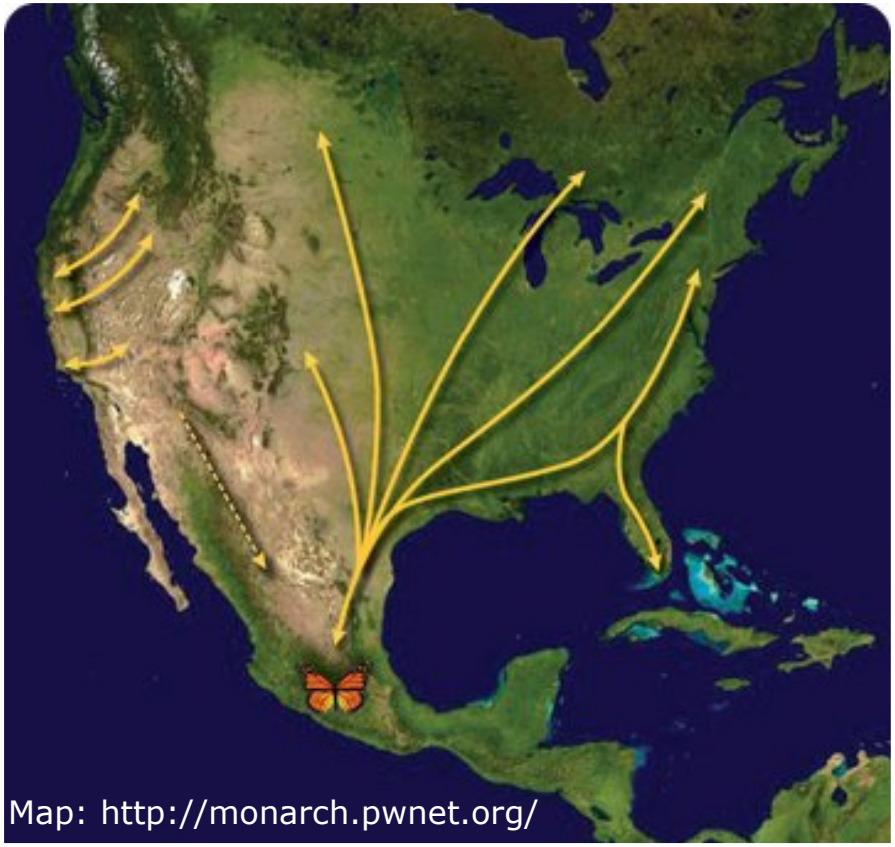
Found at Last:
The Monarch's Winter Home
(Fred Urquhart and Norah Urquhart, 1976).



Map: http://monarch.pwnet.org/

Restoration of a Process: Fire in the Monarch Butterfly Biosphere Reserve

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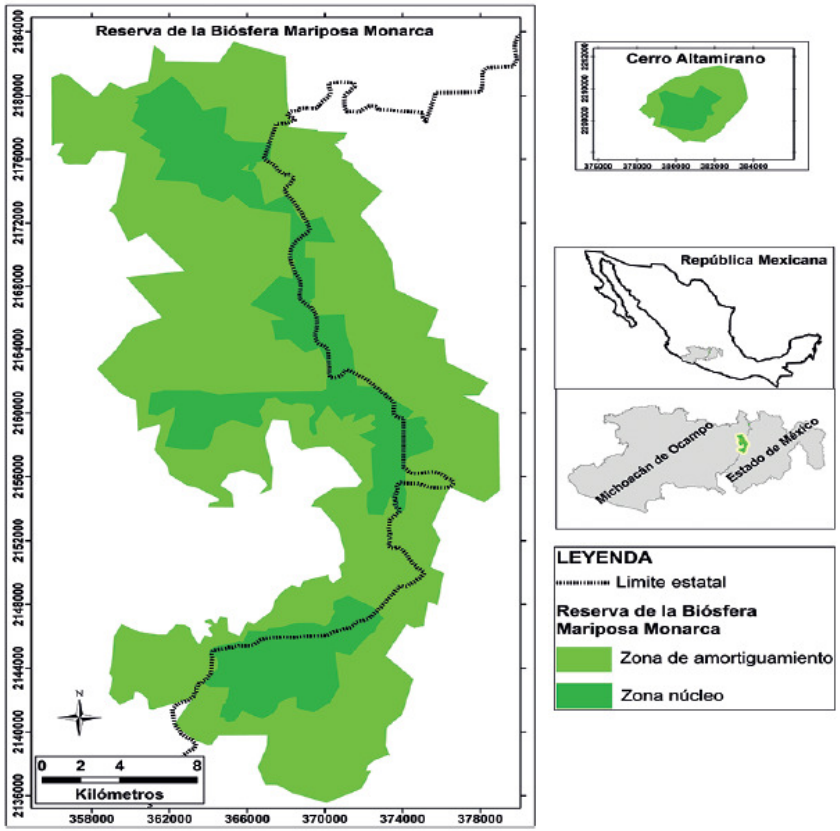
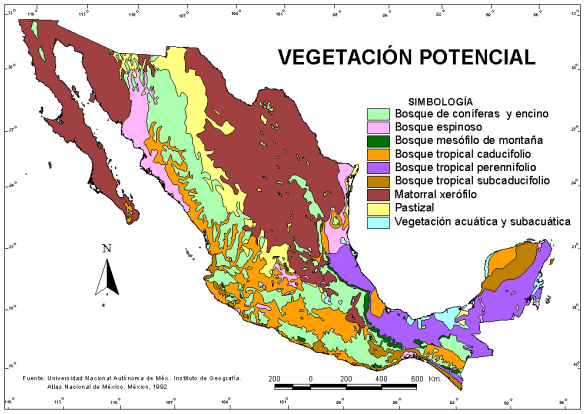
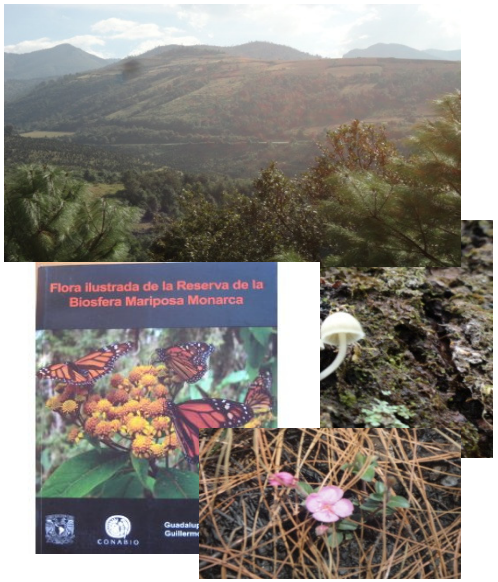
The Biosphere Reserve



- 56,259 ha
- Divided into three core areas (13,551 ha) where productive activities are not allowed, and two buffer areas (42,708 ha)
- 600 ha belong to the Federal Government of Mexico

Monarch Butterfly Biosphere Reserve





- Emblematic Biosphere in Mexico
- Representative Reserve of Mountain Ecosystems in Central Neovolcanic axis
- Provides key environmental services (Carbon sequestration and water regulation)
- Encloses large biodiversity
  - 4 major vegetation types
  - 700 + species of vascular plants
  - Presence of several endemic taxa

…also…

- Home to at least 27,346 inhabitants, in 63 settlements legally established
- Productive activities by these inhabitants have been traditionally seen as jeopardizing the ecological integrity of the MBBR
- Inhabitants might have both passively and actively modified the fire regimes in these forests

Kown historical events of the region

- Area given as Encomienda to Gonzalo de Salazar in 1550 by Viceroy de Mendoza
- Evidence of a catastrophic fires dated in 1670, and then another in 1883 (Garduño 2013)
- Mines first established in 1792

Coniferous Forests in the MBBR: Species with Contrasting Fire Regimes growing sympatrically

Dominance of Coniferous Forests

Pinus pseudostrobus	*Abies religiosa*
Grows in lower elevations	Grows in higher elevations
Associated with frequent (5 -10 years) , small (< 2 ha) fires of low intensities and severities	Associated with infrequent (> 25 years?), large (> 5 ha?) fires with higher intensities (passive crown fires) and severities (stand replacing fires)
	Forests where Monarch Butterfly hibernate

Fire regimes

- Sources of Ignition
- Frequency
- Intensity
- Severity
- Size
- Shape and continuity
- Synergies

Research questions

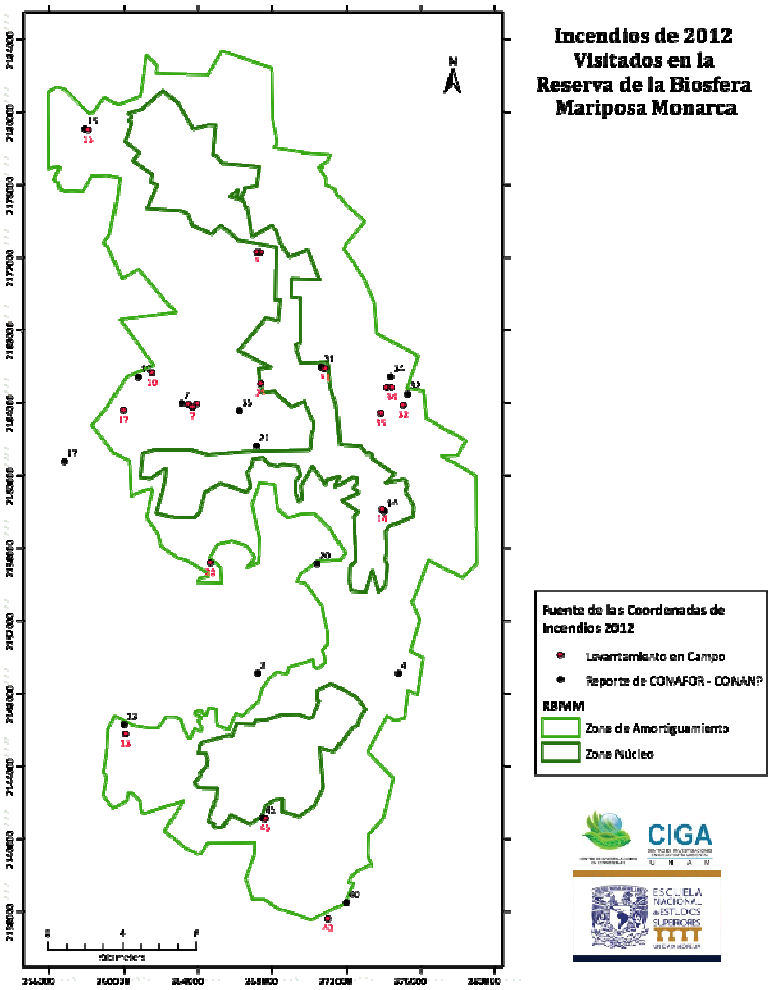
- Under the premise that fire management strategies that mimic natural fire regimes will have a lower impact upon ecosystem integrity:
  - How are do local inhabitants and authorities manage fire, and how far is this management from natural fire regimes?
  - Can we restore fire as a process in this ecosystem?

First Question: Can we trust the historical data collected by authorities in the Reserve?

- Select some sites with fire reports from the 2012 season fire season, visit them, and evaluate Sources of Ignition, intensity, severity, and size

- Contrast location and size of fires with data generated by fire brigades

Results: Fires and Fires visited 2012 (Cantú 2013)



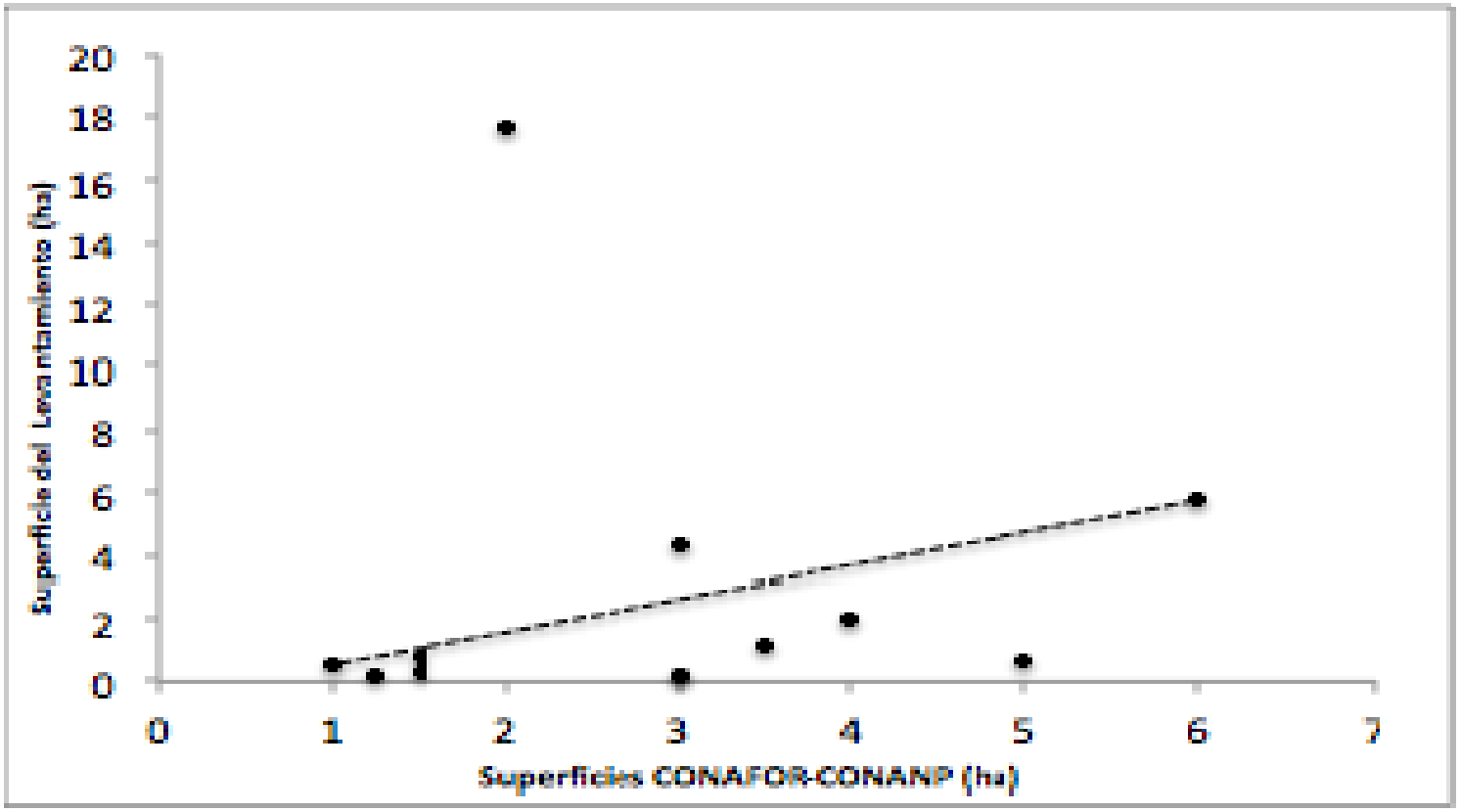
Distances
For 11 fires, distance < 1 km

3 fires with distances 3 – 10 km

2 fires with distances > 20 km

Number of fires
Two fire events were in fact six separated areas

Results: Fire size (contrast of official data with visits´) Cantú 2013



Wilcoxon z = 60, p = 0.014

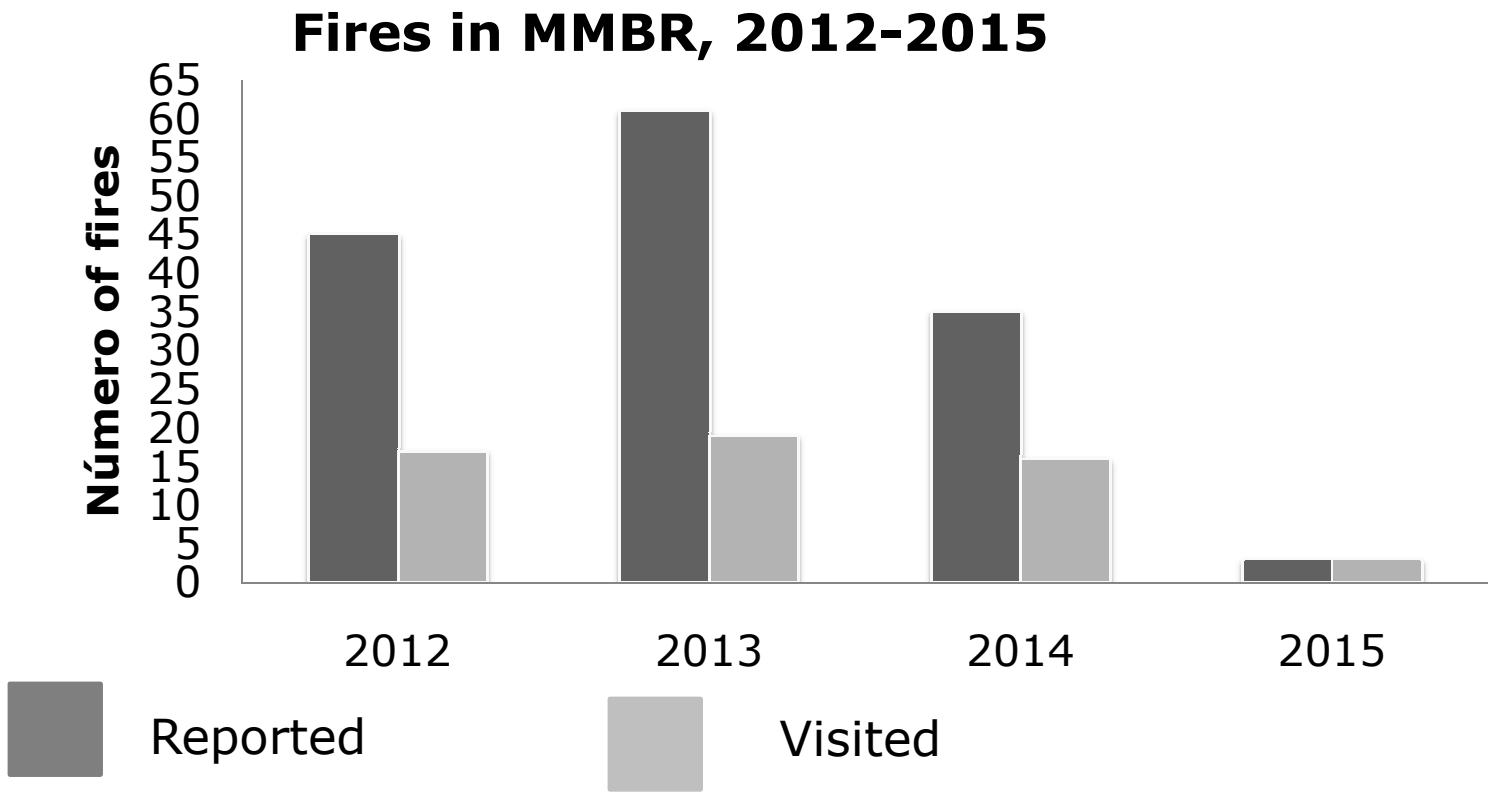
Result:

- We could not trust the historical fire records for the MBBR

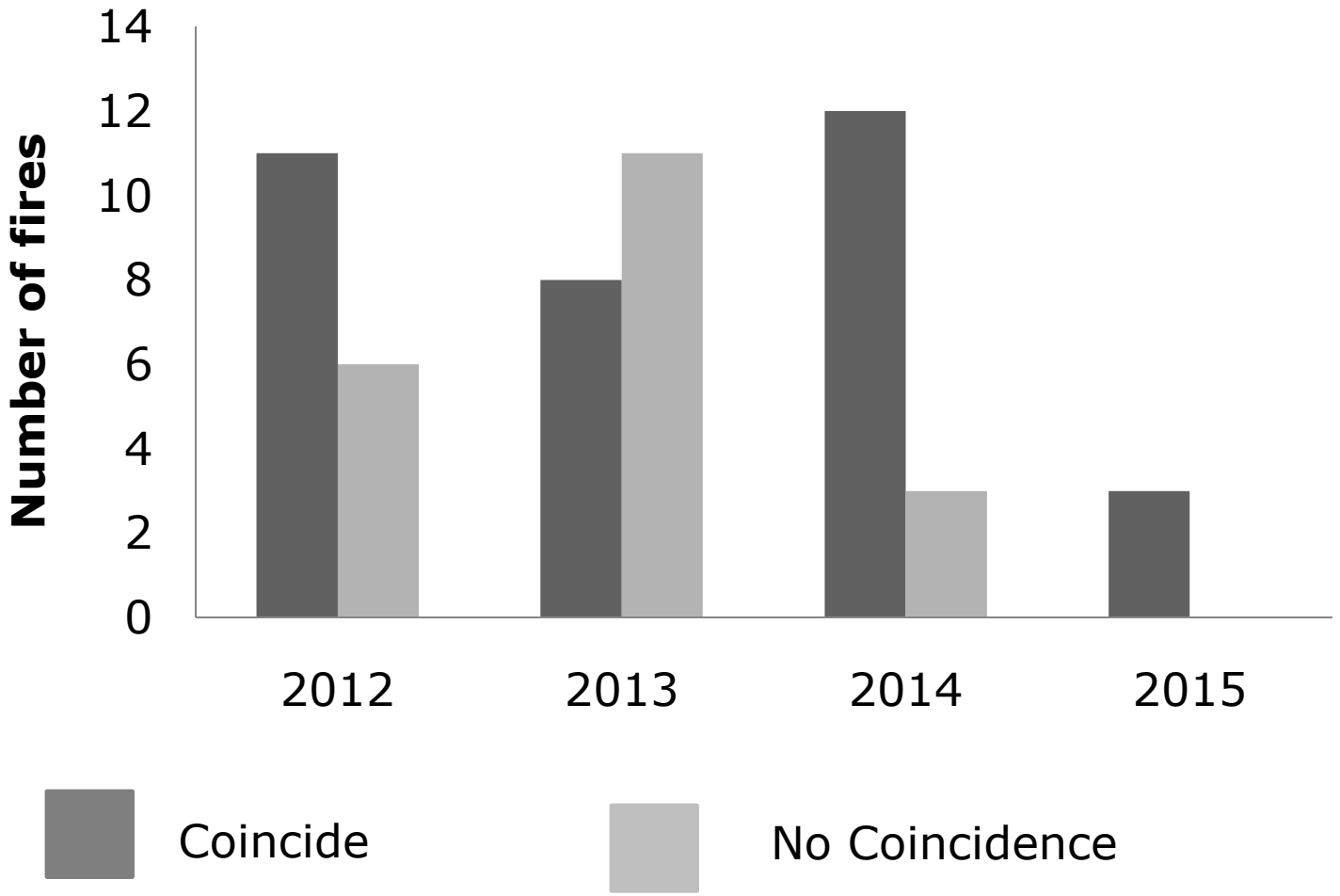
- Data were inaccurate in terms of the number of fires, their location and their extension

2012 to present

- Follow fires in subsequent years, and create our own data base



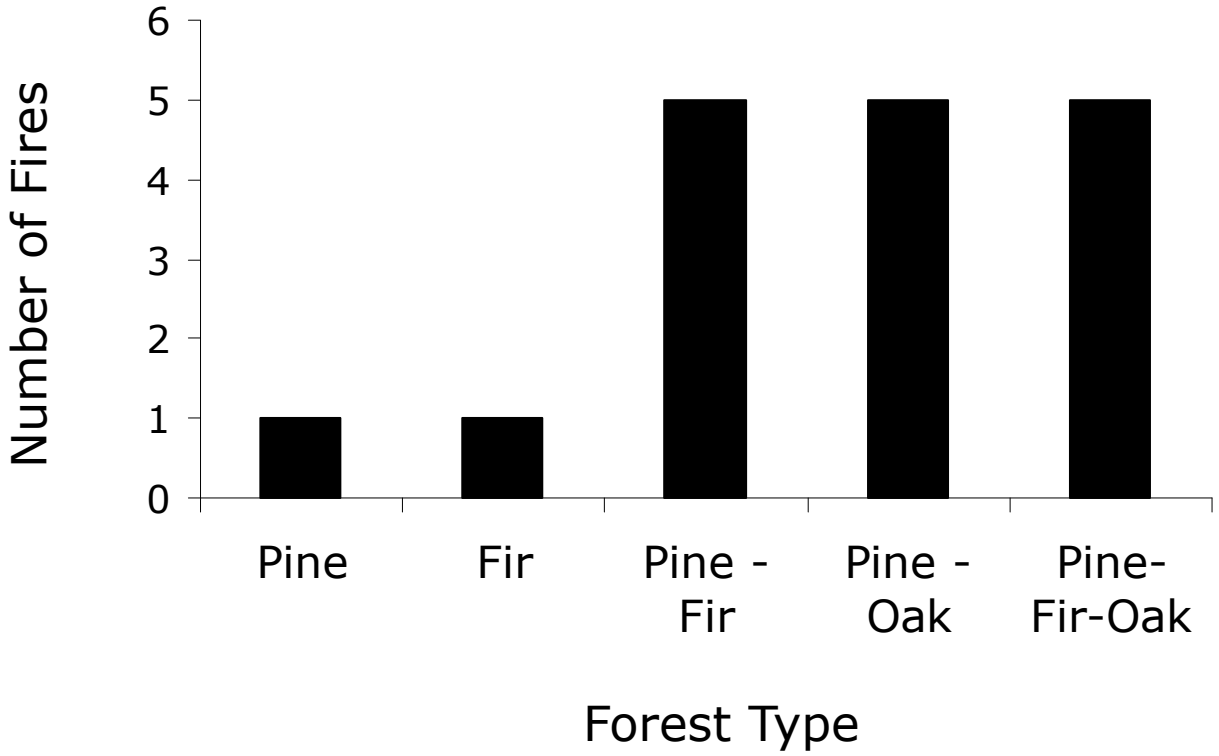
Story at different years



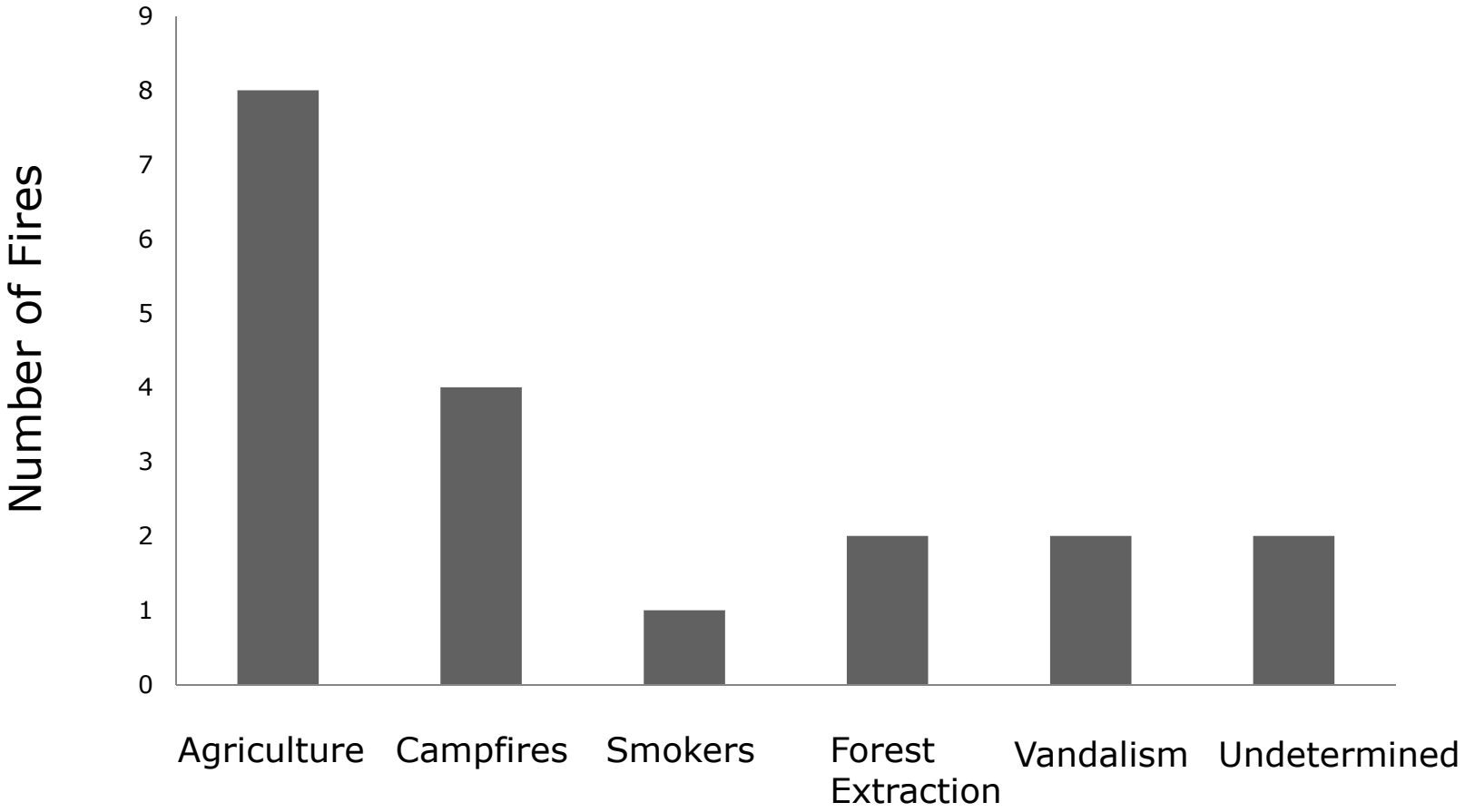

ECOLOGÍA Y MANEJO DE RECURSOS FORESTALES, UNAM-IIES


ECOLOGÍA Y MANEJO DE RECURSOS FORESTALES, UNAM-IIES

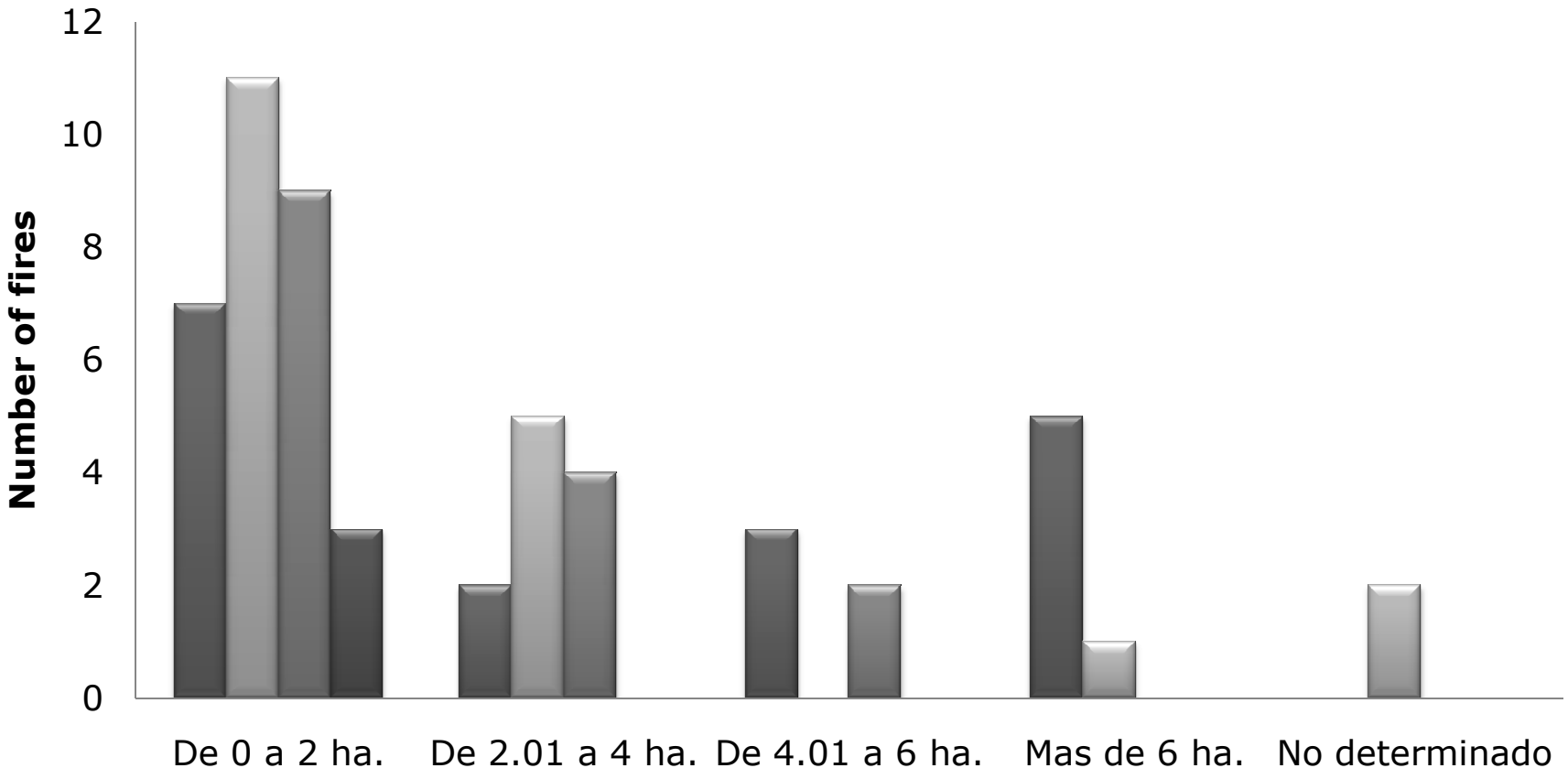
Results: Vegetation type (2012 fires)



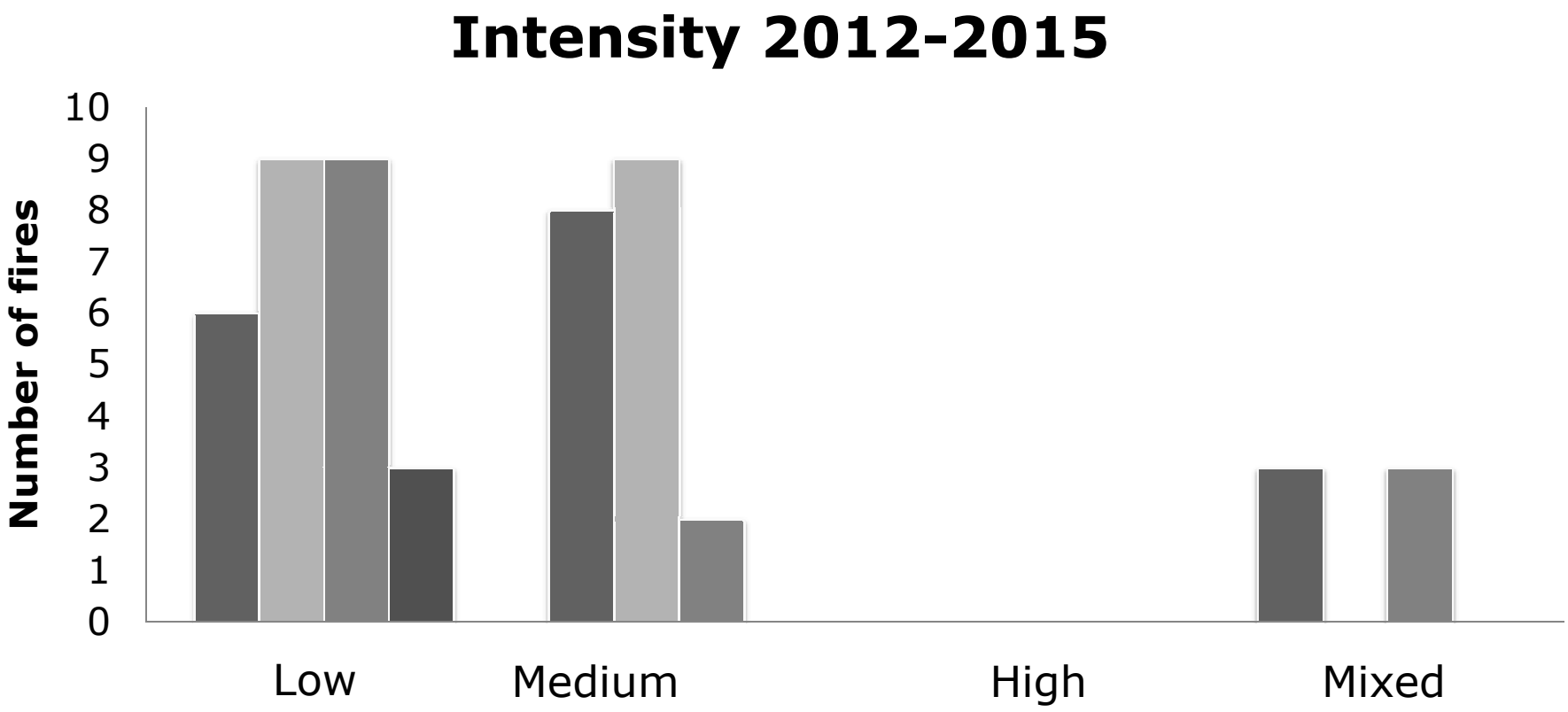
Sources of Ignition (2012 visited fires)



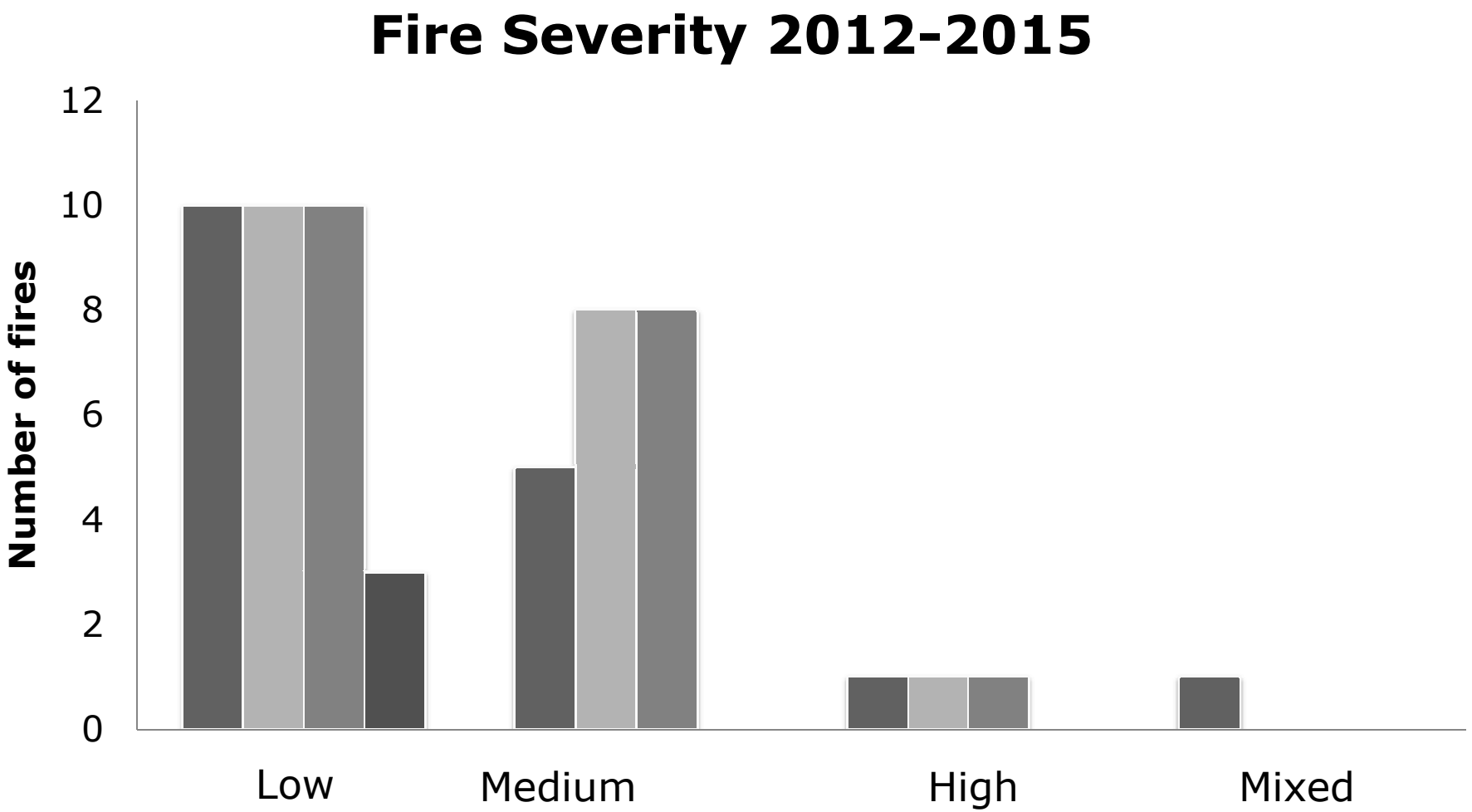
Results: Extension



Results: Intensity



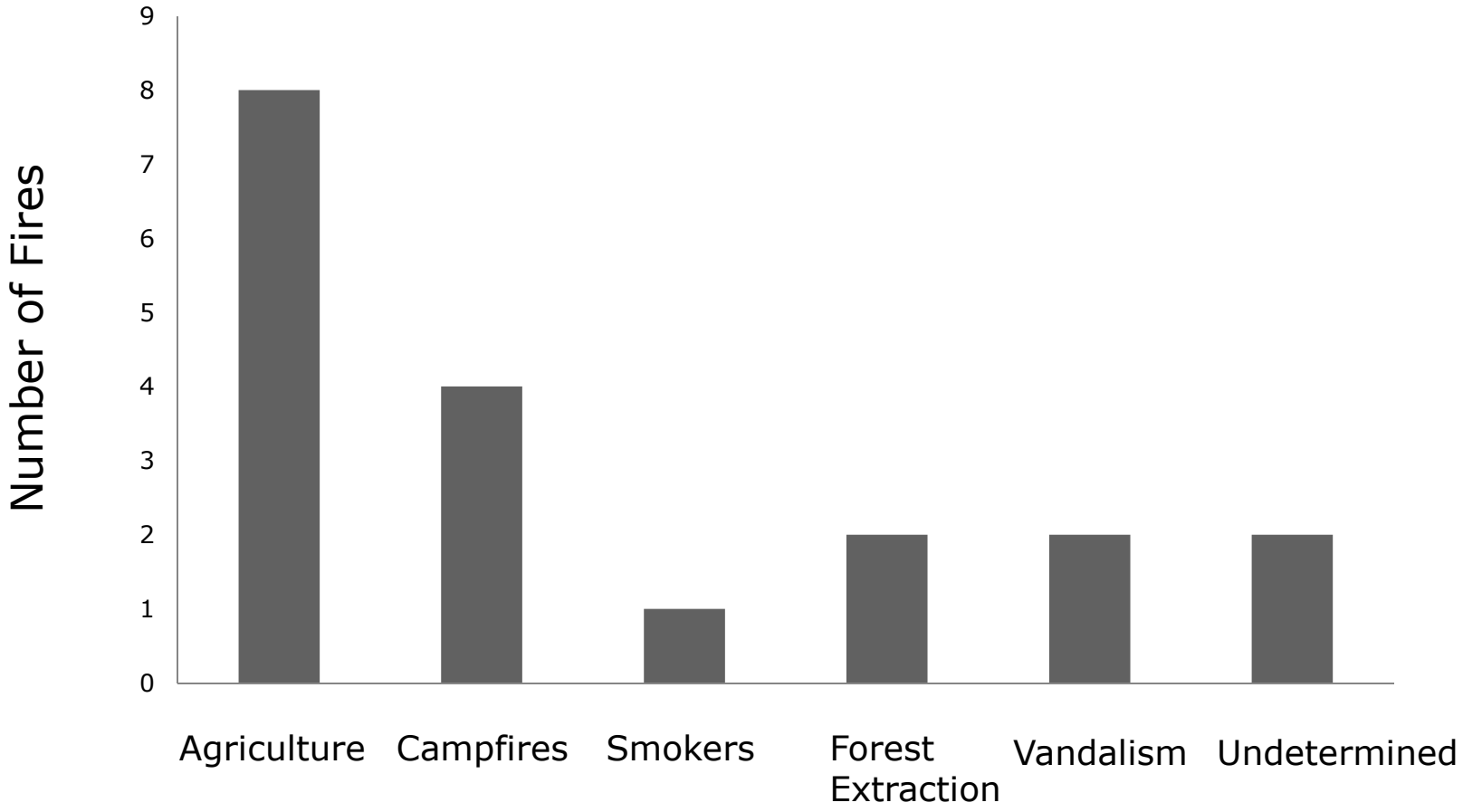
Results: Severity



Summary of this part

- Could not trust historical fire data from the reserve, so we had to collect our own data by following fires (2012-2017)
- Most fires are < 2 ha, with low intensities and severities
- There are no differences in fires between *Pinus pseudostrobus* and *Abies religiosa* forests

Sources of Ignition (2012 visited fires)
Institutional Response and Local Fire Management

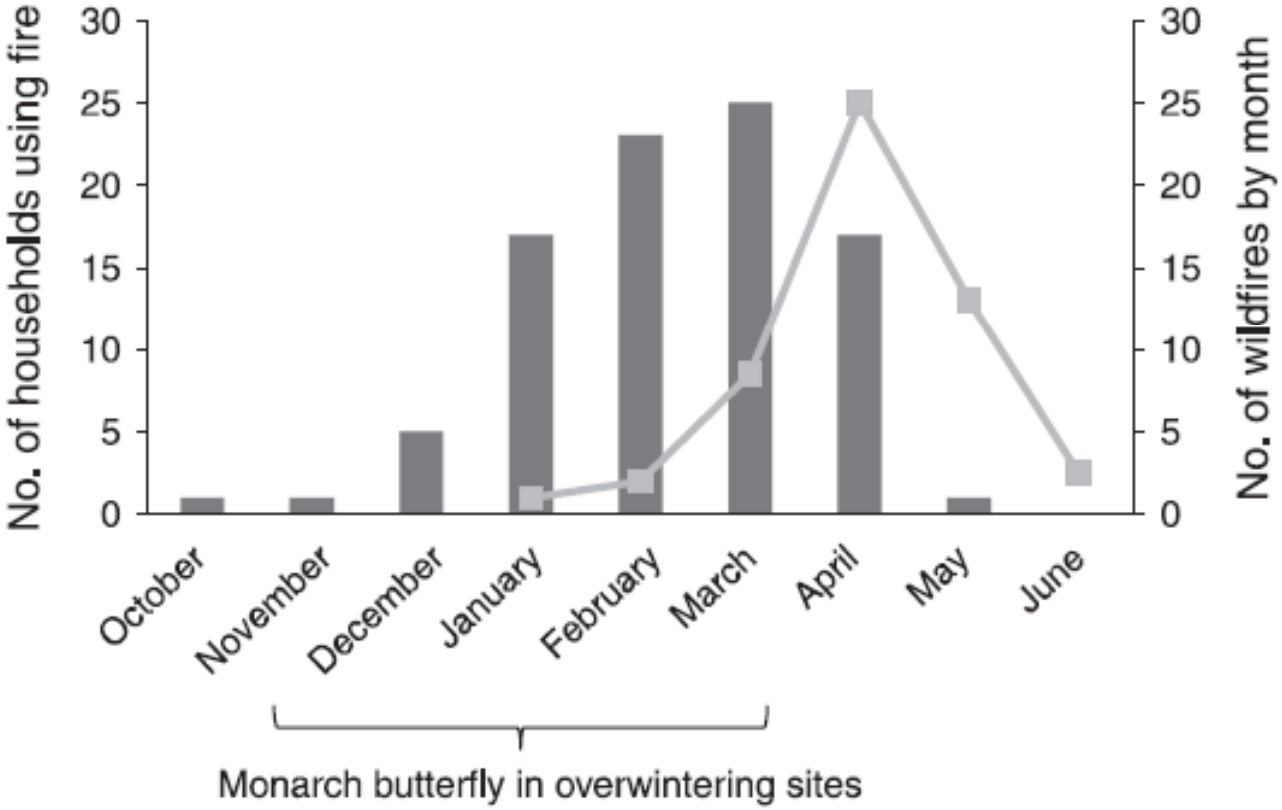


Different Uses of Fire (Martínez-Torres et al. 2016 IJWF)

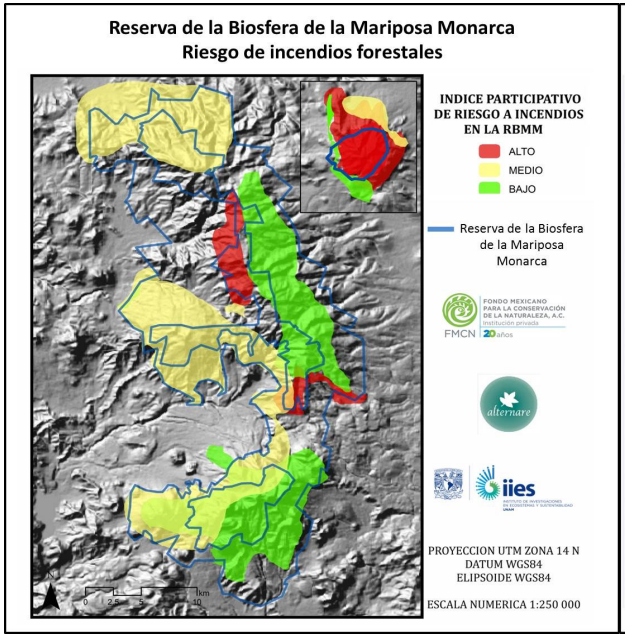
Major points

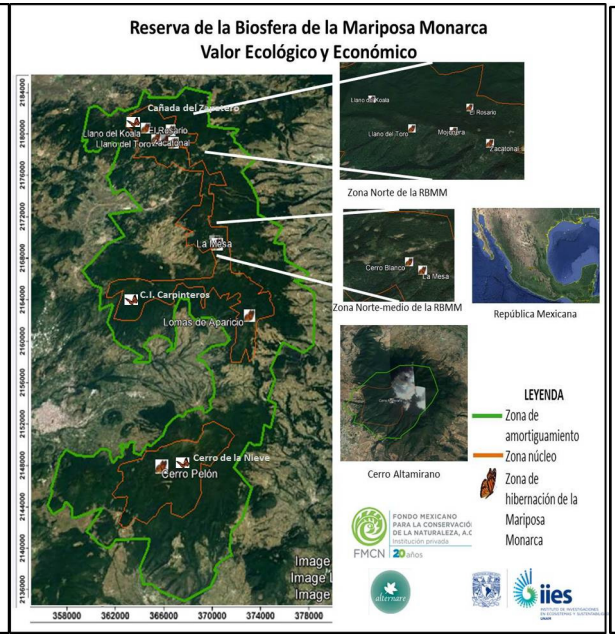
- 9 types of fire use
- The most conspicuous fire use is for agriculture, which consists of mound burning
- Traditional use of fire is transmited within families
- Losing this knowledge could be detrimental to fire management in the long term

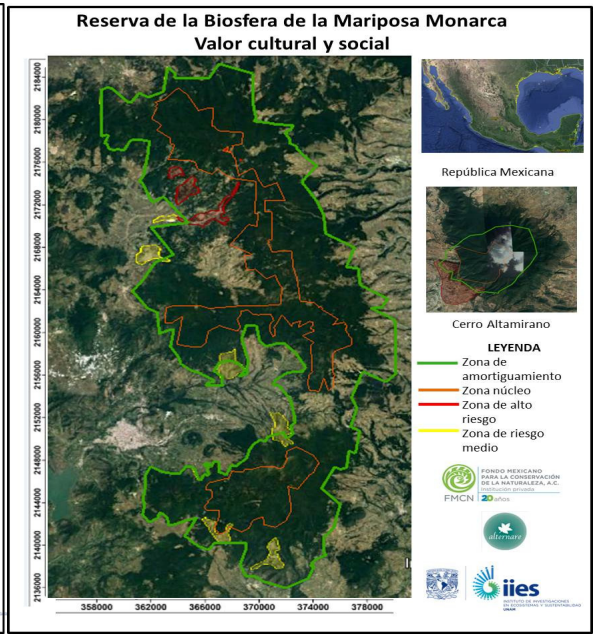
Use of fire by households vs. No. Of wildfires in the MBBR (Martínez-Torres et al. 2016 IJWF)



Risk, ecological, economic, cultural, and social values







Fire Management Plan for the MBBR

Plan integral del Manejo del Fuego en la Reserva de la Biosfera Mariposa Monarca: Acción e Investigación Participativa y Adaptable

Alternare

FMCN

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Thank you, gracias!