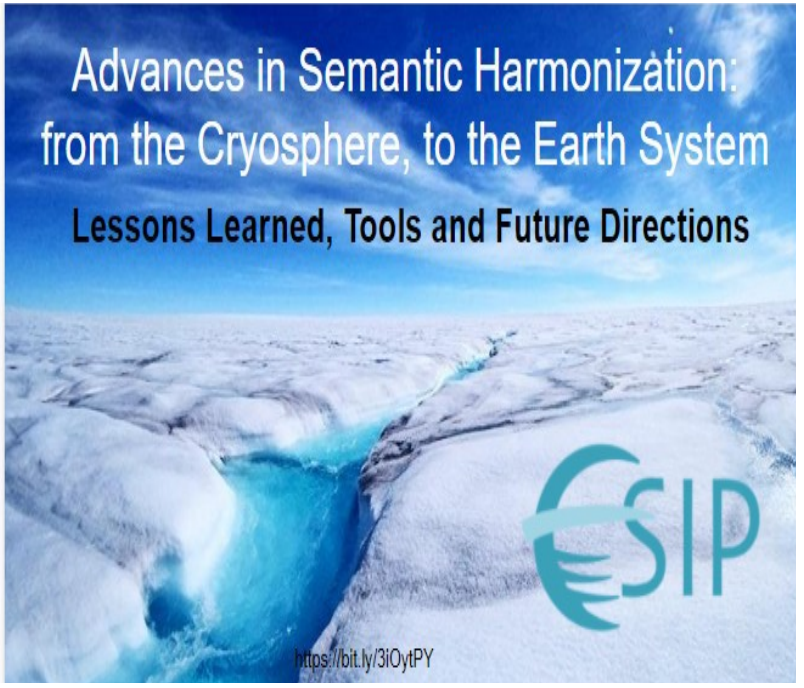
Track B: Definitions Part 3 - Semantic Harmonization



Sure would be nice to harmonize these **conversations**.

Develop quality definitions collaboratively as part of conceptual systems

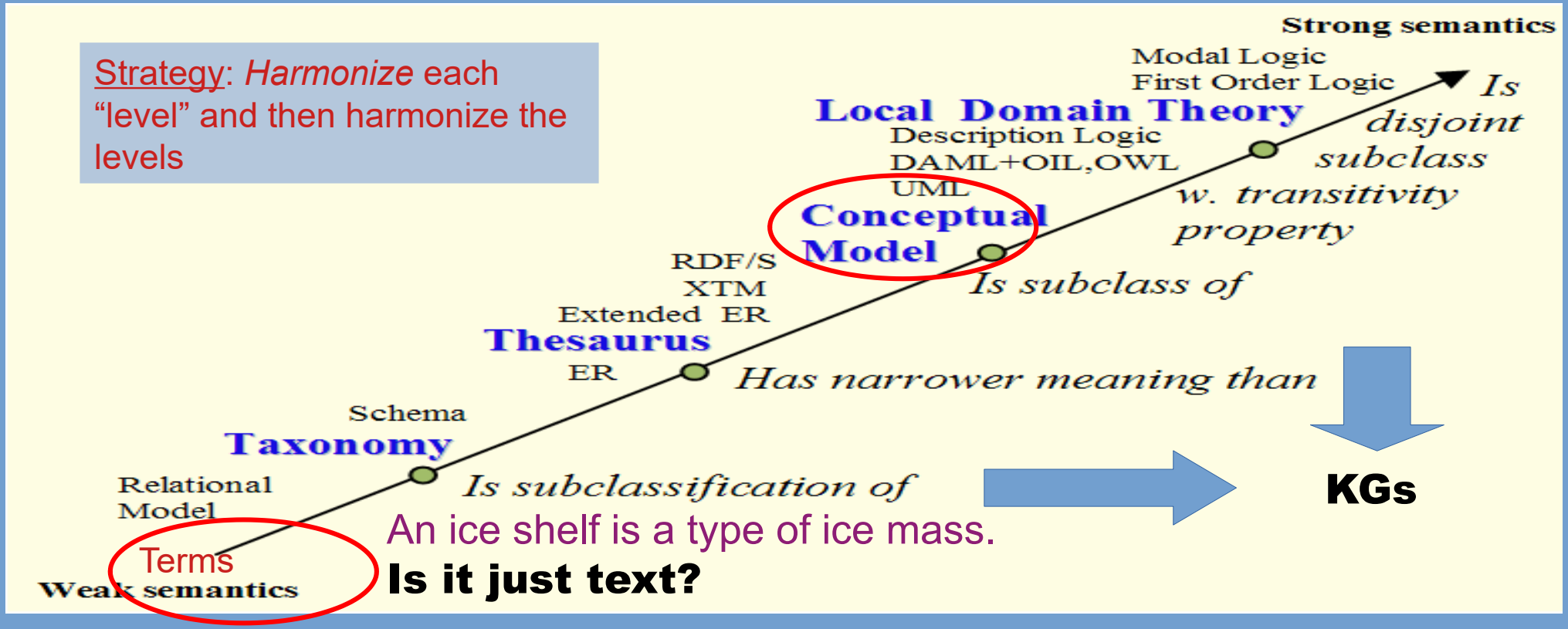


- Co-Chairs:
- Gary Berg-Cross (Ontolog) Harmonizing definitions
- Alex Shkotin: Formal Definitions

Topics

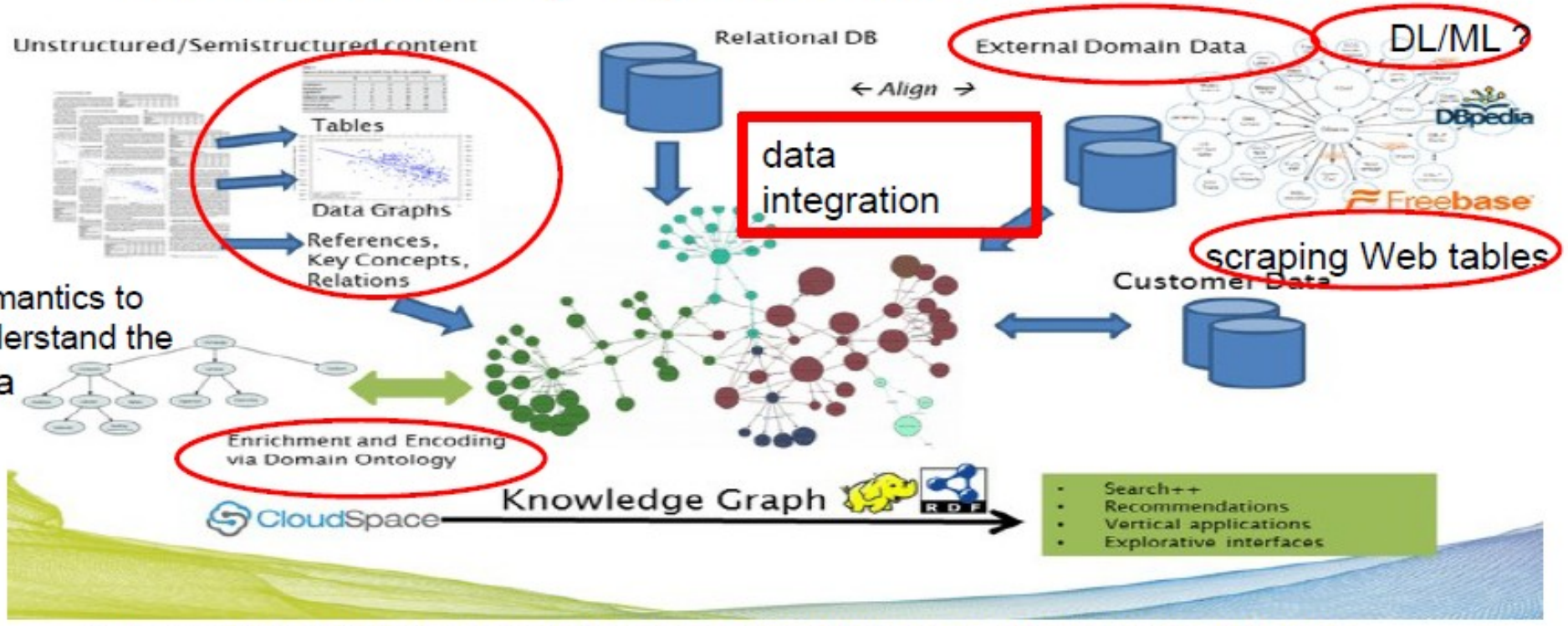
1) Recap -definitions & the semantic spectrum, Cryo, EnvO, aids, a start on best practices/principles...
    1) The Landscape - Thinking big such as developing domain knowledge graphs, but starting, opportunistically small?
2) Why semantic silos?
    - Some mitigation approaches – relevant ontologies, interdisciplinary teams, scoping...
3) Wildfire domain definitions – dictionaries, wikipedia, glossaries….
4) Leveraging glossary a range of definitions as low hanging fruit
    - Systems of related ideas and patterns seen
5) Leveraging existing ontologies- harzard, mitigation, EnvO….
6) Next steps – work towards an ESIP Summer Session

Term Definitions in a Semantic Spectrum (Silos?)
Terms may be standardized but the *meaning* has to be too.



Harmonized

There are many ingredients to a quality KG



- From https://www.researchgate.net/post/What_is_Knowledge_Graphs
  Ajit kumar Roy's What is Knowledge Graphs?

Efforts for communities related to Deep Learning, Knowledge Graphs, and NLP join their forces in order to develop more effective algorithms and applications.

Why the Silo(s) Problems including semantic ones?

- We have silos across the semantic spectrum -these include definition silos with alternate conceptualizations
  - These may be incomplete & rigid definitions
  - So some definitional efforts start over using their own ideas.
    - Extant ontologies may help here if “harmonized”.

- Problem 1 - Groups crafting definitions (or building other semantic resources like conceptual models) are of varying experience and ability and use different methods.
  Approach - One needs work sessions organized around Interdisciplinary Work Groups made up of domain experts, group facilitators and people with web/modeling/semantic/ontological experience. (VoCamps)

- Problem 2 - Definitions will vary according to context of use and target audience.
- Scoping Approach – Good definitions are made relevant for some agreed upon context with cognitive and linguistic goals. These get specified in Competency Questions.

EnvO hierarchy

combustion process
+ fire
- industrial fire
- planned burn
- conflagration
+ wildfire

Diverse Wildfire “definitions”

Dictionary: raging, *rapidly* spreading fire.

- n. Something that acts very quickly and *intensely*.
- n. Lightning occurring without audible thunder. (nope)

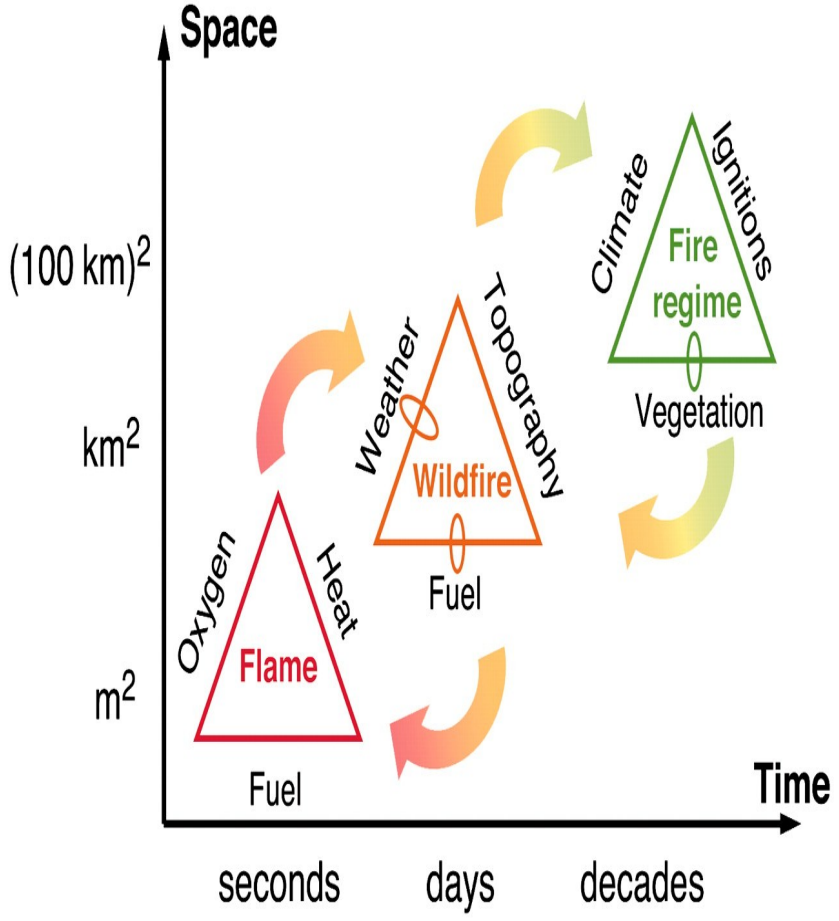
Wikipedia: A wildfire, *bushfire, wildland fire* or rural fire is an unplanned, unwanted, uncontrolled fire in an *area* of combustible vegetation starting in rural areas and urban areas.

- Depending on the type of vegetation present, a wildfire can also be *classified* more specifically as a forest fire, brush fire, bushfire (in Australia), desert fire, grass fire, hill fire, peat fire, prairie fire, vegetation fire, or veld fire….. (Encyclopedic)
- Note - Synonyms

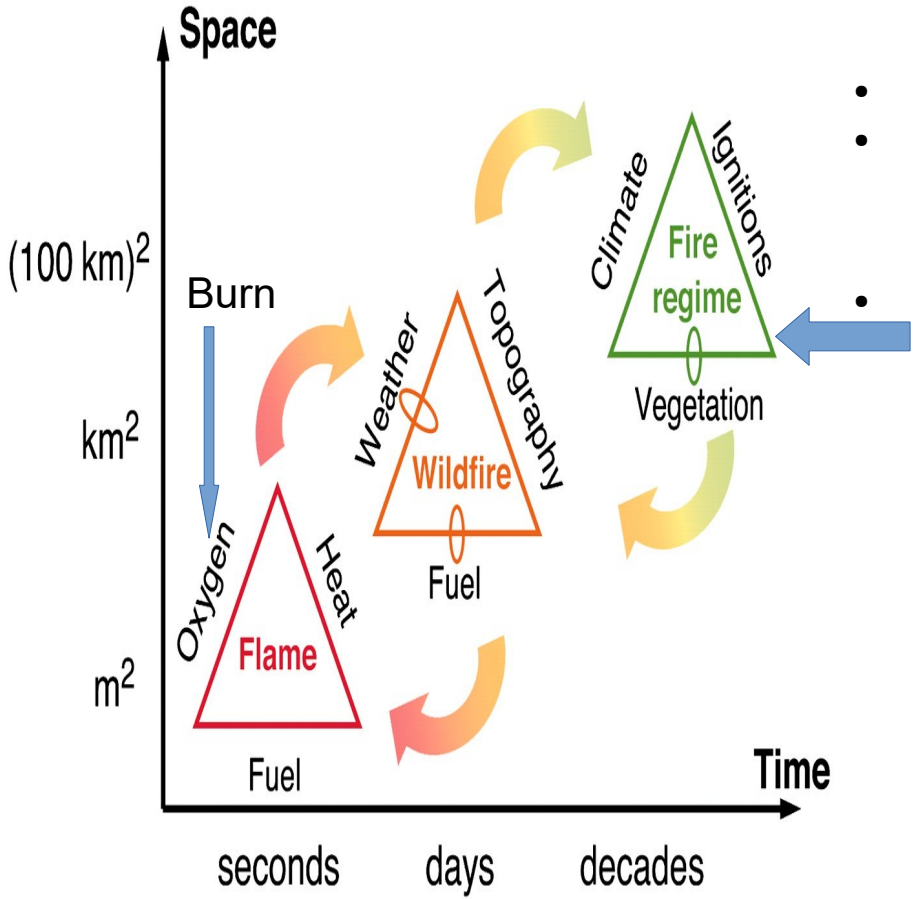
Glossary- National Wildfire Coordinating Group
A wildland fire *originating* from an *unplanned* ignition, such as lightning, volcanos, unauthorized and accidental human caused fires, and prescribed fires that are declared wildfires. Source: 2009 Guidance.

Glossaries Illustrate an Implied, Important Goal – Families of Related Definitions

- "This glossary will help to improve communication and provide consistency in terminology usage throughout those organizations with a mission of *wildland fire* or fire use management.
- It will also facilitate consistent use of glossary terms in publications, course development, and incident management activities."
- Assumes some harmonization as part of its creation.
- (Now interoperability and consistent conceptualization?)
- The implied practice lesson – with this in mind let's work through assembling domain definitions from various semantic resources and storing the result in a relevant ontology.



Fire to Fire Regime

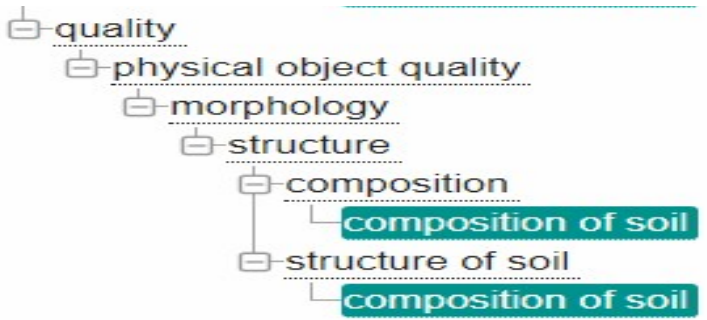


- "Burn" An <u>area</u> burned over by a wildland fire. **Or**
- A reference to a <u>working fire</u>….
  - https://www.nwcg.gov/glossary/a-z
- Fire Regime
  - Description of the patterns of fire <u>occurrences</u>, <u>frequency</u>, <u>size</u>, **<u>severity</u>**, and sometimes <u>vegetation</u> and <u>fire effects</u> as well, in a given area or *ecosystem*.
  - A fire regime is a generalization based on <u>fire histories</u> at individual sites.
  - Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval.

We are quickly runing into the need for a network of concepts not a single definition

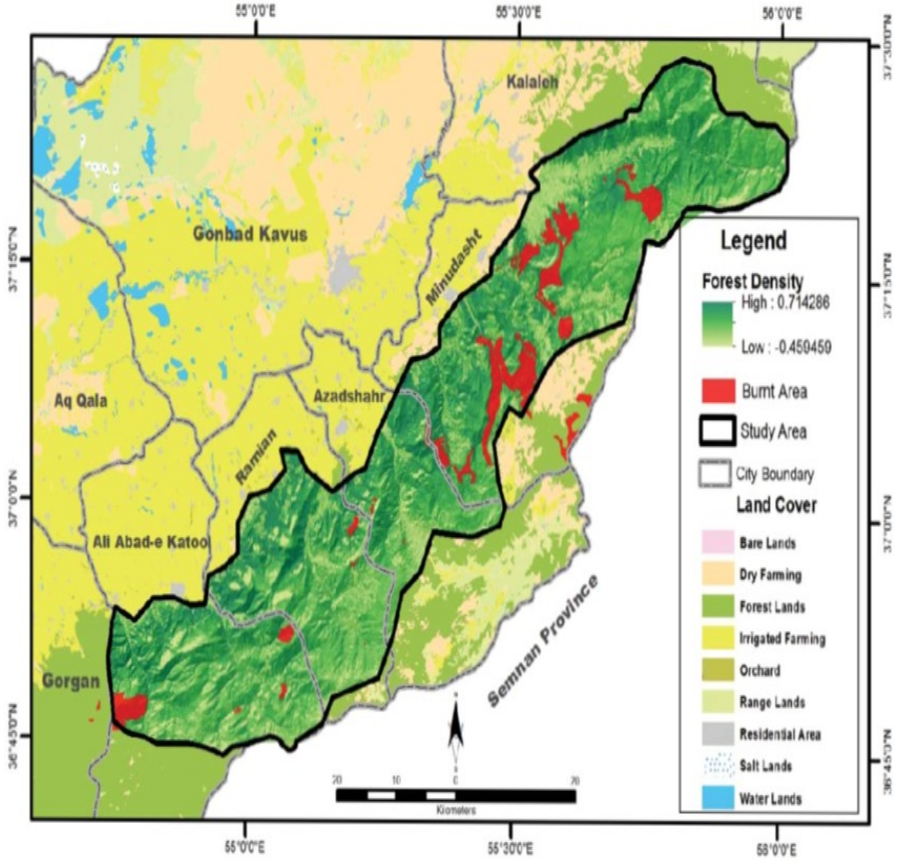
- Burn severity definition “(also referred to as fire severity) is NOT a single definition, but rather a concept and its classification is a function of the measured units unique to the system of interest. “ **Scoping**
- The systems include: flora and fauna, soil microbiology and hydrologic processes, atmospheric inputs, fire management, and society.
- Depending on the particular system of interest, the unit of measure changes. For example, in fire management the units of measure include consumption of organic material, flame length, torching index and other indicators of risk and fire behavior.
- For the atmosphere the units of burn severity include particulates and toxic gasses as a result of smoke and other inputs from fires.
- Many of these elements are touched on in EnvO.

Flame - gaseous environmental material



Competency Question = things you might ask about

- fire locations and size,
- started by
- patterns of fire occurrence,
- Frequency (in a region),
- **Severity** classification effects
  - a function of fuels & physical fire properties
    - intensity, duration, temperature
  - Fire fuel (vegetation) ……



What About Using EnvO for Hazards like Wildfires?

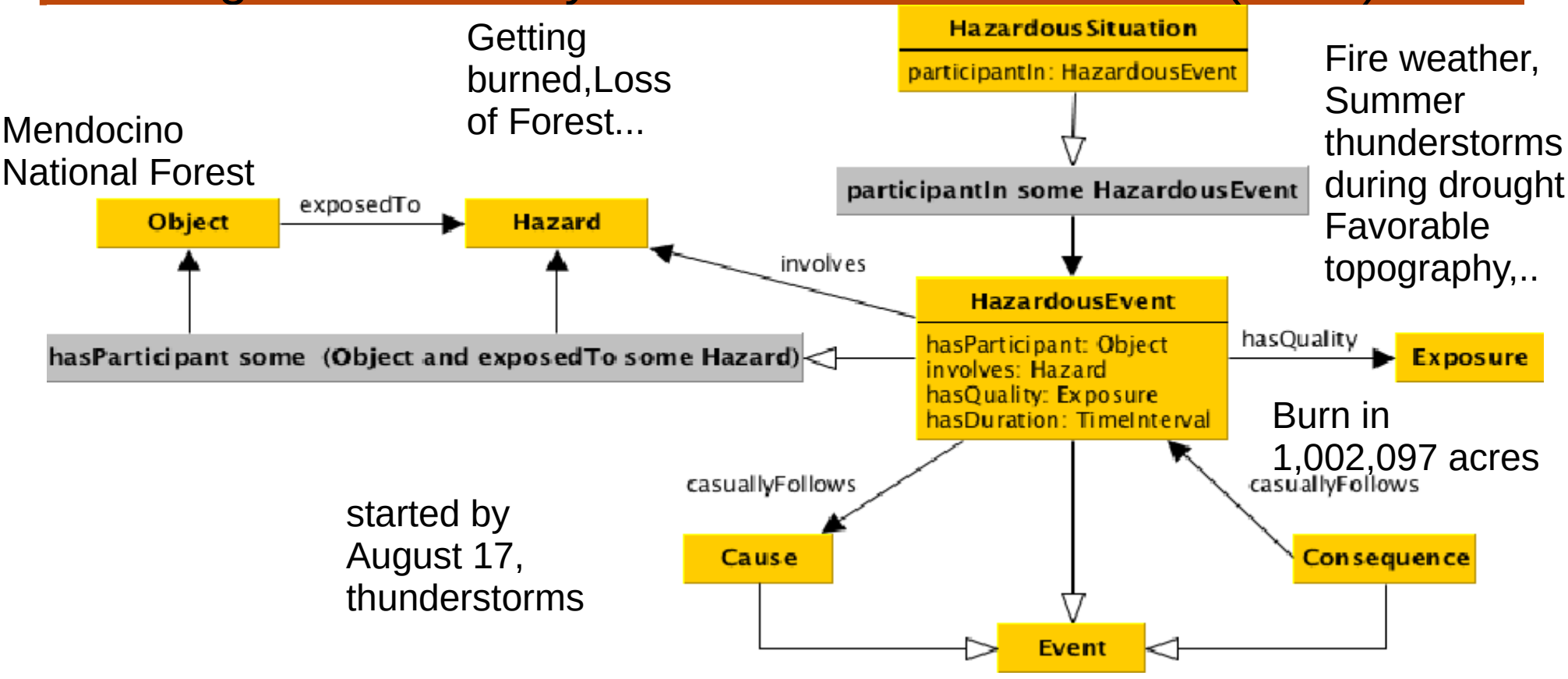
- Wildfire - “A conflagration which is uncontrolled and combusts material in a vegetated area, be it rural or wild.”
  - occurs in some terrestrial biome
  - has participant some (rural area or vegetated area)
  - ISA Conflagration - A fire which occurs in a large spatial area poses a risk to human life, animal life, health, and/or property. https://en.wikipedia.org/wiki/Conflagration]
  - has output some hydrocarbon flame
  -

- Volcanic eruption – more output properties identified
  - has participant some volcano
  - has participant some planetary crust
  - has input some magma
  - has output some hydrogen sulfide
  - has output some carbon dioxide

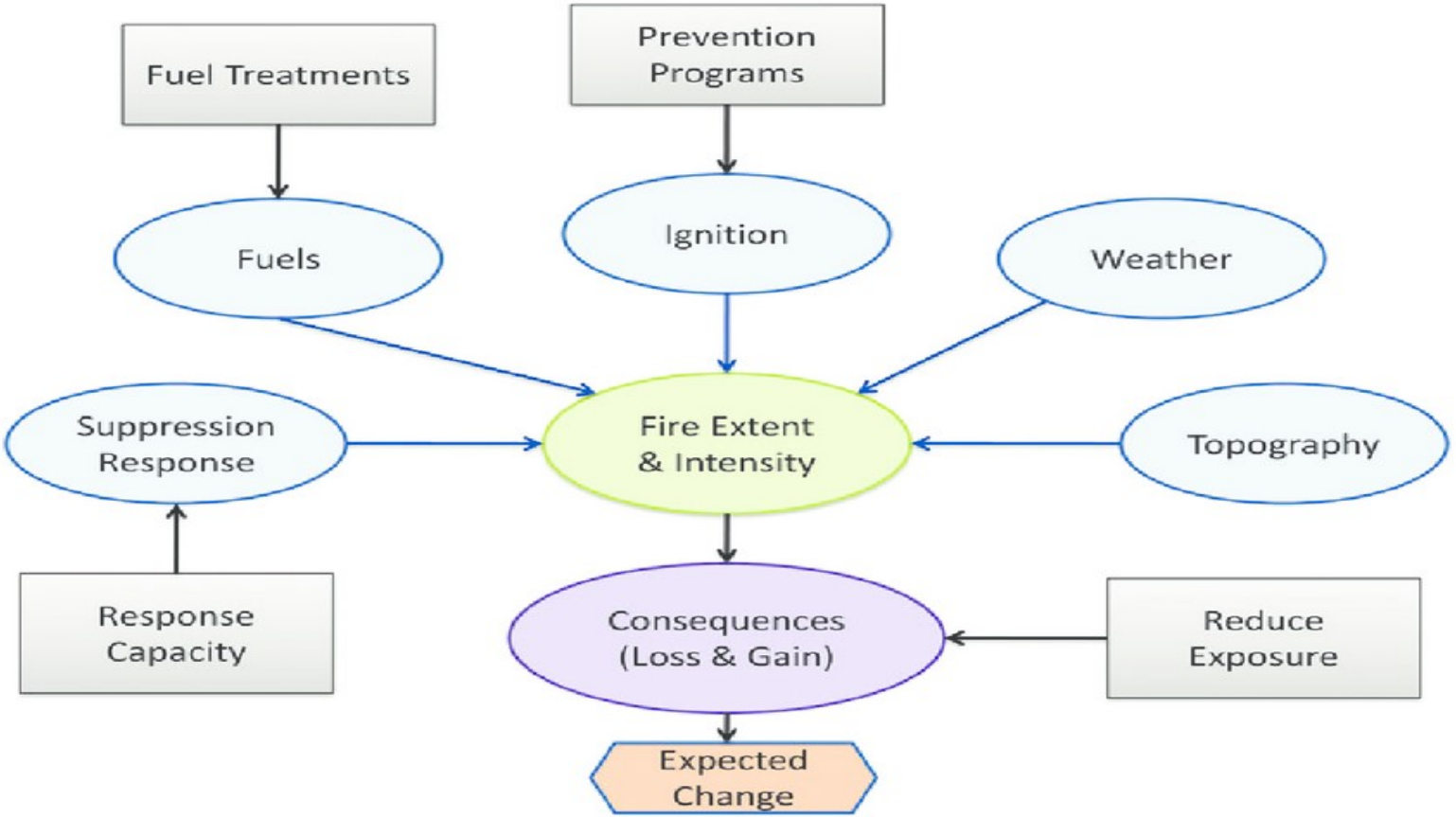
has output some carbon monoxide
has output some hydrogen chloride
has output some dihydrogen
has output some sulfur dioxide
has output some water vapour
hydrological process
material transport process

- EnvO - Big, but useful like FIBO, so pieces get us started and, ODPs may also be useful

After the Hazardous Situation Ontology Design Pattern Agnieszka Lawrynowicz & Ilona Lawniczak (2015)

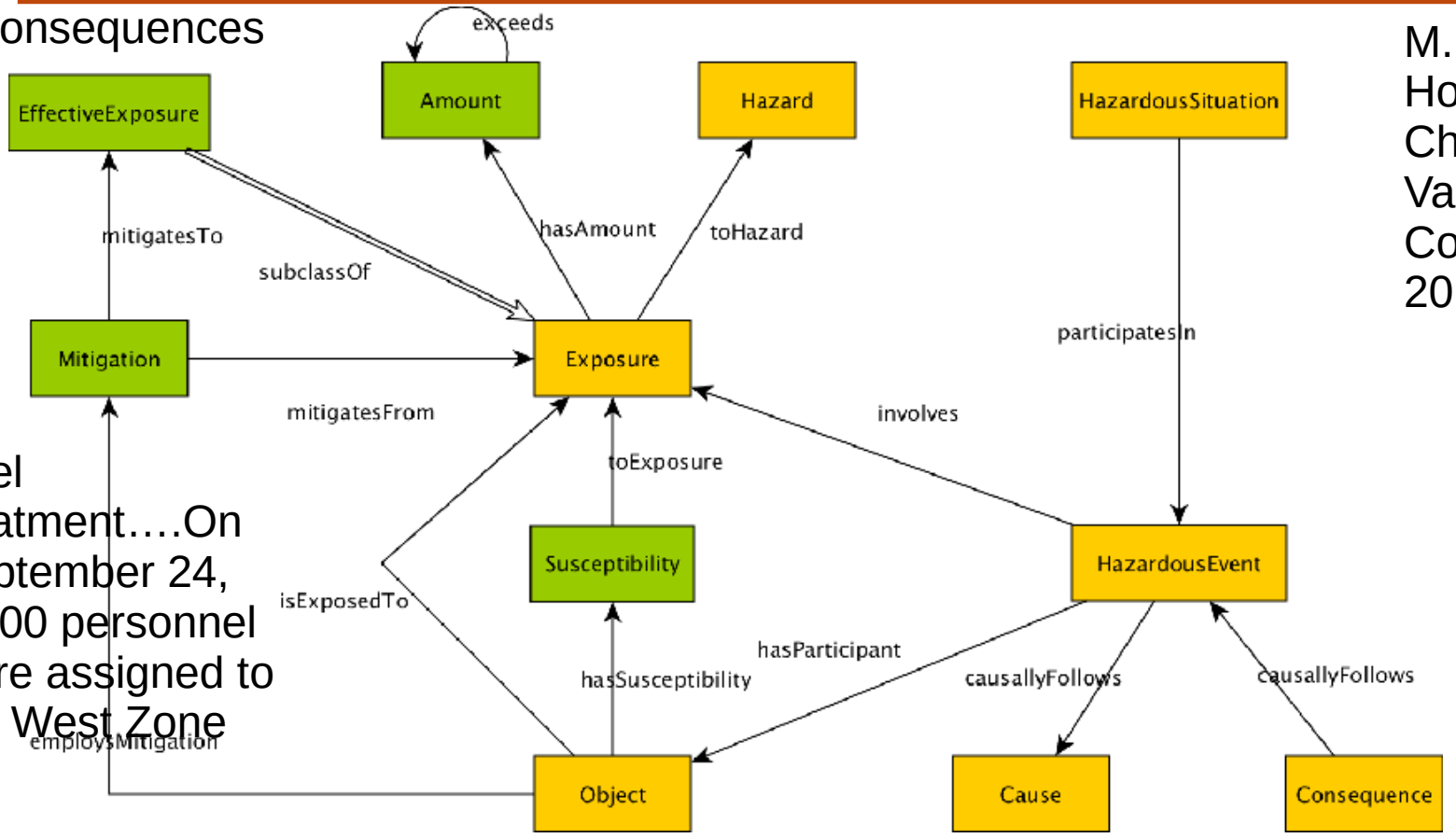


What about Mitigations?



A Modification to the Hazardous Situation ODP to Support Risk Assessment and Mitigation

consequences



M. Cheatham, Holly Ferguson, Charles Vardeman, Cogan Shimizu, 2016

Fuel treatment….On September 24, 2,000 personnel were assigned to the West Zone

Next Steps

- Leverage the OGC Disasters Pilot (a hot topic lately) https://www.ogc.org/projects/initiatives/dp21
- Identify Stakeholders
  - National reporting monitoring systems
  - National weather services
  - National wildfire monitoring services
  - Many others for example with Biohazards...
- Intergovernmental monitoring and data systems
  - WMO
  - UNESCO ODIS
- Private sector
  - ESRI
  - Google
- Clusters and groups in ESIP
  - Earth scientists
  - Cross-cutting
- Societal stakeholders
  - Agriculture
  - Humanitarian aid…..

ESIP July Session: Identifying technology capabilities that meet wildfire science and practitioner requirements

<u>Hazards to start with</u>

Wildfires & Floods
Riverine / terrestrial flooding
Coastal floods
Earthquakes / seismic events
Vulcanism
Extraterrestrial hazards
Solar flares
Debris flows
Atmospheric storms
Hurricanes / typhoons
Droughts
Marine hazards
Tsunamis & Coastal floods
Biological hazards
Pandemic
Bioterrorism / biowarfare
Invasive species/endangered species