Water Resources:
Water, Land & Life Research

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Dr. Dale Devitt
Professor
Director - Center for Urban Water Conservation
School of Life Sciences
Phone 702-895-4699

Expertise

Soil Plant Water Relations
Water Management
Evapotranspiration
Salinity

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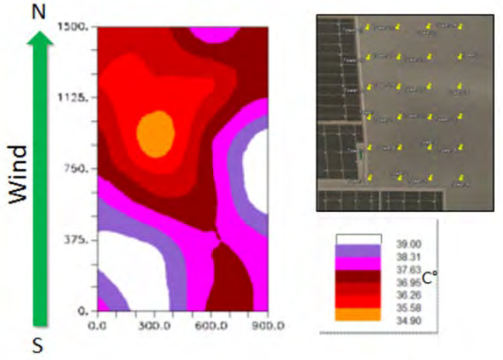
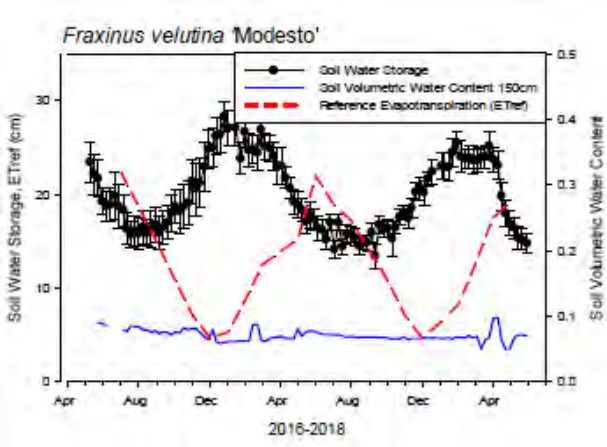
Current Research

- Assessing the impact of large scale solar development on desert ecosystems.



- Tree grass water use tradeoffs in urban landscapes



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10 acre research facility in North Las Vegas dedicated to conducting applied and basic water related research.

Response (growth, flower and seed production) of desert perennial shrubs to altered precipitation

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Astrobiology and Geomicrobiology

Dr. Elisabeth Hausrath
Associate Professor
Department of Geoscience
Phone: 702-895-1134
Email: Elisabeth.Hausrath@unlv.edu

Expertise
Geomicrobiology
Biological impacts on water-rock interactions
Astrobiology

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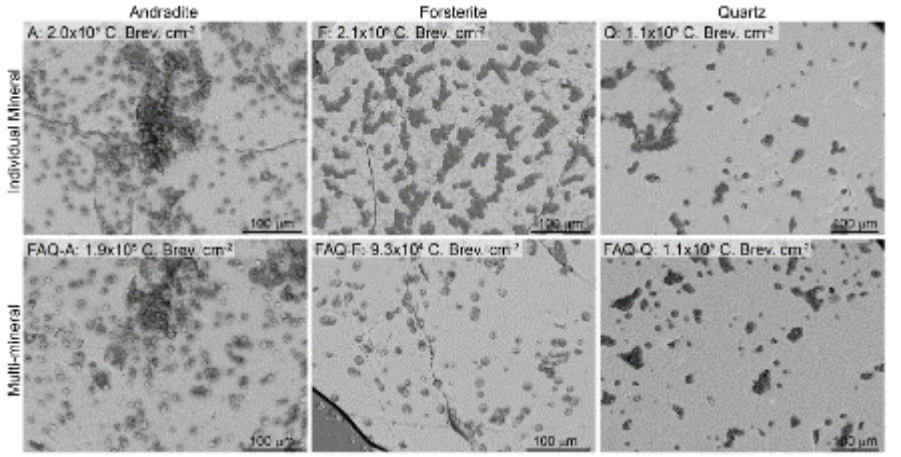
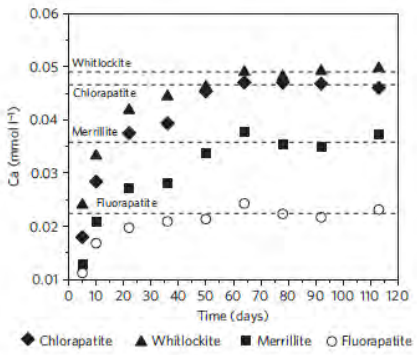
Biological Impacts on water-rock interactions

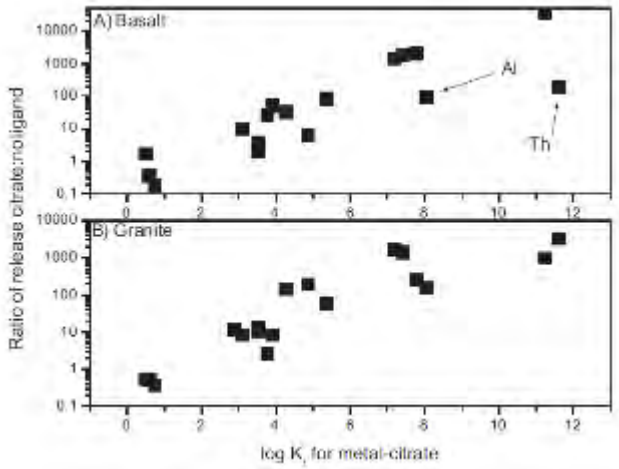
Field studies (e.g. Baumeister et al., 2014)



Laboratory studies (e.g. Phillips-Lander et al., 2020)



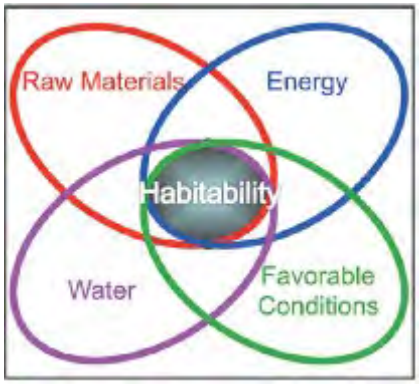
Nutrient release (e.g. Adcock et al.., 2013)



Signatures of biological alteration (e.g. Hausrath et al., 2009)

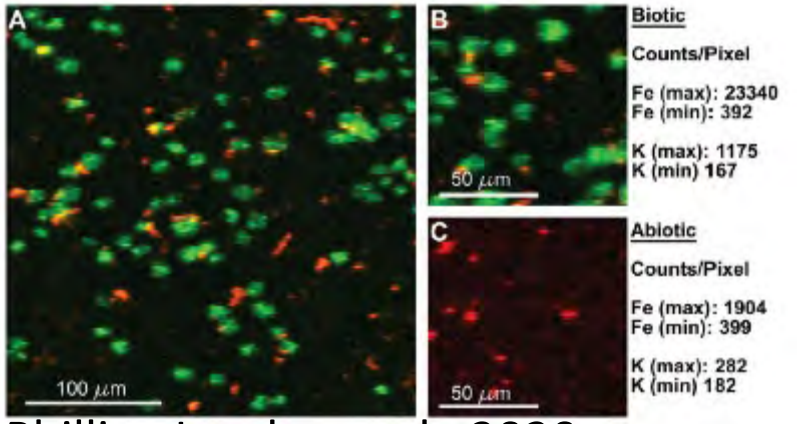
Astrobiology

Habitability



Hays et al., 2017

Potential biosignatures



Phillips-Lander et al., 2020

Mars 2020 and Mars Sample Return

NASA.gov

Sedimentary Geology

Dr. Ganqing Jiang
Professor
Department of Geoscience
Phone: (702) 895-2708
Email: Ganqing.Jiang@unlv.edu

Expertise:
Sequence and chemostratigraphy
sedimentology
Carbonate diagenesis

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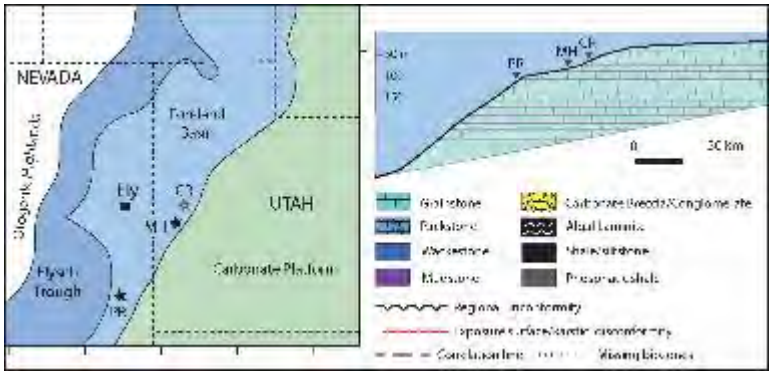
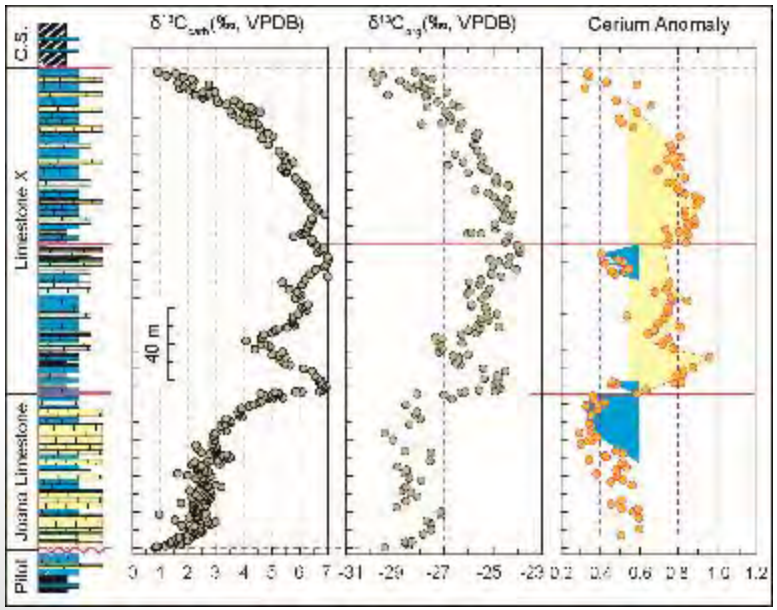
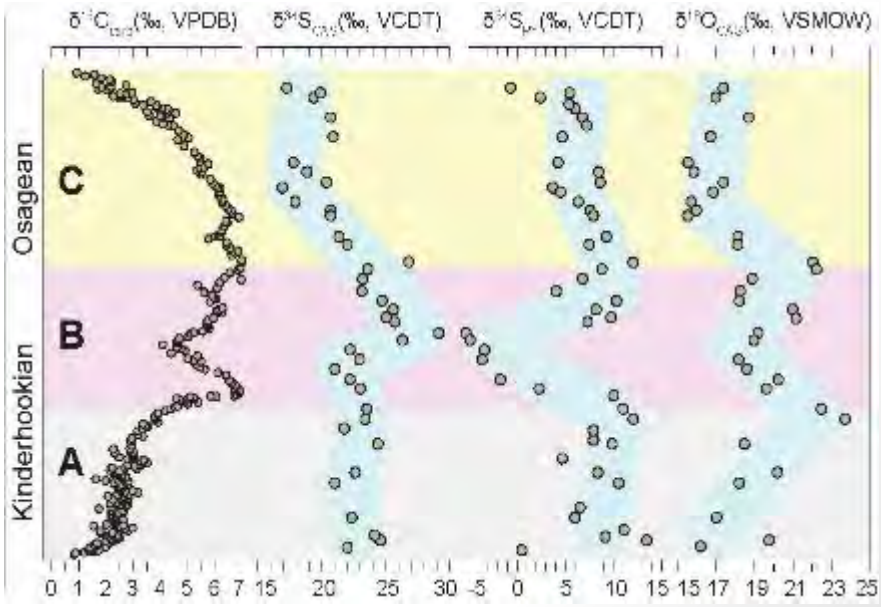
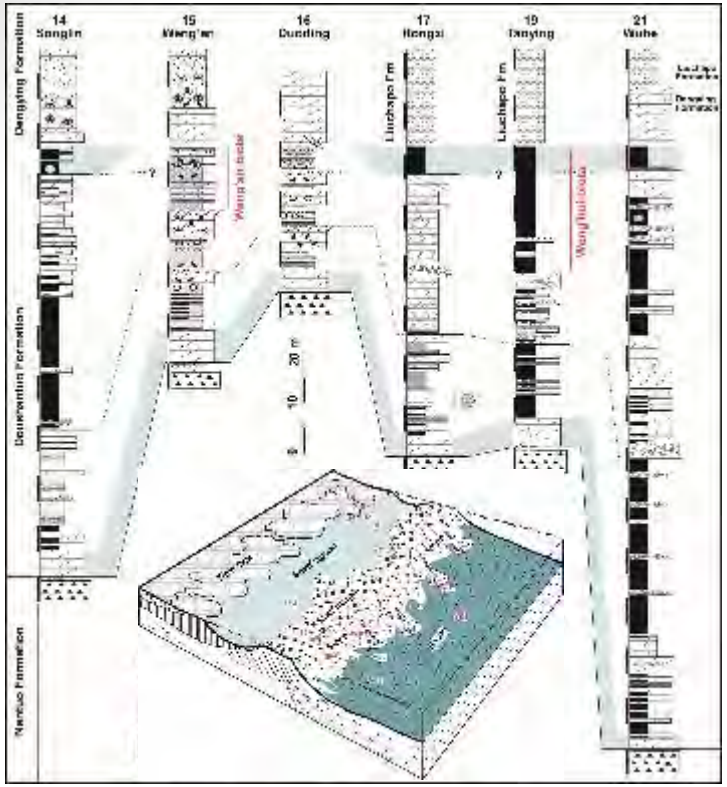
- Sequence and chemostratigraphy
- Paleogeographic reconstruction
- Applications of stable isotopes and rare earth elements
- Paleoenvironmental change across major perturbations of the carbon cycle and mass extinctions

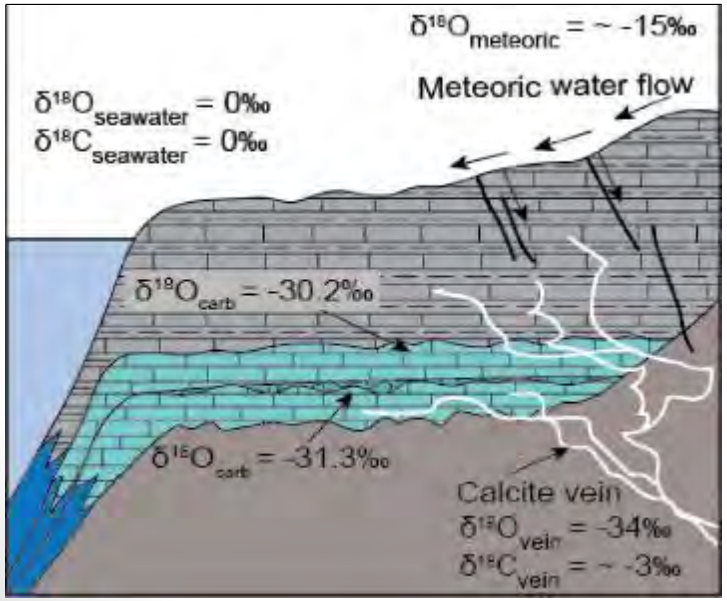








- Basin analyses and paleoceanography
- Fluid migration and carbonate diagenesis
- Tracing fluid migration in sedimentary basins using stable isotopes and trace elements
- Carbonate aquifer



Hydrology

Dr. David K. Kreamer
Department of Geoscience
Phone: (702) 895-3553
Email: dave.kreamer@unlv.edu

Expertise:

Environmental Contamination
Groundwater dependent ecosystems , spring sustainability
Water and International Security

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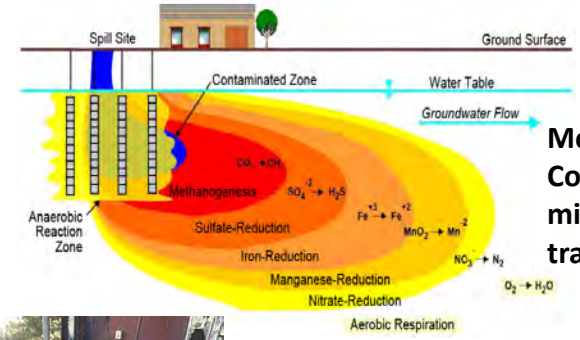
Environmental Contamination

Contaminant Transport Studies – Column tests to determine flow and leachate from Superfund landfill sites

Radioactive waste migration investigations



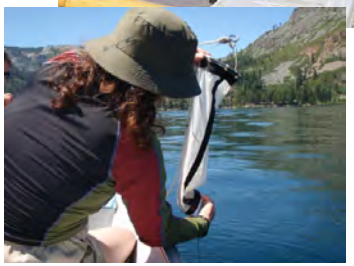
Modeling Contaminant migration and transformation

Polluted well, South Africa, non aqueous phase liquids

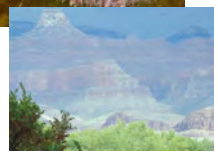
Mine waste, Arizona

Spring/ Ecosystem Sustainability

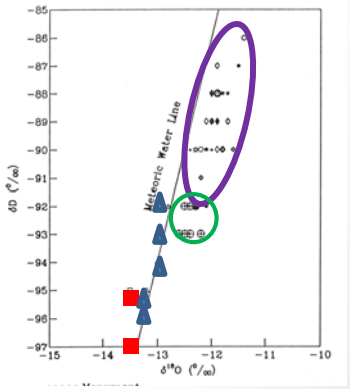
Research on Springs in Grand Canyon National Park



Lake Studies – limnological surveys in western U.S., Europe, and Africa

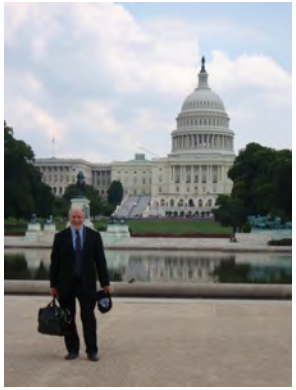


Groundwater tracking, tracing, dating with isotopes and trace elements



- Contaminant assessment, forensics, remediation, physical and numerical modeling
- Groundwater tracking, tracing and dating with isotopes, trace element chemistry to identify and protect vulnerable groundwater dependent ecosystems

Water and International Security

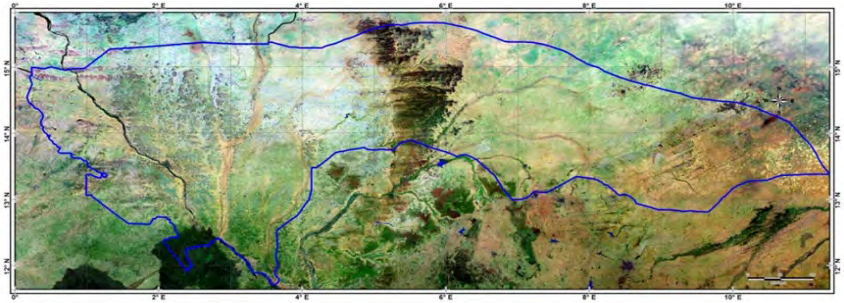


Presentations to U.S. Congress, and National Academy of Sciences – International Hydrologic Programme of the United Nations Educational, Scientific and Cultural Organization (UNESCO)

Groundwater training in Zimbabwe

Water supply studies Ghana

Negev Desert, Israel



Satellite remote sensing to locate groundwater reserves in southern Niger - Mosaic of 66 Landsat 8 images in colored composition 7, 5, 3, with radiometric balancing. The study area is within the blue zone

Drilling Technology Course, South Africa

Short Course on Water Quality to Iraqi Ministry of the Environment – Baghdad

- Using innovative methods to find clean water sources, improve sanitation
- Provide training and capacity building, reducing conflict, increasing opportunity

Climate Science and Paleoclimatology

Matthew S. Lachniet

Professor

Department of Geoscience

Phone 702-895-4388

Matthew.Lachniet@unlv.edu

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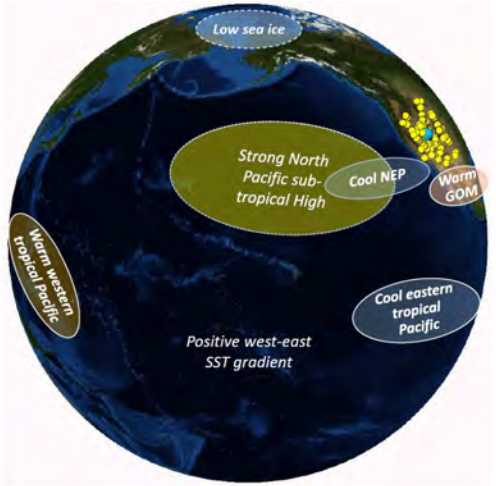
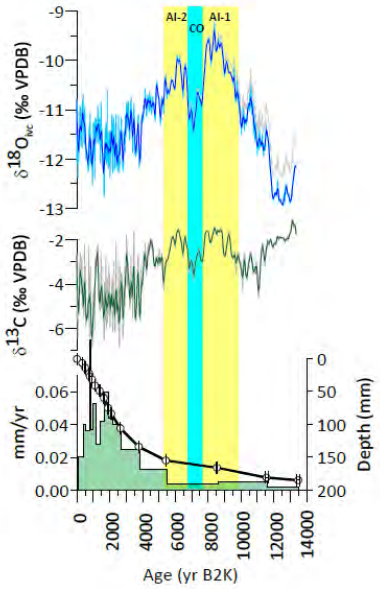
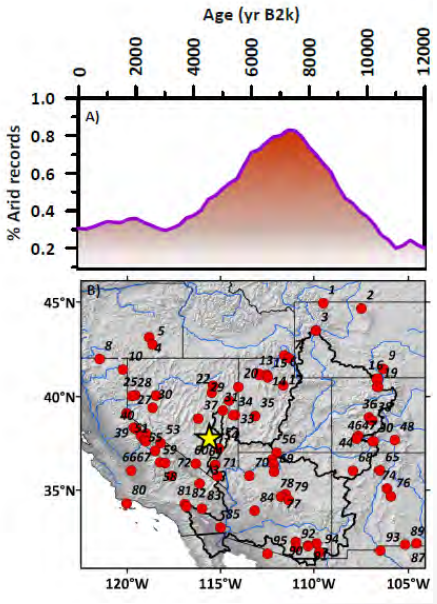
Paleoclimatology

- Study of the causes, timing, and consequences of climate change on timescales ranging from decades to millennia
- Cause of aridity in the Great Basin and Western United States
- Influence of ocean temperatures on precipitation in Nevada
- Cave archives of past climate with sites in Nevada, Mexico, Central America, and elsewhere







Hydrology

Dr. Michael Nicholl
Department of Geoscience
Phone: (702) 895-4616
Email: michael.nicholl@unlv.edu

Expertise:
Unsaturated zone hydrology
Fractured rock hydrology
Environmental fluid mechanics

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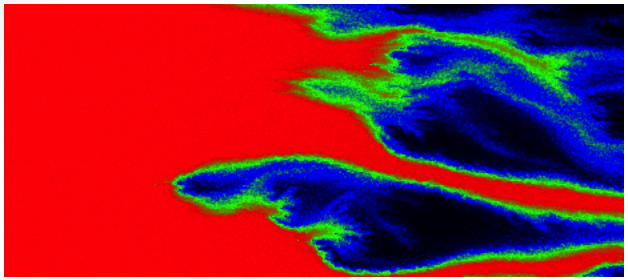
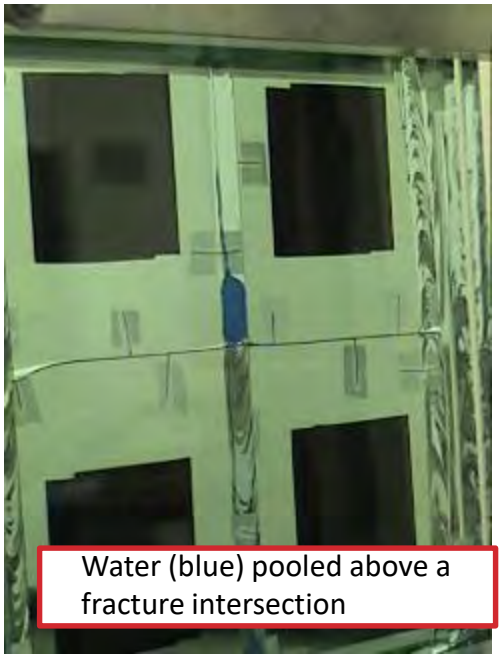
Fractured Rock Hydrology



False color image of a miscible displacement experiment in a single fracture



Water (blue) pooled above a fracture intersection

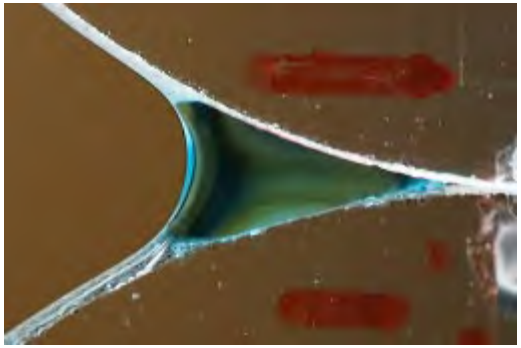
Field mapping of fracture networks
blue dye (right foreground) is from an infiltration test

Isothermal flow across a single rock fracture (matrix-to-matrix flow)

- Two-phase flow and transport in fractured rock
- Laboratory experimentation, field mapping, numerical simulations
- Contaminant transport, geothermal energy, enhanced petroleum recovery

Unsaturated Porous Media

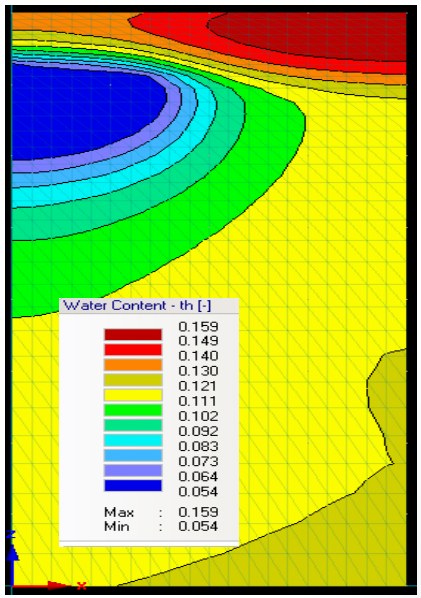
Seepage through gravel-sized capillary barrier materials



Millimeter-scale transport experiment

Hydraulic conductivity of a rock slab

Sampling Chloride as a proxy for root-driven horizontal flow



2D simulation of root-driven transport

- Challenging existing conceptual models for unsaturated and two-phase flow
- Design and execution of critical laboratory/field/numerical experiments

Dryland ecology, hydrology and climate dynamics

Dr. Matthew Petrie
Assistant Professor
School of Life Sciences
ph: 702-895-5844
e: matthew.petrie@unlv.edu

Expertise:

Vegetation ecology and near-surface hydrology
Forest regeneration
Climate dynamics and climate change forecasting
Extreme events
Landscape ecology
Manipulative field experimentation

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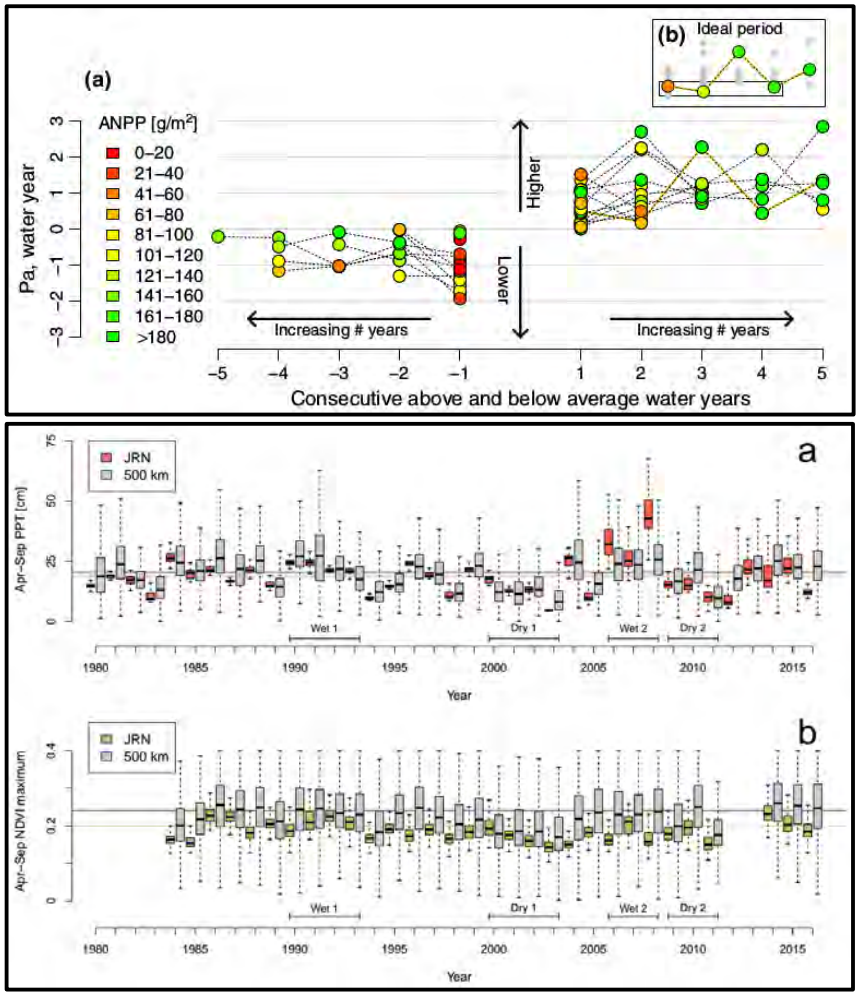
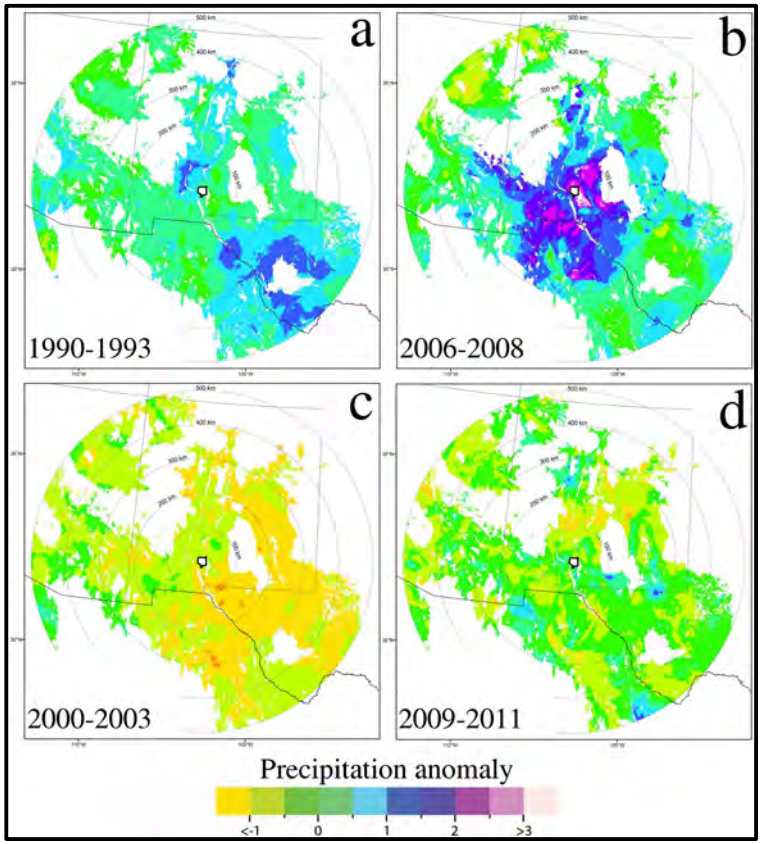
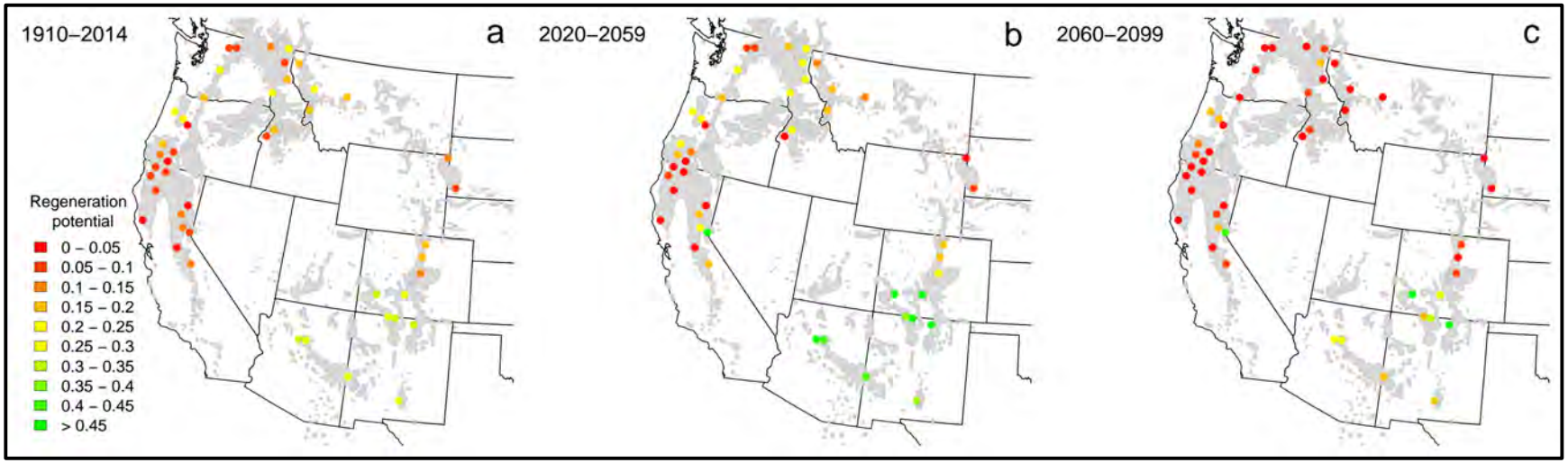
Linking extreme climate events and ecological dynamics across space and time

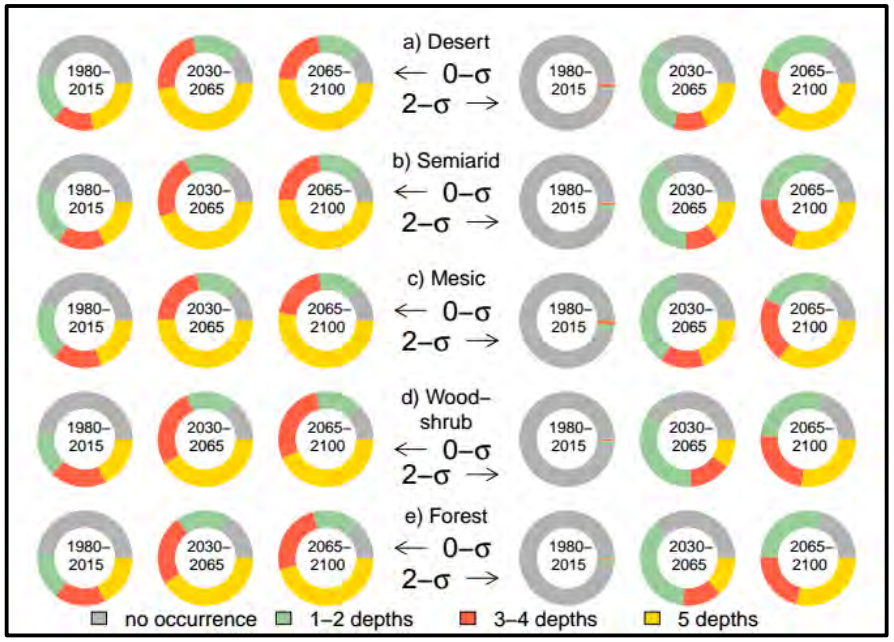




Above: Disentangling locally- and regionally-observed ecological responses to multiyear high and low rainfall periods. Multiyear periods are a key component of understanding climate impacts to arid and semiarid regions. Our research focuses on the physical mechanisms that shape ecological responses, providing a foundation for understanding the effects of local and regional extreme events in a changing climate.

Forecasting climate change impacts





Above: Natural forest regeneration may decline substantially throughout the western US in the 21st century. We study how climate, landscape properties, and the stress tolerance of tree populations will shape the future of western forests.

Left: Forecasts for increasing belowground extreme temperature events in a changing climate. We use downscaled climate model projections to forecast the increasing occurrence of moderate (0-σ) and very high (2-σ) extreme temperature events throughout multiple depths in the soil profile for ecosystems of the central and western US.

Computational biology and the physiology of plants

Dr. Paul J Schulte
Associate Professor,
School of Life Sciences
Email: paul.Schulte@unlv.edu

Expertise

- Plant water relations and transport processes
- Computational fluid dynamics
- Anatomy of transport tissues in plants

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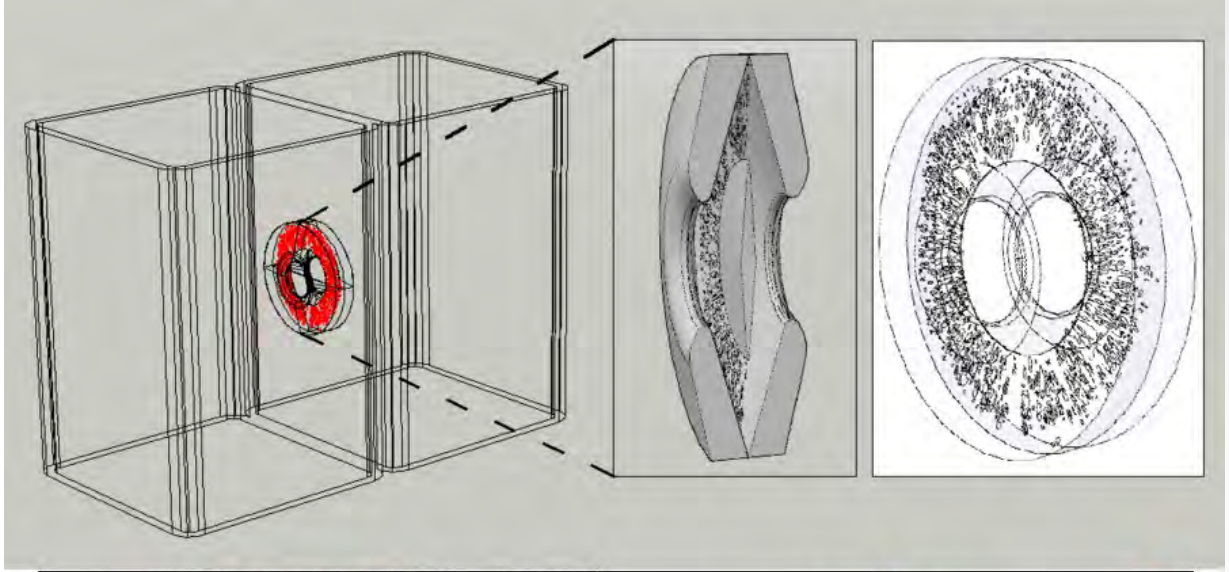
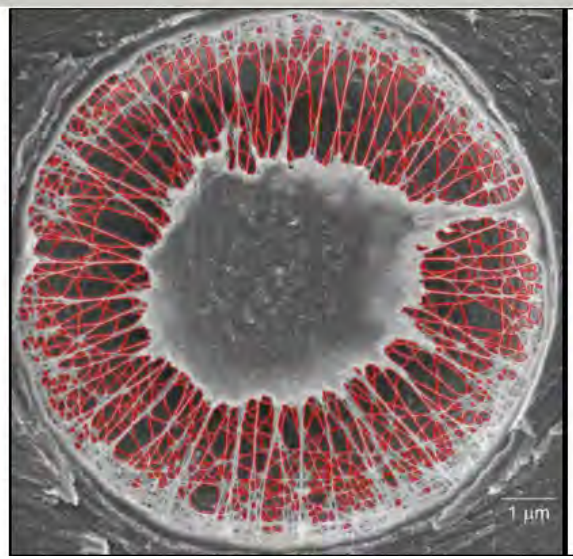
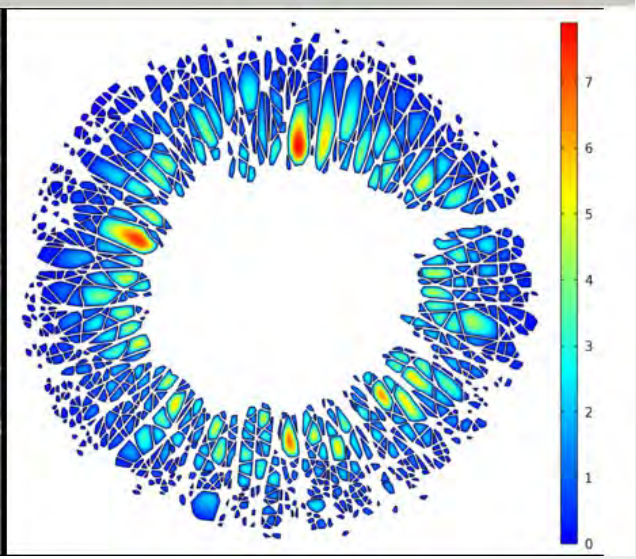
Fluid dynamics of flow between cells

Computer models and mathematical approaches to studying transport processes can help us understand the roles that these structures play in the flow of water from roots to the leaves of tall trees.

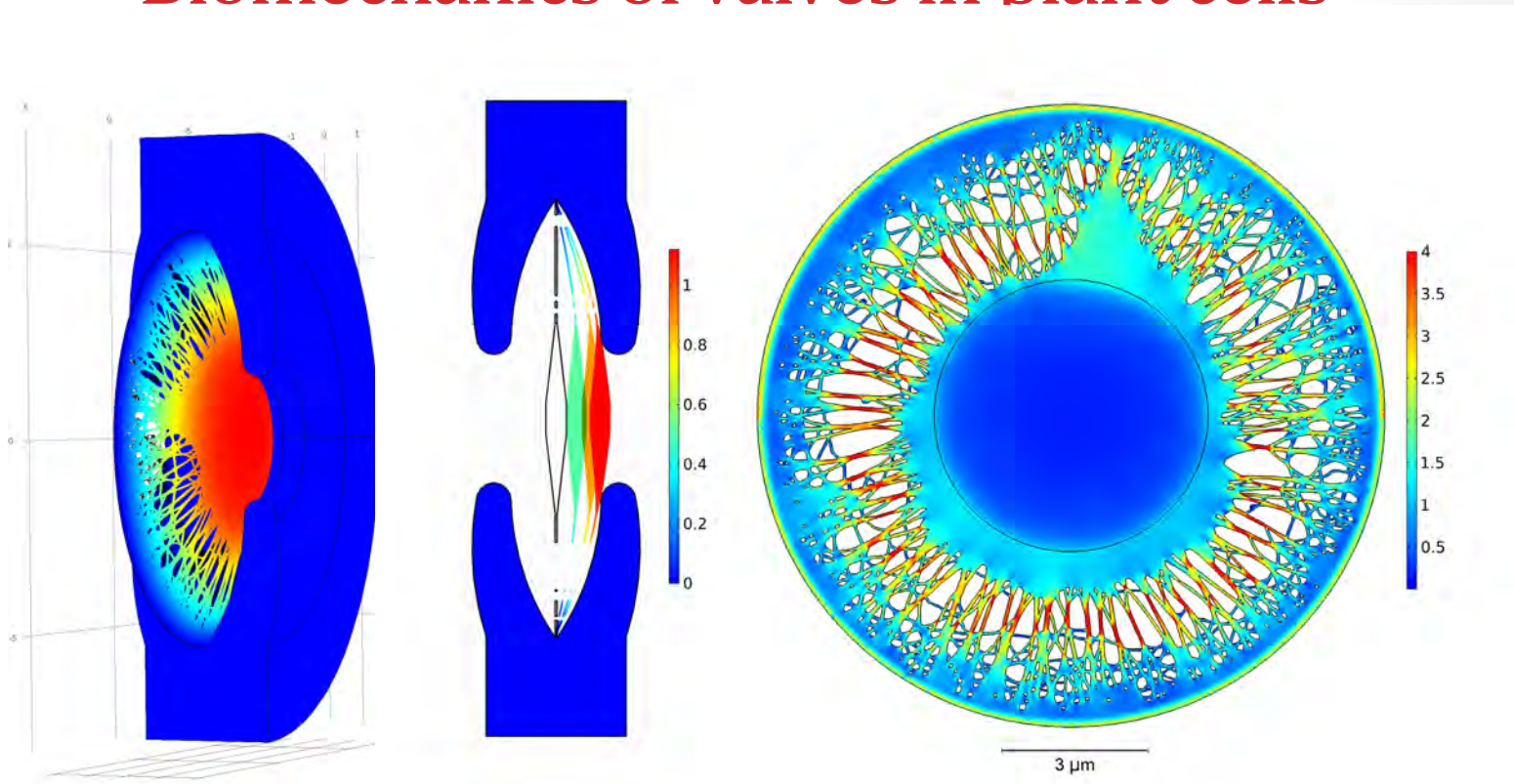
These images show work based on a computational fluid dynamics approach to flow through pits in conifer tracheids.







Biomechanics of valves in plant cells



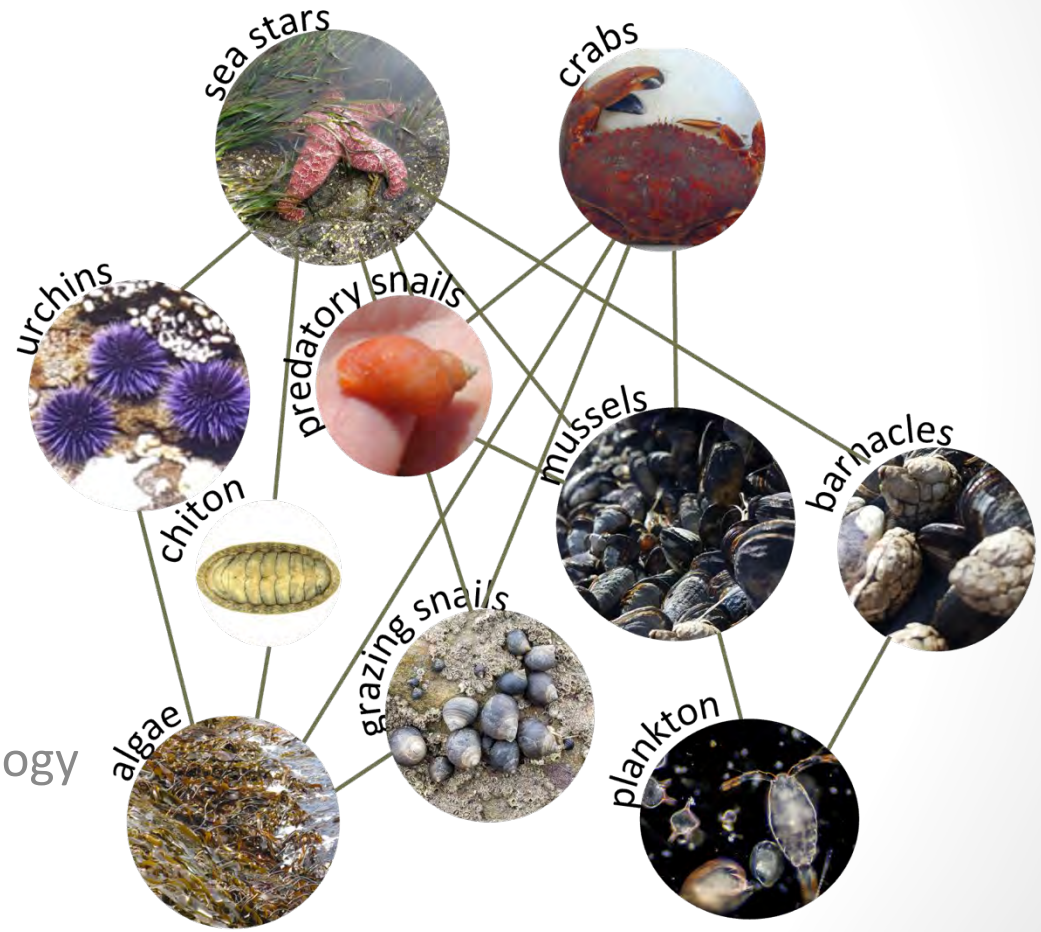
Water flows along the xylem in conifer trees from cell-to-cell through small openings called pits. The pits in many species contain structures that appear to act as valves that prevent air from spreading and blocking the transport system. The above figures show results from solid mechanics modeling of the pressures that are required to deflect the valve and seal the pit.

Paleoecology

- **Dr. Carrie L. Tyler, Ph.D.**
- Assistant Professor
- Department of Geoscience
- Email: carrie.tyler@unlv.edu
- Website: www.carrietyler.com

Expertise

- Marine invertebrates
- Taphonomy
- Food webs
- Conservation Paleobiology
- Predation



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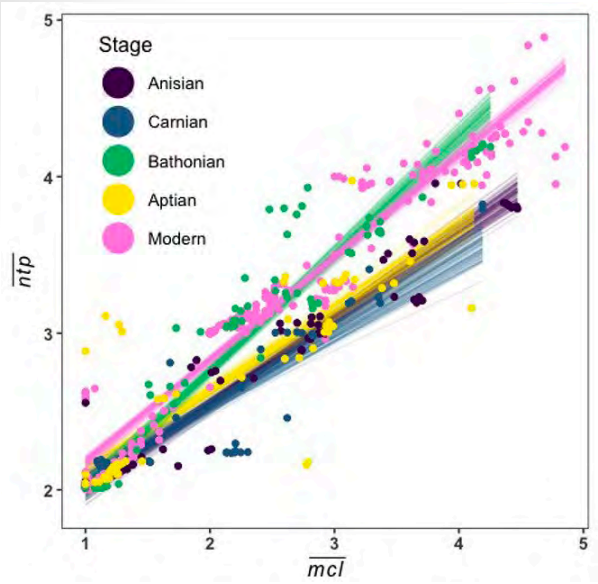


Marine food web structure from the Bathonian Stage (168 mya) resembles a modern Jamaican reef, but not the ecosystem before or after it.

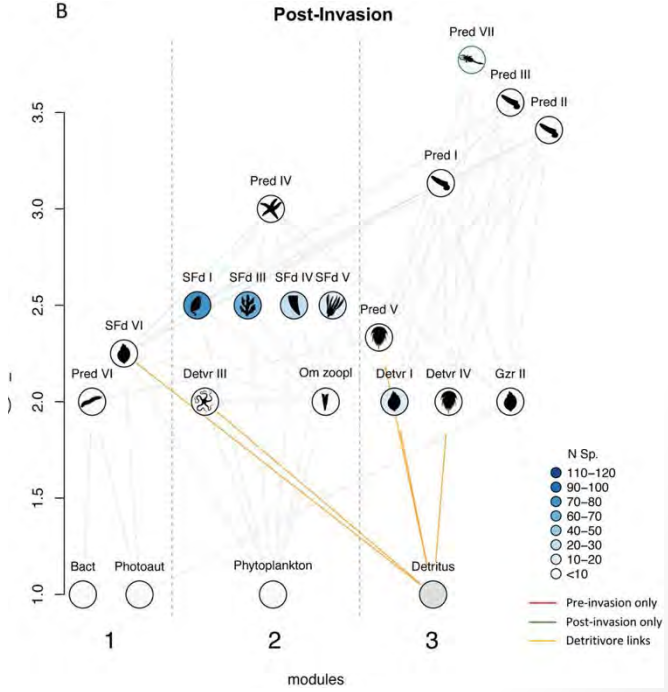
A better understanding of trophic position is needed for restoration planning, as communities may be so severely altered that restoring species or interactions may no longer be possible.

Banker *et al.* 2022 https://doi.org/10.3389/fevo.2022.983374

Fossil food webs before and after an invasion show changes in ecosystem dynamics, and invaders destabilized the ecosystem.

Conservation efforts may need to focus on preserving functional diversity if more diverse ecosystems are not inherently more stable.

Kempf *et al.* 2020
https://doi.org/10.1017/pab.2020.26



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