CLIMATE CHANGE COUNCIL
PUERTO RICO

Working Group 2:

Ecology and Biodiversity of freshwater ecosystems

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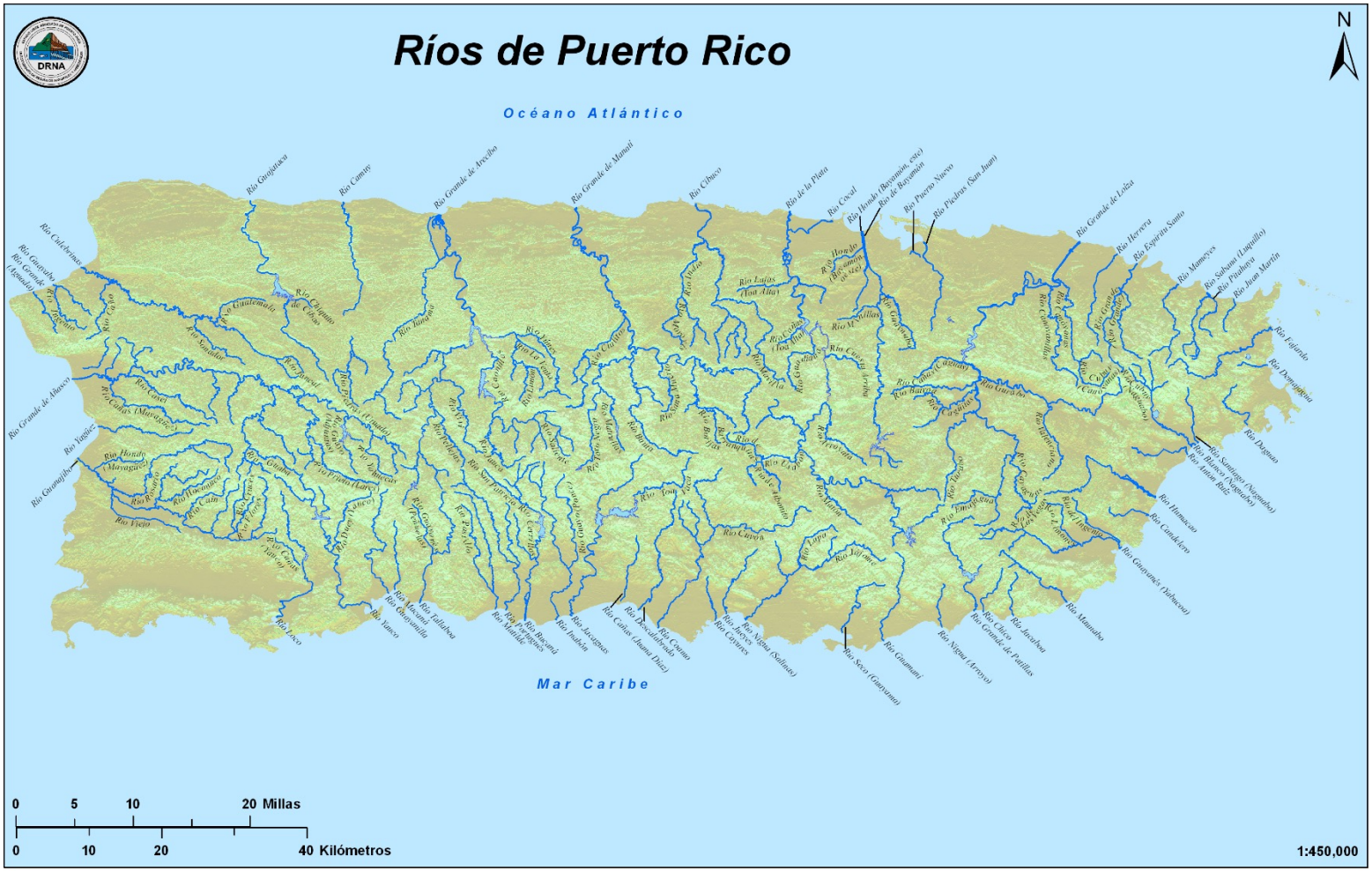
Freshwater Ecosystems of Puerto Rico

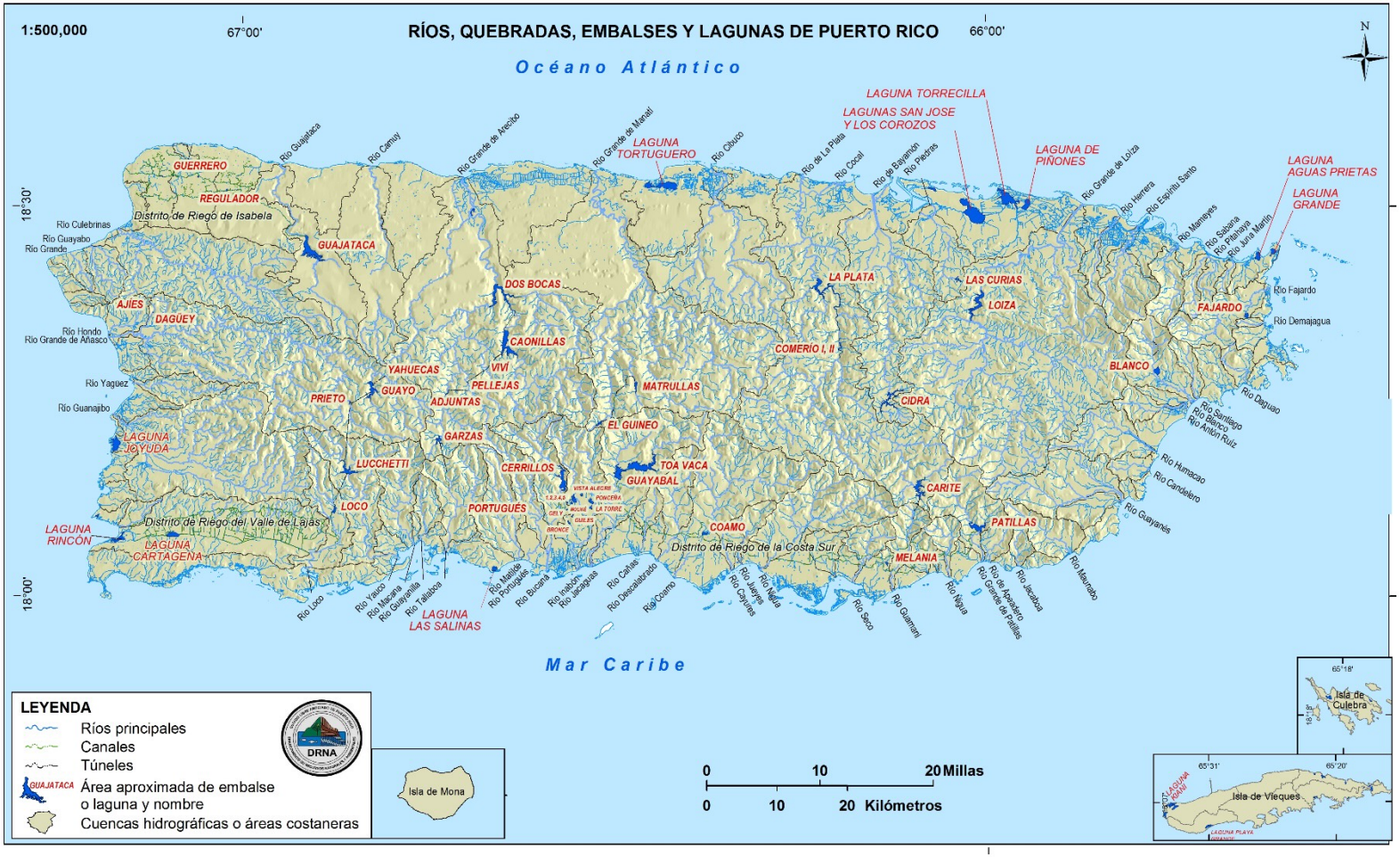
Fuente: Divisón de Monitoreo del Plan de Aguas, DRNA 2011

Freshwater Ecosystems of Puerto Rico

Ilustración 3.5 Ríos de Puerto Rico



Freshwater Ecosystems of Puerto Rico



Fuente: Divisón de Monitoreo del Plan de Aguas, DRNA 2011

Freshwater Ecosystems of Puerto Rico

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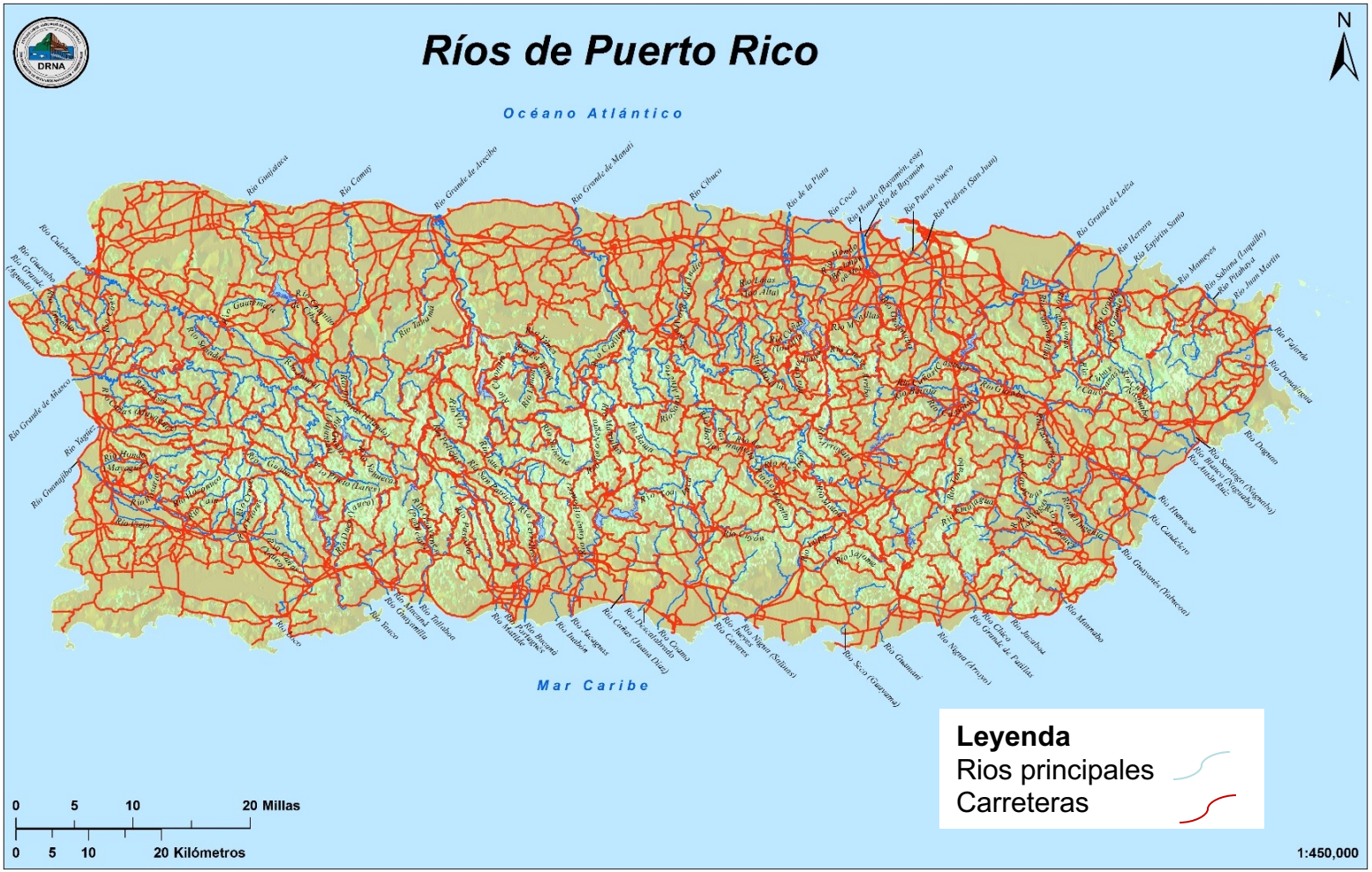
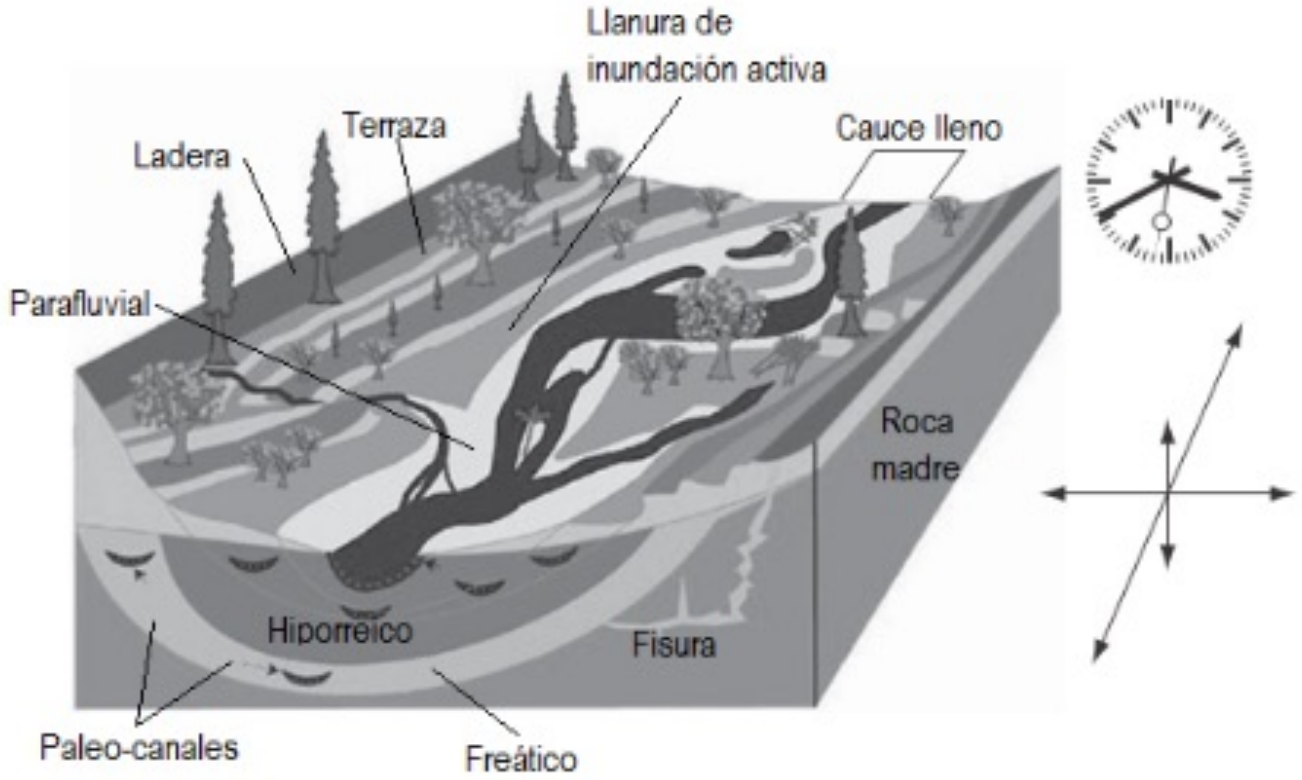
Freshwater Ecosystems of Puerto Rico



Freshwater Ecosystems of Puerto Rico



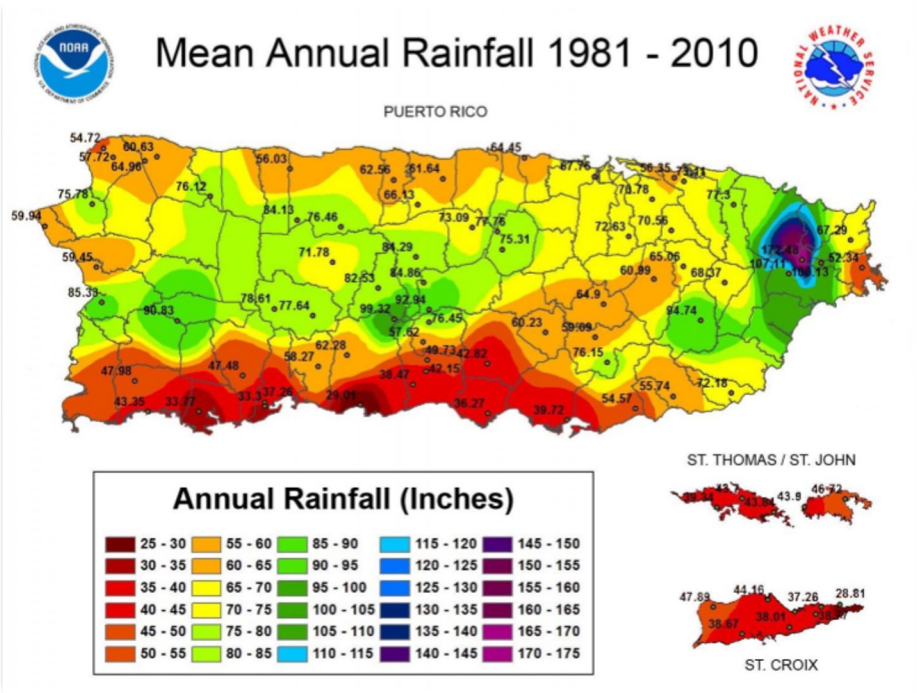
4 dimensions

- Longitudinal
- Lateral
- Vertical
- Temporal

https://www.redalyc.org/journal/721/72157132006/html/

Ecology and Biodiversity of freshwater ecosystems

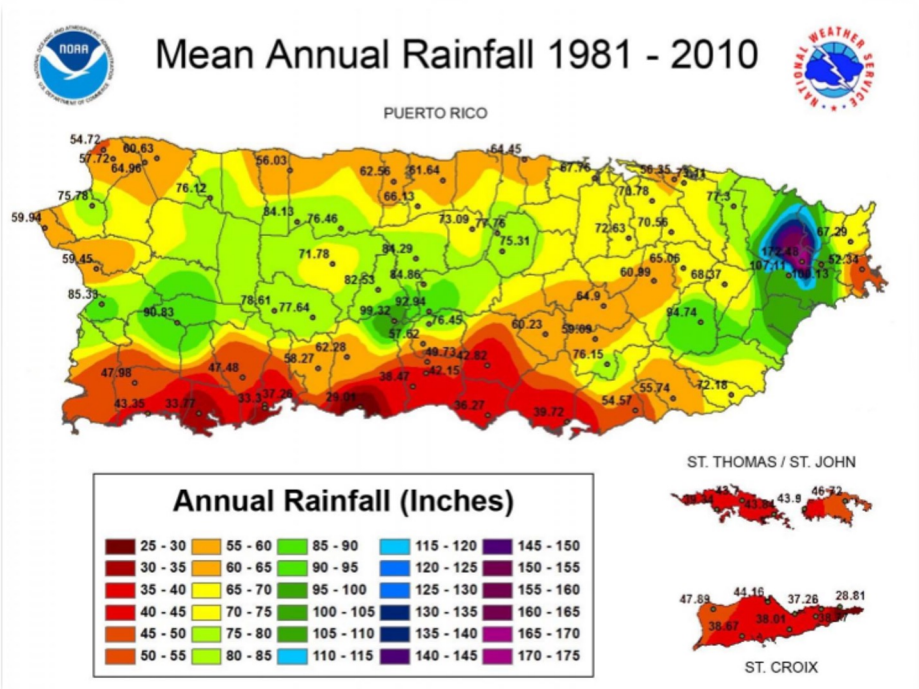
Reduction of mean annual rain, 25-50% reduction

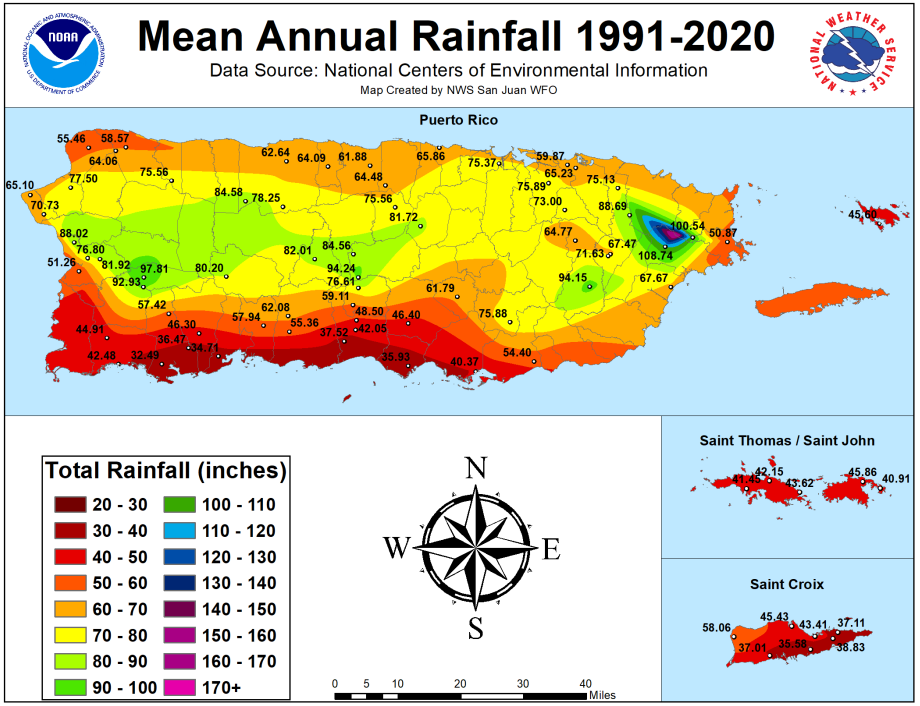


https://www.weather.gov/sju/climo_pr_usvi_normals

Ecology and Biodiversity of freshwater ecosystems

Reduction of mean annual rain, 25-50% reduction





https://www.weather.gov/sju/climo_pr_usvi_normals

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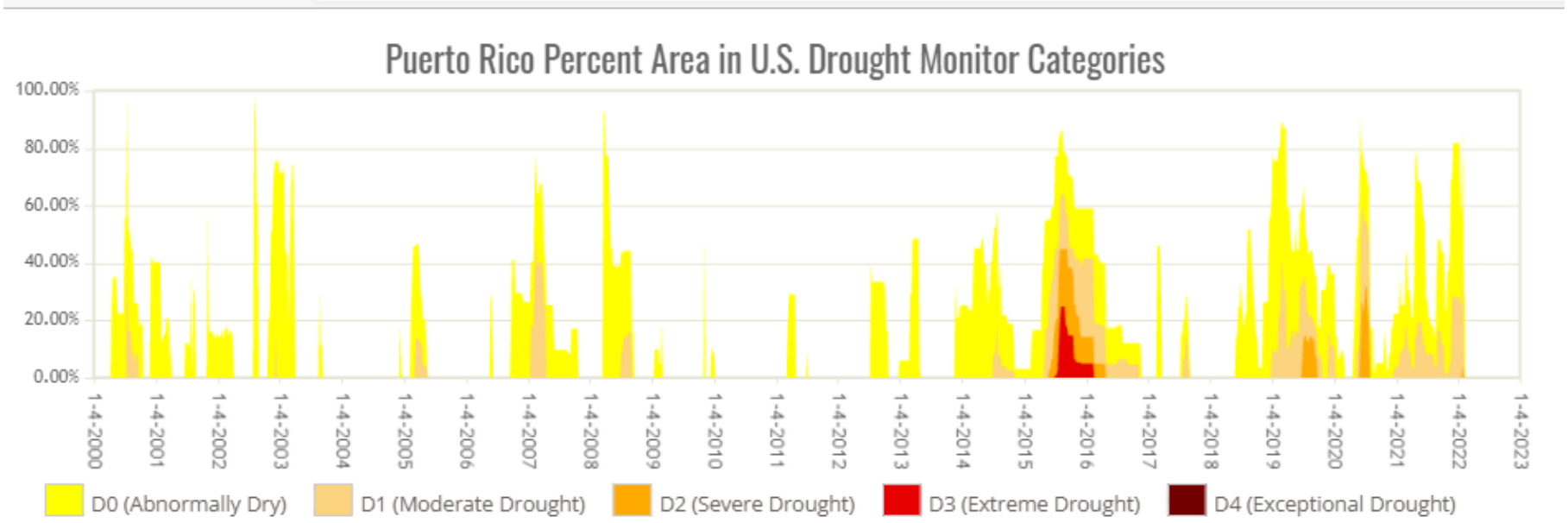

Time Series | U.S. Drought Monitor (unl.edu)

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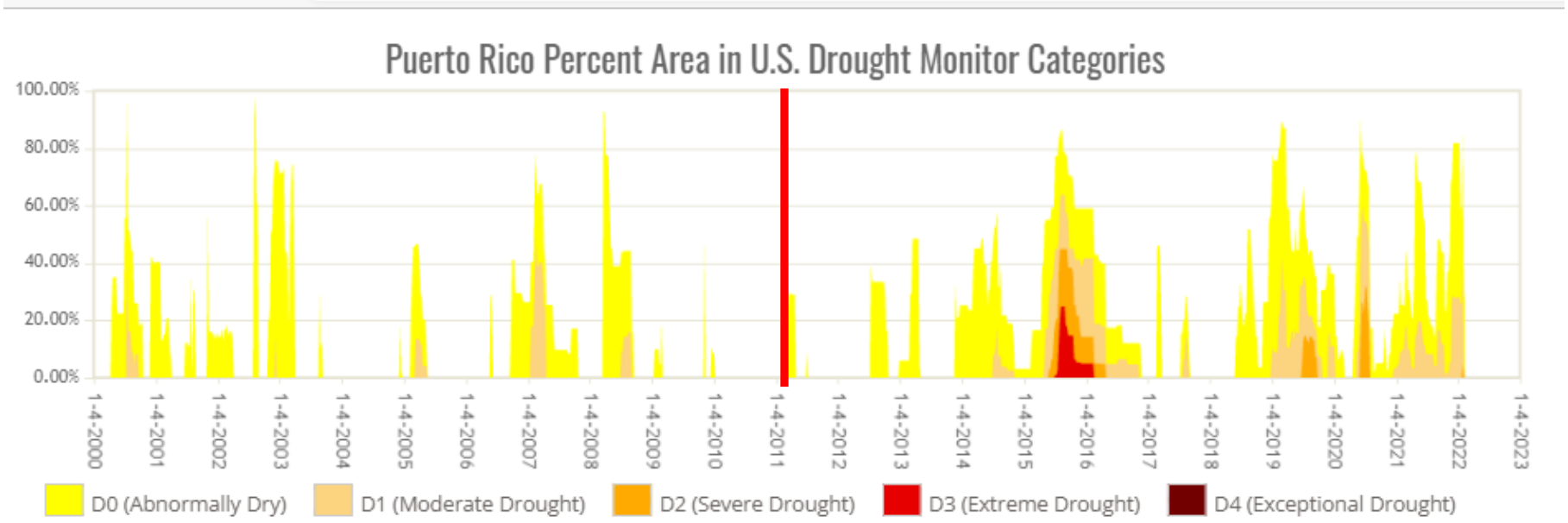

Time Series | U.S. Drought Monitor (unl.edu)

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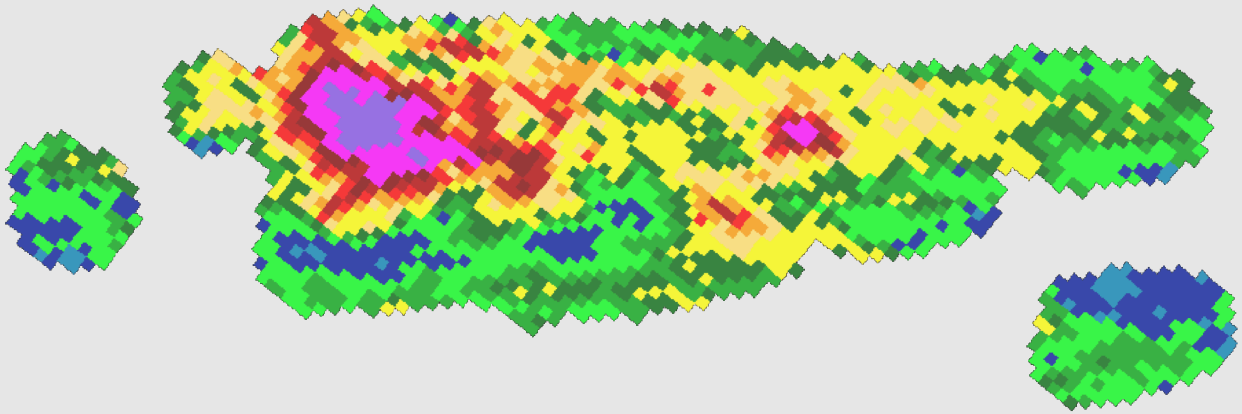
July 01, 2014 Monthly Observed Precipitation
Created on: March 12, 2022 - 23:34 UTC
Valid on: August 01, 2014 12:00 UTC



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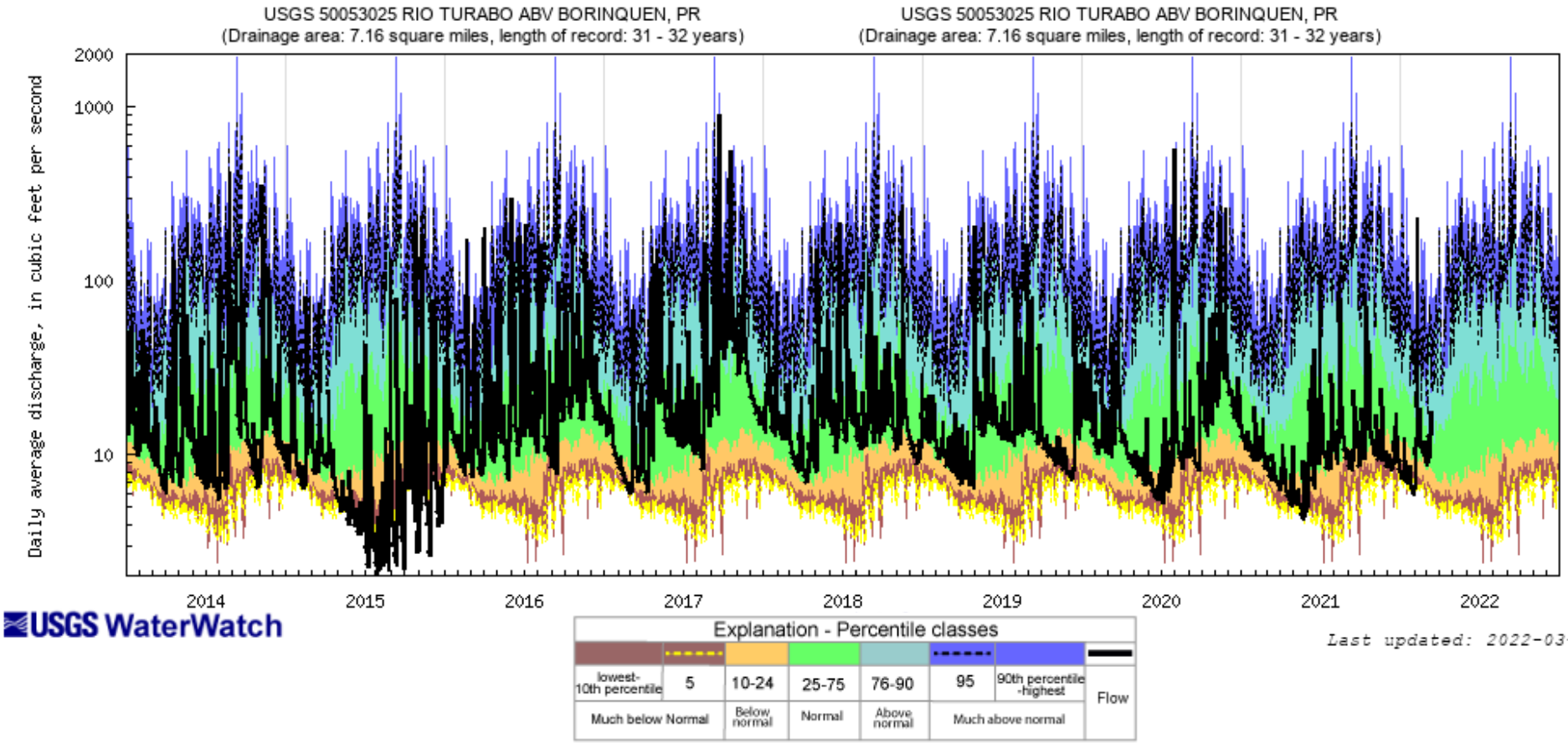
Reduction in surface water availability



https://waterwatch.usgs.gov/index.php?sno=50053025&yr=2022&xlgd=1&go=GO&ofmt=plot&atp=log&cfu=mcf&id=wwdur_cumflow&ct=wwdur_cumflow&lgd=1

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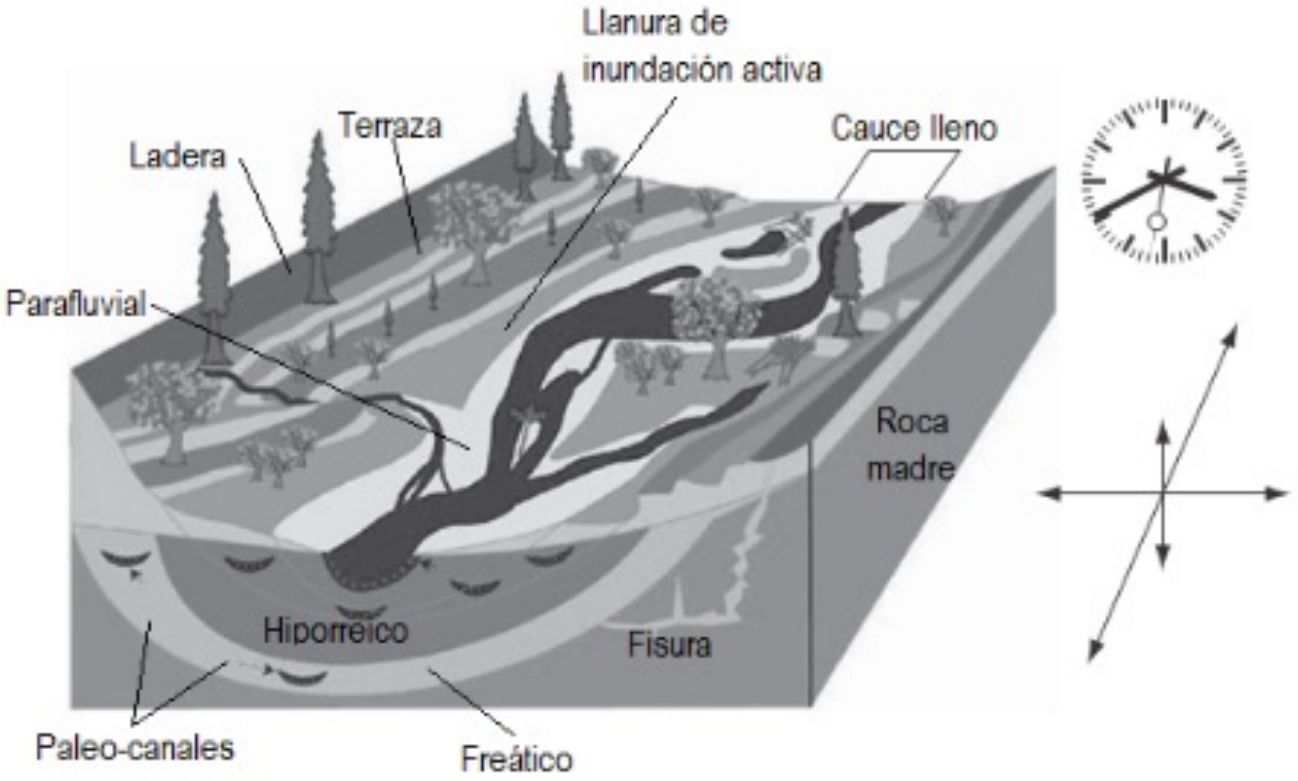
Climate change and its effects in freshwater dynamics:



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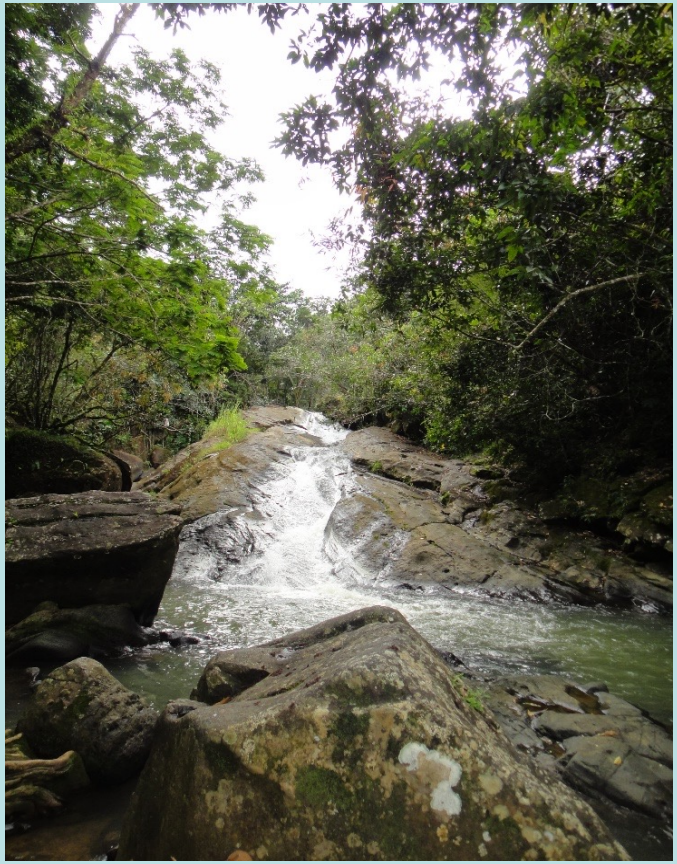
Effects on:

Ecosystems



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Effects on:

Ecosystems

Communities

Humanos:
Una gran cantidad de personas en Puerto Rico se dedican a la pesca artesanal de peces y camarones.

Egretta caerulea:
Ave, se alimentan de peces, ranas y crustáceos.

Anguilla rostrata:
Pez, se alimenta de camarones y peces. Se encuentra mayormente refugiada bajo rocas o troncos de madera en los ríos.

Sycidium plumieri:
Pez, se alimenta de biopelículas que crecen sobre las piedras. Se puede encontrar adherido a las piedras en el fondo de los ríos.

Macrobrachium carcinus:
Camarón, se alimenta de odonatos, ranas y peces (*Sycidium*). Se encuentran refugiados en cuevas.

Biopelículas:
Son un agregado de algas, hongos y bacterias. Pueden crear su propio alimento.

Ranas:
Los renacuajos se alimentan de biopelículas. Los adultos se alimentan de invertebrados acuáticos.

Odonatos:
Son invertebrados (libélulas), se alimentan de larvas de peces, y anfibios. Los adultos se alimentan mayormente de otros invertebrados acuáticos.

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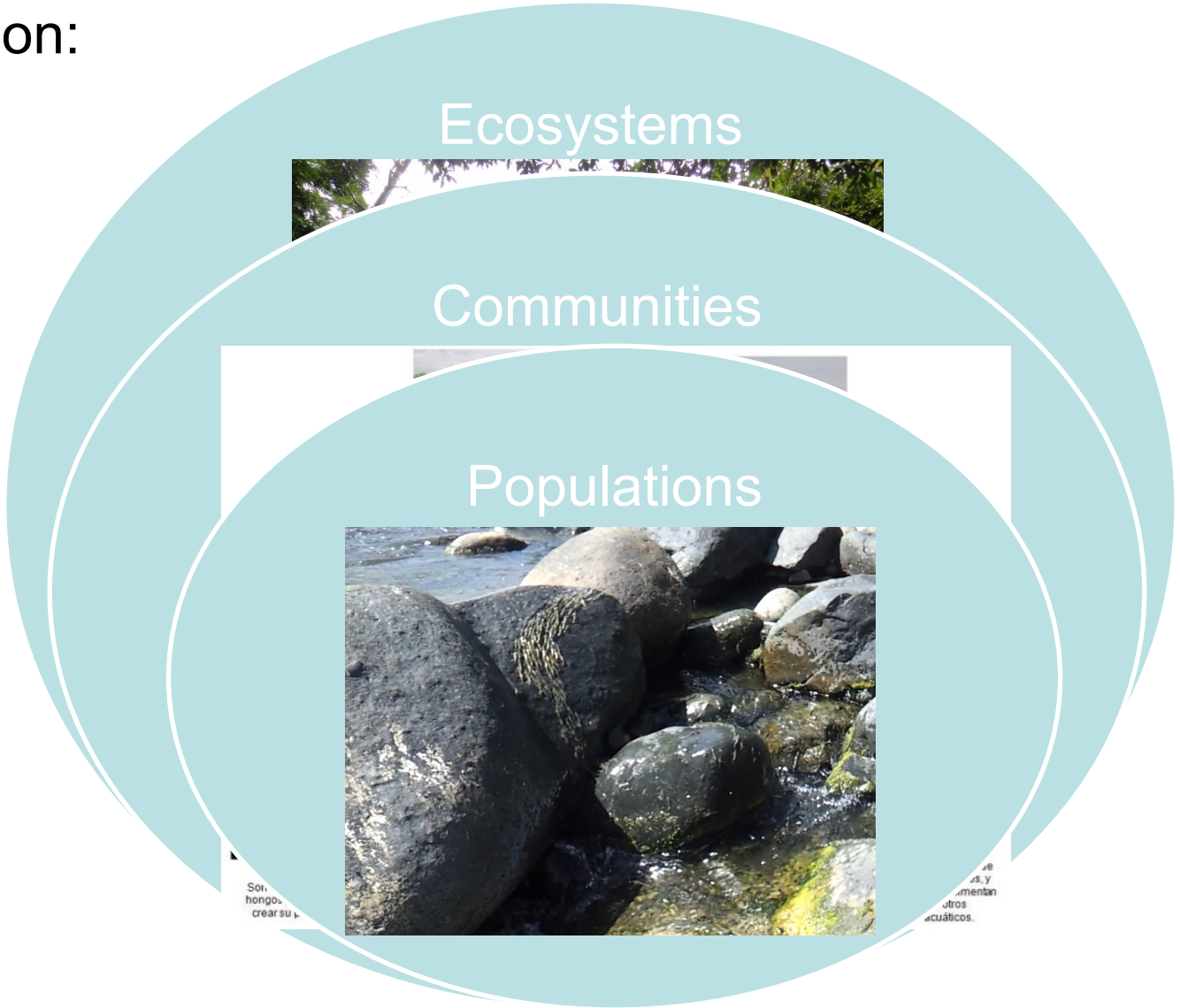
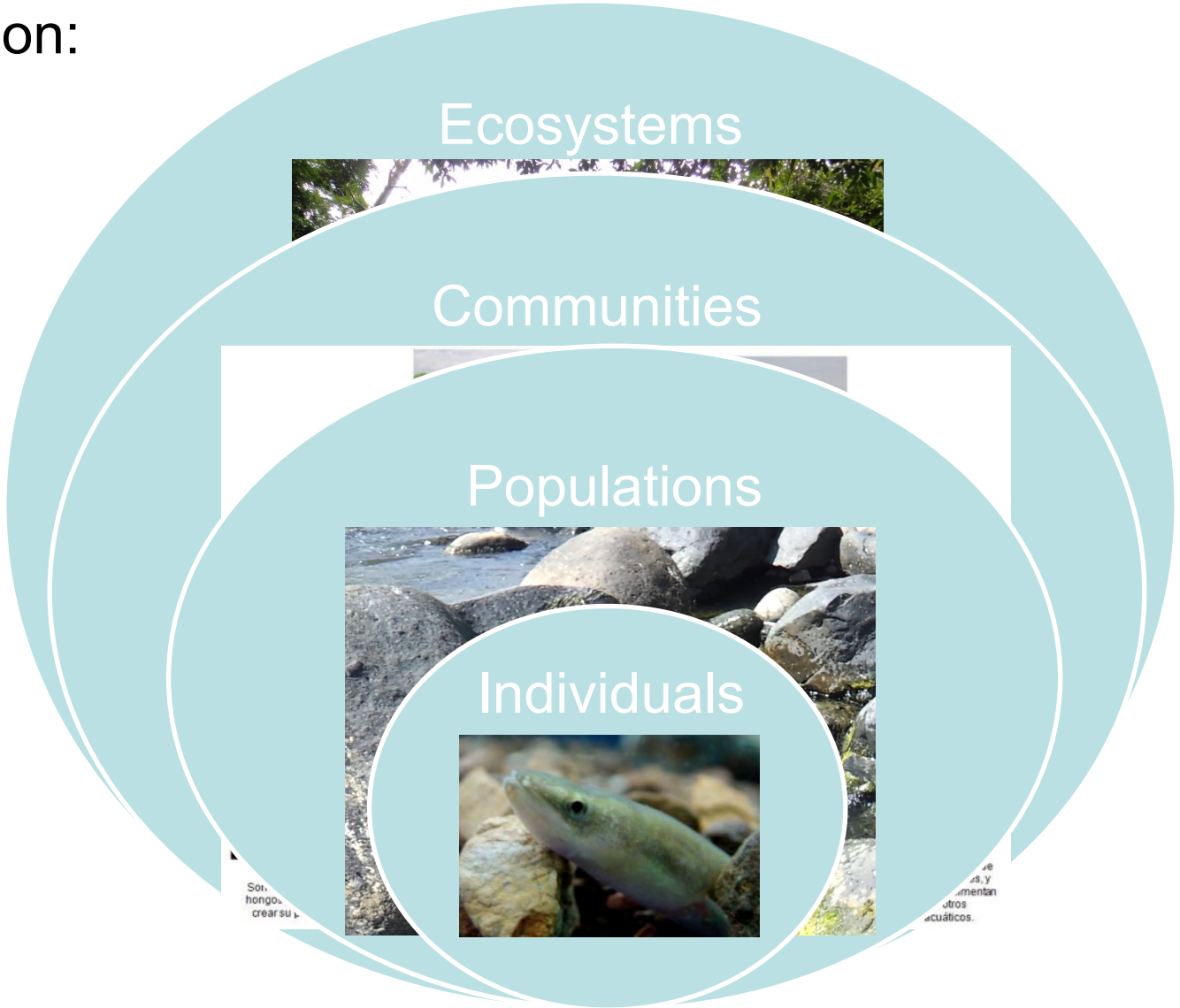
Effects on:



Ecology and Biodiversity of freshwater ecosystems

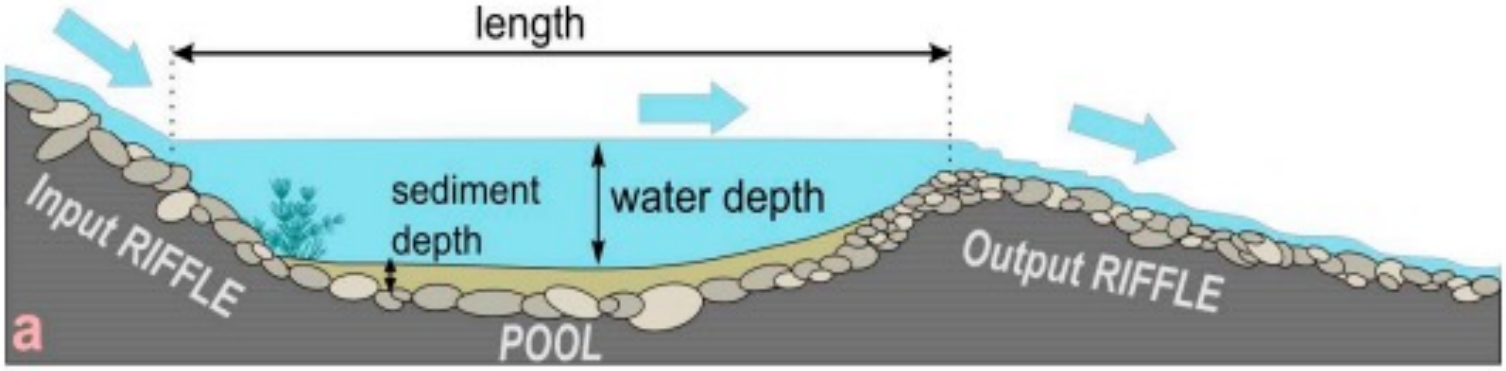
Effects on:



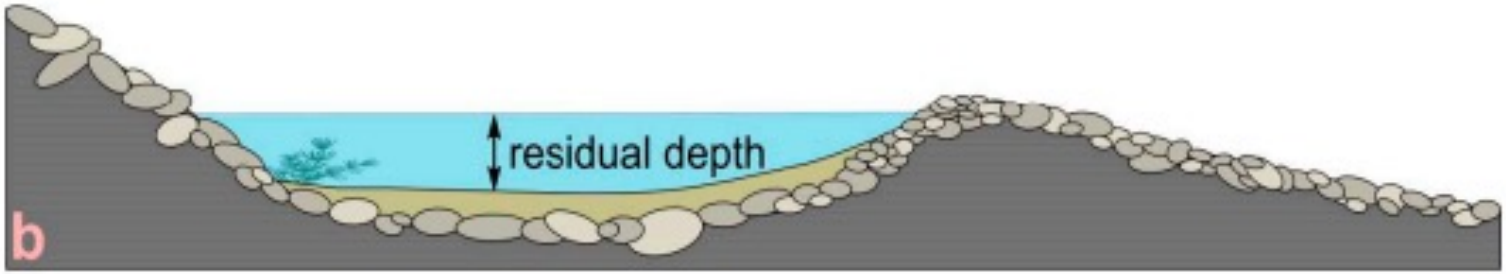
Ecology and Biodiversity of freshwater ecosystems

Longitudinal dimension: Instream flow reduction

Normal flow



Reduced flow, surface and groundwater disconnects



↑ temperature
↓ DO

↑ solutes
↑ organic matter

↑ density
↑ predation

Bonada et al., 2020.

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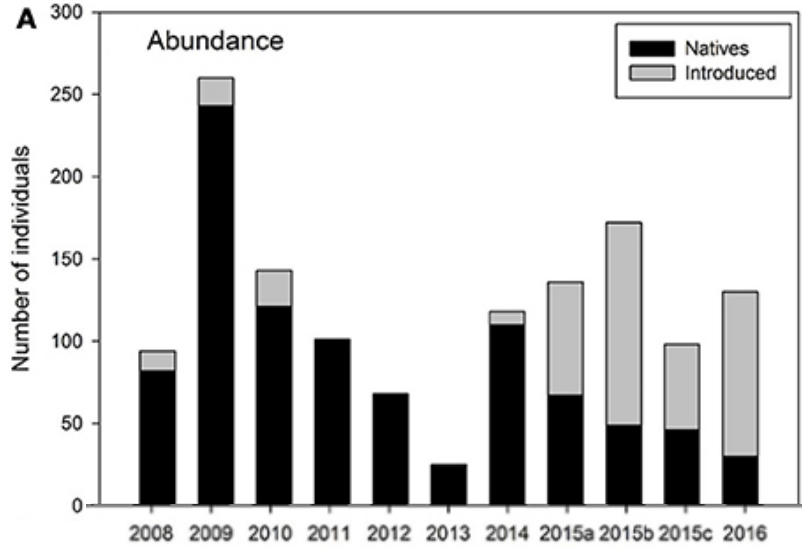
- Longitudinal dimension: Instream flow reduction
  - Instream barriers on migratory fauna (sand berms)
  - Favor tolerant, exotic fishes
  - Alteration of nutrient dynamics



Ramirez et al., 2018.

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Longitudinal dimension: Instream flow reduction

Reduction in habitat availability and quality

http://www.explorapr.org/2014/10/refugio-de-vida-silvestre-lago-la-plata.html
https://www.drna.pr.gov/wp-content/uploads/2017/01/Informe-Sequia-2014-2016.compressed.pdf

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Longitudinal dimension: Instream flow recovery

Reduction in habitat availability and quality

Longitudinal dimension: Effects on vegetation

Loss of mangrove vegetation, degradation of habitat quality, Salinas, PR

Photos provided by Francisco Catalá

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Lateral dimension: Effects to riparian vegetation

Prieta Stream normal conditions

Abundant riparian cover
Evident stream flow

Prieta Stream during 2015 drought

Loss of foliage
↓ stream flow

Pulse of organic matter
↑ carbon in the soil

https://cals.ncsu.edu/applied-ecology/news/what-is-causing-caribbean-rainforests-to-dry-out/

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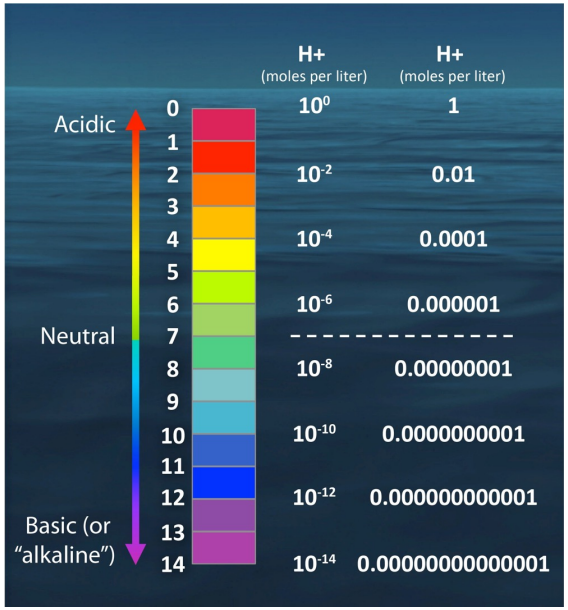
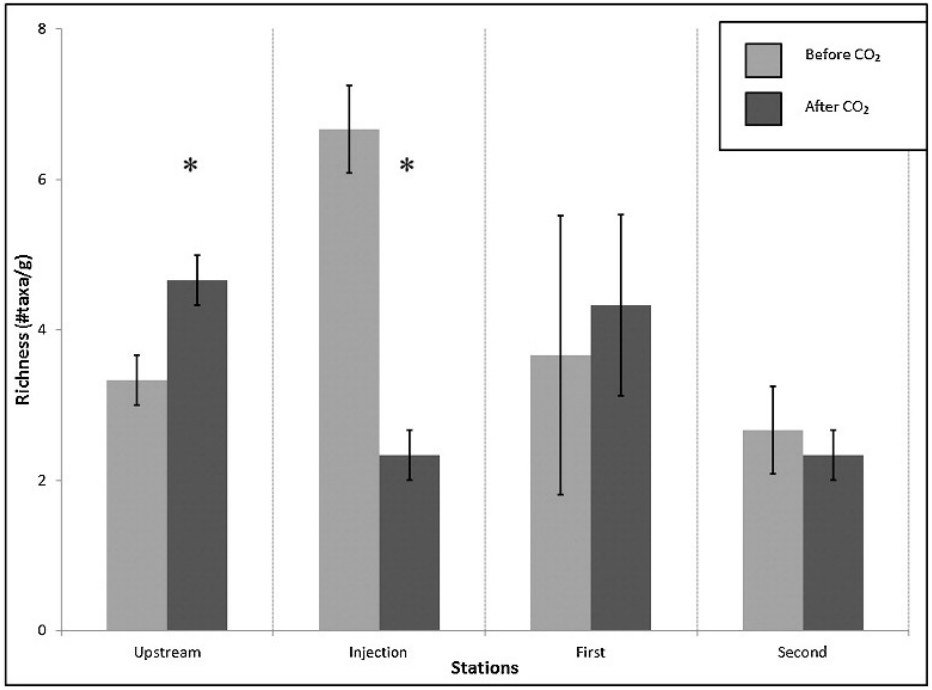
Lateral dimension: Impacts to riparian vegetation

- Stream acidification
  - CO_2 addition in July 2014
  - pH reduction from 7.13 to 5.42.



pmel.noaa.gov

Acidification Experiment, Quebrada Buruquena, Luquillo Experimental Forest



Klem and Gutiérrez-Fonseca 2017

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Lateral dimension: Reduction of nesting areas for fish

- Carraízo

DMPA, DRNA.

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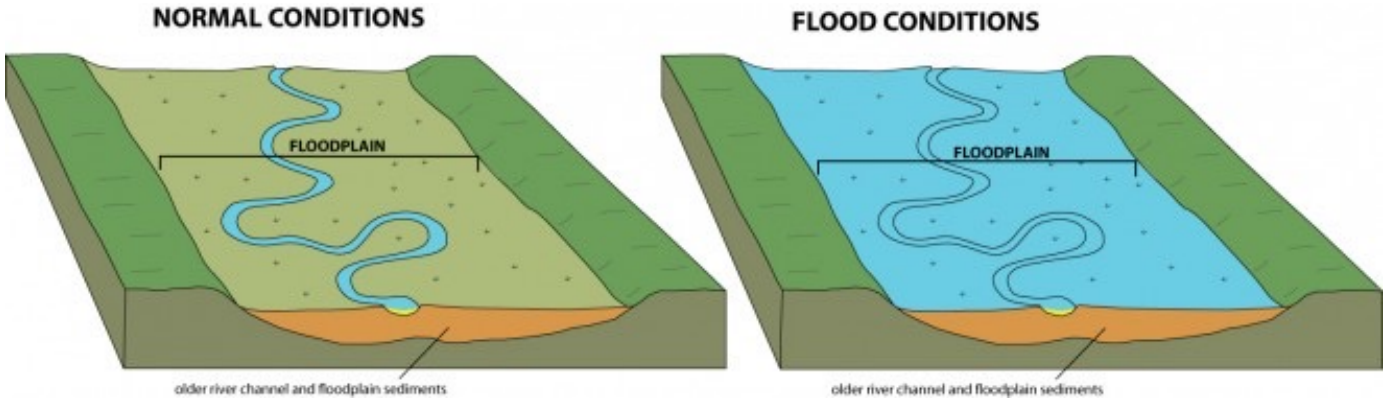
Lateral dimension: Increases in of urban and coastal floods

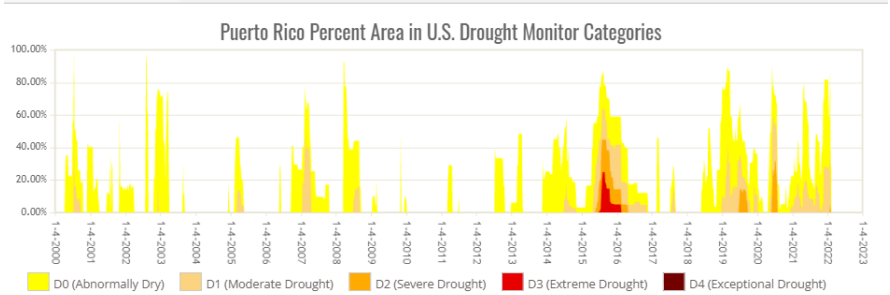


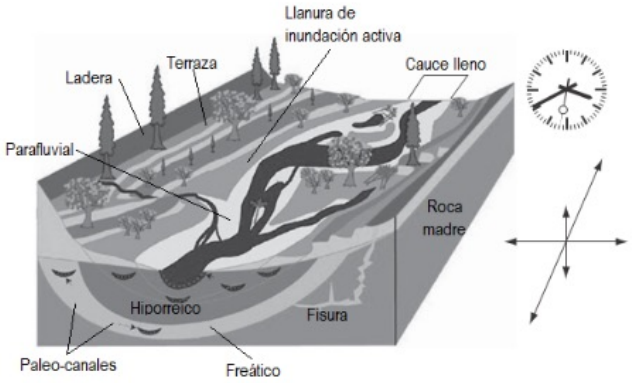
Top: https://www.elnuevodia.com/noticias/el-tiempo/notas/el-servicio-nacional-de-meteorologia-anticipa-el-desarrollo-de-mas-aguaceros-en-la-region/; Bottom: River Features - Geo for CXC

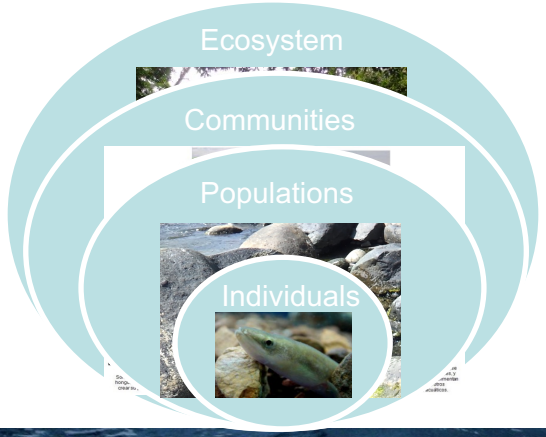
Ecology and Biodiversity of freshwater ecosystems

Take home message:

- The temporal dimension (drought) modifying the longitudinal and vertical dimensions of riverscapes.
  - Changes in habitat quality and quantity







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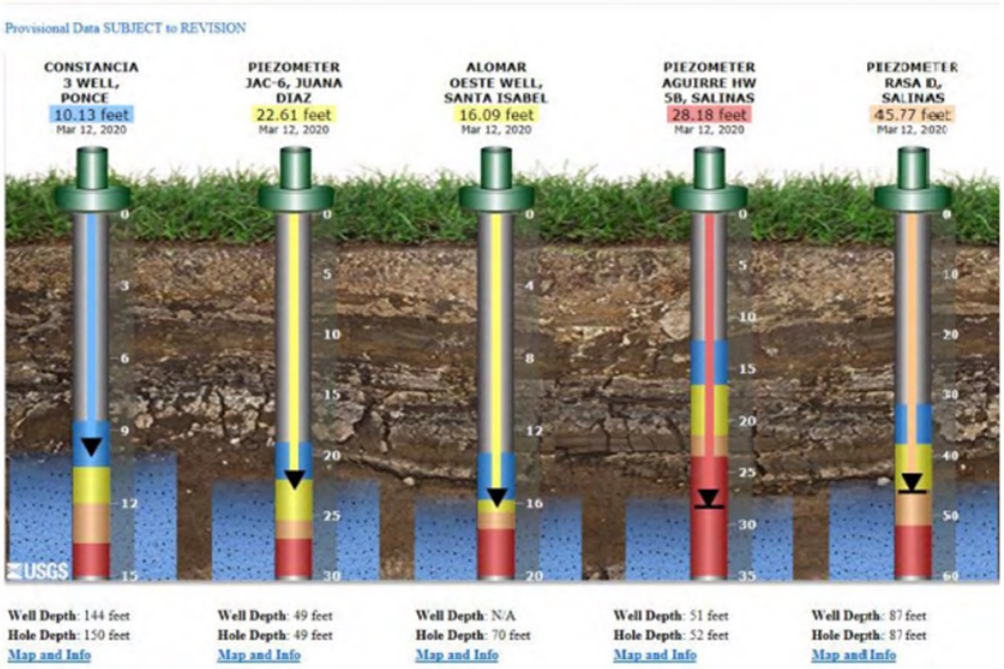
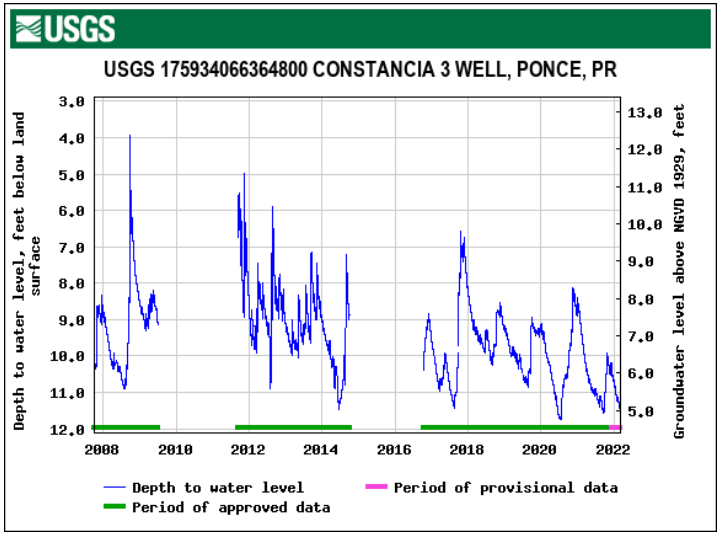
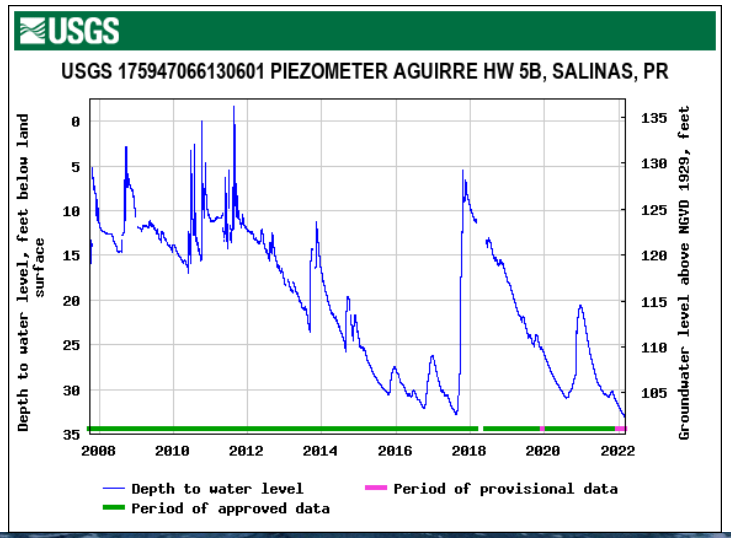
Vertical dimension: Reduction of aquifer recharge







Left: https://www.drna.pr.gov/wp-content/uploads/2021/02/Informe-Sequia-2018-2020_Final_Res.pdf; Right https://nwis.waterdata.usgs.gov/

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¡MUCHAS GRACIAS!

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