

Hot Science Cool Talks

UT Environmental Science Institute

101

How a Salamander Saved a City: The Politics and Science of Endangered Species

Dr. David Hillis

April 22, 2016

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How a Salamander Saved a City

**The Politics
and Science of
Endangered
Species**

David M. Hillis

**The University of
Texas at Austin**

April 22, 2016

*Salamander illustration
by Calder Kamin*

Hot Science Cool Talks

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If you could return to 1990 from today, how would you advise Austin's City Council about the future?

ralph.arvesen

Economic development

Population growth

Water supply protection

Increase green spaces, parks & wild areas



Metro Austin exceeds 2 million in population



**“For fifth
year, 5-county
area is U.S.’s
fastest
growing...”**

Austin American
Statesman (2016)

Why is Austin on nearly every Top-Ten list as a place to live?

Quality of Life

Strong economy

Vibrant diverse city

Excellent entertainment

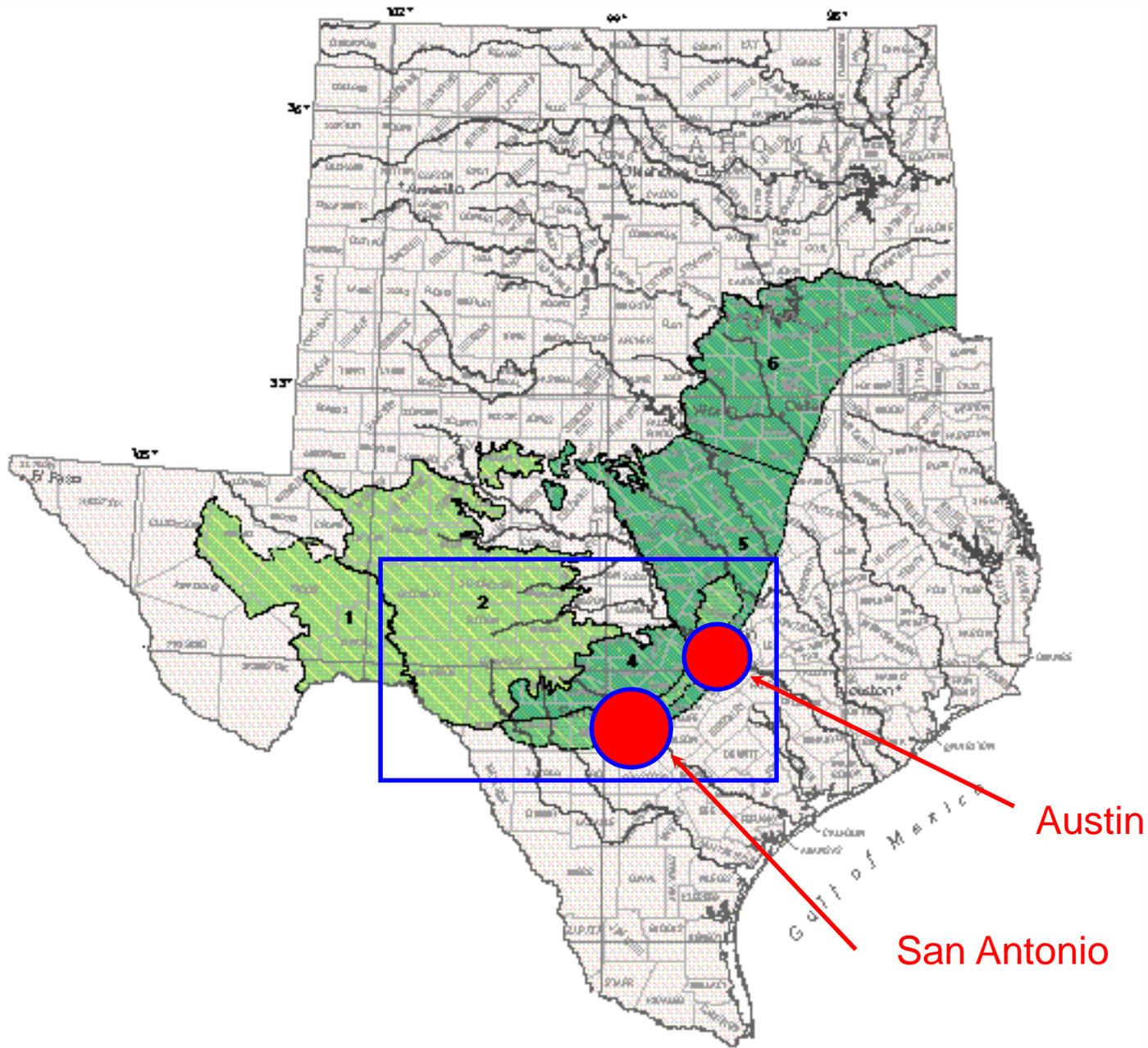
Great parks and recreation

“Weirdness” factor

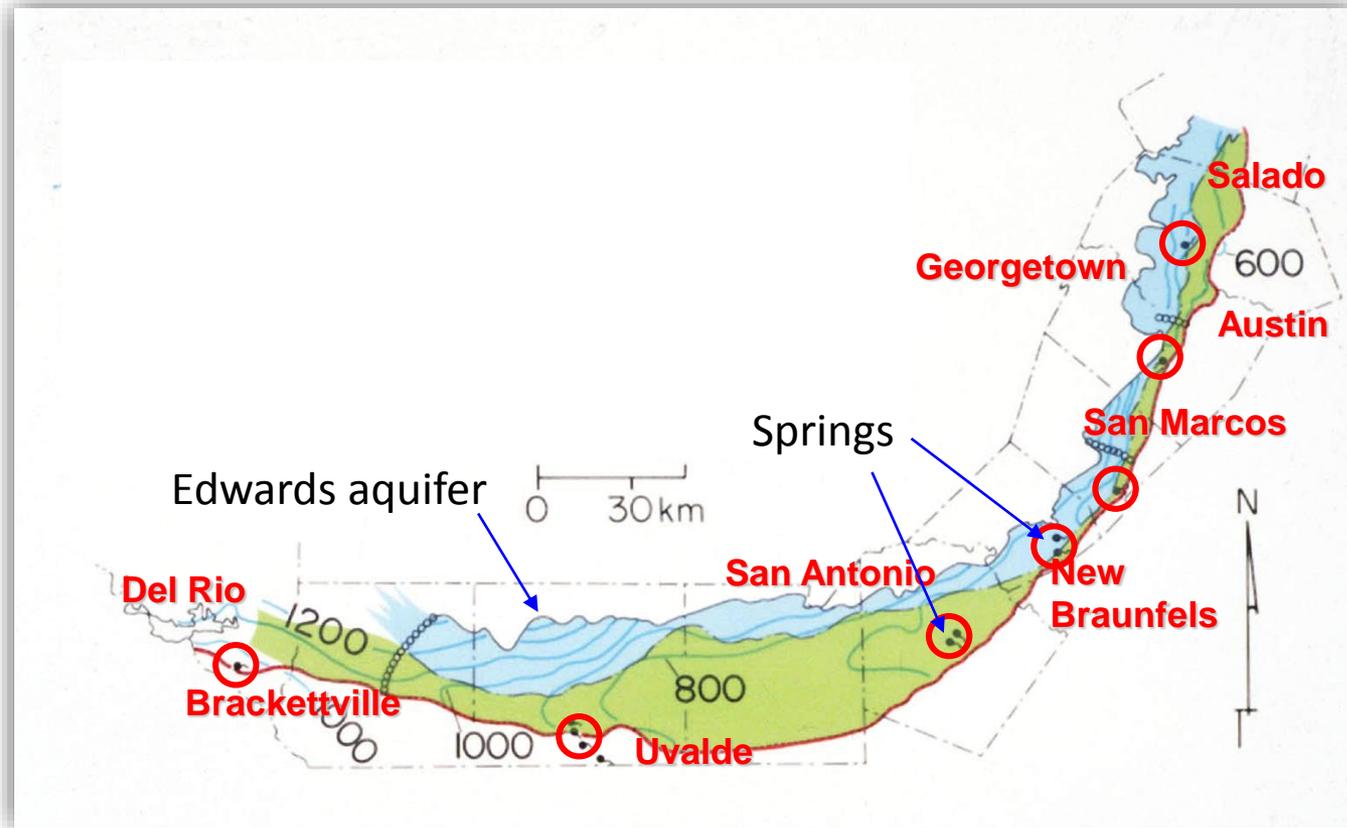


What are the top complaints about Austin?

- **Traffic**
- **Crowds**
- **Cost of living**
- **Weather**
- **Allergies**
- **Water shortages**



Settlement of Central Texas



Sharp (2003) *Hot Science – Cool Talks*

Then and Now...

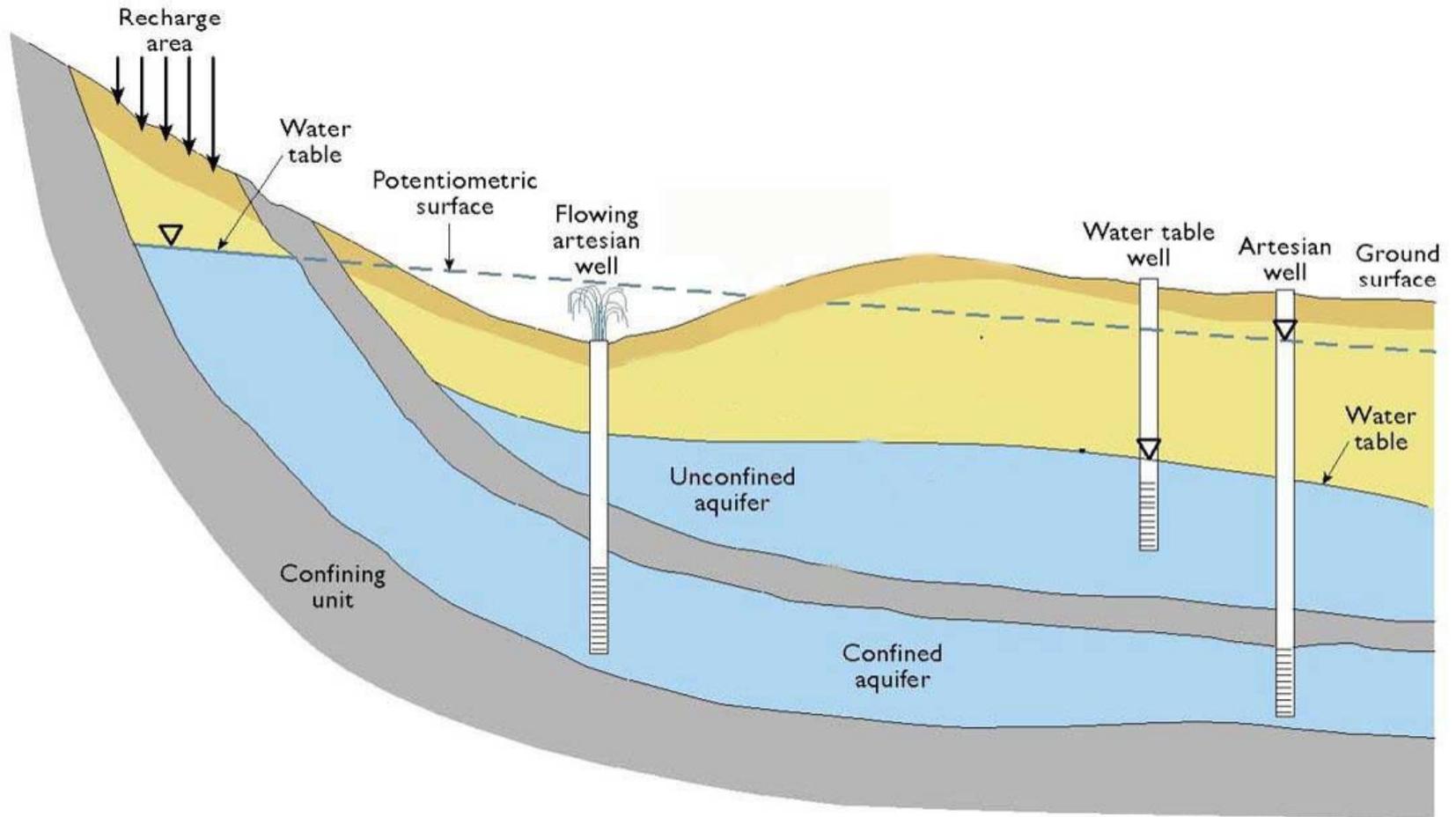


What Salado Springs looked like in the 1870s

Salado Springs Today

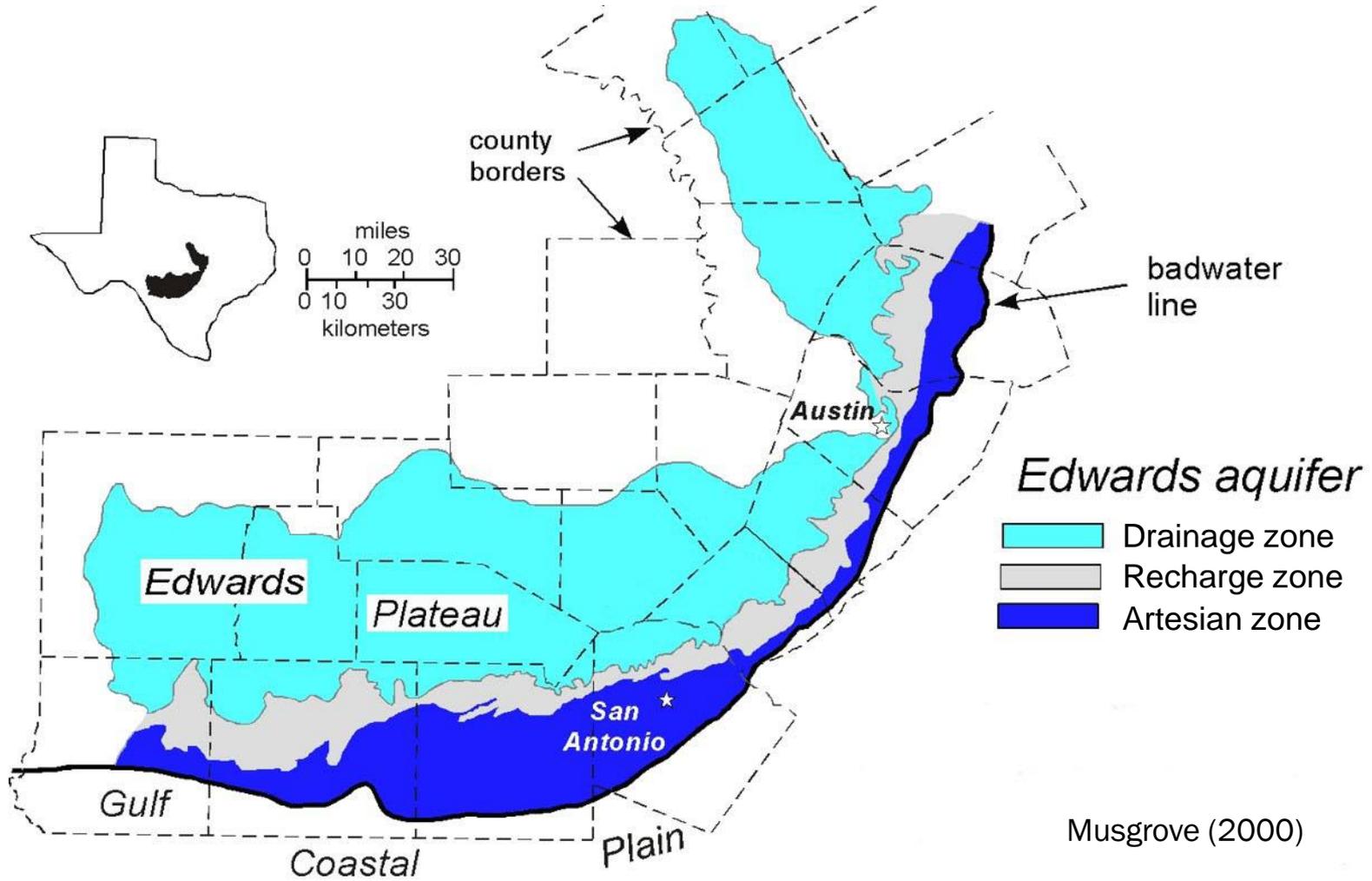


Artesian Springs and Wells



Modified after Harlan and others, 1989

The Edwards Aquifer



Central Texas is a biodiversity hot spot

Typical Terrestrial Salamander



Plethodon albagula,
White-throated Slimy Salamander

Salamander sent to Stejneger in 1896



Eurycea rathbuni,
Texas Blind Salamander

Salamanders in Texas

Texas Spring Salamander

Discovered in 1937
by Bishop & Wright



San Marcos Salamander

Discovered in 1941
by Bishop





Barton Springs

**Image Courtesy of
Save Our Springs**



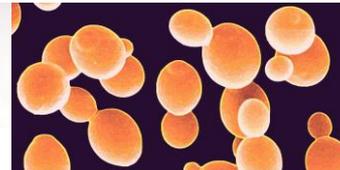
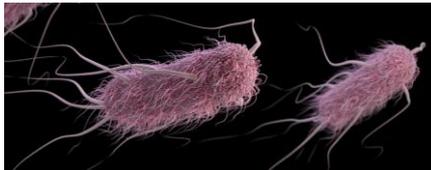
Barton Springs

Image Courtesy of
Save Our Springs
(2016)

Ideal Model Organisms

Ideal Model Organisms
(e.g., fruit flies, yeast, bacteria)

- **Abundant**
- **Easily cultured**
- **Easy to collect and observe**
- **No permits required**
- **Rapid growth, short generation time**
- **Small, easily sampled genome**



Texas Spring and Cave Salamanders

- **Endangered and rarely seen**
- **Difficult to raise**
- **Difficult to collect & observe**
- **Many permits & regulations**
- **Slow growth, long generation time**
- **Giant genome; no genome sequenced**



Barton Springs

Image Courtesy of
Save Our Springs

What is an Endangered Species?

- **Endangered Species Act (ESA) created in 1973**
- **A species likely to become extinct throughout all or a large portion of its range**
- **Receives special protections by federal government to help it recover**
- **Must be evaluated and meet certain criteria to be listed as “endangered”**



Late 1980s...

- Pool cleaning methods nearly eliminate salamanders
- “Liaison Committee” created between city and UT to develop “salamander friendly” cleaning methods



Memorabilia from conservation groups



**New methods
adopted to
clean Barton
Springs Pool**

1990s...Citizens stand up for the springs

“Barton Creek backers savor council vote”

Austin American Statesman, June 9, 1990

- 1990 hearing opposing McMoran Inc.’s proposal
- Save Our Springs (SOS) Coalition forms
- Formal proposal to USFWS to list Barton Springs salamander as endangered
- Opposition: claimed listing would be “catastrophic” to the economic development of Austin



Pogue (2012) *Austin Chronicle*



**Looking for
salamanders**



**Salamander
Trap**



Exploring wells



1992...You CAN fight City Hall

- Save Our Springs Ordinance approved (42,246 to 26,187)
- Pro-environment candidates elected to Austin City Council
- USFWS preliminary finding of Barton Springs salamanders as an endangered species



Pogue (2012) *Austin Chronicle*

But with lots of negative press...

“New cry for springs: ‘Save the salamander’

Pool may be off-limits if U.S. agrees”

Austin American Statesman, January 25, 1992



**“Save the springs for swimming by
sizzling the salamanders”**

Editorial, Austin American Statesman, January 30, 1992

“Parks board recommends chlorine for Barton pool”

Austin American Statesman, December 20, 1994

A New Species is Described...

Herpetologica, 49(2), 1993, 248–259
© 1993 by The Herpetologists' League, Inc.

A NEW SPECIES OF PERENNIBRANCHIATE SALAMANDER
(*EURYCEA*: PLETHODONTIDAE) FROM
AUSTIN, TEXAS

New species description
published in 1993, authored
by Paul Chippindale, Andrew
Price, and David Hillis



Barton Springs Salamander
Eurycea sosorum

...with a name to honor Austinites

“The species is named in honor of the citizens of Austin, Texas, whose efforts to protect the quality of Barton Springs resulted in the passage of a citizens’ aquifer-protection initiative.

This initiative is known locally as the SOS (Save Our Springs) Ordinance, and its supporters are known as SOSers. The specific name *sosorum* is the plural mixed-gender genitive form of the acronym SOS.”

Satan in West Texas ★ Dueling Catfish ★ The Sakowitz Feud

Texas Monthly

JULY 1992 • \$2.50

WHITE HOT MAMA

Ann Richards
Is Riding
High. Can
She Be the
First Woman
President?



Politicians begin to weigh in...

“State calls for more study of Travis salamanders”

Austin American Statesman, July 29, 1993

“U.S. delays rule on protection of salamander”

Austin American Statesman, March 8, 1995

“Gov. Bush opposes salamander protection”

Austin American Statesman, July 26, 1995

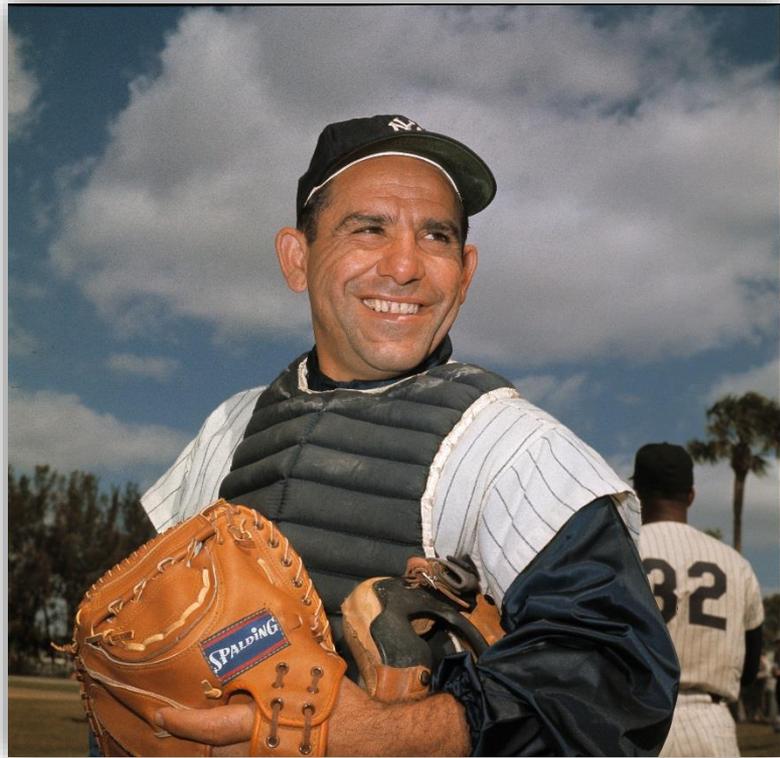
“Salamander stirs calls of morality, communism”

Austin American Statesman, July 26, 1995

“Salamander pulled from endangered consideration”

Austin American Statesman, August 29, 1996

“In a surprising announcement, Secretary of the Interior Bruce Babbitt said on Wednesday that his agency would withdraw its proposal to list the Barton Springs salamander as an endangered species.”



Washington Post (2015)

**“It ain’t over till it’s
over”**

Yogi Berra

Yankees baseball player, coach

1925 - 2015

September 1996... State of Texas and USFWS convene a panel to make recommendations

“In my professional opinion, the Barton Springs salamander is the most endangered species of vertebrate in the United States.”

Vic Hutchinson,
1996 Salamander Panel



Pogue (2012) *Austin Chronicle*

“Suit seeks review for salamander”

Austin American-Statesman, October 30, 1996

“Interior Secretary Bruce Babbitt bowed to politics and ignored science when he refused at the last minute to list the Barton Springs salamander as endangered, it was alleged in a lawsuit Tuesday.”

“Babbitt rejected advice on salamander”

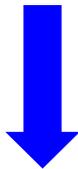
Austin American-Statesman, December 5, 1996

“U.S. Interior Secretary Bruce Babbitt rejected the advice of his own scientists in deciding not to list the Barton Springs salamander as an endangered species, newly disclosed records show.”

The salamander gets its day in court!

U.S. District Judge Lucius D. Bunton ruled:

- Interior Department violated federal law
- Interior Department must base decisions solely on best scientific data



Barton Springs salamander listed as an endangered species in April 30, 1997

You know what happened next...

“Judge rules salamander deal broke the law”

Austin American Statesman, March 27, 1997





**“No one goes there
nowadays – it’s too
crowded”**

Yogi Berra

Protection of the salamander meant protection of Austin’s water supply



Barton Springs
breeding facility

Since 1997, the City of Austin has:

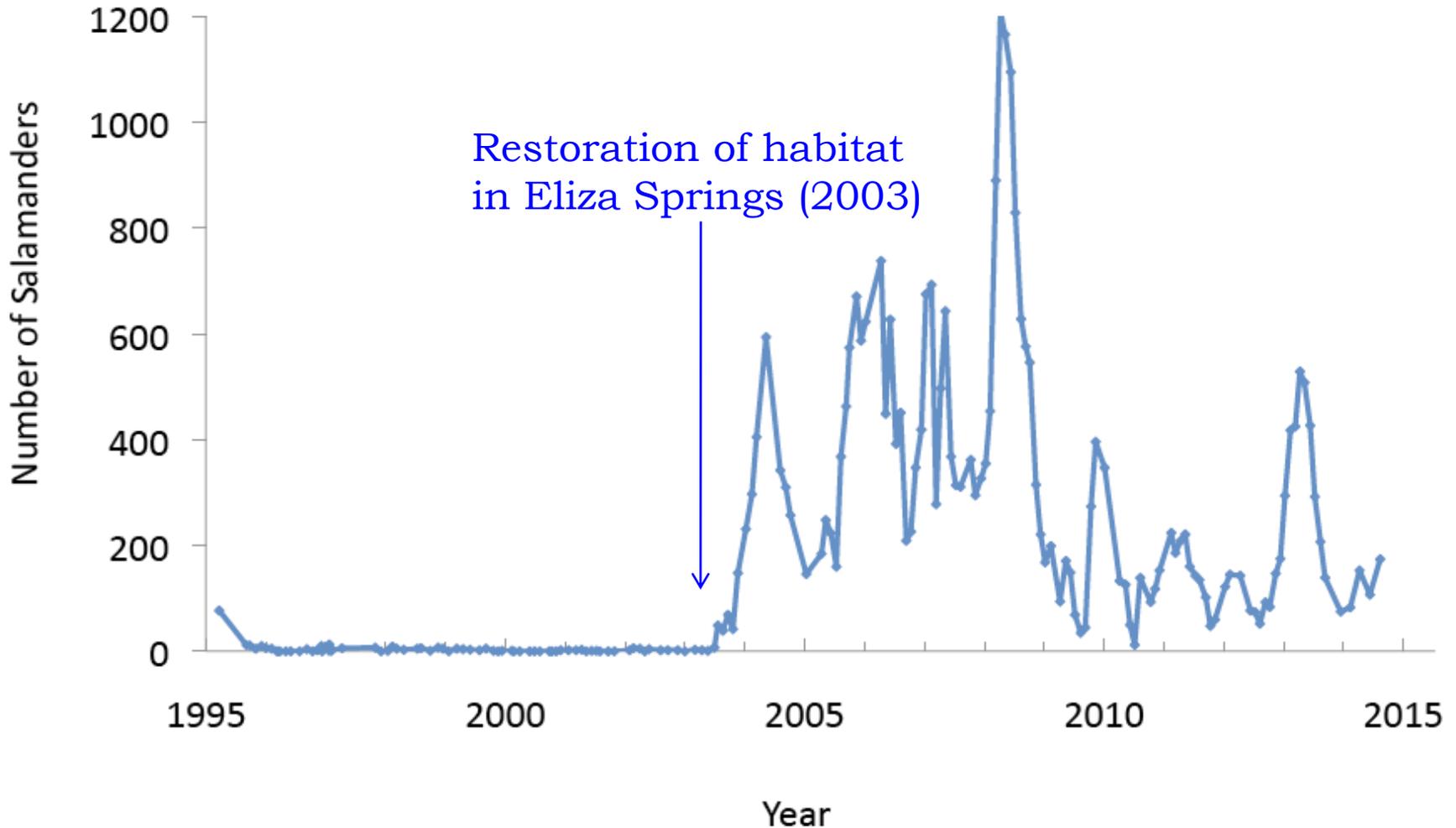
- Partnered with TPWD & USFWS
- Built a captive breeding facility
- Hired four full-time biologists to work in watershed protection
- Restored habitat at Barton Springs
- Protected Austin's water resources!



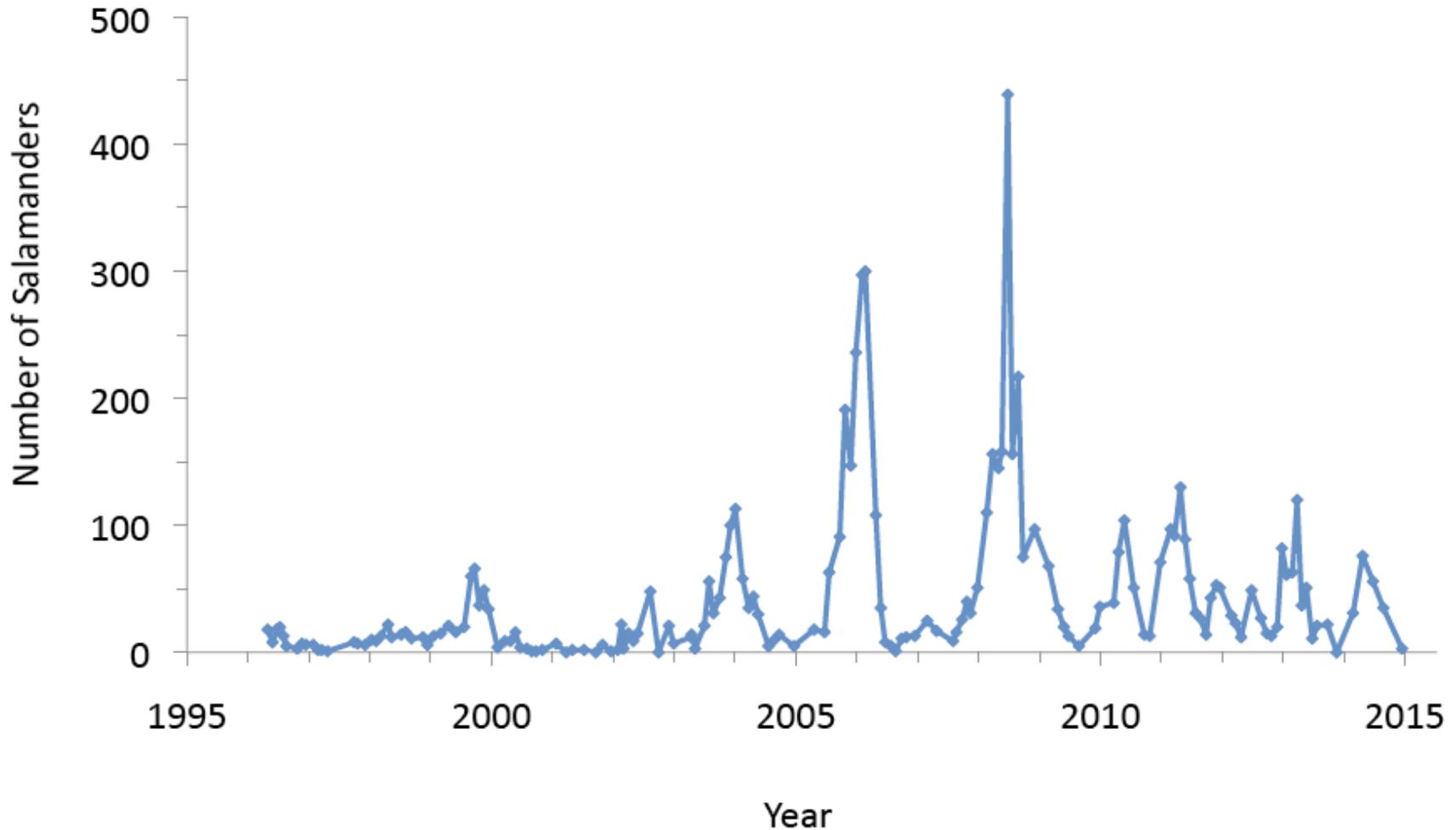
Eliza Spring salamander SCUBA survey

Austin Watershed
Protection Department
(2015)

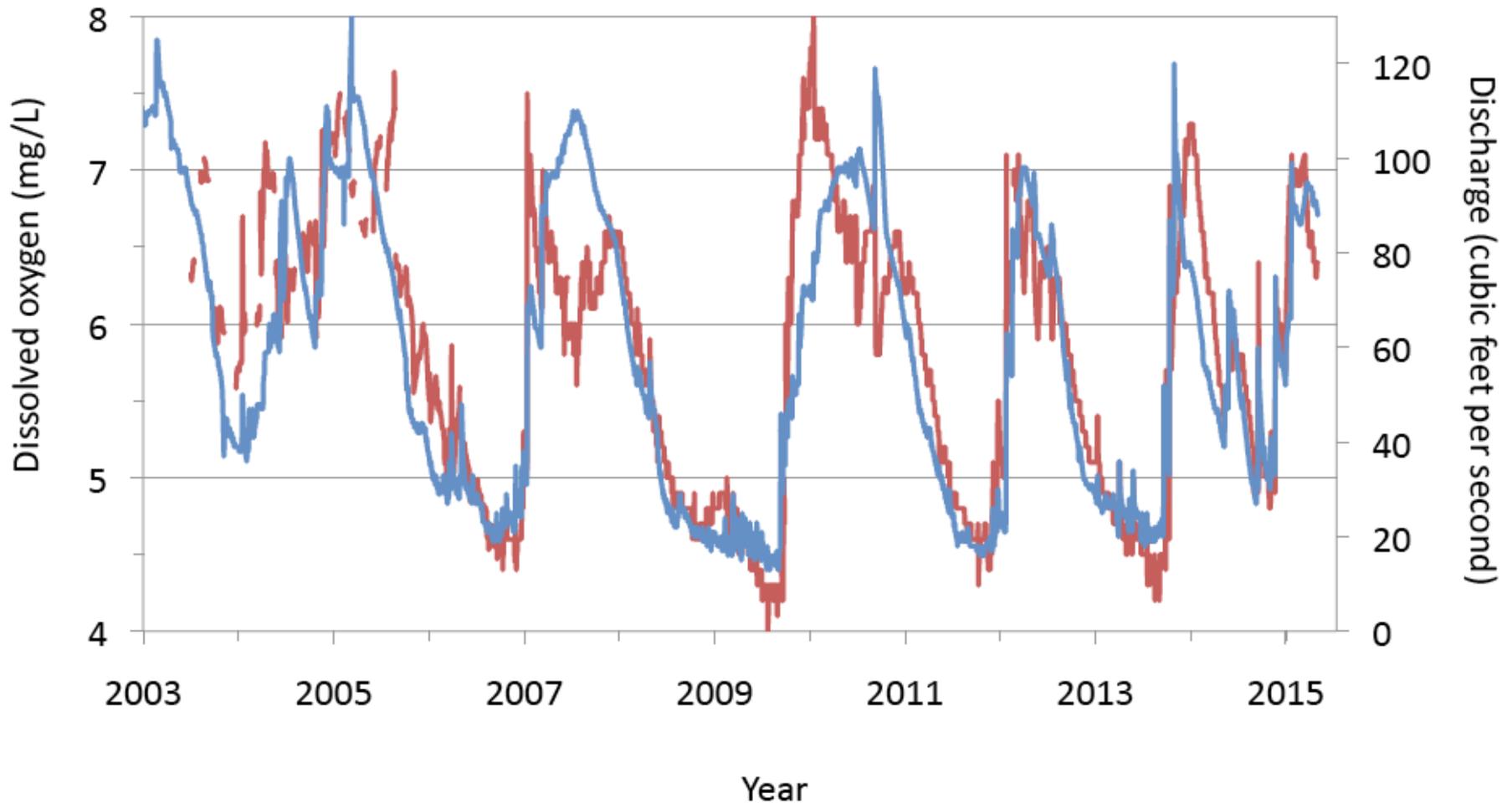
Number of Salamanders-Eliza Springs



Number of Salamanders-Barton Springs Pool



Dissolved Oxygen vs. Discharge at Barton Springs Pool





Dee Ann Chamberlain

City of Austin
Watershed Protection
Department



**Is this a new
species of
salamander?**

“You can observe a lot by just watching”
- Yogi Berra



Henry Fitch (1909 – 2009)



Tricorder, version TR590
Star Trek TV series

Is a “Biocorder of Life” Possible?

Step One

- DNA isolation and amplification of a series of target genes

Step Two

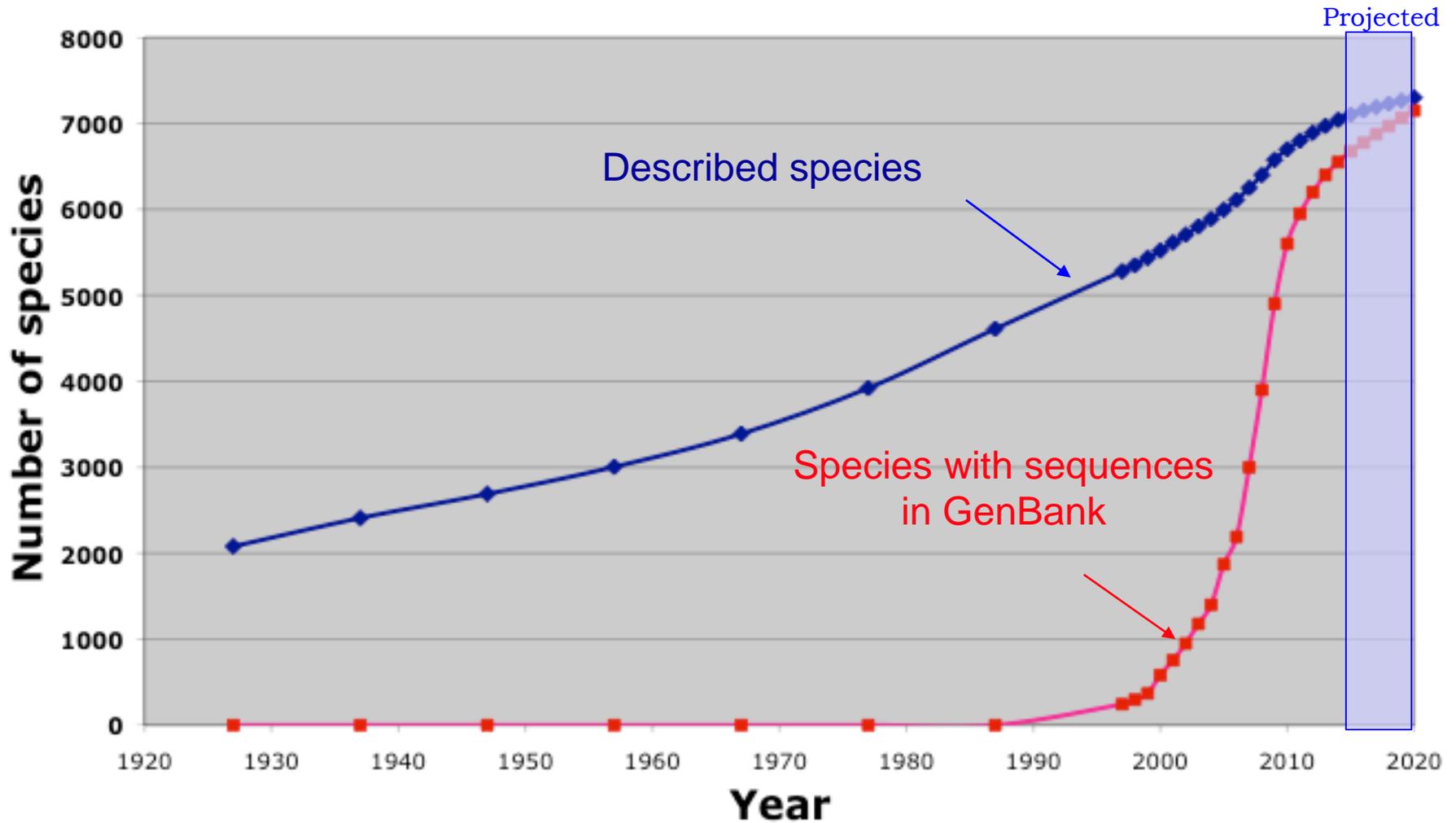
- Rapid sequencing of amplified genes

Step Three

- Placement of unknown within the Tree of Life

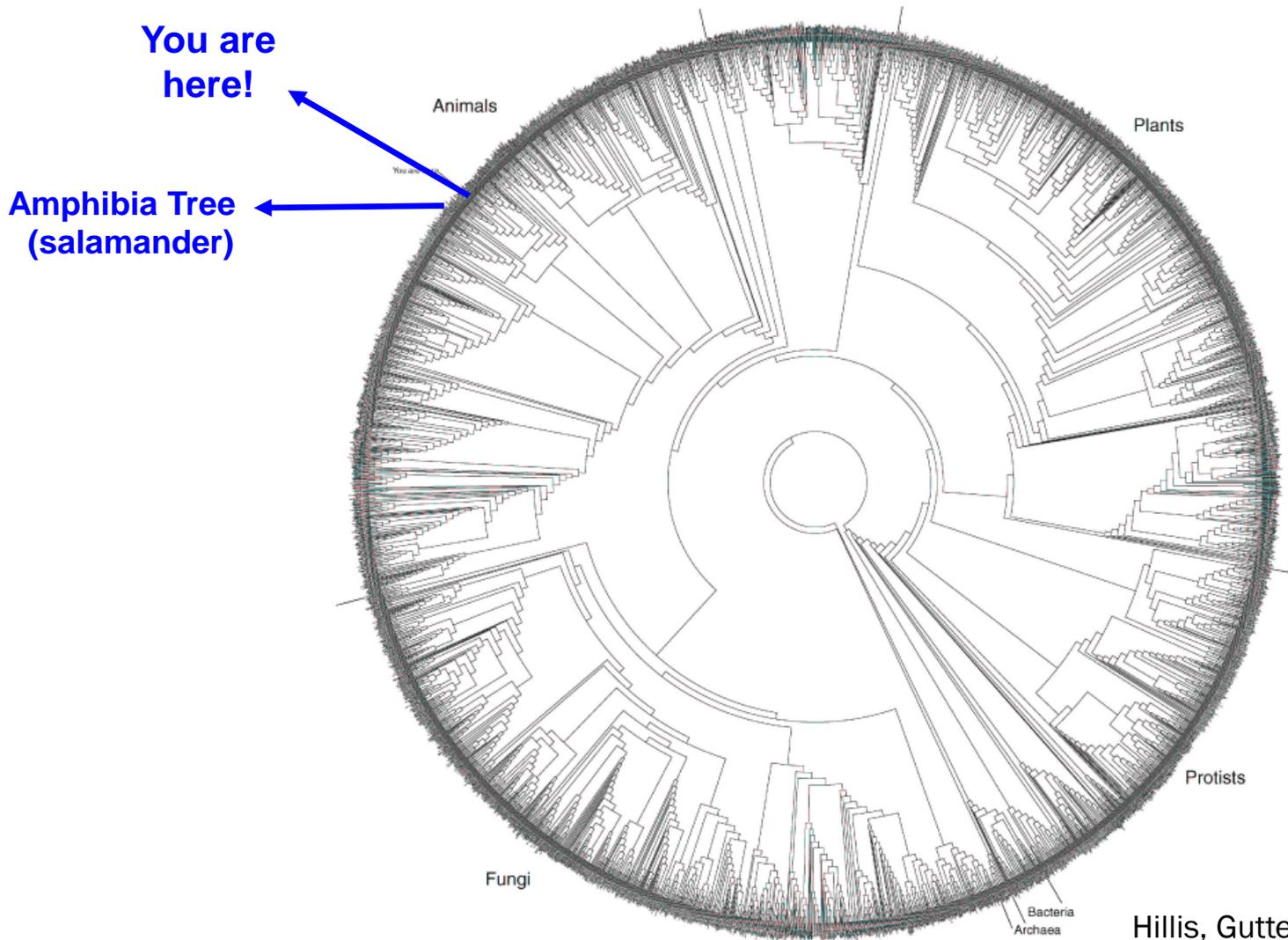


Amphibian species and sequences



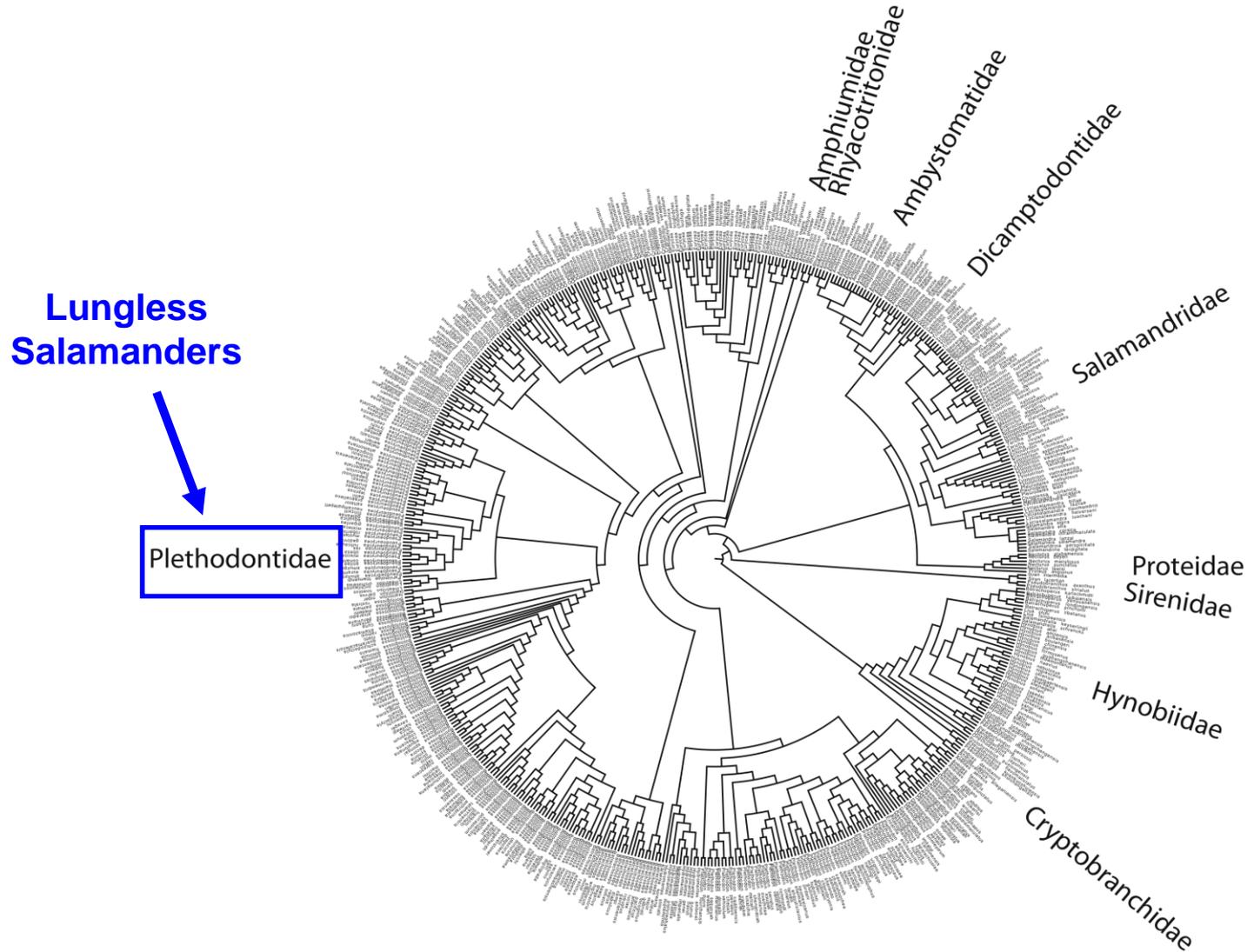
Hillis (2010) in *Evolution Since Darwin: The First 150 Years*.

Tree of Life

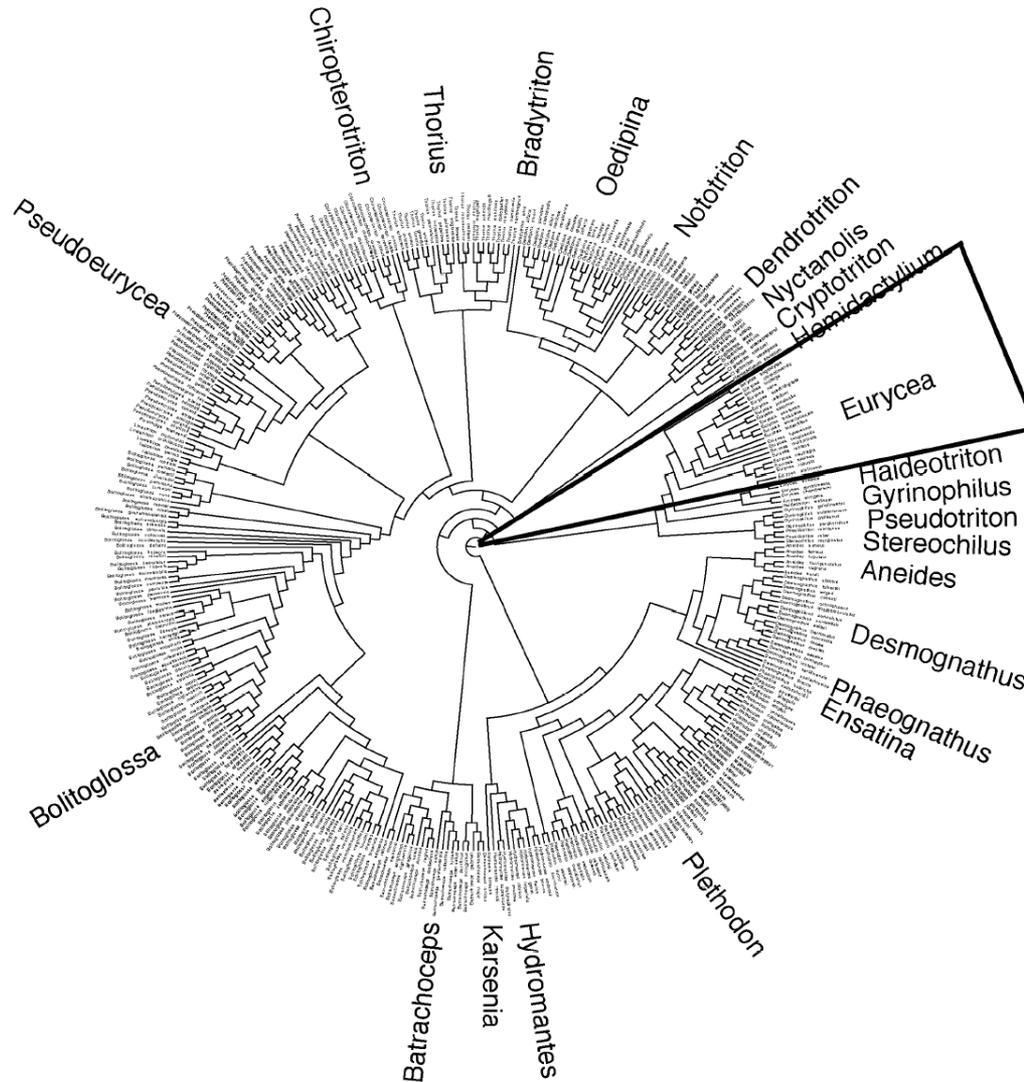


Hillis, Guttell & Zwickl *Science*
300:1692-1697

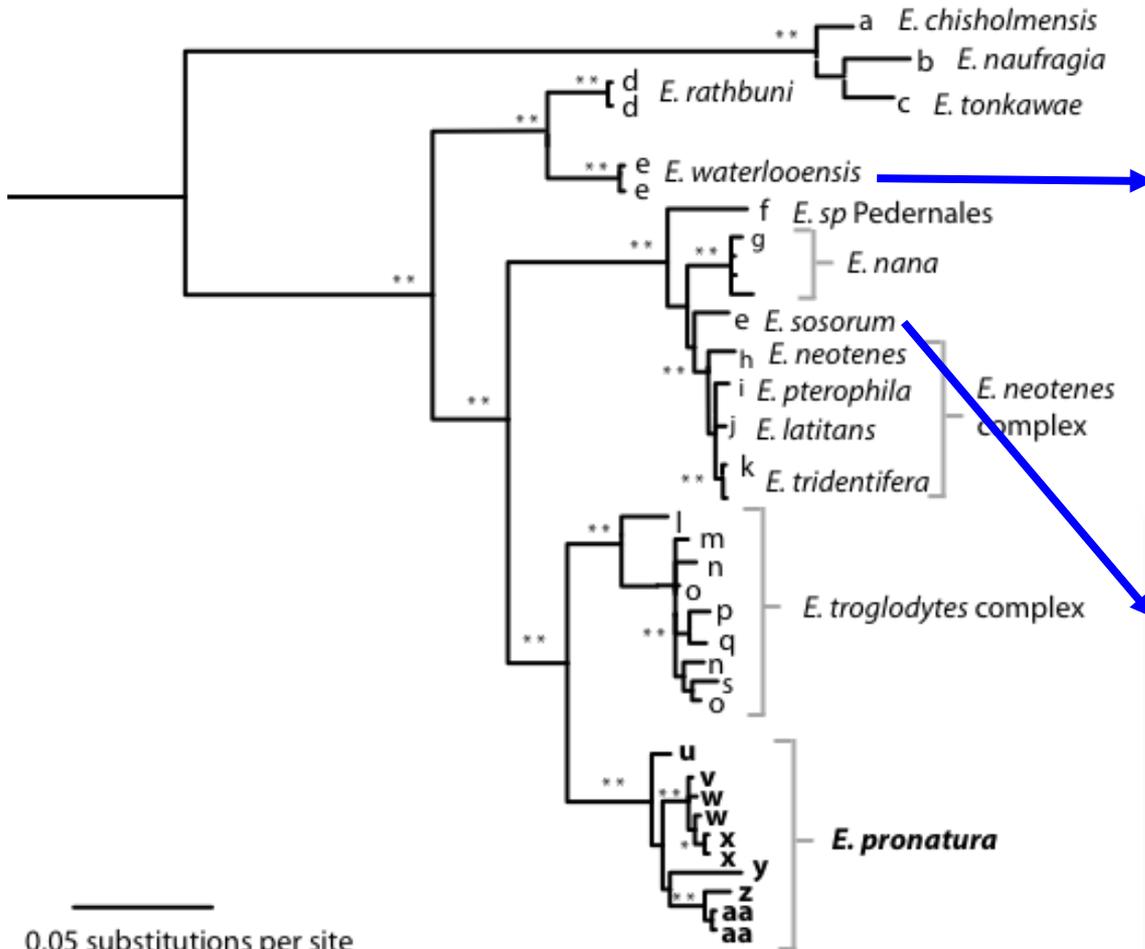
Tree of Life – Tree of all known salamanders



Tree of Life – Lungless Salamanders



Spring and cave salamanders of Texas



0.05 substitutions per site

** Posterior probability $\geq .99$

* Posterior probability $\geq .95$

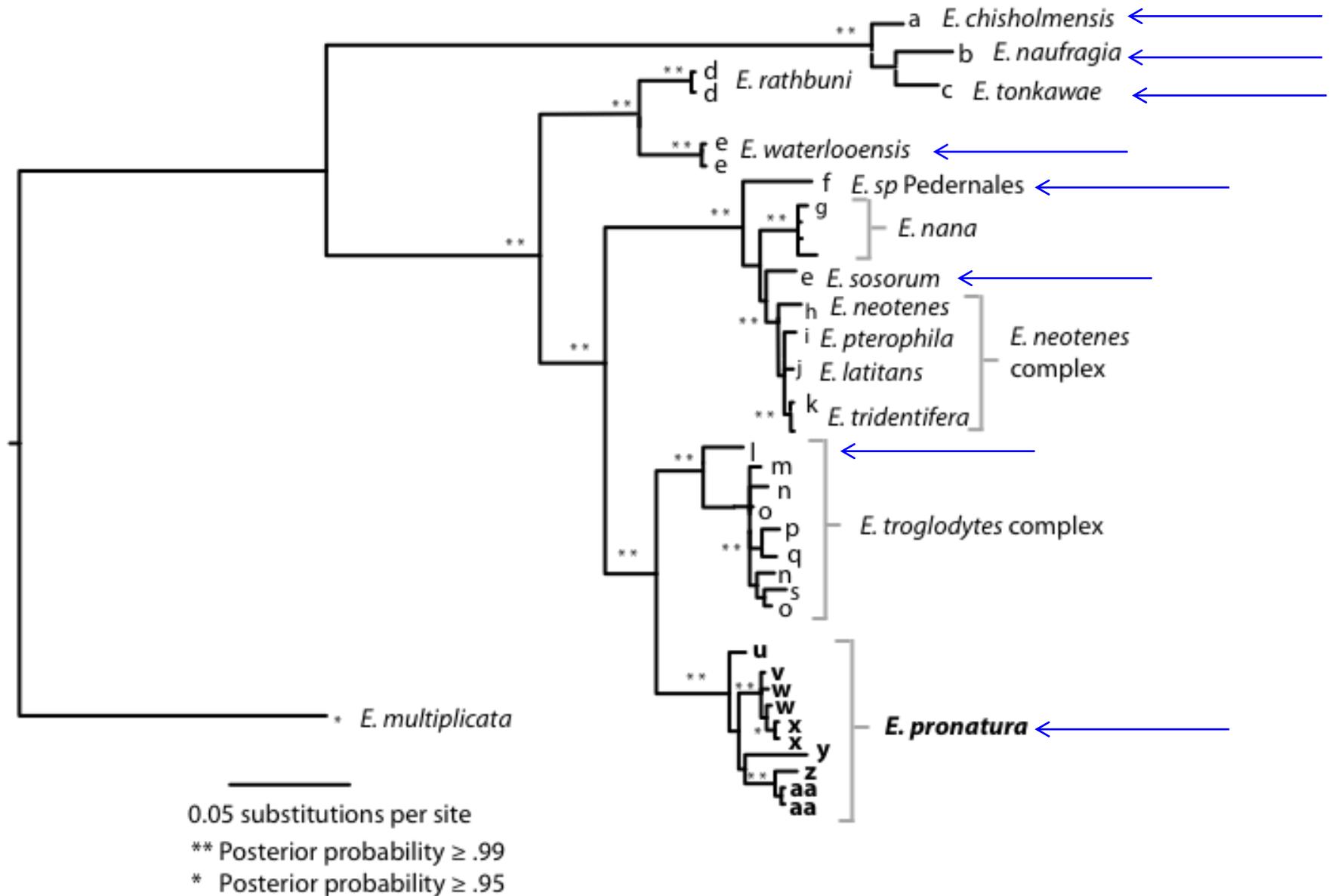


Austin Blind salamander



Barton Springs salamander

We've continued to discover new species in other regions of the aquifer:



“It’s like déjà vu all over again” -Yogi Berra

“Different salamander, same goal”

Austin American Statesman, June 14, 2005



© Nathan F. Bendik

“An Austin environmental group has asked officials to add the Jollyville salamander to the list of endangered species, potentially creating new development controversies along the Travis-Williamson county line.”

“Williamson County officials oppose federal protection of salamander”

Austin American Statesman, January 22, 2014

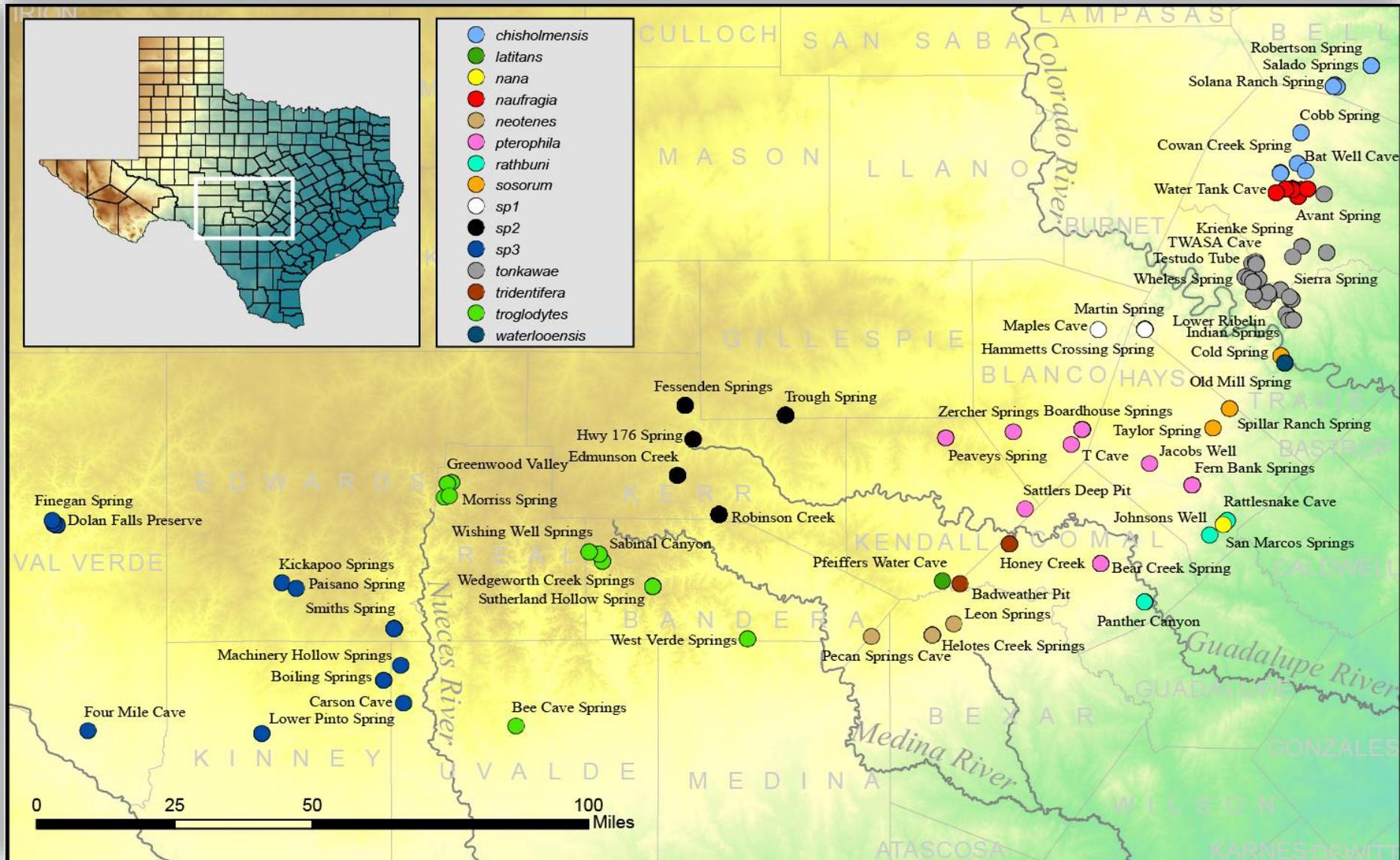
But Austin and Travis County have learned to embrace their inner salamanders!

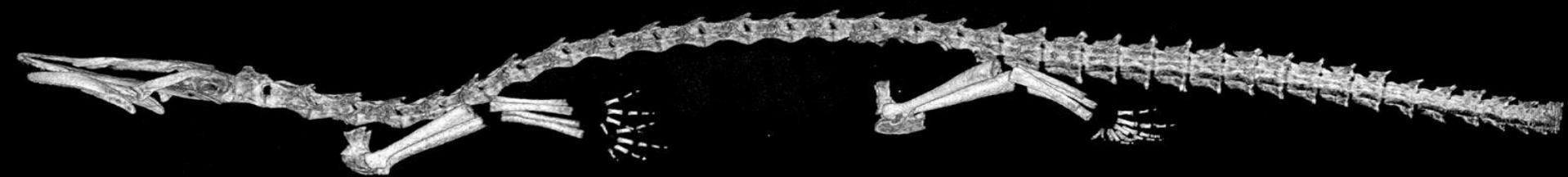
“Travis County commissioners asked to back staff recommendation to list salamanders as endangered”

Austin American-Statesman, October 9, 2012

“Travis County staffers said Tuesday that they **support the listing** of four species of salamanders in Central Texas on the federal government’s endangered species list...[joining] the **City of Austin**, which voted on the issue Sept. 27, in **supporting the listing.**”

Salamander Species Unique to Central Texas

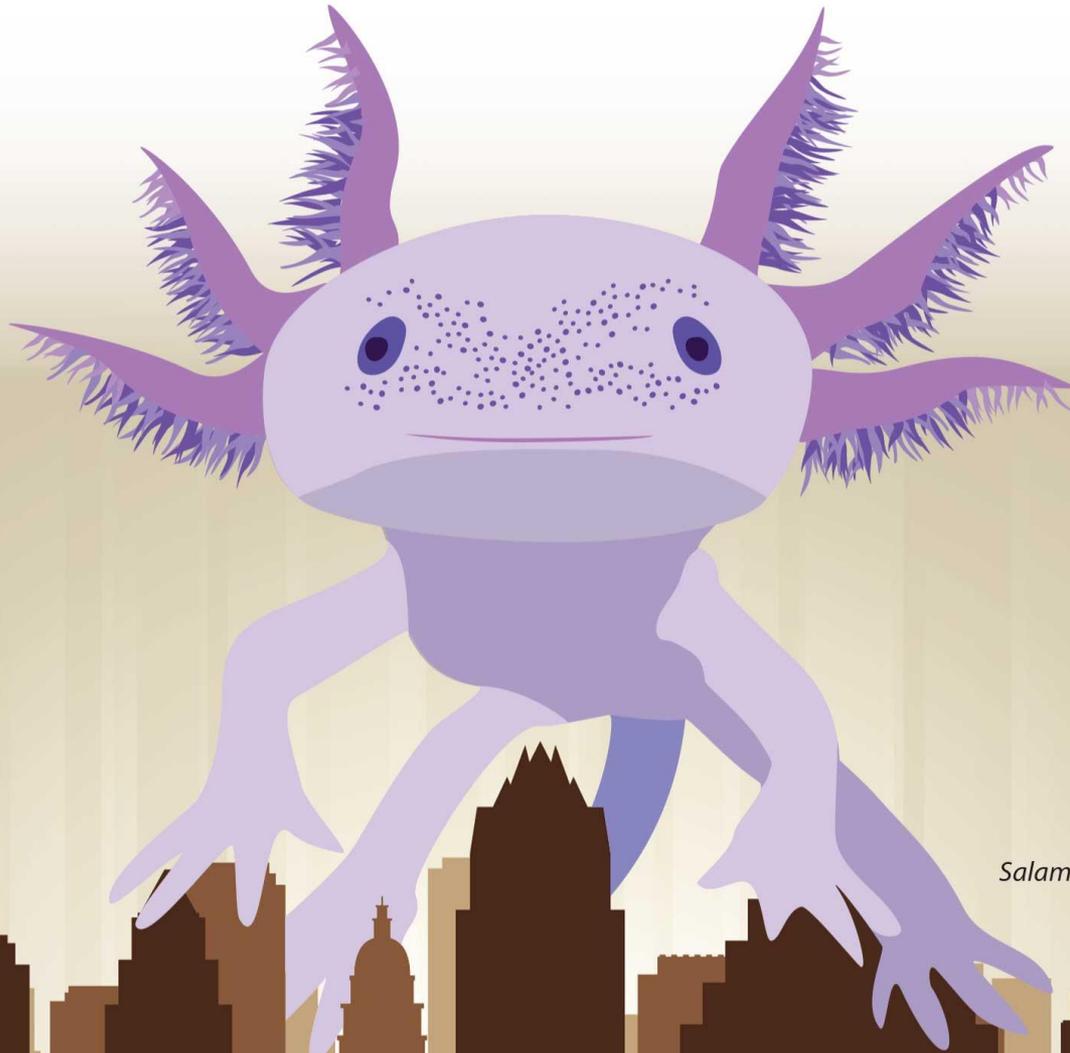






Drilling for salamanders

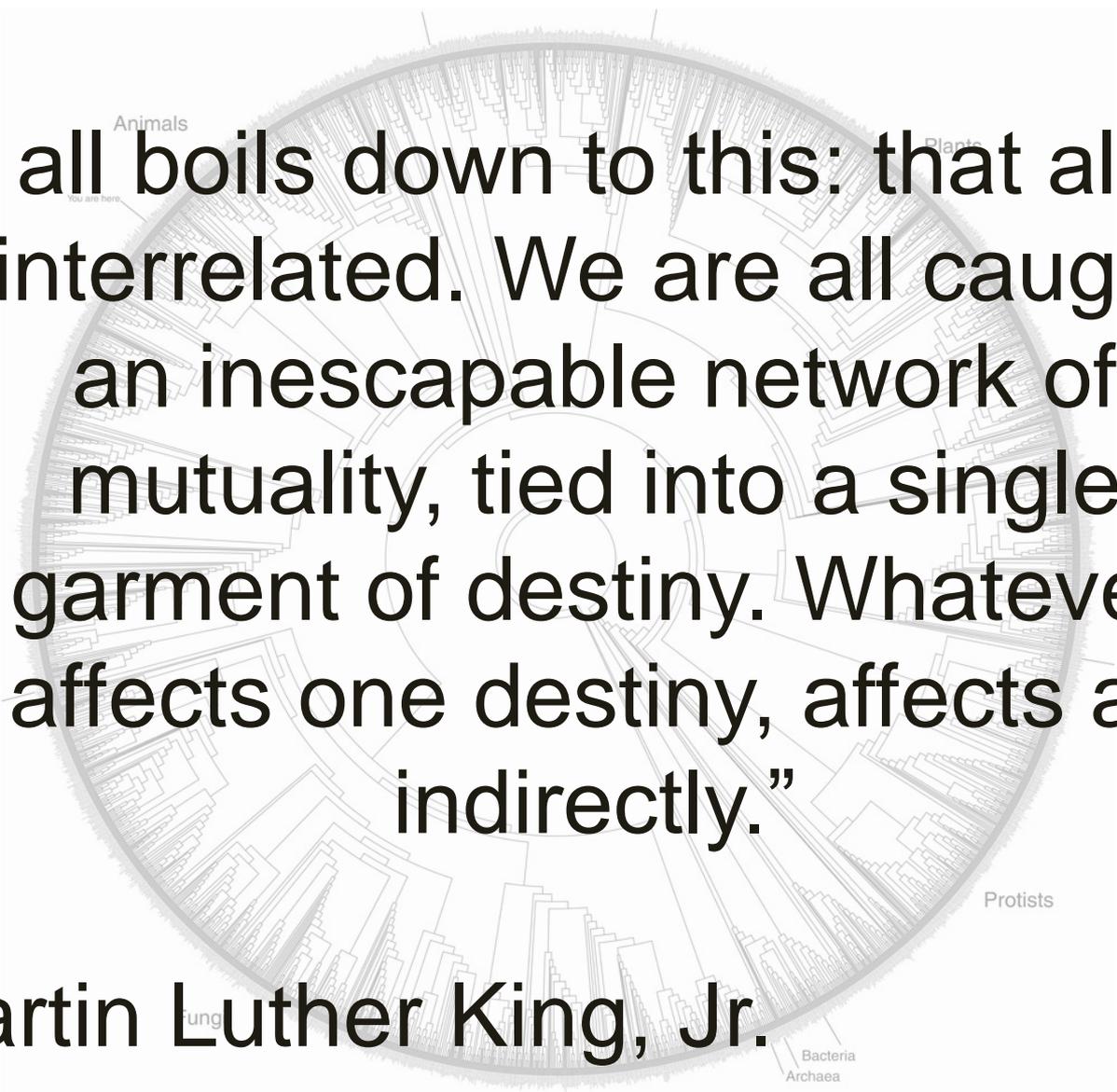
Have the salamanders done enough to save the humans?



*Salamander illustration
by Calder Kamin*

**It is not humans
versus
salamanders.**

**Saving
salamanders =
Saving humans
(and the water
supply that we
all need to
survive)**



“It all boils down to this: that all life is interrelated. We are all caught in an inescapable network of mutuality, tied into a single garment of destiny. Whatever affects one destiny, affects all indirectly.”

Martin Luther King, Jr.



Acknowledgements

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- Texas Parks and Wildlife Department: Andy Price, Chad Norris, and Andy Gluesenkamp
- NSF for funding through Presidential Young Investigator Award; USFWS for Section 6 funding through the Endangered Species Act (via the TPWD)
- The late Yogi Berra for a lifetime of wonderful contributions to the American idiom
- The moral, communist salamanders of the Edwards Plateau



Questions?

Dr. David Hillis



David M. Hillis received his B.S. degree (with honors) from Baylor University in 1980, and M.A., M.Ph. and Ph.D. (all with honors) from The University of Kansas in 1983, 1984, and 1985, respectively. After two years on the faculty at the University of Miami, he joined the Department of Zoology at UT Austin in 1987 and was awarded a prestigious National Science Foundation Presidential Young Investigator Award the same year. In 1992, he was appointed to the Alfred W. Roark Centennial Professorship in Natural Sciences, and in 1998 became the first Director of the School of Biological Sciences at the University of Texas - Austin. In 1999, Hillis was one of 32 people chosen to receive a prestigious MacArthur Foundation fellowship, known informally as the “genius award”.

David Hillis’ research interests span much of biology, from development of statistical and computational methods for analyzing DNA sequences, to molecular studies of viral epidemiology, to studies of the diversity and phylogeny of life (particularly vertebrates), to the origin and behavior of unisexual organisms. He has published over 130 scholarly articles and two technical books, and has served as Editor or Associate Editor of a dozen scientific journals. He is an active member of many scholarly societies and national research panels, and has served as the President of the Society of Systematic Biologists. In the past decade, the 23 graduate students and 12 post docs in his laboratory have produced an additional 120 independent scholarly articles.