Supplementary Information-1

Information on groundwater-dependent species and mitigation measures for sustainability of their habitats was collected from710 aquifers globally (summarized in Table S1) by reviewing 2,224 published articles and reports, and a map was created that displays the distribution of aquifers and their groundwater-dependent species (See link). Users can access the information about the approximate location, name, and type of the aquifer, and status of their inhabitant's species and associated habitat conservation measures, by clicking on blue points on the map. Among the 710 surveyed aquifers, 22.7% are in North America, 2.3% in South America, 10.6% in Asia, 42.2% in Europe, 13.2% in Australia, and 9% in Africa. Mitigation measures are either proposed or established in 90% of the surveyed aquifers. Notably, 74% of the surveyed aquifers are home to endangered species, while 41% are home to threatened species.

Table S1: Summary of the status of groundwater-reliant species and mitigation measures for protection of their aquatic habitats in aquifer systems surveyed across the globe.

COUNTRY	North America	South America	Asia	Europe	Australia	Africa	Total
Aquifers surveyed	161	16	75	300	94	64	710
Karst aquifers	40	0	46	272	24	47	429
Aquifers with mitigation measures	117	15	64	288	94	64	642
Endangered species in study aquifers	169	16	50	735	44	44	1,058
Threatened species in study aquifers	162	0	5	395	88	1	651
Aquifers home to endangered species	117	16	50	278	20	44	525
Aquifers home to threatened species	100	0	5	144	42	1	292

Supplementary Information-2

The Edwards Aquifer (map shown in Figure S2) is one of the most prolific karstic aquifer systems in the world and a source of environmental flow for several springs and rivers, including the two largest freshwater springs in Texas that form the San Marcos and Comal Rivers. The unique and ecologically delicate habitats sustained by these springs are home to endemic species that are found in no other locations on Earth.

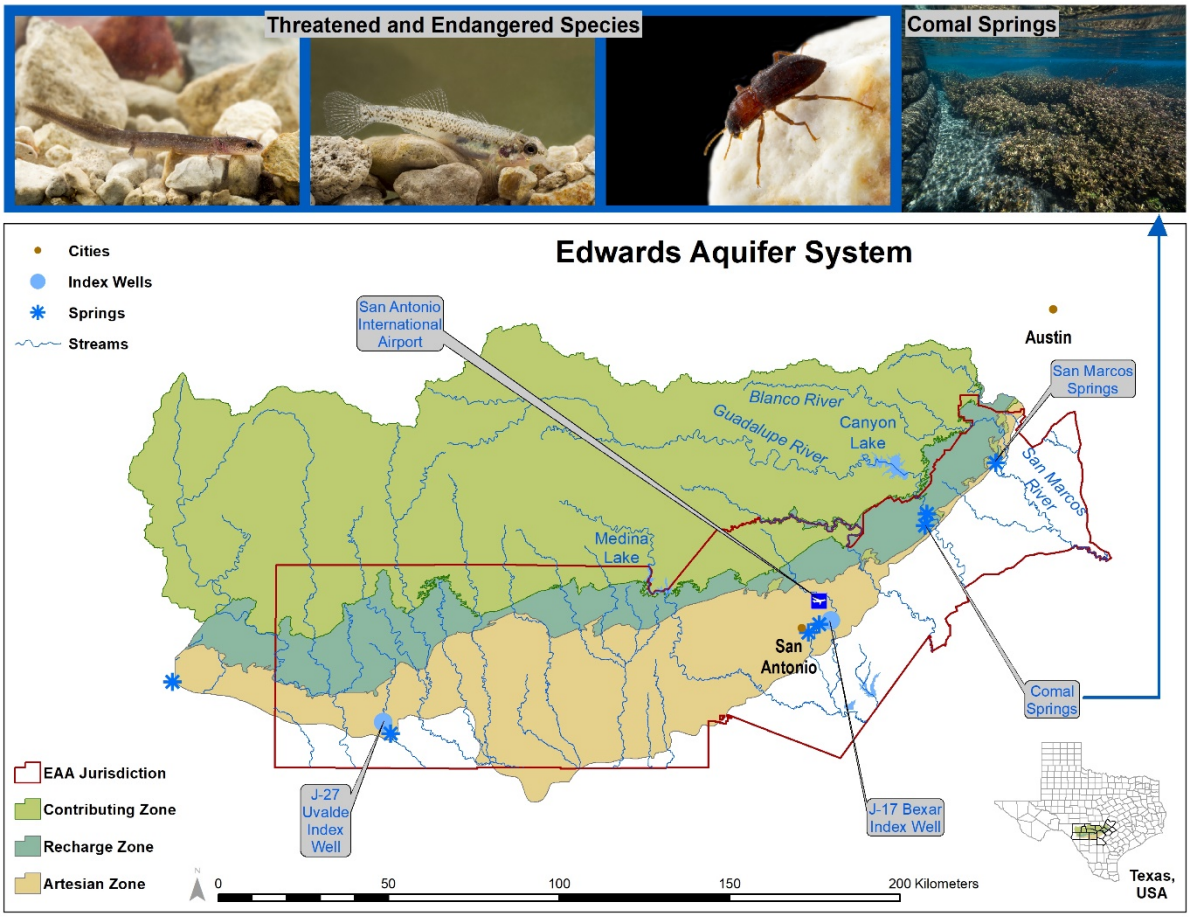

Figure S1: The map in the lower panel shows the Edwards Aquifer system under the jurisdiction of the Edwards Aquifer Authority. Groundwater levels at the J-17 Bexar Index well trigger mandated reductions in groundwater withdrawals during droughts in the eastern segment of the aquifer that extends from west of the city of San Antonio toward the Comal and San Marcos springs along the recharge and artesian zone (known as the San Antonio pool of the aquifer) under the Edwards Aquifer jurisdiction to offset the adverse impacts of droughts on groundwater levels and habitats of the endangered and threatened aquatic species in the Comal and San Marcos springs. The top panel shows a section from the Comal springs, which is home to threatened and endangered species, including the Comal springs salamander, the fountain darter, and the Comal springs riffle beetle (from left to right).

Due to the potential for declines in spring flow by anthropogenic and natural causes, these species are continuously at risk and eight of them at the San Marcos and Comal springs have already been listed as threatened or endangered under the federal Endangered Species Act. The Edwards Aquifer Authority implemented the ``Edwards Aquifer Habitat Conservation Plan

(EAHCP)" in 2002 to regulate the groundwater pumping at the permitted wells within its jurisdiction to protect the aquifer and groundwater-fed habitats of threatened and endangered species at the San Marcos and Comal springs under the influence of a growing population and warming climate in the region.

Although threatened and endangered species have been identified in many regional aquifers across the globe, natural and anthropogenic pressure on the aquifers has been assessed, and a need for artificial regulation of aquifers to improve environmental flows to sustain ecosystems has been emphasized, ‘mandated’ mitigation measures have been implemented exclusively at the Edwards Aquifer system in south-central Texas, USA, till date to protect endemic threatened and endangered groundwater-bound species.

Supplementary Information-3

Table 1 in the main section of the paper is based on the clustering-driven proximity plot shown in Figure S2. The similar years before and after mitigation implementation are chosen based on the Euclidean distance (proximity) between datapoints.

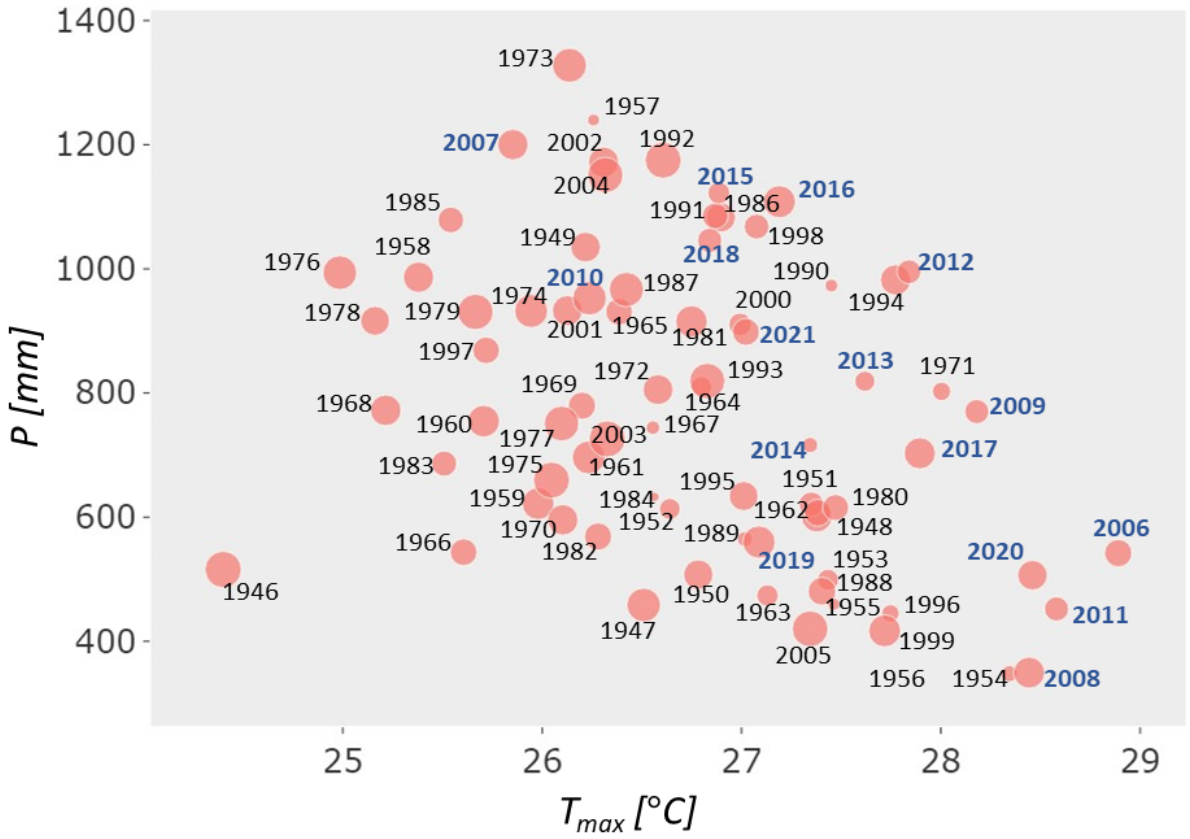

Figure S2: Proximity analysis of years based on climatic factors, which reveals similarity between years. For example, 2019 is closest to 1989 in terms of proximity measured via Euclidean distance between the climatic data for the respective years. Post-mitigation period years (2006-2021) are in blue fonts. The size of the scatter points indicates the magnitude of minimum yearly spring flows - bigger circles represent higher flows and vice versa.