EL COLEGIO DE SONORA

"**Socialshed**: Unveiling the social structure of a watershed, San Miguel river case study in Sonora, Mexico."

Presentation prepared for the 2019 SNRE Spring Seminar, University of Arizona

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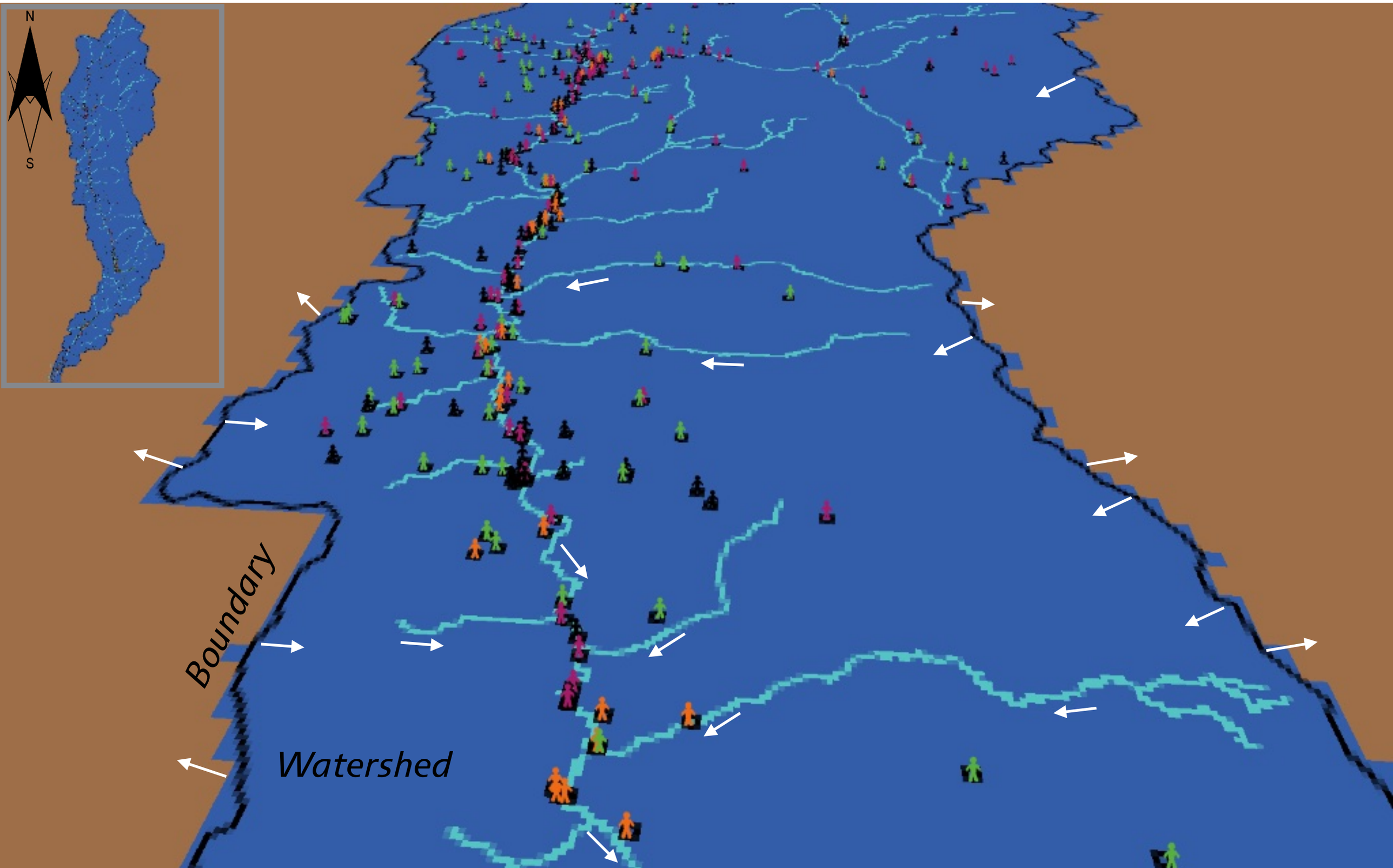
Sustainable Development Goals (SDG) UN

El Colegio de Sonora

- A Research Center **founded in 1982**.
- Located in **Hermosillo, Sonora, México.**
- URL: www.colson.edu.mx
- **Social and political sciences. Study subjects:** Public Policy, Government, Public Health, Economic Development, Migration, History.
- We are **35 researchers - professors.**
- Students (**only graduate programs:** Master and Doctorate).
- I am working in the academic group of: **Integrated Water Management in Arid Lands.**
- Has a long and successful history of collaboration with researchers from the **University of Arizona**.

El Colegio de Sonora (Photo: Alan Navarro 2019)

What is the problem?



What is the problem?

- Multiple independent water users.
- Water flow interconnected, so are benefits and inconveniences (such as pollution).
- A watershed as a natural boundary is an arena for social dilemmas ("Tragedy of the Commons" [Hardin, 1968]).
- Some sort of coordination and cooperation among water users is needed to avoid the destruction of the commons.
- This "coordination and cooperation" is conveyed through a formal organization known as "Water Council."

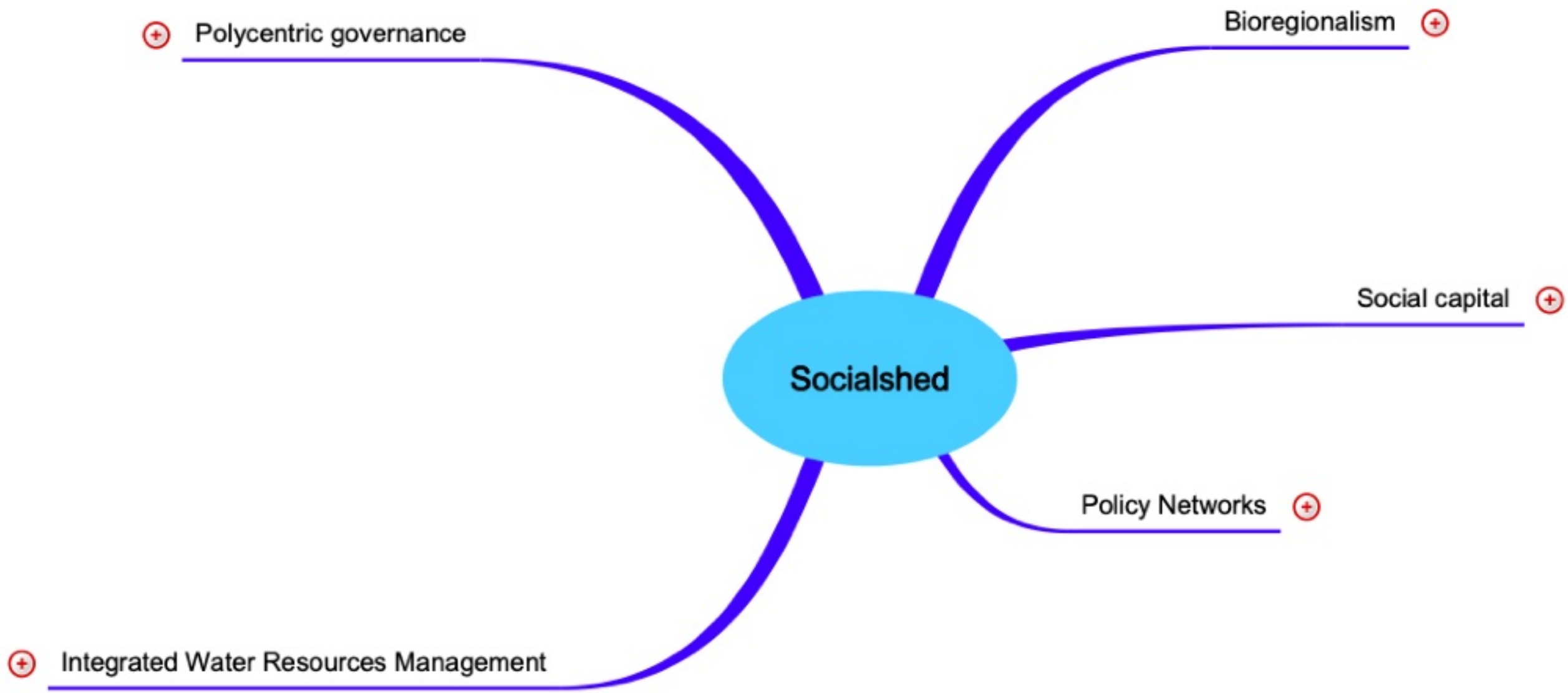
Boundary

Watershed

What is a Socialshed and Why it 's important?

For short: Socialshed is the social connectivity of a watershed.

I borrowed ideas from different theoretical frameworks:



- ***All these theoretical approaches have a common denominator:*** ***Social connectivity (of some sort).***
- ***So, I wonder,*** ***Is it possible to have social participation, cooperation, coordinated action, and agreements without Social Connection? (to achieve these macro-orders at a watershed level).***
- ***What is the Watershed Social Connectivity?***
- ***That's how I decided to map (any) meaningful Social Connectivity at a watershed level (in a case study).***

Bioregionalism: Socialshed

Bioregionalism

Peter Berg (1937-2011)

Michael Vincent McGinnis

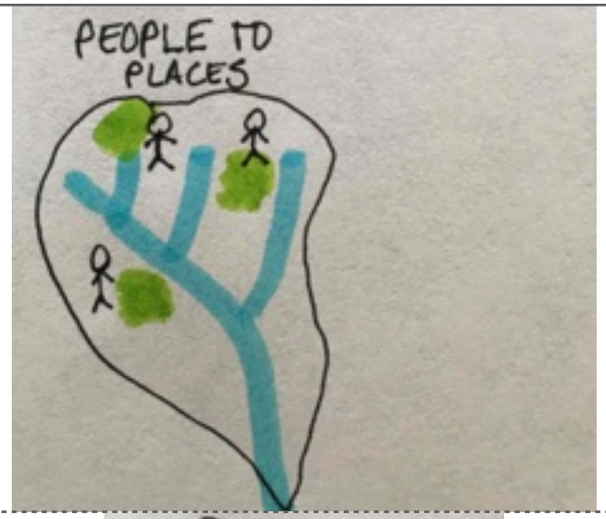
Socio-Ecological Networks (Janssen et al., 2006)

Bioregionalism: Socialshed

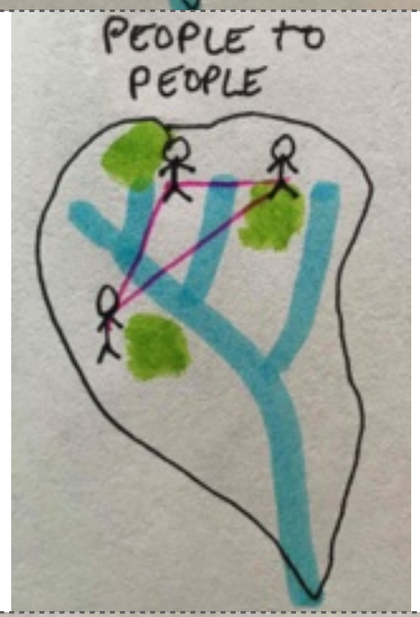
- Concept coined by **Peter Berg** (1937-2011) **(Berg, 1987)** was an advocate of the concept of **Bioregionalism**.
- **Bottom-up** formation of a **Water Council**.
- McGinnis et al., (1999) “a watershed is a representation of a bioregion.”
- My interpretation of **Bioregionalism:** Grassroots activism for nature conservation; people connectedness (and awareness) to places, landscapes, and nature; man-made Vs. natural boundaries. At the other side of the spectrum: Urban people who ignores where tap-water comes from, “insulated from nature.”

Bioregionalism: Socialshed (breaking down the concept)

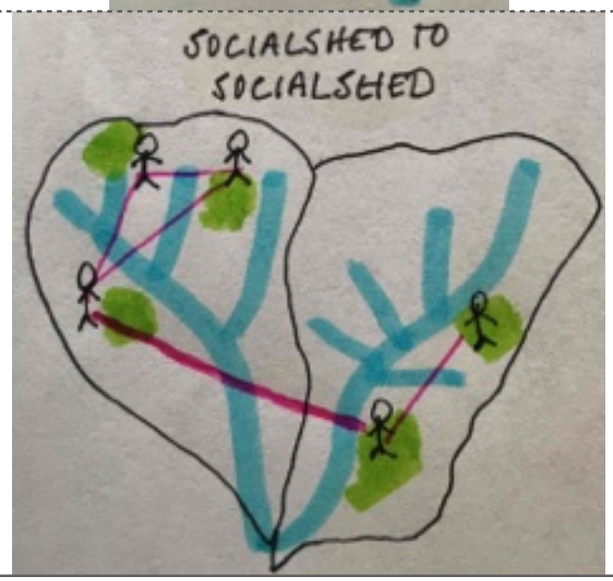
1. “**Individuals** who identify with real **places** and find ways to interact positively with the life-web around them.” (Berg, 1987:7)



2. “Involving nearby watershed **neighbors** creates a ‘socialshed’.” (Berg, 1987:7)



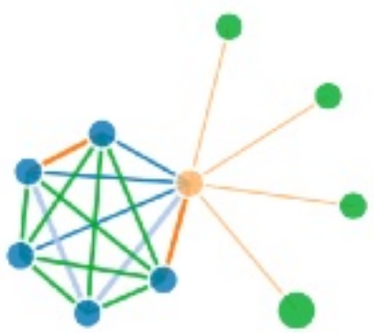
3. “Several ‘socialsheds’ of neighbors working on a wide variety of different projects can easily join together to for an organization … In effect, it would be a **Watershed Council** …” (Berg, 1987:7)



Structural dimension of social capital: Socialshed

Social capital

Structural dimension



Social networks

Mark Granovetter "social embeddedness"

(Granovetter, 1985)

Michael Woolcock (World Bank)

(Woolcock & Narayan, 2000)

Wendy Stone, Director AHURI-Swinburne Research Center

(Stone & Hughes, 2001)

IWRM: Socialshed

United Nations (UN) Sustainable Development Goals: 6.5 Integrated Water Management (2015)

In Mexico, IWRM is mandated in the Law of the Nation's Waters (Ley de Aguas Nacionales [LAN] 1992 and amended in 2004).

GWP-TAC (2000)

UN Conference on Water (Mar de Plata 1977)

Integrated Water Resources Management (IWRM)

💧*Case study: Mexico, San Miguel Watershed/Aquifer*

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- **House-Peters, L. A., & Scott, C. A. (2011, September).** Assessing the impacts of land use change on water availability, management, and resilience in arid region riparian corridors: A case study of the San Pedro and Rio Sonora watersheds in southwestern USA and northwestern Mexico. In Procedings of the XIV World Water Congress of the International Water Resources Association, Porto de Galinhas, Brazil (pp. 25-29).
- **Lutz-Ley, A.N. (2016)** Human Adaptation to Social and Environmental Change in Rural Communities of the San Miguel Watershed in Arid Northwest Mexico. The University of Arizona Doctoral Dissertation. http://hdl.handle.net/10150/623176
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- **Pope, A. J., & Gimblett, R. (2015).** Linking Bayesian and agent-based models to simulate complex social-ecological systems in semi-arid regions. Frontiers in Environmental Science, 3, 55. https://doi.org/10.3389/fenvs.2015.00055
- **Sheridan, T. E., & Nabhan, G. P. (1978).** Living with a River: Traditional Farmers of the Rio San Miguel. The Journal of Arizona History. Arizona Historical Society. https://doi.org/10.2307/42678182
- **Sheridan, T.E. (1988).** Where the Dove Calls: The Political Ecology of a Peasant Corporate Community in Northwestern Mexico. Tucson: University of Arizona Press.
- **Sheridan, T. E. (1996).** La Gente Es Muy Perra Conflict and Cooperation over irrigation water in Cucurpe, Sonora, Mexico. In J. B. Mabry (Ed.), Canals and communities: small-scale irrigation systems (p. 273). Tucson: University of Arizona Press.

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- **Hauser-Petersen, A., [illegible] (2015).** [illegible] climate change impacts on water availability, management, and resilience in arid region riparian corridors: A case study of the San Pedro and Rio Sonora watersheds in southwestern USA and northwestern Mexico. In Proceedings of the XIV World Water Congress [illegible] Porto de Galinhas, Brazil (pp. 25–29).
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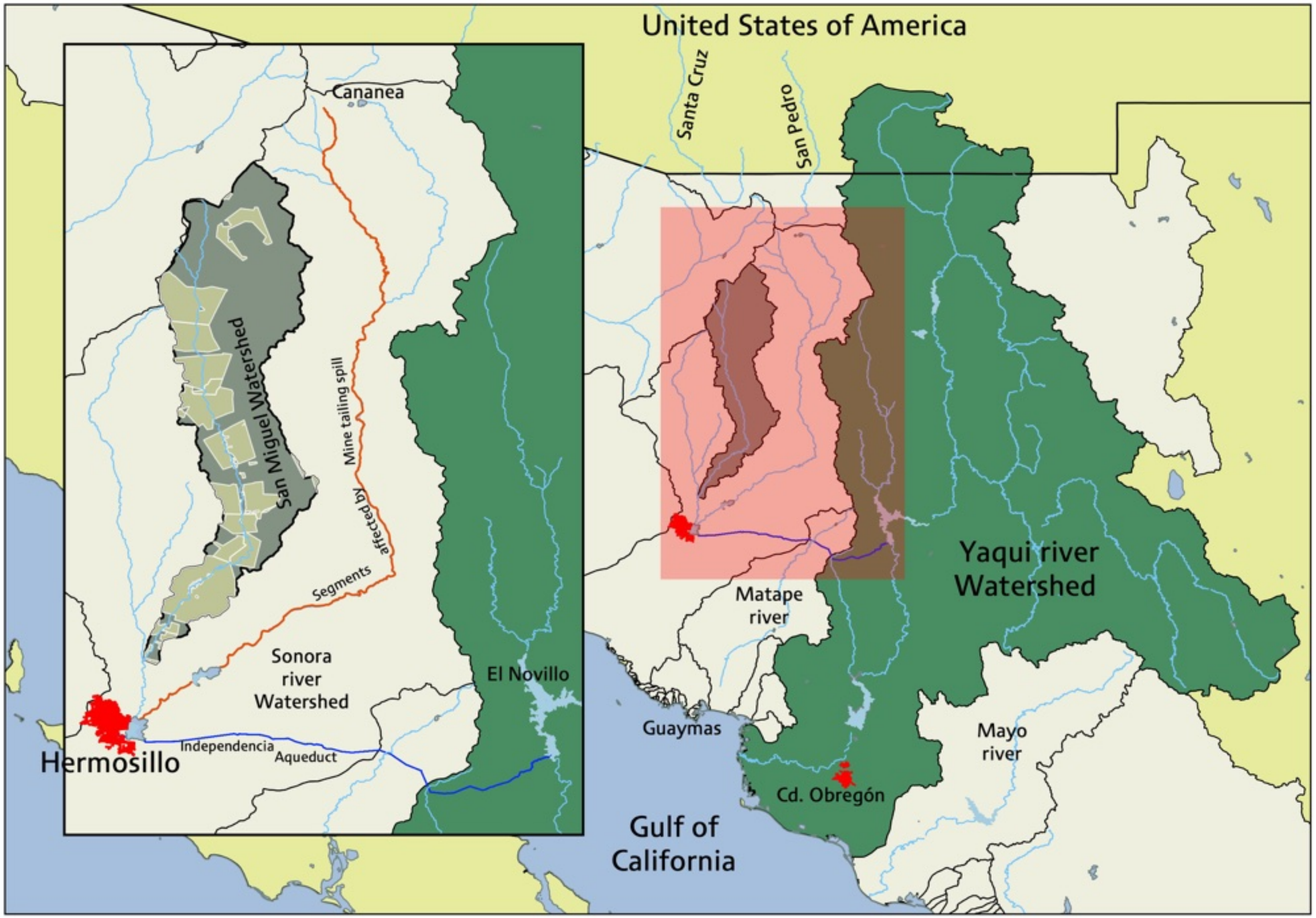
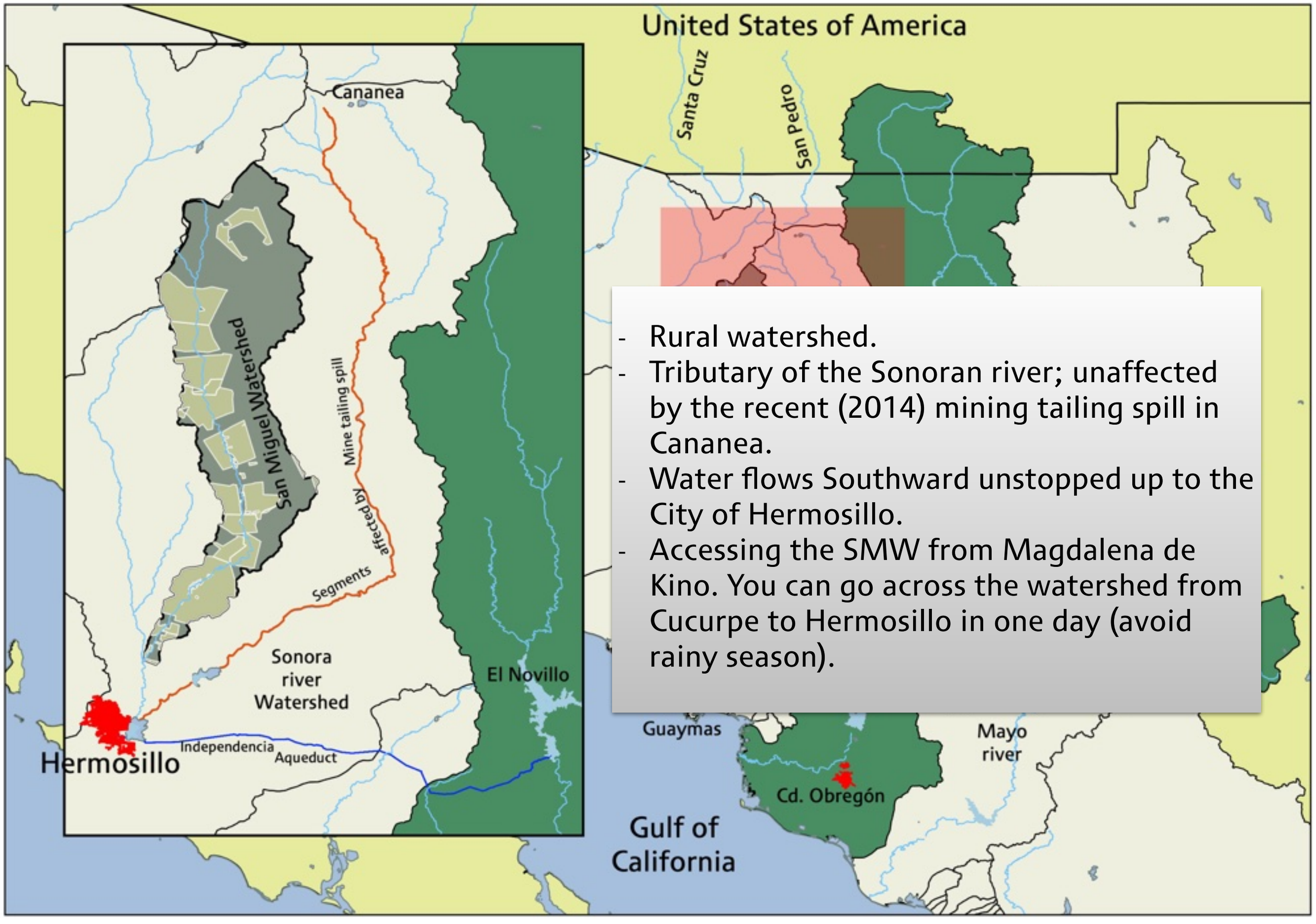
11 (at least) products (theses, dissertations, articles, books, research reports, etc.) which took the "San Miguel" as case study.

Projects initiated from The University of Arizona.

Where is the SMW located?



Visit this link to Google Maps for geotagged photos and GPS road-tracks



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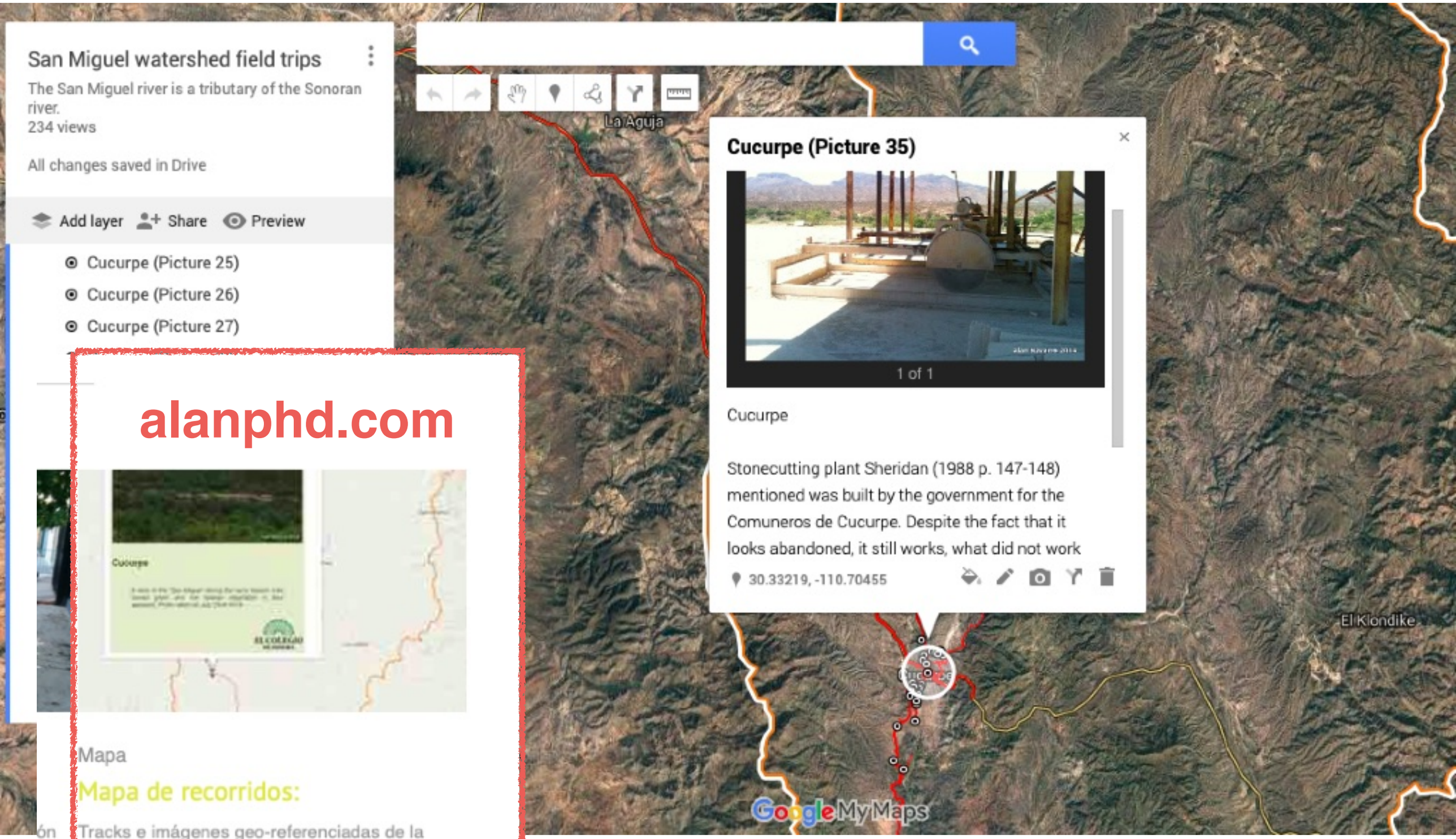
San Miguel Watershed field trips



alanphd.com

Mapa

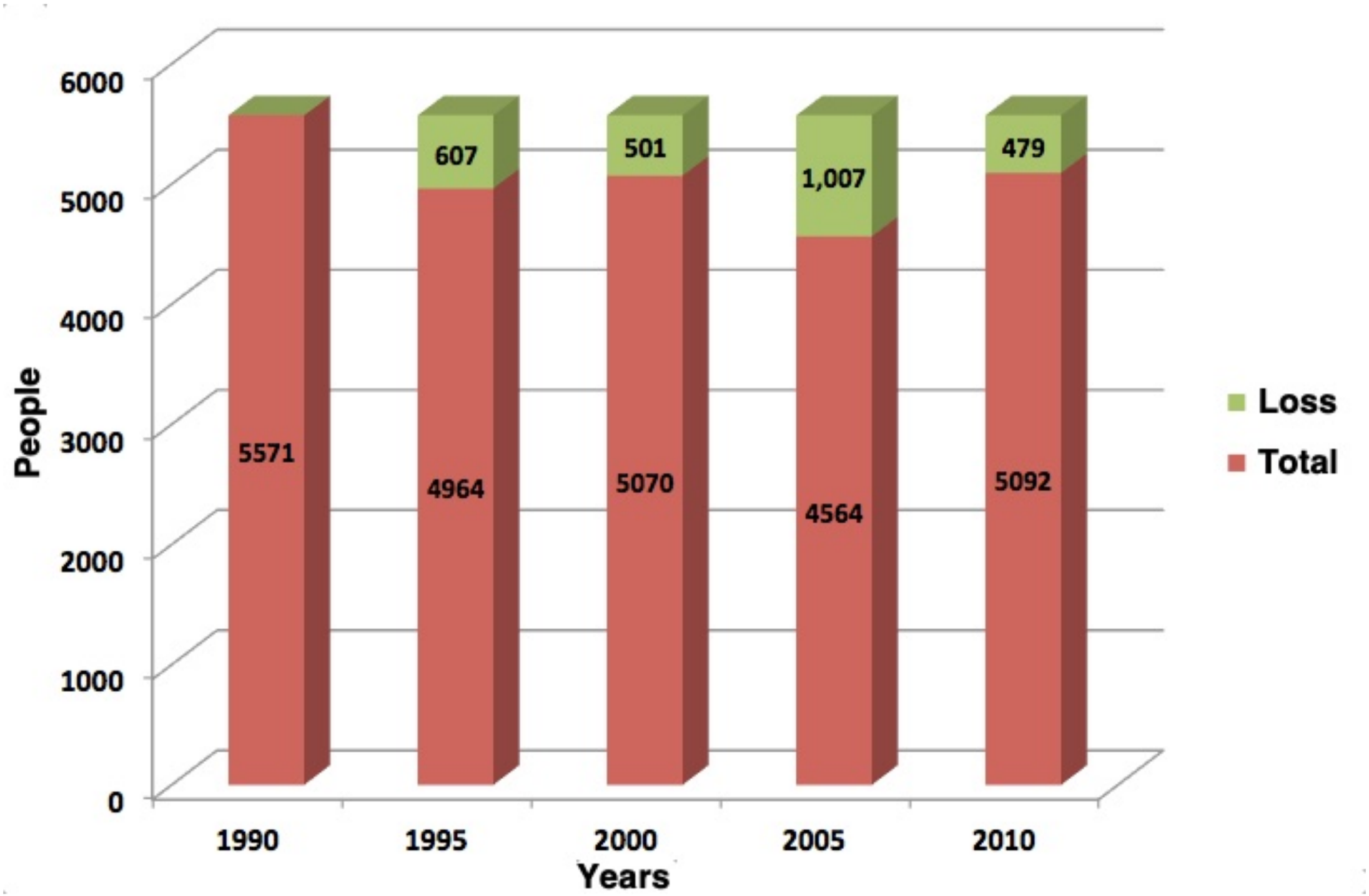
Mapa de recorridos:

Tracks e imágenes geo-referenciadas de la cuenca.

Watershed boundaries, GPS tracks, geotagged pictures with caption in English

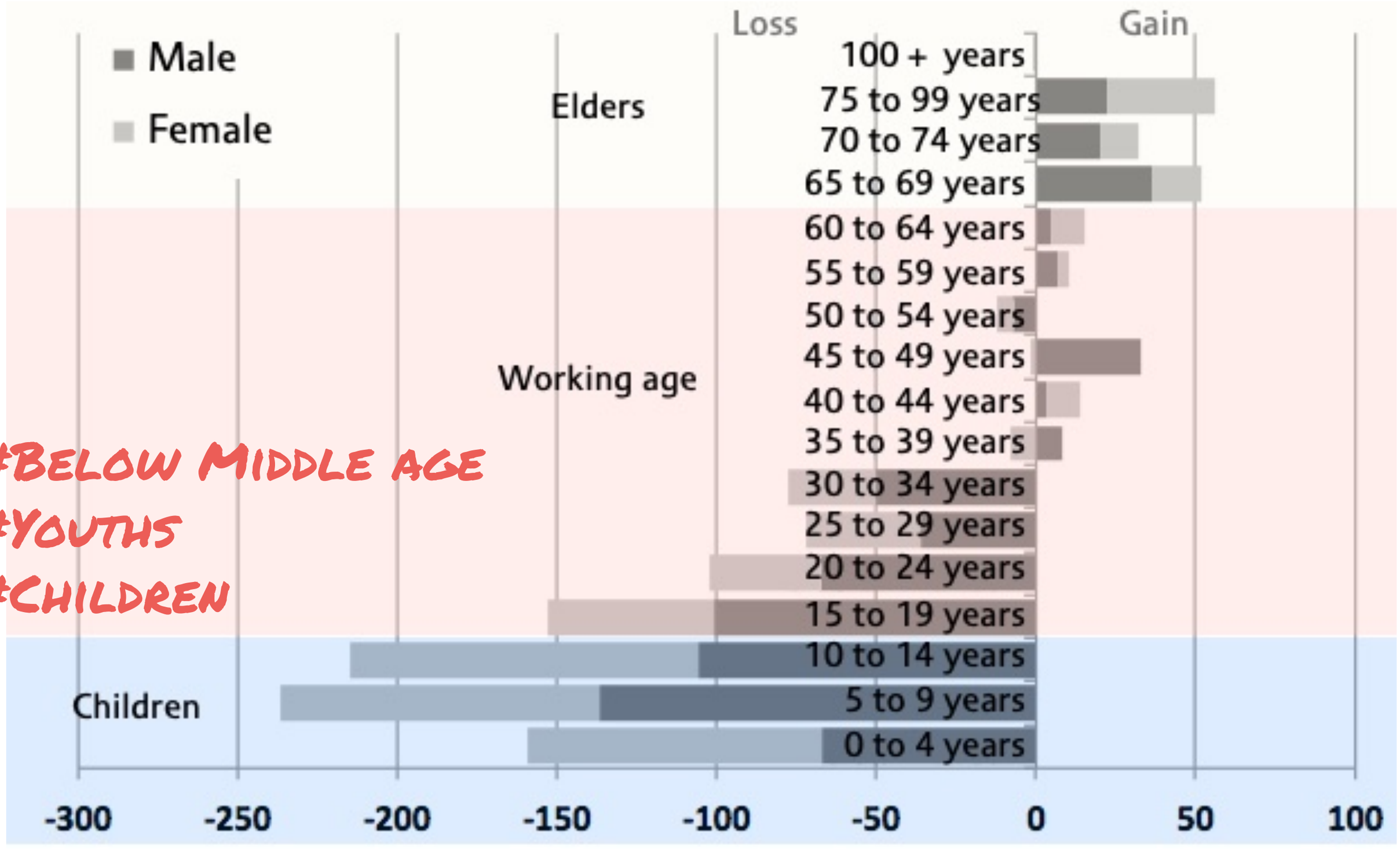
SMW: Population change (1990-2010)

#Out-migration



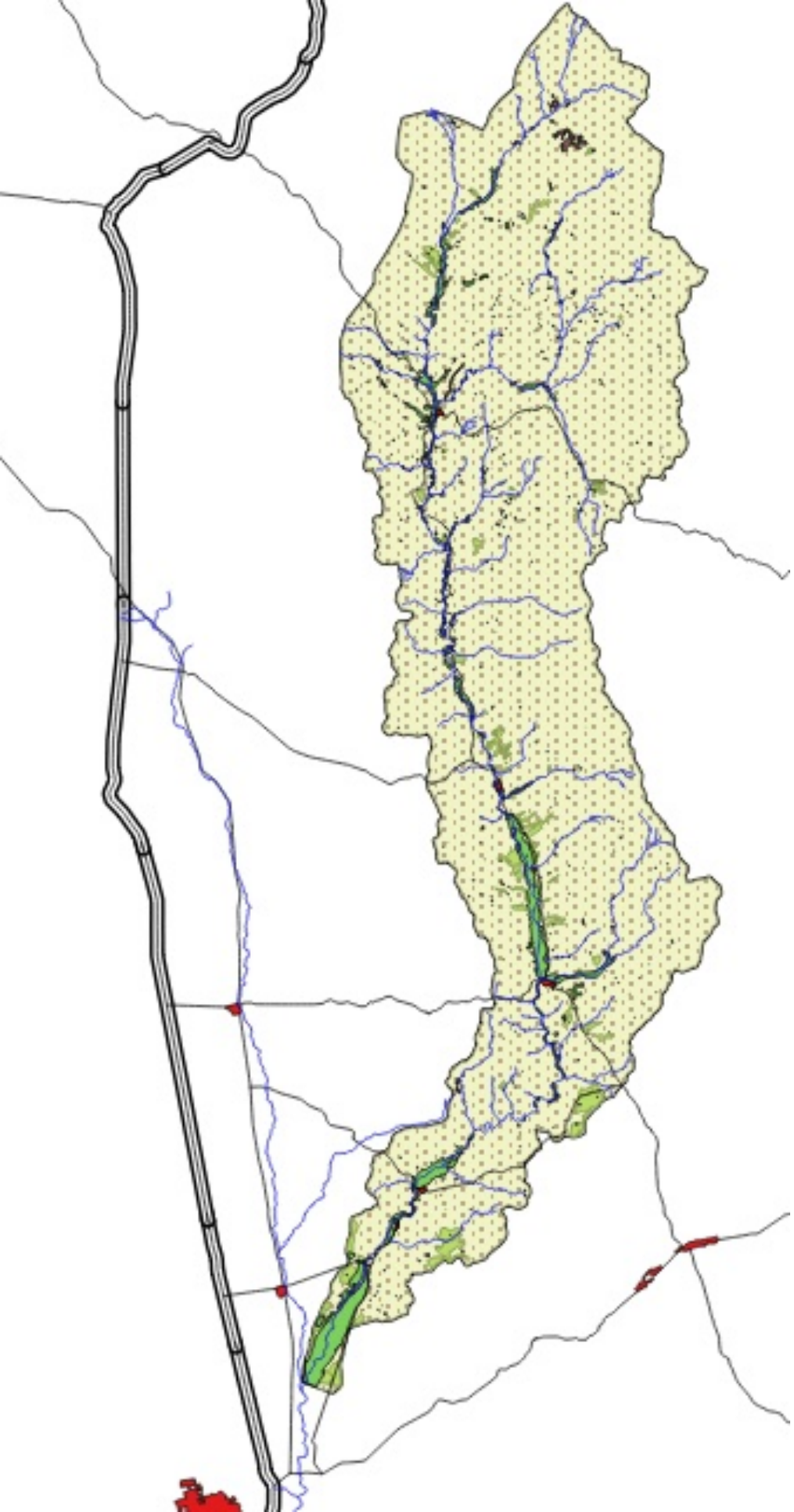
Source: Data from INEGI (1990, 1995, 2000, 2005, 2010)

SMW: Population structure change (1990-2005)



#Below Middle age
#Youths
#Children

Source: Data from INEGI (1990, 2005)



SMW: Land uses (2012)

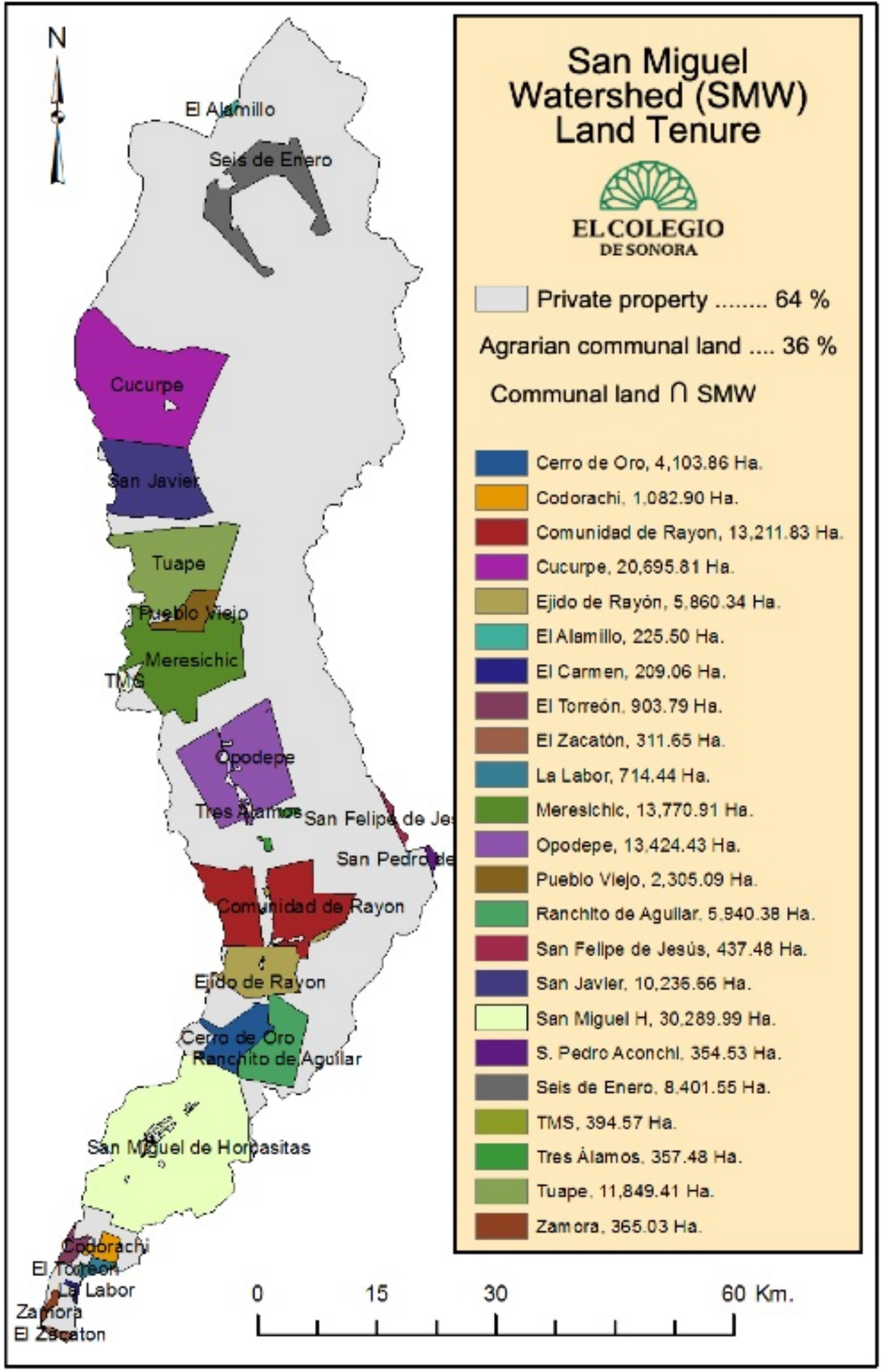
Non-riparian desert, grasslands, uplands 95.4 %
Towns 0.09 %
Water 0.05 %
Other 0.15 %
Buffelgrass 1.60 %
Agriculture 2.80 %

Most of the land is:

#Agostadero #Grazing-Land

San Miguel Valley floodplains:

Where human drama happens
(Sheridan & Nabhan, 1978).



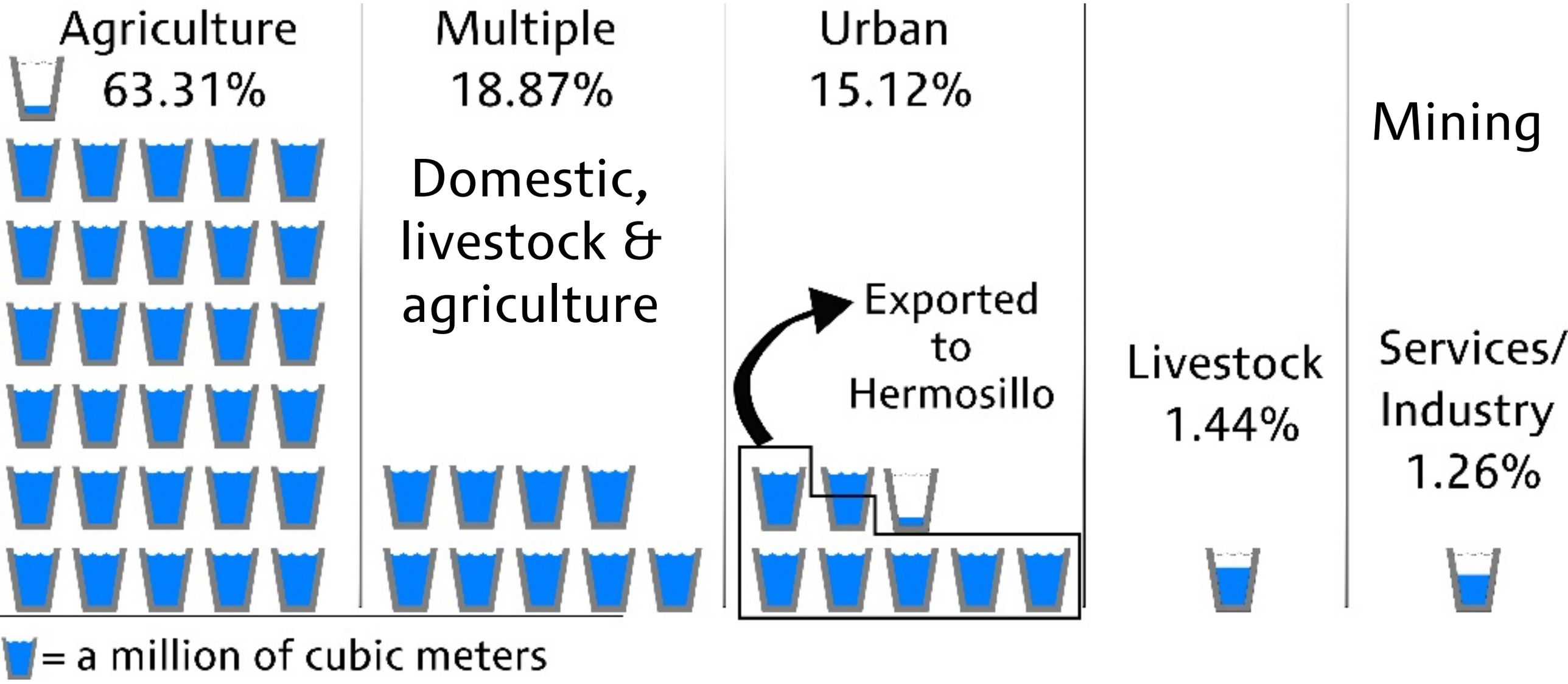
- Total ejidos/communities: 23
- 13 with a 80-100% overlap with SMW.
- 1,842 rightful owners.
- Communal land is around (embracing) the main rural towns: Cucurpe, Tuape, Pueblo Viejo, Meresichic, Opodepe, Rayon, San Miguel de Horcasitas.

#Cattle_Grazing

La Fábrica de Los Ángeles,
Photo: Alan Navarro, June 15, 2015

Rayón,
Photo: Alberto Navarro, April 17, 2014

SMW: Groundwater use



SMW: Groundwater use

Las Malvinas,
Photo: Alan Navarro,
October 12-2012

Agriculture
63.31%

Multiple
18.87%

Urban
15.12%

Fodder
cultigens
for livestock

Exported
to
Hermosillo

Livestock
1.44%

Services/
Industry
1.26%

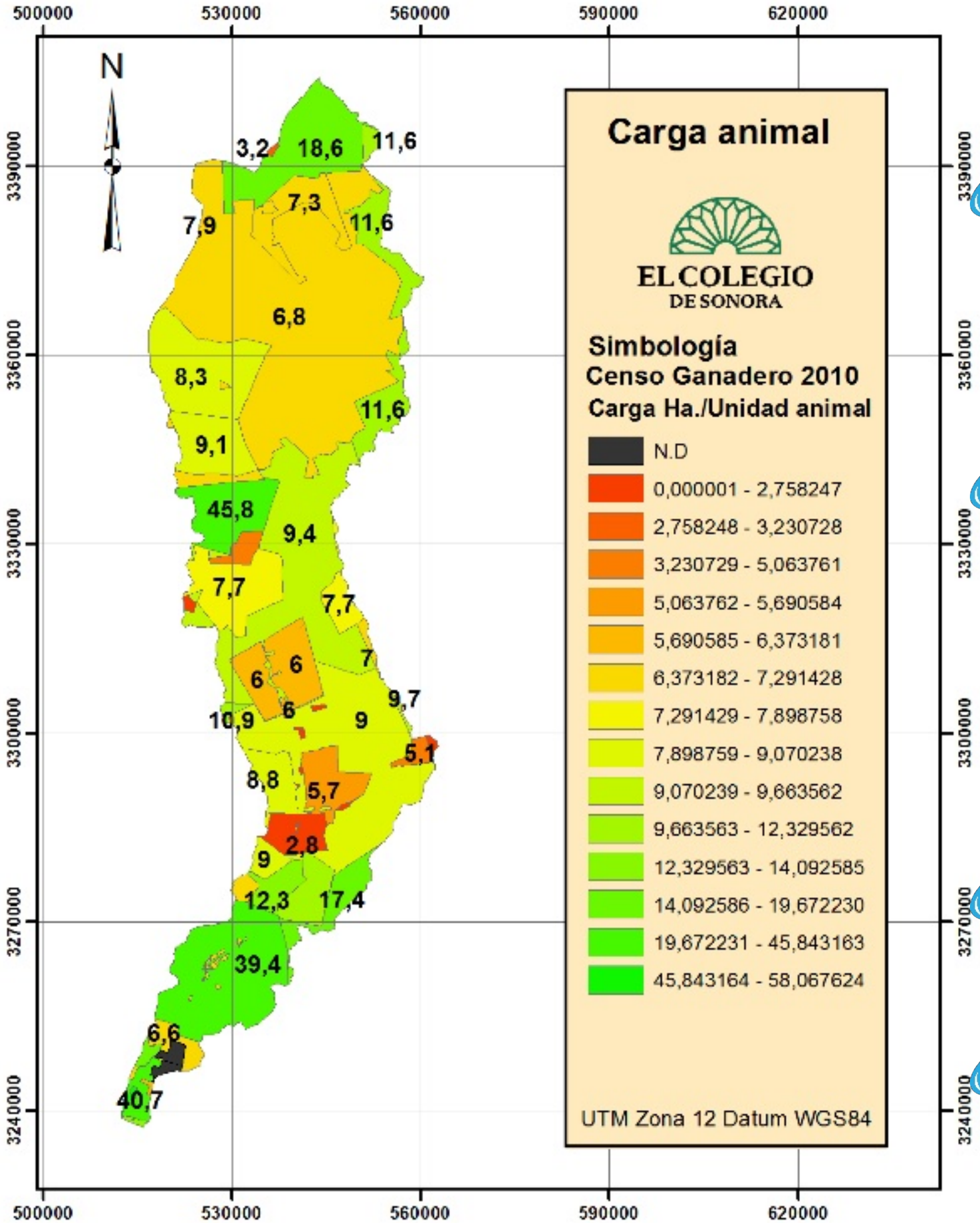
= a million of cubic meters

What about surface water?

Saracachi river, Cucurpe
Photo: Alan Navarro, April 11, 2014

Las Granaditas, Opodepe. Photo: Alan Navarro, July 9, 2015

La Galera, Rayón
Photo: Alan Navarro, July 8, 2015



SMW is overstocked

- Cattle ranching, the main economic activity in the watershed and a major water consumer, produces milk, cheese, and weaned calves.
- According to the 2010 livestock census the watershed held 46,500 Animal Units (AU or a cow-equivalent) with an average stocking rate of 12 hectares/ AU.
- For the Sonoran rangelands the average carrying capacity is 27 hectares/AU.
- 75% of the crop pattern dedicated to fodder cultigens.

Supplementing the rangelands

La Fábrica de Los Ángeles,
Photo: Alan Navarro, May 24, 2013

Let’s go back to socialsheds

Field work

- 2012-2015 Rapid Rural Appraisal.
- 2015-2016 Face to face interviews.
- Also we had 5 workshops in the community of Rayón.

Opodepe, Sonora

Rayón, Sonora

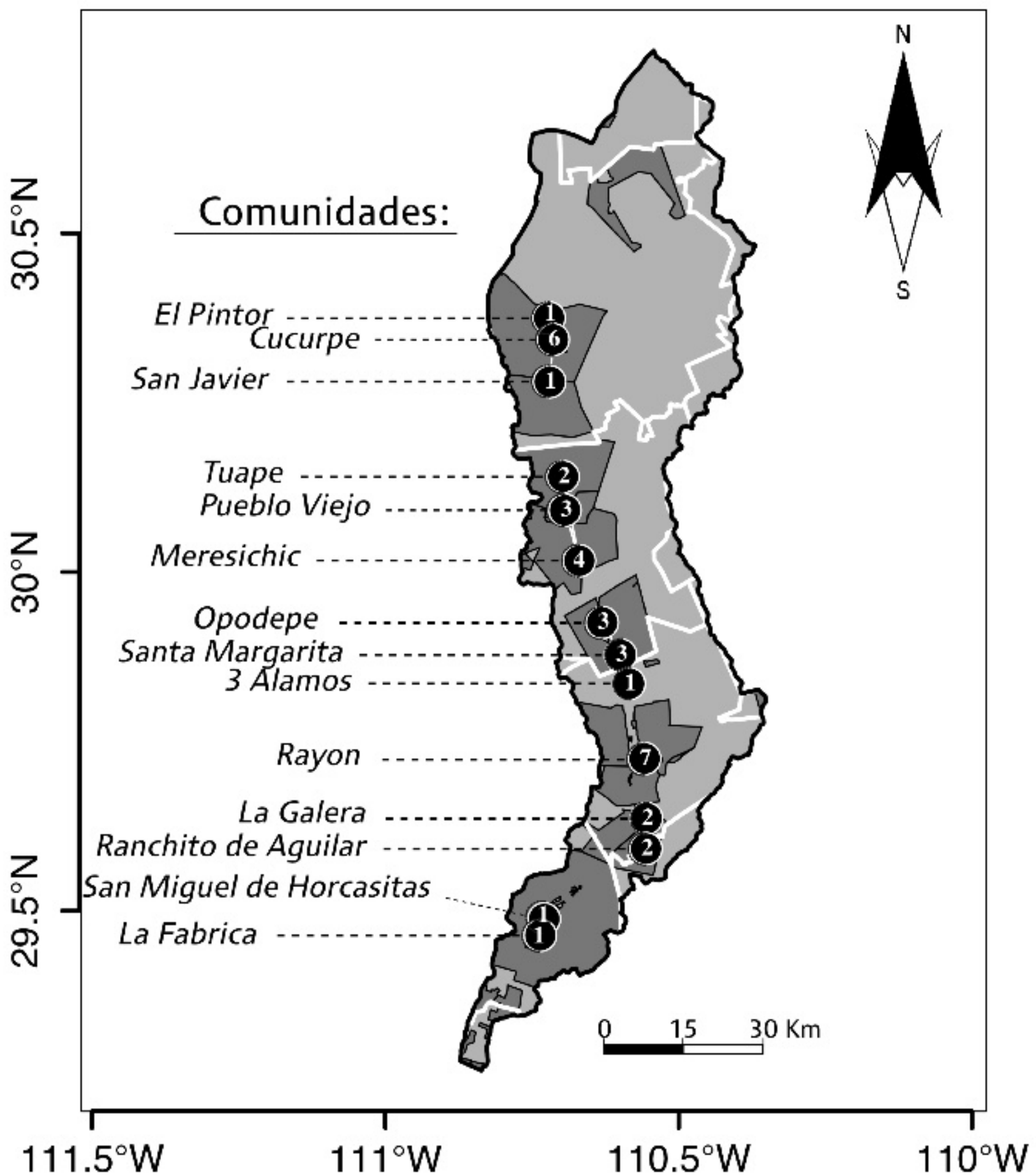
Meresichic, Sonora

Field work (Cont…)

- Compact easily accessed watershed.
- Not densely populated, few towns/communities.
- Limits of the social network set a priori.
- A social actor (subject to be interviewed) was defined as a **local representative of an organization dealing with and/or managing water.**
- **65 social actors were identified and it was possible to approach 37.**

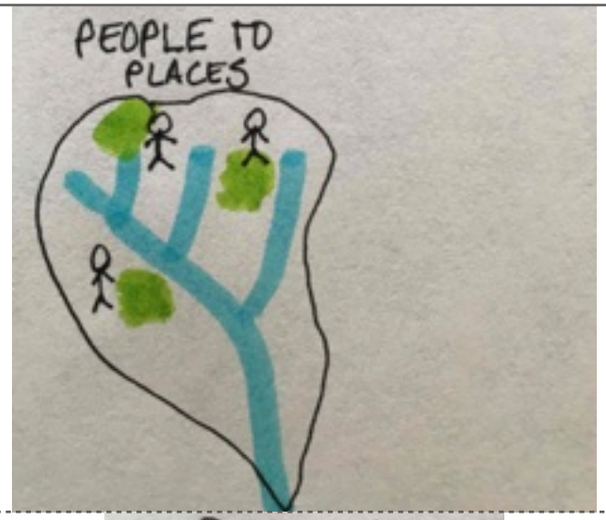
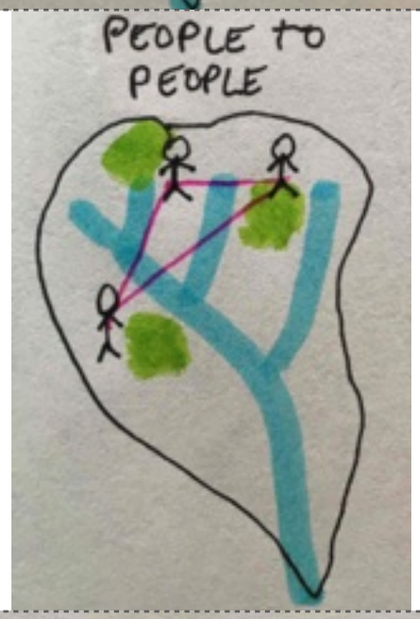
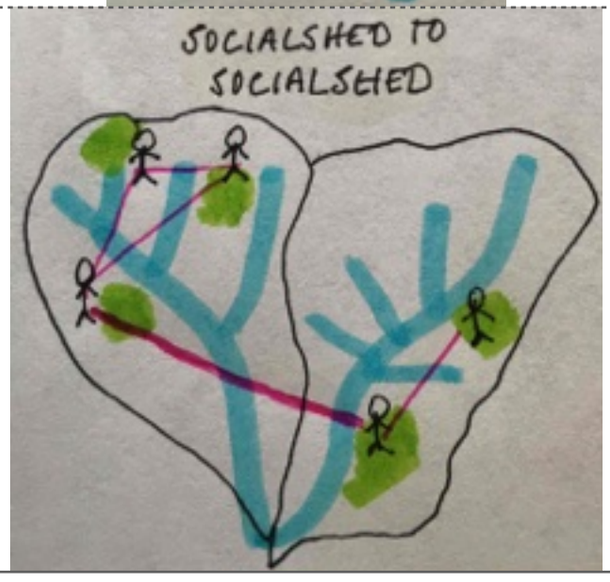
Santa Margarita, Opodepe, Sonora

Tuape, Opodepe, Sonora

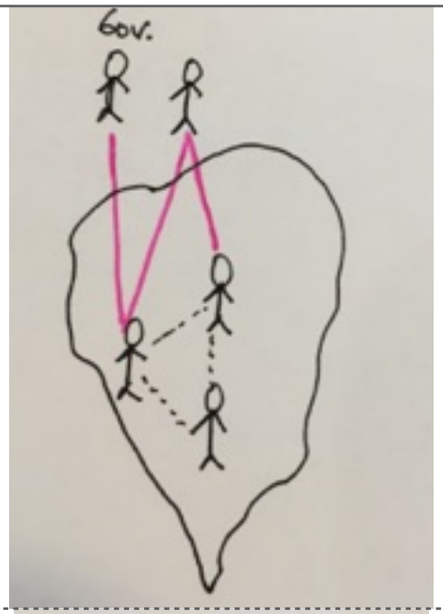
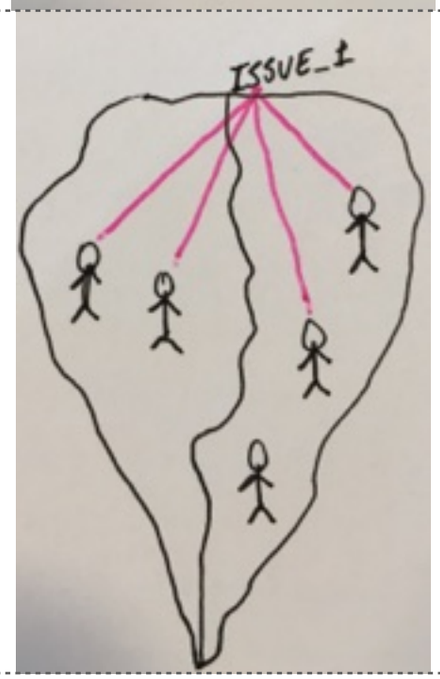


Source: Navarro et al. 2017

Any meaningful connection …

1. "**Individuals** who identify with real **places** and find ways to interact positively with the life-web around them." (Berg, 1987:7)		Janssen et al. (2006) defined **socio-ecological networks** where **people connect ecosystems and landscapes by physically interacting with them.** Not acknowledging the existence of other places and water issues creates fragmentation of a socio-ecological system.
2. "Involving nearby watershed **neighbors** creates a 'socialshed'." (Berg, 1987:7)		**Bonding Social Capital** (Woolcock & Narayan, 2000)**:** represented as closed networks of relations that engender robust individual and collective action (Coleman, 1990). Ties among geographically proximate people. People socially embedded (Granovetter, 1985).
3. "Several 'socialsheds' of neighbors working on a wide variety of different projects can easily join together to for an organization … In effect, it would be a **Watershed Council** …" (Berg, 1987:7)		**Bridging Social Capital** (Woolcock & Narayan, 2000)**:** bridging ties create the opportunity for new non-redundant information (Burt, 2009; Granovetter, 1972). Horizontal boundary-spanning networks integrate local jurisdictions operating within a geographically defined area (Ostrom, 1972).

Any meaningful connection …

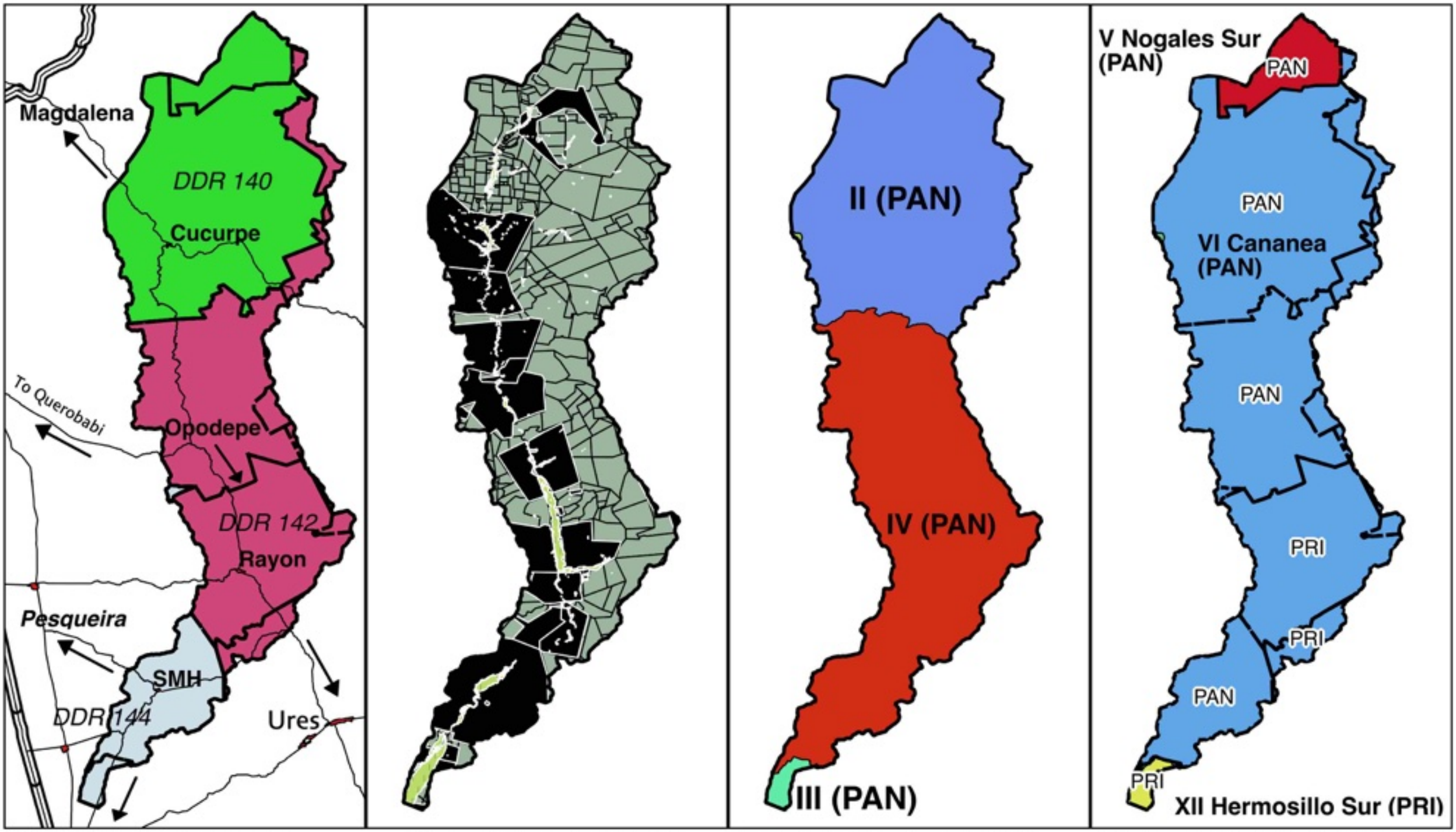
4. **Linking Social Capital** (LSC).		Stone (2003) describes LSC as involving social relations with those in authority, which might be used to gain resources or power. LSC is important for political influence, campaigning, wider social change (Muir, 2011), and providing access to external resources for strengthening physical infrastructure or investing in technological change.
5. **Issue networks** (Problemsheds or local (site-specific) water issues).		Heaney (2014) mentioned the concept of **“issue overlap networks”** referring to overlapping interest groups of issue advocates as well as **“coalition overlap networks”** where groups are tied when both pursue at least a lobbying action.

Results

0. Social actors: Descriptives

- 💧 All were men.
- 💧 86% were communal landholders.
- 💧 76% had irrigated land.
- 💧 73% were ranchers.
- 💧 Only 11% of respondents had experienced scarcity in water for domestic household use.
- 💧 62% reported to have had problems meeting livestock drinking demand.
- 💧 70% had experienced shortages in water for irrigation.

1. SMW is indeed a fragmented territory



A) Municipalities and DDRs (arrows show transport access)

B) Private and communal (in black) property

C) Federal congress (2015)

D) State congress and municipal parties (2015)

Source: Navarro et al. 2017

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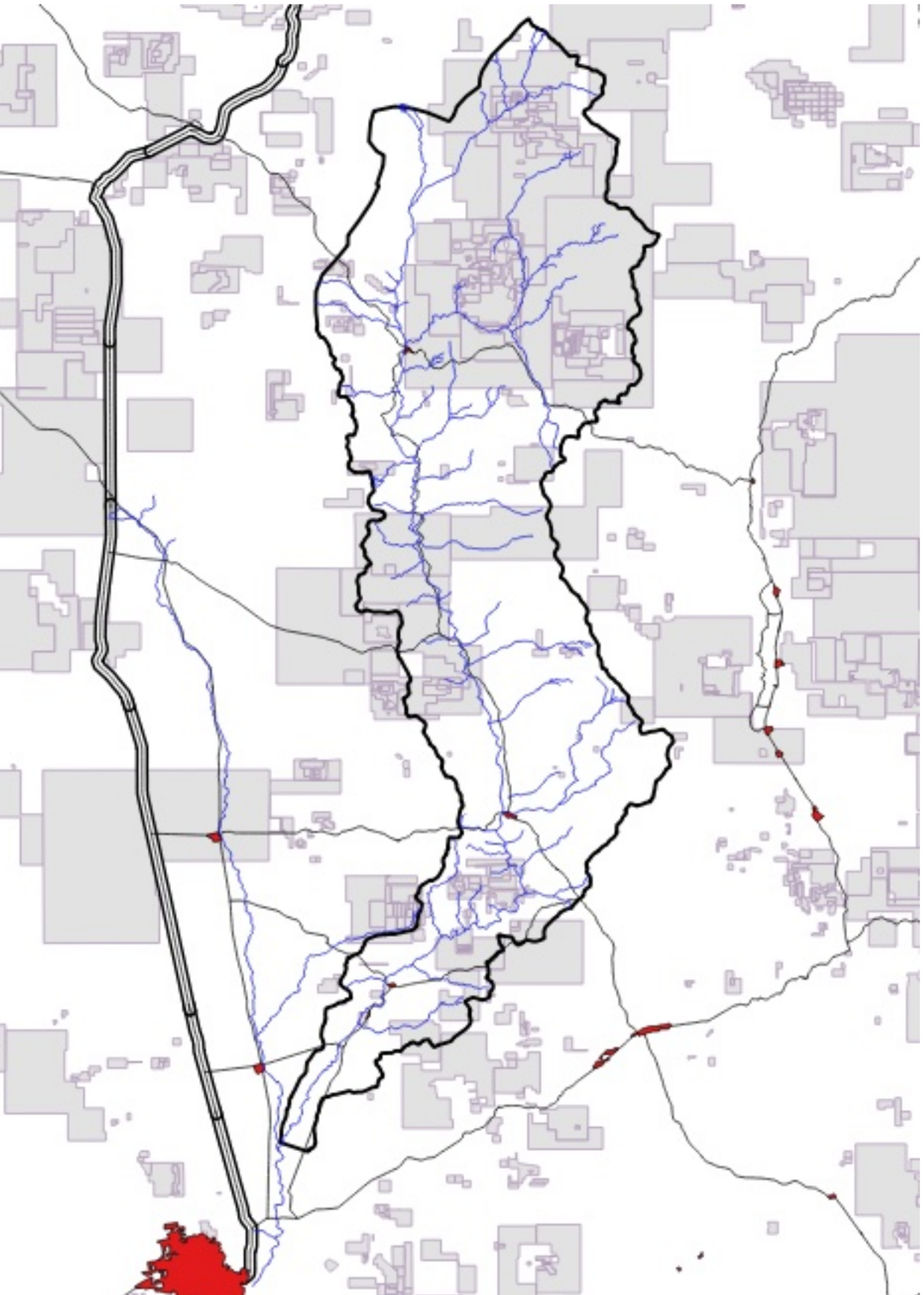


- Mining concession rights.
- Considered of “public interest.”
- Granted by Federal Government to privates (for 50-100 years).
- There is just one active mine in Cucurpe (entered smoothly).
- One starting project in Opodepe.

2. Locally water users (representatives) were socially embedded

"Analberto Cruz is a farmer [in Cucurpe] … most of his neighbors are relatives, either by blood, marriage or compadrazgo."

(Sheridan & Nabhan, 1978)

- Personal ego-networks overlap. My five-preferred persons to discuss/deal with water management issues overlap with someone else's network.
- Dense (everybody is related with everyone else) ego-networks. Density = 100% for the 37 ego-networks.
- The results showed that, on average 48 percent (range 0-100) of the ties had multiple contents, only 6 networks (out of 37) were uniplex (one type of relationship).

Ego-networks (Bonding Social Capital)

Municipio

Norte

	Cucurpe							Opodepe														Rayon										Ures		S.M.H	
	10	0	6	47	53	54	59	65	148	199	205	171	176	138	144	166	172	111	161	180	94	95	106	75	150	22	25	26	31	69	81	128	135	121	122	186	193
10	0								*El Pintor*																											
0		0	0	0	0	0	0.20	0																											
6		0	0	0.20	0	0	0	0.09																											
47		0	0.2	0	0	0	0	0	*Cucurpe*																										
53		0	0	0	0	0.20	0	0																											
54		0	0	0	0.20	0	0.20	0																											
59		0.20	0	0	0	0.20	0	0																											
65		0	0.09	0	0	0	0	0	*San Javier*																										
148									0	0.09	0.50			0	0.09	0	0																		
199									0.09	0	0.09			0	0	0	0							*Tuape*											
205									0.50	0.09	0			0	0.09	0	0																		
171												0	0.20	0	0	0	0.33																		
176												0.20	0	0	0	0.09	0.20							*Pueblo Viejo*											
138									0	0	0	0	0	0	0	0.09	0																		
144									0.09	0	0.09	0	0	0	0	0	0							*Meresichic*											
166									0	0	0	0	0.09	0.09	0	0	0																		
172									0	0	0	0.33	0.20	0	0	0	0																		
111																		0	0	0.09	0	0	0												
161																		0	0	0.09	0	0	0.09	*Opodepe*											
180																		0.09	0.09	0	0	0	0												
94																		0	0	0	0	0.33	0.09												
95																		0	0	0	0.33	0	0	*Santa Margarita*											
106																		0	0.09	0	0.09	0	0												
75																								0											
150																								0	0.09	0.09	0.09	0	0	0					
22																								0.09	0	0.20	0.20	0.09	0	0					
25																								0.09	0.20	0	0.20	0	0	0					
26																								0.09	0.20	0.20	0	0	0	0					
31																								0	0.09	0	0	0	0	0					
69																								0	0	0	0	0	0	0					
81																								0	0	0	0	0	0	0					
128																															0	0.33	*La Galera*		
135																															0.33	0			
121																																	0	0.71	
122																								*Ranchito de Aguilar*									0.71	0	
186																																			0	0
193																								*San Miguel La Fabrica*											0	0

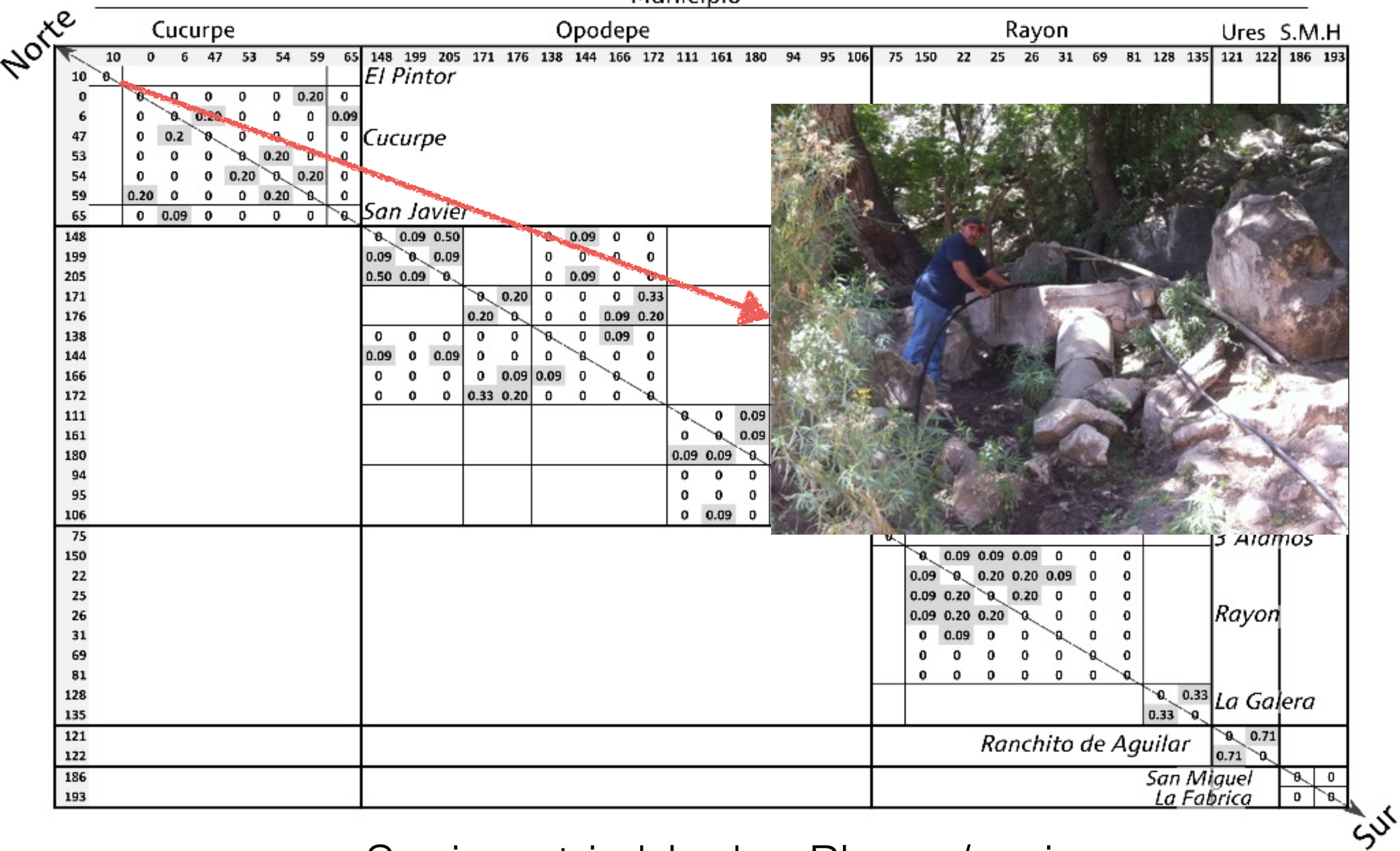
Sur

Sociomatrix blocks: Places/regions

Jaccard Index

Source: Navarro et al. 2017

Ego-networks (Bonding Social Capital)



Sociomatrix blocks: Places/regions
Jaccard Index

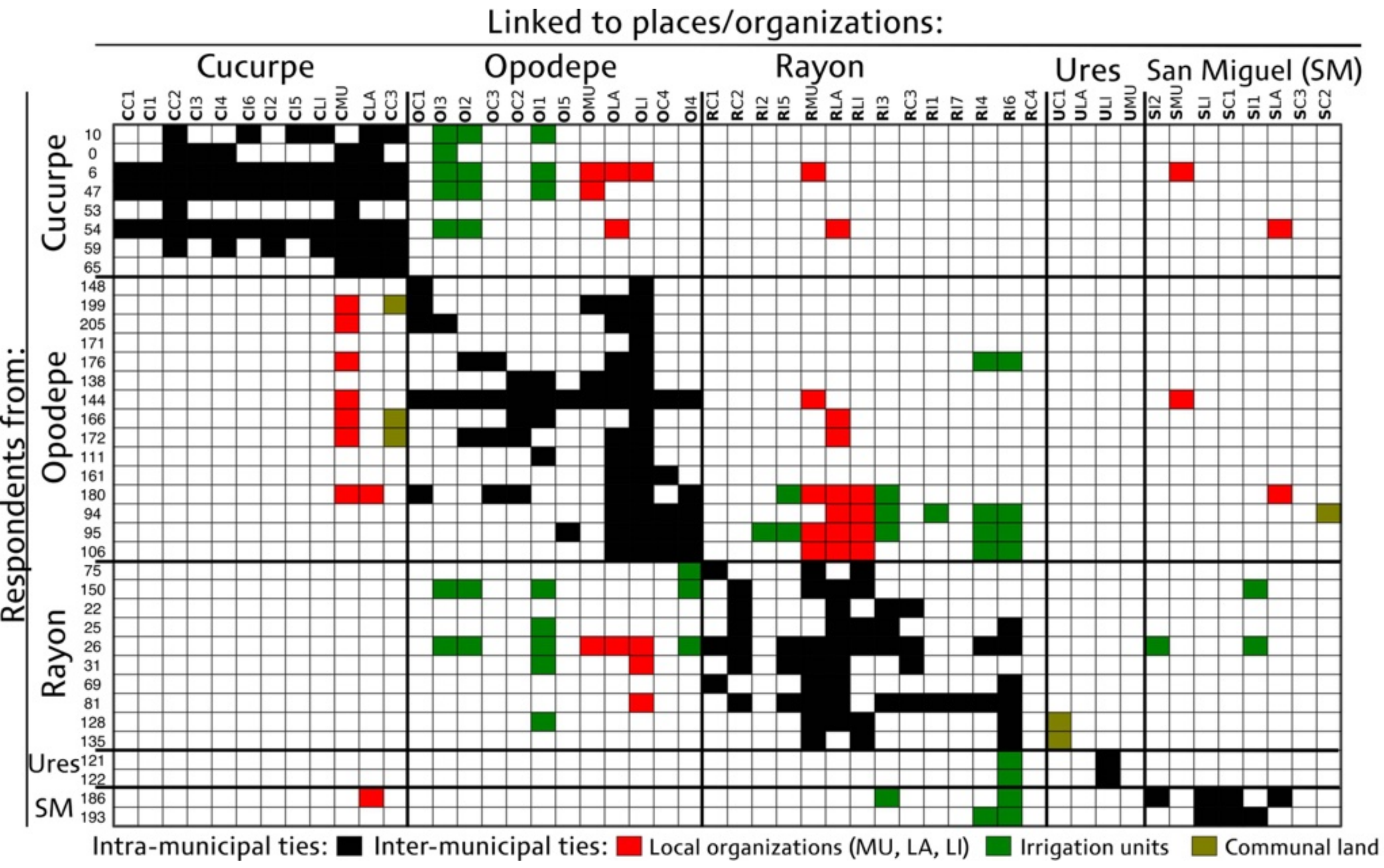
Source: Navarro et al. 2017

So far we found social connectivity within county or municipality.

3. Bridging Social Capital

- SMW intra-municipal and inter-municipal connectivity.
- First, respondents rated as “yes/no” if they knew about the existence these places.
- Second, the social “involvement” with these communities was defined in the same terms if respondents: a) have had discussion of water issues, b) jointly manage water, or c) have worked on or lobbied a common water related project.

3. Bridging Social Capital



(First letter for the municipality, "MU" stands for municipality, "LI" livestock inspector, "LA" for livestock association, second letter: "C" indicates a communal land, "I" irrigation unit)

3. Bridging Social Capital

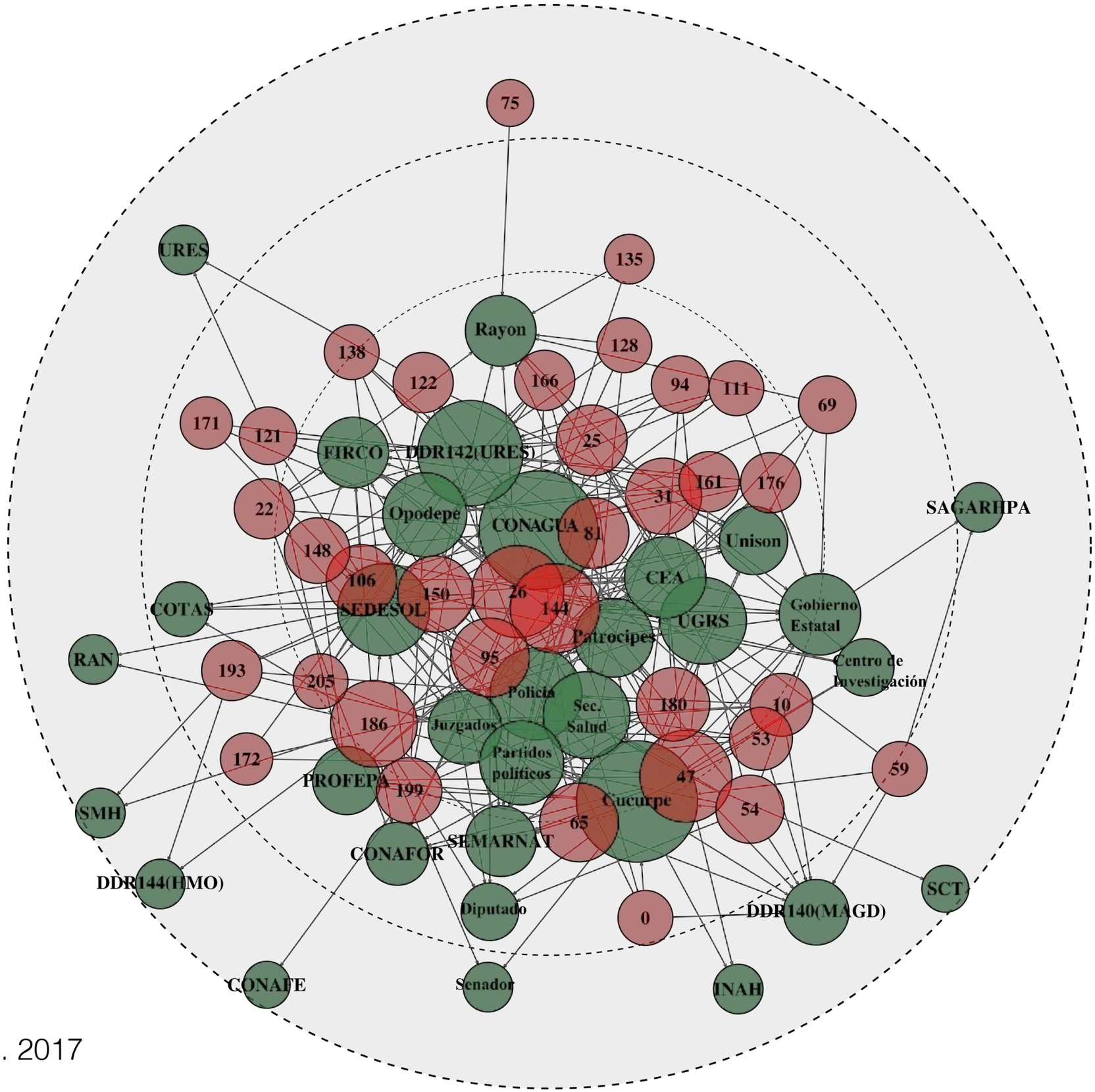
- The fact that stakeholders are more connected within their municipality and **sparsely or not connected to places/organizations of other municipalities of the watershed** strongly indicates that bridging social capital diffuses as it is scaled up geographically, that is, densely connected communities (“archipelagos”) are poorly connected.
- The municipalities (president and board members), livestock associations, and livestock inspectors; persons more likely to create inter-municipality links.
- No water forum or meeting place/event.

Densely connected municipalities but poorly connected beyond municipality boundaries.

4. Linking Social Capital

- A personal asset. Heterogeneous distributed some actors have more other almost none.
- The data showed an average number of contacts per respondent of 8 (range 1-20), a mode of 4, with 70 percent having 10 or less contacts (out of 37 max. possible).
- Vertical or hierarchical.
- Some external organizations or agencies are more popular such as Rural Development Districts (DDR).
- Represent external financial resources to invest in hydraulic infrastructure.

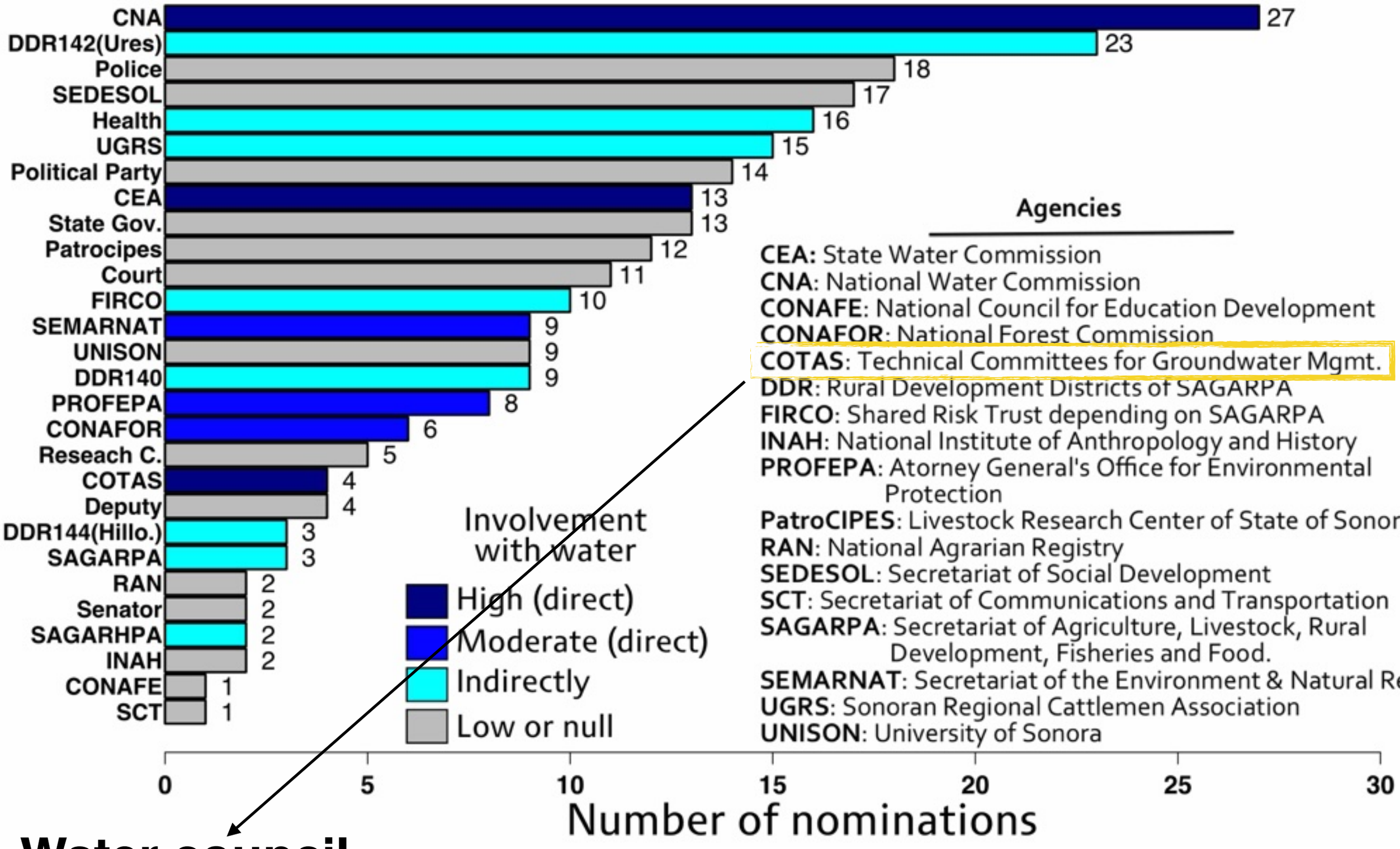
External agencies nominated by respondents



Source: Navarro et al. 2017

(maximum possible number of nominations = 37)

4. Organizations/Agencies popularity



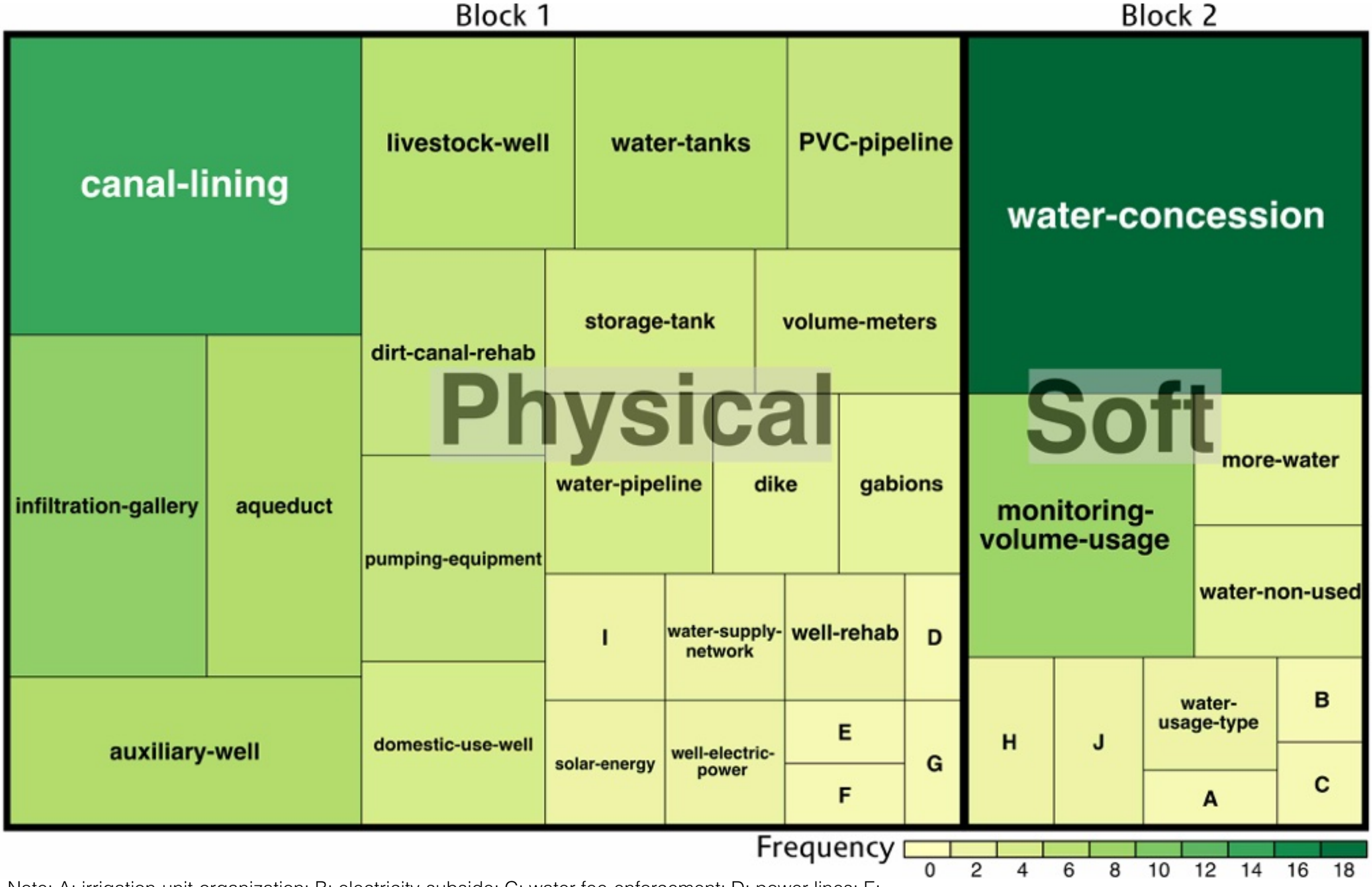
Water council

4. Linking Social Capital

- First, CONAGUA and SAGARPA (though the DDR Rural Development Districts) as the more central agencies. Second, the role of **COTAS as the agency mandated to integrate social participation in water related issues was lower than the expected.** Apparently, COTAS have very limited extension roles and received **4 nominations out of 37 (11 percent), and were mentioned only once as actively involved in any project.**
- Moreover, COTAS didn't seem to contribute to create "socialshed" like (horizontal) links, but vertical "client to patron" linkages.

What is Linking Social Capital used for?

Treemap of water-related projects



Note: A: irrigation-unit-organization; B: electricity-subside; C: water-fee-enforcement; D: power-lines; E: replace-asbestos-main; F: sewage-network; G: water-chlorination; H: lower-domestic-water-use; I: new-irrigation-systems; and J: metering-domestic

Source: Navarro et al. 2017

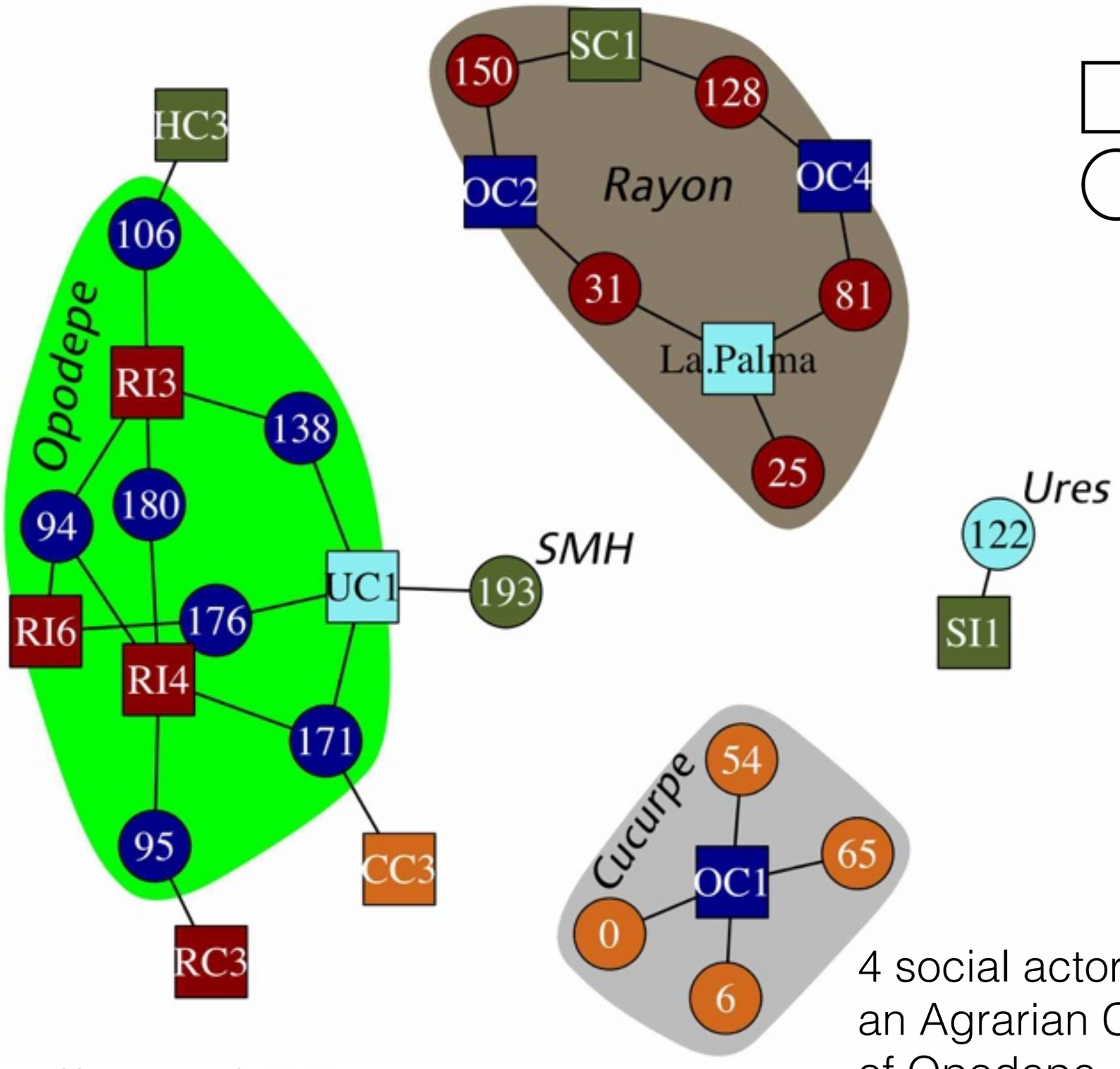
5. Issue Network

- The network intended to map connections between social actors and places/local organizations outside the borders of their municipalities.
- Knowledge about other places' water problems is important since as mentioned earlier, water interconnects the watershed; therefore, people connected with information have the potential for creating coalitions or advocacy groups.

5. Issue Network

- People is linked to their local places; there is no discussion about it.

5. Issue Network



Place/Organization

Social actor

4 social actors from Cucurpe linked to an Agrarian Communal Land Corporation of Opodepe.

Source: Navarro et al. 2017

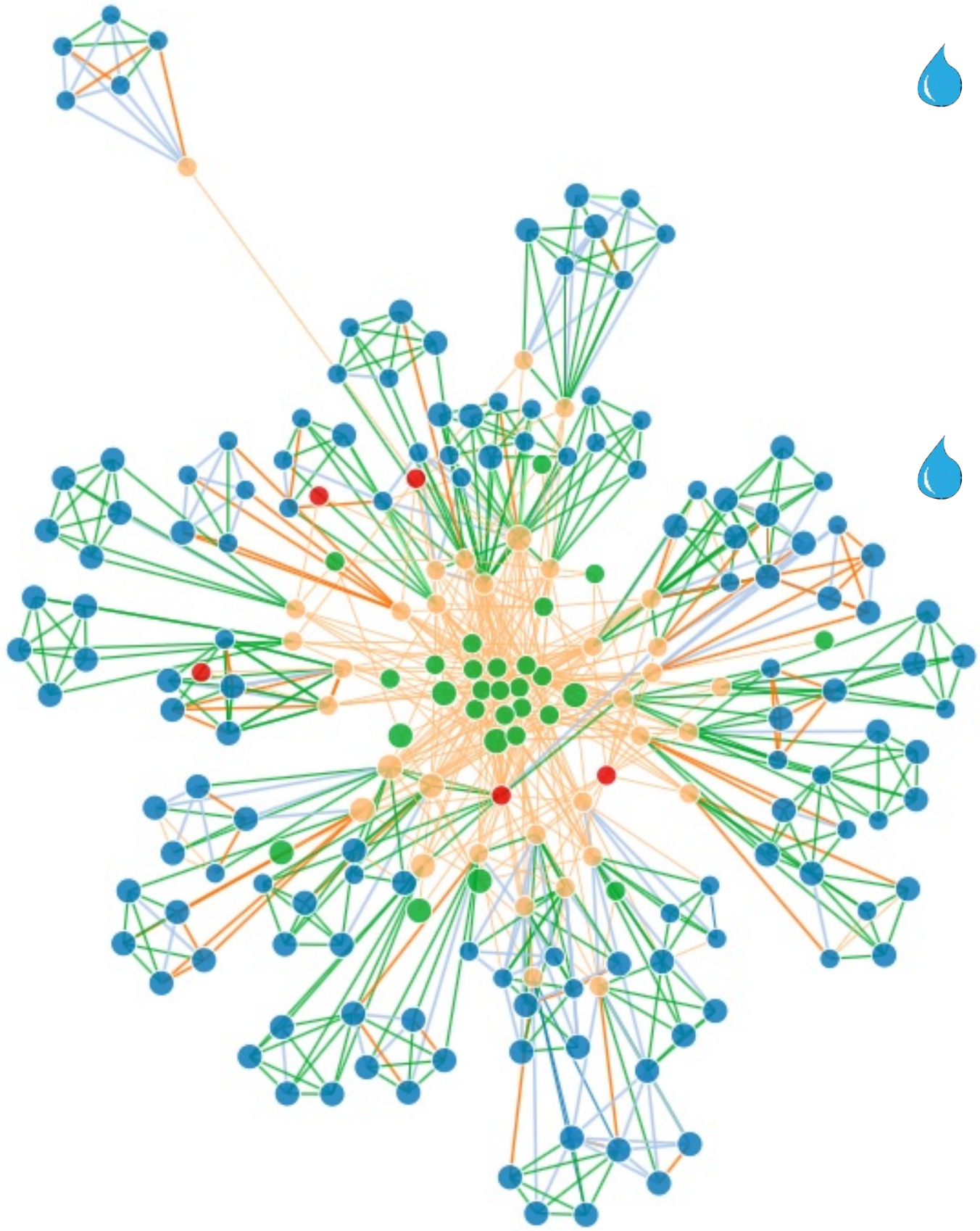
5. Issue Network

- It was not possible to gather enough data to build a full problemshed (issue) network. Around 54 percent of the respondents acknowledged not having information about any water issue out of the municipality borders.
- The rest provided vague and shallow facts about the water-related issues of the places mentioned, all of them related to drought and water scarcity.

Conclusions

- Representatives of local organizations managing/ dealing with water are **socially embedded in dense and strong networks of relatives and friends.**
- **As suggested by the Bioregionalist perspective water users are linked to their places.** As was asserted by Sheridan & Nabhan (1978) "*they realize the limitations of their environment and live within them.*"
- **Social connectivity expands within the Municipality** (County) geographical limits; where local organizations, besides personal networks, play an important role creating connections.

- Geographical scope of the social network is very limited.
- Knowledge about **distant places** within the SMW, as well as, **water related issues** is negligible. Therefore, ideas exchange and the potential creation of coalitions to deal with common issues is very unlikely.
- The social integration of the watershed, that is a bottom-up water council, **is unlikely to emerge** considering the current institutional arena.



- When the LSC is merged with the SBC network results in an integrated connected graph, with agencies at the center (green nodes).
- COTAS (and any other agency) has not explicitly the goal of creating a socialshed; social connections tend to be created as vertical ties, one-by-one, in a case-specific manner -- a process that relies on and often reinforces centralized administrative and political structures.

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Cottonwood living fencerows, Cucurpe (July 8, 2015)

Thank you!
Got a question?