Curriculum vitae

PEDRO VILLAR-SALVADOR

WORK ADDRESS

Forest Ecology and Restoration Group
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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 obtained my PhD at the Universidad de Valencia in 2000, but my doctoral research was conducted at the Instituto Pirenaico de Ecología (CSIC). Currently, I am an Associate Professor at the Universidad de Alcalá (UAH). Previously, I was a Profesor Contratado Doctor at UAH (2005–2017) and a researcher at the Centro Nacional de Recursos Genéticos Forestales "El

Serranillo" -Ministerio de Medioambiente- (1995–2005), mainly as a freelance researcher.

My research has focused on two interconnected areas. The first addresses the ecophysiological process (water economy, cold stress, nitrogen nutrition, root growth) underlying the cultivation and establishment of tree seedlings in forest plantings. The second area, which is my main current focus, investigates the factors and processes driving oak regeneration and colonization, especially acorn dispersal by corvids and shrub facilitation.

My main scientific contributions include 1) defining the functional traits and physiological processes that control the establishment of woody plants in Mediterranean forest plantatings; and 2) identifying the mechanisms by which acorn dispersal by corvids interact with shrubs and the forest understory structure to determine oak colonization.

I collaborate with researchers from USA, China, UK, Australia, Italy, Serbia, France, and of course Spain. I have published > 140 scientific studies. This includes 74 papers in JCR-indexed journals, 77% of which are in Q1, with papers in high-impact journals such as New Phytologist, Journal of Ecology, Functional Ecology, Global Change Biology, Journal of Applied Ecology, and Tree Physiology. I authored 24 book chapters, seven in English in books edited by Springer, Elsevier, and CEAM; the rest are in in Spanish, edited by the Ministry of Agriculture and Environment and mostly aimed to stakeholders involved in forestation.

On September 3, 2025, my publications had 7095 citations and an h-index=40 according to Google Scholar; 3946 (without self-citations) and 31, respectively in WoS. In most of my publications, I played a leading role in the conceptualization, conducting part of the research, supervision, and writing the drafts. I have 4 six-year research periods (sexenios), the last covering 2015-2020 (I show my best five papers published after 2020 in Section 6 of this CVN).

I have led five research projects and eight contracts (total budget involved: 0.85M of €), within a participation in 42 projects/contracts (involving 4.87M of €), including a Cost Action. I have organized two national symposia, and I was a keynote speaker at four international conferences. I was associate editor of two international journals of the JCR (New Forests and Canadian Journal of Forest Research) for 10 years, evaluator in the Juan de la Cierva program (2014), and member of a national project evaluation panel for 3 years.

I have four teaching evaluation periods (quinquenios), the last two with a "Highly favorable" Docentia evaluation. I have taught 16 subjects distributed in the Biology and Environmental Sciences degrees, as well as in the Master in Ecological Restoration. I have been the coordinator of the subject in Ecología (coordinating 6-8 teachers) in the Biology degree and Restauración de la vegetación (coordinating three teachers) in the Master in Ecological Restoration for more than 10 years.

I have also supervised 11 PhD students (plus two ongoing), three postdocs (Juan de la Cierva, Margarita Salas, Talento-CAM), and >50 MSc/BSc students in their BSc and MSc theses. I also mentored short stays of four international students.

I organized outreach events for Science Week (2021-2024) and contributed to > 30 national and international forest restoration courses.
I served as Ecology Department Secretary for 4 years, coordinator of the MSc in Ecosystem Restoration in the Universidad de Alcalá (2012–2020), and I lead the PhD program in Ecology, Biodiversity and Global Change since 2020.

RESEARCH PROJECTS AND CONTRACTS (2020-2025)

- 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 Mª 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 Mª 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.

PEER-REVIEWED PAPERS (2020-2025) * main conceptual author

- **P. Villar-Salvador***, Andivia E.*, Mariotti, B.*, Oliet, J.A., Puértolas, J., Cocozza, C., Ivetic, V., Tsakaldimi, T., Montagnoli, A., Cvjetkovic, B., Dumroese, K., Fløistad, I.S., Arellano, E., Devetakovic, J., Diez, J.J., Li, G., Maltoni, A., Ovalle, J.F., Salbitano, F., Tognetti, R., Ventura, V, Vilagrosa, A., Witzell, J. 2025. Quality matters. A quantitative review on the effect of seedling morphology and nursery practices on the outplanting performance of forest plantings. In: Stanturf J., Villar-Salvador P, Mariotti B., Ivetic V. et al. (Eds). Guidelines for climate adaptive forest restoration and reforestation projects in Europe. Elsevier (in press).
- A. Leverkus* et al. 2026. Drivers of seedling emergence and early growth of 12 European oak species: Results from a cross-continental experiment. Forest Ecology and Management 599: 123223.
- V. Cruz*, Ruiz-Benito P., Andivia E.*, Rey Benayas J.M., **Villar-Salvador P.*** 2025 The effect of shrubs on tree recruitment differs between planted and secondary forests Forest Ecology and Management 598: 123199.
- O. Lorente-Casalini*; **Villar-Salvador, P***; Andivia, E.; Valenzuela, P.; García-Pérez, J.L; Oliet, J.A.; Rey-Benayas, J.M. 2025. Abundance and spatial attributes of forest remnants differently influence colonization patterns of contrasting oak species. Landscape Ecology 40:157.
- K. Zhao*, **Villar-Salvador P**., Li, G*. 2025. Increased light cannot offset negative effects of cotyledon removal on survival, growth, and storage building in Quercus variabilis seedlings. Forest Ecology and Management 586: 122720.
- M. Sampere-Medina....(68 authors); Villar-Salvador, P.; Witzell, J.; Leverkus, A*. 2024. Ex situ germination of European acorns: Data from 93 batches of 12 Quercus species. Annals of Forest Science 81: 50

- J Puértolas*, **P Villar-Salvador***, E. Andivia*, I. Ahuja, C. Cocozza, B. Cvjetkovic, J. Devetakovic, J. Díaz- Casero, I.S. Fløistad, P. Ganatsas, B. Mariotti, M, Tsakaldimi, A. Vilagrosa, J. Witzell, V. Ivetic. 2024 Die-hard seedlings. A global meta-analysis on the factors determining the effectiveness of drought hardening on growth and survival of forest plantations. For. Ecol. Manage. 572: 122300.
- 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.
- B. Mariotti*, Oliet JA, Andivia E, Tsakaldimi M, **Villar-Salvador P**, Ivetic V, Kerkez JI, Bilir N, Bohlenius H, Cvjetkovic B, Duminš, Heiskanen J, Ivanov G, Montagnoli A, Sundheim FI, Cocozza C* 2023. A global survey on innovative, environmentally sustainable growing media to grow forest seedlings in nursery. Current Forestry Reports. 9: 413–428.
- M. Mataruga*, B Cvjetkovic*, Bart De Cuyper, Ina Aneva Petar Zhelev, Pavel Cudlín; Marek Metslaid, Ville Kankaanhuhta, Catherine Collet, Peter Annighöfer, Thomas Mathes, Tsakaldimi Marianthi, Paitaridou Despoina; Rakel 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.
- 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 resistenace 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.

PEER REVIEWED BOOK CHAPTERS (2020-2025)

- **P. Villar-Salvador**, Andivia E., Mariotti, B., Oliet, J.A., Puértolas, J., Cocozza, C., Ivetic, V., Tsakaldimi, T., Montagnoli, A., Cvjetkovic, B., Dumroese, K., Fløistad, I.S., Arellano, E., Devetakovic, J., Diez, J.J., Li, G., Maltoni, A., Ovalle, J.F., Salbitano, F., Tognetti, R., Ventura, V, Vilagrosa, A., Witzell, J. 2025. Quality matters. A quantitative review on the effect of seedling morphology and nursery practices on the outplanting performance of forest plantings. In: Stanturf J., Villar-Salvador P, Mariotti B., Ivetic V. et al. (Eds). Guidelines for climate adaptive forest restoration and reforestation projects in Europe. Elsevier (in press).
- 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) Jiaxi 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
11) Kaifen Zhao. 2024. Effect of cotyledon removal and environmental factors on the development of Quercus variabilis seedlings. 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, Conservation Science and Practice, 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.