Hydrological information

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DE ESTADÍSTICA Y GEOGRAFÍA

AIMS

Generate hydrological information and projects linked with water and sustainable development…

Personnel:
- 8 in headquarters (Aguascalientes)
- 40 in Regional and State offices

Main products:

- Surface water: watershed studies
- Groundwater: geohydrological systems (acquifers)

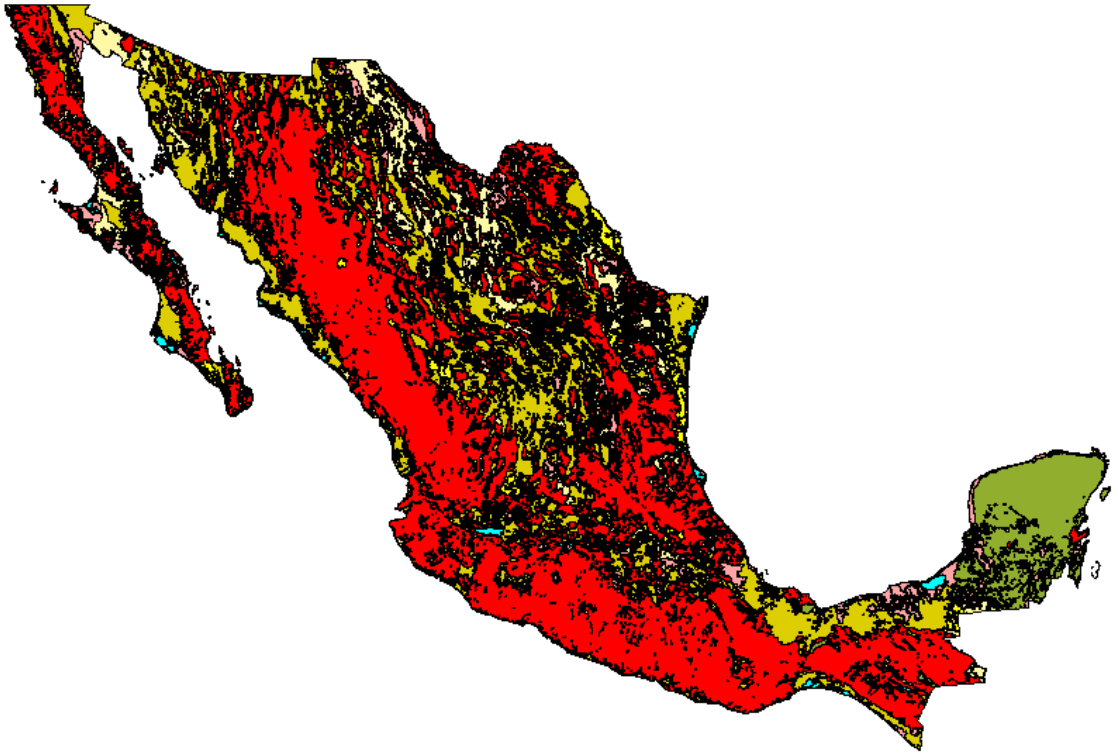
- Others:

  Basin, watersheds boundaries
  Hydrographic network both in scale 1:250 000
  Water bodies inventory
  Wetlands national inventory; scale 1:50 000

Groundwater Information

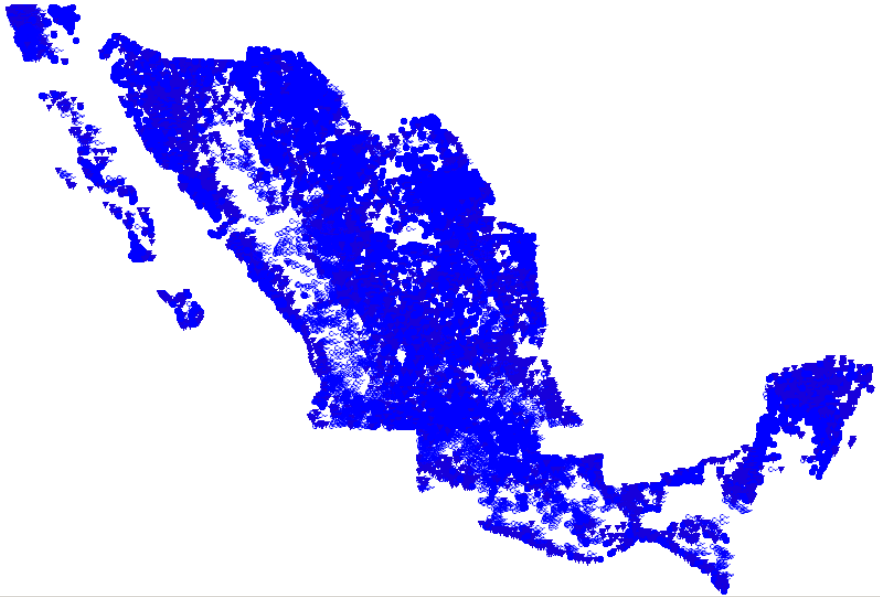
National Groundwater Data Set 1:250,000

Geohydrological units: represent the capacity of geological formations to store groundwater



Water sampling sites

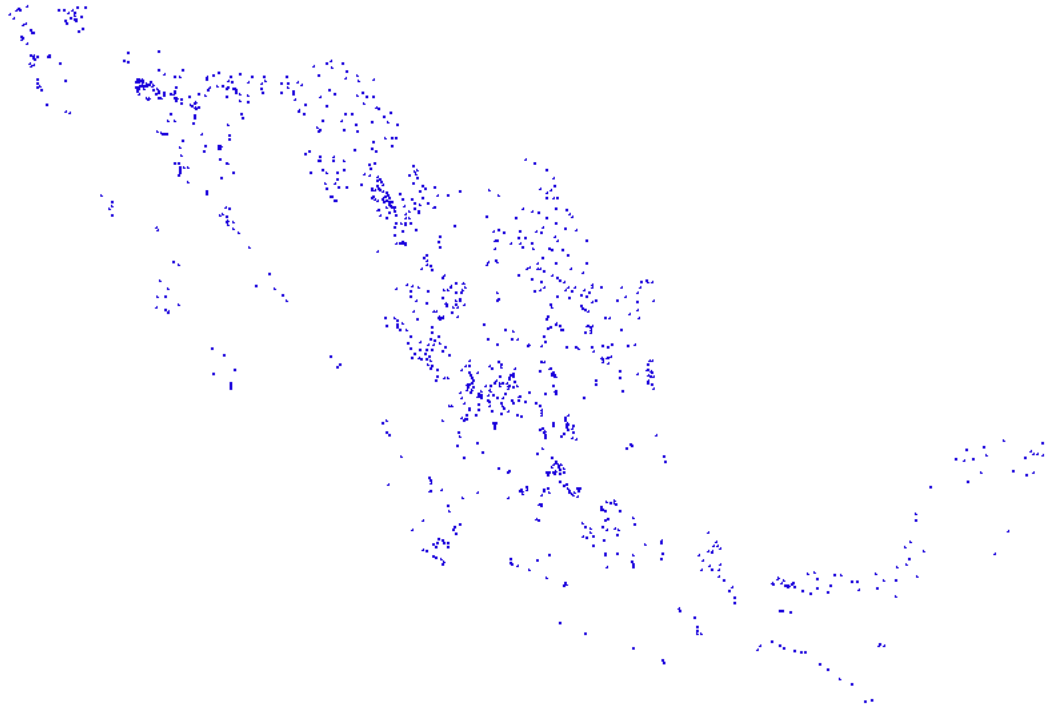
Places where groundwater samples were taken for field and laboratory measurments: physical and chemical analysis in laboratory (wells, springs, cenotes in karst environment)



Attributes of Contaprv.shp

Obra	Fecha	Ca	Mg	Na	K	Caco3	Ras	Ph	Ce	So4	Hco3	No3	Co3	Cl	Solidos
MANANTIAL	19810321	43	16.3	74.1	1.6	175.5	2.43	8.0	0.68	31.2	201.3	1.9	12.0	88.7	470
MANANTIAL	19810327	48	15.8	68.8	3.1	186.0	2.19	8.6	0.59	41.3	225.7	6.2	12.0	63.9	485
MANANTIAL	19810322	25	28.7	157.1	3.9	182.0	5.06	7.5	1.08	51.8	219.6	8.7	24.0	177.5	696
MANANTIAL	19810321	224	126.2	91.8	17.5	1086.0	1.21	7.7	2.22	813.6	134.2	9999.9	9999.9	248.5	1656
MANANTIAL	19810321	44	20.2	100.3	3.1	194.0	3.13	8.2	0.89	20.6	231.8	9999.9	12.0	131.3	563

Groundwater flow direction



Structure of groundwater data sets scale 1:250 000

Polygons cover

- Geohydrological units
- Concentration wells area
- Regulated zones coverage

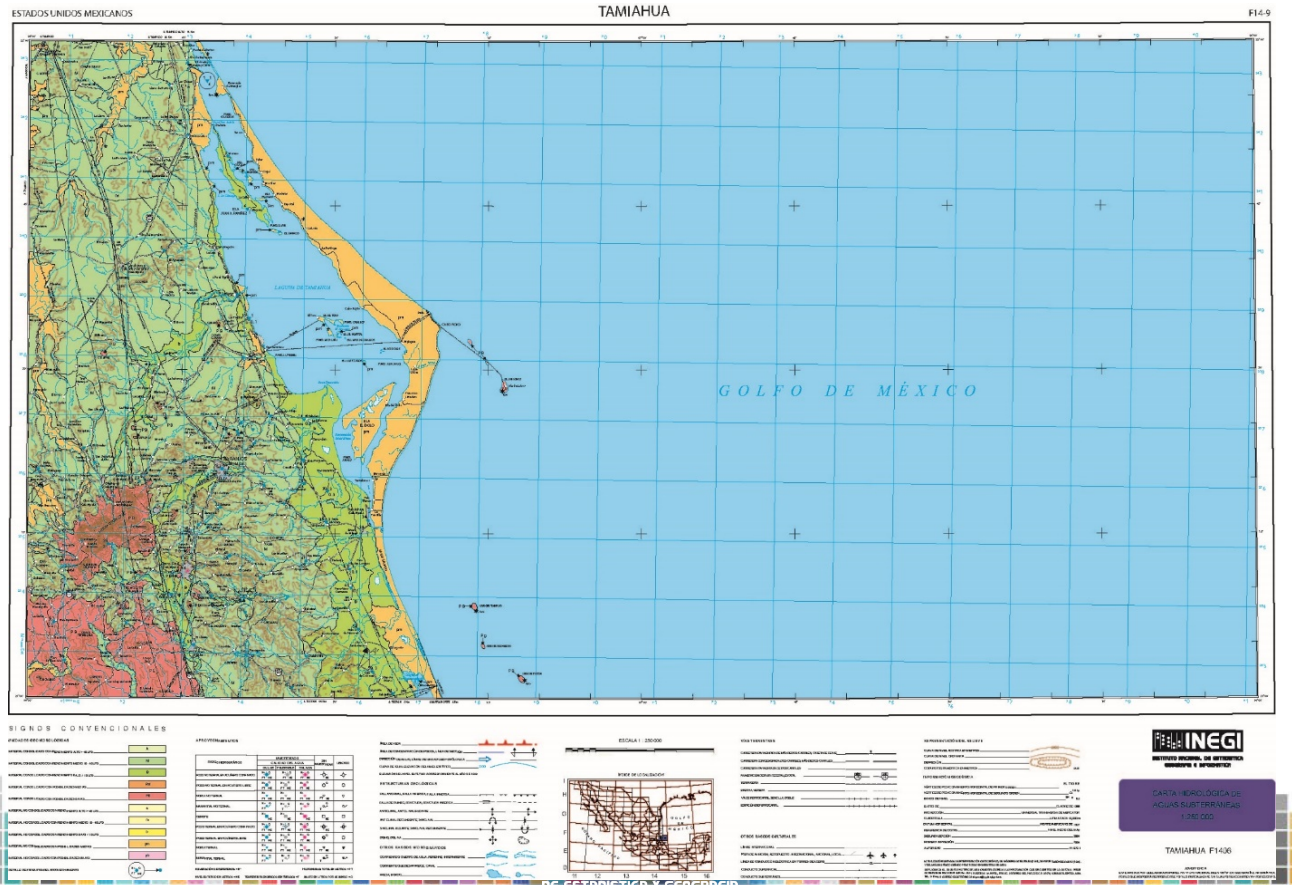
Lines cover

- Geological structures
- Geological section line
- *Elevation of the statical level curves*

Points cover

- Water quality and water samples sites
- Groundwater flow

Traditional groundwater map scale 1:250 000

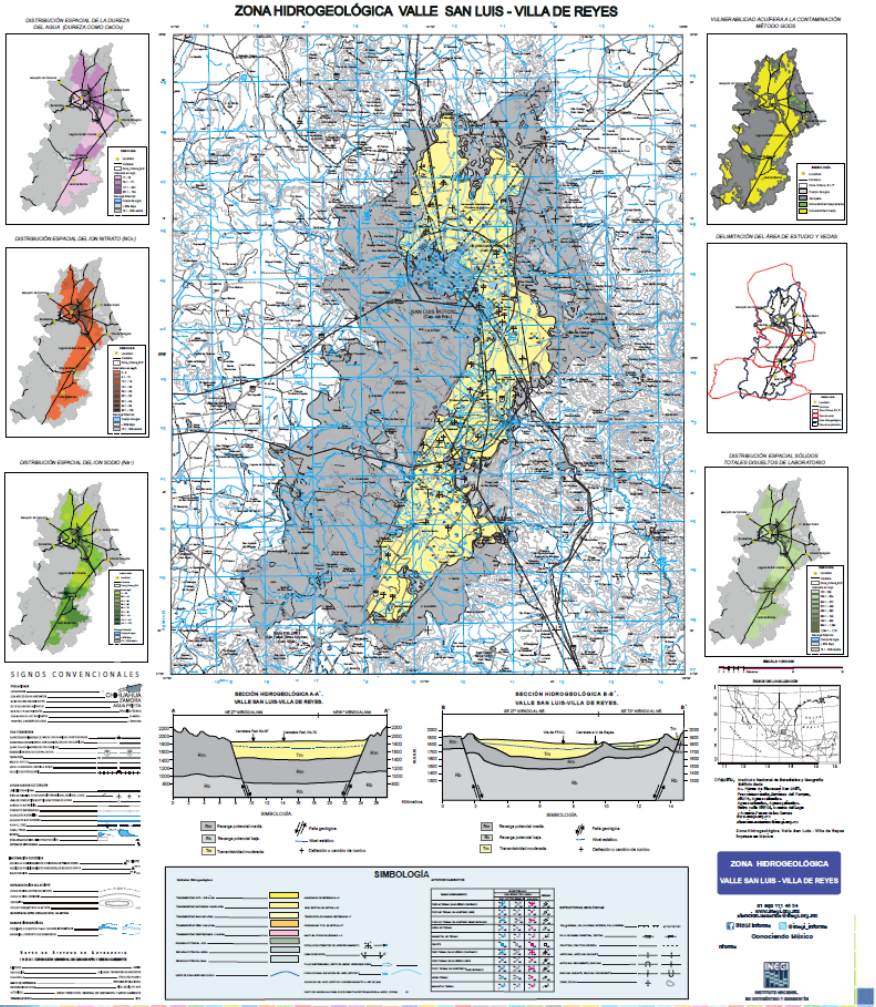


Hydrogeological zones maps

Objective

Study the most overexploited acquifers, with the purpose of representing their physical properties, water dynamics, vulnerability, geohydrological functioning, as well as the chemistry of the groundwater.

Granular acquifers, defining recharge and extraction zones using geological and topographic information.



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Structure of digital information

Unidades Hidrogeológicas
Vulnerabilidad acuífera
Zona de Veda
Intrusión marina
Zona Hidrogeológica

Curvas de igual elevación del nivel estático
Curvas de igual profundidad del nivel estático
Estructuras geológicas
Línea de sección

Pozos, Norias, Manantiales y Cenotes
Obras ubicadas
Parámetros hidrogeológicos
PIPEM
Dirección de flujo subterráneo

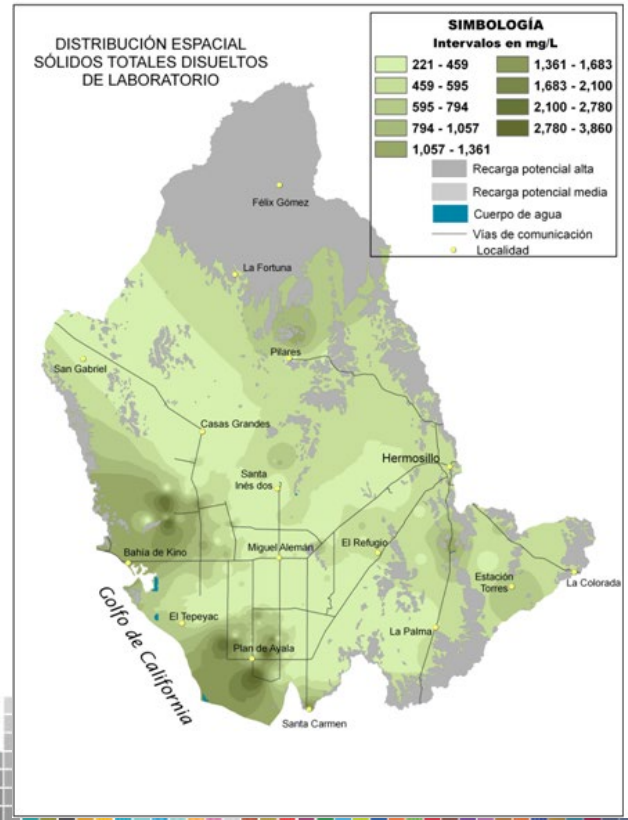
Polygon layers

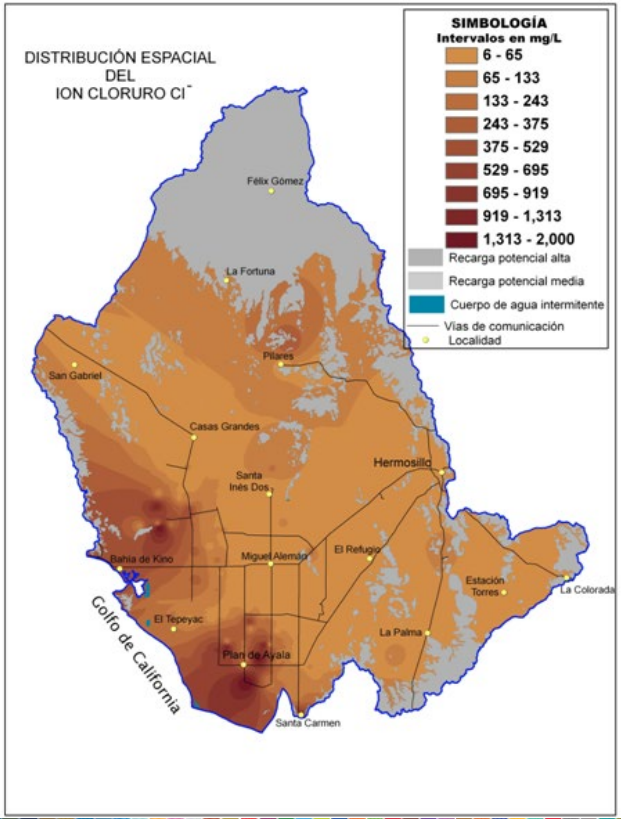
Line layers

Point layers

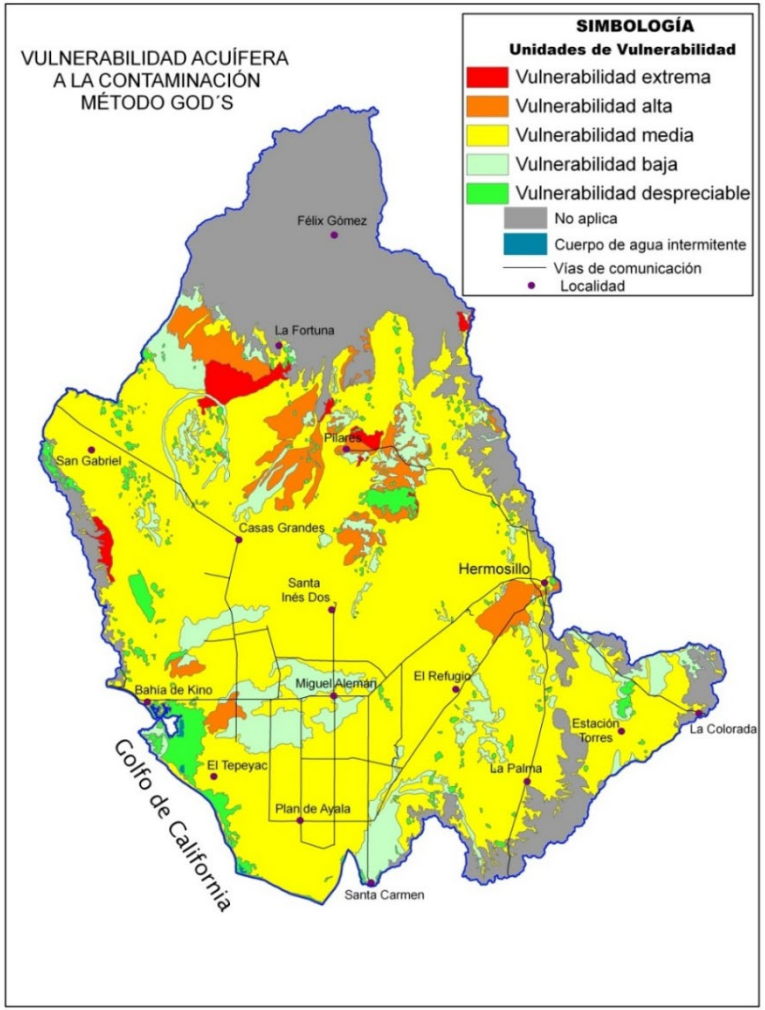
Spatial distribution of chemical pharameters

Examples: total dissolved solids and chlorides





Vulnerability

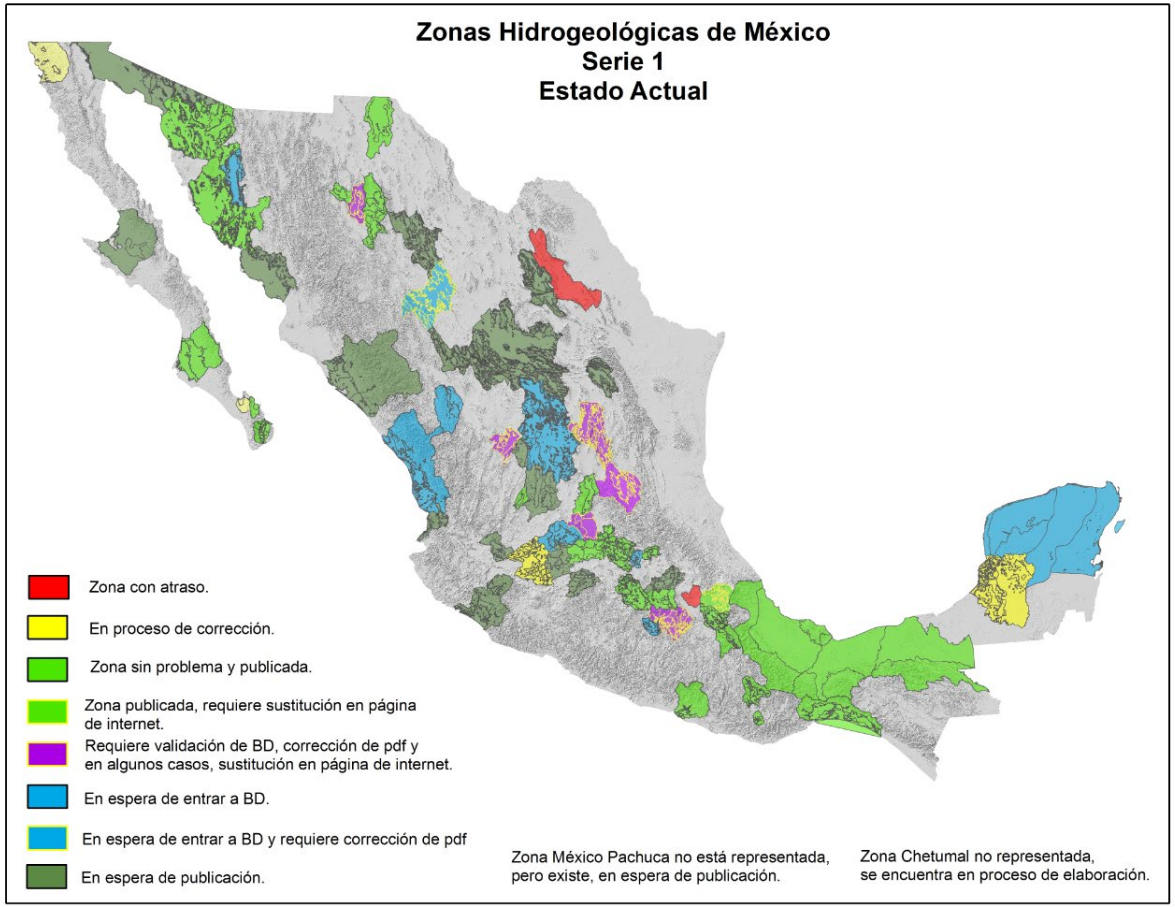


65 hydrogeological datasets available online

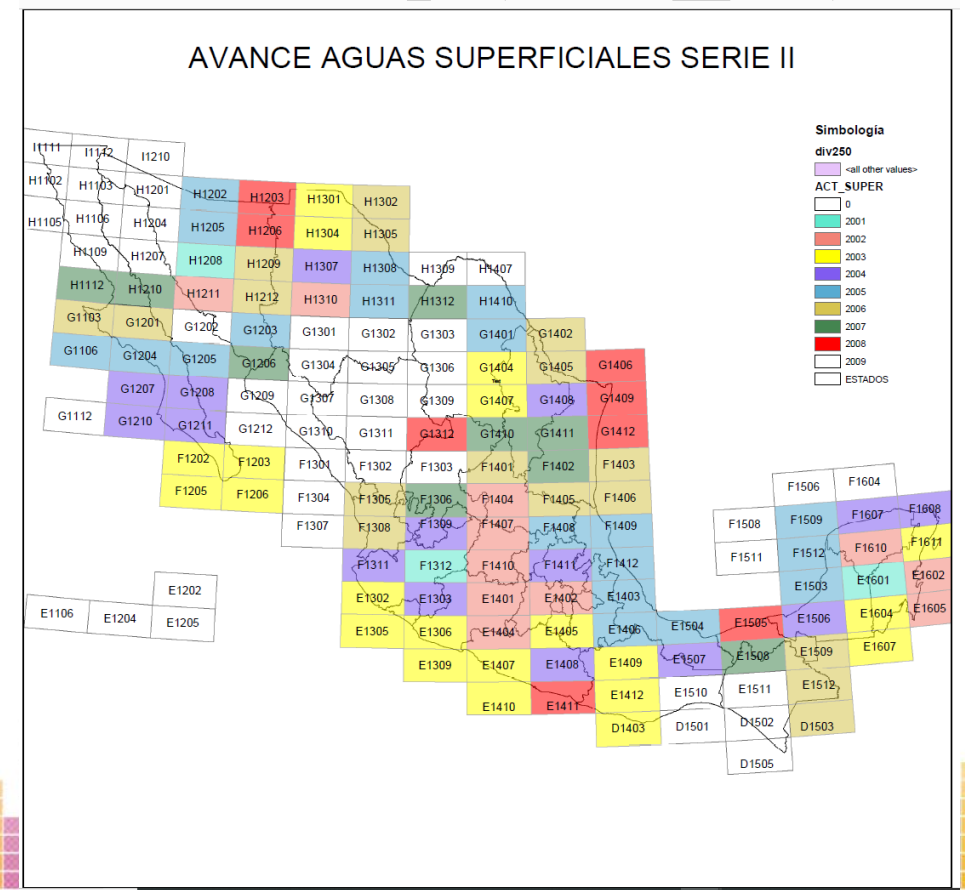
(pdf map, figures and and geospatial layers)

http://www.beta.inegi.org.mx/app/buscador/default.html?q=zonas+hidrogeologicas

PRESENT PROGRESS



Surface water datasets, scale 1:250 000



Runoff coefficient

- Percentage of rainy water that runs off, modelled after the interaction of vegetation, permeability in soils and/or rocks, precipitation and terrain slope.

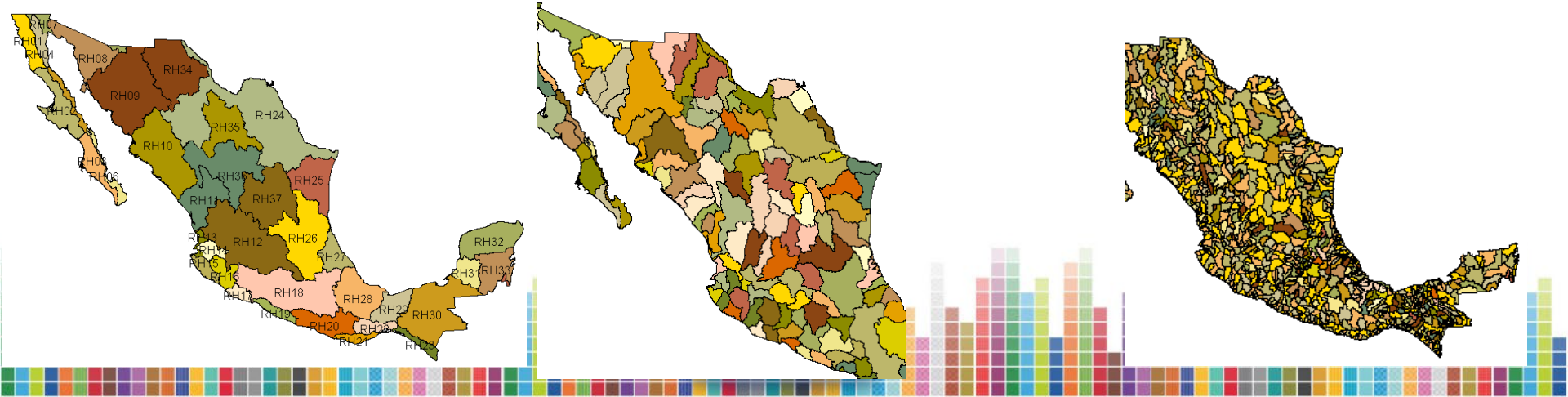
Hydrographical division

HYDROLOGICAL REGION: Area boundary by divides, that at least includes two hydrological basins, whose water flow to a main current.

HYDROLOGICAL BASIN - WATERSHED: Catchment area, whose waters flow towards a main current, or water body; it constitutes a subdivision of a Hydrological Region.

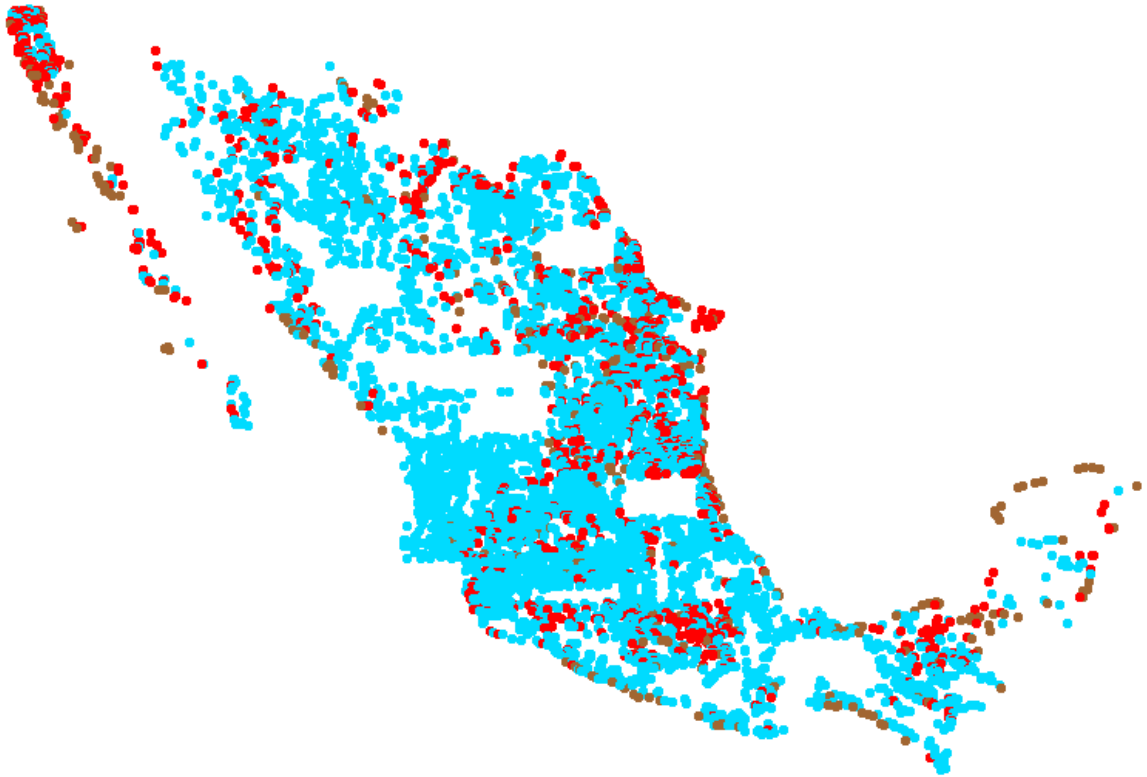
HYDROLOGICAL SUB-BASIN, SUB-WATERSHED: Area considered like a subdivision of the hydrological basin that presents/displays particular characteristics of draining and extension.

This is the first approach to a national hydrographic division focusing on the administration of national waters, not in an integral management natural resources under a watershed view

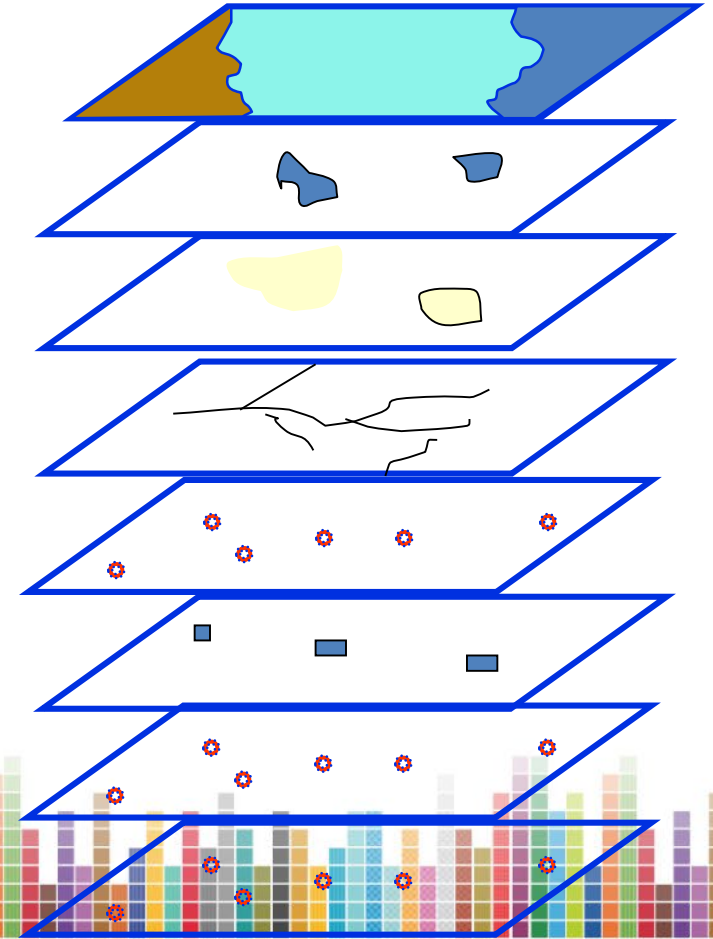


Water sampling sites

Places where water samples were taken from surface water, for their physical and chemical analysis in laboratory, (lakes, lagoons, rivers, dams, springs and channels)



Structure of surface water data sets



Run off coefficient units (Polygons)

Water bodies *(Polygons)*

Land subject to flood *(Polygons)*

Hydrographic network *(Lines)*

Water sampling sites (points)

Waste water treatment plants *(Points)*

Hydrometric stations *(Points)*

Hydraulic infrastructure *(Points)*

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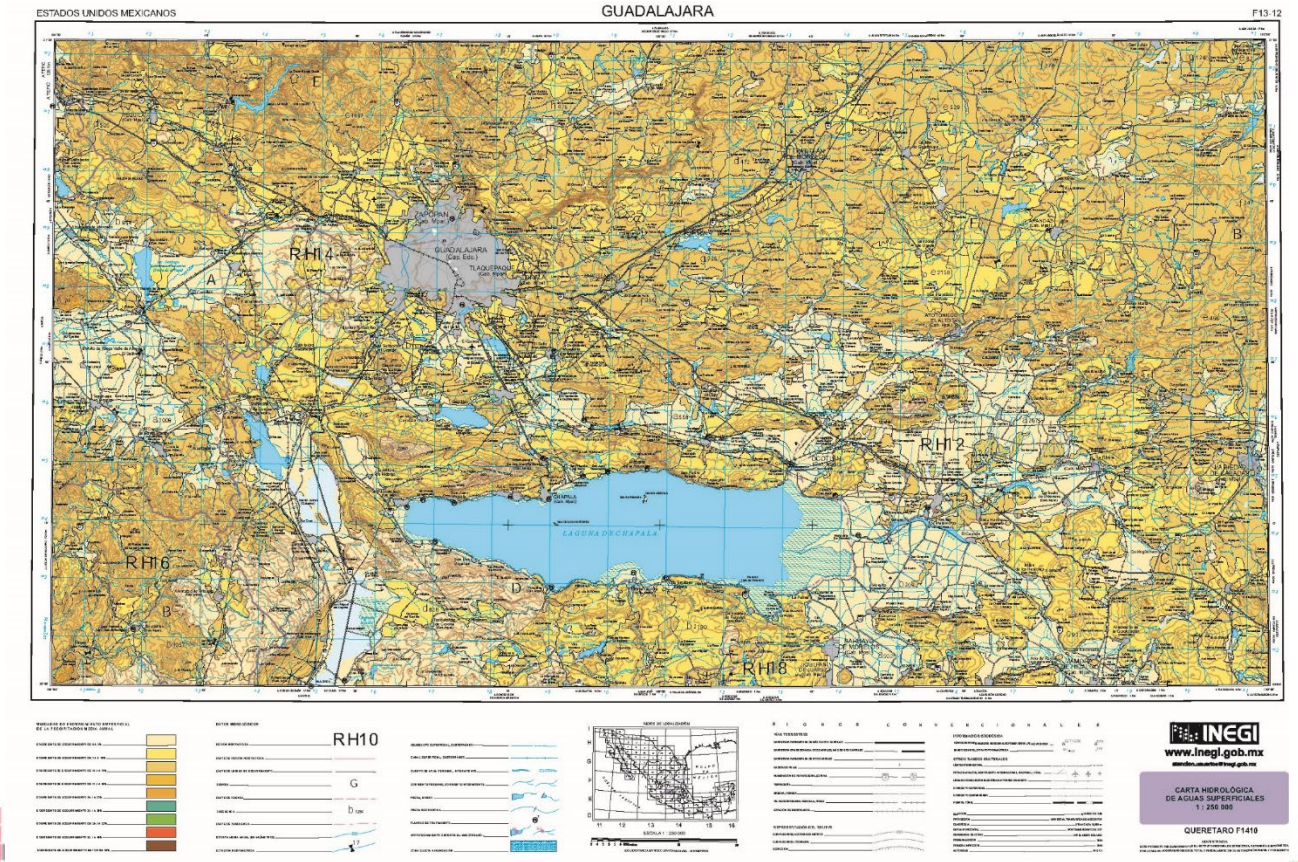
Traditional surface water map



Studies of integrated information of watersheds

Objective

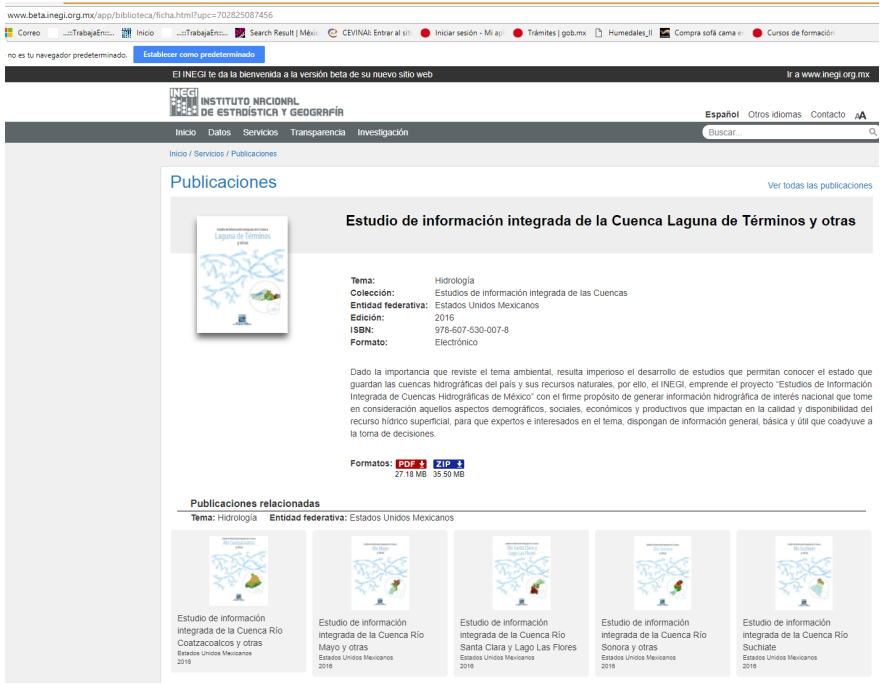
Produce hydrographic information under a watershed vision linked with natural resources and man made effects that affect quantity and quality of the water;

To understand the surface water dynamics, so that the experts and those interested in the subject have an integral basic hydrographic concept, which facilitates the decision making and contributes to the principles of social co-responsibility.

Index

Current availability online

- ✓ Río Champotón y otras
- ✓ Río Sonora y otras
- ✓ Río Mayo y otras
- ✓ Río Santa Clara y Lago las Flores
- ✓ Río Tuxpan
- ✓ Río Tijuana y otras
- ✓ Río Coatzacoalcos y otras
- ✓ Río Tonalá y otras
- ✓ Laguna de Términos
- ✓ Acuífero cárstico Península de Yucatán



http://www.beta.inegi.org.mx/app/biblioteca/ficha.html?upc=702825087456

Other projects…

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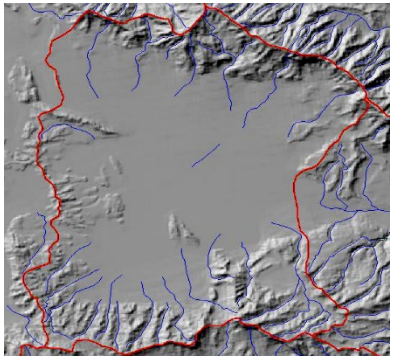
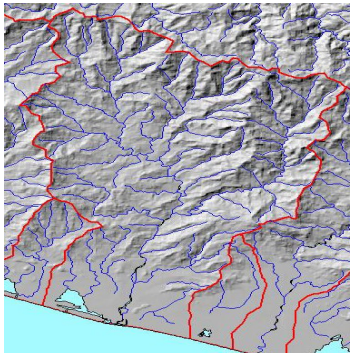
National division of hydrographic river basins of Mexico scale 1:250 000, supported on hydrographic and topographic criteria

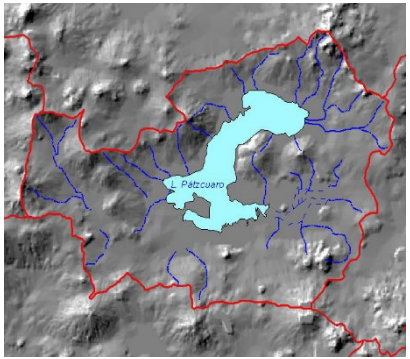
In collaboration with CONAGUA (national water commission) and INE (National Ecology Institute)

Basins

Exorreic; watersheds which drain to the sea
Endorreic; closed hydrographic systems
Arreicas; without clear definition in surface drainage







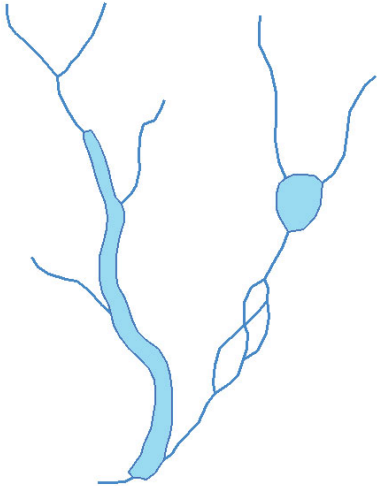
Rangos (km^2)	Núm. de Cuencas	% Núm. Cuencas	Sup. Ocupada (Km2)	% Sup. Ocupada
< 50	807	54.86	14,773.00	0.76
51 - 100	181	12.30	12,670.90	0.65
101 - 500	229	15.57	53,007.90	2.74
501 - 1000	71	4.83	48,667.30	2.51
1001 - 2000	65	4.42	94,096.20	4.86
2001 - 5000	54	3.67	169,726.70	8.76
5001 - 10000	29	1.97	206,043.20	10.64
10001 - 20000	19	1.29	252,146.40	13.02
20001 – 100,000	14	0.95	751,263.70	38.79
> 100,001	2	0.14	334,225.10	17.26
Total	**1471**	**100.0**	**1,936,620.40**	**100.00**

National Hydrographic network scale 1:250 000

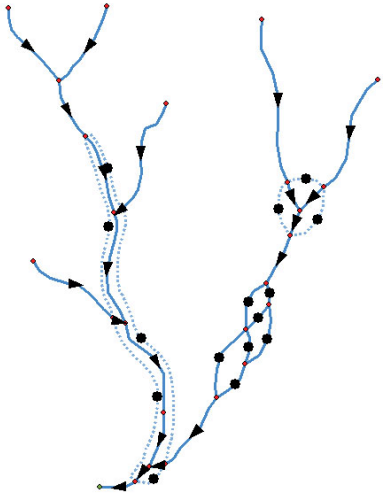
Hydrographic network, every stream line is connected with other streams: upstream and downstream (flow direction), that is, a Network Topology is created.

Virtual streams are created inside waterbody polygons to guarantee flow continuity.

One of the advantages to count with a hydrographic network, is to be able to see the water flow without interruption.
- Allows to determine the order of the channels, according to the classification of Horton,
- Each water stream segment has an unique Id, including hydrographic attributes, as watershed id, subwatershed



Hydrographic representation in maps



Hydrographic network

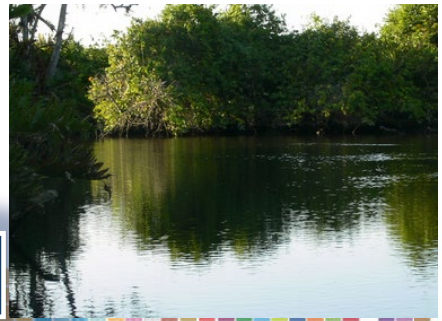
Red Hidrográfica Nacional

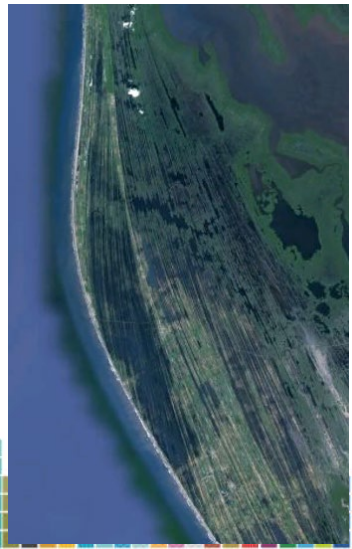
Water bodies scale 1:50 000

Waterbodies polygons were taken from the topographic data.
Their boundaries were updated using satellite images and digital orthophotos, supported on morfological criteria, this product is useful for planning projects, recovery of the environment and natural disaster prevention and for decisión making.

Spatial objects

- Flooding area
- Stream
- Channel
- Cenote
- Pond
- Lake
- Lagoon
- Marine
- Marsh
- Swamp
- Pool
- River
- Land subject to flood
- Dam
- Vaso de bordo





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Product and statistics

CONTINUO NACIONAL CUERPOS DE AGUA ESCALA 1:50 000

Rasgo	Numero de rasgos	Extensión total km 2	% relativo
Área inundable	25 449	45 896	0.6648
Arroyo	832	15 571	0.2256
Canal	683	14 483	0.2098
Cenote	1 686	1 007	0.0146
Estanque	8 297	155 877	2.2580
Estero	881	87	0.0013
Lago	10 223	569 007	8.2424
Laguna	2 769	1 389 649	20.1298
Marina	55	1 734	0.0251
Marisma	3 287	594 720	8.6148
Pantano	306	668 856	9.6887
Poza	8 089	19 898	0.2882
Río	2 240	207 577	3.0069
Terreno Sujeto a Inundación	10 542	252 4047	36.5621
Vaso Bordo	117 031	154 876	2.2435
Vaso Presa	1 461	540 162	7.8245

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