

# Let's talk about *Phragmites australis*

## Native and nonnative reed in the Grand Canyon

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*Phragmites australis*  
(common reed) is both  
native and nonnative.

- *Phragmites australis* subsp. *americanus*
- *Phragmites australis* subsp. *berlandieri*
- *Phragmites australis* subsp. *australis*
- And hybrids between ssp. *americanus* and *australis*



# Nonnative *Phragmites australis* is a big deal

- Nonnative stands have spread across the U.S.
- Nonnative *Phragmites* significantly degrades ecosystems
  - nutrient cycling
  - sedimentation
  - species diversity
  - vegetation structural complexity
  - And more!
- Extensive management investment

*Invasive Plant Science and Management*

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## Research Article

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Changing dominance of invasive common reed (*Phragmites australis*) and native plant colonization with variation in management, wildfires, and soils in a desert wetland

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SCIENCE


LISTEN & FOLLOW 

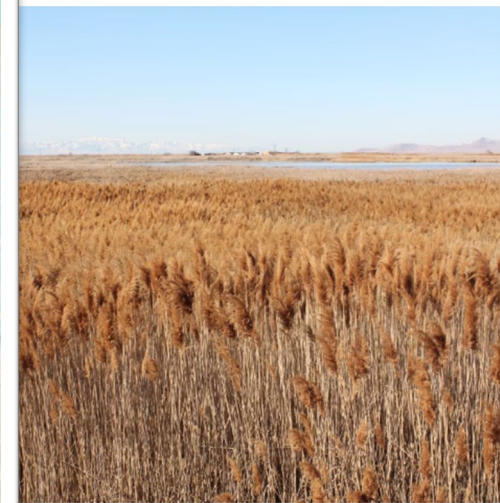
You might beat back phragmites, the scourge of wetlands, but then what?

DECEMBER 11, 2024 - 3:20 PM ET

by Matt Greenfield@boyce

5-Minute Listen

[+ PLAYLIST](#) [TRANSCRIPT](#) 



# Native *Phragmites* is important, too.

- Ecologically and culturally important
- Declining as nonnative increases
- But we don't know as much about southwestern native *Phragmites* as we do about nonnative *Phragmites*

Photo: E. Palmquist



Artifact photos courtesy of Museum of Northern Arizona, upper left NA117.U.36, upper right NA3293.90, middle A1709, bottom NA7523.55

# Especially important in the Glen and Grand Canyon regions

- Documented occurrence at least 40,000 years
- Culturally important species in a sacred landscape
- Glen Canyon Dam fundamentally changed the Colorado River



# Increasing *Phragmites* downstream of Glen Canyon Dam

- Expansion of vegetation in general
- Documented increase in *Phragmites* recently (since 2002)

Photo: R.B. Stanton

1890



2016

Photo: A. H. Fairley & H. Fairley



# Nonnative *Phragmites* has recently expanded into the southwest.

- Salt Lake (1997)
- Las Vegas Wash (1990s?)
- Virgin River (early 2000s?)
- Recent expansion of native or spread of nonnative?

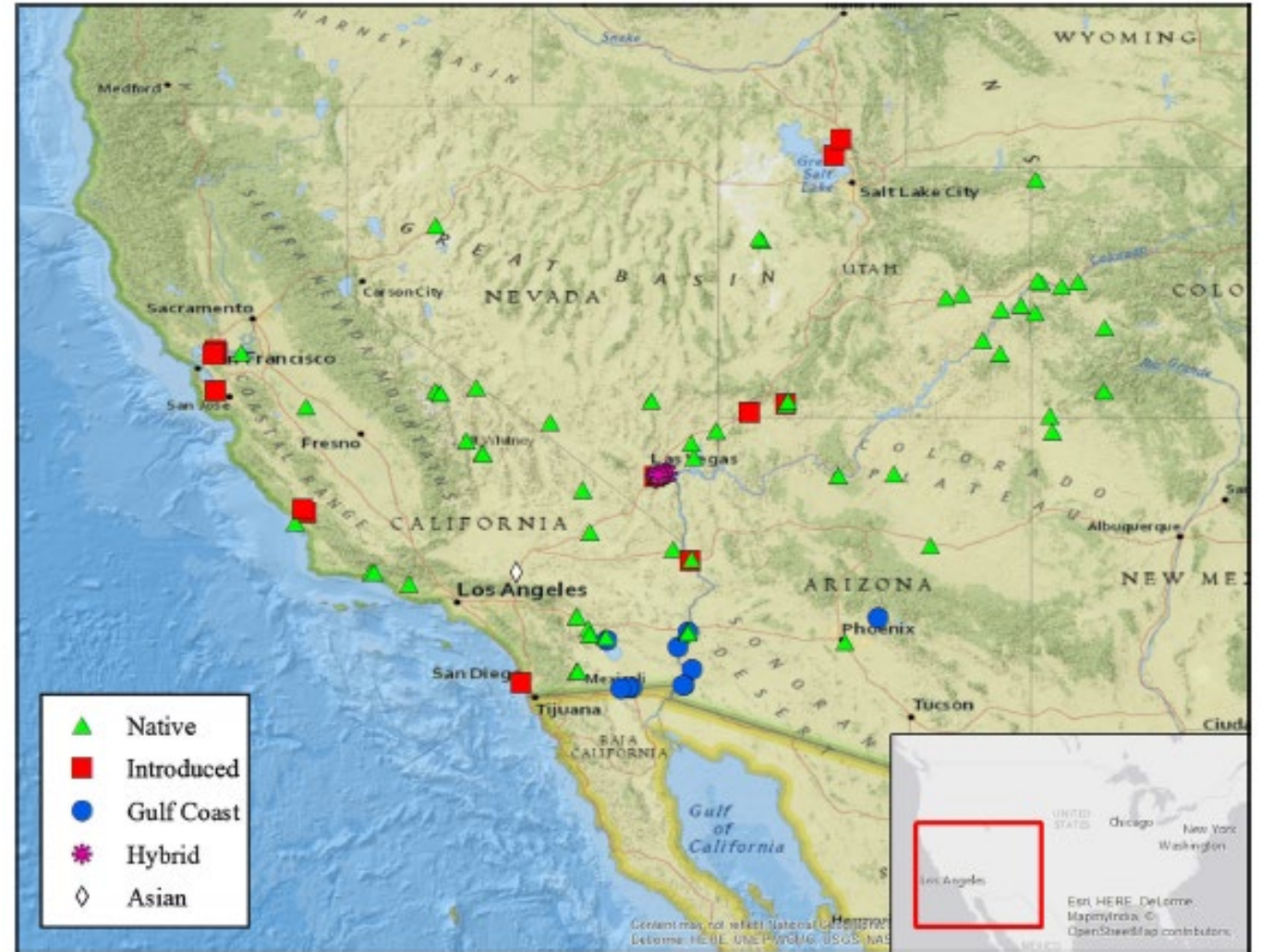


Figure 1 from Lambert and others, 2016

# The arrival of nonnative *Phragmites* will lead to management actions.

- Desire to avoid degradation of rare wetland habitats
- Could lose native *Phragmites*
- Confidence in subspecies identification = better communication, decision-making, and collaboration
- Determining genetic composition can assist with restoration
- Morphological differences in southwest facilitates rapid management



# Provide management-relevant information for protecting native *Phragmites*

- evaluate the distribution of native and nonnative *Phragmites* in the greater Glen and Grand Canyon region
- determine the genetic diversity and structure of native *Phragmites* for restoration planning
- assess the utility of morphological characters to distinguish between native and nonnative *Phragmites* in southwestern landscapes.



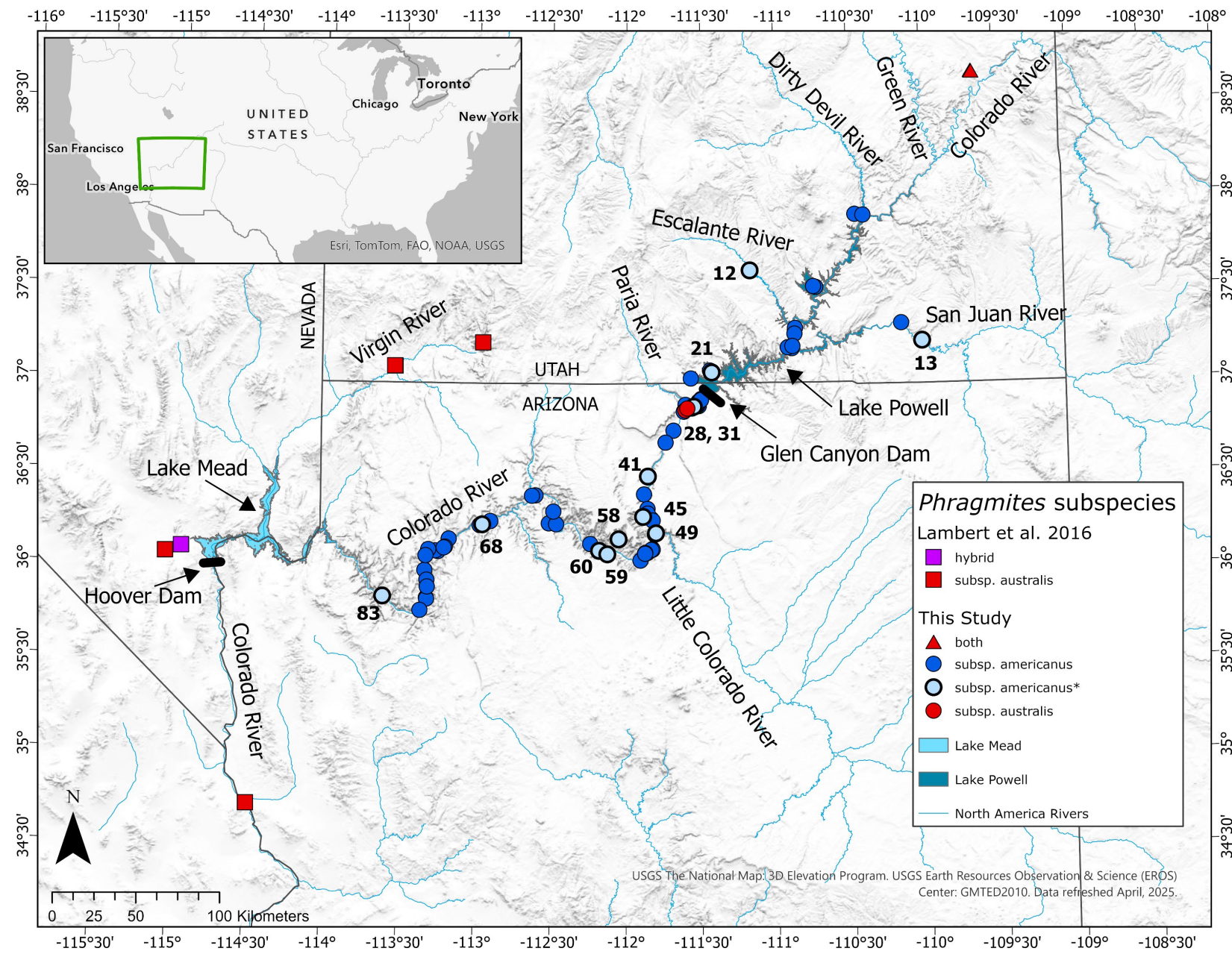
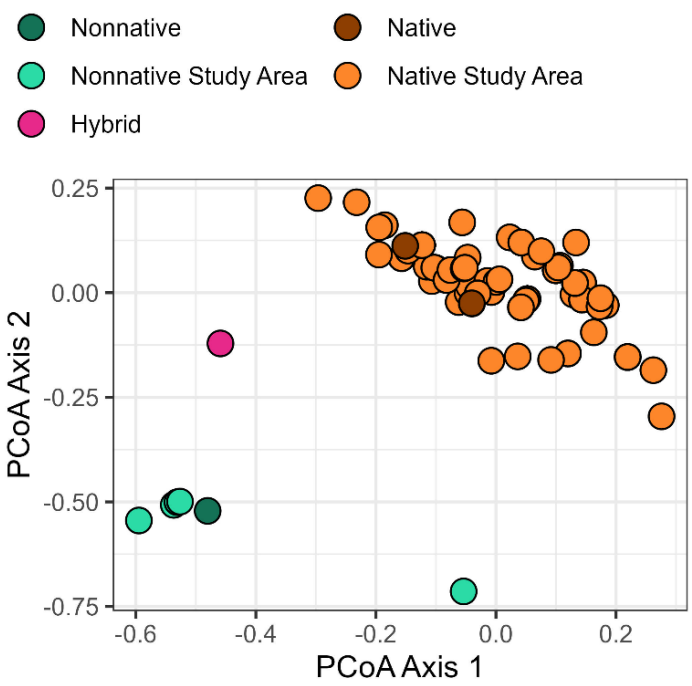
# Methods

- Genetics analysis of 83 stands
  - rtPCR
  - Microsatellite loci
  - *k*-means clustering, discriminant analysis of principal components (DAPC), and analysis of molecular variance (AMOVA) for population genetic analyses
  - Genetic diversity calculated
- Morphological measurements from all stands
  - Characters that were useful elsewhere
  - Compared to published ranges for nonnative *Phragmites*



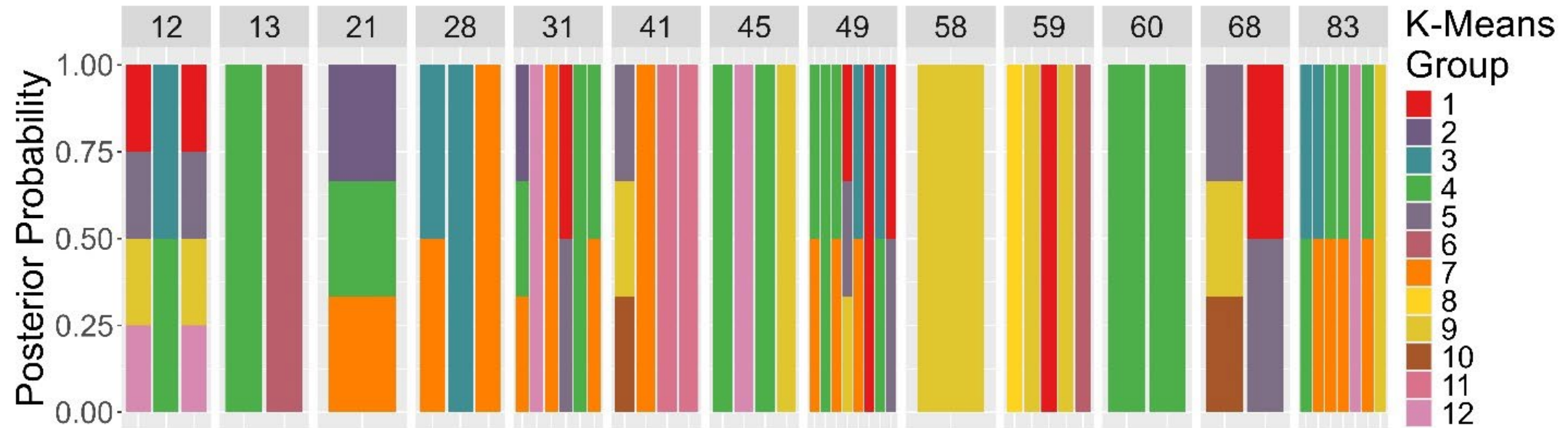
Photos: E. Palmquist

# Four of 83 stands were nonnative, no hybrids



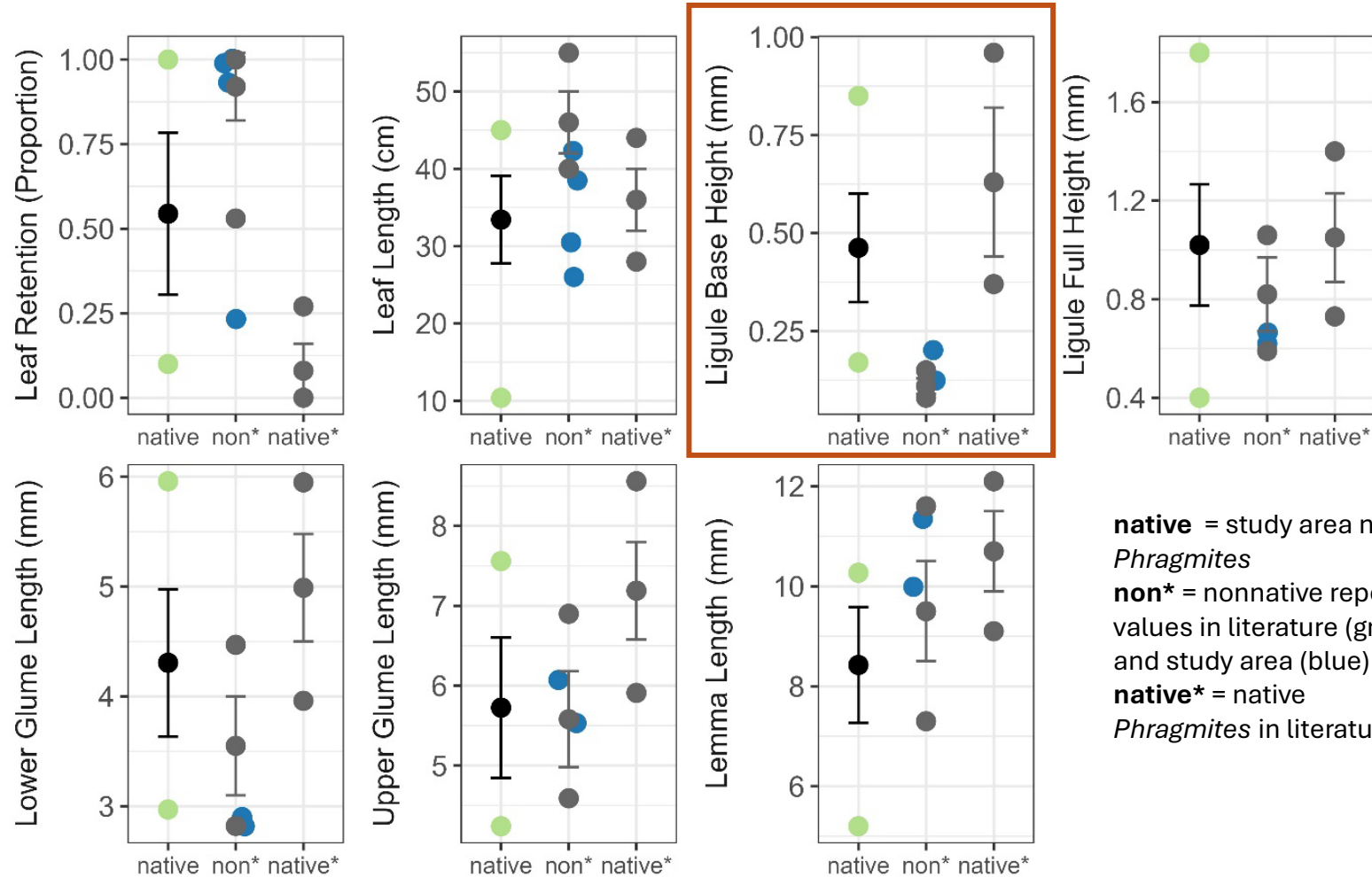
# Native stands genetically diverse, high gene flow, but each stand unique

- Nei's gene diversity = 0.29 (0.15 – 0.38)
- 36% genetic variation explained by differences among sample sites



Preliminary Information – Subject to Revision. Not for Citation or Distribution.

# Ligule base height only trustworthy continuous variable.

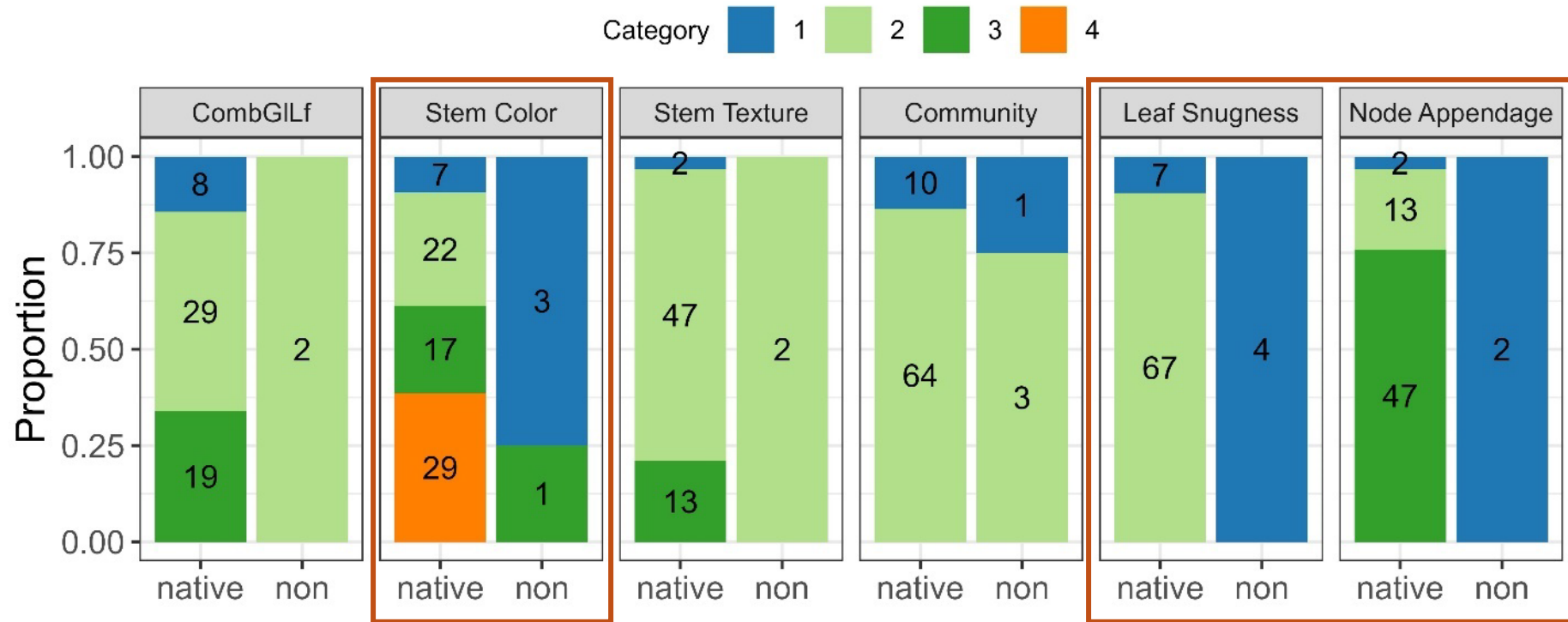


**native** = study area native *Phragmites*  
**non\*** = nonnative reported values in literature (gray) and study area (blue)  
**native\*** = native *Phragmites* in literature



From Figure 3 in McTavish and others, 2023

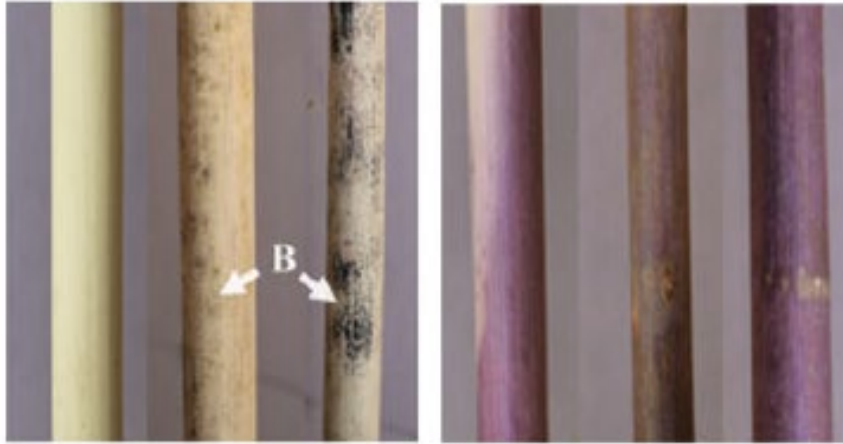
# Stem color, leaf snugness, and node appendages reliably distinguish subspecies.



# Southwestern native *Phragmites* is more morphologically variable than elsewhere but can still be identified.

Nonnative

Native



(stem mostly covered)



Photo: E. Palmquist

# Southwestern native *Phragmites* blooms later than nonnative *Phragmites*.

Native – (August) Sept/Oct



Nonnative – (June) July/August



Photos: E. Palmquist

There's a color difference, but most noticeable when side by side.

Native

Nonnative



Photo: E. Palmquist

# Native *Phragmites* thrives in desert wetlands and along a dam-regulated river.

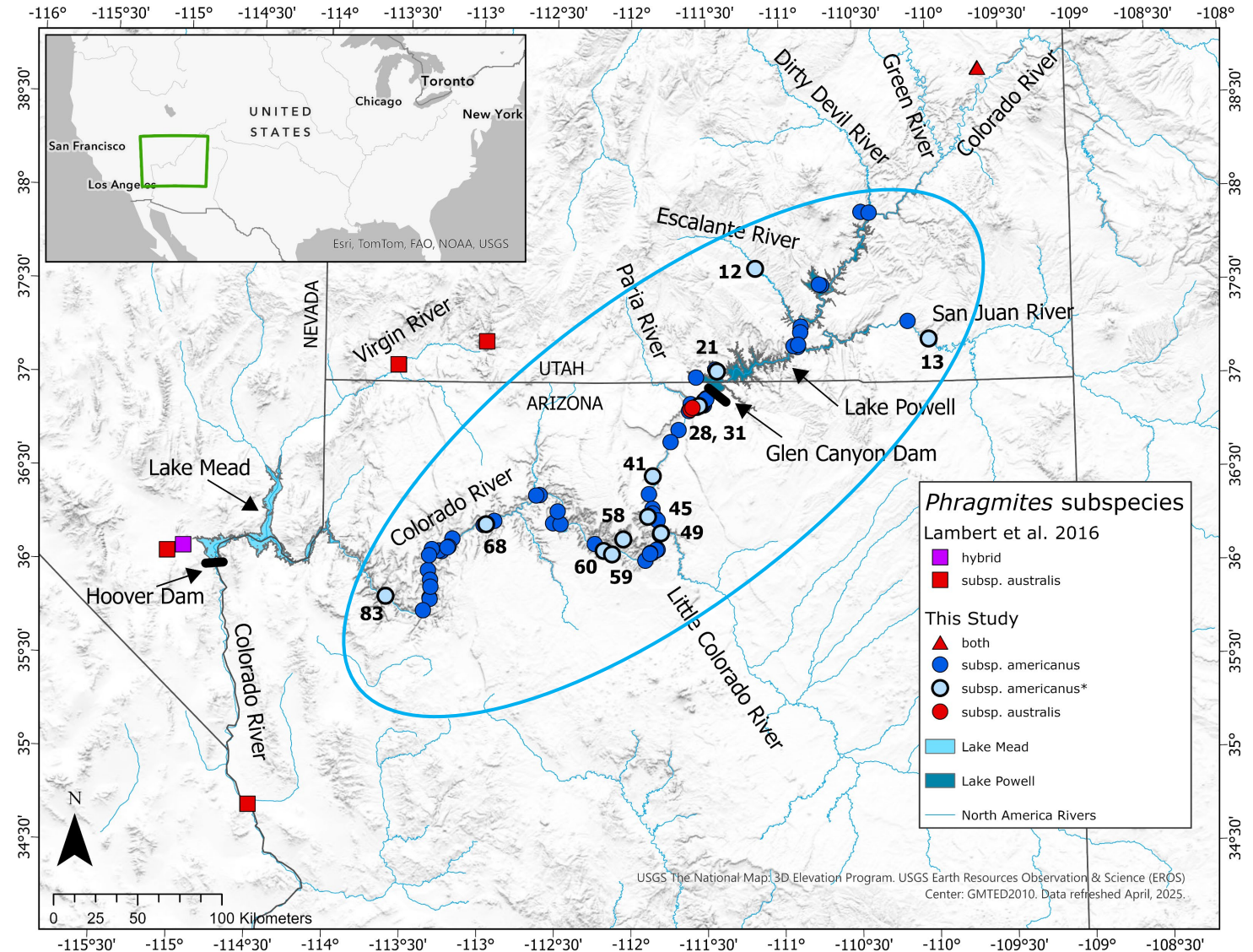
- Remaining small populations around Lake Powell are persisting
- A hydropower dam in the desert is supporting large stands of genetically diverse native *Phragmites*

Photo: E. Palmquist



# Genetically diverse native *Phragmites* can be sourced region-wide for restoration purposes.

- Ideal for developing restoration materials.
- Can collect from multiple stands from across the region and plant them out anywhere.





## Are Grand Canyon waterways doomed?

- Conversion from native to nonnative in ~25-30 years around Great Salt Lake
- Deltaic sediments around Lake Powell may be suitable for nonnative
- But rivers, flash floods, nutrient and sediment poor conditions not really nonnative *Phragmites*' thing
- Hybrids and native *Phragmites* co-existing elsewhere

# This large, diverse population is threatened by nonnative *Phragmites*.

- Decisions about how the manage nonnative *Phragmites* are being made
- Could benefit from coordination among management agencies and stakeholders with deep ties to the land



# Let's talk about *Phragmites* everywhere!

- Identify *Phragmites* everywhere (and tell me what you find!)
- Start conversations with Tribal partners, land managers, recreationists, scientists PRIOR to finding nonnative *Phragmites*
- Evaluate the risk of southwestern springs and waterways to nonnative invasion
- It's not all about nonnative *Phragmites*; let's celebrate our diverse and amazing native *Phragmites*!

Photo: E. Palmquist



What's your *Phragmites* experience?  
I'd love to hear about it!



### Further questions?

Contact me:

[epalmquist@usgs.gov](mailto:epalmquist@usgs.gov)

or Search "Emily Palmquist USGS"

### Data are available:

Palmquist, E.C., Damon, B., Benson, T., and DiMartini, C., 2025, Morphological and genetic data for *Phragmites australis* along the Colorado River and in tributaries from southern Utah to west-central Arizona: U.S. Geological Survey data release, <https://doi.org/10.5066/P14TDHES>.

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Photo: E. Palmquist

# References Cited

- Abella, S.R., Porter, S.L., Kline, K.A., Chiquoine, L.P., and Jurand, B.S., 2024, Changing dominance of invasive common reed (*Phragmites australis*) and native plant colonization with variation in management, wildfires, and soils in a desert wetland: *Invasive Plant Science and Management*, v. 17, no. 3, p. 172-181, <https://www.cambridge.org/core/product/C506CF1E594F4032D460C0B9DE7D90A6>
- Armitage, D.R., Plummer, R., Berkes, F., Arthur, R.I., Charles, A.T., Davidson-Hunt, I.J., Diduck, A.P., Doubleday, N.C., Johnson, D.S., Marschke, M., McConney, P., Pinkerton, E.W., and Wollenberg, E.K., 2009, Adaptive co-management for social–ecological complexity: *Frontiers in Ecology and the Environment*, v. 7, no. 2, p. 95-102, <https://doi.org/10.1890/070089>.
- Durning, L.E., Sankey, J.B., Yackulic, C.B., Grams, P.E., Butterfield, B.J., and Sankey, T.T., 2021, Hydrologic and geomorphic effects on riparian plant species occurrence and encroachment—Remote sensing of 360 km of the Colorado River in Grand Canyon: *Ecohydrology*, v. 14, no. 8, p. e2344, online, <https://doi.org/10.1002/eco.2344>.
- Hansen, R.M., 1978, Shasta ground sloth food habits, Rampart Cave, Arizona: *Paleobiology*, v. 4, no. 3, p. 302-319.
- Kulmatiski, A., Beard, K.H., Meyerson, L.A., Gibson, J.R., and Mock, K.E., 2011, Nonnative *Phragmites australis* Invasion into Utah Wetlands: *Western North American Naturalist*, v. 70, no. 4, p. 541-552.
- Lambert, A.M., Saltonstall, K., Long, R., and Dudley, T.L., 2016, Biogeography of *Phragmites australis* lineages in the southwestern United States: *Biological Invasions*, v. 18, no. 9, p. 2597-2617, <https://doi.org/10.1007/s10530-016-1164-8>.
- McTavish, M.J., Smith, T., Mechanda, S., Smith, S.M., and Bouchier, R.S., 2023, Morphological traits for rapid and simple separation of native and introduced common reed (*Phragmites australis*): *Invasive Plant Science and Management*, v. 16, no. 2, p. 110-118, <https://www.cambridge.org/core/product/47377F16AD751AD37DE80D6CAF0C2642>.
- Meyerson, L.A., Cronin, J.T., Packer, J., Pyšek, P., and Saltonstall, K., 2025, Ecology, Evolution, and North American Invasion of One of the World's Most Successful Plant Species: *Annual Review of Ecology, Evolution, and Systematics*, <https://www.annualreviews.org/content/journals/10.1146/annurev-ecolsys-102723-051221>.
- Palmquist, E.C., Deemer, B.R., Metcalfe, A.N., Kennedy, T.A., Bair, L.S., Fairley, H.C., Grams, P.E., Sankey, J.B., and Yackulic, C.B., 2025, eZ flow metrics: Using z-scores to estimate deviations from natural flow in the Colorado River below Glen Canyon Dam: *River Research and Applications*, p. 1-16, <https://onlinelibrary.wiley.com/doi/abs/10.1002/rra.4360>.
- Saltonstall, K., 2002, Cryptic invasion by a non-native genotype of the common reed, *Phragmites australis*, into North America: *Proceedings of the National Academy of Sciences*, v. 99, no. 4, p. 2445-2449, <https://www.pnas.org/doi/abs/10.1073/pnas.032477999>.
- Saltonstall, K., Peterson, P.M., and Soreng, R.J., 2004, Recognition of *Phragmites australis* subsp. *americanus* (Poaceae: Arundinoideae) in North America: Evidence from Morphological and Genetic Analyses: *SIDA, Contributions to Botany*, v. 21, no. 2, p. 683-692, <http://www.jstor.org/stable/41968310>.
- Saltonstall, K., Lambert, A.M., and Rice, N., 2016, What happens in Vegas, better stay in Vegas: *Phragmites australis* hybrids in the Las Vegas Wash: *Biological Invasions*, v. 18, no. 9, p. 2463-2474, <https://doi.org/10.1007/s10530-016-1167-5>.
- Topping, D.J., Schmidt, J.C., and Vierra, L.E., 2003, Computation and analysis of the instantaneous-discharge record for the Colorado River at Lees Ferry, Arizona—May 8, 1921, through September 30, 2000: U.S. Geological Survey Professional Paper 1677, 118 p., <http://pubs.water.usgs.gov/pp1677/>.