

# FIRE MITIGATION IN THE WILDLAND URBAN INTERFACE SMARTCODE MODULE

PREPARED BY DREILING TERRONES ARCHITECTURE, MARTIN DREILING

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*To study fire is to inquire into one of the informing processes of the earth. To manage fire is to perform one of the defining acts of human beings. That, distilled, is the sufficient and necessary reason to understand fire.*

Steve Pyne  
1996



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## SMARTCODE ANNOTATED

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### FIRE MITIGATION

#### IN THE WILDLAND URBAN INTERFACE

##### SMARTCODE MODULE

This Module should be used for any planning area that includes Fire Hazard Severity Zones or equivalent.

Such zones should be identified for each state. The information should be available from state or local agencies that deal with fire protection.

The term “Fire Hazard Severity Zone” should be changed to the terminology used by the regulating body.

Many local jurisdictions already require a Fire Hazard Mitigation Plan or equivalent when development is proposed in a Fire Hazard Severity Zone. This Module is intended to modify some of the requirements normally stipulated for those plans that are in conflict with principles of good urban design. The primary tool introduced is the Common Zone of Defense.

This Module, therefore, should be used not only to address actual plan proposals or desirable outcomes, but to tactically address fire mitigation issues that may be embedded in current codes, policies or simply local practice.

##### ZONES OF DEFENSE

The purpose of a Zone of Defense is to prevent fire from moving easily from one fuel type to another, or to otherwise modify the fire type to one of lower intensity. For example, an active crown fire may shift to a ground fire. Zones of Defense can be effective simply by reducing the intensity of vegetation such that a fire is substantially modified as it crosses into a Zone of Defense.

Zones of Defense are typically covered by state and local codes. Care should be taken when reviewing these codes to ensure that their Zones of Defense do not force extreme separation of buildings or the creation of landscape areas that are largely devoid of plants. Local interpretations of these codes can result in removal of all substantial vegetation. In some cases, such as Brush / Scrubland, such clearing is warranted, and agricultural uses should be considered in these areas. But many Fuel Models can achieve adequate treatment simply by restoring conditions that allow natural fires to manage the fuels.

**ARTICLE 1. GENERAL TO ALL PLANS****FIRE MITIGATION IN THE WILDLAND URBAN INTERFACE****1.X FIRE HAZARD ASSESSMENT**

Each plan submitted under this code that includes lands listed by state or local agencies as **Fire Hazard Severity Zones (FHSZ)** shall include an assessment of specific fire hazard elements present. Assessment shall include the following:

- a. Identification and location of existing Fuel Models based on the 1978 National Fire Danger Rating System (NFDRS) Fuel Model system.
- b. Identification of historic weather patterns affecting fire behavior, including most likely direction of fire origination and propagation.
- c. Identification of the fire history pertinent to the plan area, including location and age of prior burns and Fuel Treatments.
- d. Identification of appropriate Fire Hazard Mitigation Measures for the specific design elements of the plan.

**1.X FIRE HAZARD MITIGATION MEASURES**

All plans submitted under this code that include lands within a Fire Hazard Severity Zone shall provide Fire Hazard Mitigation Measures. They shall include specific actions within the plan as well as the set aside of lands on which development may not occur due to high fire hazard. Fire Hazard Mitigation Measures shall include, as a minimum, the following:

**1.X.1 ZONES OF DEFENSE**

- a. Zones of Defense shall be located between natural areas that are prone to wildfire and buildings and related development.
- b. Zones of Defense shall be configured in direct response to the adjacent Fuel Models present and shall reflect appropriate treatments and dimensions for those models.
- c. Zones of Defense shall not be required to be devoid of vegetation or forest cover. Vegetation shall be reduced or otherwise managed such that approaching fires are adequately stopped or stalled such that structures within the ZD do not ignite, and such that firefighters can work safely to fight fires that may enter the Zone of Defense and approach structures.
- d. Dimensions for Zones of Defense shall be provided as follows, such that fire encroachment will be restricted for the existing Fuel Model.
  - i. The width of a standard Zone of Defense shall be **100 feet** minimum and shall include a Reduced Fuel Zone of **70 feet** minimum and a Critical Defense Zone of **30 feet** minimum.
  - ii. Reduced Fuel Zones shall include Fuel Treatments that reduce the native Fuels while maintaining native landscape character.
  - iii. Critical Zones shall include Fuel treatment or removal such that advancing fires are stopped.
  - iv. Zones of Defense **should** be decreased or increased in response to specific local conditions of Fuels, topography and weather.
  - v. Zones of Defense may include noncombustible architectural elements, such as walls, both to increase defensive capability and to reduce or modify the overall dimension of the zone, where the adjacent Fuel Model permits.

### COMMON ZONE OF DEFENSE

This section introduces “Common Zone of Defense,” a new term for the concept of collective Zones of Defense around a cluster of structures such as a hamlet (CLD in the SmartCode). Rather than have numerous redundant Zones of Defense generating sprawl patterns, a Common Zone will address the same fire modification and fire fighting issues as a standard Zone of Defense, while facilitating more compact development.

It is important to understand that clustered buildings will necessarily be more fire resistant due to other requirements of standard building codes and, therefore, support the goals of wildfire mitigation.

There will likely be resistance to this from firefighters who will still require space between buildings for fire fighting.

Since a Common Zone of Defense offers greater social and environmental benefits to a community, while generating more efficient development patterns, calibrators can offer these larger zones of defense as a means to mitigate concerns over clustered buildings, and better isolate CLD from wildfire environments.

### FUEL MODELS

Fuel Models refer to the particular collection of plant species and plant residual materials that are relevant in a given area. Fuel Models have been identified for most fire-prone areas of the U.S., in accordance with several accepted systems of modeling. The most common is the 1978 NFDRS Fuel Model System; however, other systems have been developed and may be in use by local agencies.

Assignment of local Fuel Models may be determined by State or Local agencies. Alternately, Fuel Models present in a planning area can be determined according to USDA Guidelines, per USDA Technical Report INT-122, Anderson 1982.

For some plans, simplified Fuel Models may be adequate for calibration. In such cases simplified Fuel Models as listed herein should be clearly identified and acceptance by local agencies should be verified. However, if Fuel Models have not been assigned at a fine enough scale to be useful in the development of the plan, it may be necessary to further refine the assignment according to these categories, or by using one of the accepted models in use that includes more diverse categories.

**1.X.2 COMMON ZONE OF DEFENSE**

- a. For all Fire Hazard Severity Zones, any planned development patterns shall include a Common Zone of Defense as the primary means to isolate developed areas from high fire risk conditions in the surrounding landscape.
- b. A Common Zone of Defense shall protect multiple buildings, compounds, TND edges adjacent to wildlands, and the Urbanized areas of CLD Community Units.
- c. A Common Zone of Defense shall be required for any development within or immediately adjacent to a FHSZ and shall generally comply with state and local regulations regarding standard Zones of Defense for individual buildings, but shall be designed to isolate groups of multiple buildings from adjacent fire hazard areas.
- d. The Common Zone of Defense shall serve multiple purposes beyond the purpose of Fire Modification, including the following:
  - i. Agricultural uses that substantially reduce the risk of fire spreading from native Fuel types to Fuel types within the area of development.
  - ii. Recreational or other natural area that includes a Fuel type modified for low risk.
  - iii. Natural Zones of Defense treated for Fuel reduction such that approaching fires would either reduce in intensity or cease progress when the Zone of Defense is encountered.
- e. The Common Zone of Defense shall include adequate access for fire fighting equipment within the proposed Thoroughfare system.
- f. Individual Zones of Defense around isolated buildings shall be utilized where isolated buildings are permitted by this Code. Such individual Zones of Defense shall be designed per state and local requirements and shall be contiguous with public Thoroughfares.

**1.X.3 SPECIFIC RESPONSE TO FUEL MODELS PRESENT**

- a. Development shall be directly responsive to the Fuel Models present in the plan area. Fuel Models present shall be identified as part of the Fire Hazard Mitigation Measures.
- b. When Fuel Models have not been assigned as part of a FHSZ, or via other mechanisms by local or regional jurisdictions, development areas shall be differentiated among the following three Fuel types as a minimum:
  - i. Grassland
  - ii. Brush / Scrubland
  - iii. Forest Lands
- c. Fuel Treatment shall be designed to respond directly to the Fuel Models present. All Fuel Treatment shall be designed to isolate development areas from areas where wildfire may occur. Fuel treatment shall also be designed to reduce risk of wildfire ignition caused by escaping structure fires.
- d. Fuel Treatment shall not require the full removal of natural vegetation, landscape materials or agricultural planting in or near the development area or within the Zone of Defense, except as may be required for a specific Fuel type as provided in [Section 1.X.4 below](#).

### 1.X.4 GENERAL REQUIREMENTS FOR BASIC FUEL TYPES

#### Grassland Fuel Models

Grassland fires are usually easier to fight than other fuel types. Development in areas of grassland fuels shall anticipate fast-moving ground fires with lower height and lower risk of spotting. Fires may recur at high frequency and development shall anticipate regular recurring fire at the scale of seasons.

**a. ii** This may require multiple treatments per season as growth recurs.

#### Brush / Scrubland Fuel Models

Development in areas of brush/scrubland pose the highest fire threat as these lands burn often based on quick fuel growth. Brushlands can burn very hot and frequently; brushland species often regenerate quickly and fuel loads can accumulate rapidly. There may be greater effects from topography including rapid and random fire spread, high frequency of spotting and high energy release.

Expect high annual fuel accumulation, ongoing and frequent Fuel Treatment and high difficulty for fire fighting.

**b. ii** This may require multiple treatments per season as growth recurs.



## 1.X.4 GENERAL REQUIREMENTS FOR BASIC FUEL TYPES

**a. Grassland Fuel Models : General Requirements**

- i. Development should include a low to moderate level of isolation between development areas and areas prone to wildfire.
- ii. Development shall anticipate horizontally advancing fires and shall utilize Fuel Treatment as the primary mitigation of threat to structures. Fuel Treatment shall occur as often as needed to remove or reduce natural grass regeneration.
- iii. Fuel Treatment shall not require full removal of vegetation, but shall reduce plant material via mowing to levels that will not allow wildfire to progress or develop high heat.
- iv. Agricultural operations are permitted, provided that adequate firebreaks occur between grasslands and agricultural installations, and between agricultural areas and development areas. Agricultural planting shall not add to the Fuel Load in the treatment areas and shall include diverse species exhibiting different Fuel characteristics, including seasonal maturation that does not coincide with the likely fire season.
- v. Development shall anticipate the possibility of light airborne ash and sparks, and shall include Fuel Treatments internal to the development areas adjacent to grasslands.
- vi. Development shall include roof and material selections designed to reduce risk of structure fire from low temperature ash.
- vii. Extent of Fuel Treatment may be reduced by the use of noncombustible walls and other landscape elements that will impede fire progress and isolate development from likely wildfire areas.

**b. Brush / Scrubland Fuel Models: General Requirements**

- i. Development should include a high level of isolation between development areas and areas prone to wildfire.
- ii. Development shall anticipate fast moving, horizontally advancing fires of high heat and shall include Fuel Treatment as the primary mitigation of threat to structures. Fuel Treatment shall occur as often as needed to remove or reduce natural brush / scrub regeneration.
- iii. Development shall anticipate that fires will recur frequently in the same area, possibly on an annual basis, and shall require frequent and ongoing Fuel Treatment appropriate to the Fuels present.
- iv. Fuel Treatment shall require full removal of brush and scrub in critical portions of the treatment area to ensure that fire spread does not approach development areas. Replacement by grasses and low landscaping shall be permitted provided regular treatment occurs, and provided that landscape materials are highly varied and carry low risk of ignition.
- v. Agricultural operations are permitted, provided that adequate firebreaks occur between brushlands and agricultural installations, and between agricultural areas and development areas. Agricultural planting shall not add to the Fuel Load in the treatment areas and shall include diverse species exhibiting different Fuel characteristics, including seasonal maturation that does not coincide with the likely fire season.

### Forest Land Fuel Models

Forests lands present the most complex fire management challenges because fire has been suppressed for so long that fuel accumulations are large and unbalanced with any natural fire resistance capabilities. In fire adapted landscapes, fire typically manages the understory fuel loads on a regular basis in such a way that intense fires rarely ignite and older trees can generally resist fire damage.

Crown Fires are the most devastating in a forest setting. Fuel Treatments will seek to reduce Crown Fires by eliminating Ladder Fuels and to modify an existing Crown Fire so that it drops back down to the ground (by reducing understory fuels).

**c. ii** This may require multiple treatments per season as growth recurs.

### 1.X.5 TOPOGRAPHY

Restrictions based on topography will likely harmonize with other environmental concerns including stormwater, geotechnical considerations and seismic considerations. Many places that offer high risks for wildfire also offer high risks for at least one of these other concerns.

Additionally, in certain locations recurring wildfire is often coupled with landslides caused by removal of vegetation. This is typical for scrublands where thin soils may be present and underlying stability is low.

The primary focus for topography should be on fires that can move upslope rapidly. This concern increases as slope increases, and mitigation should increase in severity concomitantly, to the limit that no development should occur on, or at the top of, steep slopes, draws, or canyons.

### 1.X.6 WEATHER PATTERNS

Consideration of weather patterns requires fine grained observation of specific sites and will not necessarily generate regional-scaled information.

Specific weather events, such as lightning strikes, are hard to predict, particularly when the weather at the moment of the event may be highly variable. In general, site planning consideration for weather will address other issues such as stormwater, flooding, and/or high winds as they affect structures and access. Appropriate response to these items will generally deliver an adequate response to fire as well.

- vi. Development shall anticipate the possibility of light to heavy airborne ash and sparks of moderate to high temperatures, and shall include Fuel Treatments internal to the development areas adjacent to brush / scrubland areas.
- vii. Development shall include roof and material selections designed to reduce risk of structure fire from high temperature ash.

**c. Forest Land Fuel Models: General Requirements**

- i. Development should include a moderate level of isolation between development areas and areas prone to wildfire, coupled with both Fuel Treatment and wider areas of Fuel reduction. When appropriate, wide area Fuel Treatment as part of a forest stewardship program shall be included in the plan area.
- ii. Development shall anticipate horizontally advancing fires and shall utilize Fuel Treatment as the primary mitigation of threat to structures. Development in Forest Lands shall assume fire threats from all types of fire, including Crown Fires, Ground Fires, Spotting and Firebrands. Fuel Treatment shall occur as often as needed to remove or reduce Understory materials and Ladder Fuels.
- iii. Development shall anticipate intermittent fires with long spans of time between fire events and shall include a mechanism for ongoing Fuel Treatment and Fuels Maintenance spanning seasons and possibly decades.
- iv. Fuel Treatment shall not require the full removal of plant materials. Materials shall be removed or reduced such that forest character is maintained, yet Fuel Loads are reduced such that a fire would be adequately modified to reduce or eliminate threat to development.
- v. Agricultural operations are permitted provided adequate Fuel Treatment occurs in adjacent Forest Lands to modify an advancing fire to one of lower intensity, or to prevent advance into areas of differing Fuels.
- vi. Agricultural planting shall not add to the Fuel Load in the treatment areas and shall include diverse species exhibiting different Fuel characteristics including seasonal maturation that does not coincide with the likely fire season.
- vii. Development patterns shall include high levels of Fuel Treatment coupled with complex Zones of Defense that provide isolation from intense fire types, while preserving forest amenities that provide assets for development and promote forest health.

**1.X.5 RESTRICTED DEVELOPMENT BASED ON TOPOGRAPHY**

Development shall not be permitted in areas that exhibit high fire risk based on topography. See Table FM-1d. These areas shall include:

- a. steep slopes of xx percent minimum grade where convection can generate increased winds, updraft and upslope fire progression
- b. draws and canyons where convection can generate extreme drafts coupled with high radiant heat from constrained geography
- c. areas where historic fire patterns reflect repeated fire occurrence.

**1.X.6 RESTRICTED DEVELOPMENT BASED ON PREVAILING WEATHER PATTERNS**

Development shall not be permitted where historic weather patterns generate high risk of fire, either via fire propagation or ignition. See Table FM-1de. Considerations shall include:

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### FUEL TREATMENT

Fuel Treatment requirements for landowners will be covered by other local or regional regulations. These codes should be reviewed for potential conflicts with the development goals of this code and addressed as part of this calibration. Specific attention should be paid to local codes that favor non-native landscaping or irrigated turf.

While not necessarily addressed by local codes, Fuel Treatments should be aimed at returning existing landscapes to a condition that mimics natural conditions, where fire has not been suppressed but has been allowed.

Moisture of Extinction is a value specific not only to each fuel type but to the arrangement of the fuel. In typical wildfire regulations, for each fuel model there will be a defined Moisture of Extinction above which fire safety goes up. Local climate and weather patterns play a part. This is how the fire severity signs are set, such as “Fire Hazard Today: Low.”

### O-1 PRESERVED OPEN SECTOR

This section allows for Fuel Treatment activities that may be sensible or required in otherwise preserved lands. In many cases, strategic Fuel Treatments may make sense some distance away from an area of development to prevent fire from moving into certain higher risk topographic settings. This is an issue of overall wildland fire management, but may occur within a plan area.

At a finer scale, this section also addresses the problem of difficulties arising with Fuel Treatment on public and private lands adjacent to development. This should be calibrated, depending on the nature of the plan, to require access to adjacent lands, even if already developed, for Fuel Treatment from a systems point of view.

This suggests that each private property within a plan area shall provide access for Fuel Treatments when subsequent development, as identified in the plan, occurs. It essentially establishes “treatment rights” for all development identified in the plan. It also reduces the ability of adjacent land owners to limit planned development based on refusal to allow fuels treatment. However, inclusion of this section requires careful definition of “Treatment” in the adopted code such that environmental, cultural and social values are preserved.

### 1.X.7 INITIAL FUEL TREATMENT

Initial Fuel Treatments, prior to development, may be required and the limits of those treatments will likely be the subject of negotiation. For non-conventional development patterns like those supported by transect-based codes, the extent and pattern of Fuel Treatments may pose conflicts with regard to resource and habitat preservation in adjacent areas, as well as the general landscape qualities sought for the plan area. Fuel Treatments proposed should be finely tuned to the specific Fuel Models and the local climate, such that over-treatment does not occur.

### SET ASIDE LANDS

This section assumes that within the WUI there will be lands identified as part of the Fire Hazard Assessment that are not suitable for development specifically due to wildfire considerations.

### O-2 RESERVED OPEN SECTOR

This section provides for Fuel Treatment as part of stewardship activities that can return lands to a condition of natural fire management as a means to protect the WUI as well as restore particular lands to natural performance.

The O-2 Sector is intended for lands that should be preserved, but are privately owned and not yet preserved. It is typically a temporary designation. It may be reassigned to O-1 or G-1 during the course of a planning charrette or over a series of revised plans, or years later.

- a. high risk of lightning strikes on ridgelines, knolls, and other exposed locations
  - b. prevailing winds coupled with topographic features that will likely increase rapid fire movement should ignition occur, including draws, steep slopes facing prevailing winds, or upslope conditions relative to likely wildfire advance
  - c. specific climate zones, typical Fuels moisture during highest risk fire seasons, and typical Moisture of Extinction for the Fuel Models present.
- 1.X.7 **INITIAL FUEL TREATMENT**
  - a. For all SFHZ areas where development may occur, Initial Fuel Treatments shall be included as part of the Fire Hazard Mitigation Measures.
  - b. Initial Fuel Treatments shall comply with state and local codes.
  - c. Initial Fuel Treatments shall be coordinated with the specific configuration and dimensions of the Common Zone of Defense specified for each plan area.
- 1.X.8 **FUEL MAINTENANCE**
  - a. Plans shall include an operational strategy for ongoing Fuel Maintenance, in accordance with and subject to enforcement by [state and/or local statutes](#).

## ARTICLE 2. REGIONAL SCALE PLANS

### 2.X. SET ASIDE LANDS

- a. Lands in a Fire Hazard Severity Zone that are set aside for the purpose of fire hazard mitigation, and that are not designated for agricultural uses or currently in private ownership for agricultural uses, shall be permanently assigned to the O-1 Preserved Open Sector. Such lands in private ownership shall be assigned O-2 Reserved Open Space Sector for intended reassignment to O-1 through Transfer of Development Rights or other compensatory actions, or to the G-1 Restricted Growth Sector, allowing only CLD development in the future.

### 2.X. SECTOR DESIGNATIONS

- a. Undeveloped lands in Fire Hazard Severity Zones shall be limited to designation as O-1, O-2, G-1, or G-2. Developed lands in the FHSZ shall be assigned to the G-4 Infill Growth Sector.

#### 2.X.1 O-1 PRESERVED OPEN SECTOR

- a. Lands in Fire Hazard Severity Zones designated O-1 [may](#) include Fuel Treatments at Sector boundaries adjacent to other Sectors where structures may be present, and in other locations where Fuel Treatments provide a strategic advantage for fire hazard mitigation for existing and proposed development and for general stewardship purposes.
- b. Lands in Fire Hazard Severity Zones designated O-1 may include agricultural production and structures, timber production and structures, and parklands facilities and structures by Warrant.

#### 2.X.2 O-2 RESERVED OPEN SECTOR

- a. Fuel Treatment in O-2 and O-1 shall return undeveloped lands within the Sector to a condition in which naturally occurring fires generate ongoing Fuels Maintenance.

#### 2.X.3 G-1 RESTRICTED GROWTH SECTOR AND G-2 CONTROLLED GROWTH SECTOR

- a. Lands in Fire Hazard Severity Zones designated G-1 or G-2 may include agricultural production and related structures.

### 3.4 SPECIFIC TO ZONE T-2

This section is intended for Community Scale Plans where O-2 and G-1 Sectors or T-2 agricultural and stewardship zones are identified and development potential is present. While T-2 lots may be very large (20 acres minimum in the model SmartCode), in the FHSZ, buildings are disposed near public thoroughfares. This satisfies much of the fire fighting concern because the structures are readily accessible.

Additionally, it seeks to establish individual property patterns in traditional ways such that, should development intensify, these T-2 patterns closely associated with public roads may generate opportunities for transition to the CLD (hamlet) scale.

### 3.4 SPECIFIC TO ZONE T-3

In most communities developed and protected under this Code, T-3 will be the primary development zone associated with the WUI. The T-3 zone, if protected by a Common Zone of Defense on the outer edges, is effectively a transition between wildland fire risks and the more intensely developed T-4 zone where wildland fire is likely to be irrelevant and urban fire fighting techniques come into play. This is particularly the case in larger villages and towns, such as the TND Community Unit type or several adjacent TNDs.

Additionally, this section allows for T-3 / T-4 levels of development as part of a CLD (hamlet) pattern that is entirely surrounded by a Common Zone of Defense. In this case the T-3 need not be on the edges only.

The Common Zone of Defense is intended to isolate wildfire from clustered development in the first place by generating a larger overall Zone of Defense than would be generated by sprawl development patterns. The goal is to eliminate the WUI by creating, instead, an Agricultural-Urban Interface (AUI) at the T-2 / T-3 boundary. The T-3 development then requires no different fire mitigation than any urban development. Thus buildings may be closely spaced with the understanding that building codes (health/safety codes) already require increased fire resistance for such configurations.

It is also the intent of this section to require access for fire fighting via a street and alley system, but to link the requirements for those thoroughfares back to the other provisions of the SmartCode, rather than deferring to typical agency standards for their dimensions. It is not appropriate to include street and alley standards here, as they should be considered as systems rather than isolated responses to individual concerns. See Section 3.7 of the base code and the Complete Thoroughfares Module.



**ARTICLE 3. COMMUNITY SCALE PLANS****3.X SET ASIDE LANDS**

a. Lands mapped in a Community Plan that occur in a Fire Hazard Severity Zone and are set aside for the for the purpose of fire hazard mitigation, and that are not designated for agricultural uses or currently in private ownership for agricultural uses, shall be permanently assigned to Civic Space or the O-1 Preserved Open Sector.

**3.3 COMMUNITY UNIT TYPES****3.3.X GENERAL**

a. Development occurring in or adjacent to a Fire Hazard Severity Zone shall be limited to the following:

- i. TND where the existing or proposed WUI occurs, provided the WUI is modified via a Common Zone of Defense per [Article X](#).
- ii. CLD as regulated in [Section 3.3.1 of the SmartCode](#) and including a Common Zone of Defense per [Section 3.3.X](#) below.

**3.3.X SPECIFIC TO CLD**

a. If any part of the Urbanized area of a planned CLD falls inside or adjacent to a Fire Hazard Severity Zone, the entire Urbanized area shall be subject to a Common Zone of Defense separating it from the Fire Hazard Severity Zone. The required 50% T1/T2 zone in the CLD may act as part of the Common Zone of Defense if it satisfies the other requirements of this Code for a Zone of Defense.

**3.4 TRANSECT ZONES****3.4.X SPECIFIC TO ZONE T2 WITHIN A FIRE HAZARD SEVERITY ZONE**

- a. Individual structures permitted by this Code that are justified within the FHSZ in support of land management, stewardship, agricultural production, and related residential and industrial structures shall include individual Zones of Defense and shall be located adjacent to public roads for ease of access for fire fighting.
- b. Multiple structures comprising a compound shall utilize a Common Zone of Defense such that clusters of buildings are isolated from adjacent fire hazards as a group. The Common Zone of Defense may be increased in dimension to ensure isolation and to protect structures without requiring individual Zones of Defense.
- c. Multiple, but separate, individual structures or compounds that may be permitted by this Code (such as farmsteads) shall be located in close proximity to each other such that Zones of Defense or Common Zones of Defense overlap or occur directly across roadways as a means to facilitate fire fighting and discourage a pattern of sprawl. See Table FM-2.

**3.4.X SPECIFIC TO ZONE T3 WITHIN OR ADJACENT TO A FIRE HAZARD SEVERITY ZONE**

a. Any T-3 zone at the edge of a TND shall be located such that a Common Zone of Defense occurs between the T-3 zone and any T-2 zone, T-1 zone or O-1 Preserved Open Sector that includes areas listed as Fire Hazard Severity Zones. The Common Zone of Defense shall separate the wildlands from the edge of T-3 and eliminate the need for special consideration of T-3 with regard to wildfire.

### ARTICLE 5: BUILDING SCALE PLANS

Rather than develop a full set of slightly varied requirements for individual buildings (or specifically combat those required by standard codes), the Module uses the Common Zone of Defense method to make the case that buildings in the development area are, as a clustered unit, sufficiently separate (and easily protected) from severe wildfire risks. This requires careful delineation of the Common Zones of Defense so that they are, in fact, defensible when reviewed by fire protection officials.

Emphasis on conversion of the WUI to an AUI (or equivalent) is intended to shift the conversation from incidental fire protection of development to intentional modification of fuel types such that fire does not approach development in a threatening manner.

However, in the T-2 zone, or T-1 or Civic Space (CS) by Warrant or Variance, there may be isolated buildings that are permitted by the SmartCode within a Community Plan, but which would require individual Zones of Defense. Ideally, advance planning with careful placement (disposition) of such buildings and facilities would allow normal T-2 development within a Common Zone of Defense, though this is not always possible. See Table FM-2 and Table FM-3.

The Common Zone of Defense rationale should establish that the resulting buffer is somewhat larger (community scaled) than a typical Zone of Defense, and thus provides far better fire protection and access for whatever fire fighting may be necessary.

### BUILDING DISPOSITION SPECIFIC TO ZONES T1, T-2, CZ

This section expands relevant issues for T-2 partly to support specific development patterns and partly to defend against other codes that encourage sprawl.

It reinforces street friendly locations for development partly to support fire fighting efforts and partly to reinforce the natural succession of Transect Zones for future intensification, following the traditional settlement patterns of Article 3 and Article 4 of the base SmartCode.



**3.7 THOROUGHFARE STANDARDS****3.7.X GENERAL TO DEVELOPMENT WITHIN OR ADJACENT TO FIRE HAZARD SEVERITY ZONES**

- a. In Fire Hazard Severity Zones, public Thoroughfares shall be the primary means of accessing private Lots for fire fighting access.
- b. Common Zones of Defense that protect CLD and TND Community Unit types shall include access and connectivity per the Intent of this Code, Section 1.3.

**ARTICLE 5. LOT AND BUILDING SCALE PLANS****5.X BUILDING DISPOSITION****5.X.1 GENERAL TO ALL ZONES**

- a. Buildings that are protected by a Common Zone of Defense shall not require individual Zones of Defense.
- a. Buildings shall be disposed such that they can be easily accessed for fire fighting and shall favor site locations adjacent to streets, roads or other public Thoroughfares.

**5.X.2 FUEL TREATMENT AND FIRE RESISTANCE**

- a. Fuel Treatment as required on Lots shall extend to the public Thoroughfare. See Table FM-1.
- b. Individual buildings shall be designed per the applicable building codes for fire resistance. Clustered buildings shall be designed for fire resistance to the extent required by the applicable building codes for buildings in close proximity to each other that are not within a Fire Severity Hazard Zone.

**5.X.3 SPECIFIC TO ZONES T1, T2, CIVIC ZONES (CZ)**

- a. Individual structures permitted by this Code, by Right or by Warrant, that are not part of a CLD Community Unit and that are justified in support of land management, stewardship, agricultural production, related residential and industrial structures, etc. shall require individual Zones of Defense.
- b. Multiple structures comprising a compound shall be clustered so that a Common Zone of Defense may protect all structures.

**5.X BUILDING FUNCTION****5.X.1 SPECIFIC TO ZONE T2**

- a. Marshalling yards, animal and product handling and other agricultural uses may occupy portions of the Common Zone of Defense.

**TABLE FM-1**  
**COMMON ZONE OF DEFENSE**  
**FUEL TREATMENTS**

Zones of Defense should be explicitly tuned to the fuel types present in the plan area, as different fuel types will result in somewhat different fire patterns. As fire moves through a landscape and encounters different fuel types its character changes. The goal of wildland fire suppression is not necessarily to extinguish a fire, but to modify it such that its intensity matches the natural fire resistance (and adaptation) of the subject landscape.

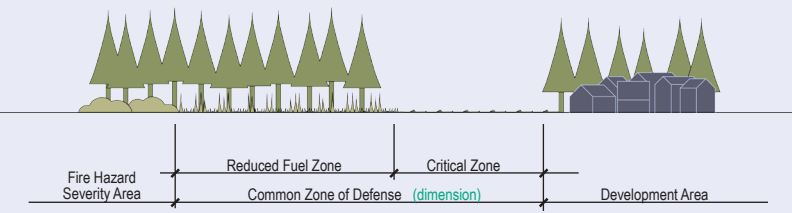
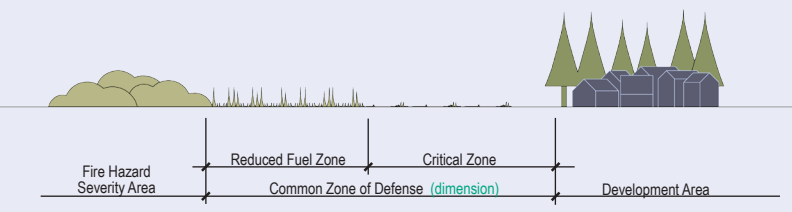
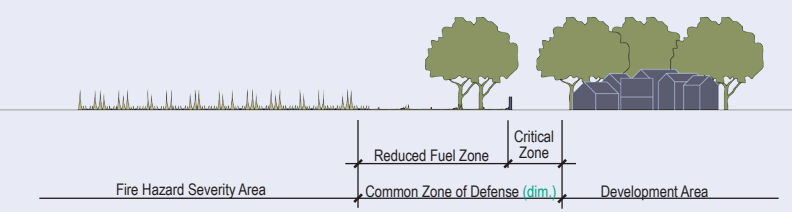
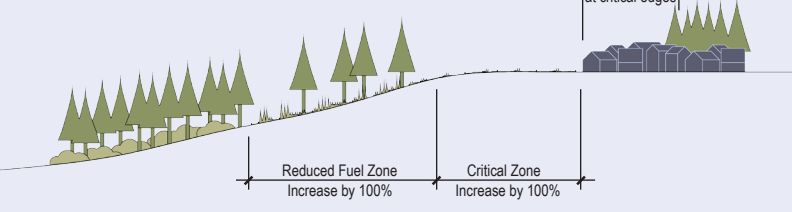
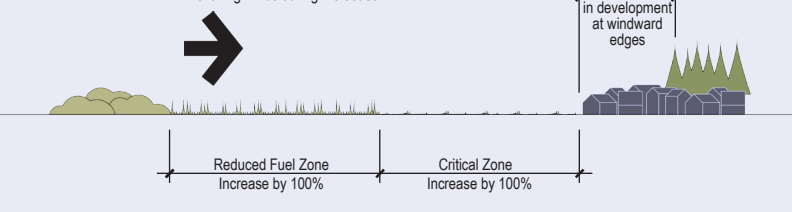
Fuel includes living trees and plant material, dead and decaying material on the ground including duff and slash, buildings and appurtenances, vehicles, chemicals, agricultural products, etc.

All Zones of Defense, whether Common or not, should be calibrated to each plan area, and should address the existing codes regarding dimensions as well as desirable dimensions.

The language in this table is regulatory. It may be modified to be advisory (“should” instead of “shall”) as local politics require.

**Slope Issues / Climate Issues**

Responses to topographic and climate / weather issues are highly sensitive to local conditions and are best informed by fire history in the plan area. Code elements addressing these items should focus on development / no development settings, as there are minimal responses available to better suit development for these circumstances. The primary tool is expansion of the Zone of Defense (a de facto “no-development” response).

<p><b>a. Common Zone of Defense: Forest Land Fuel Types</b></p> 	<p><b>Fuel Treatment shall be implemented as follows:</b></p> <ul style="list-style-type: none"> <li>• Understory treatment throughout the Zone of Defense</li> <li>• tree reduction or removal in the Critical Zone</li> <li>• conversion to agriculture in the Critical Zone</li> <li>• trees shall be permitted in the Critical Zone and within the development area when Ladder Fuels are managed.</li> </ul>
<p><b>b. Common Zone of Defense: Scrub / Brushland Fuel Type</b></p> 	<p><b>Fuel Treatment shall be implemented as follows:</b></p> <ul style="list-style-type: none"> <li>• Fuel reduction throughout the Zone of Defense</li> <li>• conversion to agriculture in the Critical Zone</li> <li>• trees shall be prohibited in the Critical Zone</li> <li>• trees shall be permitted within the development area when Ladder Fuels and Crown Fuels are managed.</li> </ul>
<p><b>c. Common Zone of Defense: Grassland Fuel Type</b></p> 	<p><b>Fuel Treatment shall be implemented as follows:</b></p> <ul style="list-style-type: none"> <li>• Fuel Reduction and Fuel Management throughout Zone of Defense</li> <li>• conversion to agriculture in the Critical Zone</li> <li>• trees shall be permitted in Critical Zone and within the development area when Ladder Fuels are managed</li> <li>• Critical Zone may be reduced by Warrant via inclusion of walls, grade breaks, and other barriers.</li> </ul>
<p><b>d. Common Zone of Defense: Slope Issues</b></p> 	<ul style="list-style-type: none"> <li>• Where topography includes slopes, draws, canyons and other features that focus wind effects, the Zone of Defense shall be increased.</li> <li>• Development shall be prohibited on slopes, and limited to benches, ridges and other locations where fire fighting in the Critical Zone is facilitated.</li> <li>• Within development, Fuel sources shall be reduced at edges adjacent to increased Zone of Defense</li> </ul>
<p><b>e. Common Zone of Defense: Climate Issues</b></p> 	<ul style="list-style-type: none"> <li>• Where prevailing winds (during fire season) coincide with wildland Fuel sources, the Zone of Defense shall be increased.</li> <li>• The reduced Fuel zone shall be limited to grasses or agrarian production.</li> <li>• Within development, Fuel sources shall be reduced at edges adjacent to the increased Zone of Defense (see diagram).</li> </ul>

**TABLE FM-2**  
**COMMON ZONE OF DEFENSE**  
**COMMUNITY SCALE PATTERNS**

This table provides a basic sampling of plan types in which Common Zones of Defense are relevant. It contrasts a small cluster where each building has its own Zone of Defense with a small ag compound pattern that would enable a Common Zone of Defense. Larger clusters and CLD (hamlets) should use this pattern as well. The edge of a TND is also appropriate for a Common Zone of Defense.

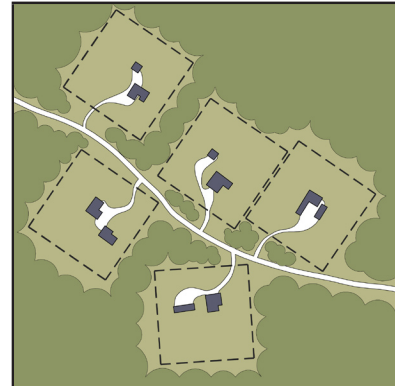
A basic review of the literature on both fire mitigation and fire behavior is recommended before entering into a discussion of the specific use of, and dimensions for, the Common Zone of Defense for each group of buildings or full neighborhood.

All Zones of Defense, whether Common or not, should be calibrated to each plan area, and should address the existing codes regarding dimensions as well as desirable dimensions.

The language in this table is regulatory. It may be modified to be advisory (“should” instead of “shall”) as local politics require.

#### a. Prohibited Pattern: Conventional Sprawl

- Conventional sprawl patterns shall not be permitted that generate redundant Zones of Defense, increased building spacing, and/or complex fire fighting situations.



#### b. Individual Buildings, Compounds, Farmsteads, Agricultural / Stewardship, Proto-Hamlets:

- Zones of Defense shall be provided around single structures.
- Multiple structures shall be clustered [per this Table, items b, c, and d](#).
- Common Zones of Defense shall be provided around clusters of multiple structures.
- Structures shall be located close enough to public Thoroughfares for direct fire fighting access.
- Zones of Defense shall be contiguous with public Thoroughfares.
- Multiple buildings and compounds under separate ownership shall be located in close proximity to each other to reduce the total quantity of individual Zones of Defense and to initiate development patterns that favor emergent CLD development. In such cases, Zones of Defense may overlap.



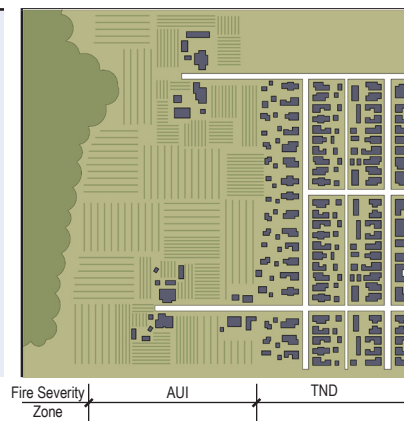
#### c. CLD with Common Zone of Defense:

- For CLD Community Unit types, Common Zones of Defense shall be provided to isolate development from Fire Hazard Severity Zones. See Section 3.3.X.
- Common Zones of Defense shall provide adequate isolation from likely wildfire threats via distance, Fuel Treatment and fire fighting access, such that resulting development shall be regulated by this Code and [the local Building Codes](#) and shall not require more restrictive regulation in response to proximity to Fire Hazard Severity Area.



#### d. Common Zone of Defense at Edge of TND; Agrarian Urban Interface (AUI):

- For TND Community Unit types, Common Zones of Defense shall isolate development from Fire Hazard Severity Zones.
- Common Zones of Defense shall extend between relevant edges of TND and the Fire Hazard Severity Zone.
- WUI shall be converted to AUI, thus separating wildland fire fighting requirements from urban fire fighting requirements.
- Farmsteads and related agrarian compounds may occur within the Agrarian Urban Interface per item b. above.



**TABLE FM-3**  
**WUI CONVERSION TO AUI**

This table provides a diagram of the interrelated aspects of some basic development types that may occur within a plan area. It contrasts recent conventional scattered “sub-urban” development with older patterns that traditionally separated development and wildfire risks.

Table FM-2 and Table FM-3 both reflect the overall intent of this Module, which is to separate development from fire risk at the scale of the community rather than the scale of the building.



**a. Prohibited Pattern:**

- Dispersed development that requires numerous and redundant Zones of Defense and increases the extent of the WUI shall not be not permitted.



**b. Permitted Pattern:**

- Conversion of the WUI to AUI at the edge of existing or planned development shall be permitted.
- For isolated development, compounds with Common Zones of Defense located adjacent to public Thoroughfares shall be permitted.
- For CLD and other clustered development, as well as the edges of TND, Common Zones of Defense that convert WUI to AUI shall be permitted.

### ARTICLE 7. DEFINITIONS OF TERMS

Fire fighting and fire management activities utilize a number of terms not commonly used in other areas of land management. Since the application of this module will likely require debate with fire officials regarding appropriate mitigation methods, some terms have been selected specifically to harmonize with the language that will likely be used in coordination with these officials. While these may seem counterintuitive, or there may be lay terms available, this Module, when used in a code, will likely be scrutinized heavily by groups that speak this language.



## ARTICLE 7. DEFINITIONS OF TERMS

**Agrarian Urban Interface (AUI):** the geographic area where urban development, even at low intensities, interfaces directly with low Fuel agricultural lands. It includes former wildlands in a Fire Severity Hazard Zone that have been modified to reduce fire risk by supporting agriculture, i.e., crop lands, grazing lands and support facilities. The AUI buffers wildlands from development such that a Wildland Urban Interface no longer exists.

**Brush / Scrubland Fuel:** areas of short to tall brush, chaparral and/or loosely spaced small trees accompanied with other brushland shrubs.

**Common Zone of Defense:** a Zone of Defense surrounding a collection of buildings rather than only one building.

**Critical Zone:** the designated portion of the Zone of Defense closest to development. See *Table FM-1*.

**Crown Fire:** fire that moves through the crown of trees in a continuous tree canopy, whether supported by heat from a Surface Fire below or a fire that is expanding solely via the crown.

**Crown Fuel:** combustible plant material in the tree canopy.

**FHSZ:** see **Fire Hazard Severity Zone**.

**Firebrand:** rolling or falling debris already burning.

**Fire Extinction:** the complete extinguishing of a fire via elimination of Fuel, changes in weather or actual suppression.

**Fire Hazard Severity Zone (FHSZ):** specific area designated by state or local agencies as prone to severe fire occurrence and related risks. The designation results from prior federal and state fire hazard assessment and planning, and calibrates specific areas to applicable codes.

**Fire Modification:** the changing of a fire type, usually from an intense type to one of lower intensity, either by direct suppression, or by Fuel Treatment along the course of a fire.

**Forest Lands Fuel:** any woodlands, from small deciduous trees to thick conifer climax forests.

**Fuel:** any material, natural or human-made, that is combustible during a wildfire event.

**Fuel Load:** the quantification of Fuel in a particular area.

**Fuel Maintenance:** the regular cutting, thinning, trimming and removal of Fuels on a repeated basis as a means to implement long-term Fuel Management

**Fuel Management:** the cutting, thinning or removal of Fuels as a means to reduce the spread of a wildfire or modify its particular characteristics.

**Fuel Model:** a description of a particular collection of varied Fuels that occur in specific geographic areas. Fuel Models can describe regional scale or very localized conditions depending on the nature of the subject area and the variability of Fuels within the area. Fuel Models typically have a relationship to the type of fire that can be expected, and are used to describe geographic conditions for the purpose of Fire Modification.

## SMARTCODE ANNOTATED

*These annotations are advisory only. The SmartCode itself appears only on the right side of each spread.*

**Fuel Reduction:** the removal of accumulated Fuels to reduce the spread of wildfire or modify an approaching fire to a lower level of intensity.

**Fuel Treatment:** the task of reducing, maintaining or otherwise modifying the Fuel Loads in a given area.

**Grassland Fuel:** Fuel characterized by grasslands and intermittent shrub areas with isolated trees or wooded areas. Grassland Fuel types can burn often with relatively low long-term damage.

**Ground Fire:** fire that progresses at or below the ground surface via combustion of duff, debris, deep slash or peat.

**Initial Treatment, Initial Fuel Treatment:** the first Fuel Treatment to occur in conjunction with a development area, usually done before any construction begins.

**Ladder Fuels:** Fuels that allow a Surface Fire to climb up through the tree canopy and possibly generate a Crown Fire.

**Moisture of Extinction:** the Fuel moisture content at which a fire will not spread, or spreads only sporadically and predictably.

**Reduced Fuel Zone:** the designated portion of the Zone of Defense between wildlands and the Critical Zone. See *Table FM-1*.

**Spotting, Spot Fires:** fires that are started as a result of airborne ash and sparks from a nearby fire front, or from Firebrands.

**Surface Fire:** fire that moves along the ground surface via combustion of grasses, shrubs and slash.

**Understory:** Shrubs, grasses, and young trees that grow below established trees in older forests.

**Urbanized:** developed at the intensity of the T-3 zone or higher.

**Wildland Urban Interface (WUI):** the geographic area where urban development, even at low intensities, interfaces directly with wildlands. It includes areas where older traditional development has approached the edge of wildlands, but particularly where more recent suburban and exurban development has penetrated into wildlands that were not previously utilized for agriculture or some other form of human settlement.

**Zone of Defense:** an area of substantial or complete Fuel Treatment, creating a fire break between buildings and approaching fires and a safe zone in which fire fighters may operate. See **Common Zone of Defense**.