# World Conference on Ecology

March 19-20, 2018 | Berlin, Germany

## Posters

Ecology 2018

Fan Hao et al., J Ecosyst Ecography 2018, Volume 8
DOI: 10.4172/2157-7625-C1-033

# World Conference on Ecology

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## Climate sensitive leaf vein traits of Quercus variabilis

**Fan Hao** and **Xiaofeng Zheng**
Northwest A&F University, China

**Statement of the Problem:** Quercus variabilis is a widely distributed tree species in China. The climatic status in the habitats of Q. variabilis is changing under global warming in recent years. Plant's veins provide mechanical supports and mainly occur in the mesophyll of leaf lamina. Ecological adaption of a given plant in its occurring areas could be reflected by leaf vein characteristics. The structure, function and development of leaf venation, as well as its ecological traits have been reported for multiple times. However, the evolution of leaf venation networks in different climatic conditions remains unclear. In this study, we focus on the correlation of leaf venation characteristics with the climatic status in the habitats of Q. variabilis all across China.

**Methodology & Theoretical Orientation:** Leaf samples, a total of 320 samples of Q. variabilis collected from 16 areas in China, were analyzed with the LEAF GUI software after scanning. The corresponding climatic data, 30 years, from 1986 to 2016, were extracted from the weather logs based on local meteorological bureaus.

**Findings:** Our results show that the vein density, i.e. vein length per area (mm/mm2) and distance between veins (mm) of leaves are strongly correlated with the mean annual temperature (MAT) and mean annual precipitation (MAP). When the temperature goes up, the vein density decreases significantly while the distance between veins tends to increase. As to precipitation, it shares the same trajectory of the temperature.

**Conclusion & Significance:** For Q. variabilis, the leaf vein traits are sensitive to the climatic indicator referring to the MAT and MAP. Q. variabilis cannot be immune to the global climate change, so much more concerns should be given to conserve Q. variabilis ecological niche.

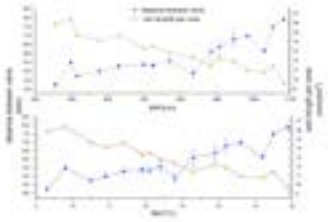

**Figure 1:** Leaf vein traits in correlation with mean annual temperature (MAT) and mean annual precipitation (MAP)

### Recent Publications

1. Caringella M A, Bongers F J and Sack L (2015) Leaf hydraulic conductance varies with vein anatomy across Arabidopsis thaliana wild-type and leaf vein mutants. Plant Cell & Environment 38(12):2735.
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3. Qi D D, Lu L and Hu L C (2015) A leaf veins visualization modeling method based on deformation. Communications in Computer & Information Science 525:340-352.
4. Song L, Hu C and Hou X (2015) Relationship between photosynthetic characteristics and leaf vein density in Sorghum bicolor and Perilla frutescens. Chinese Bulletin of Botany 50(1):100.
5. De Boer H J, Drake P L and Wendt E (2016) Over-investment in leaf venation relaxes morphological constraints on photosynthesis in eucalypts. Plant Physiology 172(4).

### Biography

Hao Fan, PhD Candidate, majors in ecology, focusing on acclimation; Xiaofeng Zheng, PhD Candidate, majors in ecology, focusing on plant community ecology, forest soil and plant-soil feedback.

haofan@nwafu.edu.cn; xfzheng@nwafu.edu.cn

Saint Laurent Diane, J Ecosyst Ecography 2018, Volume 8
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## Forest structure and distribution of soil organic carbon in riparian forest soil affected by frequent floods (Quebec, Canada)

**Saint Laurent Diane**
University of Quebec at Trois-Rivières, Canada

Assess the soil organic carbon (SOC) and C stocks in riparian forest soils affected by floods are crucial to evaluate their concentration and distribution along hydrological gradients, and also to understand the recruitment rates and forests structure and composition. Flood frequency and duration may cause important variation in concentrations of organic matter and total organic carbon in soils and could have direct effects on C stocks in alluvial soils. There are also direct impacts on success of recruitment rates of tree species. In this research, we assessed variations and concentrations of SOC and C stocks in riparian soils collected along transects perpendicular to the riverbanks which cross through inundated and non-inundated zones. Across the different zones, total organic carbon and C stocks show marked difference in their concentration and spatial distribution and the lowest values are found in mineral soils affected by successive floods. We also examine the recruitment rates and the structure and composition of tree populations. The concentrations of SOC are significantly lower in active floodplains with average value of 2.89% compared to the non-inundated soils (5.09%). The proportion of C stocks calculated in soils (inundated vs. non-inundated) was also significantly different with average values of 41.8 and 77.44 t.ha-1, respectively. Recruitment rates are lower for frequently flooded zones and tree diversity is slightly lower in these zones.

### Recent Publications

1. Saint Laurent D, Berthelot J S and Gervais Beaulac V (2017) Habitat fragmentation and structure and composition of tree populations in agroforestry landscape (southern Quebec, Canada). Agroforestry Systems doi:10.1007/s10457-017-0099-0.
2. Saint Laurent D, Gervais Beaulac V, Paradis R, Arsenault Boucher L and Demers S (2017) Distribution of soil organic carbon in riparian forest soils affected by frequent floods (southern Quebec, Canada). Forests 8(4):124.
3. Paradis R and Saint Laurent D (2017) Spatial distribution of organic carbon and nitrogen in soils related to flood recurrence intervals and land use changes in southern Quebec, Canada. Journal of Soil Science and Environmental Management 8(2):25-36.
4. Saint Laurent D, Paradis R, Drouin A and Gervais Beaulac V (2016) Impacts of floods on organic carbon concentrations in alluvial soils along hydrological gradients using a digital elevation model (DEM). Water 8(208):1-17.
5. Berthelot J S, Saint Laurent D and Gervais Beaulac V (2015) A comparison of the composition and diversity of tree populations along a hydrological gradient in floodplains. Forests Journal 6:929-956.

### Biography

Saint Laurent Diane has her research interests in the pedogenetic processes of alluvial soils, transport of contaminants, and impacts of climatic changes on the forest ecosystems. The river dynamics, the reconstruction of flooding and paleo-flooding from radiogenic indicators, bank erosion, floodplain flooding processes and assessment of sedimentary rates are also part of my concern research. The use of pedogenetic and ecological parameters, paleoenvironmental indicators (14C dating, lead-210, dendrochronology / dendrogeochemistry) and historical and ecological data are widely used to reconstruct the chronological framework of events and processes analyzed.

diane.saint-laurent@uqtr.ca

**Notes:**

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## Are nurse protege interactions associated with seed dispersal or phylogeny in thorn scrub?

**Enrique Jurado, Ignacio Tamez, Renata Valdes, Marisela Pando** and **Eduardo Estrada**
Universidad Autonoma de Nuevo Leon, Mexico

In nurse protege interactions, seedlings benefit from the micro-environment created by adult plants without effect for the latter. They are more common in harsh environments such as those found in arid and semi-arid ecosystem. In here we study Zanthoxylum fagara (L) Sarg. (Rutaceae), a vertebrate dispersed shrub that occurs from the United States (Texas and Florida) to Paraguay and the Caribbean. In Mexico, it is a common genus in semiarid environments. Seedlings are conspicuous and often seen under the canopy of shrubs and trees. Species with similar fruits (and perhaps dispersal agents) have been found to grow together. Because plants that grow together compete for resources, it has been suggested that they might be phylogenetically distant, as close relatives would have similar requirements and hence be stronger competitors. In this study we explored whether seedlings from this species (i) occur more often under the canopy of shrubs and trees (nurse plants) than in open spaces, and whether these nurse plants were more often (ii) vertebrate dispersed and (iii) phylogenetically distant. We measured the distribution of seedlings of Zanthoxylum fagara in Tamaulipan thorn scrub, under shrubs and trees and in cleared places. In a total of 50 plots, 308 seedlings were found under canopies, and 19 under direct sunlight. The number of seedlings found under the canopy of two species with unassisted seeds: Vachellia farnesiana and Havardia pallens and three species with vertebrate dispersed seeds: Cordia boissieri, Prosopis laevigata, and Zanthoxylum fagara was similar. Hence, Zanthoxylum fagara seedlings do occur more often under the canopy of nurse plants than under direct sunlight, but without relation to their dispersal syndrome or their phylogeny.

### Recent Publications

1. Pompa García M, Sigala Rodriguez J A, Jurado E and Flores J (2017) Tissue carbon concentration of 175 Mexican forest species. iForest 10:754-758.
2. Joel Flores, Reyes M Perez Sanchez and Enrique Jurado (2017) The combined effect of water stress and elevated temperatures on seed germination of Chihuahuan Desert species. Journal of Arid Environments 146:95-98.
3. Martinez Adriano C A, Jurado E, Flores J, Gonzalez Rodriguez H and Cuellar Rodriguez G (2016) Flower, fruit phenology and flower traits in Cordia boissieri (Boraginaceae) from northeastern Mexico. PeerJ 4:e2033.
4. Cuellar Rodriguez G, Jurado E and Flores J (2016) Beetle diversity in fragmented thornscrub and isolated trees. Brazilian Journal of Biology, 77(1).
5. Mariana Contreras Quiroz, Marisela Pando Moreno, Enrique Jurado, Joel Flores, Karen Bauk and Diego E Gurvich (2016) Is seed hydration memory dependent on climate? Testing this hypothesis with Mexican and Argentinian cacti species. Journal of Arid Environments 130:94-97.

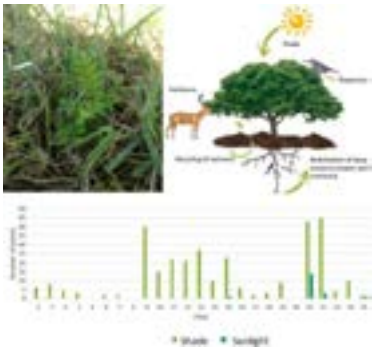

**Figure 1:** Seedling of *Z. fagara* growing under the canopy of shrubs, possible causes of the benefit of growing under nurse plants and number of seedlings of *Z. fagara* found under direct sunlight and shade

### Biography

Enrique Jurado is a Mexican National Research Scientist with recognition of level 3. He is a Member of the National Academy Sciences and has a PhD since 1991 from Macquarie University in Australia. He has published over 100 papers on Ecology, mainly of plants and germination. His research has been cited over 2000 times. He has supervised many undergraduate and graduate students at the University of Nuevo Leon (the research institution where he works) and also as an Invited Professor elsewhere.

enrique_jurado@hotmail.com

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## Germination of seeds from thornscrub species with respect to light and phylogeny

**Joel Flores**[1], **Jacinto Iracheta**[2], **Jonathan Marroquín**[2], **Horacio Villalon**[2] and **Marisela Pando**[2]
[1]Universidad Autonoma de Nuevo Leon, Mexico
[2]Instituto Potosino de Investigacion Científica y Tecnologica, Mexico

Germination is crucial in the life of plants; they go from a quiescent stage to growing in a sometimes rapidly changing environment. In arid and semiarid lands, moisture availability is a limiting factor that affects germination. Seeds in northern Mexico semiarid zones tend to germinate quickly after rainfall or to do it under the canopy of other species arguably for protection from immediate desiccation. We explore influence or light quality and neighboring seeds on germination. The expectations are that red light will mimic the light filtered by a tree canopy under natural conditions and that to avoid competition; seeds will germinate more next to phylogenetically distant species than with their own species or close relatives. This study was developed using shrub species from northeastern Mexico: Vachellia farnesiana, Cordia boissieri, Ehretia anacua, Havardia pallens, Celtis pallida and Caesalpinia mexicana. In a separate experiment, we placed seeds from Acacia berlandieri, (Acacia) Vachellia farnesiana, Acacia rigidula, Acacia Schaffneri, Acacia wrightii, Caesalpinia mexicana, Ebenopsis ebano, Havardia pallens and Prosopis laevigata to germinate on their own, or with each of the rest of the species. Seeds were inside petri dishes in germinating chambers with 12/12 light, in a random design, with ten seeds in each replicate per species. We used direct light, 80% shade, darkness and red plastic as light treatments. Germination was recorded daily. Ehretia anacua and Havardia pallens germinated in the three light conditions. Caesalpinia mexicana germinated more in shade and darkness. Celtis pallida germinated more under light and shade. For Vachellia farnesiana the number of germinated seeds was higher in direct light and in darkness. Cordia boissieri did not germinate in any treatment. Germination was not affected by red light. Seeds of most species germinated equally placed on their own or with other species thus germination was not influenced by phylogeny.

### Recent Publications

1. Aragon Gastelum J L, Flores J, Yanez Espinosa L, Reyes Olivas A, Rodas Ortiz J P, Robles Diaz E and Gonzalez F J (2017) Advantages of vivipary in Echinocactus platyacanthus, an endemic and protected Mexican cactus species. Journal of Arid Environments 141:56-59.
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3. Arroyo Perez E, Flores J, Gonzalez Salvatierra C, Matías Palafox M L and Jimenez Sierra C L (2017) High tolerance to high-light conditions for the protected species Ariocarpus kotschoubeyanus (Cactaceae). Conservation Physiology 5(1):cox042.
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5. Cuellar Rodriguez G, Jurado E and Flores J (2017) Seeds and seedlings from isolated mesquite trees. Journal of the Torrey Botanical Society 144:58-62.

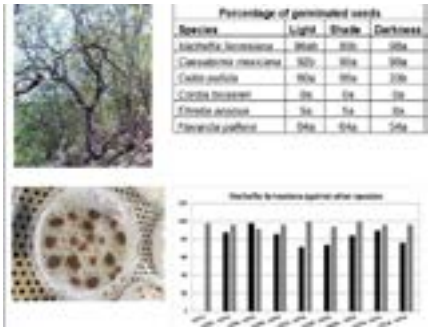

**Figure 1:** a) Tamaulipan thornscrub. b) Five of the six species germinated equally under the three treatments. c) Seeds of two species placed in petri dishes for germination trial. d) Vachellia farnesiana (ACFA) showed the highest germination when competing against others, kinship did not influence germination between competing species.

### Biography

Joel Flores is a Mexican National Research Scientist with recognition of level 3. He has a PhD since 2001 and has published over 80 papers on Ecology and Ecophysiology of plants. His research has been cited over 800 times. He has supervised many undergraduate and graduate students at the IPICYT (the research institution where he works) and also as an Invited Professor elsewhere.

joel@ipicyt.edu.mx

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## Leaf, flower and fruit phenology of 21 thornscrub plant species across 13 yr.

**Marisela Pando, Flor Andres, Enrique Jurado** and **Eduardo Estrada.**
Universidad Autonoma de Nuevo Leon, Mexico

This work seeks to contribute to the knowledge of phenology of 21 species of thornscrub in northeastern Mexico, providing information on three phenological stages (foliar, flowering and fruiting). For this purpose, percentage measurements were made to a total of 105 individuals (five per species), within a University vegetation reserve in Northeastern Mexico. Data collection was made every 15 days throughout thirteen years. The correlation between the percentages obtained from the phenological phases and the temperature and precipitation variables were analyzed. Only two species presented seasonality in the three phenological stages and ten more only produced fruits in the same season each year. Celtis pallida (Ulmaceae) and Zanthoxylum Fagara (Rutaceae) did not present seasonality in any of the phases studied. Three species showed no tendency, Foresteria angustifolia (Oleaceae), Cordia boissieri (Boraginaceae) and Acacia rigidula (Fabaceae). At least 14 species produced flowers and fruits twice a year, mainly in spring and late summer. Leucaena leucocephala (Fabaceae) produced fruits ready for dispersion 4 times per year. Phenology of Melia Azederach (Meliaceae) showed the most significant correlation with rainfall and temperature. Patterns of leaf and fruit production were not consistent within families, implying a lack of phylogenetic constraint.

### Recent Publications

1. Mendoza A.D., Cortina J. Pando-Moreno M. 2014. Biological soil crust influence on germination and rooting of two key species in a Stipa tenacissima steppe. Plant and Soil. Issn:0032-079x.
2. Silva, A, F., Pando-Moreno M., Gonzalez, R.H., Scott, M.L. 2013. Changes in the chemical properties of a soil impacted by intensive agriculture, North-Eastern Mexico. International Journal of Bio-Resources and Stress Management. Vol. 4(2), pp. 126-131. ISBN: 1930-2126.
3. Estrada, E., Soto, B., Garza, M., Villarreal, J., Jimenez, J., Pando-Moreno M., Sanchez J., Scott, L 2013. Medicinal plants in the southern region of the state of Nuevo Leon, Mexico. Journal of Ethnobiology and Ethnomedicine. Vol 8(45) ISSN: 1746-4269.
4. Jurado, Y, E., Flores, R, J., Muro, P.G., Gonzalez, R, H., Pando, M. M., Doria, O. 2013. Are nurse plants always necessary for succulent plants? Observations in northeastern Mexico, including endangered and threatened species. Bradlyeya, Vol. 31. Pp. 150-156.

5. Mendoza, A, D. Jurado, Y, E., Pando, M, M 2013. Posible disparo de metano en el cambio climatico. CIENCIA UANL, Vol 16(60) pp. 94-101. ISSN: 2007-1175
6. Pando-Moreno M., Reyna L., Scott L., Jurado E. 2013. Characterization of soil in colonies of Mexican prairie dogs (Cynomys mexicanus Merriam) in Northeastern Mexico. ISSN: 1405- 3586. Revista Mexicana de Ciencias Forestales. Vol 4:98105.
7. Pando-Moreno, M., R. Pulido, D. Castillo, E. Jurado, y J. Jimenez. 2008. Estimating fiber for lechuguilla (Agave lecheguilla Torr., Agavaceae), a traditional non-timber forest product in Mexico. Forest Ecology and Management.Vol. 255 (11): 3686-3690.

### Biography

Marisela Pando Moreno was nominated Woman Scientist of the State of Nuevo Leon in 2005. She has a PhD in Geography and a MSc. in Natural Resources. She is a member of the national research system in Mexico, has published dozens of research paper and edited books. She has supervised over 50 thesis and her research has been cited over 50 times. Dr. Pando has contributed to research by obtaining funds from national and international sources.

Mpando55@hotmail.com

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# Accepted Abstracts

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# World Conference on Ecology

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## Educational fieldworks towards urban biodiversity preservation: Case study of Japanese gardens management of Kanazawa city, Japan

**Aida Mammadova**[1] and **Juan Pastor Ivars**[2]
[1]Kanazawa University, Japan
[2]UNU-IAS, Japan

Japanese gardens can be consider as the unique hubs to preserve urban biodiversity, as they provide the habitant for the diverse network of living organism, facilitating to the movement of the rare species around the urban landscape, became the refuge for the moss and many endangered species. For the centuries, Japanese gardens were considered as ecologically sustainable and well organized ecosystems, due to the skilled maintenances and management. However, unfortunately due to the depopulations and ageing in Japanese societies, gardens are becoming more abandoned, and there is an urgent need to increase the awareness about the importance of the Japanese gardens to preserve the urban biodiversity. In this study we have conducted the participatory educational fieldtrips for 12 students into five gardens protected by Kanazawa city and learned about the preservation activities conducted at the governmental, municipal, and local levels. After the courses students have found a strong linkage between the gardens with the traditional culture. Kanazawa city, for more than 400 years is famous with traditional craft makings and tea ceremonies, and it was noticed that the cultural diversity of the city was strongly supported by the biodiversity of the gardens, and loss of the gardens would bring to the loss of the traditional culture. Using the experiential approach during the fieldworks it was observed by the students that the linkage between the bio-cultural diversity strongly depends on humans' activities. The continuous management and maintenance of the gardens are the contributing factor for the preservation of urban diversity. However, garden management is very time and capital consuming process, and it was also noticed that there is a big need to attract all levels of the society to preserve the urban biodiversity through the participatory urbanism.

mammadova@staff.kanazawa-u.ac.jp

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## Impacts of permafrost thaw on carbon sequestration of wetlands in cold region of Northeast China

**Changchun Song**
Chinese Academy of Sciences, China

Permafrost in northern high latitudes was a huge soil carbon sink. About 16%-30% of the terrestrial surface soil carbon was stored in northern permafrost region, which was quite sensitive to the global change. During the 21 century, 25%-30% of the soil organic carbon of the permafrost region will be decomposed. The high latitude permafrost in northeast China is within the southern margin of the permafrost region on the Eurasian continent. More than 48% of the marsh wetlands in China inhabit in the northeast region and they are huge soil carbon sink. There were four main frozen soil types in northeast China, which was continuous permafrost, discontinuous permafrost, isolated permafrost and seasonal freezing soil, respectively. The active layer depths of the permafrost have been increasing since 1970s. During 1970-2009, annual temperature of permafrost region in northeast China increased by 0.9-2.2 ℃and there was obvious northward movement for the southern boundary of permafrost region. In our research, the impacts of permafrost thaw on soil organic carbon variations and greenhouse gas emissions were investigated in northeast China. Our results demonstrated that air temperature and solar radiation were the main environmental factors affecting the net primary production of plants in the permafrost region of northeast China. The soil organic carbon (SOC) content, soil N content and C/N of different wetland soils increased following the sequence from seasonal freezing soil, discontinuous permafrost and continuous permafrost. The permafrost regions had greater organic carbon content than the regions with seasonally frozen ground. The light fraction organic carbon accounted for 5%-83% of the SOC and was particularly enriched in the permafrost region; however, their activities were low due to the cold temperature. Under global warming, the labile carbon pool may be mobilized and contribute to the greenhouse effect. Compared with the CH4 concentration in the active layer, the concentration in the permafrost layer was 10-40 times higher with higher temperature sensitivity. CH4 emissions of the wetlands in the seasonal freezing region showed a synchronized change with the variation of air temperature while those in the permafrost region showed synchronized change with the variation of active layer depth. The results of intensive field campaign on the estimation of CH4 emission in the spring freeze-thaw transition period showed that the spring thaw could cause a large CH4 emission with the maximum hourly emission rate three orders higher than the regularly observed CH4 emission rate in the growing season. Vascular plants play an important role in wetland CH4 emission during the spring freeze-thaw transition period. Net ecosystem CO2 exchange of wetlands in different permafrost region correlated significantly with temperature. Using eddy covariance technique, we found that wetlands in permafrost region and seasonal freezing region both functioned as carbon sink of the atmosphere under current climate conditions with carbon sequestration rates of 47.6 and 138.6 gCm-2yr-1, respectively.

songcc@iga.ac.cn

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## Influence of the width on the cooling effect of waterfront green corridor

**Huiwen Zhang**[1,2], **Deshun Zhang**[2] and **Sahar Sodoudi**[1]
[1]Free University Berlin, Germany
[2]Tongji University, China

Urban waterfront green corridor plays an important role in mitigating the urban heat island (UHI) effect, cooling down the extreme high temperature in summer and adjusting the urban local climate. Especially in the high-density cities, proper width of water front green corridor can expand the cooling effect of waterfront green corridor as far as possible in limited area. Former researches have proved that, with the increase of width, the cooled down area by green corridor will expand. However, the correlations between them are nonlinear. As a consequence, it is necessary to figure the threshold and saturation points of width of waterfront green corridor in cooling down city area, to efficiently utilize the land in high-density cities so as to adapt to climate change and adjust local climate. To realize that aim, empirical researches are conducted with the combination of measurement and modeling simulation. By using microclimate model ENVI-met, 51 scenarios including different widths and vegetation densities of waterfront green space are simulated, to calculate the threshold and saturation value of width of waterfront green corridor under different vegetation structures. At the same time, multi-line simulations are made to clarify the cooling effects of water body, green space and the combination of them both in the complicate situation that water and vegetation can both generate cooling effect. In additionally, in-situ measuring experiments are taken in Fengling green space alongside Suzhou river in Shanghai. By comparing the high-precise measuring data and the simulated data, the models are verified and analyzed to ensure the accuracy of results. The results show that, when the green corridor is arranged next to water body, the amplitude of cooled down air temperature can be additional combined. However, the range of cooled down area cannot expanded obviously. When the cooling capacity of waterfront green corridor is equal to that of water body, the benefit of waterfront green space on expanding cooling area can be observed. When the vegetation density is increasing in waterfront green corridor, the saturation value of width will turn to be shorter. The results can provide suggestion for the climate-adaptive design and planning of waterfront green corridor under the climate change and provide reference for the further research in the effect of green space on adjusting the urban climate.

zhanghuiwen@zedat.fu-berlin.de

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## Short-term effects of stream and riparian restoration on wildlife

**James T Anderson, Kathryn R McCoard** and **Anthony A Billings**
West Virginia University, USA

Restoration of riparian zones, as part of stream restoration, can improve water quality and aquatic life by decreasing nutrient and sediment loads into streams. Although in-stream monitoring is often a focus for evaluating restoration success, fewer studies have emphasized potential short-term impacts of the disturbance on riparian wildlife. We monitored riparian wildlife responses during a natural stream channel design restoration project along a 1,100 m restoration reach (RR) of the Cacapon River, West Virginia, USA. Reference (RS) and control (CS) sites were located upstream and downstream of the RR. Small mammal trapping, bird counts, frog call surveys, and vegetation surveys were conducted pre- and post-restoration. We observed six species of small mammals, 79 species of birds, eight species of anurans, and 96 species of plants. Small mammal abundance was higher in CS than RR post-impact. Small mammal richness, diversity, or evenness did not differ between sites or time periods. Overall bird abundance, richness, and diversity were higher in the RR compared to CS post-impact. No effect on passerine diversity metrics, the abundances of each of the five most common bird species, or anuran richness was observed. Vegetative diversity metrics tended to be higher in the RS compared to the CS or RR for native species. Community composition of both plants and wildlife exhibited minor variations between pre- to post- monitoring. Riparian restoration does influence riparian wildlife, but overall there were few negative effects and we anticipate observing increasing riparian biodiversity as post-restoration time length increases and the riparian zone matures.

jim.anderson@mail.wvu.edu

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## Throughfall and its spatial variability beneath xerophytic shrub canopies within water-limited arid desert ecosystems

**Yafeng Zhang**
Chinese Academy of Sciences, China

Throughfall is known to be a critical component of the hydrological and biogeochemical cycles of forested ecosystems with inherently temporal and spatial variability. Yet little is understood concerning the throughfall variability of shrubs and the associated controlling factors in arid desert ecosystems. Here we systematically investigated the variability of throughfall of two morphological distinct xerophytic shrubs (Caragana korshinskii and Artemisia ordosica) within a re-vegetated arid desert ecosystem, and evaluated the effects of shrub structure and rainfall characteristics on throughfall based on heavily gauged throughfall measurements at the event scale. We found that morphological differences were not sufficient to generate significant difference ($P<0.05$) in throughfall between two studied shrub species under the same rainfall and meteorological conditions in our study area, with a throughfall percentage of 69.7% for C. korshinskii and 64.3% for A. ordosica. We also observed a highly variable patchy pattern of throughfall beneath individual shrub canopies, but the spatial patterns appeared to be stable among rainfall events based on time stability analysis. Throughfall linearly increased with the increasing distance from the shrub base for both shrubs, and radial direction beneath shrub canopies had a pronounced impact on throughfall. Throughfall variability, expressed as the coefficient of variation (CV) of throughfall, tended to decline with the increase in rainfall amount, intensity and duration, and stabilized passing a certain threshold. Our findings highlight the great variability of throughfall beneath the canopies of xerophytic shrubs and the time stability of throughfall pattern among rainfall events. The spatially heterogeneous and temporally stable throughfall is expected to generate a dynamic patchy distribution of soil moisture beneath shrub canopies within arid desert ecosystems.

zhangyafeng1986@gmail.com

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## The field measurement of surface soil hydraulic properties in artificial revegetated sand area established at different years, Northwest China

**Yanxia Pan, Xinping Wang, Rui Hu** and **Yafeng Zhang**
Chinese Academy of Sciences, China

Water condition is a key factor improving the ecological environment in desert area, the redistribution processes of precipitation can be precisely delineated with proper sets of soil hydraulic properties derived from in situ experiments. The establishment of artificial revegetation especially the colonization of biological soil crusts would change the soil surface hydraulic properties, further would influence the water condition this area. Hence, the objective of this study was to investigate the effect of artificial revegetation establishment time on soil surface infiltration characteristics, sorptivity, hydraulic conductivity and soil pore contribution rate in northwest China. The experiment was performed at four artificial revegetation sample plots of Shapotou desert area established in 1956, 1964, 1981 and 1987 year, respectively. Correlated hydraulic properties were measured in May of 2009 with tension infiltrometers. The results indicated that thirty years later after artificial revegetation was planted, the soil cumulative infiltration amount, initial infiltration rate, stability infiltration rate, saturated hydraulic conductivity, α value, soil sorptivity all reduced gradually with the continue increase of sand-fixation time, while the time achieving stable infiltration increased with increasing sandfixation time due to the colonization and development of biological soil crusts. Compared to the reference values, Philip formula was the most appropriate calculation methods of soil sorptivity in experiment area. The soil surface porosity distribution is more homogeneous with further increase of sand-fixation time thirty years later after artificially revegetation established. Revegetation changed the contribution rate distribution of different class pore to water flow, which was more uneven with the increase of sand-fixation time. The contribution rate of macropore to water flow is significant greater in 1956 year revegetation area than other revegetation areas ($p<0.01$). This study may provide valuable information for the effective management of water resources at wide artificial revegetation desert area.

panyanxia@lzb.ac.cn