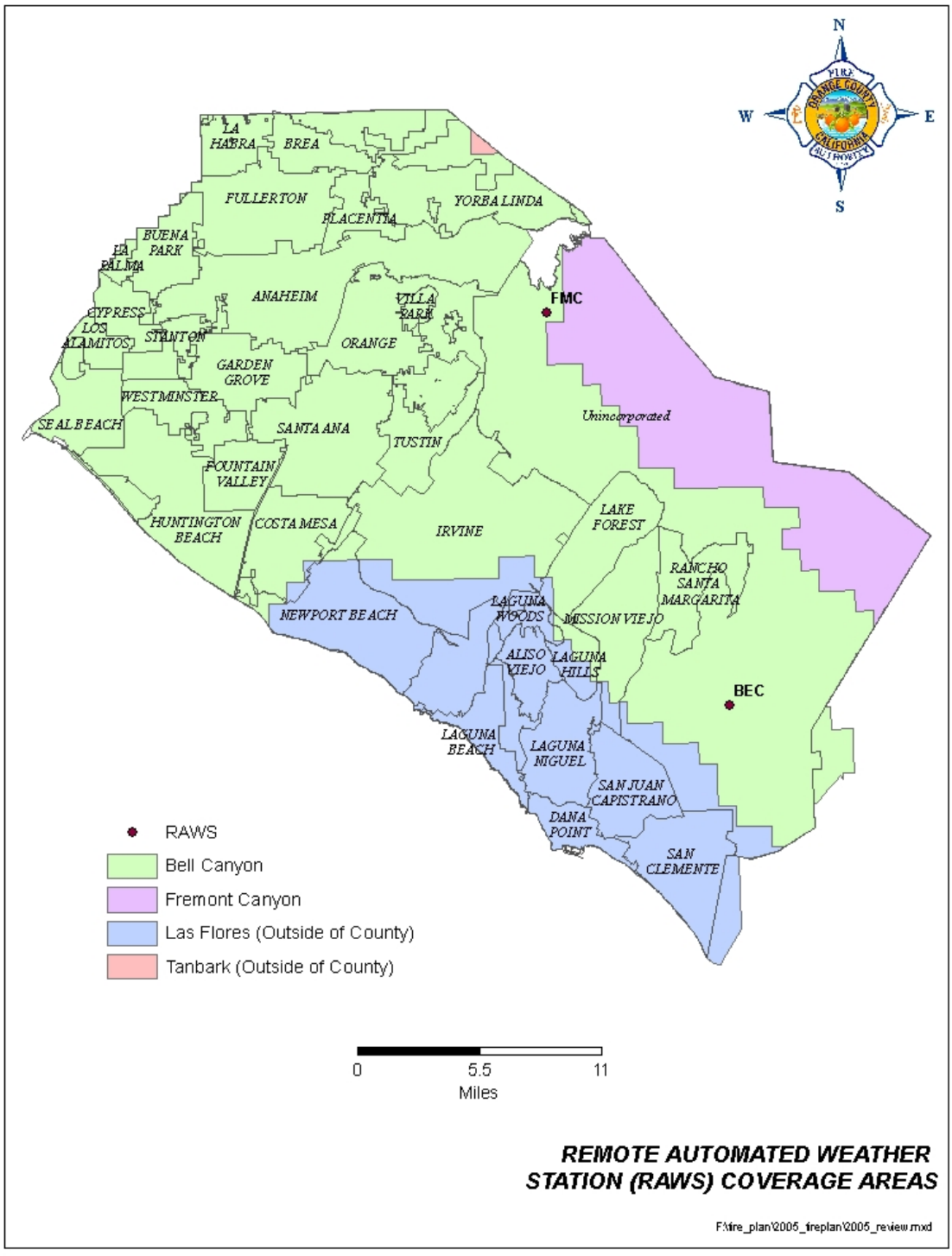
The assessment framework will consist of a systematic set of tools that describe the existing levels of wildland fire protection services. Additionally, the framework will assist in identifying high-risk and high-value areas that are potential locations of costly and disastrous wildland fires, assist in ranking the areas in terms of priority needs and prescribe what can be done to reduce the future costs and losses. The Wildland Fire Protection assessment system has four (4) components. These are Weather, Assets at Risk, Fuels and Level of Service.

WEATHER

Fire behavior is dramatically influenced by weather conditions. Large and costly fires are frequently, though not always, associated with severe weather conditions, typified by high temperatures, low humidity and strong surface winds. The different local climates within Orange County experience a different frequency of weather events that lead to severe fire behavior (severe fire weather).

CDF FRAP data provides a weather assessment that uses a Fire Weather Index (FWI) developed by USDA Forest Service researchers at the Riverside Fire Lab. This index combines air temperature, relative humidity and wind speed into a single value. This index can be calculated from hourly weather readings such as those collected in the California Remote Automated Weather Station (RAWS) data collection system. FWI does not include fuel moistures or fuel models. The FWI includes topography only to the extent that the RAWS station weather readings are influenced by local topography.

The following map shows the locations of the RAWS units and the areas of coverage for each station that has is used for this planning effort.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REMOTE AUTOMATED WEATHER STATION (RAWS) COVERAGE AREAS
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ASSETS AT RISK

As part of the State Fire Plan, CDF has developed a methodology for analyzing Assets at Risk (AAR). Using their methodology, OCFA has identified the Assets at Risk categories that apply to the county and the following table represents these Assets and the methodology used in ranking them.

Asset at Risk	Public Issue Category	Location and ranking methodology
Fire-flood watersheds	Public safety Public welfare	Watersheds with a history of problems or proper conditions for future problems (South Coastal Plain, field/stakeholder input), ranked based on affected downstream population
Soil erosion	Environment	Ranking of post-fire erosion potential based on weighted combination of fuel characteristics, soil k-factor, slope, and peak rainfall.
Scenic	Public welfare	Four mile viewshed around Scenic Highways and 1/4 mile viewshed around Wild and Scenic Rivers, ranked based on potential impacts to vegetation types (tree versus non-tree types)
Range	Public welfare	Rangelands ranked based on potential replacement feed cost by region/owner/vegetation type
Air quality	Public health Environment Public welfare	Potential damages to health, materials, vegetation, and visibility; ranking based on vegetation type and air basin
Historic buildings	Public welfare	Historic buildings ranked based on fire susceptibility
Recreation	Public welfare	Unique recreation areas or areas with potential damage to facilities, ranked based on fire susceptibility
Structures	Public safety Public welfare	Ranking based on housing density and exposure (potential for structure loss in a large fire event)
Non-game wildlife	Environment Public welfare	Public and NGO land holdings specifically for protection of non-game wildlife habitat, ranked based on fire susceptibility.
Infrastructure	Public safety Public welfare	Infrastructure for delivery of emergency and other critical services (e.g. repeater sites, transmission lines)
Ecosystem Health	Environment	Ranking based on condition class, potential for ecological damage from a severe fire event due to deviation from historical fire return interval

The asset framework and validation process will be refined as stakeholders are identified and are participating in the Fire Plan process. Agencies, such as The Nature Conservancy, have played a vital role in identifying the assets within Orange County.

Knowledge of the types and magnitudes of assets at risk to wildland fire, as well as their locations, is critical to fire protection planning. Given the limits on fire protection resources, they should be allocated, in part, based on the magnitude of the assets being protected. Knowledge of assets at risk is necessary to choose those pre-fire management projects that will provide the greatest benefit for a given amount of investment. At this stage of

development of the *Wildland Fire Management Plan*, OCFA's primary concern is reducing the fire risk and potential loss of the various assets described here in an effort to provide for the safety and protection of life and property while reducing suppression costs.

The AAR analysis used a common unit called the quad 81st. Each quad 81st must be ranked as High, Medium, or Low for each AAR based on potential impacts from a large fire event, if one were to occur. Rankings are developed based on the potential physical fire effects as well as the human valuation of those effects. For example, for the air quality AAR the physical effects of a large fire in timberlands are higher than grasslands due to production of a larger volume of smoke. The valuation of this effect will differ based on the additional factor of how many people are potentially affected within specific air basins.

The potential physical effects of a large fire also include a susceptibility component for assets such as structures, historic buildings, or recreation that involve specific sites within a quad 81st. For example, the ranking procedure for structures involves both a valuation component based on the number of housing units within a grid cell as well as a susceptibility component, or exposure. The exposure measure includes site-specific factors near housing such as vegetation clearance, roof type, and accessibility.

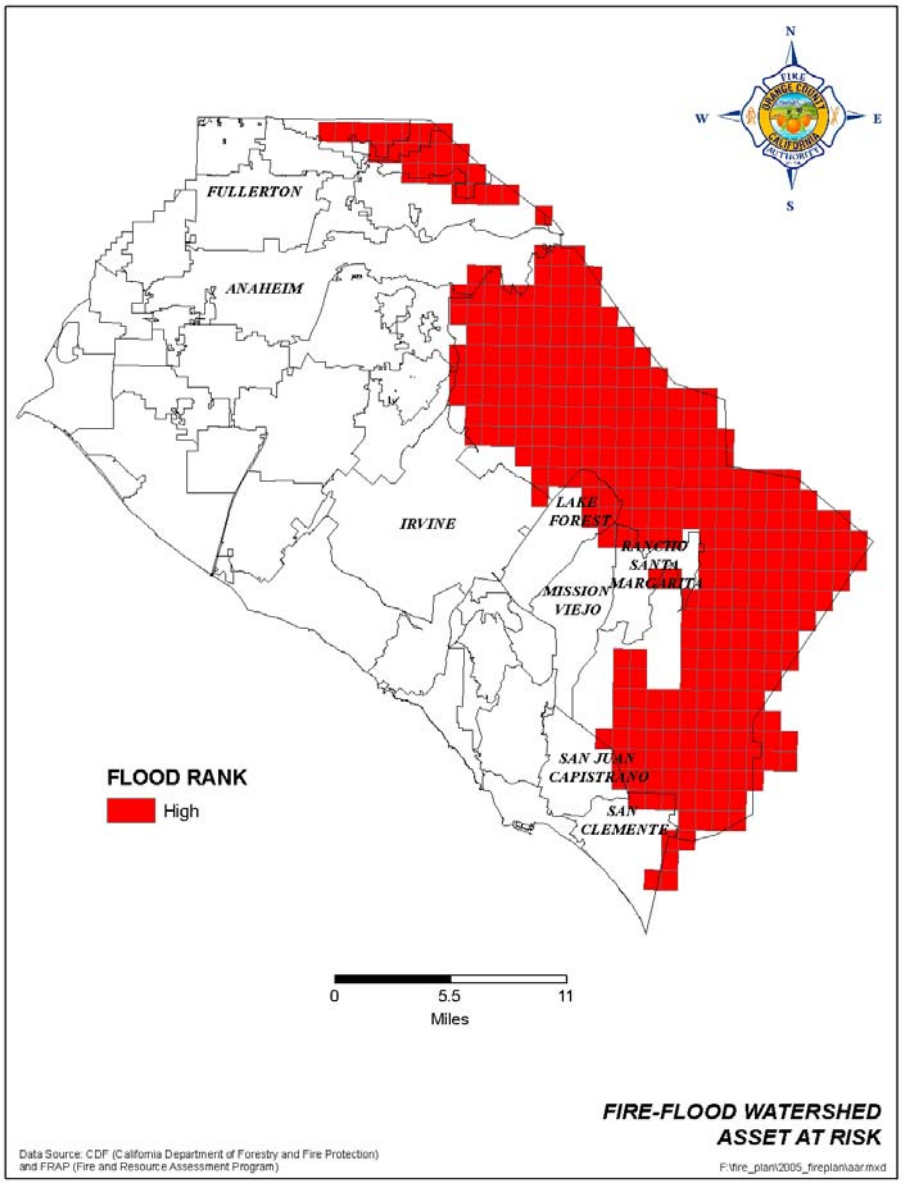
1. Fire-Flood Watersheds

The California Fire Plan describes the potential for certain watersheds to produce fire-flood sequences. These watersheds can burn in the dry season and then discharge torrents of debris into downstream-populated plains during severe storms in following wet seasons. Historically, California's South Coastal Plain has suffered the worst effects of the flood-fire sequence; because it has the greatest concentration of fire prone, high debris producing watersheds that discharge into populated areas. Impacts include damage to downstream values such as homes, roads, debris basins, and other infrastructure. As an initial statewide approach, watersheds in the general area that has proved to be fire-flood prone in the past have been extracted from the statewide 1:24,000 scale CALWATER watershed data. While the initial statewide data are limited to the South Coastal Plain, the fire-flood sequence is not limited to these areas alone, and additional watersheds may be identified in other parts of the state through the Unit validation process.

For quad 81st that contain portions of a watershed prone to the fire-flood sequence, rankings are assigned based on the potentially affected downstream population from 1990 census data.

RANK	AFFECTED DOWNSTREAM POPULATION*
High	High: over 2500 per square mile
Medium	Medium: 100-2500 per square mile
Low	Low: less than 100 per square mile
Not ranked	Watershed not fire-flood prone

* Original rankings based on 1990 census, update to 2000 census has not been performed since at the broad scale at which downstream populations are calculated it would probably results in extremely minor changes in the rankings.



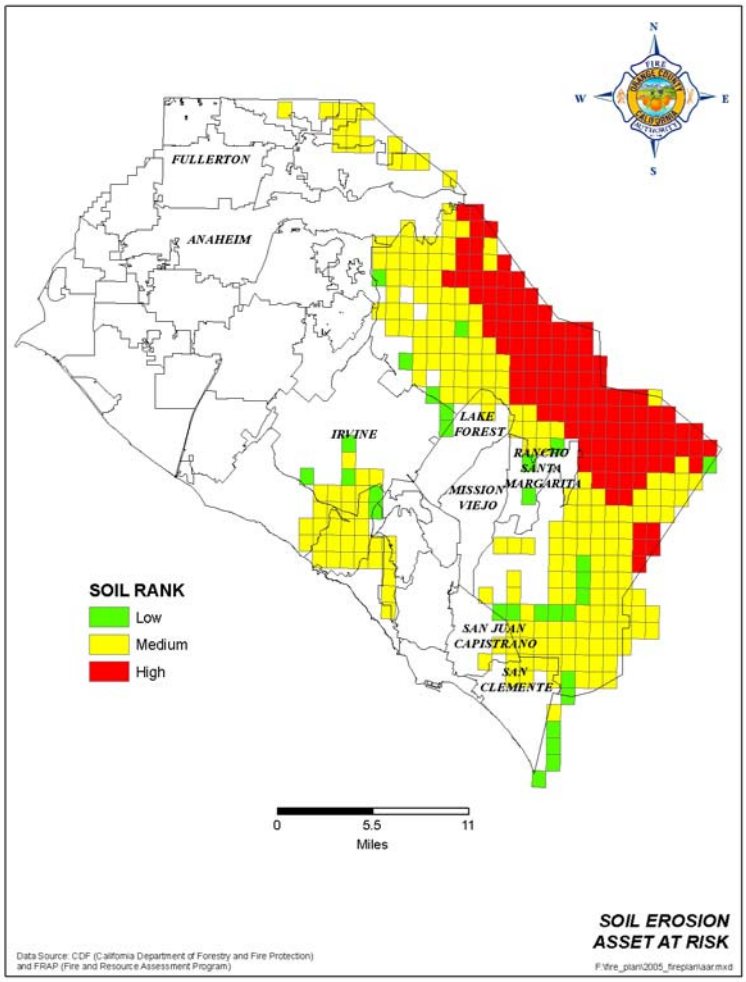
2. Soil Erosion

The Post-fire erosion potential is calculated as a combination of,

Slope
Soil k-factor
Fuel characteristics
Peak rainfall

A score for each cell is derived as a weighted summation of these factors. The range of scores was then analyzed to assign the three ranks.

The methodology is designed to provide a reasonable statewide depiction of the spatial variation in post-fire soil erodibility. If the rankings do not adequately represent the local situation, field validation is not an option. Options are to locate better data inputs, or have FRAP adjust the methodology to fit local conditions, for example by changing the weighting scheme. Due to these restraints OCFA accepted the rankings as is and will validate at a later time.

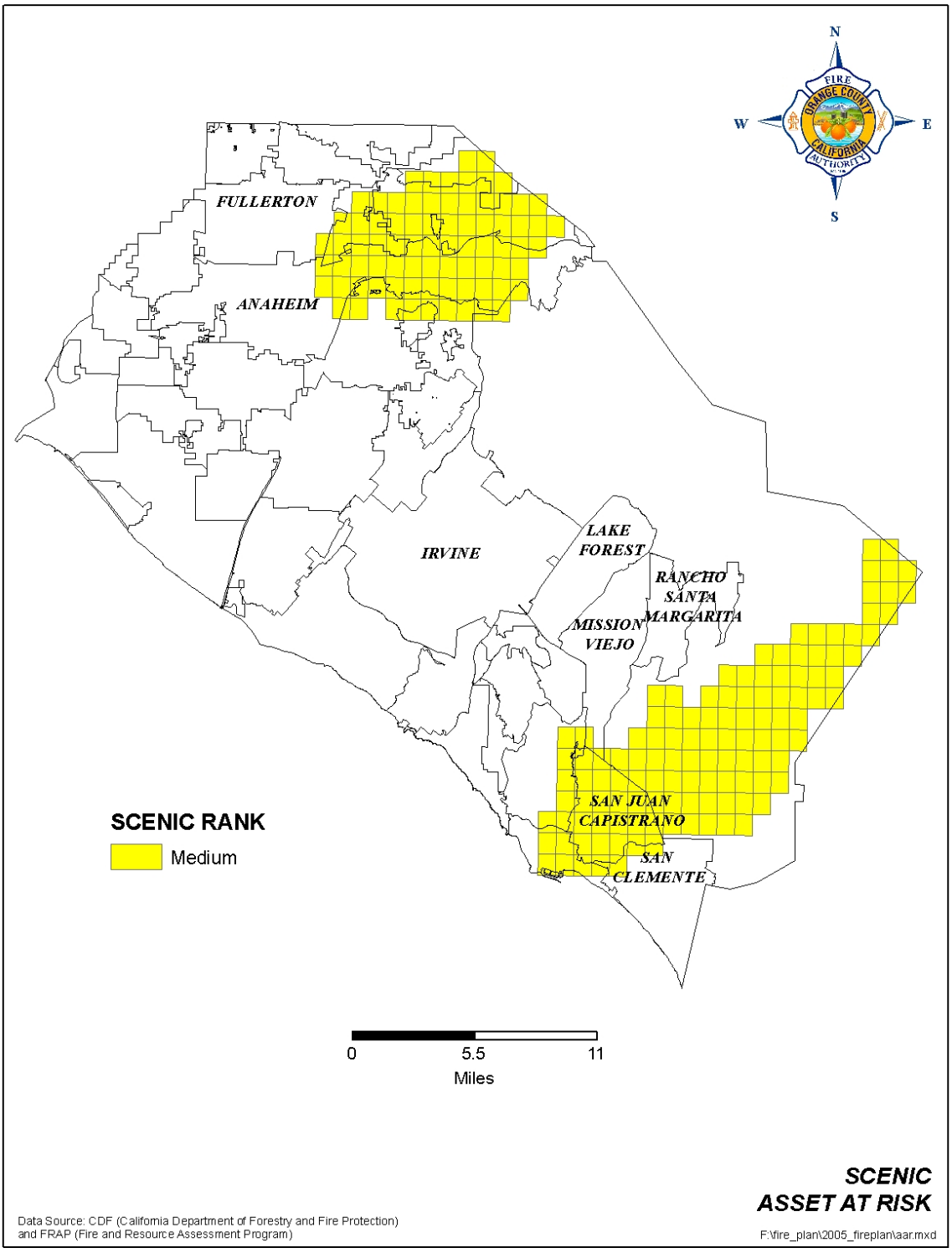


3. Scenic

The scenic asset includes the viewshed around state designated Scenic Highways, Forest Service and BLM Scenic Byways, and designated Wild and Scenic Rivers. Scenic highway designations are monitoring based on the CALTRANS web site, http://www.dot.ca.gov/hq/LandArch/scenic_highways

Based on conversations with the Forest Service, the visibility zone along roads within which scenic values might be impacted by a large fire event is assumed to be a maximum of four miles, but can be less depending on topography. Within this zone, vegetation type will influence the potential degree of impact on scenic values. For herbaceous and shrub types, the impact is probably less severe, and the duration of impact more limited. For tree types (conifer or hardwood), the impact is potentially more severe and longer lasting. For the statewide analysis, each quad 81st is characterized as to whether it is within a scenic area viewshed, and whether the most prevalent vegetation within the cell is a tree or non-tree type. Cells are then ranked according to the following table.

RANK	ROUTE TYPE	VIEWSHED	VEGETATION TYPES
High	State Scenic Highway, Forest Service Scenic Byway, BLM Scenic Byway	Up to four mile viewshed in either direction, subject to topography	Timber, woodland
Medium	State Scenic Highway, Forest Service Scenic Byway, BLM Scenic Byway	Up to four mile viewshed in either direction, subject to topography	Non-tree vegetation
Medium	Designated Wild and Scenic River	1/4 mile viewshed in either direction	Timber, woodland
Low	Designated Wild and Scenic River	1/4 mile viewshed in either direction	Non-tree vegetation
Not ranked	No scenic designation		All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Data Source: CDF (California Department of Forestry and Fire Protection) and FRAP (Fire and Resource Assessment Program)
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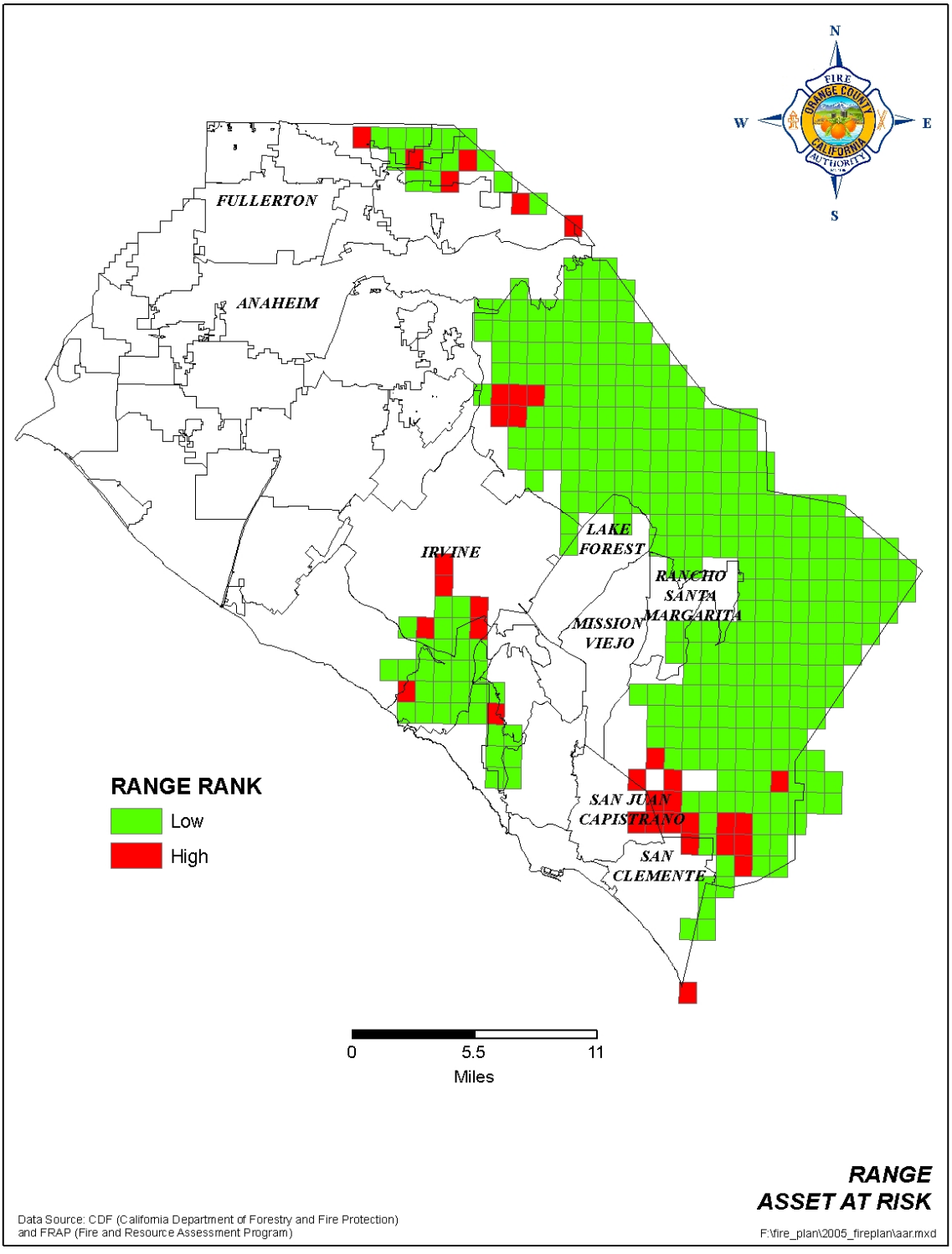
4. Range

The California Fire Plan provides estimates of the cost impact of burning an acre of rangeland for different vegetation types, ownerships, and regions of the state. The impact is based on the replacement cost of oat hay or alfalfa to compensate for lost forage production over a two-year period. While this may not accurately reflect actual losses due to other alternatives such as leasing to compensate for lost forage production, it does provide at least a process for determining the relative rankings of different areas. Using this impact value over all rangelands, many of which are not grazed by livestock, overestimates the actual economic impact. However, in the absence of data for which lands are grazed, it at least provides a relative ranking based on forage production, which has value for wildlife as well as livestock.

For the statewide analysis, each quad 81st is assigned its most prevalent range vegetation type, region, and ownership class. Based on these three designations for the cell, an impact value can be derived, and a ranking assigned based on the following table.

RANK	**PER ACRE IMPACT**	**EXAMPLES**
High	Over $35 per acre	North Coast private oak woodland Central Coast private annual grassland
Medium	$17.50 to $35 per acre	East Side private sagebrush Central Sierra private oak woodland
Low	Less than $17.50 per acre	Northern Interior Conifer lands (all owners) Desert (all regions/owners)
Not ranked	$0	Barren, urban, water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5. Air Quality

The California Fire Plan draws on past research to provide estimates of the per acre impact of burning an acre of different vegetation types in various air basins. The estimates attempt to capture impacts on health, materials, vegetation, and visibility. Impacts are much higher for timber and brush than for grass and woodland due to higher emission rates, and for more populous air basins. The following table (from California Fire Plan Appendix C) provides these estimates - for a detailed explanation of how the estimates are derived the reader is referred to the California Fire Plan.

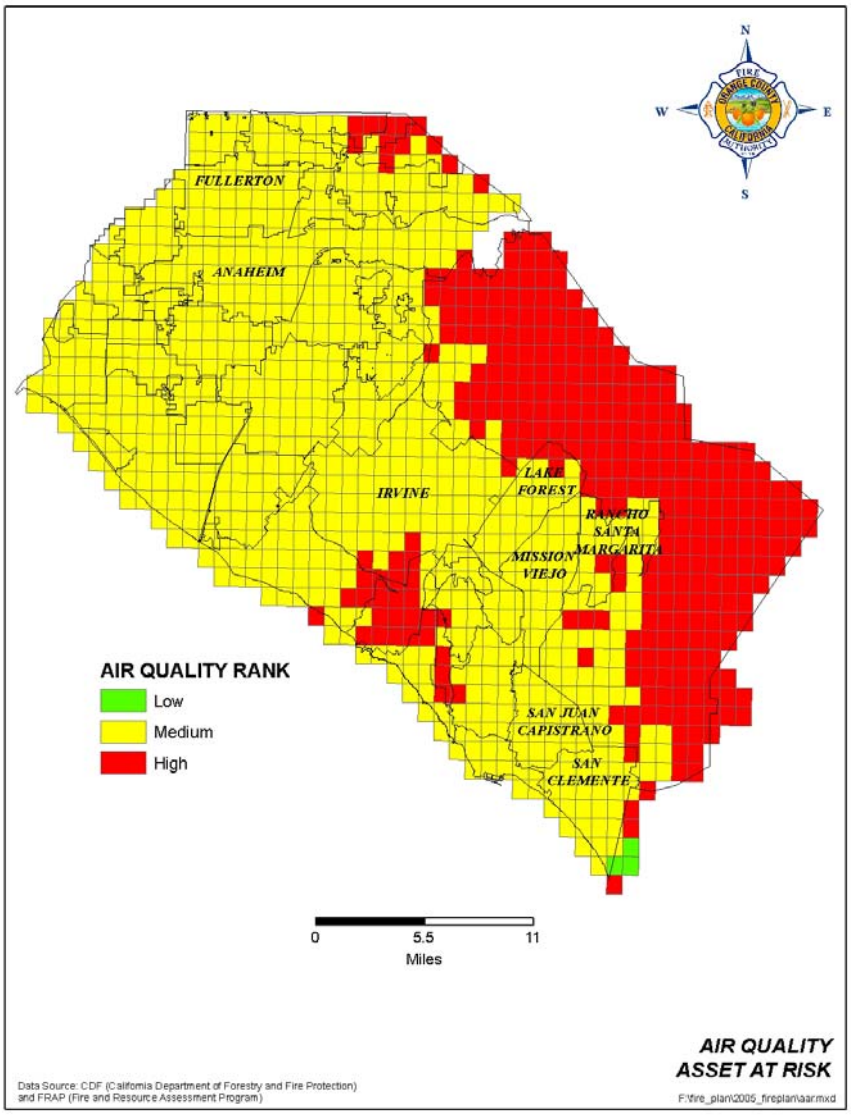
				Including Pollution Right Value	
Air Basin	**Marginal Emission Value ($/ton)**	**Grass and Woodland ($/acre)**	**Timber and Brush ($/acre)**	**Grass and Woodland ($/acre)**	**Timber and Brush ($/acre)**
San Francisco Bay Area	$24,258	$279	$7,641	$295	$8,093
South Central Coast	$6,441	$74	$2,029	$74*	$2,029*
South Coast	$46,458	$534	$14,634	$550	$15,086
San Diego	$24,593	$283	$7,747	$283*	$7,747*
Sacramento Valley	$2,935	$34	$925	$50	$1,377
Southeast Desert	$708	$8	$223	$88*	$223*
San Joaquin Valley	$5,184	$60	$1,633	$60*	$1,633*
North Central Coast	$6,441	$74	$2,029	$74*	$2,029*
North Coast	$1,703	$20	$536	$20*	$536*
Great Basin Valley	$125	$1	$39	$1*	$39*
Northeast Plateau	$395	$5	$124	$5*	$124*
Lake Tahoe	$924	$11	$291	$11*	$291*
Lake County	$908	$10	$286	$10*	$286*
Unweighted Average	$9,313	$107	$2,934	$111	$3,038

* Indicates assumed PM10 pollution right value is zero.

Sources: California Energy Commission 1993, 1995; Air Resources Board 1994.

Each quad 81st is assigned its most prevalent vegetation type and the air basin it is within. Based on the associated impact for the vegetation type and air basin, cells are ranked based on following table.

RANK	AVERAGE PER ACRE IMPACT	EXAMPLES
High	Over $2500 per acre	San Diego air basin brush South Coast air basin brush
Medium	$500 to $2500 per acre	South Coast air basin grassland Mountain Counties air basin timberland (1)
Low	Less than $500 per acre	Northeast Plateau air basin brush North Coast air basin oak woodland

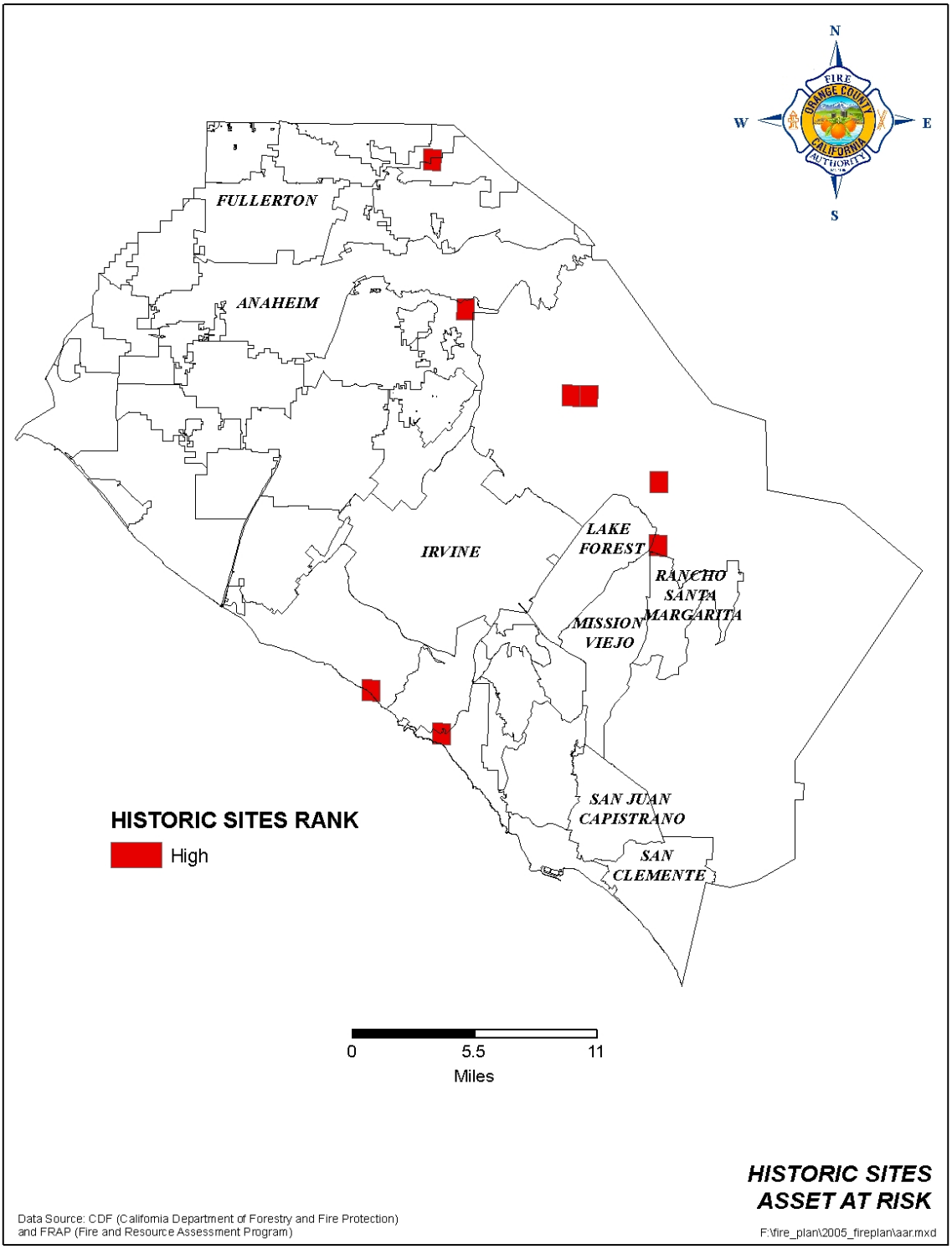


6. Historic Buildings

There is no statewide digital data that contains the location and fire susceptibility of historic buildings. As a result, OCFA relied on data from local Historical Societies to capture locally important historic features that are susceptible to fire.

The following table provides a suggested ranking system based on likely impacts in the event of a large fire event based on historic value and susceptibility which is a combination of surrounding vegetation, as well as ignition resistance (construction type).

RANK	HISTORIC VALUE	SUSCEPTIBILITY
High	High	High
High	High	Medium
High	Medium	High
Medium	High	Low
Medium	Low	High
Medium	Medium	Medium
Low	Medium	Low
Low	Low	Medium
Low	Low	Low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and FRAP (Fire and Resource Assessment Program)
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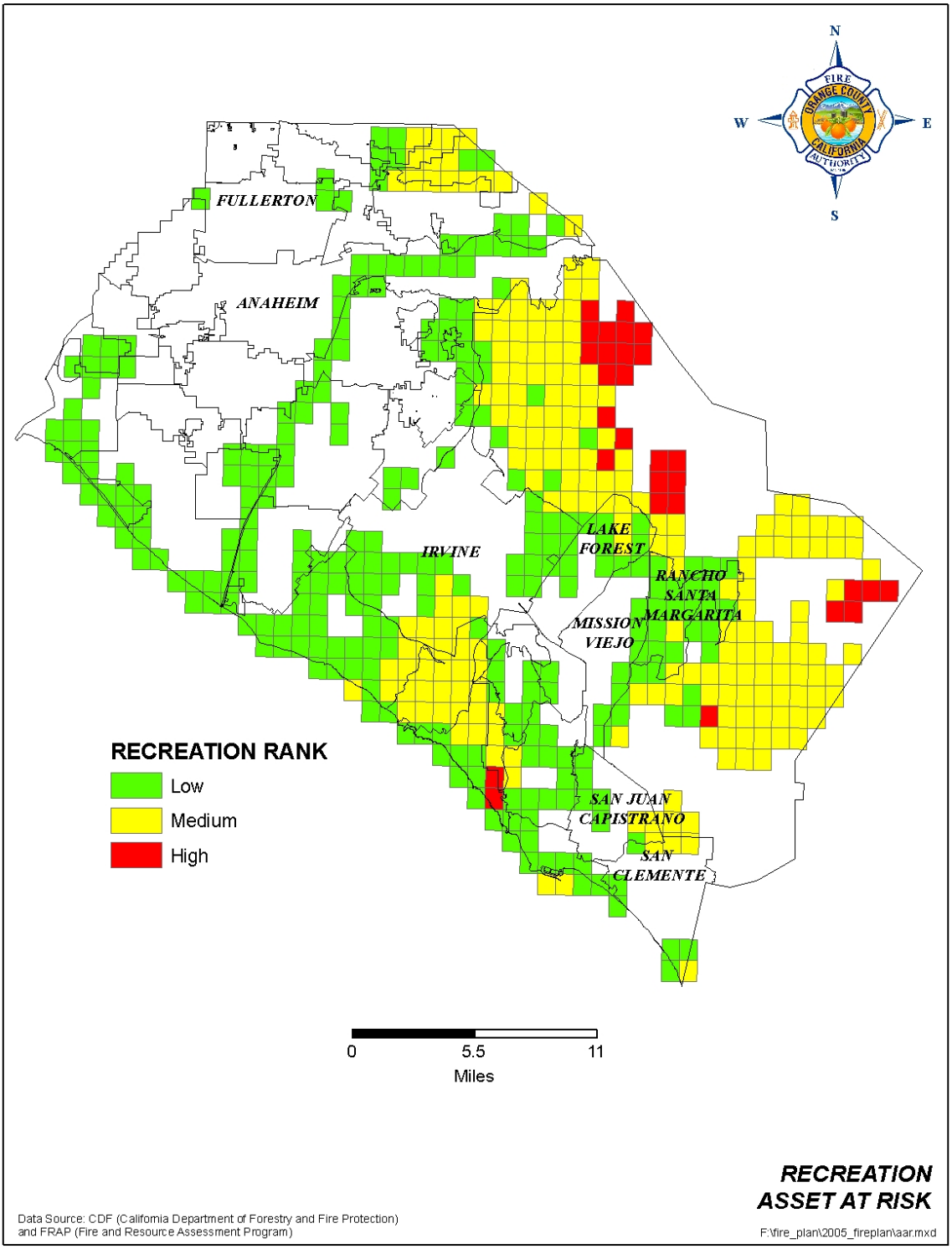
7. Recreation

The methodology that CDF create for the statewide analysis will focus on two main impacts of large fire events on recreation. First, fire can cause severe damage to a unique recreation opportunity that cannot be replaced within a reasonably close geographic area. Secondly, impacts can cause facility or infrastructure damage that requires major public or private outlays to restore the recreation opportunity. For the analysis, the following recreation area designations are assumed to meet one of these two criteria

RECREATION IMPACT	RECREATION AREA DESIGNATION
Potential damage to unique recreation opportunity and/or potential for damages requiring significant outlays to restore the opportunity	County, City, or Regional Park National Recreation Area (NPS) National Seashore (NPS) National Preserve (NPS) National Monument (NPS) National Historic Site (NPS) National Park (NPS) U.S. Forest Service and BLM wilderness areas CA Dept of Fish and Game administered areas CA State Park Santa Monica Mountains Conservancy U.S. Fish & Wildlife Service administered areas

For each quad 81st that contains a recreation area an initial estimate of the susceptibility to fire damage is derived from the fuels rank derived as part of the Fire Plan. Rankings for the recreation asset at risk are assigned based on table below.

RANK	RECREATION DESIGNATION	FUELS RANK (RANKFUEL)
High	Meets above table criteria	Very High
Medium	Meets above table criteria	High
Low	Meets above table criteria	Medium
Not ranked	Does not meet criteria	All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8. Structures

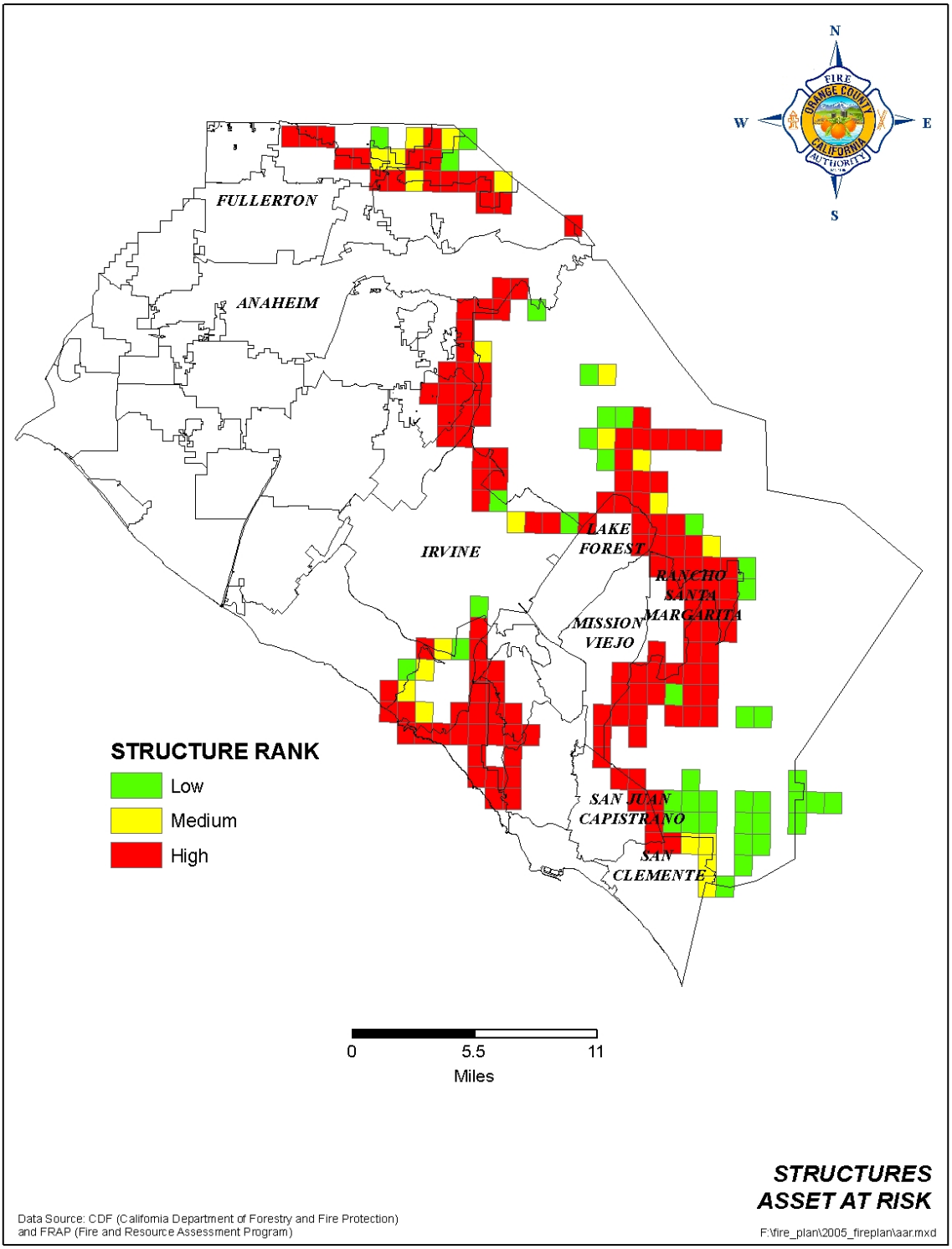
For the statewide analysis, CDF developed a methodology where the asset ranking is created by combining, 1) the value of housing, as measured by density, with 2) susceptibility to loss (exposure). Exposure is a measure of the likelihood of structures actually being destroyed or damaged, if a large fire event occurs. The following is a suggested list of factors that could contribute to exposure;

Building materials/roof type
Accessibility of fire control equipment to housing locations
Slope conditions affecting housing
Vegetation conditions immediately surrounding housing (fuel type, clearance, etc.)
Presence and timing of past pre-fire projects

Together, density and exposure provide a measure (rank) of overall potential loss of structure values if a large fire event occurs. OCFA adopted the same methodology for the Orange County Fire Plan.

The following table shows the ranking criteria for the structures AAR

	EXPOSURE			
HOUSING DENSITY	**0**	**Low**	**Med**	**High**
Very High	0	M	H	H
High	0	L	M	H
Medium	0	0	L	M
Low	0	0	0	L
Not ranked	0	0	0	0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9. Non-Game Wildlife

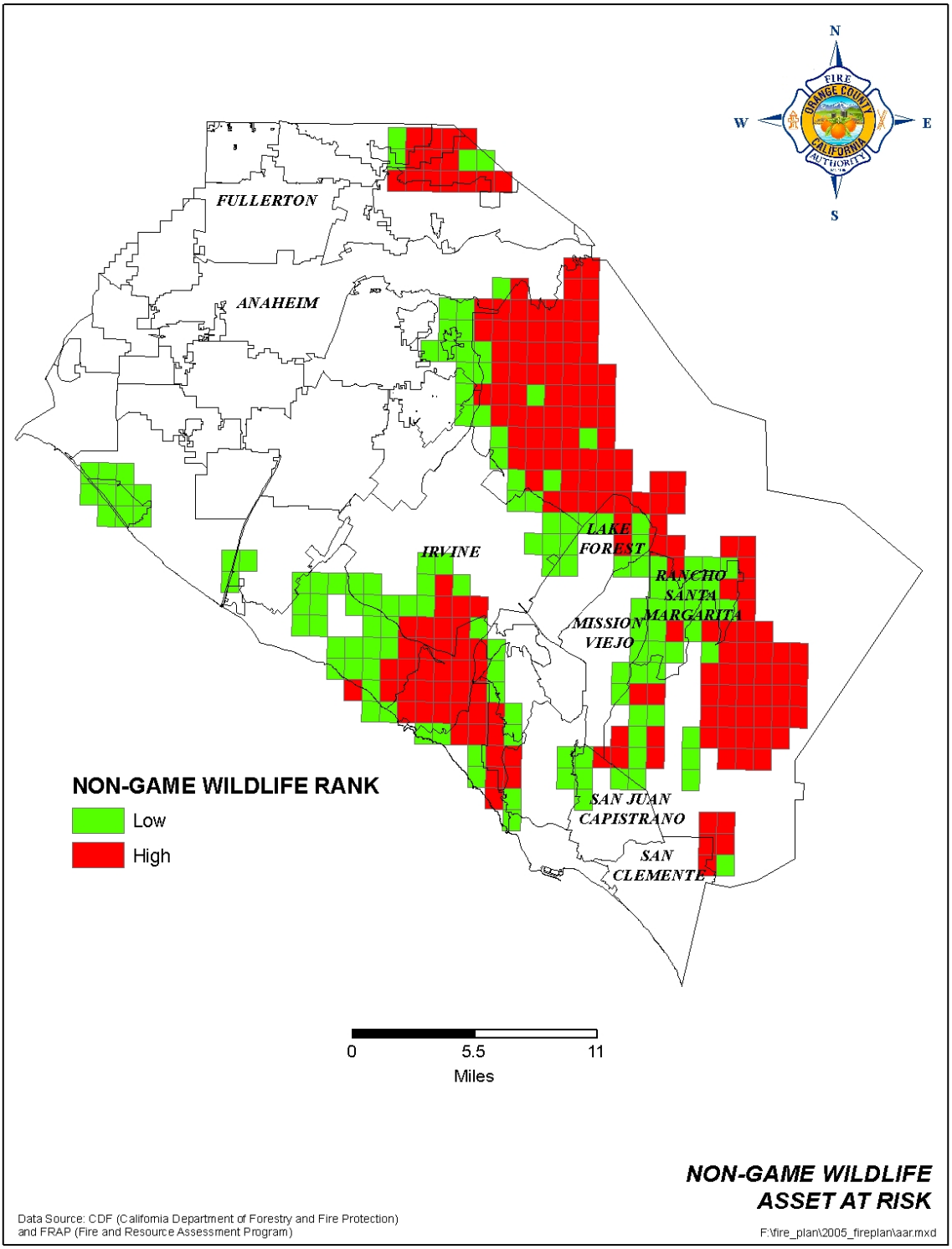
For the statewide analysis, CDF identified specially designated critical wildlife areas, which include:

CDFG Wildlife Areas and Ecological Reserves
USFWS refuges
NPS preserves
NGO/land trusts (e.g. The Nature Conservancy)

These areas are assigned a rank based on fire susceptibility as reflected by the fuel rank.

RANK	**FEATURE**	**FUELS RANK (RANKFUEL)**
High	Critical designated non-game wildlife area	Very High
High	Critical designated non-game wildlife area	High
Low	Critical designated non-game wildlife area	Moderate
None	None	All

This methodology does not capture important wildlife areas that may have been identified such as T&E locations, spotted owl nest sites, etc. The USFS and BLM have identified many of these areas within their jurisdictions. Additional work is required to obtain, analyze, and rank these additional data sources.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NON-GAME WILDLIFE
ASSET AT RISK
Data Source: CDF (California Department of Forestry and Fire Protection)
and FRAP (Fire and Resource Assessment Program)
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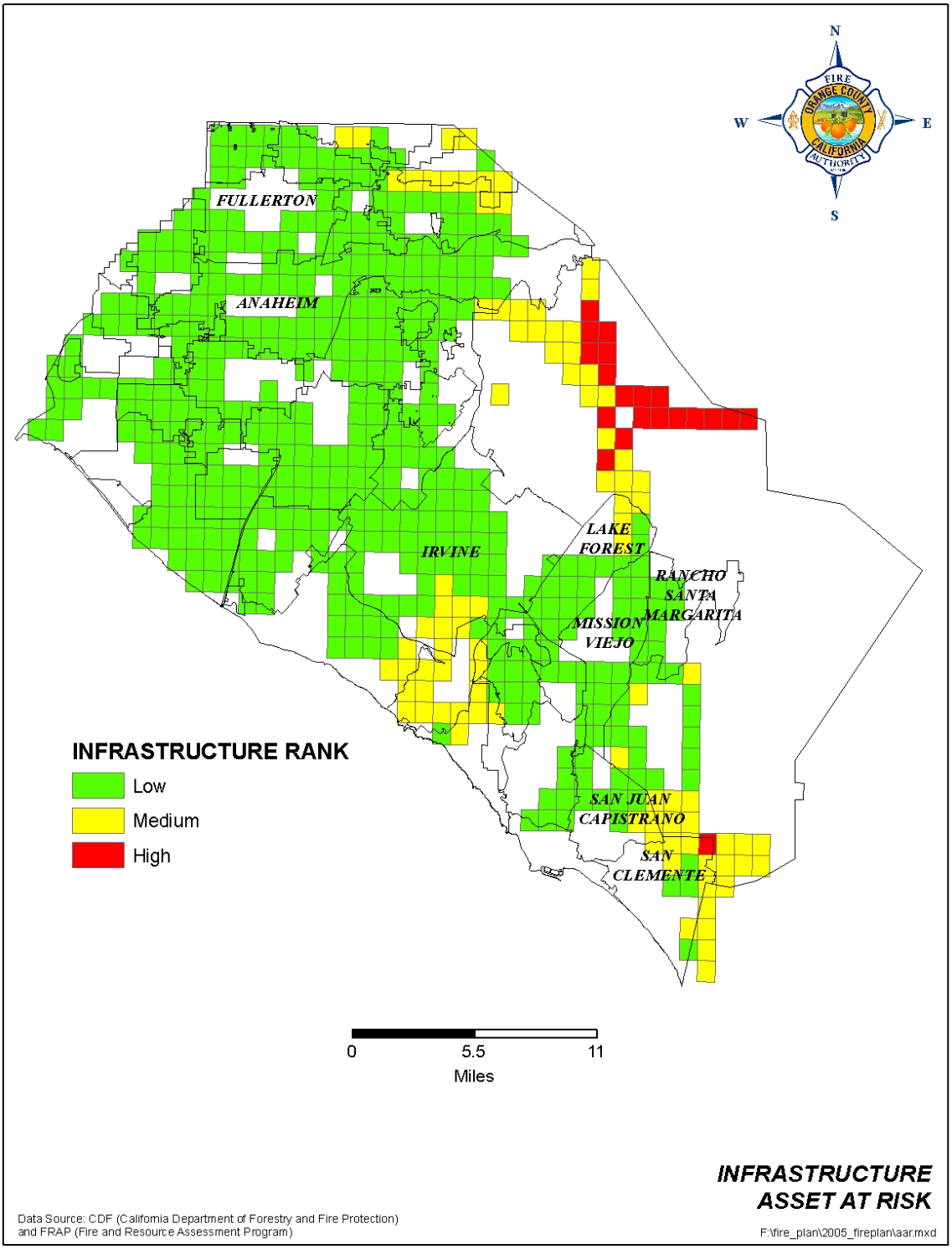
10. Infrastructure

There are numerous components of infrastructure that contribute to the delivery of emergency services and the economic well-being of different regions and localities. This includes power delivery and communications sites susceptible to extended loss of service due to fire. Interruption of these services is a public safety as well as a public welfare issue.

Initial fire plan analysis data will include: a) electrical transmission lines; b) repeater sites.

All quad 81st containing a transmission line are ranked based on the following table.

RANK	**FEATURE**	**FUEL RANK**
High	Transmission line	High
Medium	Transmission line	Medium
Low	Transmission line	Low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Data Source: CDF (California Department of Forestry and Fire Protection) and FRAP (Fire and Resource Assessment Program)
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11. Ecosystem Health

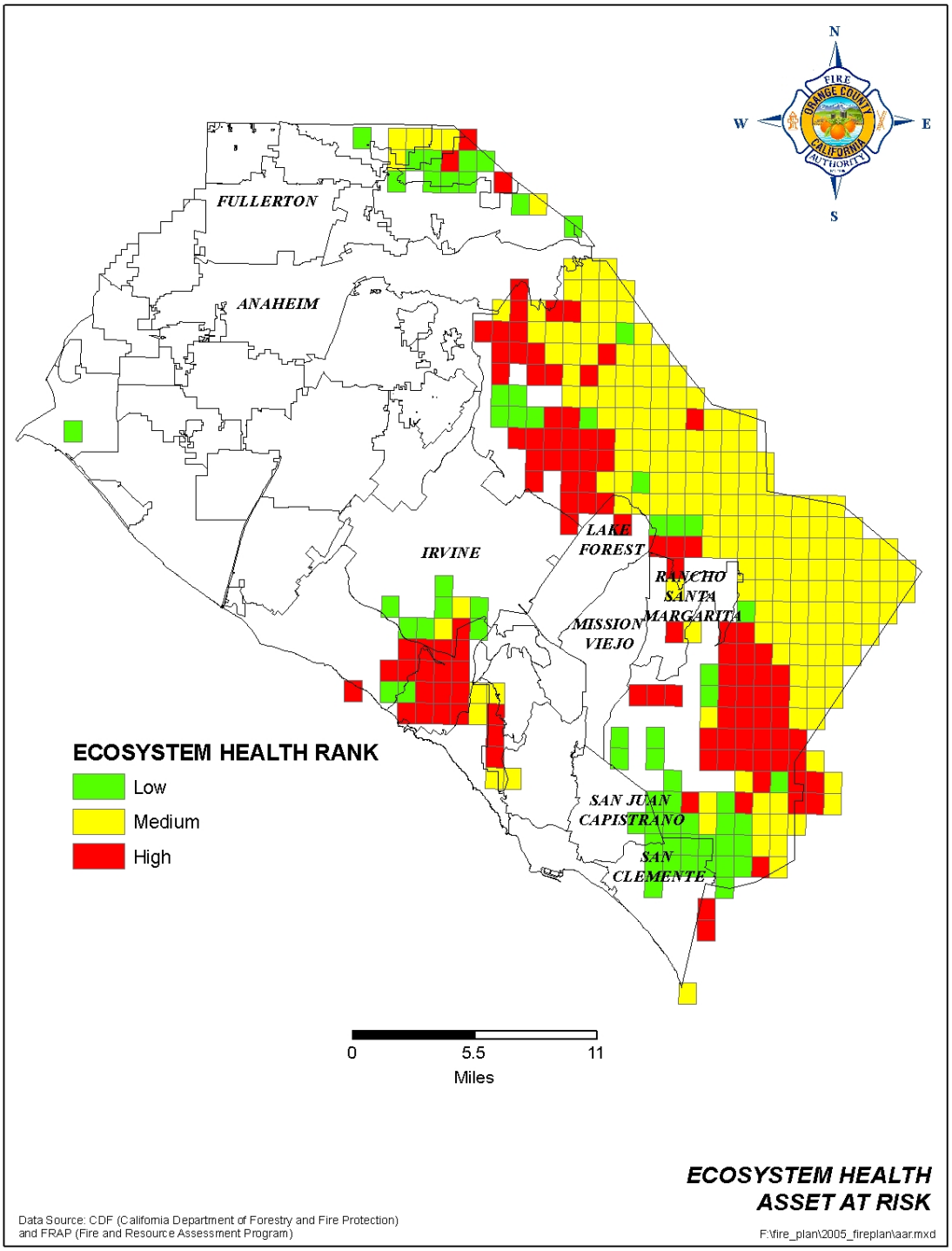
The concept of “condition class” is used to rank cells based on potential ecological damage from a severe fire event. Cells that are assigned condition class 3 typically diverge significantly from the historic fire return interval, resulting in fuel conditions that could promote ecological damage (e.g. mortality within larger tree sizes, soil impacts). Condition class 2 areas have the potential for damage due to moderate divergence from historic return intervals. Condition class 1 refers to areas that are basically within the historic range of fire return interval.

Highest treatment priority will typically be assigned to class 3 areas. Within these areas, project design is critical (e.g. fuel reduction method and timing of treatments) in order to minimize ecological damage.

Class 2 areas are also potential targets for treatment. Fuel reduction projects can prevent these areas from either degrading into condition class 3, or in a worst case being damaged by a severe fire event.

The following table shows the ranking method for ecosystem health, which basically just uses the condition class as a rank.

RANK	**CONDITION CLASS**
High	3
Medium	2
Low	1
None	Non-fuel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ECOSYSTEM HEALTH RANK
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ASSET AT RISK
Data Source: CDF (California Department of Forestry and Fire Protection)
and FRAP (Fire and Resource Assessment Program)
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FUELS

Vegetation found within Orange County include annual grasses, woodland, desert brush, riparian, timber, coastal sage scrub and chaparral. Chaparral is a mosaic of vegetation communities whose establishment is essentially determined by fires and micro-site conditions. "Hard" chaparral, for the present purposes, is identified as vegetation dominated by Chamise, scrub oak or shrub forms of canyon live oak or interior live oak. It occupies an elevation position generally between low elevation coastal sage scrub (a form of "soft" chaparral) and higher coniferous areas.

1. Fuel Dynamic Pathways

Fire history plays an important role in modifying fuel model assignments in recently burned areas. FRAP developed a method to reflect changes in surface fuel characteristics resulting from past fires, and to account for fuel changes as burned areas regrow. GIS analysis assigned new surface fuel models based on the time since last burned. This process is called the "Fuel Dynamics Pathways".

Fuel dynamic pathways can be simple (e.g., change anything burned in the last 15 years to model 14) or they can be more complex. Below is an example of more complex "fuel dynamic pathways" for areas within Orange County. This table shows that brush fuel models 4, 5, and 6 regrow differently on north and south slopes. (Note that north and south slopes do not differentiate other fuel models.) After a fire on south slopes, for example, fuel models 4, 5, and 6 stay in a model 1 for the first 3 years. After 3 years of regrowth, brush begins to return, reducing wind speeds and adding to fuel loading, producing a typical fuel model 2. Because north slopes are typically wetter, they often have less severe fire and provide for faster regrowth conditions than south slopes. In the example below, brush models on north slopes return immediately (0 -10 years) to model 5, bypassing the grass model phase experienced on south slopes.

Fuel model pathways after wildfire for Orange County.
Models 4, 5, and 6 (brush types):
South slope:
0-3 years since burn model 1
3-16 years since burn model 2
17-25 years since burn model 5
26-40 years since burn model 6
40+ years since burn model 4
North slope:
0-10 years since burn model 5
11-35 years since burn model 6
35+ years since burn model 4
Model 1 (grass):
no change due to fire

Model 2 (pine grass):
0-10 years since burn model 1

10+ years since burn model 2

Models 8,9,10,11,12,13 (timber and any slash models):
0-2 years since burn model 1
2-10 years since burn model 14 (if replanted); otherwise model 2
11-15 years since burn model 5 (due to brush component and immature trees)
16+ years since burn original model.

2. Hazardous Fuels

Assets have a high likelihood of being destroyed in chaparral, grass and transition fuel types. The annual grasses support fast moving but lower intensity fires. The coastal sage scrub supports fast moving fires with higher intensities. The chaparral fuels sustain very high intensities and spotting problems.

Again, GIS thematic layers have been developed to determine the hazardous fuels throughout Orange County. The first layer development included vegetation coverage from the most recent and detailed vegetation composition and structure information. Vegetation data was obtained from the CDF FRAP and from a variety of other sources and merged together to provide a complete, albeit heterogeneous, coverage map. Additionally, a variety of crosswalk methodologies from previous statewide projects were incorporated to filter the vegetation coverage and translate the data to a Fire Behavior Prediction System (FBPS) fuel model. Orange County Fire Authority supplemented this by a crosswalk of data from the Cleveland National Forest, Orange County vegetation mapping program and the GAP Analysis program of the U. S. Fish and Wildlife Service in defining the County's fuel model coverage. This method produced a fine-grained portrayal of surface fuel types as the second layer.

Fuel hazard ranking methodology assigns ranks based on expected fire behavior for unique combinations of topography and vegetative fuels under given severe weather conditions (wind speed, humidity, and temperature). Basically, the ranking procedure is best described in a formula:

Fuel Model + Slope = Surface Ranking
Then
Surface Rank + Ladder Index + Crown Index = Hazard Ranking

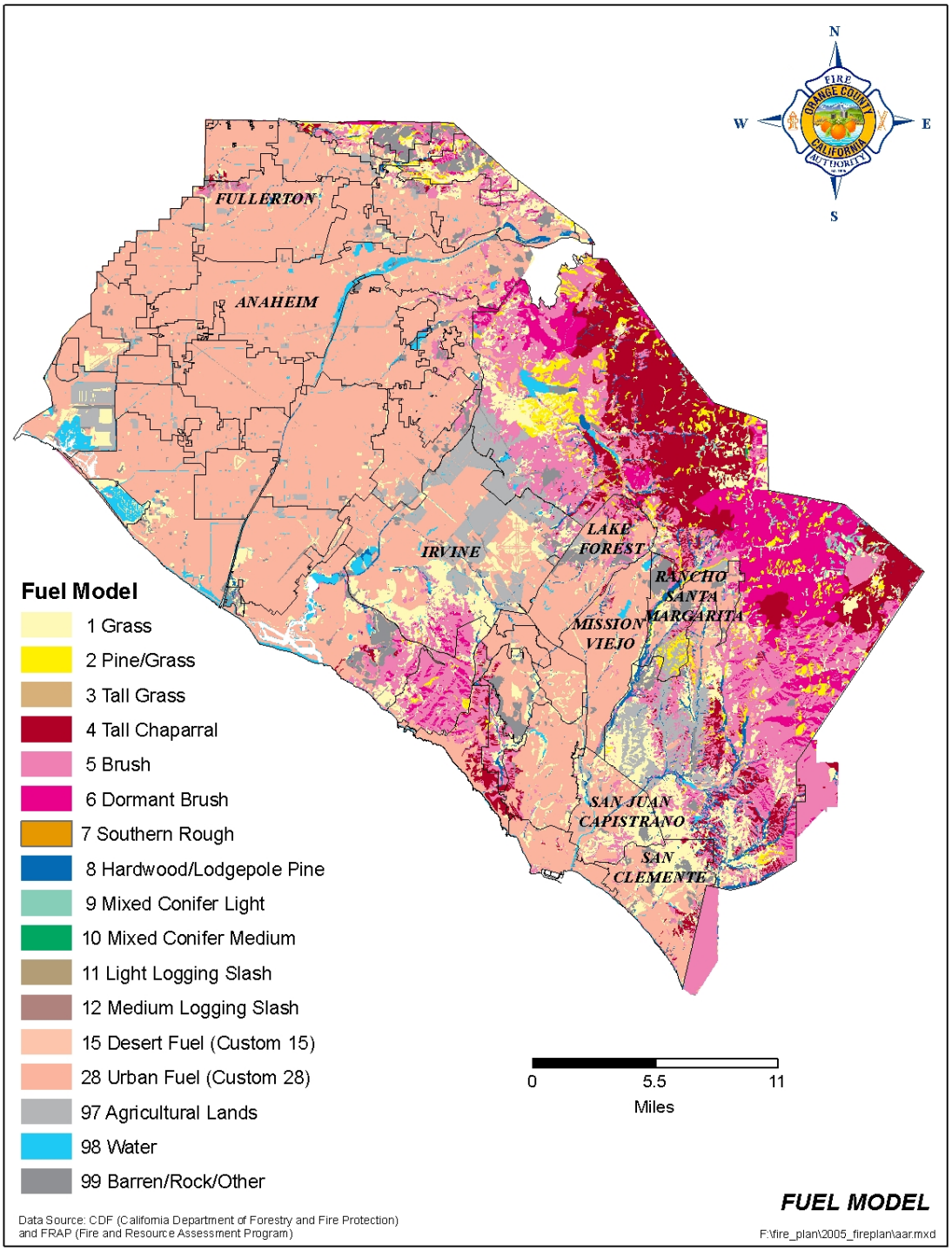
Throughout California the Hazard Rank is broken into three (3) categories: Moderate, High and Very High. Within Orange County the categories are Moderate to represent urbanized areas, High to represent wildland urban interface and Very High representing the wildland areas.

3. Crown and Ladder Fuel Characteristics

The method ascribes additional ladder and crown fuel indices to surface model polygons. If the vegetation data provide sufficient structural detail, the method imputes these additional indices from those data. If the vegetation data lack structural detail, the method imputes indices based on the fuel model.

The ladder and crown fuel indices convey the relative abundance of these fuels. The indices take values ranging from 0 to 2, with 0 indicating “absent", 1 representing “present but spatially limited” and 2 indicating “widespread”. These indices contribute to understanding the probability that torching and crown fire would occur if the stand were subjected to a wildland fire under adverse environmental conditions.

Based on the above methodology a GIS layer produced a fuel hazard ranking by changing the base map to reflect surface fuel characteristics as a result from past fires, and to account for fuel changes as burned areas re-grow. A study will be performed to evaluate post-fire fuel conditions based on comparisons of pre-fire fuel models and the span of time, since the fire occurred. The results will be sent to CDF’s FRAP division to establish future crosswalks. Crosswalk methodology assesses the amount and extent of California's forests and rangelands, analyzes their conditions and identifies alternative management and policy guidelines. This method updates the base map by overlaying fire perimeters on the fuel types, calculating the span of time since the fire for each burned area, and then changes the fuel model within the burned area according to the crosswalk.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SAN CLEMENTE
Fuel Model
1 Grass
2 Pine/Grass
3 Tall Grass
4 Tall Chaparral
5 Brush
6 Dormant Brush
7 Southern Rough
8 Hardwood/Lodgepole Pine
9 Mixed Conifer Light
10 Mixed Conifer Medium
11 Light Logging Slash
12 Medium Logging Slash
15 Desert Fuel (Custom 15)
28 Urban Fuel (Custom 28)
97 Agricultural Lands
98 Water
99 Barren/Rock/Other
0
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Data Source: CDF (California Department of Forestry and Fire Protection) and FRAP (Fire and Resource Assessment Program)
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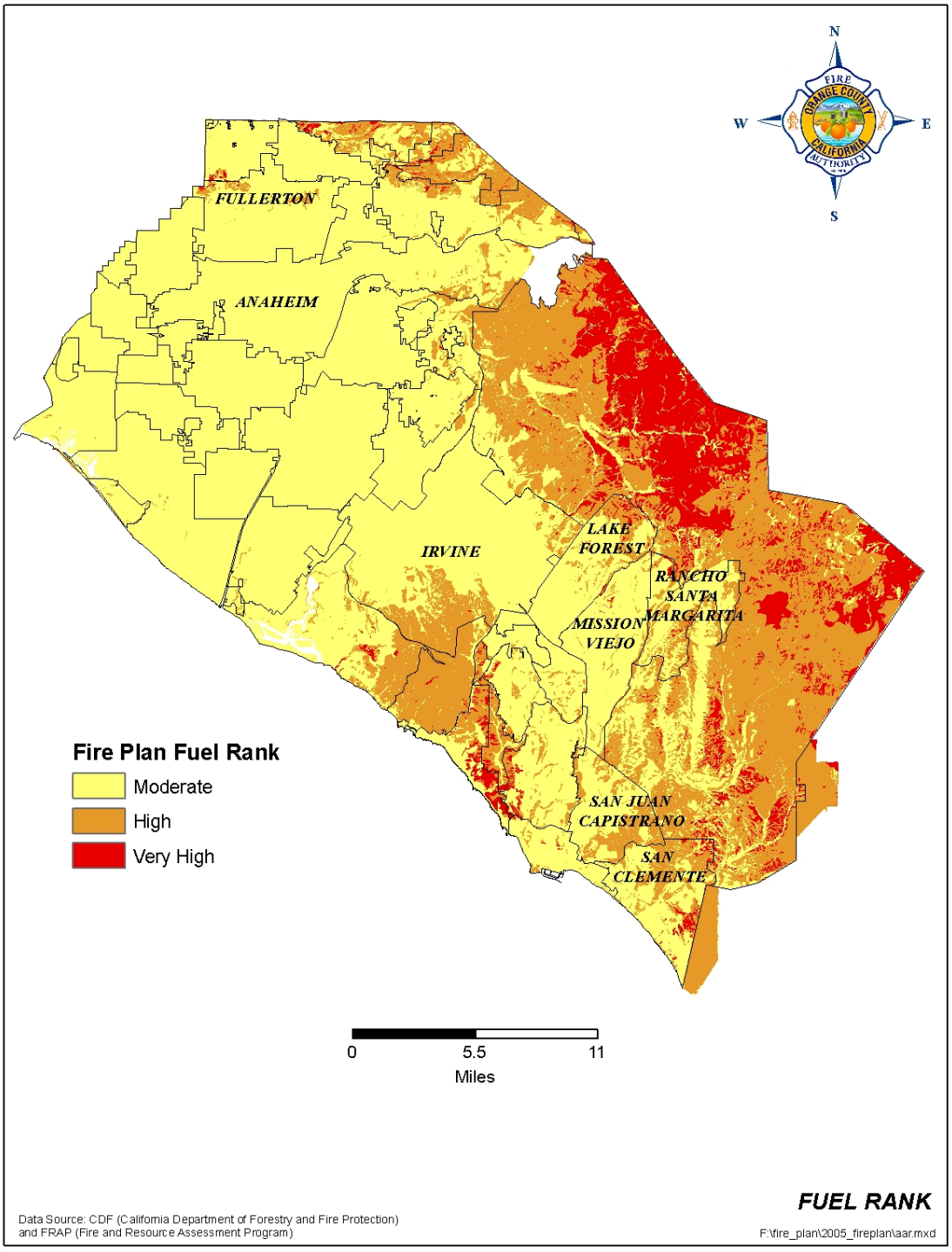
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Fire Plan Fuel Rank
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Data Source: CDF (California Department of Forestry and Fire Protection)
and FRAP (Fire and Resource Assessment Program)
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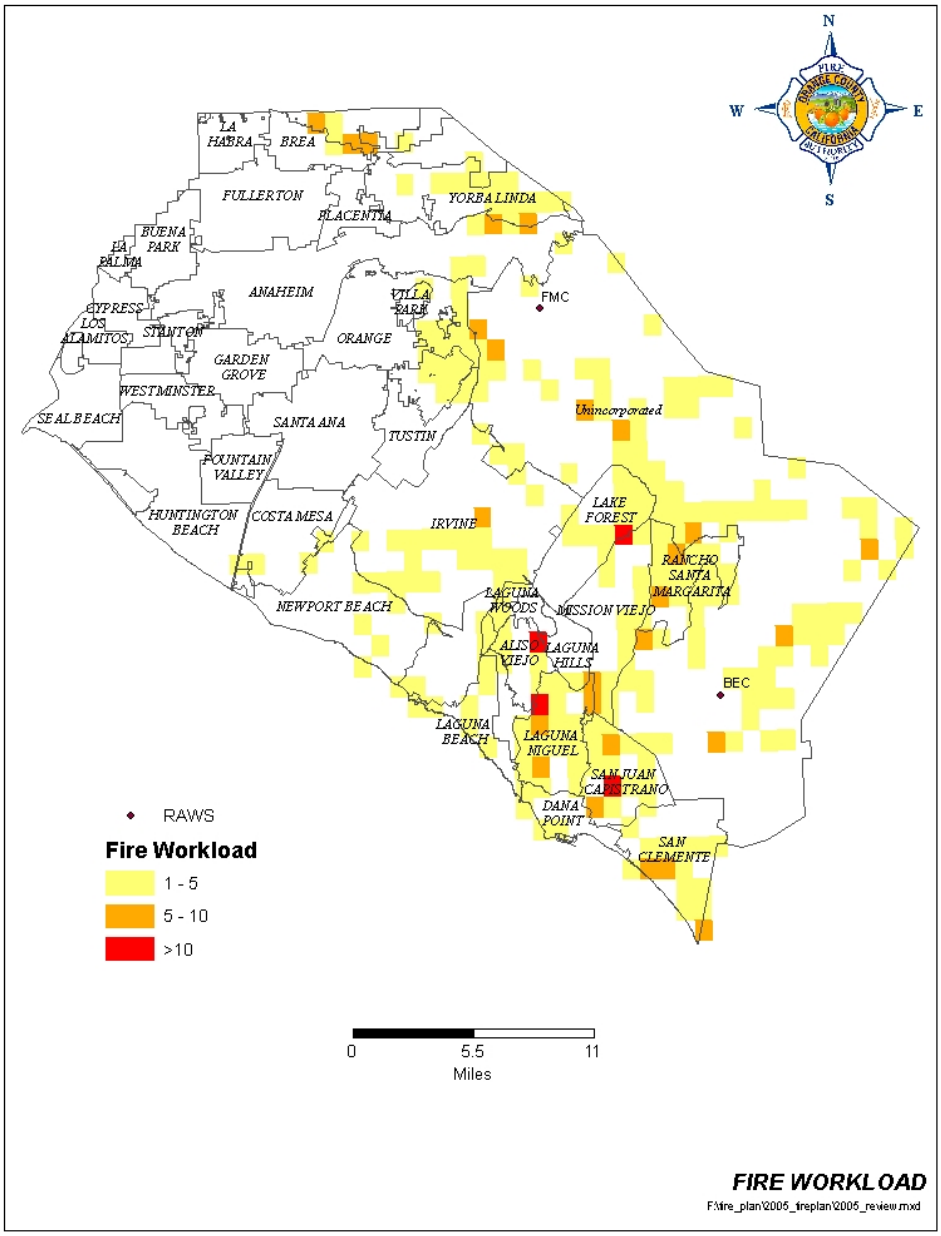
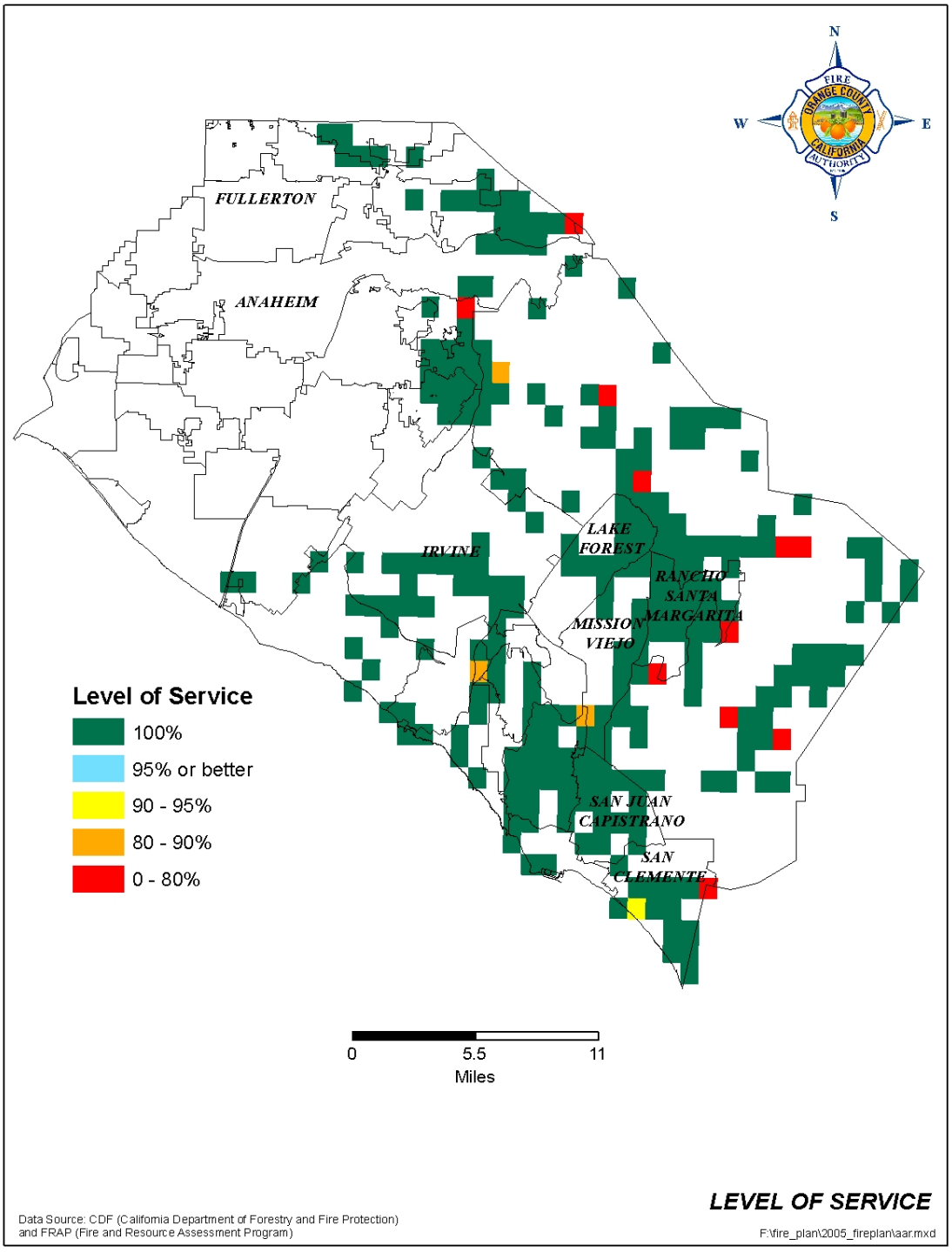
LEVEL OF SERVICE

The Level of Service (L.O.S.) rating used in this plan represents the number of incidents where initial attack efforts succeeded. Successful initial attack is defined in terms of the amount of resources needed to suppress the fire within an acceptable size of 100 acres or less, the level of resource commitment, acceptable suppression cost and minimal damage to assets at risk.

The following maps graphically indicate the Level of Service ranking for the County:

- Initial Attack Fire Workload
- Level of Service

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Level of Service
100%
95% or better
90 - 95%
80 - 90%
0 - 80%
0
5.5
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Miles
LEVEL OF SERVICE
Data Source: CDF (California Department of Forestry and Fire Protection)
and FRAP (Fire and Resource Assessment Program)
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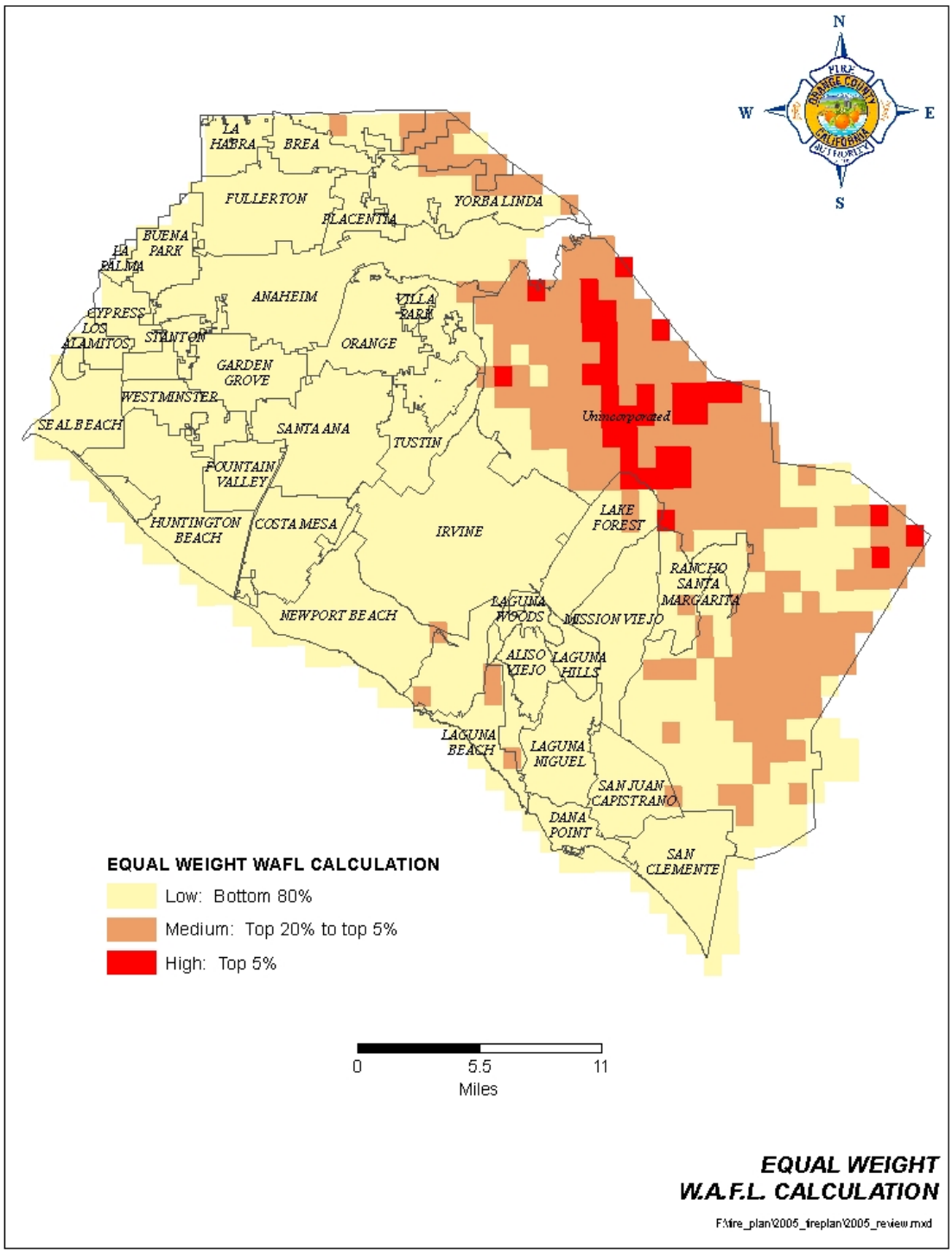
W.A.F.L. (Weather, Assets at Risk, Fuels, Level of Service)

The W.A.F.L. calculator is a Fire Plan tool that will combine weather, assets at risk, fuels, and level of service (LOS). Based on the weighted value entered by the user into the calculator, the four components will result in a High, Medium, and Low ranking. The calculated results will focus the user to high value, high risk areas with severe fire weather and a demonstrated low level of service.

Each of the four W.A.F.L. components can be weighted to increase or decrease its importance. The W.A.F.L. calculator will either add up the scores for each of the four fields or count the number of high scores and then multiply the scores by their weights to arrive at a final score. The user then must determine how to break down the final scores into high, medium, and low rankings. These categories are determined by percentile breakdowns of the final W.A.F.L. scores.

The following maps are examples of the various calculations that can be run using the Fire Plan tools provided by CDF. To illustrate the dynamic process of the Fire Plan tools W.A.F.L. calculator, the first map displays the results when the four components have been given an equal weighted value. The following four maps display the results when each of the component is given a separate high weighted value.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CYPRESS
LOS ALAMITOS
STANTON
ORANGE
GARDEN GROVE
WESTMINSTER
SEAL BEACH
SANTA ANA
TUSTIN
Unincorporated
FOUNTAIN VALLEY
HUNTINGTON BEACH
COSTA MESA
IRVINE
LAKE FOREST
RANCHO SANTA MARGARITA
LAGUNA WOODS
MISSION VIEJO
NEWPORT BEACH
ALISO VIEJO
LAGUNA HILLS
LAGUNA BEACH
LAGUNA MIGUEL
SAN JUAN CAPISTRANO
DANA POINT
SAN CLEMENTE
EQUAL WEIGHT WAFL CALCULATION
Low: Bottom 80%
Medium: Top 20% to top 5%
High: Top 5%
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EQUAL WEIGHT
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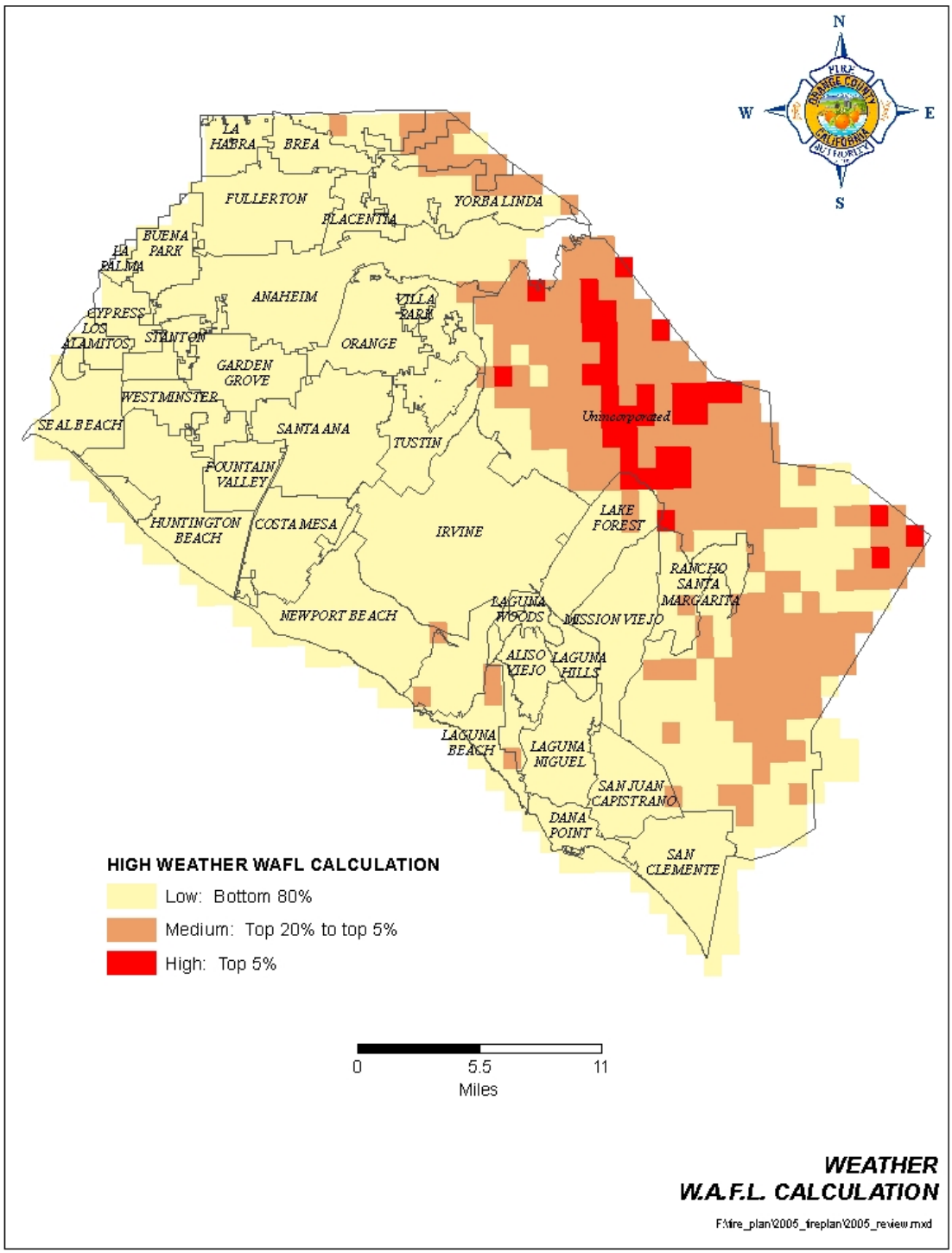
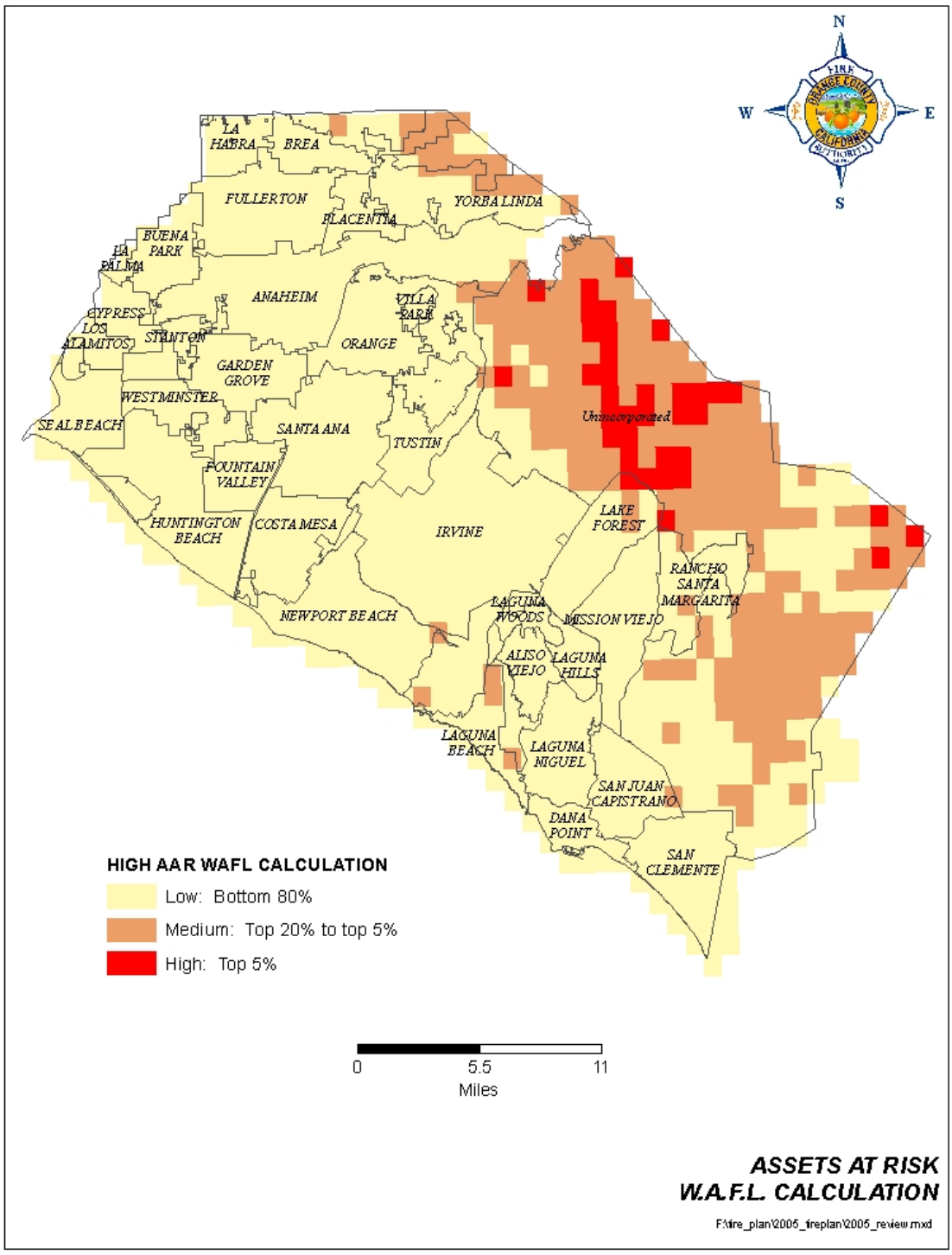
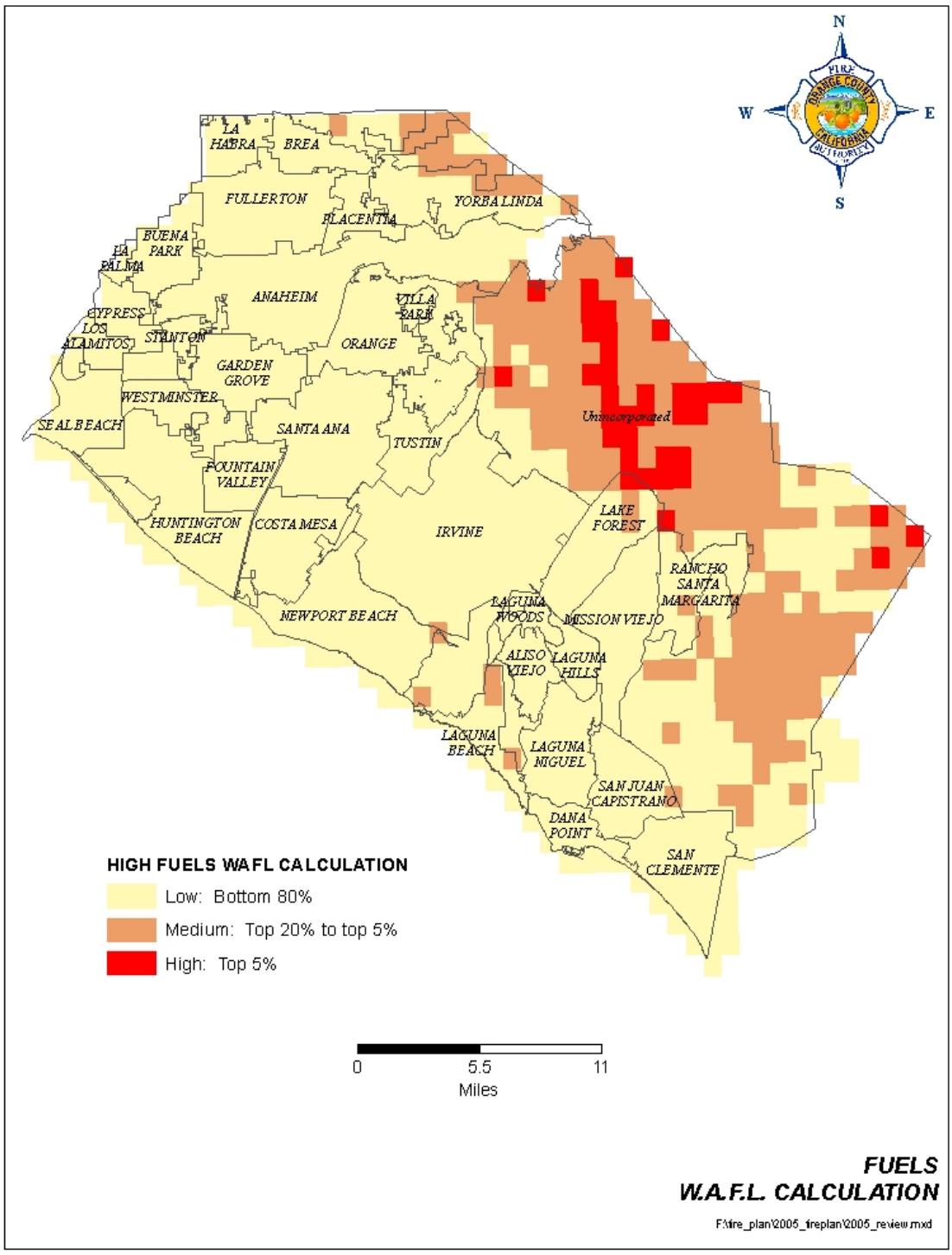


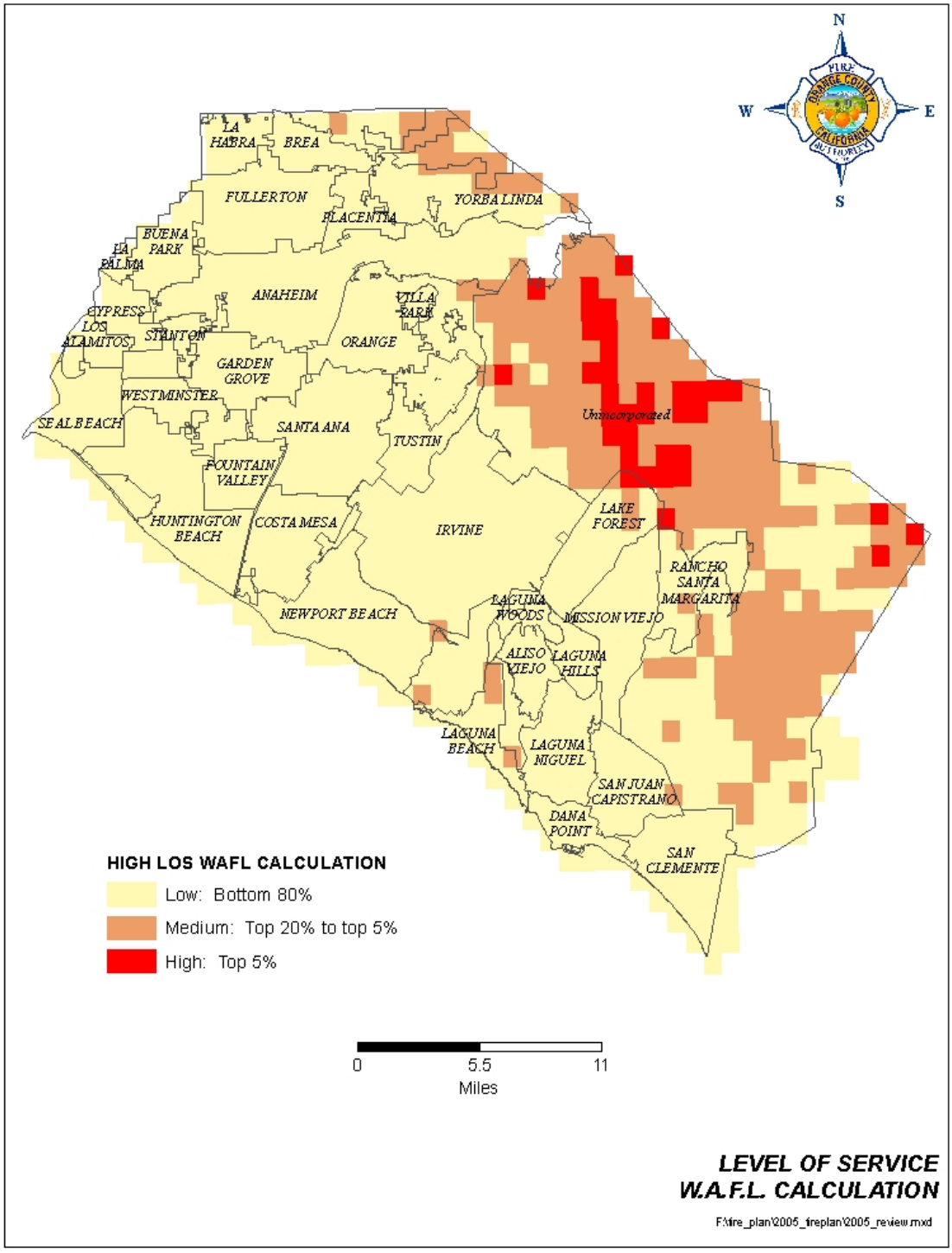
Weather component is given a weighted value of 5 (high) and the other 3 components are given a value of 1 (low).



Assets at Risk component is given a weighted value of 5 (high) and the other 3 components are given a value of 1 (low).



Fuels component is given a weighted value of 5 (high) and the other 3 components are given a value of 1 (low).



Level of Service component is given a weighted value of 5 (high) and the other 3 components are given a value of 1 (low).

STAKEHOLDERS

In order to assess all wildlands, this plan utilizes an integrated inter-governmental approach. State, local and federal wildland fire protection agencies are identified. The objective of this approach is to identify high risk, high value areas and develop solutions to reduce costs of large and damaging fires. While the vast majority of wildland fires occurrence in Orange County is along major transportation corridors, this plan will include all areas of Orange County. Our partners include but are not limited to:

Federal Agencies
USDA Forest Service - Cleveland National Forest
USDI - Fish and Wildlife
DoD - Marine Corp Camp Pendleton

State of California
Department of Forestry and Fire Protection
Department of Parks and Recreation
Department of Fish and Game

County of Orange
The Cities of:

Aliso Viejo	Buena Park
Cypress	Dana Point
Irvine	Laguna Hills
Laguna Niguel	Laguna Woods
Lake Forest	La Palma
Los Alamitos	Mission Viejo
Placentia	Rancho Santa Margarita
San Clemente	San Juan Capistrano
Seal Beach	Stanton
Tustin	Villa Park
Westminster	Yorba Linda

Private and Quasi-Public Stakeholders

Stakeholders are defined as any person, agency or organization with a particular interest, i.e.; a stake, in fire safety and protection of assets from wildland fires. Stakeholders within Orange County will validate asset information, identify unacceptable risk to their assets, and assist in defining solutions. Participation of individuals from the following list of organizations is welcome.

Private individuals / property owners.
Agro-industry utilizing open lands.
Corporate entities holding lands or conducting business in areas at risk.
Home and property owners associations.
Real Estate and Business Associations.
Coordinated Resource Management Planning Committees (CRMP).
The Nature Conservancy.

The Nature Reserve of Orange County (NROC).
Firesafe Councils and Alliances.
Water companies relying on watershed areas.
Electric companies concerned with power generation and distribution.
Railroads and other transportation entities traversing wildlands.
Communications companies with facilities sited on or traversing wildlands.
Agricultural commissions, boards, committees and associations.
Habitat conservation groups.
Groups and associations promoting various outdoor activities.
Historical societies.
Tourism and commerce promoting groups.
Petroleum / Natural Gas pipeline companies.

It is an objective of the Wildland Fire Management Plan that those who benefit from the protection of an asset should also share in the costs for protecting that asset. Asset stakeholders are encouraged to provide financial support for the projects that provide significant benefits to their assets at risk. Therefore, it will be necessary to develop a cost share formula that will identify multiple benefactors of a particular project.

ISSUES AND RECOMMENDATIONS

Issue - The ecological processes, including wildland fire and other disturbance, and changing landscape conditions are often not integrated into management planning and decisions. With few exceptions, existing land management planning tends to be confined within individual agency or departmental jurisdiction boundaries. This is partly due to being directed by agency or departmental mission and policy and or simply based on the goals of a single program.

Recommendation - OCFA management planning must consider the risks, probabilities, and consequences of various management strategies of hazard mitigation, e.g., fire use vs. fire exclusion. In a responsive planning process, management decisions must be monitored, integrated and supported at each step.

OCFA management must understand and accept the need to integrate all forms of hazardous fuel reduction techniques, including the use of prescribed fire, into management plans and objectives. This integration must be reconciled with other societal goals, e.g., maintaining a healthy ecosystem, producing commodities, protecting air and water quality, and above all, the protection of human life and property.

OCFA management must recognize the importance of hazardous fuel reduction through the development of management plans that delineate a program of work to provide a safe environment in the wildlands. The plan will outline a course of action, that when accomplished, will provide for protection of life and property while reducing the potential devastating effects from an unplanned wildland fire.

OCFA management must work in unison with our stakeholders and encourage them to accept and understand to role of hazardous fuel reduction programs. We will encourage

stakeholders to either participate with OCFA as we work toward meeting our goals in the OCFA Wildland Fire Management Plan or to develop their own plans in which OCFA may enter into effective cooperative efforts to provide assistance. Either way, stakeholders will share in the opportunity and responsibility of protecting our communities.

Likewise, management needs to focus on protection goals to determine a success ratio of initial attack when responding to the unplanned wildland fire ignitions. The ratio should be indicative of levels at which the unplanned wildland fire is considered excessive or unacceptable either in final size (acres burned) or cost of suppression. Other factors for review can be added as required.

Issue - Several factors tend to constrain attempts, either prescribed fire or mechanical, to reduce hazardous fuels on a significant scale.

First, favoring the status quo often times impedes progress. Managers may feel the need to wait for certainties (scientific or otherwise) before taking action. Hesitation due to the devastating results of past failures, or a lack of new or better techniques, will hinder the manager and delay implementation.

Second, management plans may not be in place thus precluding managers from taking advantage of options presented by influencing factors.

A third constraining factor is the increasing human settlement that encroaches upon wildlands (wildland urban interface). Orange County history supports the concept that wildfire is an accepted way of life. In early times, wildland fire, under extreme conditions, would grow into an uncontrollable monster that would be influenced only by weather. With the small and scattered populations, humans often fell victim to wildfire. As populations grew, and continue to grow, the areas of wildlands are becoming fragmented, isolated and shrinking.

Smoke is yet another perceived factor that may affect managers' ability to use wildland fire on a large scale or frequency to restore and maintain fire-dependent ecosystems. Federal, State, County and local governments have developed standards (even though many are considered as constraints) that set air quality standards for pollutants that affect public health. There are many examples of fire agencies and local air quality authorities successfully working together to accomplish objectives, resolve conflicts and avoid violation of air quality standards.

Recommendation - First, OCFA management must continually review hazardous fuels reduction plans and must consider values to be protected, management objectives and environmental conditions.

Second, OCFA must embrace the concept that the threat is changing, from the wildland fire threatening humans, to the single- or multi-structure fire that escapes into the wildlands, thus destroying the shrinking wildlands, ecosystems and aesthetic values. OCFA must prepare to deal with providing a protection system that will be considered a "two-way street".

Third, OCFA must plan and implement actions in areas where planning has determined a wide range of appropriate management activities, treatments by use of fire or mechanical means, and that these opportunities should be implemented as safely and cost-effectively as possible to accomplish goals and objectives.

OCFA needs to be a leader in efforts to continue successful interagency conflict resolution to enhanced cooperation and understanding the roles of smoke management and to insure the use of planned wildland fire use in the future.

Issue - For many people, wildland fire remains a fearsome, destructive force that can and should be controlled at all costs. Smokey Bear's simple, time honored "only you" fire prevention message has been so successful that any complex talk about the healthy role of fire in the ecosystem is often lost or quickly squelched.

Another segment of the population feels that any type of disturbance to the ecosystem, either by fire, by hand or by mechanical means, is unwarranted. The concepts of letting nature run its course has repeatedly proven too costly both too the environment and populace.

Recommendation - OCFA must develop a comprehensive message is that clearly conveys the desired balance of avoiding wildland fires with adverse effects while simultaneously increasing the knowledge and use of prescribed fire for the protection of human life and property and the benefit of the ecology. Stated again, Orange County histories supports the fact that fire is a way of life, we must protect ourselves from the hazards of wildland fire and prevent losses to the optimum extent possible.

OCFA must periodically review this plan with stakeholders for additional input and a focused group of stakeholders potentially affected by or benefiting from specific pre-fire projects will be conducted for cost share determination.

OCFA must develop a cost-share formula to aid in the decision process and insure that funding sources are identified and acquired to support and insure that pre-fire projects will be implemented.

GLOSSARY

Assets - a generic term referring to all facets that can be affected by an impinging fire. Effects can be either positive or negative in terms of amount of disturbance.

Assets at Risk - Assets identified as being at risk from wildland fire. Assets include, but are not limited to, citizen and firefighter safety, watershed and water, timber, wildlife and habitat (including rare and endangered species), unique areas (scenic, cultural and historic), recreation, range, structures and air quality.

Hazardous Fuels - Combustible materials, usually in the form of loose surface litter on the soil surface consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

Initial Attack Success - A term given to the process for measuring the protection system for wildland fire and the ability to provide an equal level of protection to lands of similar type. The measured outcome is referred to as "Level of Service" (see below).

Level of Service (LOS) – A rating representing the number of incidents where initial attack was successful. The success is that effort which contains the wildland fire to an acceptable size, the level of resource commitment, acceptable suppression costs and minimal damage to the Assets at Risk.

Pre-Fire Management - A defined and assessed list of alternatives to protect assets from unacceptable risk of wildland fire damage, the alternatives can become a program of work to provide protection to Assets at Risk.

Prescribed Fire - Any fire ignited by management actions under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist prior to ignition.

Stakeholders - Any person, agency or organization with a particular interest, in fire safety and protection of assets from wildland fire.

Wildland Fire - Any nonstructural fire, other than prescribed fire, that occurs in the Wildlands.

Wildland Urban Interface - The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.