

Curriculum vitae
PEDRO VILLAR-SALVADOR

WORK ADDRESS

Forest Ecology and Restoration Group
Department of Life Sciences
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EDUCATION

- BSc in Biology, 1990. University of Valencia (Spain).
- PhD in Biology, 2000. Title of the thesis: Ecological and functional strategies of xylem in Mediterranean woody species. University of Valencia (Spain).

PRESENT POSITION

Associate professor in Ecology at the University of Alcalá since 2005

APPOINTMENTS

Position	Institution	
Biologist (contracted)	C.S.I.C., Instituto Pirenaico de Ecología (Zaragoza, Spain)	1993
Researcher (contracted)	Empresa de Transformaciones Agrarias (TRAGSA) (Guadalajara, Spain)	1995-1996
Researcher (as a freelance)	National Centre of Forest Improvement "El Serranillo", Spanish Ministry of Environment (Guadalajara, Spain)	1997-2005
Assistant professor in Ecology	University de Alcalá (Madrid, Spain)	2000-2004

MAIN RESEARCH TOPICS

Ecophysiology and functional ecology of plants, nursery plant cultivation and afforestation, woodland restoration and regeneration, regeneration and recruitment of oaks, and acorn dispersal.

CV SUMMARY

I have oriented my scientific career to understand the processes and factors that control forest establishment and plant functioning. I work in two interconnected fields. The first one, with an

applied perspective, addresses the ecophysiological process underlying the cultivation and establishment of tree seedlings in forest plantations. Within this framework I have studied the acclimation of Mediterranean plants to water and cold stress, plant nitrogen nutrition, root growth, and the physiological processes that drive seedling establishment in the field. The second research line, in which I am more focused at present, addresses the factors and processes that drive oak natural regeneration and colonization with emphasis on acorn dispersal and shrub facilitation. I consider that my **main conceptual contributions of my research** are 1) defining the functional attributes and physiological processes that control the establishment of woody plants in Mediterranean forest plantations; 2) identifying the mechanisms by which acorn dispersal by corvids interact with shrubs to determine oak colonization.

I have an extensive collaboration network with researchers from Spain, USA, UK, Australia, China, Italy, and France. I have published > 120 scientific studies, 71 are papers published in the Science Citation Index journals, 68% of them in Q1. I have published in high impact journals such as *New Phytologist*, *Journal of Ecology*, *Functional Ecology*, *Global Change Biology* and *Tree Physiology*. I have also published 19 book chapters, three in English in books edited by Springer, Elsevier and CEAM, and the rest are in Spanish, most in books edited by *Organismo Autónomo Parques Nacionales* (Spanish Ministry for Agriculture and Environment). I have 4 six-year evaluation periods (*sexenios*), the last evaluated period was 2015-2020. According to Google Scholar, the total number of citations=6431 and Index h=38. According to Web of Science the figures are 3768 and 30, respectively.

My research has been disseminated in more than 140 contributions to international and national congress, symposia, courses, and workshops. I was the invited keynote speaker in 3 international congresses.

I have supervised 8 PhD thesis (at present I am supervising 3 more), 3 postdoctoral scientists (Juan de la Cierva, Margarita Salas and Talento -CAM- fellowships) and >40 MSc and BSc students. I mentored 4 foreign PhD and undergraduate students carrying out short research stays. I have also organized popular science events in the Science Week (2018, 2021 and 2022) and organized 2 symposia on forest ecology and restoration.

I participated in 34 research projects and contracts most of them in open regional and national calls and 1 Cost Action. I have been the principal researcher in 5 projects and 8 contracts, which involves 0.51M euros.

I was an associate editor of *New Forests* (Springer) for 10 years and in the *Canadian Journal of Forest Research* for 2 years. I participated in the 2014 Evaluation program Juan de la Cierva in 2014 and in the Expert Evaluation Committee of Projects in 2012, 2014 and 2021.

At the Universidad de Alcalá, I have been the secretary of my department for 4yr, the coordinator of the Ecosystem Restoration Master degree (2012-2020) and, since 2020, I lead the new PhD program in Ecology, biodiversity, and global change.

RESEARCH PROJECTS AND CONTRACTS (2019-2024)

- Project title: **Colonization differences among coexisting oaks: from acorn properties and dispersal to facilitation (QueVADIS)** (PID2022-141762OB-I00).

Financing entity: Spanish Ministry of Science and Innovation. Funding: 231.250€. Duration: 2023-2027. PI: Pedro Villar-Salvador and José M^a Rey Benayas. Number of researchers: 10 of the University of

Alcalá, Universidad Complutense de Madrid, the CNRS Montpellier, and the University of natural resources and life (Viena, Austria).

- Project title: **TRANSition towards enhanced revegetation success: large-scale implications of seeding vs. planting for ECOlogical restoration** (TED2021-130976B-I00).

Financing entity: Ministerio de Ciencia e Innovación. Duration: 2022-2024. PI: Alex B. Leverkus. Number of researchers: 3 (main team), >15 (international team). Funding: 179.000 €.

- Project title: **Carbon sequestration and storage potential in native (NT) and exotic (NNT) species in a context of climate change** (PIUAH22/CC-027).

Financing entity: UAH call. PI: Elena Granda. Duration: 2022-2023. Number of researchers: 7 of the University of Alcalá. 7000 €.

- Project title: **Assessing avian functions and ecosystem services in agroforestry systems (EVALUAVE)** PID2019-106806GB-I00.

Financing entity: Spanish Ministry of Science and Innovation. Funding: 163.350 €. Duration: 2020-2023. PI: Salvador Rebollo and José M^a Rey Benayas. Number of involved researchers: 6 from University of Alcalá and the University of Granada.

- **Project title: Pan-European Network for Climate Adaptive Forest Restoration and Reforestation** (CA19128, PEN-CAFORR)

Financing entity: COST Program, UE. 23 countries from Europe + Canada and USA. 550000 €

- **Project title: Program for contracting research assistants and technicians**

Financing entity: Community of Madrid and European Union. 45.000 €. Duration: 2021-2023. PI: Pedro Villar-Salvador. University of Alcalá.

- **Project title: Scientific knowledge for achieving the Sustainable Development objectives: a translational ecology is needed** (S2013/MAE-2719)

Financing entity: Programa de actividades de I+D de la Comunidad de Madrid. PI: Adrián Escudero (all coordinated project) PI at the UAH: José M. Rey Benayas. Funding: 850000€ of which 71300 € are for UAH. Number of involved research centers: 7 Researchers of the University of Alcalá: 10. 01/01/2019-31/12/2022.

- **Contract title: Design and performance of ecosystem restoration projects**

Financing entity: Contract with the International foundation for Ecosystem Restoration (FIRE). 15.000 €. Duration: 2017-2019. PI: Pedro Villar-Salvador. University of Alcalá. Number of involved researchers: 8 of the University of Alcalá.

- **Project title: Program for contracting research assistants and technicians**

Financing entity: Community of Madrid and European Union. 45.000 €. Duration: 2017-2019. PI: Pedro Villar-Salvador. University of Alcalá.

- **Project title: Ecosystem services provided by birds (high mobile link species) in farmland and forest mosaics: forest regeneration and plague regulation** (CGL2014-53308-P).

Financing entity: Spanish Ministry of Economy. 180.000 €. Duration: 2015-2019. PI: Salvador Rebollo and José M^a Rey Benayas. Number of involved researchers: 5 of the University of Alcalá and the University of Granada.

PEER-REVIEWED PAPERS (2019-2024) * main conceptual author

- K. Zhao*, **Villar-Salvador P***, Li, G*. 2024. Legacy effects of early cotyledon simulated predation on the growth, carbon and nitrogen storage, and drought response of *Quercus variabilis* seedlings. *Forest Ecology and Management* 550: 121498 .
- Chenrui Huo*, **Villar-Salvador P.**, Li Y., Wang J., Li, G*. 2024. Physiological recovery after drought increases with leaf and taproot drought tolerance among oaks. *Environmental and Experimental Botany* 222: 105747
- K. Zhao*, **Villar-Salvador P.**, Li, G. 2024. The contribution of acorn and soil N to early development of Chinese cork oak (*Quercus variabilis* Blume) seedlings under contrasting soil fertility conditions. *Trees. Structure and Function* 38:251-256.
- D. García de León*, Rey Benayas, J.M*., **Villar-Salvador, P.** 2023. Assessing the limiting factors of natural regeneration in Mediterranean planted hedgerows. *Frontiers in Ecology and Evolution* 11:1206000.
- Barbara Mariotti*, Oliet Juan A, Andivia Enrique, Tsakaldimi Marianthi, Villar-Salvador Pedro, Ivetic Vladan, Kerkez Jankovic Ivona, Bilir Nebi, Bohlenius Henrik, Cvjetkovic Branislav, Duminš Karlis, Heiskanen Juha, Ivanov Georg, Montagnoli Antonio, Sundheim Fløistad Inger, Coccozza Claudia* 2023. A global survey on innovative, environmentally sustainable growing media to grow forest seedlings in nursery. *Current Forestry Reports*. 9: 413–428.
- Milan Mataruga*, Branislav Cvjetkovic, Bart De Cuyper, Ina Aneva Petar Zhelev, Pavel Cudlín; Marek Metslaid, Ville Kankaanhuhta, Catherine Collet, Peter Annighöfer, Thomas Mathes, Tsakaldimi Marianthi, Paitaridou Despoina; Raket J. Jónsdóttir; Maria Cristina Monteverdi, Giovanbattista de Dato Barbara Mariotti, Dana Dina Kolevska Jelena Lazarevic, Inger Sundheim Fløistad, Marcin Klisz, Wojciech Gil, Vasco Paiva, Teresa Fonseca, Valeriu-Norocel Nicolescu, Vladan Popovic, Jovana Devetakovic, Ivan Repác, Gregor Božic, Hojka Kraigher, Enrique Andivia, Julio J. Díez, Henrik Böhlenius Magnus Löf, Nebi Bilir; Villar-Salvador P. 2023. Monitoring and control of forest seedling quality in Europe. *Forest Ecology and Management* 546:121308.
- L. Pérez-Camacho*, Villar-Salvador P*, Cuevas J.A., Gómez, T.; Martínez-Baroja, L. 2023. Spatial decision-making in acorn dispersal by Eurasian jays around the forest edge: Insights into oak forest regeneration mechanisms.. *Forest Ecology and Management* 545: 121291.
- Vieco-Martínez, Rey-Benayas J.M*, Oliet J.A*, Villar-Salvador P*, Martínez-Baroja L. 2023. Efectos de la forestación de tierras agrícolas mediterráneas y de su manejo en el establecimiento de árboles y arbustos. *Ecosistemas* 32: 2460.
- M. Molina-Morales*, Leverkus A.B., Albaladejo-Robles G., Martínez-Baroja L., Pérez-Camacho L., **Villar-Salvador P.**, Rebollo S., Rey Benayas J.M., Castro J*. 2022. Linking animal behaviour and tree recruitment: caching decisions by a scatter hoarder corvid determine seed fate in a Mediterranean agroforestry system. *Journal of Ecology* 111:400-411.
- L. Martínez-Baroja, Rey-Benayas J.M*, Pérez Camacho L., **Villar-Salvador P***, 2021 Drivers of oak establishment from 25 year-old woodland islets planted to assist natural regeneration in Mediterranean old fields. *European Journal of Forest Research* 141:17-30.
- J.L. García, Oliet, J.A*, **Villar-Salvador P.**, Guzmán, J.E. 2021. Root growth dynamics and structure in seedlings of four shade tolerant Mediterranean species grown under moderate and low light. *Forests* 12, 1540
- A.B. Leverkus*, L. Levy , E. Andivia , P. Annighöfer , B De Cuyper , V. Ivetic , D. Lazdina, M. Löf , P. Madsen, **P. Villar-Salvador** 2021 Restoring vegetation through direct seeding or planting: Protocol for a continental-scale experiment" provides a clear and detailed methodology to test how seeds and seedlings interact with a range of environmental conditions across Eurasia. *Plos One* 16(11): e0259552.

- Luo Na*, **Villar-Salvador P.**, Li G*, Wang J. 2021. The dark side of nursery photoperiod reduction for summer plantation in a temperate-climate conifer: high winter mortality mediated by reduced seedling carbohydrate and nitrogen storage *Forest Ecology and Management* 491: 119171
- E. Andivia*, **Villar-Salvador P***, Oliet, J., Puértolas J., Dumroese R.K, Ivetic V. Molina-Venegas R., Arellano E., Li G., Ovalle J. 2021 Climate and species stress resistance modulate the higher survival of large seedlings in forest restoration worldwide. *Ecological Applications* e2394.
- L. Martínez-Baroja*, Pérez-Camacho L.*, **Villar-Salvador P.**, Rebollo S., Leverkus A.B, Pesendorfer M., Molina-Morales M., Castro J., Rey-Benayas J.M. 2020. Caching territoriality and site preferences by a scatter-hoarder drive the spatial pattern of seed dispersal and affect seedling emergence. *Journal of Ecology* 109: 2342–2353.
- A.O. Toca*, **Villar-Salvador P***, Oliet J., Jacobs D.F. 2020 Normalization criteria determine the interpretation of nitrogen effects on the root hydraulics of pine seedlings. *Tree Physiology* 40: 1381-1391.
- V. Cruz*, **Villar-Salvador P***, Ruiz-Benito P., Ibáñez I., Rey-Benayas J.M. 2020. Long-term dynamics of shrub facilitation shape the mixing of evergreen and deciduous oaks in Mediterranean abandoned fields. *Journal of Ecology* 108: 1125-1137.
- L. Martínez-Baroja*, Pérez Camacho L.*, **Villar-Salvador P***, Rebollo S, Quiles P., Gómez-Sánchez D., Molina-Morales M, Leverkus A, Castro J, Rey-Benayas JM. 2019. Massive and effective acorn dispersal into open agroforestry systems by an overlooked vector, the Eurasian magpie (*Pica pica*). *Ecosphere* 10 (12): e02989.
- A.O. Toca*, Oliet J.*, **Villar-Salvador P.***, Martínez R., Jacobs D.F. 2019 Ecologically distinct pine species show differential root development after outplanting in response to nursery nutrient cultivation. *Forest Ecology and Management* 451: 117562
- P. Ruiz-Benito*, **Villar-Salvador P.**, Pardos M., Herrero H., Cruz-Alonso V. Andivia E.* 2019. Bases ecológicas para la gestión adaptativa de sistemas forestales”, IV reunión del Grupo de Trabajo de Ecología, Ecofisiología y Suelos Forestales de la Sociedad Española de Ciencias Forestales. *Ecosistemas* 28:120-121
- S. Rebollo*, Rey-Benayas J.M.*, **Villar-Salvador P.**, Pérez-Camacho L., Castro J., Molina-Morales M., Leverkus A.B., Baz A., Martínez-Baroja L., Quiles P., Gómez-Sánchez D., Fernández-Pereira J.M., Meltzer J., Monteagudo N., Ballesteros L., Cayuela L., de las Heras, D., García-Salgado G., Martínez-Hestekamp S. 2019. Servicios de la avifauna (high mobile link species) en mosaicos agroforestales: regeneración forestal y regulación de plagas. *Ecosistemas* 28: 32-41.
- L. Fernández-Pérez, Zavala M.A., **Villar-Salvador P.**, Madrigal-González J*. 2019. Divergent last century tree growth along an altitudinal gradient in a *Pinus sylvestris* dry-edge population. *Forests* 10: 532 [10.3390/f10070532](https://doi.org/10.3390/f10070532)
- W. Shi*, **Villar-Salvador P.**, Li G*, Jiang, X. 2019 Acorn size is more important than nursery fertilization for field performance of planted *Quercus variabilis* seedlings *Annals of Forest Science* 72 (1), pp.22.
- V. Cruz-Alonso*, Ruiz-Benito P.*, **Villar-Salvador P.**, Rey-Benayas, J. M. 2019. Long-term recovery of Mediterranean forests depends on restoration strategy and forest type. *Journal of Applied Ecology* 56: 745-757.
- J. Wang*, **Villar-Salvador P.**, Liu Y., Li G*. 2019. Water stress does not inhibit nitrogen remobilization allowing high growth in high nitrogen content *Quercus variabilis* seedlings under drought conditions *Tree Physiology* 39: 650–660.

- E. Andivia, Zuccarini P., Grau B, De Herralde F., **Villar-Salvador P***, Savé R*. 2019. Rooting big and deep rapidly: the ecological roots of pine species distribution in southern Europe. *Structure and Function* 33: 293–303.
- E. Andivia*, **Villar-Salvador P.**, Oliet J., Puértolas J., Dumroese K. 2019. How can my paper be useful for future meta-analysis on forest restoration plantations? *New Forests* 50: 255–266.

PEER REVIEWED BOOK CHAPTERS (2019-2024)

- A. Herrero, Ruiz-Benito P., Andivia E., Madrigal-González J., **Villar-Salvador P.**, Ratcliffe S., Zavala M.A. 2021. Assessing drivers of current and future distribution of Mediterranean pine forests. In: N. Gidi and O. Yagil (eds.). *Pines and their mixed forest ecosystems in the Mediterranean Basin*. Chapter 17. pp 251-277. Springer, Cham, ISBN: 978-3-030-63624-1.
- J.M. Rey Benayas, Martínez de Baroja L., García de León, D., Crespo Cepas G., Pajares Guerra M., Pérez Camacho L., **Villar Salvador P.** 2021. Forest islands and hedgerows plantations as green infrastructure to assist natural regeneration in Mediterranean agricultural landscapes. In: J. Pemán, R.M. Navarro, R. Serrada (eds). *Ecological and Technical Basis for the forestation*. pp: 523-532. Ministerio para la Transición Ecológica y el Reto Demográfico. Madrid (Spain). ISBN: 9788418508561 (in Spanish)
- **P. Villar Salvador**, Oliet J.A. 2021. Factors and processes determining seedling establishment in forest plantations. In: J. Pemán, R.M. Navarro, R. Serrada (eds). *Ecological and Technical Basis for the forestation*. pp: 89-127. Ministerio para la Transición Ecológica y el Reto Demográfico. Madrid (Spain). ISBN: 9788418508561 (in Spanish).
- **P. Villar Salvador**, Nicolás Peragón J.L., Peñuelas Rubira J.L. 2021. The quality of forest reproduction material. In: J. Pemán, R.M. Navarro, R. Serrada (eds). *Ecological and Technical Basis for the forestation*. pp: 781-822. Ministerio para la Transición Ecológica y el Reto Demográfico. Madrid (Spain). ISBN: 9788418508561 (in Spanish).

SYNERGISTIC ACTIVITIES AND CONFERENCES

- Associate Editor of *New Forests* (2010 to 2021)
- Associate Editor of *Canadian Journal of Forest Research* (2019 to 2021)
- Secretary of the Department of Ecology at the University of Alcalá (2009-to 2013).
- Coordinator of the Master on Ecosystem Restoration at the University of Alcalá (2013 to 2021).
- Coordinator of the PhD programme Ecology, Biodiversity and Global Change. University of Alcalá (2020-to present)
- Chair in the scientific committee of the symposium on Restoring Forests
- Chair in the scientific committee of the III y V Spanish Forestry Congress, held in Granada 2001 and Ávila 2009, respectively.
- Organization of the congress: 1st Co-meeting of the working group of forestation of the Spanish Society of Forest Science (SECF) and the group on Ecological Restoration of the Spanish Society of Terrestrial Ecology. November 2007.
- Organization of the congress: IV Meeting of the Working group on Ecology, Ecophysiology and Forest soils of the Spanish Society of Forest Science (SECF). May 2019.
- Keynote speaker in the 1st Congress on Reforestation challenges. IUFRO-University of Belgrade, Belgrade (Serbia), June 2015. Title of conference: Restoration of the Spanish Mediterranean forests: challenges for the XXI century and lesson on plant quality and nursery cultivation.
- Keynote speaker in the 2nd Restoring Forests. IUFRO-Purdue University. Lafayette, Indiana, USA.

Title of conference: Importance of stored nitrogen and carbohydrates on seedling outplanting performance.

- Keynote speaker in the Congress on Nutrient Dynamics of Planted Forests, November 2012, Vancouver, Washington USA. Title of the conference: Nursery fertilization of oaks: consequences for plant quality and out-planting”

SHORT STAYS AT RESEARCH INSTITUTIONS

- INRA, Unité Mixte de Recherche, Ecologie et Ecophysiologie Forestières. Nancy (France). February-May 2004
- Macaulay Institute, Aberdeen, (UK). June 2008
- INRA, Unité Mixte de Recherche, Ecologie et Ecophysiologie Forestières. Nancy (France). October 2010.
- Forestry and Natural Resources Department, Purdue University. West Lafayette (Indiana, USA). July 2011
- Biological and Environmental Sciences, School of Natural Sciences, University of Stirling, UK. October 2013.
- Forestry and Natural Resources Department, Purdue University. West Lafayette (Indiana, USA). August 2014
- Key Laboratory for Silviculture and Conservation, Beijing Forestry University, Beijing, China. July 2017
- Key Laboratory for Silviculture and Conservation, Beijing Forestry University, Beijing, China. May-July 2019
- Key Laboratory for Silviculture and Conservation, Beijing Forestry University, Beijing, China. May-May 2023

SCIENTIFIC SUPERVISOR:

- Supervised PhD thesis:
 - 1) Bárbara Cuesta. February 2010. Revegetation of abandoned croplands in Mediterranean continental environments. From the ecophysiology of individuals to ecosystem properties. Universidad de Alcalá (Spain).
 - 2) Mercedes Uscola July 2013. Ecophysiology of nitrogen in Mediterranean plants: strategies of nitrogen forms absorption, functional responses, and use of reserves for growth. Universidad de Alcalá (Spain).
 - 3) Laura Fernández Pérez. May 2018. Functional responses of conifers to cold and drought: a multiscale approach. Universidad de Alcalá (Spain).
 - 4) Wenhui Shi. June 2018. Effects of acorn nutrient and soil fertility on *Quercus variabilis* seedling quality and outplanting performance. Beijing Forestry University (China).
 - 5) Jiayi Wang. June 2019. Effect of nitrogen loading on seasonal nitrogen internal cycling and seedling quality of *Quercus variabilis*”. Beijing Forestry University

- 6) Andrei Toca 2019. The role of nitrogen on the frost tolerance, root growth dynamics and hydraulic conductance of ecologically distinct Pinus spp. species. Universidad de Alcalá (Spain).
 - 7) Verónica Cruz 2019. Long-term dynamics of forest recovery in Mediterranean abandoned fields: Outcomes, processes and drivers of contrasting restoration strategies. Universidad de Alcalá (Spain).
 - 8) Loreto Martínez Baroja 2021. Drivers of the recruitment of holm oaks (*Quercus ilex*) in agroforestry mosaics. Acorn dispersal by magpies (*Pica pica*) and seedling establishment. Universidad de Alcalá (Spain).
 - 9) José Luis García 2022. Spatial patterns and processes determining the diversification of Mediterranean pine plantations. Ecological and silviculture factors. Polytechnic University of Madrid (Spain)
 - 10) Luo Na. 2023. Effects of photoperiod manipulations and watering treatments on summer planting performance of seedlings and their underlying mechanisms. Beijing Forestry University
- Master and Undergraduate thesis: Supervisor of more than 42 students.

REFeree IN INTERNATIONAL SCIENTIFIC JOURNALS

Acta Botanica Croata, Acta Oecologica, American Journal of Botany, Annals of Forest Science, Bosques, Canadian Journal of Forest Research, Ecological Engineering, Ecosphere, Environmental and Experimental Botany, Forest Ecology and Management, Forest Pathology, Forest Systems, Frontiers in Forests and Global Change, Functional Plant Biology, Journal of Applied Ecology, Journal of Arid Environments, Journal of Forest Research, Journal of Vegetation Science, New Forests, New Phytologist, Oecologia, Planta, Plant Cell and Environment, Plant Ecology, Plant Ecology and Diversity, Plant and Soil, PlosOne, Restoration Ecology, Scientific Reports, Tree and Forestry Science and Biotechnology, Tree Physiology, Web Ecology.