

CrowdDoing and ARISE-US



Wildfire Disaster Risk Reduction - Scorecard

Summary Version

Introduction

This is the summary version of the [Wildfire Disaster Risk Reduction Scorecard](#) ("full version" - also available from UN DRR's [PreventionWeb](#)).

The summary is intended to play several roles:

- Providing an introduction the full breadth of activity that may be required for wildfire disaster risk reduction (DRR);
- Supporting workshops for consensus building around the strengths and weaknesses of a community's wildfire DRR positioning, being better suited for this purpose than the full version - but perhaps guiding focus and attention when completing some or all of the full version.
- Functioning as an executive summary of the completed full version.

Like the full version, the summary is a free, open-sourced tool that communities¹ may use to assess their current positioning in identifying, adapting to, mitigating, and responding to wildfire risks - and recovering from actual wildfires. Currently both tools are only available in downloadable form (Excel spreadsheets), but we are working to create on-line versions also. Both are part of the Community Wildfire Reduction Toolkit, now under construction, which will provide resources to enable communities to identify, implement and monitor the strategies that work best for them.

What is the Wildfire Disaster Risk Reduction Scorecard?

Successful wildfire risk reduction requires action from multiple perspectives:

- Understanding the factors contributing to a wildfire which increase hazard, exposure and vulnerability, such as excess fuel load, lack of defensible space, location in the wildland-urban interface (WUI), drought conditions, and flammable construction materials among many.
- Understanding and seizing opportunities to mitigate these, by strategies as diverse as landscape hydration, vegetation reduction, ecosystem enhancement, home and infrastructure hardening, building code changes, community participation to increase resilience, and many more.
- Planning in advance for event management and post-event recovery, on the assumption that at some point wildfires may occur however much mitigation has been applied, and that the faster the community recovers, the less the long-run impact of the fire.

Doing so in turn requires understanding and action on multiple scales:

¹ The generic term "community" is used to mean city, municipality, town or neighborhood. While many of the considerations set out in this Scorecard are not necessarily within the jurisdiction of smaller communities alone, the community's resilience will nevertheless be affected – and the community should therefore lobby and influence (with other communities, as applicable) to ensure that, over time, all considerations are addressed.

- The *landscape* scale, including factors such as topology, vegetation, water resources and ecosystem services.
- The *community* scale, including factors such as urban layouts, land use, and landscape vegetation, as well as the community's economy and community engagement.
- The *property* scale, including building and asset hardening and building codes.

The Scorecard enables self-assessment in each of these perspectives and scales.

Who are the publishers?

ARISE-US is the US network of ARISE², established by the UN to build public-private collaboration in disaster resilience. We are a 100% volunteer organization operating in 35 countries worldwide, with some 450 corporate members and many more NGO and governmental partners. We published the original UN City Disaster Resilience Scorecard, now used by roughly 350 cities world-wide (including many in the US), on which this wildfire-specific scorecard is modeled, as well as several other scorecards, and a free critical asset management tool.

CrowdDoing.World is a joint initiative of the Match4Action Foundation and Reframelt, focused on addressing the social, economic, and environmental challenges our world faces by collaborating with professionals and volunteers from many different industries. We offer a platform for individuals to connect and collaborate toward creating systemic change. It aims to support social innovations with transformative impact potential through global multi-disciplinary volunteering, micro-leadership and service learning. CrowdDoing's Catastrophic Wildfire Prevention coalition is working to establish the collective opportunity for net risk reduction by communities, achieved by having a multi-stakeholder model for how the costs and liabilities of inaction can be used to finance action to prevent wildfire risks, and with a portfolio of new and traditional strategies for prevention, mitigation and adaptation.³

Why use a Scorecard? What are the benefits?

The Scorecard provides a baseline from which communities identify and implement the steps required to protect themselves from wildfire, with multiple benefits:

- Reduce the likelihood and/or severity and extent of a potential wildfire occurring in their area;
- Reduce the risk of:

² See <https://www.ariseglobalnetwork.org>, and <http://www.arise-us.org/>

³ See http://preventwildfire.world/?page_id=2 and <https://www.crowddoing.world/>.

- loss of life or injury;
- damage to property – private or public;
- damage to infrastructure and loss of key services;
- crop or livestock destruction from smoke or fire damage;
- business interruption and economic damage - loss of economic vitality;
- harm to air and water quality in the community and beyond;
- post-fire erosion, landslides/mudslides and flooding;
- harm to the health of professional and volunteer fire fighters;
- long-term health-related disabilities to people and pets, created by wildfire smoke exposure;
- harm to wildlife and biodiversity (including endangered species) around the community;
- Reduce insurance losses;
- Reduce required evacuations;
- Reduce the release of toxic firefighting and combustion byproduct chemicals;
- Protect the amenity value in wild landscapes, both from damage and from lost access time, and so help to safeguard the mental and physical health benefits of outdoor recreation;
- Reduce the release of carbon into the atmosphere, and increase the degree to which landscapes secure the carbon they have.
- Better position community members to transfer wildfire risk through insurance coverage, by demonstrating mitigation already in place;
- Enable community-wide collaboration in the development and deployment of more effective wildfire risk reduction strategies for individual properties, the community and the surrounding landscape.

How does the Scorecard work?

The Scorecard creates a baseline assessment of how a community is currently positioned, through a set of questions that enables it to assess its wildfire resilience. In providing that baseline, it enables a community to measure its progress in moving forward, or indeed the impact of retrograde steps where for example a community expands into the wildland urban interface (WUI). It thereby contributes to the creation of a comprehensive strategy and implementation plans for community wildfire DRR. The Community Wildfire Reduction Toolkit, referenced above, will also contain guidance on how to move forward once the scorecard findings are available - how to create a program of action, how to pursue finance, how to engage a community and so on.

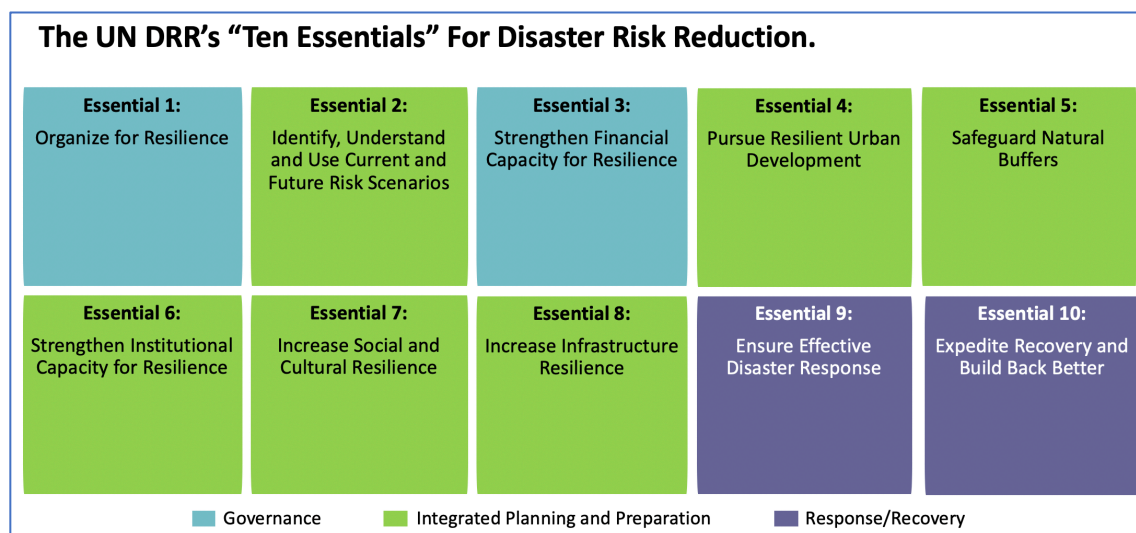
Who should use the Scorecard?

The scorecard is intended for use by anyone in the community with direct or some contingent responsibility for wildfire risk reduction through mitigation, adaptation, event response and post event recovery. It may also be used by neighborhoods or other concerned community members' groups, business owners, farmers and landowners, government bodies, utilities, insurers, banks and other risk-assuming institutions, and community organizations, churches or NGOs, with expert assistance as required.

How is the Scorecard structured?

The Scorecard is structured around the UN DRR’s ‘Ten Essentials’ of disaster risk reduction. These are shown in Figure 1, below. The broad definition that the Ten Essentials bring to disaster resilience means that the Scorecard goes beyond the more traditional issues of structure hardening, emergency preparation, and so on, to cover the full breadth of issues on which action to reduce wildfire risk may be required, and to cover the many interdependencies within these.

Figure 1: The UN DRR’s “Ten Essentials”⁴



How should the Scorecard be used?

The Scorecard is designed to encourage holistic thinking about all the elements of wildfire hazard, exposure and vulnerability, at the property, community and landscape scales.

All relevant stakeholders should if possible work together to complete the Scorecard and frame plans for moving forward, but it is rare that *all* such stakeholders are engaged, at least to begin with. We suggest you start with what and who you have to hand, and use the results to embark on the

⁴ Note that an [Addendum](#) was published in July 2018 synthesizing and expanding measures that apply to the public health implications of, and preparations for, disasters. A [further Addendum](#) was published in 2022 addressing the resilience of food supply chains.

communication, persuasion and dialog required to bring other stakeholders into alignment and into action. Section 1 enables you to assess the completeness of your stakeholder group and the effectiveness of your governance structure.

The Scorecard is deliberately pitched as a “counsel of perfection”: it is very unlikely that any community in the world will ever achieve the maximum score. On one hand, total invulnerability to wildfires is impossible and we certainly do not want the Scorecard to encourage complacency! On the other, the Scorecard itself implies in several places taking actions that, though they would be highly beneficial, have never been attempted as far as we are aware. In this sense, we hope that the Scorecard will trigger innovations and improvements in practice as well enabling the baselining described earlier.

The Scorecard may direct attention to issues that a community cannot immediately control – for example, utility-owned energy or water systems, or the stance of neighboring communities towards preparing for resilience. However, if those issues affect the disaster resilience of the community, they should be known, and they need to be planned for even if in the short term they cannot be corrected. In the longer term, they become subjects for discussions, negotiations, advocacy, lobbying and legislation and working through industry associations to bring about the necessary changes.

Scoring

The Scorecard aims to capture how the community is positioned "as of now". We recommend using a simple self-assessment scoring system for this purpose of:

- 0 - No attempt so far to resolve the issue in question (or don't know the answer)
- 1 - Issue resolved only at a rudimentary level and/or with only very low coverage of the community's area or population
- 2 - Issue resolved at a more complete level but still with major gaps in content or coverage
- 3 - Issue resolved relatively completely, with only minor shortcomings in content or coverage.
- 4 - Issue resolved with 100% coverage of the area and population.

You may also want to allocate fractional scores (for example, 1.5, 2.5 or 3.5), which is fully acceptable; or, you may also choose to use a different scoring system altogether.

Your scores can be captured using the accompanying spreadsheet "[Ref]", and then graphed. You can capture them at several levels:

- Detailed - each individual assessment or line-item in the Scorecard - this would give some 41 separate scores;
- Summary - average for each Essential (chapter) - this would give 10 scores in total.

No scoring method would be "objective", but if you complete the Scorecard and record the reasoning behind each score you should succeed in at least creating a *thorough* and *systematic* baseline of current strengths and weaknesses, and creating a way to assess progress when returning to it at regular intervals.

Having scored your community's current situation, you may also wish to give additional scores for the criticality of specific items and also the ease or difficulty of resolving the issue concerned.

What are the terms on which the Scorecard is offered?

The Scorecard is available free of charge via download to anyone who wishes to use it. Any person or organization that wishes to use it to create for-profit derivatives such as software or consulting services is also at liberty to do this, provided that they do not charge for the Scorecard itself.

While it is thorough, and systematic and while it has been peer-reviewed as set out below, *no warranty is offered as to the Scorecard's completeness or suitability for use in any specific set of circumstances. Users are **strongly** encouraged to satisfy themselves that the Scorecard is suitable for the purpose at hand and that it contains no erroneous suggestions or omissions when applied to their specific circumstances.*

If you have suggestions for improving the Scorecard, whether just editorial or more substantive, or whether you are an expert or a "lay person", we would welcome your contributions, to rwilliams1958@gmail.com

Contributors

We would like to thank the following authors and reviewers:

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Essential 1 (E1): Organize for Disaster Resilience

This essential addresses the community’s governance of wildfire DRR. Governance includes ensuring that all interested parties (“stakeholders”) are represented, organization and roles, rules and methods, and transparency of decision making.

#	Question	Comments
1.1	Governance	
1.1.1	To what extent do we have a governance structure that openly and transparently engages all relevant stakeholders in this community?	<p>Governance arrangements should be evaluated for the following:</p> <ul style="list-style-type: none"> • Stakeholders included: these may include (but are not restricted to): <ul style="list-style-type: none"> • Community: property owners, HOAs, renters, farmers & landowners, community organizations & associations (churches, clubs etc), minorities of all kinds - ethnic, linguistic, physical abilities, medical conditions; <ul style="list-style-type: none"> ○ Neighboring communities (for planning and execution of mitigation and response activities, sharing resources, helping evacuees, sharing emergency response capabilities, help with rebuilding, and so on). • Business (especially those with local presence): businesses - large and small - as applicable: owners, CXO, <ul style="list-style-type: none"> ○ Utilities (power, water, sanitation, communications), ○ Other non-governmental critical asset owners ○ Insurers/reinsurers • Government: <ul style="list-style-type: none"> ○ Wildfire Prevention Districts (or equivalent); community government(s). ○ As applicable, planning, code enforcement, fire department, emergency management, public works, engineering, highways, community development, economic development, public health, finance (for example for budgets and for bond financing of mitigation activity), parks and recreation. ○ County government - as above, plus Property Tax. ○ State government - legislators, finance, state fire services, state departments of water resources natural resources, state EPAs. ○ Federal Agencies - Federal Emergency Management Agency (FEMA), National Atmospheric and Space Administration (NASA), US Department of Agriculture (USDA - includes Bureau of Land Management -BLM- and US Forest Service), Environmental Protection Agency (EPA), etc. ○ First responders, public health agencies, education districts, academia. • The Earth/the environment itself (and whoever speaks for it): <ul style="list-style-type: none"> ○ Conservation districts and groups • Structure: clear roles and active participation from all stakeholders in identifying, planning, preventing and drilling for wildfire risk. • Inclusivity: engaged presence of minority or disadvantaged segments of the community on an equal footing with other stakeholders. • Openness: Meetings need to be open to all with passion and interest in the subject. They should not require a “warm introduction” from an existing stakeholder from within the network, for access. • Transparency: completeness of information sharing (see also E6).

#	Question	Comments
1.1.2	To what extent is there engagement beyond the community?	<p>Communities may need to draw on wider ideas and expertise, taking care also to engage their own experts such as the local fire department in these activities:</p> <ul style="list-style-type: none"> • Subject matter expertise: stakeholders working on wildfire risk reduction need to have access to subject matter expertise on multiple issues. • Alliances: these might include, as examples: Fire-Adapted Communities, Firesafe Councils, Crowddoing, universities, other communities currently also working on wildfire DRR.
1.2 Strategy and Alignment		
1.2.1	To what extent do we have a comprehensive strategy and plan for wildfire risk reduction in the community and around it, aligned consistently across all stakeholders, and regularly updated?	<p>The wildfire strategy should be evaluated on the following dimensions:</p> <ul style="list-style-type: none"> • Comprehensiveness: Clearly, wildfire risk reduction requires a plan that addresses all aspects of the issue. You can derive many of the headings needed for that plan from the structure of this scorecard: <ul style="list-style-type: none"> ○ Governance and collaboration structure, plans, targets and metrics, stakeholder sign-off (this Essential, E1) ○ Assessment of hazard, vulnerability and exposure at all relevant scales - property, community, landscape, also combined risks (E2) ○ Financial architecture (E3) - funding (tax, grants, bonds, loans), tax incentives, resilience “dividends” (See E3) or co-benefits, insurance, in kind contributions (eg loan of earthmoving equipment), carbon credits; ○ Land-use and building code: effectiveness of zoning and codes, standards embodied, enforcement levels, changes required (E4) ○ Use and protection of natural buffers, and consideration of all relevant nature-based solutions, ones that are locally familiar and scientifically valid (E5). ○ Required skills and data (E6) ○ Community engagement (E7) ○ Critical infrastructure assets - energy, telecommunications, water, sanitation, healthcare, highways etc, and the roles of their owners (E8) ○ Emergency response assets (E8/9) ○ Event warning, response, coordination and responsibilities (E9) ○ Post event program - actions for social and economic reboot (E10) • Coordination: Ideally, this will be through a single body embracing <i>all</i> stakeholders, including local businesses. In reality, there may well be separate bodies where separate government agencies are involved (public health is one common example) or where private utilities manage their own activities. In such cases the key is then the connectedness of these different bodies and their propensity to collaborate, ideally under the facilitation of a single program manager. • Alignment: it is essential to ensure that stakeholders' own plans share alignment and realism in terms of: assessment of risk; assumptions about other stakeholders’ mutual intentions and capabilities; assumptions about access, capacity and ownership of evacuation routes, and maintenance responsibility; planned response to a wildfire – including assumptions about capacity for simultaneously fighting multiple fires; and not conflicting with other stakeholders' plans, or duplicating effort.

#	Question	Comments
		<ul style="list-style-type: none"> • Regularity of updates: all strategies and plans age rapidly, and need to be updated, for example, as building takes place, as funding levels change, as stakeholders' presence and activities change, or as new best practices and technologies become apparent.
1.3 Decision-making		
1.3.1	To what extent do we routinely consider fire risk in all policy creation and decision-making in the community?	<p>Policy and decision making processes should be evaluated on these dimensions:</p> <ul style="list-style-type: none"> • Policy making: all existing policies should be evaluated for absence of conflicts with the goal of wildfire risk reduction. • Decision Making: just as the financial implications of any decision would routinely be considered, it is essential also to consider the wildfire risk implications - for example where a WUI development would exacerbate wildfire risk, or where creating a proposed trail might also create a firebreak. There may be no wildfire risk implications, but this should be actively confirmed.

Essential 2 (E2): Identify, Understand and Use Current and Future Risk Scenarios

This Essential addresses the completeness and adequacy of the community’s understanding of wildfire risk, on the landscape scale, the community scale and the individual property scale.

#	Question	Comments				
2.1. Understanding of wildfire hazard – landscape scale						
2.1.1.	To what extent is the likelihood of wildfires in the landscape in and around this community, both now and in the future, assessed, mapped and understood?	<p>To manage and mitigate wildfire hazard, it is essential to understand the many factors in the landscape around the community that could exacerbate (or attenuate) wildfire. It is helpful to consider them under 3 headings: topography, weather and fuel, of which only the latter can be managed directly:</p> <table border="1"> <thead> <tr> <th>May exacerbate wildfire hazard</th> <th>May attenuate wildfire hazard (see also E5)</th> </tr> </thead> <tbody> <tr> <td> <p>Topography and landscape</p> <ul style="list-style-type: none"> • Extreme slopes • Wind funnel effects • Burn scars on steep land (for land/mudslides – see later) <p>Weather</p> <ul style="list-style-type: none"> • Strong dry wind patterns, including seasonal winds such as the Chinook or Santa Ana • Lightning (may cause multiple simultaneous fires) • Temperature patterns and trends • Humidity patterns and trends • Forecast weather <p>Fuel</p> <ul style="list-style-type: none"> • Flammable vegetation, bark beetle infestation • Poor vegetation management – accumulation (wood, scrub, grass) • More than 7 years since last burn • Active fire suppression • (ignition sources - see later) </td> <td> <p>Topography and Landscape</p> <ul style="list-style-type: none"> • (Absence of exacerbating factors) • Surface water and landscape – broad bodies of water, wetlands, riparian zones etc. <p>Weather</p> <ul style="list-style-type: none"> • (Absence of exacerbating factors) • Rain or snow • Higher moisture content in vegetation <p>Fuel</p> <ul style="list-style-type: none"> • Less flammable vegetation • Recently burned (does not apply to grassland or prairie, as this vegetation renews annually) • Fuel breaks • Effective vegetation management practices - grazing, clearing </td> </tr> </tbody> </table> <p>Some of these items are dynamic - for example, humidity trends, extent of surface water, vegetation accumulation and moisture levels. The hazard assessment therefore cannot be a “once every five years” exercise - <i>it needs updating annually, to account for such trends</i>. Mid-year assessments may also be needed where vegetation is seasonal. It is also important to continue to project the assessment into the future, as climate change has more of an impact and as urban boundaries expand into former wildlands (see below).</p>	May exacerbate wildfire hazard	May attenuate wildfire hazard (see also E5)	<p>Topography and landscape</p> <ul style="list-style-type: none"> • Extreme slopes • Wind funnel effects • Burn scars on steep land (for land/mudslides – see later) <p>Weather</p> <ul style="list-style-type: none"> • Strong dry wind patterns, including seasonal winds such as the Chinook or Santa Ana • Lightning (may cause multiple simultaneous fires) • Temperature patterns and trends • Humidity patterns and trends • Forecast weather <p>Fuel</p> <ul style="list-style-type: none"> • Flammable vegetation, bark beetle infestation • Poor vegetation management – accumulation (wood, scrub, grass) • More than 7 years since last burn • Active fire suppression • (ignition sources - see later) 	<p>Topography and Landscape</p> <ul style="list-style-type: none"> • (Absence of exacerbating factors) • Surface water and landscape – broad bodies of water, wetlands, riparian zones etc. <p>Weather</p> <ul style="list-style-type: none"> • (Absence of exacerbating factors) • Rain or snow • Higher moisture content in vegetation <p>Fuel</p> <ul style="list-style-type: none"> • Less flammable vegetation • Recently burned (does not apply to grassland or prairie, as this vegetation renews annually) • Fuel breaks • Effective vegetation management practices - grazing, clearing
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#	Question	Comments
		<p>Given the speed with which wildfire can travel, and given the size of some wildfires, communities need to assemble these assessments and projections to create a regularly updated “perimeter of understanding” extending <i>at least</i> 20 miles beyond the boundaries of the community itself. This is an onerous size, but consider that the 2003 Cedar fire near San Diego, California, travelled 29 miles in a single night! Communities are likely to have to collaborate to build and maintain their "perimeter of understanding"⁵.</p> <p>Hazard understanding should be evaluated for depth of coverage of the following:</p> <ul style="list-style-type: none"> • Vegetation patterns: Some resinous types of vegetation (for example gum or eucalyptus trees) are known to exacerbate wildfire risk while other types, perhaps with more tannin (for example, redwoods), are known to reduce it. In addition, accumulations of dead or dried vegetation, or uncut undergrowth, significantly enhance risk. • Wildfire history: Certain broad areas have historically proven more prone to wildfires than others. Is the community in a high risk area? Recently burned forest areas are less likely to have dangerous accumulations of vegetation, while infrequent burns present greater risk. However, this does not apply to prairie or grassland, as this vegetation both burns extremely hot and renews itself annually. These require more frequent controlled burns, or mowing or ploughing if practicable, accordingly. • Weather patterns: wildfire risk can be dramatically exacerbated by wind/wind direction, temperature (including night-time temperature), drought and (lack of) humidity. These may exhibit seasonal patterns (wind patterns, temperature and rainfall), or annual trends (droughts).

⁵ Data for wildfire risk reduction is frequently available, but fragmented. Examples of free datasets are shown in the links below. In addition, efforts are under way to assemble integrated data sets. For example, NOAA leads an initiative called the Climate Mapping for Resilience and Adaptation (CMRA) that as of November 2022 integrates multiple datasets on hazards and value at risk, nationwide, at the census tract level⁵. FEMA now publishes an integrated National Risk Index⁵. Insurance organizations such as HazardHub (now part of Guidewire) also publish very granular and multi-dimensional hazard data.⁵ In some areas, universities or even civil grand juries may have undertaken analyses of risk for which data is available. Finally, data and sources may be available in your local area, such as data from your county, fire agencies and fire associations such as FireSafe, FireWise, Fire Adapted Communities (FAC), and may also be found in existing Community Wildfire Protection Plans (CWPPs), or County Hazard Mitigation Plans (HMPs) mostly accessed online. (Data on status of mitigation efforts, level of readiness etc. - see E6).

See for example:

- <https://www.earthdata.nasa.gov/learn/toolkits/disasters-toolkit/wildfires-toolkit>
- <https://data.world/data-society/us-air-pollution-data>
- <https://www.kaggle.com/datasets/rtatman/188-million-us-wildfires>
- <https://developers.google.com/earth-engine/datasets/>
- <https://www.earthdata.nasa.gov/learn/toolkits/disasters-toolkit/wildfires-toolkit>
- <https://usfs.maps.arcgis.com/apps/MapSeries/index.html?appid=fb8b5561702944e5b467ad0419786107>

(The authors of this Scorecard cannot offer a warranty or vouch in any way for this data and user care is therefore advised).

#	Question	Comments
		<ul style="list-style-type: none"> • Topological features: these can increase or decrease wildfire hazard. For example, hill top communities may be at greater risk because fire burns faster uphill; or communities in valleys may be subject to wind-tunnel or wind-corridor effects. <ul style="list-style-type: none"> ○ Steep slopes that have been burned may be prone to land- or mudslides. These risks have caused loss of life in their own right (for example in Montecito, CA in 2018), as well as blocking major transport arteries and damaging infrastructure (for example, the landslides that severed all land connections between Vancouver, with its major port, and the rest of Canada in 2021). • Surface water (rivers, lakes and surrounding wetlands) offers natural firebreaks, but the level of protection may be reduced if flows and water levels are reduced by drought, or if vegetation grows excessively high along the river banks allowing flames to jump the river. • Ignition sources: in addition to natural lightning strikes (which tend to happen in some locations more than others), potential human-caused ignition sources can include factors with predictable locations such as power lines and industrial processes
2.2. Understanding of wildfire hazard and exposure – community scale		
2.2.1.	To what extent is the community as a whole at risk from wildfires:	Community-scale wildfire hazard and exposure factors (both positive and negative) include: <ul style="list-style-type: none"> • Wildland-urban interface (WUI): the WUI is defined by the US Federal Register as anywhere that contains at least 1 housing unit per 40 acres and is more than 50% occupied by vegetation (labelled "intermix" WUI); or less than 50% occupied by vegetation (labelled "interface" WUI)⁶. 60,000 communities in the US are in one or other form of WUI⁷. Communities extending into the WUI are significantly more exposed to wildfire hazards than those within larger urban areas, due to a greater "attack surface" for fires (a longer boundary along which a fire can damage a community), and due to more potential ignition sources. (See also E4) • Evacuation routes: Communities with single evacuation routes, or those with narrow or single-lane streets intended to be used for evacuation routes, are known to have experienced loss of life from fast-moving wildfires that cut off escape. • Building density: more densely packed buildings and row-homes increase exposure: they are more prone to being caught up in a single wildfire incident, and more prone to enabling the spread from one building to the next. However, if building density means less open land, it may in some ways reduce hazard in the first place. • Flammable facilities: Facilities such as gas & propane stations, or lumber yards, or buildings constructed in an especially flammable way (for example with wood shake roofs) may increase the hazard and exposure to wildfire damage of buildings around them. • Landscaping: Landscaping in parks, medians, office parks and other such areas in the community may contain plants or features such as wood-chip mulch and wooden fencing avoided, all of which may increase wildfire hazard.

⁶ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5879688/>. The US Forest Service uses a slightly different definition.

⁷ <https://www.usfa.fema.gov/wui/what-is-the-wui.html>

#	Question	Comments
		In addition, wildfires pose risks from smoke inhalation , even in communities that may not have a direct fire risk. In the Bay Area of California, it is possible on occasions to smell (not just see) airborne smoke from wildfires in the Sierra Nevada, 100 miles or more away; in 2023 wildfire smoke from Canada was detectable without instruments in the Midwest and on the East Coast of the US.
2.3. Understanding of wildfire exposure and vulnerability – individual property scale		
2.3.1.	To what extent are individual properties at risk from wildfires?	Individual property exposure and vulnerability factors (both positive and negative) which need to be evaluated include: <ul style="list-style-type: none"> • Standards: properties built or retrofitted to a standard such as NFPA1144 or other standards – in how many buildings, and how thoroughly, have the standards been implemented? • Building styles, spacing and materials: Some building materials are more flammable than others (and/or may need regular treatment to prevent them from becoming flammable). For example, in California, many houses have wooden siding or solid wood walls, and may be separated by wooden fencing. Closely spaced properties (with a structure separation distance of <30ft) may be more collectively vulnerable than those that are spread out.
2.4. Compilation of hazards exposures and vulnerabilities into scenarios for emergency planning		
2.4.1.	To what extent has the community assembled known wildfire hazards exposures and vulnerabilities into scenarios as an aid to assessing the adequacy of proposed responses and post event arrangements?	In order to enable effective financial planning (E3) land use planning (E4 and E5), data, data sharing and skills needs (E6), community mobilization (E7), infrastructure investment (E8), emergency panning (E9) and post event response planning (E10), it is recommended that risks be assembled into <i>scenarios</i> . Ideally there will be a minimum of two – a “moderate” case and a catastrophic, worst case. They should address hazard, exposure and vulnerability; and they should be updated regularly. They should also include multi-hazards. One 2021 multi-hazard example was where communities had to deal with wildfires while also maintaining precautions for dealing with COVID-19.
2.5. Total Community and Economic Vulnerability		
2.5.1.	To what extent is the population of the community at risk of displacement , and its economy at risk of stoppage for 1 month or longer due to vulnerability to a wildfire?	Complete this assessment last in the scorecard. One month is an arbitrary threshold designed to capture the limits beyond which the community is likely to struggle to rebound to its previous size or vitality. (Post event recovery – see E10).

Essential 3 (E3): Strengthen Financial Capacity for Resilience

This Essential addresses the financial “architecture” of the community’s wildfire DRR – its understanding of funding sources⁸, availability of funds, provision of tax and grant incentives, identification of side benefits to help the business case for wildfire DRR, budgeting and protection of funds.

#	Question	Comments
3.1. Financial Planning and Management		
3.1.1.	To what extent has the community researched and explored all possible approaches to funding the work required to reduce wildfire risk?	<p>Many communities do not have a fully developed “atlas” of where all possible sources of resilience funding may lie. As a result, improvements to resilience may go un-funded. Communities should evaluate the thoroughness of their search for alternative financing methods and sources that may include, but are not restricted to:</p> <ul style="list-style-type: none"> • Government: grants, including matching grants; other government agencies that may have a direct interest in some aspect of resilience – for example where a transportation agency finances a new bridge that may also improve evacuation capacity; and taxes and surcharges. • Non-profit or low profit: development banks and aid organizations; foundations that may have a direct interest in some aspect of resilience – for example where a conservation NGO might support restoration of ecosystem services, or an education NGO might support awareness and training; social impact or resilience bonds (payment for results achieved); Crowd-funding. • For-profit: development fees; public-private partnerships; bonds; corporate funding - insurance, big companies; leasing, corporate philanthropy. • "Dividends" or co-benefits: <ul style="list-style-type: none"> ○ “Inbound” dividends: where investments elsewhere in the community have additional resilience benefits. For example, upgrades to the electricity supply system for operational purposes may also make it more wildfire resilient. Inbound dividends will tend to reduce the visible costs (and funding needs) of wildfire risk reduction. ○ “Outbound”, where investments in resilience also provides an additional, non-resilience benefit- for example where creating firebreaks enables recreational trails to be established. Outbound dividends increase the benefits (and ROI) of wildfire risk reduction, and may allow additional sources of funds to be tapped (for example, housing, transportation, or environmental funds).
3.1.2.	To what extent does the community have a coherent financial plan for the work required to reduce its wildfire risk (including its post event recovery)?	<p>Key evaluation points for the financial plan will include the following:</p> <ul style="list-style-type: none"> • Feasibility: sufficient funds are available, or realistically expected to be available (even if not immediately), to cover anticipated needs. • Integrated sources: if (as is likely) funding comes from several sources, the combined funding needs to be coordinated and mutually consistent, despite the fact that each source may have different goals and rules, "as if" the funding came from a single source. • Protection: funds need to persist through changes in political leadership - funding for projected capital and consequent operating expenses needs to be protected from being siphoned off for other uses.

⁸ The ARISE-US Action Guide referenced in the introduction to this scorecard also addresses financing strategies.

#	Question	Comments
		<ul style="list-style-type: none"> • Contingency funds: sources of funds for post event recovery (some combination of insurance - see below, emergency grants and loans from higher levels of government, or from local taxation) need to be identified as needed.
3.2. Insurance Coverage		
3.2.1.	To what extent is insurance adequate in the community for wildfire risks?	<p>Adequacy of insurance cover is a major determinant of a community's ability to recover from wildfires. ("Adequate" means covering all instants and extents of realistically anticipated losses). This needs to be evaluated in the following areas:</p> <ul style="list-style-type: none"> • Property: the ability of property owners to repair or rebuild their homes (and those homes they may be renting out), and recoup any costs from loss of use is a critical determinant of the probability of long term community recovery from a wildfire event. The insurance market in some countries is beginning to develop approaches to insurance that reduce coverage costs based on mitigation work carried out. • Health: wildfires occasion multiple health risks - burn injury, smoke inhalation, the psychological impacts of trauma and loss, and so on. In areas with healthcare systems that rely upon insurance cover, community vitality and wellbeing may depend on the level of cover, post wildfire, for the impacts arising. • Automobiles: in many countries (including the US) vehicles that may be burned in wildfires are covered by automobile insurance rather than domestic property insurance. Community members who lose their vehicles to wildfires when they cannot afford a replacement may be unable to work or, in rural areas, unable to continue living there at all. • Non-domestic (business) property and business continuity insurance: the ability of individual businesses to repair or rebuild is a critical determinant of the probability of long term community recovery from a wildfire event. <ul style="list-style-type: none"> ○ Business continuity insurance is also critical - as it may determine a business's ability to survive the loss of cashflow while restarting operations. • Forests, crops and livestock: As a subset of business insurance needs, landowners and farmers in areas prone to wildfires need to ensure that their forests, crops and livestock are insured, sufficiently to cover replacement and/or loss of revenue. Failure to address this need can result in additional economic damage to the community and thus loss of vitality, as well as loss of amenity, after a wildfire. • Community assets (buildings, facilities, infrastructure): Community assets may be self-insured or insured tacitly or explicitly by higher levels of government. Where these do not apply, those assets and facilities will need to be insured on the private market, and they need to insure against loss of service from infrastructure such as water and energy systems. The value and replacement costs of these assets will need to be understood. • Community liabilities: where a community is responsible for starting a wildfire, or is culpable for some failure in its wildfire mitigation, planning, or response, it may incur a major financial liability - even where all other aspects of its activities are exemplary.

#	Question	Comments
		<p>Insurance may be traditional or, as is now being trialed in some countries, parametric insurance: this has been used for crop earthquake and hurricane insurance and can in principle be applied to wildfires to decrease aspects of disruption (for business continuity, for example, and some insurers are known to be investigating the potential for parametric insurance to enable better forest management, for example). It has a higher basis risk (the proportion not covered) but pays out much faster than a traditional loss adjustment process and tends to be more affordable.</p> <p>Community-based catastrophe insurance (CBCI) - insurance purchased or facilitated by a community entity for a group of properties, and usually paid as an add-on to property tax - may also increase affordability of wildfire insurance cover as well as create incentives for individual property risk reduction.</p> <p>There is also a need to consider the availability of financing for the community and its members for losses NOT covered by insurance.</p>
<p>3.3. Financial Incentives</p>		
<p>3.3.1.</p>	<p>To what extent has the community created appropriate financial incentives to homeowners, businesses and community groups to reduce their exposure to wildfire risk, and avoided adverse incentives?</p>	<p>The financial plan should be evaluated for its coverage of Incentives to homeowners and businesses. These can come from multiple sources including, as examples: free advice; discounts at local hardware stores, and with builders approved for property hardening work; discounts on other community-provided services; discounts on insurance in exchange for carrying out mitigation work; expedited (and discounted) permitting and inspections; grants - matching and outright; low interest loans; property and other tax incentives (may require participation from other tiers of government); organized crowdfunding; priority for, say, landscape renovation in exchange for community engagement in property hardening; and prizes and draws.</p> <p>The potential for NGOs and community groups to assist with wildfire DRR - in exchange for grants, cost recovery, publicity and so on - is also considerable and should be covered in the financial plan. For example:</p> <ul style="list-style-type: none"> • Churches and community organizations can assist with community engagement (E7) and also, in some cases, with food supply after an emergency; • Scouts, Kiwanis/Rotary groups and other organizations can help with vegetation abatement or distributing leaflets; • Schools could take responsibility for individual wetland or forest resources; • Citizen science groups can help assess vegetation health; • Hiking groups can log where vegetation is impinging on powerlines; • In similar vein, although obviously not NGOs, larger local firms can act as communications channels (see E7) and arrange community service days for their staff to help in landscape risk abatement tasks; • Groups supporting disadvantaged communities or people with special needs can deliver wildfire readiness and risk abatement messaging; • Groups promoting regenerative agriculture or sustainable forestry, which have known impact in reducing wildfire risk, can emphasize this benefit.

#	Question	Comments
		<p>Just as the community should encourage, by whatever means, wildfire risk reduction, it should avoid providing incentives for individuals, businesses and activities that will increase risk. Activities and perverse incentives that increase risk might include using funds to encourage or enable:</p> <ul style="list-style-type: none"> • Draining wetlands (for example to build on them); • Building in the WUI or other areas of fire risk; • Fire suppression (in preference to controlled burns and vegetation clearance); • Permitting buildings that do not conform to the highest fire resilience standards; • Allowing landscaping that does not conform to the highest fire resilience standards.

Essential 4 (E4): Pursue Resilient Urban Development and Design

This Essential addresses the adequacy of the community's land use and building codes, and enforcement thereof.

#	Question	Comments
4.1	Land Zoning	
4.1.1	To what extent has land use zoning been defined with wildfire risk in mind - for example, restricting building out in to the wildland urban interface (WUI) - and is it enforced ?	<p>The effectiveness of land use zoning needs to be evaluated.</p> <p>Many communities in wildfire-prone areas were originally laid out with no thought of the fire risk at all and as a result find themselves seriously exposed. In particular, communities building into the WUI are known to exacerbate the wildfire risk, essentially because they increase the "attack surface" (the extent of directly bordering on wild or open land) that a fire can take to individual properties, and because they may also increase the range of ignition sources in an area. Older communities may have been established with no consideration of this issue, and indeed smaller and/or older rural settlements may be <u>all</u> WUI.</p> <p>Lack of enforcement can undermine the effectiveness in wildfire risk reduction of any land zoning policy or rules, and is an issue in many countries and many US States. There may be "grandfathered in" properties where land use zoning is now otherwise enforced, or the issue may be ongoing with new con-compliant properties still being built.</p>
4.2	Building codes	
4.2.1	To what extent do building codes mandate fire resistant construction techniques and community/street layouts , and is it enforced?	<p>The effectiveness of building codes also need to be evaluated.</p> <p>While each community will have its own building codes the key is to be certain that they maximize fire resistance, for example with: non-combustible roofing; short eaves; mesh-covered and/or double-baffle roof vents; double-pane windows; combustion-resistant wall coverings (for example stucco, as opposed to wood siding); fire resistant decking; 30 feet of defensible space (local fire marshals may operate on smaller or larger space recommendations); gravel instead of mulch; and sealed gaps where utilities enter each property. (This is NOT an exhaustive list).</p> <p>Additional standards from external bodies may enable higher levels of wildfire risk mitigation than local building codes provide for. Examples might include: National Fire Protection Association standard 1144 for ignition hazards; California Building Code Chapter 7a for building materials and methods (although clearly regional, this may form a basis for other areas to copy); ASTM E05 series standards for multiple aspects of fire risk; IBHS Wildfire Prepared Home standards; Factory Mutual standards; and Fire Adapted Community standards which reference many of the former. Unfortunately, these standards are not always mutually consistent, so one approach might be to mandate the best of each one. Communities should encourage the take-up of these standards in new-build and retrofit, where they enhance levels of protection, and their incorporation in official building codes.</p> <p>As regards layouts, people have died in wildfires as a result of restricted carrying capacity on local roads, or when single access/escape routes became blocked by fire or by people evacuating, so this factor needs evaluating. While it may not</p>

#	Question	Comments
		<p>be possible to do much to address road layouts in the short term, communities need to plan for the risk they may pose, and develop offsetting mitigation approaches, while also avoiding perpetuating the problem with new build.</p> <p>As with zoning, lack of enforcement can undermine the effectiveness in wildfire risk reduction of any building codes, and is an issue in many countries and US States.</p>

Essential 5 (E5): Safeguard Natural Buffers to Enhance Ecosystems’ Protective Functions

This Essential addresses the protection and enhancement of ecosystem services that serve to reduce wildfire risk.

#	Question	Comments
5.1. Ecosystem health		
5.1.1.	To what extent does the community understand which ecosystem services enable wildfire risk reduction , and are they protected and in good health ?	<p>Ecosystem features that act as natural buffers, reducing wildfire risk, may include, but are not limited to: surface water; floodplains and riparian zones; any natural feature that encourages or enables hydration and hydration retention around properties or in the landscape – vegetation cover, accessible ground water and so on; healthy and hydrated soil; certain plant types⁹. If some aspect of a community’s wildfire DRR positioning is dependent on ecosystem services, then self-evidently it is essential to maintain the health and buffering capacity of those services. For example, the following may need to be evaluated:</p> <ul style="list-style-type: none"> • Effective forest and under-storey management: this creates a forest which can accommodate fire without allowing it to flare out of control. • Managing groundwater depletion: if not addressed, depletion may weaken trees and make them more susceptible to beetle attack turning them into fuel ; conversely, grey-water recycling may reduce groundwater draw and (if used for irrigation) may actually replenish groundwater. Replenishing groundwater can help to recharge streams, creeks and rivers which can form natural, “blue” fire-breaks; encouraging beavers has been shown to be especially helpful in this regard¹⁰. • Protection of keystone or critical species: this may have knock-on implications. The reintroduction of wolves in Yellowstone has improved the health of riparian zones, because the wolves prey on elk and deer, which had formerly grazed on foliage to the point of reducing riparian extents. Beavers may also be considered a critical species, where present,. because of the impact they have in hydrating the landscape. • Management of invasives: for example, gum or eucalyptus trees, introduced into California in the 19th century, are not only highly flammable in their own right, but they displace native species that may be less combustible. <p>To ensure the long-term health and preservation of natural buffers around a community, it may be necessary to erect some form of legal protection around them, whether through conservation easements where the owner agrees to protect them in exchange for some payment, outright purchase, or making them into regional parks.</p>

⁹ For example - non-resinous or low-resin, and/or high tannin content plants and trees that reduce combustibility, deciduous plants that are less flammable in winter and promote mulching which helps moisture retention (mulch should not be in immediate proximity of buildings), plants with shiny leaves that encourage condensation to form and then drip into the ground; native plants, and xeriscaping of community landscapes. When CrowdDoing’s partner APDCC evaluated native plants for applicability and fire-resistance and drought tolerance in the Santa Barbara, CA region, there were a number of options that were recommendable based on public evidence: electric blue foothills beardtongue (Penstemon), showy pink evening primrose (Oenothera speciosa), shimmer evening primrose (Oenothera Fremontii), Sonoma coast yarrow (Achillea), scarlet tanager (Gazania), orange carpet creeping hummingbird trumpet (Zauschneria), snow-in-summer (Cerastium), partridge feather (Tanacetum). It is likely that every region will have its own variant of this list. Other sources for plant planning include: California Native Plant Society: Fire Recovery Guide – <https://www.cnps.org/wp-content/uploads/2019/08/cnps-fire-recovery-guide-2019.pdf>

¹⁰ <https://www.nationalgeographic.com/animals/article/beavers-firefighters-wildfires-california-oregon>

#	Question	Comments
5.1.2.	To what extent are ecosystem services identified by stakeholders as having a financial value?	<p>The extent to which valuation has been applied to ecosystem services should be evaluated. Those that help with wildfire DRR are capable of being valued in several ways: the economic value (GDP), property and lives they help to protect, combined with the level of risk reduction they bring about; decreased erosion, increased wind resistance; reduction in fire speed of movement or intensity from “green fire breaks”; reduced carbon cost of catastrophic wildfire; improved amenity value. When they are valued, it becomes easier to make the business case for protecting and expanding them.</p> <p>Additionally, nature based solutions often have “dividends” or co-benefits beyond wildfire risk reduction. For example:</p> <ul style="list-style-type: none"> • Land co-benefits: landscape hydration, land fertility, landscape amenity value; mulch derived from ecological forest management practices can be used to reduce evaporation from parks and open spaces. • Water co-benefits: protection of water resources and clean water. • Wildlife co-benefits: benefits to other species with value of their own (eg wildfowl), or birds and bats that are both attractive and eat pests. • Air co-benefits: clean air (from less smoke). • Property co-benefits: property values (from greater resilience and area desirability); decreased heat island effects due to hydration promoting growth and shade; potentially, decreased insurance costs (from reduced risk).
5.2. Use of nature-based methods		
5.2.1.	To what extent does the community balance and combine nature-based solutions with technological solutions ?	<p>The use of nature based solutions be evaluated. Nature based solutions need to be considered as one set of tools, whose use should be maximized, but not to the exclusion of technology-based solutions where these may be more applicable. Often, they will be used in combination. For example, mechanical means or prescribed burns may be used to remove dense understory vegetation, but goats or sheep could then be used annually to prevent it regrowing; and cattle grazing can be used to reduce grassland fuel loads.</p> <p>Examples of nature based solutions include (but are not limited to):</p> <ul style="list-style-type: none"> • Grazing: Fuel load reduction via goat & sheep (and, on grasslands, cattle) grazing can reduce the chance of wildfires becoming crown fires jumping from tree-top to tree-top, or building up unstoppable momentum across a prairie. The animals also fertilize the land as they go and may offer edible byproducts (meat, cheese, textile fibers etc). Techniques of this type need to be repeated regularly as the fuel regrows. • Hydration: as noted earlier, allowing streams to spread out from man-made channels, and encouraging beavers are frequent nature-based intervention in this category. Also, reducing aquifer drawdown through greywater recycling, rain gardens and rainwater harvesting can reduce the depletion of rivers and streams and creeks and increase their water flow. Increased flow in streams, creeks and rivers enhances their function as “blue” firebreaks and makes them more likely to stop catastrophic wildfires from spreading across them.

#	Question	Comments
		<ul style="list-style-type: none">• Wind breaks: created with trees to change wind speeds. Wind speed can be one of the greatest accelerants to catastrophic wildfire spread. (Wildfires can generate some of their own wind and the trees themselves will of course be flammable, so this can limit the speed of catastrophic wildfire spread only to a certain degree).

Essential 6 (E6): Strengthen Institutional Capacity for Resilience

This Essential addresses two key elements of institutional capacity for wildfire DRR – the availability of skills, and sharing of data on mitigation status, current status and plans (availability of data on risk was covered in Essential 2).

#	Question	Comments
6.1	Skills, knowledge and experience	
6.1.1	To what extent does the community have access to the skills, knowledge and experience it may need to minimize its wildfire risk, in the numbers required?	<p>Communities need to evaluate whether they have access to the skills, knowledge and experience they need. These may include, but are not limited to:</p> <ul style="list-style-type: none"> • Essential 1: governance and organization structures; lobbying; planning, program and project management. • Essential 2: climate and meteorology; risk understanding and analysis; risk communication. • Essential 3: economics and investment appraisal; finances (CPAs, budget analysis); insurance - markets and buying; grant writing. • Essential 4: building code interpretation and application; fire resistant construction techniques; city planning; • Essential 5: landscape ecology, biology, botany - especially relating to regenerative techniques; arboriculture, forestry and landscaping; ecosystem valuation; farming and livestock; natural mitigation methods (forest management, goat grazing, land hydration). • Essential 6 (this Essential): (all skills listed here); data science and analysis. • Essential 7: community development and activism; local history and cultural history; languages spoken in the area; social media. • Essential 8: building and construction (residential, commercial – new build, mitigation retrofits etc); civil, mechanical and electrical engineering; geology and geotechnical engineering; energy and water management; highways; telecommunications. • Essential 9: emergency/first response; medical; traffic management; law and order; logistics; communications. • Essential 10: (all the above); loss adjustment and damage assessment; event response and area recovery. <p>Few, if any, communities will have all of these skills available in-house! Potential sources for them may include: universities and technical colleges; government agencies; NGOs; consultancies; volunteers; partnering and sharing with neighboring communities; local employers.</p> <p>Aspects of some of the required skills (for example, recognizing fire prone vegetation) can be taught; others may be present in volunteers (for example, some police forces have volunteer sub-officers).</p>
6.1.2	To what extent does the community attempt to learn from the knowledge and experience of other – similar and dissimilar – communities ?	The experience of others sharing the same wildfire DRR challenge is a powerful capability builder. Capturing this experience could take several forms, ranging from case studies, through ad hoc one-to-one conversations, through to regular multi-participant learning or study groups. Some form of formal alliance structure between communities may help to cement the level of sharing of knowledge or resources or best practices, or other collaboration.

#	Question	Comments
6.2	Data availability and sharing	
6.2.1	<p>To what extent does the community have access to the data it needs to reduce its wildfire risk, and is this data shared?</p> <p>(Data on hazard, exposure and vulnerability – see E2).</p>	<p>In addition to data on current and future hazard, exposure and vulnerability (see E2), communities’ data needs for wildfire risk reduction will be extensive. Below an example list of data items and sources whose availability needs to be evaluated:</p> <ul style="list-style-type: none"> • Essential 1: plans, objectives and activities of any other organization or group whose activity affects the wildfire resilience of the community (including those of neighboring communities); progress, status and issues. • Essential 2: data on hazard, exposure and vulnerability (covered earlier). • Essential 3: budgets and financial sources; mitigation costs. • Essential 4: future development plans and approvals; status of zone and code compliance; individual property-level mitigation. • Essential 5: location, extent and health of natural buffers; status of landscape scale mitigation. • Essential 6 (this Essential): skills levels and sources, a catalog of data needs. • Essential 7: community make-up, status of community engagement efforts; names and addresses of those needing extra help to evacuate. • Essential 8: capacities and capabilities of utility response mechanisms (eg back up provisions, service restoration capabilities, etc); identification, location and ownership of/responsibility for critical assets (infrastructure and other) and dependencies between these. • Essential 9: capacities and capabilities of the local health system, first responders, and law & order; names, locations and capacities of emergency accommodation. • Essential 10: contact and contract/MOU details for all those likely to be involved in post event response. <p>This data will be a mix of geographical information system (GIS), numerical, image and free text. Sources may vary (and may be both private and public - government data is free and often quite extensive) for meeting these needs, the format, interoperability and quality of those sources, and agreements on what shall be shared with whom. The data then needs to be deployed in map/visual, diagrammatic and text formats that make it understandable and usable.</p> <p>Data sharing is critical, to ensure that all organizational stakeholders are operating from compatible assumptions and expectations of each other. Sharing is a continuous process (or perhaps with regular updates) rather than a one-time exercise. In many cases, sharing will come naturally. Unfortunately, though, some stakeholders such as utilities or some government agencies may be less willing to share. In particular, data on risk and readiness needs to be shared in a digestible form with members of the community.</p>

Essential 7 (E7): Understand and Strengthen Societal Capacity for Resilience

This Essential addresses community engagement, and its ongoing quality¹¹.

#	Question	Comments
7.1. Community connectedness		
7.1.1	To what extent is the community “ connected ” and cohesive internally, with a “ mutual-help ” mentality?	<p>Community connectedness is crucial to wildfire resilience: as one recent article put it, “local connections shape fire outcomes¹²”. However, while communities should understand their connectedness, it is not easy to measure directly. The measures below are proxies for connectedness that may be helpful:</p> <ul style="list-style-type: none"> • Evidence of mutual-help from prior emergencies, or in working on wild-fire risk currently. Examples include: community and neighborhood "buddy" plans; friends or relatives that each family could call upon for shelter if evacuated; tradition of extended families caring for their members, or communities of care; collaboration on mitigation planning, implementation and measurement; collaboration with neighboring communities, agencies, businesses (e.g. Fire department, water agencies, environmental agencies, public utilities, road construction, etc.); frequency and level of attendance at meetings. • Participation levels: frequency of, and levels of participation in community events generally; • Inclusion: evidence that the above spans different minority groups, where applicable. • Absence of, or mitigation strategy available for, adverse factors. Examples include: individuals or groups choosing not to participate; high resident turnover; crime and violence (within families and/or the community); poverty and food insecurity; high score on CDC/ADSR Social Vulnerability Index; high incidence of mental health issues; high incidence of physical health issues; specific obstacles to engagement – language barriers, lack of meeting places, family role structures etc; low score on social vulnerability in FEMA National Risk Index; absence of evidence that any adverse factors worsened after a previous disaster. <p>When assessing connectedness, consider blocks and neighborhoods within the wider community. Individuals’ willingness and ability to mitigate wildfire risk is addressed below.</p>
7.2 Community activity and outreach		
7.2.1	To what extent has the community (the entire population of the area in question) been fully and effectively engaged ?	<p>There are many aspects to full and effective engagement that need to be evaluated:</p> <ul style="list-style-type: none"> • Engagement channels: community engagement will be through organizations working directly on wildfire issues, but also organizations serving other purposes that may also serve as communication “channels” – schools (see below), HOAs, churches, Kiwanis, Rotary Clubs, 4H, sports teams, Scouts and Guides, and others

¹¹ The forthcoming ARISE-US Action Guide, referenced in the introduction to this Scorecard, will address engagement.

¹² https://www.preventionweb.net/news/how-can-practitioners-leverage-their-networks-maximize-wildfire-risk-reduction?utm_source=PreventionWeb&utm_campaign=659b4c72c5-PreventionWeb+Newsletter%3A+all+content+%28daily%29&utm_medium=email&utm_term=0_b73053c1c6-6

#	Question	Comments
	<p>(Community Information – see E6).</p>	<p>who may simply pass on messages, or better, weave wildfire mitigation and response into their various activities. Businesses can also be a major channel, to their workforces (see below).</p> <ul style="list-style-type: none"> "U-Shaped" model: engagement encompasses all three dimensions shown in the "U" model below – enabling “top-down” dissemination of information and policies from government to citizens; “side-to-side” (neighbor to neighbor, group to group) collaboration and information sharing; and “bottom-up” communication and feedback back to government. The implication of the "bottom-up" dimension is that government needs to spend as much time listening as talking. <div data-bbox="856 472 1661 894" style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>The diagram illustrates the 'U-Shaped' model of engagement. It features three main components arranged in a U-shape:</p> <ul style="list-style-type: none"> “Top Down” (left side): <ul style="list-style-type: none"> Government: <ul style="list-style-type: none"> – Laws, policies, regulations, codes. – Advice, warnings, notifications. – Open data. Also - external experts, universities, NGOs etc. “Bottom Up” (right side): <ul style="list-style-type: none"> Citizen to government <ul style="list-style-type: none"> – Immediate needs for help. – Comments, feedback, complaints. – Suggestions, requests. – Sentiment. “Side to Side” (bottom): <ul style="list-style-type: none"> Peer to peer (people, groups, neighborhoods). <ul style="list-style-type: none"> – Self help, community engagement, deep local knowledge – individuals who may be housebound, for example. May be initially seeded “top down”. <p>The diagram also includes a central graphic showing a person and a smartphone with social media icons (Flickr, YouTube, Facebook, Twitter) and a double-headed arrow between two people, representing side-to-side communication.</p> </div> <ul style="list-style-type: none"> Content: engagement needs not just to be about response actions or property hardening. It needs to address issues such as release of risk data which might impact property values, and reservations about controlled burns. Engagement with vulnerable groups: these will include lower income people, different ethnicities, disabled persons, the elderly, those without transportation, and (in the context of controlled burns etc) those with respiratory issues. They may also include those with different first languages, especially if outreach materials are not available in those languages. Persistence: in any community, there will always be “hold-outs” who are reluctant to become involved. Strategies such as attempting to involve them in plans and activities, pointing out how they may already have benefitted from wildfire DRR work, and inviting them to “pay it forward”, or interviews with former hold-outs who decided to participate, may help. Engagement with neighboring communities: there may be “enlightened self-interest” or mutual benefit in engaging other communities if their lack of activity weakens the risk reduction efforts in your community, for example by failing to deal with fuel loads which may then allow fires to build up to levels which cannot easily be fought; or if communities share a common hazard such as being located in a wind-funnel area or an

#	Question	Comments
		<p>adjacent badly maintained forest. Ideally, collaboration on risk analysis (creating "perimeters of understanding" as referenced in E2), mitigation, prevention and preparation, including preparing for post-event response, will be on a basin (river basin, air basin, forest basin) scale.</p> <ul style="list-style-type: none"> • Maintenance over time: community outreach is never a “one-shot” exercise. It’s a process that must be renewed regularly, in perpetuity. Outreach needs can be driven by income levels, language differences, physical abilities, skills in mitigation actions, culture and other local factors. They will change over time as new needs arise and others decrease, for example as people arrive in or leave the community.
7.3 Wider engagement		
7.3.1	To what extent have specific interests and stakeholders been engaged?	<p>Dimensions of specific stakeholder engagement, that need to be evaluated, might include:</p> <ul style="list-style-type: none"> • Schools: some US elementary schools today have instruction on fire response, around themes such as “stop, drop and roll” should their clothes be alight. This can be expanded into consideration of the factors that drive fires, potential responses in individual homes, the community and in the landscape; dividends or side benefits (see E2) from fire mitigation; social engagement; and so on. These themes can be woven into civics, science, sociology, economics, business studies and other classes; and into volunteer activity such as canvassing or preparation of materials. Schools may want to partner with NGOs. • Universities: Universities can be engaged through environmental science, building science, architecture, civil engineering, meteorology, public administration, politics and sociology, and many others on (as examples): risk analysis; mapping and data visualization, landscape management; ecosystem protection and enhancement; wildfire mitigation strategies for the areas surrounding campuses; benefit assessment; community engagement; and many other activities. These could be curriculum driven, or voluntary. • Businesses: businesses may naively take the view that natural disasters are “someone else’s problem”, despite the obvious direct risks of loss of revenue, premises, supplies, equipment and workforce – and despite the fact that local governments cannot mitigate the issue away, and cannot deal with it alone. Securing business engagement, based on a realistic risk appraisal , is essential. <ul style="list-style-type: none"> ○ Communities can use businesses (and unions) as communications channels to their workforces on wildfire issues - perhaps as part of the business's own risk reduction activities. ○ Businesses may provide employees with time to volunteer for mitigation or response work. Especially applicable to those with relevant skills such as project management, engineering, etc. ○ Businesses may also provide employees on a secondment basis, and view wildfire risk reduction as an upskilling opportunity for staff. ○ One key aspect is advocating that all businesses have business continuity plans (BCPs) to expedite their return to operation after wildfire - so protecting the community's economy. ○ Businesses may help their workforce (and thus the community) to become more resilient. In some hurricane-prone parts of the US, employers maintain stocks of materials such as tarpaulins that may be required to keep houses habitable until roofs are repaired – so allowing employees to come back to work earlier. The same model could work for fire mitigation, for example with small grants towards property hardening, or discounts negotiated with local vendors or insurers; or supplies of ground-clearing tools.

#	Question	Comments
		<ul style="list-style-type: none"> • Local governments in some countries (Japan is one) may have MOUs with large businesses in their area that, in the event that an emergency is declared, each business will provide certain things – say warehousing, earthmoving equipment or trucks, premises for shelters, food, and so on. This practice is present, but rare, in the US. • Retailers: those selling products and services relevant to wildfire offer a potential resource for communities. Examples may include: hardware stores running displays or promotions on home fire-hardening, perhaps with presentations on how to go about this; gardening stores, similarly with fire resistant plants - and also warnings on products that may reduce wildfire resilience, such as climbing or especially flammable plants; food and hardware stores maintaining “surge” capacity for post wildfire supplies, as Walmart does for hurricane response in the southern USA (See also E10); displaying wildfire education materials at check-outs. • Contractors: local contractors could be persuaded to create fire-hardening packages or “tune-ups”, or rainwater harvesting packages, much like heating engineers often do with HVAC systems, to make it easy to for homeowners to engage. The same idea could apply to arborists. Such steps will also serve to boost wildfire awareness. • Landlords: Landlords (residential or business) have a responsibility to help their tenants engage with wildfire risk mitigation and response, and a vested self-interest in doing so. Small landlords can collaborate with tenants to identify catastrophic wildfire risk mitigation opportunities. Companies that own large numbers of buildings can be shown that they have insurance coverage gaps that mean mitigation will be required for effective risk management. • Landowners: landowners (farmers/growers, those with large land holdings) have a responsibility to address wildfire risks arising on their land, as these may transfer to habitation and businesses around them. This is aside from their self-interest in doing so.
7.4 Effectiveness of communications outreach		
7.4.1	To what extent has outreach and collaboration been carried out using a “ multi-media, multi-channel ” strategy, and its effectiveness validated?	<p>Simple emails or newsletters alone will not suffice for outreach. The use of all possible channels – social media, emails, physical advertising, physical mailers, newsletters, booths at local or county fairs, parades, schools, employers, retailers and contractors (see above), friends and family, and others – should be evaluated.</p> <p>Self-evidently, communications and outreach need to be effective - clear, relevant, accurate and acted upon - and validated as such by all segments of the community.</p>

Essential 8 (E8): Increase Infrastructure Resilience

This Essential addresses the wildfire resilience of key physical infrastructure systems, both those owned by the community itself and those owned by 3rd parties such as utilities or healthcare companies.

#	Question	Comments
8.1.	Infrastructure Systems	
8.1.1.	<p>To what extent are the community's infrastructure systems at risk of loss or damage in the event of a wildfire. How adequate are any back-up options that may be available?</p> <p>(If desired, this question may be split into separate ratings for each infrastructure system)</p>	<p>Infrastructure systems and their critical component assets should be evaluated for resilience in the light of the risk scenarios from Essential 2. Where the assets in question are owned by third parties (for example, energy or telecommunications companies) the community needs to press the owners for the required information.</p> <p>For each system, the community needs to know:</p> <ul style="list-style-type: none"> • Which critical assets in that system (for example, for communications, cellphone towers, above-ground or near-surface trunk cables etc) are in areas of high fire risk (or high post-fire landslide risk) and have not been hardened? • What areas and population segments in the community are vulnerable to loss of service from each? • Can the system be segmented in any way to minimize damage or loss of service within the community? • What is the potential duration of service loss, given likely time needed for service restoration? • What backups exist, what level of service can these provide and for how long? <p>The infrastructure systems that need to be evaluated for vulnerability and likely outage times include the following:</p> <ul style="list-style-type: none"> • Communications: cellphone, internet, satellite, landlines). Most or all community infrastructure systems, and many economic and social systems, and the public, are likely to rely upon them. • Electricity: generation and distribution. Again, the level of dependency will be high. The community should also try to understand <ul style="list-style-type: none"> ○ How many homes and businesses have back-up generators; ○ Who may be dependent on power for in-home medical equipment. • Gas: may be a critical issue if the community is extensively gas powered and if, for example, the local water company has to issue "boil water" notices in the aftermath of a wildfire. While most of a gas infrastructure is underground, it will emerge above ground for consumer access and may do so for pressurization, inspection facilities and so on. Rural properties may have propane tanks which are highly vulnerable. • Water supply: sources, treatment and distribution. As above, the level of dependency will be very high. Aside from the direct risk of fire damage, water resources may be contaminated by fire-fighting chemicals or by sediment running off from burned hillsides; physical assets may be liable to fire or landslide damage; and water distribution systems can be contaminated by fire retardant and combustion by-products (and if PVC pipes are used close to the surface, by the by-products of these melting).

#	Question	Comments
		<ul style="list-style-type: none"> ○ Some communities, or at least some properties within the community, may use wells as their primary water supplies which, by virtue of being distributed, may be more resilient than centralized systems (provided that there is back-up energy is required to pump water). ○ Clearly, the water system is a major firefighting resource, but as recent experience has shown, there are a number of constraints on this: coverage of the entire community; availability and maintenance status of hydrants and access points; ability to generate and maintain enough pressure for effective firefighting, throughout the community. ● Waste-water: collection, treatment and discharge. Critical because of the implications for human and environmental health if they are damaged. As with water systems, wastewater systems (sewers, pump stations, treatment plants, outfalls) may be vulnerable to damage from fire, post fire landslides, or sediment and chemical loads in waste water from firefighting and combustion, and from post-fire run off. <ul style="list-style-type: none"> ○ Some communities, or at least some properties within the community, may use septic tanks as their primary system which, being distributed, may be more resilient than centralized systems. ● Roads: critical for emergency response, evacuation and post event recovery. Damage may come from heat, the movement of heavy firefighting equipment, or post-event landslides. Loss of access may come from fire activity, or from debris such as downed powerlines or trees. <ul style="list-style-type: none"> ○ One issue is potential choke-points where parts or all of the community are only accessed by a single road that may be vulnerable to blockage in the event of a wildfire or post-fire landslide, or where narrow roads or bridges may hold up traffic and impede evacuation. ○ Where there alternative routes, can these handle expected volumes of traffic when the main route is out of action? Are they usable by all types of vehicle? ● Other transportation: the vulnerability of other transportation infrastructure (rail, ports, airports, as applicable) to damage or loss of access from a wildfire may be critical for post event recovery. ● Healthcare: the vulnerability of healthcare facilities (hospitals, outpatient facilities, old-people's homes, supply warehouses, ambulance stations) to loss or damage in the event of a wildfire is clearly critical for both the immediate and longer term health of the community. Temporary loss of service may also be a key issue, for example from loss of power, water or road access. <ul style="list-style-type: none"> ○ Communities will want to be certain that healthcare data is protected. ● Education: the vulnerability of education facilities (schools, universities, supply warehouses, school buses) to loss or damage in the event of a wildfire is critical where they are used as shelters, and for children's education and for the longer term vitality of the community. Temporary loss of access may also be a key issue, for example from loss of power, water or road access.
8.2. First response infrastructure		
8.2.1.	To what extent are critical emergency response assets at risk of loss or damage in the event of a wildfire?	Classes of assets involved here, that may themselves be vulnerable to wildfire damage, and whose vulnerability communities need to understand, are listed below. In all cases the issue is the risk of damage to the asset itself, and loss of access if roads are blocked or if there are communications or energy outages.

#	Question	Comments
		<ul style="list-style-type: none"> • Fire service assets: including fire stations, maintenance facilities, communications facilities and equipment stores. (Greenville Fire station was destroyed in the Dixie fire in California in August 2021). • Police service assets: including police stations, maintenance facilities, communications facilities and equipment stores. • Emergency coordination centers: (if separate from fire or police facilities) . <p>In each case, one issue will be whether backup facilities exist. These will presumably be further away, but first responders will still require a base to work from and emergency response centers, if separate, will need to be re-established elsewhere should they be lost or inaccessible during a wildfire.</p>
8.3. Administrative infrastructure		
8.3.1.	<p>To what extent is the community's administrative infrastructure and data at risk of loss or damage in the event of a wildfire?</p> <p>(See also E3 for community insurance)</p>	<p>The vulnerability of the community's administration infrastructure (offices, supply warehouses, depots etc) for applicable tiers of government and other agencies to loss, damage or loss of access may be critical for emergency response and will be for post event recovery. This definition would also include post offices, welfare offices, DMVs and the like. Loss of access would also include loss of communications access (phones, internet etc).</p> <p>Administrative data, including personal records, infrastructure drawings, permits, financial data and many other items may be vulnerable to loss from a wildfire where computing or data storage facilities are damaged, resulting in inconvenience and conceivably risks to community members, and excessive additional costs for the administration. Ideally, data will be backed up off site at a location in a different region from the community and will be available by "hot standby" arrangement.</p>
8.4. Cascading (inter-system) failures		
8.4.1.	<p>To what extent does the community understand which are its critical assets and how they are interconnected?</p>	<p>Few communities have a fully inclusive list of their critical assets and fewer still understand how they are related to each other. This means that the possibilities for cascading system failures (for example, where loss of an electricity substation in a wildfire causes failure of a water treatment facility, which in turn makes a hospital several miles away unusable - a cascading failure spanning three functionally and geographically separate systems) may not be understood and may come as a complete surprise.</p> <p>UN DRR and ARISE provide a free tool to enable communities to inventory their critical assets and map the linkages between them¹³.</p>

¹³ <https://climateresilient.world>

Essential 9 (E9): Ensure Effective Disaster Response

This Essential addresses the effectiveness of wildfire warning and emergency response capabilities.

#	Question	Comments
9.1	Warning systems	
9.1.1	To what extent are detection and warning systems available that coverage for the entire area of the community?	<p>Key considerations for evaluating detection and warning systems include:</p> <ul style="list-style-type: none"> • Speed of detection: 30 minutes' extra notice can make the difference between fire fighters finding a small spot fire which they can easily put out, as opposed to finding an out of control conflagration. • Night-time capability: many of the worst catastrophic wildfires start at night and grow by morning to the scale where they are more difficult to put out. Night-time detection requires infrared cameras; these may also serve to look through smoke for where new fires may be starting as a result of blowing embers. • Reach: warnings need to reach the entire population, allowing for the fact that some people may not have phones with them or possess them at all. Warning systems may be via physical sirens and electronic billboards, TV, radio, web or various forms of social media and messaging (or preferably all of these). • Reliability: can the system be trusted to function at all times? • Smoke: warning systems need also to warn of smoke drifting into the area from other fires. • Multi-hazard: fire and smoke warnings need to be clearly differentiated from each other from other hazards that may apply.
9.2	Emergency response plans	
9.2.1	To what extent are there up-to-date emergency response plans that address the risks identified in Essential 2?	<p>Key considerations for evaluating emergency response plans include:</p> <ul style="list-style-type: none"> • Coverage: plans need to cover, as a minimum, command and control - overall command, coordination with other agencies and cities, roles, responsibilities procedures (see Essential 1); evacuations (including hospitals, jails, etc.); communication systems; critical asset management (including likely "failure chains" – see E8); fire service response; medical response; law and order response; inventory of PPE for smoke available to community members; all external resources, and assumptions concerning these; public information policies and channels; triage policies. • Integration: ensuring that all parties (emergency responders - fire, police, medical, also critical infrastructure/asset operators; community organizations; education districts, etc) are: <ul style="list-style-type: none"> ○ Operating from the same set of assumptions, especially where their assets or activities depend on one another (for example, if power is lost, do all parties understand the back-up run time of cellphone tower generators; or do evacuation plans allow for the large school located in the area?); ○ Planning their responses and activities to be consistent and interoperate with one another. • Expectation setting: experience shows that members of the public frequently overestimate the ability of first responders to respond to them during a disaster in a timely manner, or at all. This can lead to a dangerous sense of complacency, whereby community members either do not do "their" part in preparing for disasters, or respond inappropriately. This puts them at risk and places more strain on first responders.

#	Question	Comments
9.2.2	<p>To what extent can emergency responders access, from their own resources or via mutual aid, the equipment and personnel they need to deal with the wildfire within the required response time, and are these interoperable?</p> <p>(See also E6 for data sharing).</p>	<p>Emergency responders need to be able to access the equipment (vehicles, earthmovers, aircraft, tools, communications, personal safety gear etc and all associated logistics) and personnel they need to respond, should the risks identified in Essential 2 come about. These may come from their own resources, neighboring communities, other tiers of government or private sources, but overall adequacy needs to be evaluated.</p> <p>There also needs to be available additional surge or back up capacity to meet with other needs that the community may have as the wildfire is being dealt with, from internal or external resources.</p> <p>Emergency response in some locations has been hindered in the past by incompatible communication systems, incompatible equipment (even such basic items as hose-pipes from different fire services having different diameters, requiring adaptors before they could work together), and incompatible processes.</p> <p>Equipment and processes or standard operating procedures need to be shown - in advance of an actual wildfire - to be interoperable as between all emergency responders.</p>
<p>9.3 Managing the public</p>		
9.3.1	<p>To what extent does the community have viable plans to meet the needs of all population segments in all risk scenarios?</p>	<p>Emergency plans and practices need to be evaluated for the following aspects of managing the public:</p> <ul style="list-style-type: none"> • Evacuation demands: these will depend on where people are located, the road layout, access to vehicles and ability to drive, the terrain and the nature/direction of the fire. They may also depend on the willingness of people to evacuate, even in the face of evident personal danger. Schools, with large numbers of children and teens, need to be a particular focus. • Individuals' plans: all community residents need an emergency plan for dealing with wildfires that includes gathering family members; gathering up pets, personal documents and key possessions; evacuation - route(s) and meet-up points. • Smoke protection: community members may be seriously affected by wildfire smoke, especially (but not only) if they have respiratory issues - is PPE available for them? • Shelter: communities may need to rely on schools, churches, community centers, sports centers, malls and the like to provide very short term communal emergency shelters before people move on to their own emergency accommodation (see Essential 10 - in some cases people may evacuate directly to their own accommodation). Shelters need to take account of the specific needs of men, women, children and the disabled, and to provide for safety, servicing and public order. Pets may also need to be sheltered. • Food and staples: Those in shelters will need access to food (including for those with dietary restrictions), petfood, water and staple goods such as spare clothes, blankets and sleeping supplies, hygiene and sanitary items, toys, access to TV and internet and so on. • Emergency fuel and transportation: It is in the community's and individuals' interest to encourage people to leave communal shelters, either to temporary accommodation (see Essential 10) or to relatives. Communities may need to provide emergency gasoline distribution, funds for gasoline or alternative transportation.

#	Question	Comments
9.4	Practices and Drills	
9.4.1	To what extent are drills held that require all emergency responders and relevant community organizations to practice their response together, also engaging the public ?	<p>Key aspects of the community's approach to drills that need to be evaluated include:</p> <ul style="list-style-type: none"> • Frequency: it is critical for emergency plans to be practiced regularly, and for those practices to involve all responders (defined as above to include emergency/first responders, medical services and operators of critical infrastructure systems) who need to contribute to the wildfire response. • Realism: practices and drills need to be based on scenarios addressing the risks identified in Essential 2. They also need to include the impact of ancillary issues such as public safety power shutoffs - utility companies should be engaged for this. • Learning: there also needs to be a "wash-up" after drills to evaluate what worked and what needs improving. • Community involvement: If possible, some drills should engage the community, especially those who live in at-risk areas, as participants - not just onlookers. This becomes a valuable form of community engagement in itself (see Essential 7).

Essential 10 (E10): Expedite Recovery and Build Back Better

This Essential addresses the extent to which preparation been made in advance for post-event recovery.

#	Question	Comments
10.1. Post-wildfire planning – in advance		
10.1.1.	To what extent are likely immediate needs anticipated and planned for?	<p>Experience has shown that post event planning is one of the most neglected area of any in the UN DRR City Disaster Resilience Scorecard. Yet many issues can be foreseen and planned for in advance – those that arise in the immediate aftermath, and those that are part of the longer term recovery.</p> <p>Post event plans should be evaluated for the extent to which, in the light of the risk analysis in Essential 2, they anticipate and meet the following immediate needs, whether through MOUs with contractors, mutual aid arrangements, or through help from county, State or Federal sources:</p> <ul style="list-style-type: none"> • Survivor search, body removal: an obvious need, but are resources available to carry this out as rapidly as possible? • Law & order: looting of burned or abandoned homes is a known phenomenon during and after wildfires. Other law and order workloads may also increase due to needs such as blocking access to roads, finding missing people and so on. Many communities have mutual aid arrangements with other areas for law & order services. • Debris removal: <ul style="list-style-type: none"> ○ Trees: after wildfires in wooded areas, felling, removal and disposal of burned and potentially unsafe trees poses major issues in terms of availability of foresters, haulage trucks and drivers, and lumber mill capacity. ○ Soot, ash and debris: each pose different hazards after a wildfire. Their removal can be a major issue – both the removal itself and identifying sites for debris to be disposed of (or recycled), especially given that some of the post-combustion waste will be toxic and that in some cases that toxicity will persist for many years even after the waste is buried. • Emergency housing: one of the observed after-effects of major wildfires is the scramble for displaced people to find accommodation, at reasonable rates, either to supplement shelters or when these close. This can be addressed through identification in advance of potential accommodation and agreement on nightly rates to prevent gouging. At least one software solution is available on the market for this purpose, and some hotel chains participate in such arrangements. <ul style="list-style-type: none"> ○ This need may give way to a need for temporary housing for when people leave emergency accommodation but cannot yet move back to their homes. • Ground decontamination: ground can become contaminated from firefighting chemicals or chemicals that may be released when premises or cars burn. Long term monitoring may also be required. • Property assessment and red-tagging: Building inspectors may be faced with large numbers of properties to be inspected and assessed as safe or dangerous. Delays in doing this can hinder the speed of recovery.

#	Question	Comments
		<p>Communities need to plan for additional property inspection workloads after a wildfire, perhaps via mutual aid arrangements with other areas.</p> <ul style="list-style-type: none"> • Insurance processing: Insurance assessments, in particular the loss adjustment process and claims processing for non-parametric insurance, is a frequent cause of hold-ups to enabling communities to recover from disasters. Having enough loss adjusters - who need to be familiar with local construction techniques - is a frequent issue. • Pets and livestock: especially in rural communities, it has proven during and after wildfires to be a major exercise to help people find accommodation for their pets or livestock, and to deal with short or longer term injuries to them (the latter may arise from smoke inhalation, for example). There may also be injured or displaced wildlife that requires help. • Price increases: in the aftermath of a major wildfire, local price increases in many items and services essential to the recovery, and potentially items such as food and fuel, are a known issue. An allowance for these factors can be included in budgets etc advance. <ul style="list-style-type: none"> ○ Ideally, there will be standing MOUs agreed with contractors to ensure availability and lock in pricing, to prevent gouging, even if renegotiated annually. There may also be a list of approved contractors for domestic repairs, again with pricing agreed.
10.1.2.	To what extent has the need for rebooting physical infrastructure systems been anticipated and planned for ?	<p>Critical assets, especially if above ground, will be at risk of damage from wildfires, hindering recovery. Operations or repair staff living in the area directly affected by the fire may not be available – they may be attending to their families or homes, or they may have had to evacuate. The speed with which the relevant systems can be restored to operation will directly affect the community's recovery, and DRR plans (the community's, and those of the infrastructure owner, which the community should press to understand) should be evaluated for coverage of post event re-boot issues.</p> <p>Physical infrastructure systems affected include: communications - land-line, cellphone and internet infrastructure; electricity and gas; water supply and distribution (there may be a need for water tanker service for some months or even years after the wildfire); wastewater treatment; and roads, and other transportation if applicable.</p>
10.1.3.	To what extent has the need for rebooting community and government systems been anticipated and planned for ?	<p>Community and government systems will also be at risk of damage and staff displacement, again hindering the community's recovery. Plans should be evaluated for coverage of, and ability to deal with, these issues:</p> <ul style="list-style-type: none"> • Healthcare: as well as considering direct risks, the local healthcare infrastructure should be evaluated for surge capacity, as there will probably be an increase in: burns and trauma; emergency room visits for heart attacks and other cardiac events and symptoms; stroke and other cerebrovascular emergencies; asthma; pneumonia complications; exacerbation of pre-existing cancer symptoms and heart disease (COPD etc); bronchitis; and mental health issues. <ul style="list-style-type: none"> ○ Some of these health issues, both physical and mental, may be long term. • Education: enabling children and teens to restart school will help parents to focus on house repairs and other work, or indeed return to work. If schools have been burned, emergency bussing will be required, and the capacity of the school bus system should also be evaluated in advance.

#	Question	Comments
		<ul style="list-style-type: none"> • Other community systems (mail and package delivery, trash collection, leisure facilities etc). These systems may have the same damage and staffing issues as physical infrastructure systems. • Government systems (government services - especially welfare offices, help centers, vehicle depots, permitting, finance) may also have these issues. <ul style="list-style-type: none"> ○ Permitting will also need to plan for a surge issue, anticipating a large number of rebuilding applications. There is frequently a tension in the need to expedite permits by loosening requirements temporarily, while not reducing (or while improving) future wildfire resilience. ○ With finance, after a wildfire, communities may be faced with a major influx of donations that need to be accounted for, and <i>in extremis</i> may lose the function of their accounting systems. Communities should consider a back-up accounting arrangement either via state government, or by a private sector organization such as an accounting firm, to be activated if required.
10.1.4.	<p>To what extent has the need for rebooting the economic and commercial activity been anticipated and planned for?</p>	<p>As above, critical assets within various commercial systems may be damaged in a wildfire, or staff may not be available, and delayed restoration will affect the recovery of the community. Communities need to understand what alternative arrangements the companies concerned may have made:</p> <p>The affected systems include:</p> <ul style="list-style-type: none"> • Food supply: croplands, stock, transportation, cold storage, food-stores; • Banking: ATMs, local offices, availability of emergency loans for businesses and property repair; • Gasoline: supply, gas stations; • Building supply: raw material and supply stocks, transportation, stores/outlets; <p>In addition, as stated earlier, the community should encourage all businesses to have viable business continuity plans (BCP) that maximize the chances of them being able to resume operations rapidly, and in so doing maintain employment, economic activity, tax revenues and economic vitality in the community. (See E3 for business property and continuity insurance).</p> <p>There may be additional needs for funding for displaced people until their jobs can restart, to prevent them from leaving the area, and possibly also career counselling and job training to help them find employment without leaving.</p>
10.2. Environmental damage and remediation		
10.2.1.	<p>To what extent has remediation been planned in advance for likely environmental damage?</p> <p>(See also E5)</p>	<p>Wildfire damage to woodland, vegetation, habitats and other natural features or ecosystem services may well arise. Post-event plans should be evaluated for the extent to which they anticipate and allow for remediation of the following:</p> <ul style="list-style-type: none"> • Water systems and resources: Lakes/reservoirs, creeks, rivers, and even near-to-the-surface ground water can be contaminated by wildfires: by ash, firefighting chemicals and also by combustion by-products from cars, buildings, and facilities. If these water resources are part of the drinking water supply, the contamination issue will be greater.

#	Question	Comments
		<ul style="list-style-type: none"> • Vegetation: this may need to be re-established with deliberate planting if natural regeneration will not suffice. There may also be a chance to eliminate invasive species. • Wildlife: as above - to maintain ecological balance some species may also need to be reintroduced deliberately.
10.2.2.	To what extent has the risk of flash floods and mud/landslides in burn scar areas been anticipated and planned for?	Wildfires destroy vegetation that may be holding steeper slopes together and delaying water run-off. In addition, severe fires can vitrify some soils making them impervious to water and thus exacerbating the speed of run off. Until vegetation is reestablished the result can be either flash floods or severe mud or landslide risk (see E2). Plans should be evaluated for the extent to which they pinpoint likely risk spots and address that risk.
10.3. Learning loop(s)		
10.3.1.	To what extent are processes in place to learn from other communities' recovery successes and failures , and to educate other communities about your successes and failures?	Communities can learn from each other on how to plan for post event recovery – pitfalls, strategies, methods and so on. Do the “sister communities” of your community have different approaches to catastrophic wildfire resilience and recovery? If so what can be learned from these? What can you help them with?