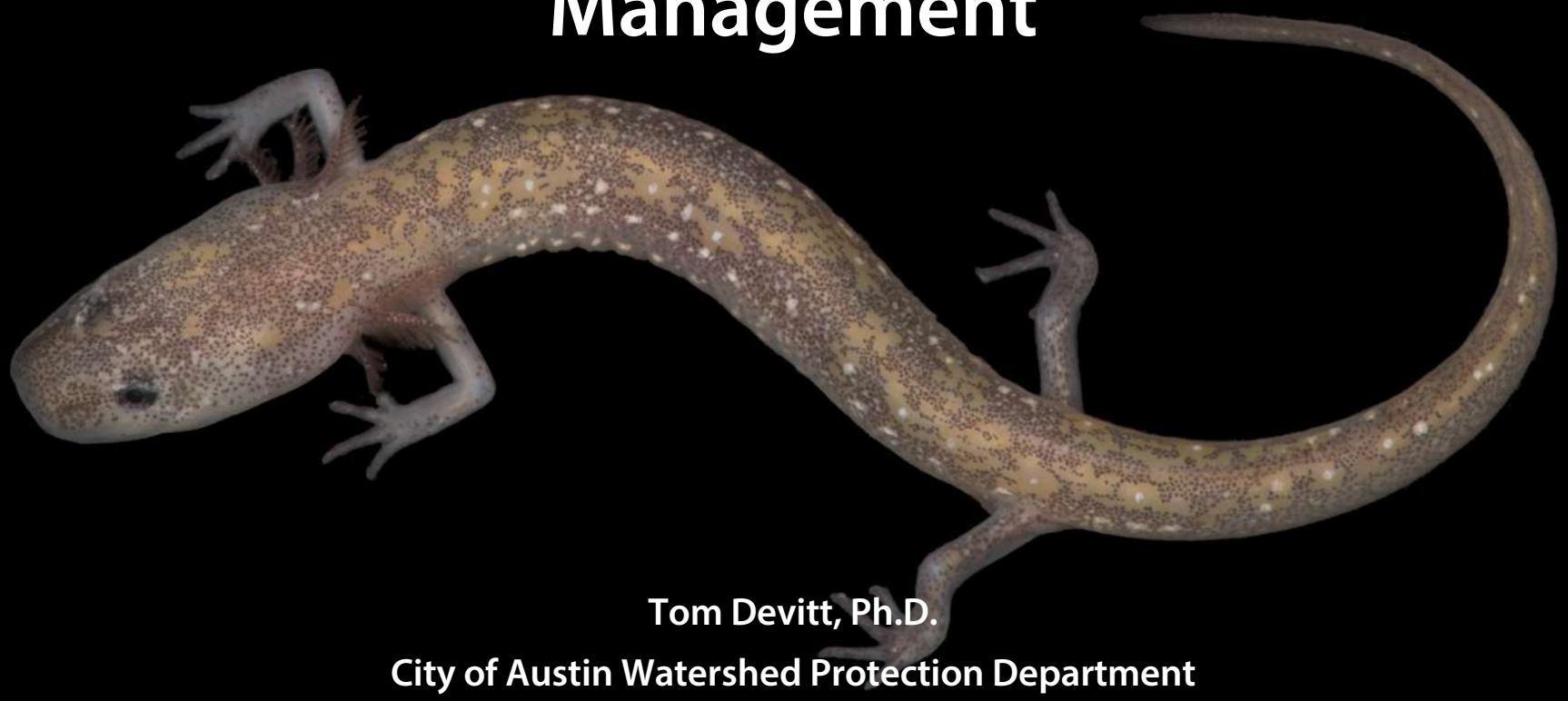
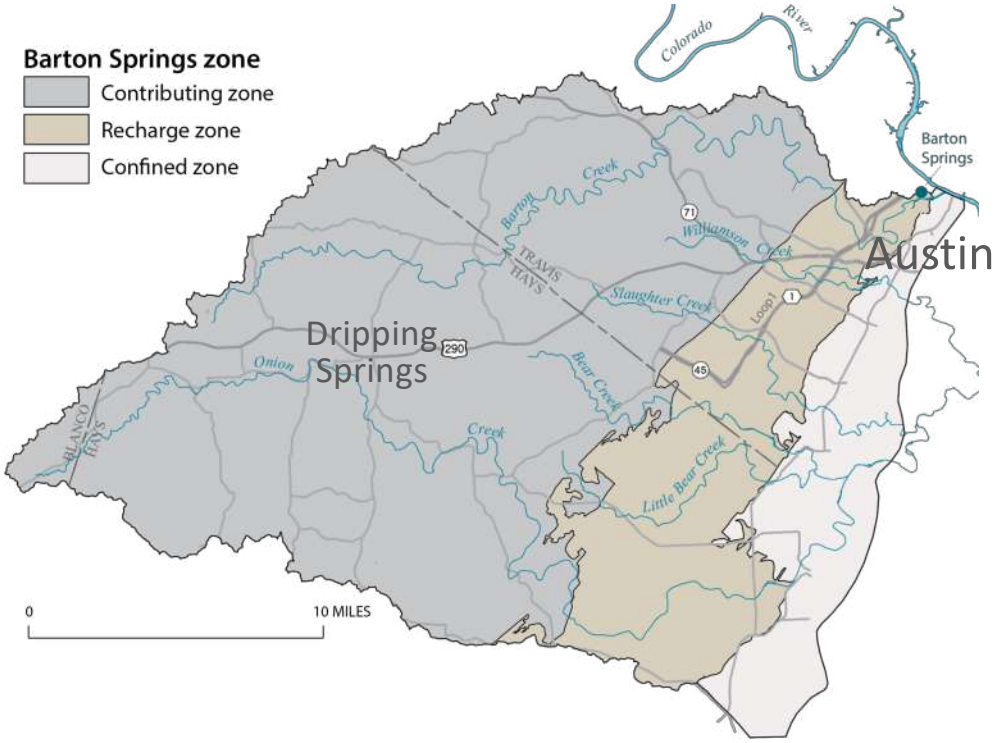
Austin's Endangered Salamanders:
An Update on their Conservation and Management

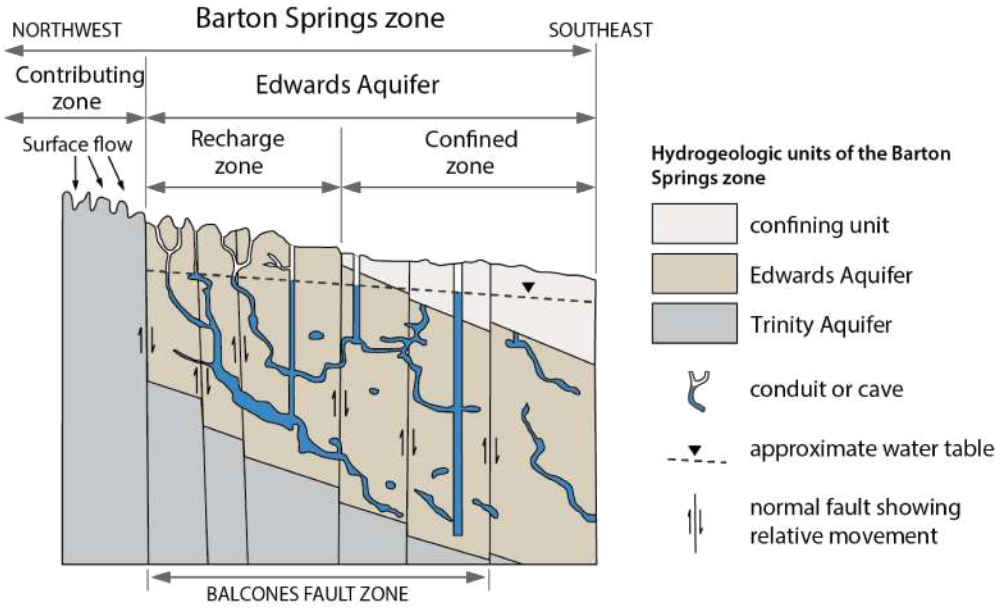


Tom Devitt, Ph.D.

City of Austin Watershed Protection Department

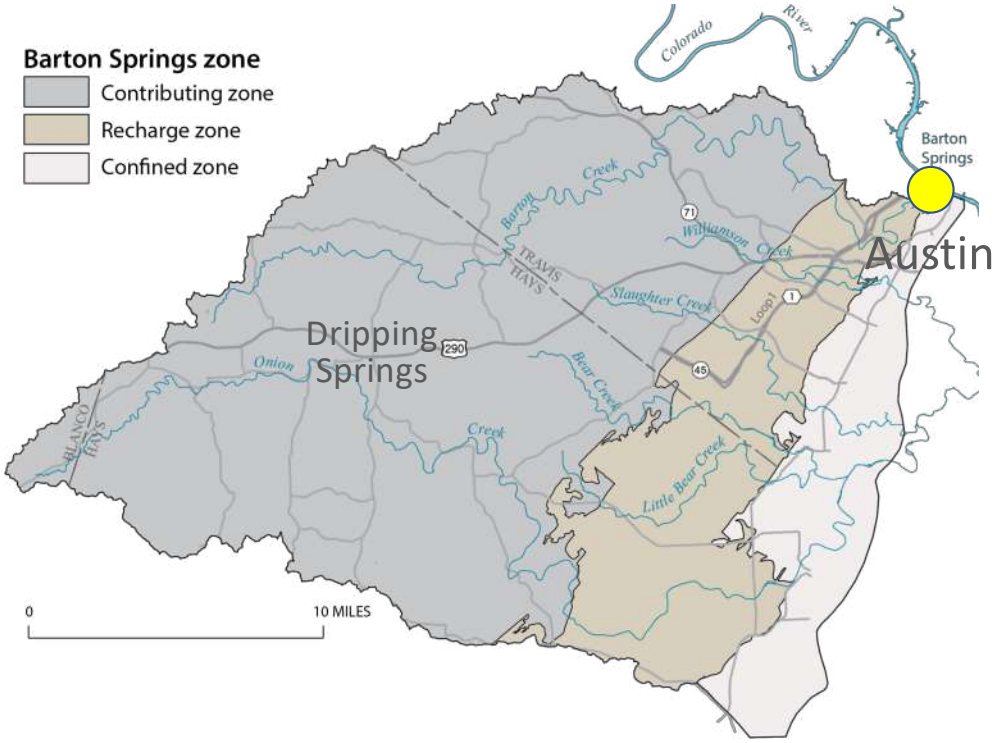
The Barton Springs Zone





Modified from Mahler et al. USGS Sci. Inv. Rep. 2011-5139

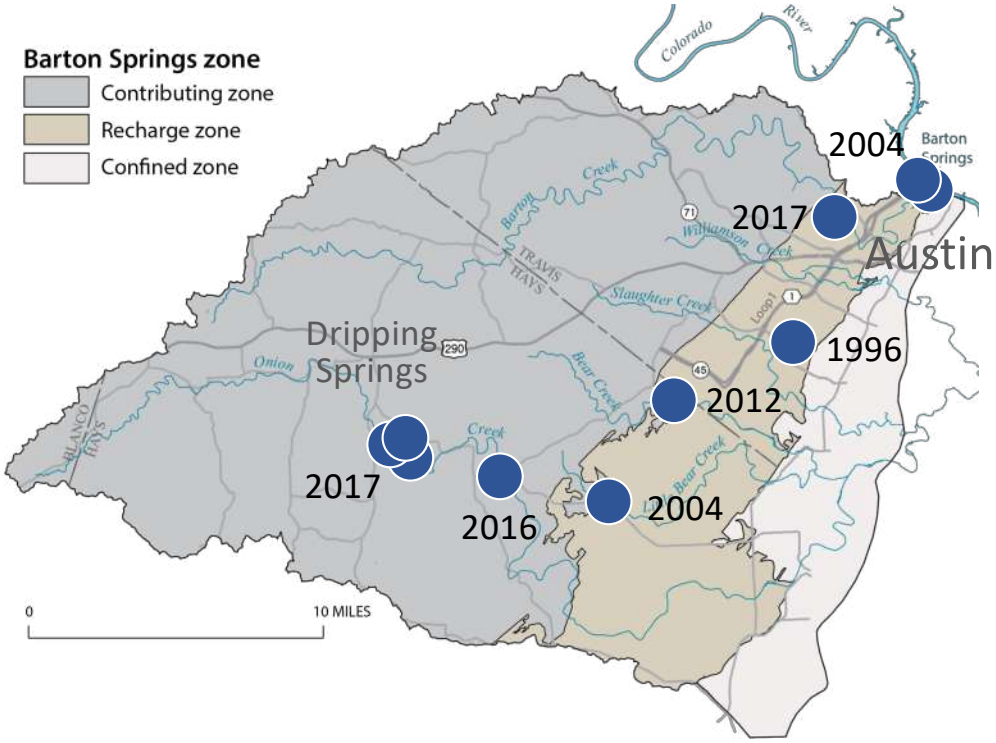
Austin Blind Salamander



Modified from Mahler et al. USGS Sci. Inv. Rep. 2011-5139

Austin Blind Salamander (*Eurycea waterlooensis*) from Upper Barton Spring

Barton Springs Salamander



Modified from Mahler et al. USGS Sci. Inv. Rep. 2011-5139

Listed Under the Endangered Species Act

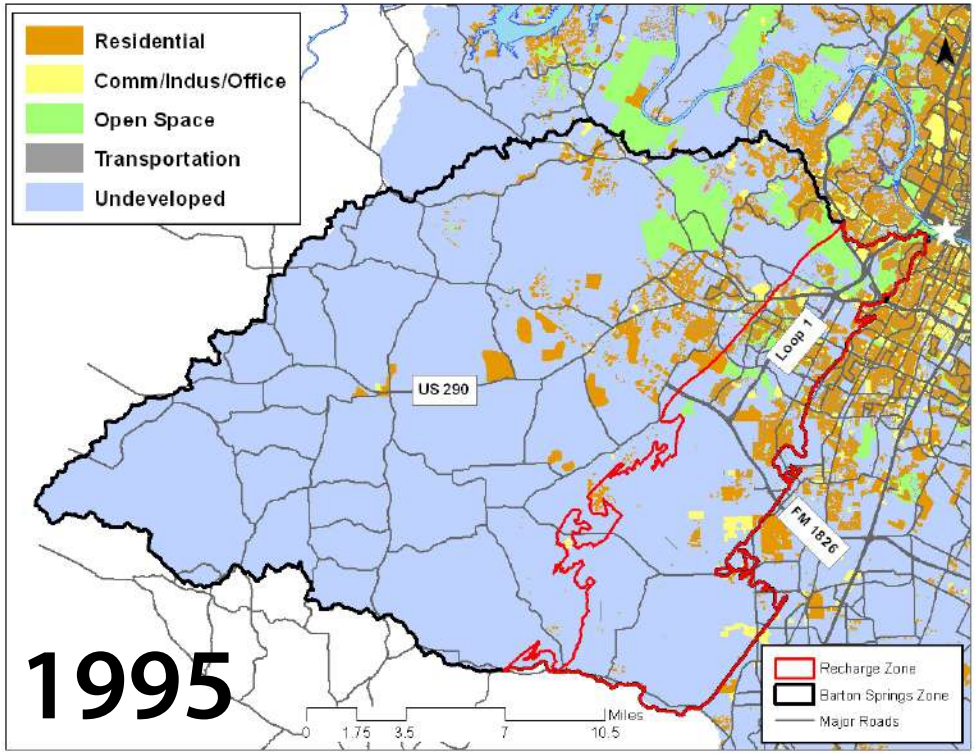
Based on:

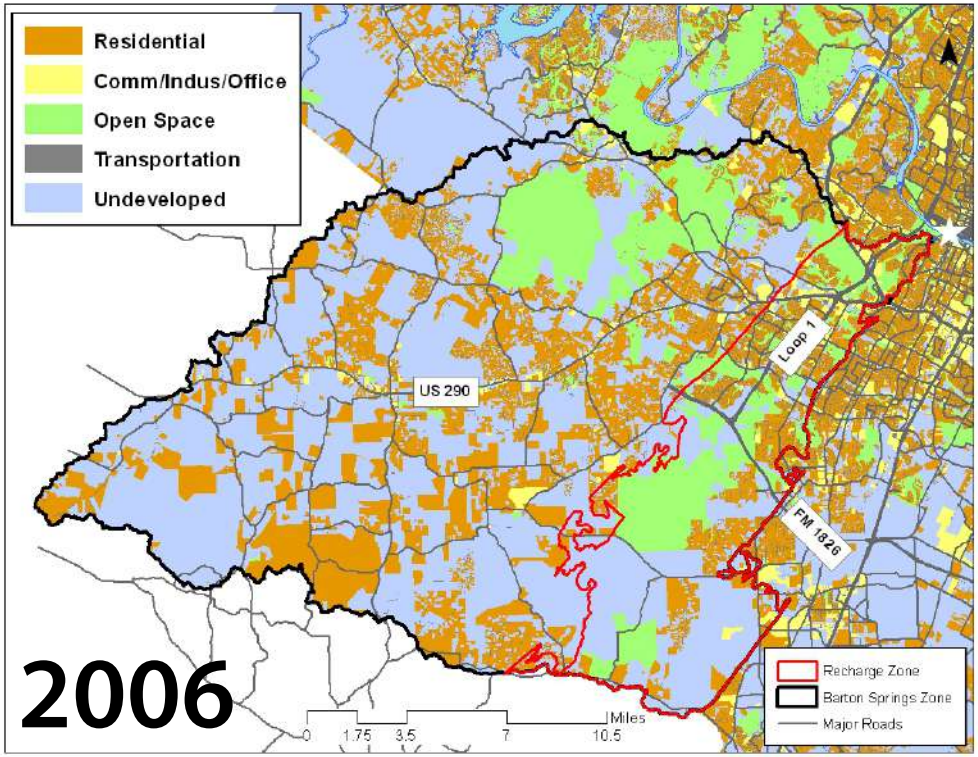
1) **Destruction, modification, or curtailment of habitat/range**
2) **Inadequacy of existing regulatory mechanisms for protecting water quality and quantity**

Barton Springs Salamander listed in 1997

Austin Blind Salamander listed in 2013

Land Use Change





Chris Herrington, City of Austin Watershed Protection Department

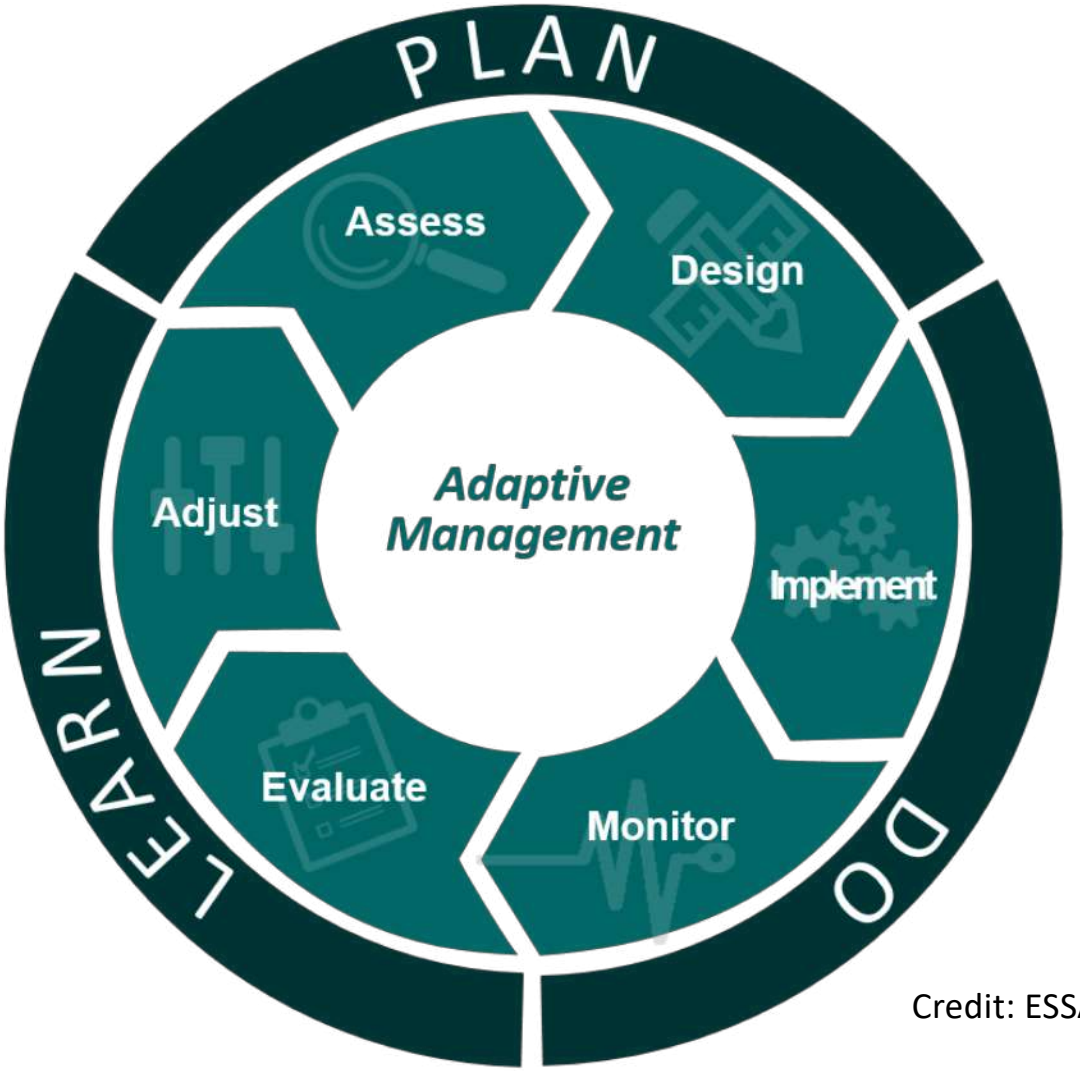
Habitat Modification

Eliza Spring

Old Mill Spring

Main Spring

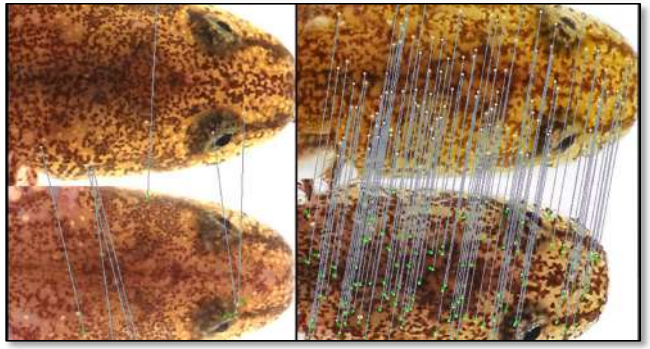
Upper Barton Spring



Credit: ESSA Technologies, Ltd.

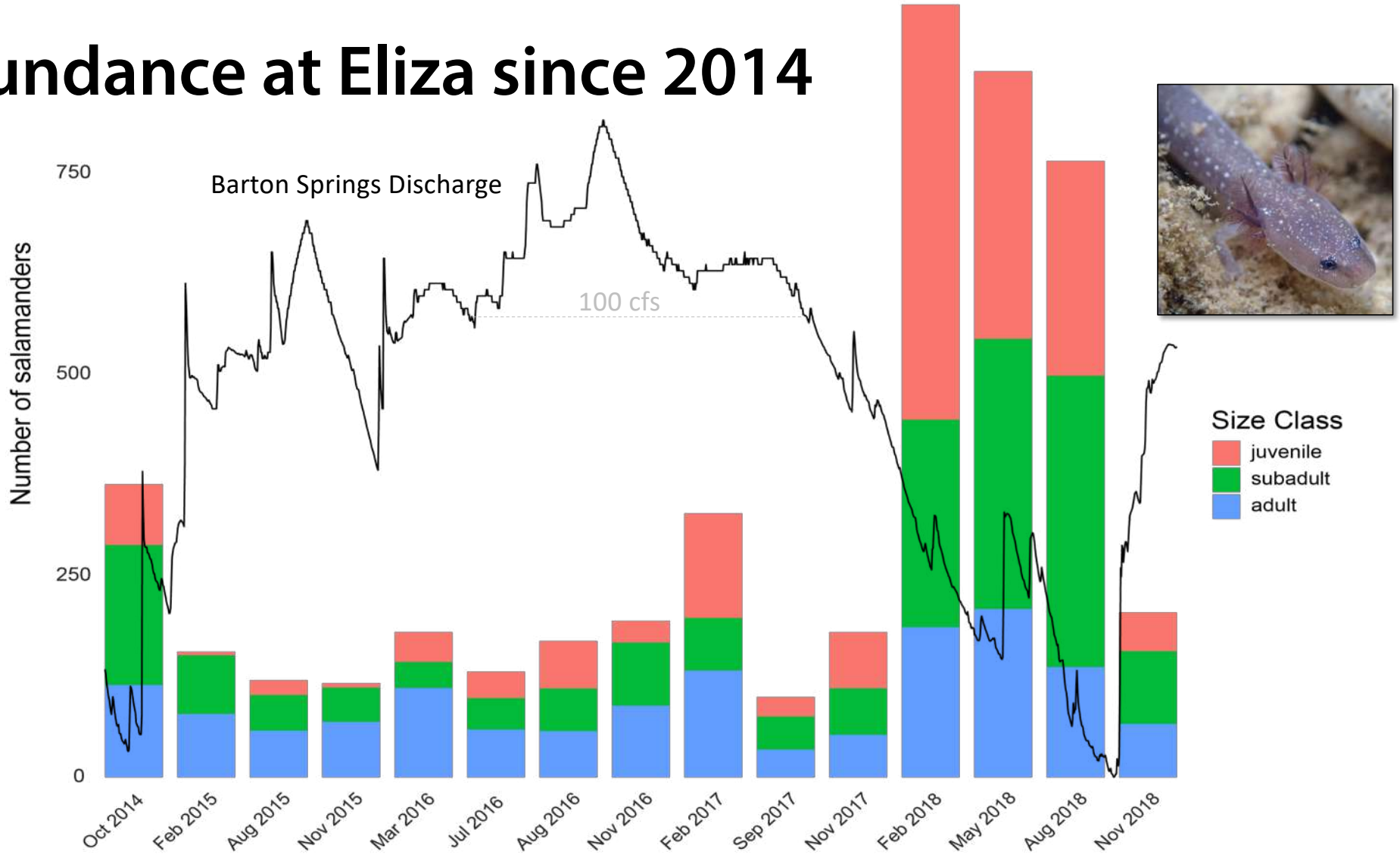




Population Monitoring

Abundance at Eliza since 2014



Habitat Restoration

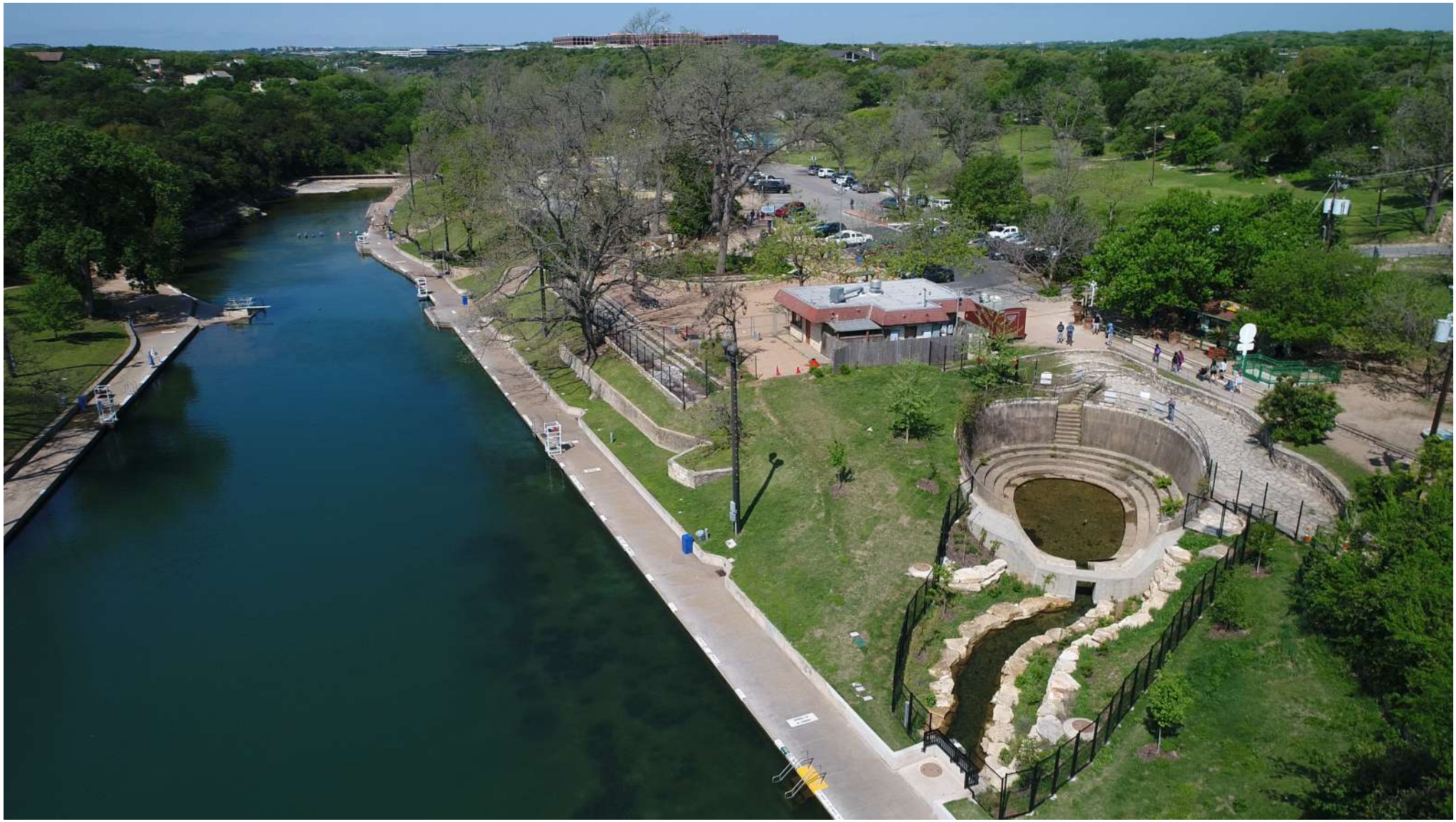
Eliza Spring daylighting project

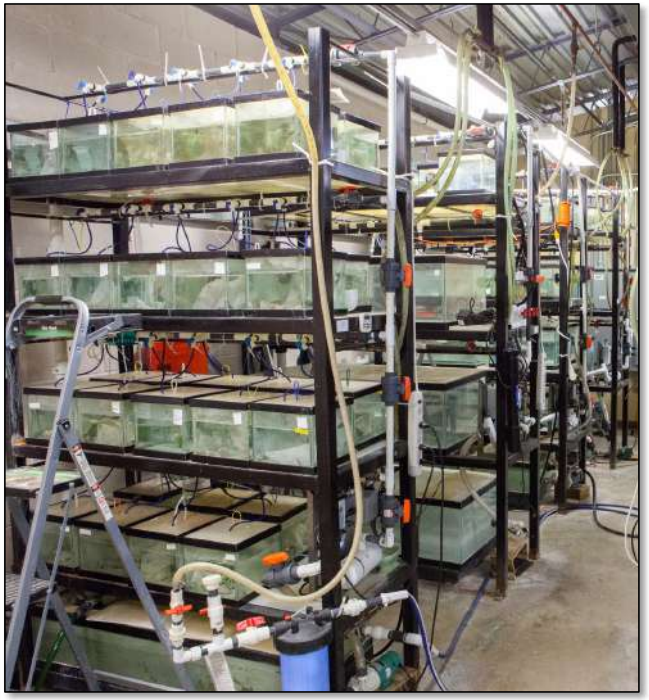
Digital rendering of stream design


Habitat Restoration
Eliza Spring daylighting project

Habitat Restoration

Eliza Spring daylighting project

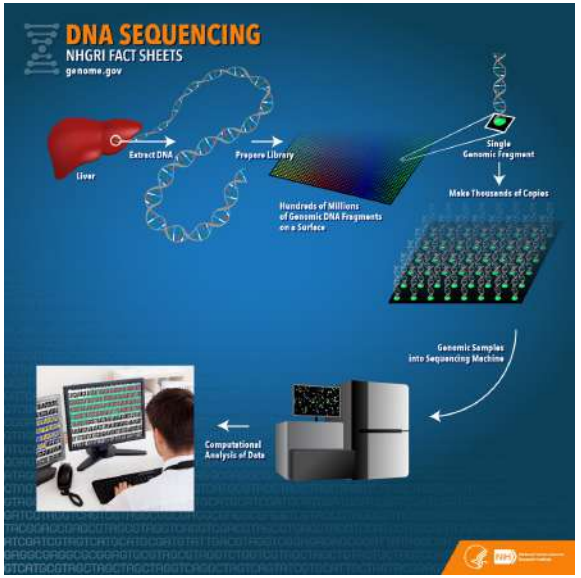




Captive Propagation

Field sampling at Ben McCulloch Spring

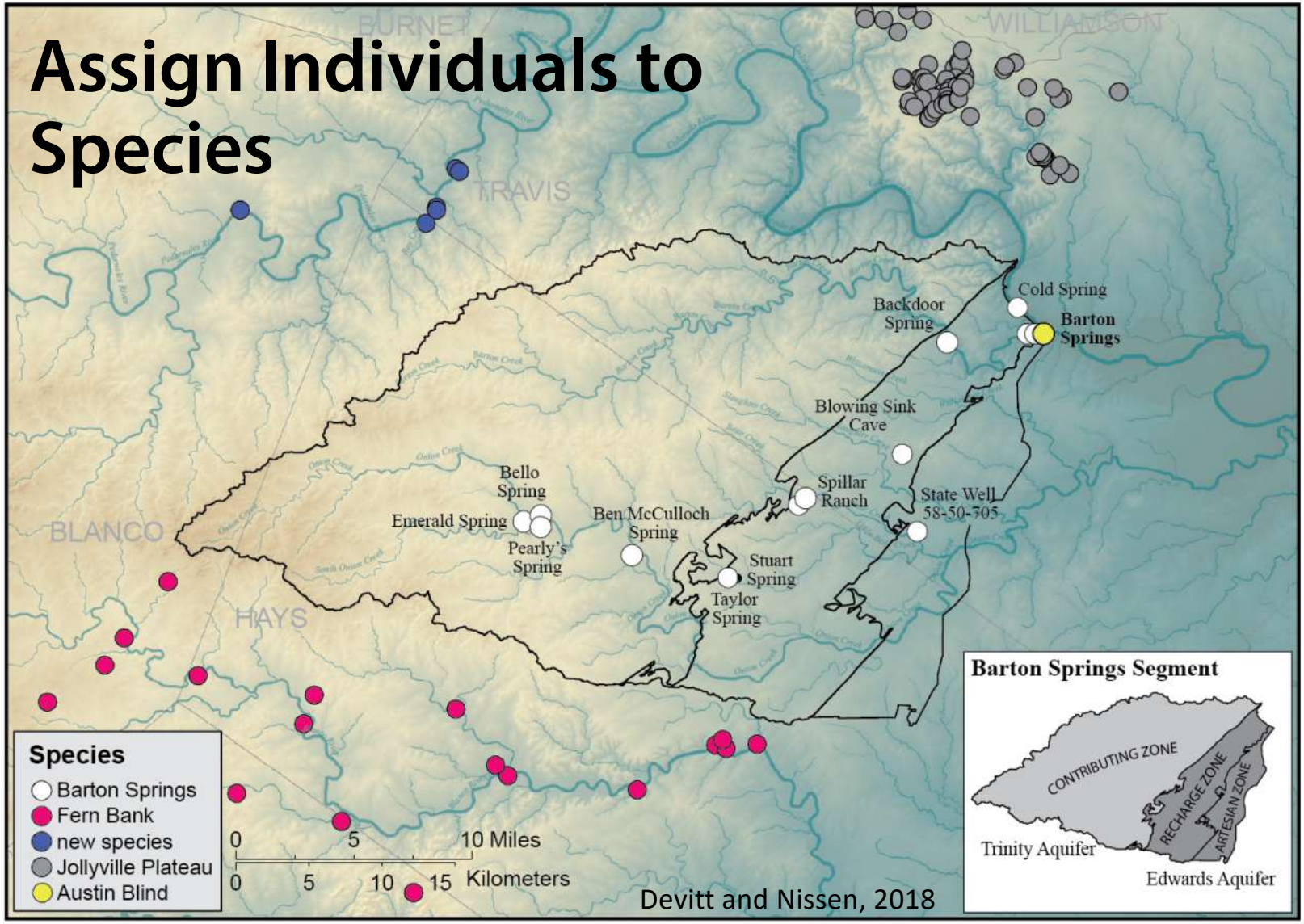
Liquid nitrogen tank at UT housing frozen tissue samples



Genomics Sequencing and Analysis Facility, Texas Advanced Computing Center (UT)

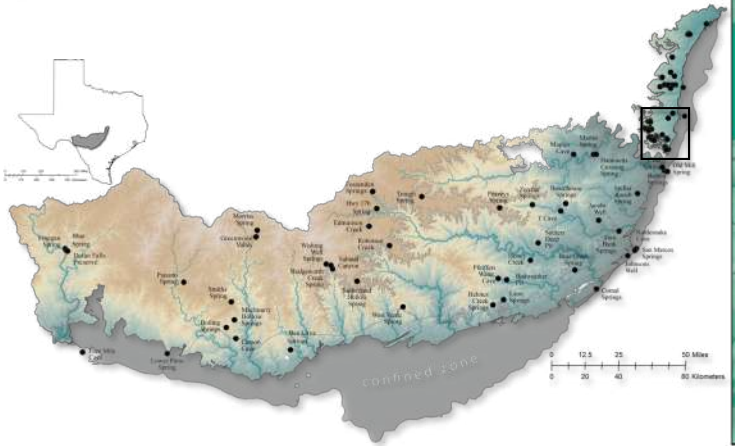
Scientific Research

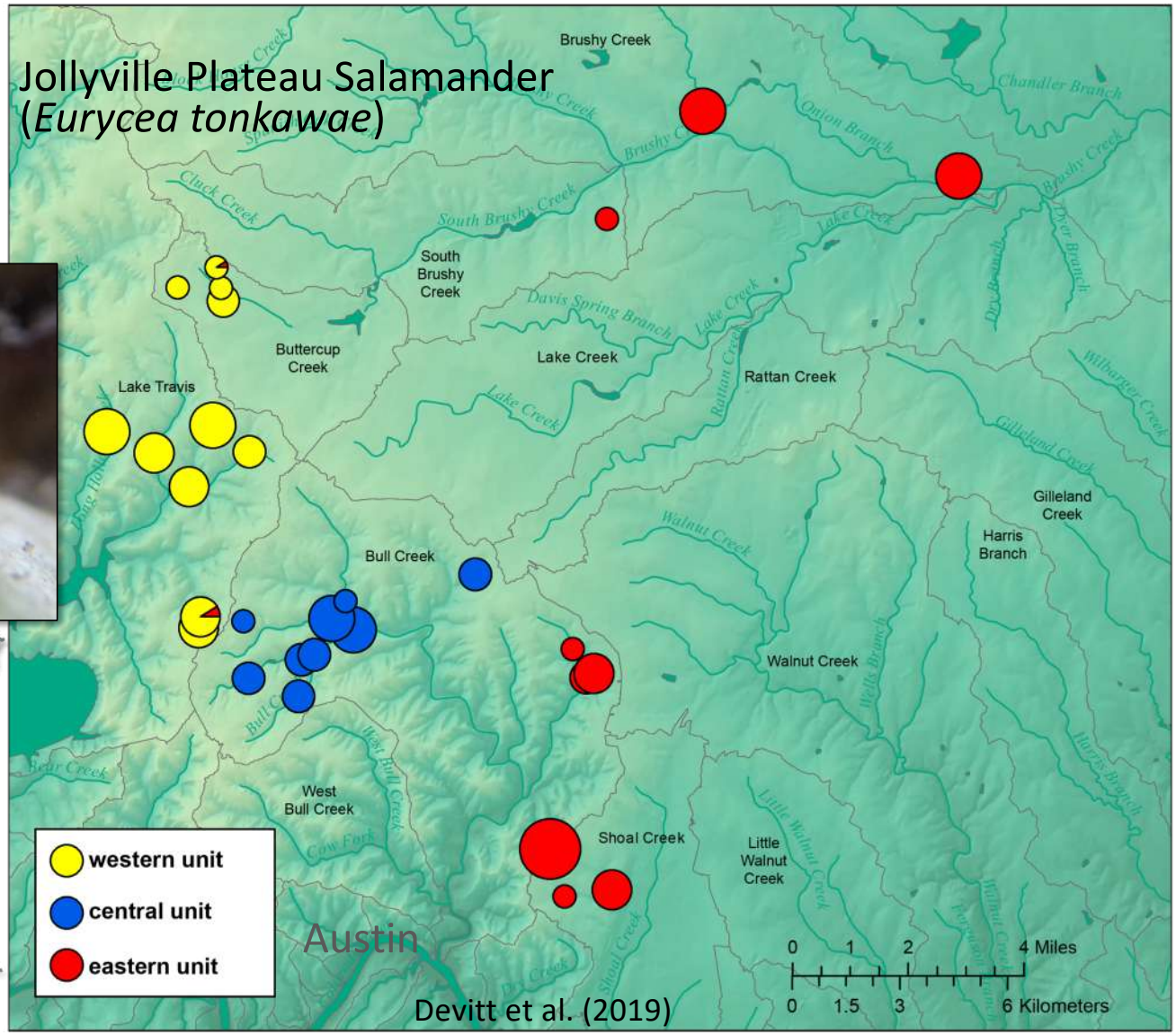
Assign Individuals to Species



Devitt and Nissen, 2018

Delimiting Conservation Units





Species delimitation in endangered groundwater salamanders: Implications for aquifer management and biodiversity conservation

Thomas J. Devitt[a,b,1,2], April M. Wright[a,b,3], David C. Cannatella[a,b], and David M. Hillis[a,b,1]

[a]Department of Integrative Biology, The University of Texas at Austin, Austin, TX 78712; and [b]Biodiversity Center, The University of Texas at Austin, Austin, TX 78712

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PNAS

Proceedings of the National Academy of Sciences of the United States of America www.pnas.org

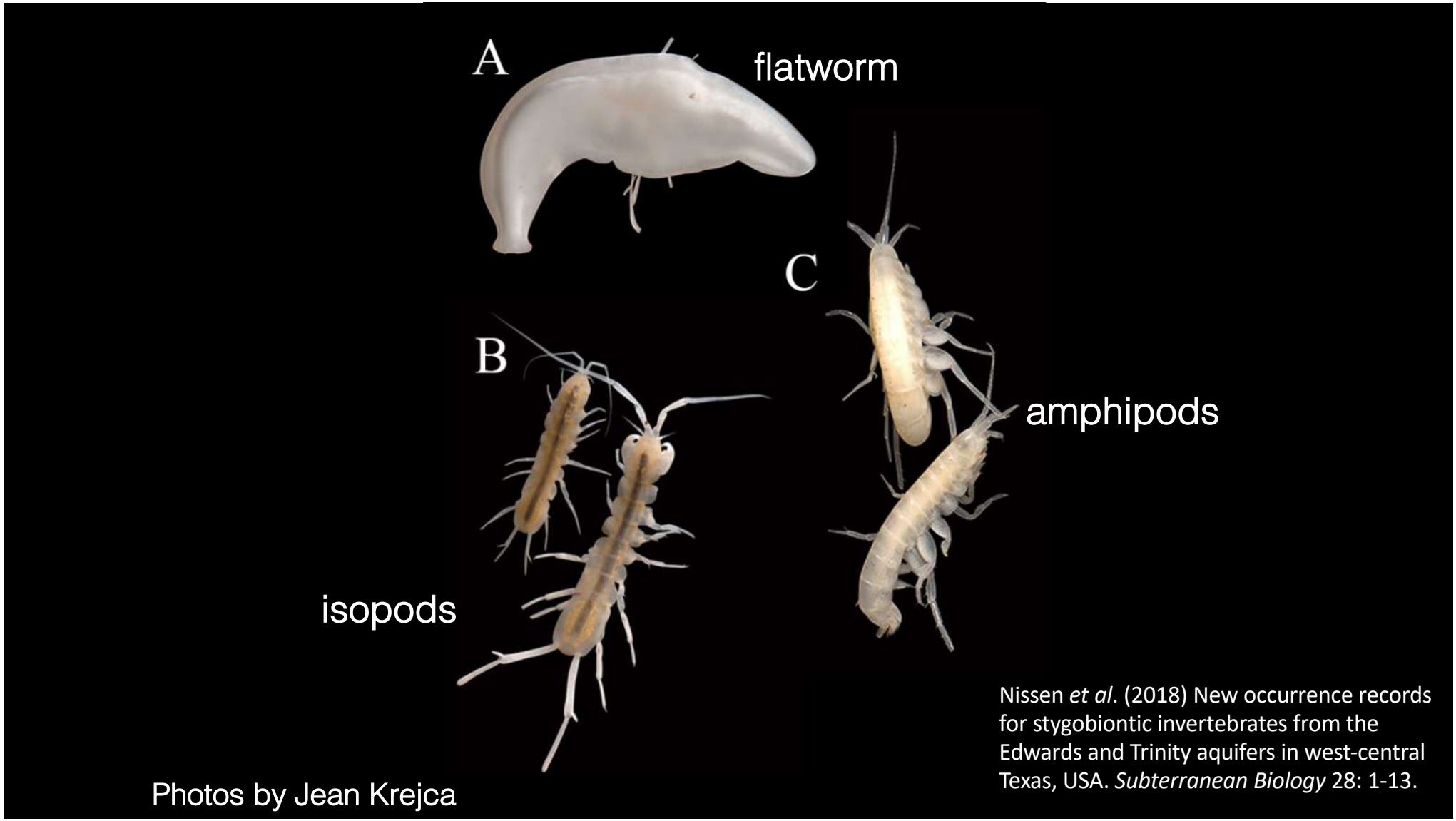
Hydrogeology and groundwater-dependent salamander evolution

Tracking influenza virus uncoating

Coexisting species and local adaptation

Mammalian body size and foot posture

Autism and social influence



Nissen *et al*. (2018) New occurrence records for stygobiontic invertebrates from the Edwards and Trinity aquifers in west-central Texas, USA. *Subterranean Biology* 28: 1-13.

Listing Under the Endangered Species Act

Both species listed as endangered due to:

1) **Destruction, modification, or curtailment of habitat/range**
2) **Inadequacy of existing regulatory mechanisms for protecting water quality and quantity**

Barton Springs Salamander listed in 1997

Austin Blind Salamander listed in 2013

Direct Discharge and Nutrient Enrichment

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NEWS

Hold That Wastewater!

Effluent flows could cripple three local endangered species

BY MICHAEL KING, FRI., MARCH 10, 2017

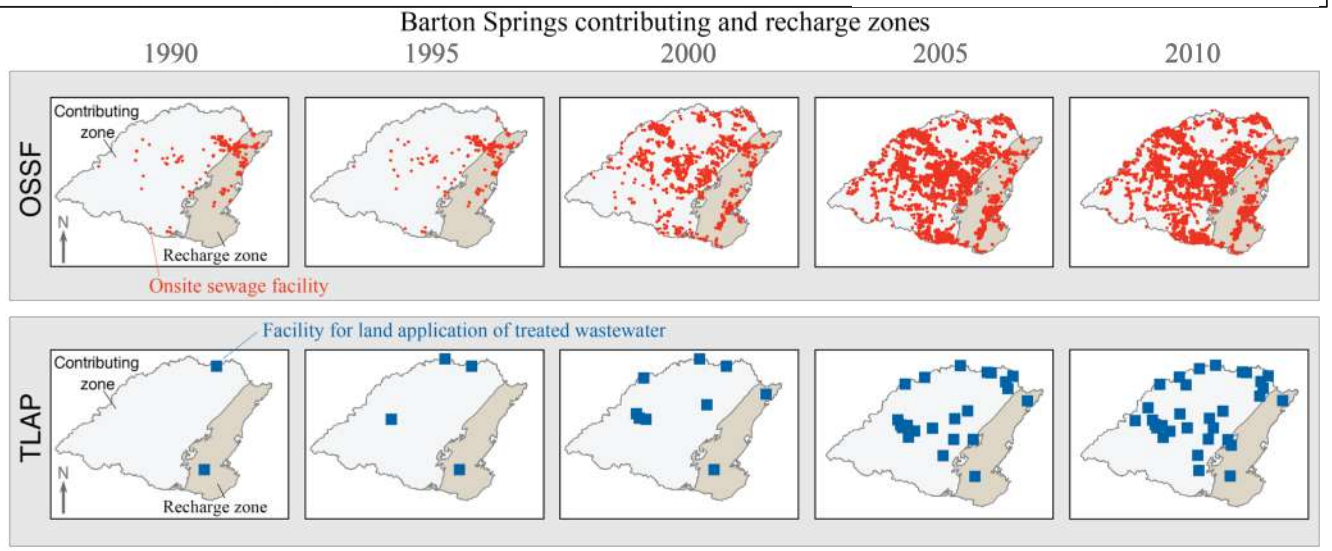
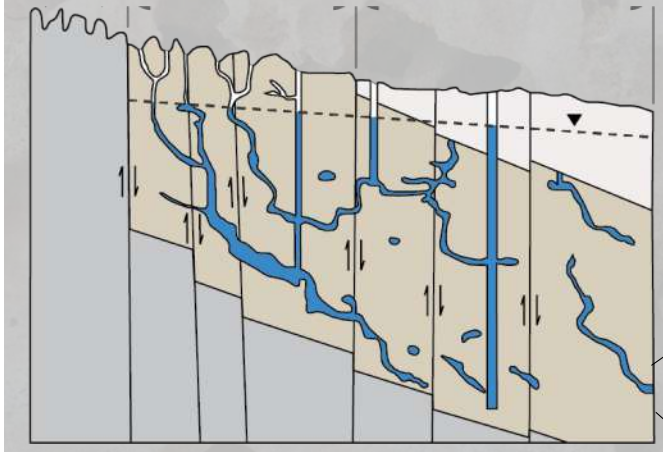


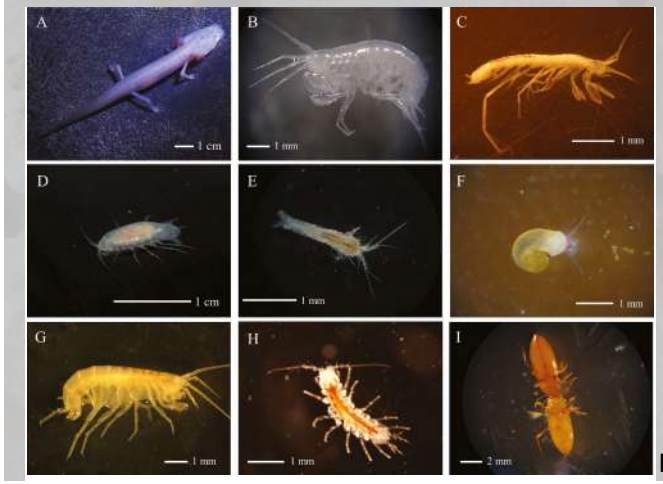
Figure 4. Permits for on-site sewage facilities (OSSFs) (septic systems) and land application of treated wastewater (Texas Land Application Permits [TLAPs]) on the Barton Springs contributing and recharge zones have increased greatly since 1990.

USGS Fact Sheet 2011-3035

Benefits

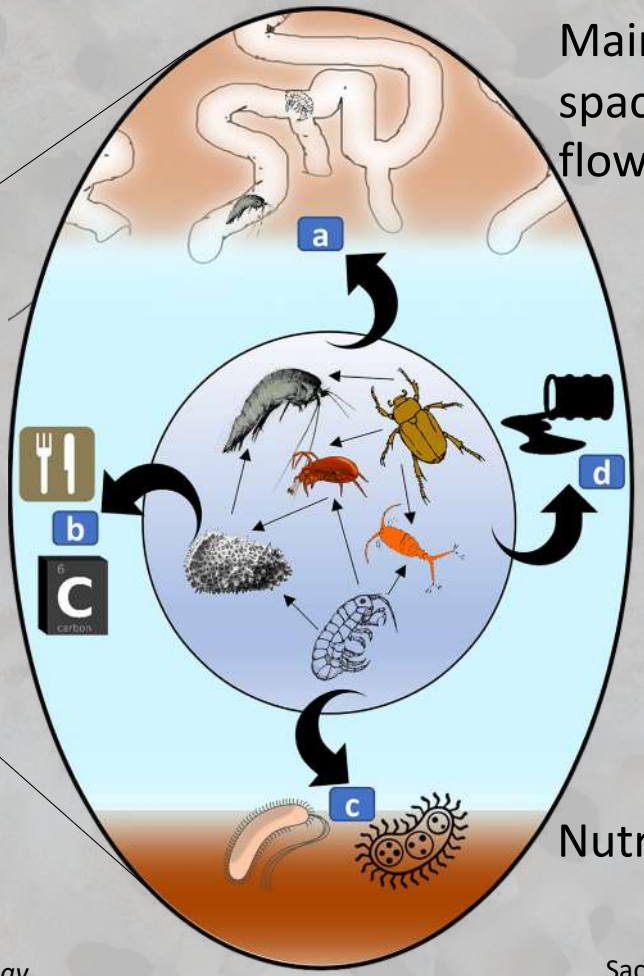
Groundwater Ecosystem Services





Hutchins et al. (2016) *Ecology*

Water purification

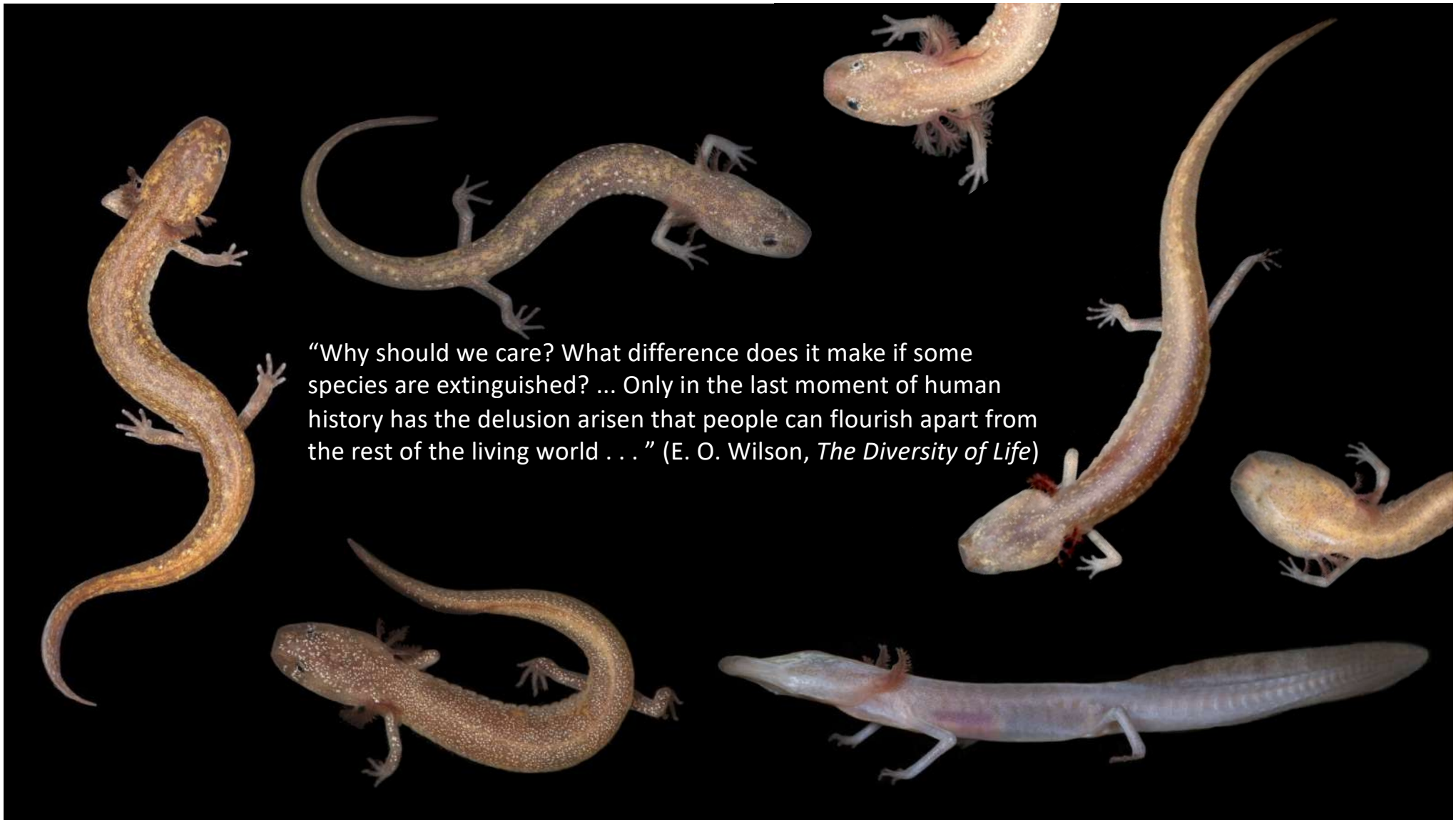


Maintain open spaces for water flow

Biodegradation of contaminants and pathogens

Nutrient cycling

Saccò et al. (2019) *Sci. Total Environ.*


"Why should we care? What difference does it make if some species are extinguished? ... Only in the last moment of human history has the delusion arisen that people can flourish apart from the rest of the living world . . . " (E. O. Wilson, *The Diversity of Life*)