
Draft
Grammar
of Coordination & Collaboration
in Wildfire Risk Management

Grammar /ˈgramər/ [noun]

The system and structure of a language or of languages in general, usually taken as consisting of syntax and morphology (including inflections) and sometimes also phonology and semantics.

– Oxford dictionary

Preface

Wildfire risk in the western US is concentrated within several dozen geographic hotspots. Despite their similarity in terms of wildfire risk, the underlying factors that contribute to that risk are as diverse as the communities, ecosystems, and climate of each region.

Many of these regions have become rich testbeds for innovative fire management strategies. Not least of these innovations are the social partnerships that have formed as stake-

holders work together to address the shared aspects of wildfire risk across interests, across jurisdictions, and across boundaries of land ownership and management.

Despite this accumulation of local knowledge and experience, stakeholders and managers often find they lack a common vocabulary for describing these innovations. Words are sometimes costly. Lacking a common vocabulary, coordination and collaboration can become mired in confusion, skepticism, and inefficiencies.

The goal of our June 29, 2020 workshop and this handbook is to develop a working grammar and vocabulary for describing successful patterns of coordination and collaboration for managing wildfire risk. So too, this grammar serves to identify examples of each pattern, as well as the common obstacles and solutions for overcoming these barriers.

For instance, we have found within both research and in the field that the interchangeable use of the words collaboration, coordination, and cooperation can lead to frustration. While

precise definitions of such terms are often unimportant, there are key instances in wildfire management, for example incident response, where misunderstandings may be a recipe for disaster.

It is also worth pointing out that grammar is not engineered in the same sense as other systems. Rather, it is a set of rules for making sense of frequent interaction of individuals seeking to communicate. Thus, while this handbook is titled the Grammar of Coordination and Collaboration in Wildfire Risk Management, we do not mean for this handbook to be the authoritative source for how stakeholders must work together.

Rather, the handbook is intended to be a “living” compendium of lessons learned. Hence, the ideas described here reflect knowledge drawn both from the significant amount of research that has been conducted in this area, and the grounded experience of those who juggle on a daily basis the need for crafting and maintaining partnerships against other priorities given limits in time and resources.

Purpose & Organization

This handbook is organized into 2 parts. Part 1 is a brief primer on the ideas and concepts that make up the grammar while Part 2 contains a series of network diagrams meant to describe the basic social network building block of wildfire risk management. The two parts of the handbook are meant to complement each other: Part 1 provides context for understanding Part 2; Part 2 provides the visual vocabulary for the principles in Part 1

These social network building-blocks are visually shown as a collection of shapes, colors, and lines. Generally speaking, the shapes are meant to describe the individual or groups involved in a partnership, although they might also represent discrete parcels of land, such as two adjacent forest stands or neighboring properties that share fire risk.

Connecting these shapes are lines, which can represent different things depending on what they are connecting. Lines between two individuals may represent a partnership, whereas lines between landscape parcels can represent movement of wildfire across boundaries. Lines that connect individuals or groups to the landscape represent ownership or jurisdictional responsibilities.

The list of network patterns is by no means complete, but it is a start for unpacking what successful collaborative wildfire risk management looks like. Insights gathered from the workshop will help us refine and expand an evolving visual grammar.

PART I

Network Primer

In our daily lives, our professional endeavors, and our attempts to cope with our natural and social environments, we are surprised . . . over and over and over again.

– Hulse et al. 2017

Surprise

Around the world, record temperatures and drought now combine with population growth and increased fuels to push wildfire risk outside the bounds of experience, requiring new thinking, approaches, and tools (Schoennagel et al. 2017). This broader pattern of global change, where increasingly extreme disturbances (e.g., floods, hurricanes, storm surges) intersect with expanding human settlement, is putting more things people care about at risk. As evidenced by devastating wildfires in western US, Greece, and Australia, understanding how unpredictable disturbances in populated landscapes respond to different management approaches is critical to developing and maintaining resilient communities.

No matter how comprehensive the information on wildfire we gather, how astute our planning, how elegant our mitigation strategies, how profound our collaborative efforts, or how receptive and well prepared we think we are , wildfire surprises will happen. Ironically, one of the few things we can be certain of is surprise.

C.S. Holling, an ecologist and systems scientist, defined surprise as the condition when our perceived reality is fundamentally different from our expectation. Moreover, surprising events are significant in magnitude,

long-lasting, and highly impactful. Having experienced surprises in the past, we are left with an enduring desire to avoid expecting wrong. Our best defense against surprise may be to resist the innate human tendency to overestimate the certainty with which we can anticipate the future based on past experience, trends, patterns or processes that we, and others before us, have known (Lempert, Popper, & Bankes, 2002).

Signals & Risk

How do we avoid expecting wrong? For this, we rely on signals from the landscape, from others we trust, and from those in broader society who have experienced or planned for surprise in the past.

Signals can be information obtained from risk assessments or other evaluations of the intersections between human and natural systems. Signals can be information shared between neighbors, friends, and colleagues. Signals can also come in the form of directives or incentives from authorities and other stakeholders.

Trust and reputation increase our confidence in the value of the signals we receive. The more we see the same signals repeated from various trusted and reputable sources, the more likely we may be to try and act, within our means, to reduce the explicit or implicit risk communicated by the signal.

While individuals can process signals and turn them into individual action, groups can turn signals into collective action. Collaborative Governance Potential is an expression of the degree to which diverse stakeholders can work together to enact decision-making in the collective interest. Network qualities, such as levels of trust, social ties that bridge different groups, and decentralization can all impact Collaborative Governance Potential.

Coping & Adapting

Coping is one way to deal with risk that involves intensifying or attenuating signals transmission. Coping prioritizes information and actions that

help minimize the undesired consequences of a risk at a given level of collaborative governance potential, without having to reconfigure social networks.

Adapting, on the other hand, implies some reorganization of social network relationships so as to reduce risk in the face of an intensifying disturbance regime, like wildfire in the context of changing fuels and growing human settlement patterns. Reorganization refers to changes in social networks that arise from new patterns of information exchange among actors and with their environment.

Compared to coping, adaptation is more dynamic and has greater potential to enhance our ability to avoid surprise by processing and transmitting new signals, bridging previously unconnected groups and individuals, and supporting new behaviors. Adaptation, however, is not without costs, and requires experimentation, failure and reflection.

Understanding Networks

Scientists use networks to study systems of interacting parts, like the diversity of people involved in managing natural boundary natural hazards like wildfire. These networks are often depicted as a “web” of circles and lines, each representing the two main components of a network: actors (i.e., individuals or groups) and ties (i.e., the relationships between them).

Yet social networks can be difficult to understand and visualize when considering hundreds of actors and ties. Simple diagrams that depict common arrangements among actors and the landscape can help to identify and highlight the distinctive building-blocks that make up larger networks.

These simple building blocks, also known as ‘motifs’, offer insight into how the structure of a large network may affect the ways people communicate with and influence one another (or cope), and how those existing relationships might be adapted to better achieve desired goals.

Thus, just as the parts of a sentence are ordered to communicate an idea, those sentences are organized into paragraphs, paragraphs into chapters, etc., these simple motif building blocks, and how they are arranged, affect the ways that ideas, knowledge, practices and resources flow within a network. For this reason, we use the term grammar – the rules for making sense of a language – as a metaphor for understanding collective action achieved through effective coordination and collaboration.

The following pages list a number of motifs, the network building-blocks that have been identified by scientists who study how people work together to protect the collective interest, like safety from wildfire or intact ecosystems. This list is by no means complete.

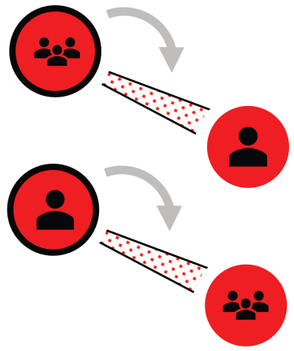
PART II

Network Pattern

Legend

- Actor representing either a single individual or organization
- A single actor highlighted for reference since we often think about social networks from the perspective of a single person.
- Actors from other sectors of society (hence different colors)
- Landscape representing either a distinct ownership or ecosystem
- Institutional actor (higher level organization or agency)

Social Influence



Two individuals and/or organizations have a relationship through which they influence one another

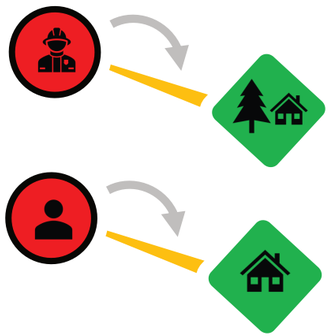
Most ecosystems do not abide human-made borders. As a result, effective management of these ecosystems requires that actors agree on shared rules and practices regarding reasonable use, resolving conflicts, negotiating tradeoffs, sharing information, and building common knowledge (e.g. Folke et al., 2005).

These processes are described as social ties because they occur between individuals. The relationship may be symmetric (both actors influence the other equally) or asymmetric (one actor has more influence than the other). The overall structure of these ties (i.e. its topology) can have profound impacts on how actors actually behave and how ecosystems are managed (Degenne and Forsé, 1999; Wasserman and Faust, 1994). Factors such as trust and reputation increase the confidence that one actor has in the value of information received from another (LaChapelle and McCool 2012).

Examples of social influence ties include:

- Creating and sharing of risk mitigation techniques such as prescribed fire or mechanical fuel removal.
- Mobilizing money and resources needed to fund these projects, particularly when multiple organizations are involved.
- Creating a set of shared rules, expectations, and consequences that build trust among individuals and organizations.

Management Tenure



An individual or organization has an interest, right or responsibility for an given landscape or parcel

Social tenure of land exists in many forms. For example, fee-simple ownership of land reflects the right of owners to exclude access and transfer ownership to others.

Other forms of tenure are more nuanced, including those where lands are publicly held and managed. Many functions of local government occur within so-called “special districts”, which describe the particular rights and responsibilities reserved by local government to provide services or protect public goods. Examples include utility districts, zoning overlays, fire protection, etc.

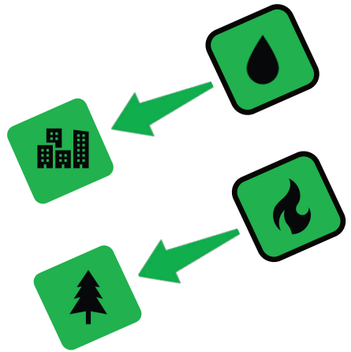
External parties can still hold significant interest in another’s property even when no formal right exists, such as when actions are a legal nuisance.

Interests in land extend beyond legal rights, yet can be just as important. Communities have strong feelings regarding how nearby lands are managed due to the recreational and amenity values those lands provide.

Examples of management tenure include:

- Property rights held by landowners.
- Grazing rights that are sold independent of land .
- Amenity values that drive development near public lands.
- Obligations to respond to a fire within a certain district.

Environmental Connectivity



Two locations are connected through one or more natural processes

Landscape connectivity describes the degree to which the landscape facilitates or impedes movement among areas of similar land type or ownership (i.e., patches) (Taylor et al 1993), although connectivity may also exist as a continuous property (i.e., independent of patches).

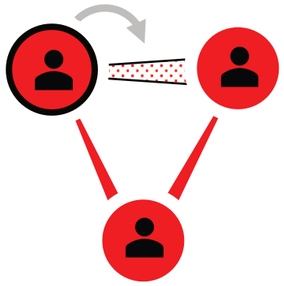
Connectivity describes both the physical transfer of energy or material (i.e., structural connectivity) as well as the movement of individuals (e.g., plants, animals) among patches (i.e., functional connectivity) (Kindlmann and Burel 2008).

From a biological perspective, connectivity effects the amount and rate of dispersal among patches, which influences gene flow, adaptation rates, extinction risk, etc. (McRae et al. 2012). From a physical perspective, connectivity describes the movement of water, the propagation of wildfire, or the movement of air, etc.

Examples of environmental connectivity include:

- Accumulation of smoke produced by a wildfire.
- Natural or human-made fuel breaks used to disrupt connectivity of fuels, thereby interrupting wildfire.
- Dispersal of animals among habitat patches.

Collaboration / Bonding



When an individual or organization is connected to two other actors, those actors often share a common tie as well

Confronted with changing conditions, actors may need to reevaluate their day-to-day operations. Cooperation can play a key role in facilitating adaptation because it can help to build trust, shared knowledge, and agreements (Adger 2003).

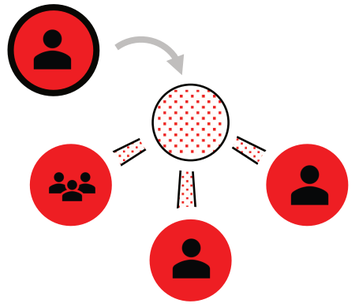
Networks with numerous connections often have increased capacity to act collectively (i.e., social capital, see Burt 2005). Dense networks may also guard against the possibility that other actors may not act as agreed or expected (i.e., a lack of trust; Berardo and Scholz 2010).

Finally, dense networks can facilitate learning (Prell and Lo 2016) and reinforce existing knowledge to better cope with incremental change (Olsson et al. 2006, Fischer and Jasny 2017).

Examples of collaboration & bonding include:

- Collaborative meetings (formal or informal)
- Learning networks (formal or informal)
- Community wildfire protections plans (CWPPs)

Coordination / Bridging



An individual or organization acts as a hub connecting multiple others

Adaptation involves coordinating management actions and resource use among groups of actors in a timely fashion, which can rely on effective guidance by a few centralized actors who can organize the flow of information and delegate tasks efficiently (Provan and Kenis 2008).

Such “bridging-capital” is a form of network centralization that can lower transaction costs for agreed-upon actions (Carlsson and Sandström 2008).

Preexisting social norms, trust (facilitated by bonding capital), effective legislation, or organizational guidelines can enhance effective coordination (McAllister et al. 2017).

Coordination is easiest to achieve among actors in similar institutional sectors, which differentiates coordination from the term brokerage used in subsequent motifs.

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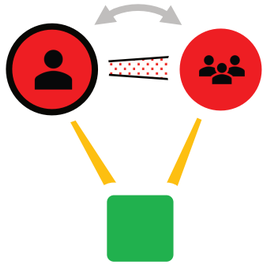
Examples of coordination & bridging include:

- Dispatch coordinator & incident command teams.
- Delegation of authority from local to state or national.

Co-Management



Individuals and/or organizations that share mutual (perhaps conflicting) interest in the same landscape

Social-environmental coupling can be seen as a form of social–geographical "bonding capital" that enables actors to effectively cope with changes (Cumming et al. 2006). The lack of interactions between two or more actors that share a stake or interest in a resource or geography can be detrimental both to the actors and the shared resource (Bodin and Tengö 2012). Social-environmental coupling ensures that actors are able to adjust their actions in response to changing internal processes and demands, such as new resource or risk management decisions made by other actors. Improved coupling may limit smaller changes in the system from "scaling-up" with undesirable impacts on system-level outcomes (e.g., escalating losses from fire; overexploitation of ecological resources; Gunderson and Holling 2002).

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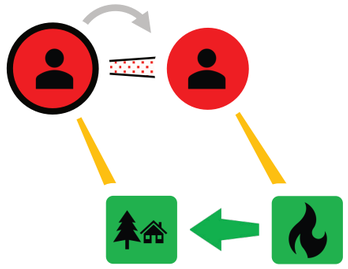
Examples co-management include:

- Mutual aid agreements
- Access agreements (e.g., Good Neighbor Authority)
- Values-at-risk important to multiple groups.

Interdependence



Individuals and/or organizations with interests in connected landscapes cooperate because of their interdependence.

Changes in the environment are rarely confined to just one species or location, and many ecosystems are strongly interconnected (Levin 1998). Natural hazards can spread outside the domain of a single actor, such as when wildfire burns across ownership boundaries.

Ignoring these spillover effects can render day-to-day operational actions ineffective (Armitage et al. 2009), yet these interdependencies are often poorly recognized or were not considered when management regimes were first established.

As a general principle, management is more effective when actors who share stakes in interconnected ecological resources are also connected themselves (Christensen et al. 1996).

Connected actors can coordinate management actions to minimize spillover effects, thus tightening feedback loops between actions and outcomes, and enabling the internalization of system-level costs (and benefits) of governance (Guerrero et al. 2015, Lubell et al 2017).

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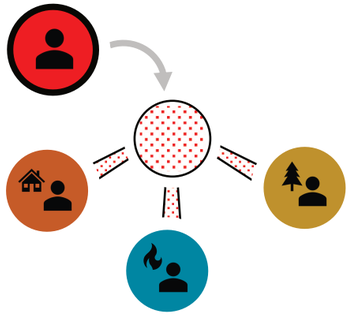
Examples of interdependence include:

- All-lands fire analysis and mitigation prioritization
- Fuels mitigation on 'both-sides of the fence'
- USFS thinning near residential area
- WUI zoning ordinances near fire-prone public land.

Horizontal Brokering



An individual or organization acts as a horizontal broker spanning actors from different sectors

Adapting to novel environmental hazards requires coordination across sectors of society that historically shared little interaction.

Preparing for and responding to these shocks requires coordination of complex tasks spanning multiple sectors of society (Bodin et al. 2006; Alexander et al. 2017).

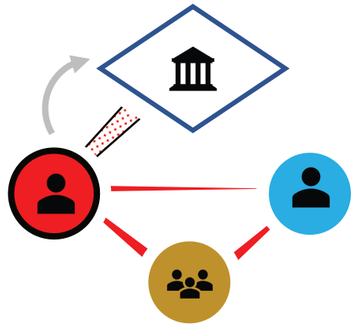
Coordination that spans institutional boundaries is fundamental to a governance network's capacity to adapt. How effective its coordination capacity is may in fact determine if its role in brokering is ever called upon.

This coordination is referred to as brokerage to reflect the challenge of connecting actors from distinct sectors of society. This motif is the first example of boundary-spanning brokerage.

Examples of horizontal brokering include:

- Utah's Watershed Restoration Initiative is a multi-agency restoration funding program managed by the state DNR.
- Regional wildland-urban interface (WUI) coordinators coordinate multi-stakeholder mitigation work.

Vertical Brokering



An individual or organization acts as a vertical-bridge between actors operating at one level with those at other levels

Changes to the fundamental constitution of management regimes often requires involvement of actors operating at different levels (e.g., national, state, local), as well as centrally located brokers who can bolster cross-scale cooperation (King 2000, Carlsson and Sandström 2008).

Vertical-relationships can increase the diversity of responses, mobilize broad support, and provide legitimacy for actions at both local and regional scales (Adger 2003, Folke et al. 2005).

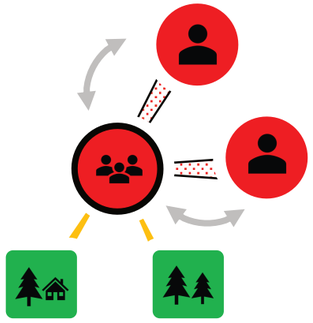
This motif illustrates theory that supports the need for nested institutions that cut across scales (Brondizio et al. 2009, Ostrom 2012).

Not every actor needs such scale-spanning links, but it is important for those who play such roles (Ernstson et al. 2010) to be well connected with their peers, thereby allowing them to act as effective brokers (Alexander et al. 2015). Thus, this broker is connected across different hierarchies, levels of organization or scales, as well as to his or her own peers in the SES.

Examples of vertical brokering include:

- The National Wildfire Cohesive Strategy articulates desirable wildfire management outcomes across scales.
- Shared-stewardship agreements between states and USFS.

Facilitated Co-Management



An organization managing multiple landscapes and/or resources facilitates the interest of others

Diversity is also seen in patchiness of resource ownership, where actors linked to multiple resources may have access to distinctive thinking and knowledge.

Multiple, distinct environmental resources may encourage experimentation while reducing risk (Folke et al. 2005). Further, social connections to other actors provides an avenue for knowledge sharing concerning the results.

Several studies have noted that resourceful actors (i.e., powerful or influential; see Morrison et al. 2017) may resist change and thus pose a barrier to adaptation (Crona and Bodin 2010).

Resourceful actors that are both linked to multiple environmental resources and socially connected may become engaged in discussions about potential alternative futures, rather than being mentally locked into current trajectories.

Examples of facilitated co-management include:

- Through forest collaboratives, the USFS grants influence to peripheral actors who have no formal jurisdiction on federal lands.

About this Project

Adapting to Wildfire is a project seeking to explain where, when, why, and how increasing wildfire risk causes people and organizations to change.

This project explores how individuals, communities, groups, and organizations in fire-prone regions change and reorganize relationships to become better able to cope with and adapt to increasingly large and intense wildfires.

Over four years, the project will:

1. Explore wildfire adaptation experiences in four fire-prone western US study areas.

2. Convene a stakeholder council with leading national and state wildfire networks to derive key lessons.

3. Test the most promising lessons in the Deschutes area near Bend, Oregon using a first-of-its-kind computer model to simulate different adaptation strategies.

4. Provide experiential, research-based educational, engagement experiences for minority and underrepresented students to help broaden the diversity of future scholars engaged in wildfire research.

5. Disseminate insights about how organizations can increase adaptive capacity while being responsive to local conditions and cultures.

Through collaborative engagement with students, educators, stakeholders, policymakers and resource managers, lessons and outcomes will be shared and made accessible to communities, land managers, and scientists in an effort to increase resilience in the face of increasing wildfires.

This project is funded by the National Science Foundation, and is coordinated by Oregon State University, Portland State University, University of Florida, and the University of Oregon.

Research Cited

This handbook builds on an extensive body of research from the fields of social psychology, natural resource economics, sociology, ecology, game theory, social networks, and system science.

The concept of motifs was developed by Orjan Bodin and colleagues (e.g., Bodin & Tengo 2012). Many of the motifs in the handbook were adapted from Barnes et al. 2017. These and other articles reference in this handbook are listed below.

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