

**TITLE: DEFINING DRY RIVERS AS THE MOST EXTREME TYPE OF NON-
PERENNIAL FLUVIAL ECOSYSTEMS**

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Supplementary Material. Comparison between the possible ecosystem services (ES) provided by the two hydrological phases (flowing and dry) of IRES, *Intermittent rivers and ephemeral streams* according to Datry et al. [1] and the ES provided by Dry Rivers (DRs) according to the evidence found. We maintain the classification used by Datry et al. [1] for ES (“V” = provided, “§”= altered in the dry phase and “#”= lost in the dry phase) and we incorporate two new ones (“n/a” = not applicable and “_” = no data). The not applicable category is required because in both DRs and the dry phase of intermittent rivers, some ES cannot be provided, which would be an anthropogenic impact (e.g. develop aquaculture in dry channels to provide food services). The category "no data" refers to the ES not verified in the bibliography (e.g., control of diseases).

				NON-PERENNIAL RIVERS		DRY RIVERS		
Ecosystem service category	Main types of output or process	Biological, physical or cultural type or process.	Biological or material outputs and bio-physical and cultural processes that can be linked back to concrete identifiable service sources.	Hydrological phases (According Datry et al. [1])				
				Flowing	Dry	Dry Rivers	Example/Evidence	Reference
Provisioning	Nutrition	Biomass	Cultivated crops	V	§	V	Cereal crop	[2]
			Reared animals and their outputs	V	§	V	Cattle of sheep and goat	[3]
			Wild plants, algae and their outputs	V	§	V	Collection of wild asparagus	[4]
			Wild animals and their outputs	V	§	V	Rabbits	[5]
			Plants and algae from in-situ aquaculture	V	#	n/a		
			Animals from in-situ aquaculture	V	#	n/a		
	Water	Water	Surface water for drinking	V	#	V	Water-harvesting systems	[6]
			Ground water for drinking	V	V	V	Qanat system	[7]
	Biotic materials	Biomass	Fibers and other materials from plants, algae and animals for direct use or processing	V	§	V	Uses of the mesquite plant (<i>Prosopis</i> spp.) as building	[8,9]

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				Flowing	Dry			
							material, exudates like gum Arabic, resins, etc	
			Materials from plants, algae and animals for agricultural use	V	§	V	Use of Palo Fierro (<i>Olneya tesota</i>) as livestock fodder	[10]
			Genetic materials from all biota	V	§	V	Many plants that grow in dry rivers have medicinal uses	[11,12]
		Water	Surface water for non-drinking purposes	V	#	V	Water-harvesting systems to agriculture	[6]
			Ground water for non-drinking purposes	V	V	V	Qanat system to drink the cattle	[7]
	Energy	Biomass-based energy sources	Plant-based resources	V	§	V	Coal processing from mesquite plant (<i>Prosopis</i> spp.)	[8]
			Animal-based resources	V	n/a	n/a		
		Mechanical energy	Animal-based energy	V	n/a	V	Use of animals to extract water from wells equipped with small wheels	[13]
Regulation & Maintenance	Mediation of waste, toxics and other nuisances	Mediation by biota	Bio-remediation by micro-organisms, algae, plants, and animals	V	§	V	Leaf litter decomposition by microbial communities	[14]
			Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	V	§	V	Bioremediation by microbial community	[15]
		Mediation by ecosystems	Filtration/sequestration/storage/accumulation by ecosystems	V	§	V	Loss of total phosphorus in sediments of dry riverbeds	[16]

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				Flowing	Dry			
			Dilution by atmosphere, freshwater and marine ecosystems	V	#	V	Nitrogen total sequestration in dry riverbeds from the atmosphere	[16]
			Mediation of smell/noise/visual impacts	V	§	ı		
	Mediation of flows	Mass flows	Mass stabilisation and control of erosion rates	V	§	V	Vegetation of dry channels increase resistance to erosion	[17,18]
			Buffering and attenuation of mass flows	V	§	V	Vegetation of dry channels enhance the processes of sedimentation	[17,18]
		Liquid flows	Hydrological cycle and water flow maintenance	V	#	V	High rates of infiltration into dry channels	[19]
			Flood protection	V	§	V	After a flood a single-thread channels can transition into braided reducing its catastrophic effects	[19]
		Gaseous / air flows	Storm protection	n/a	n/a	V	Vegetation of dry channels reduces the sediment transfers downstream	[17]
			Ventilation and transpiration	V	§	V	Some plants of dry riverbeds provide shade decreasing the environmental temperature	[20]
	Maintenance of physical,	Lifecycle maintenance,	Pollination and seed dispersal	V	§	V	Seed dispersal by the wind	[21]

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				Flowing	Dry			
	chemical, biological conditions	habitat and gene pool protection	Maintaining nursery populations and habitats	V	§	V	Dry channels are temporary habitats for terrestrial arthropod assemblages.	[22]
		Pest and disease control	Pest control	V	§	V	Some invasive plants in dry riverbeds can be controlled by small rodents.	[23]
			Disease control	V	§	¿		
		Soil formation and composition	Weathering processes	V	§	V	Mesquite is an indicator of the presence of groundwater	[24]
			Decomposition and fixing processes	V	#	V	Some plants of dry riverbed deposit organic matter facilitating the formation of soil	[8]
		Water conditions	Chemical condition of freshwaters	V	#	V	Denitrification via microbial is the most important loss of nitrogen in ephemeral streams.	[25]
			Chemical condition of salt waters	V	#	n/a		
		Atmospheric composition and climate regulation	Global climate regulation by reduction of greenhouse gas concentrations	V	#	V	The residence time of organic carbon in dry riverbeds is much longer than in forest areas.	[26]
			Micro and regional climate regulation	V	§	V	Some plants of dry riverbeds generate a milder microclimate	[27]

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Cultural	Physical and intellectual interactions with biota, ecosystems, and land-/seascapes [environmental settings]	Physical and experiential interactions	Experiential use of plants, animals and land-/seascapes in different environmental settings	V	V	V	Large amount of plants from the arid zones are used as food, forage for cattle, medicine, temples, etc.	[12]
			Physical use of land-/seascapes in different environmental settings	V	V	V	Dry rivers are used as communication routes by local human populations	[28,29]
		Intellectual and representative interactions	Scientific	V	V	V	Drylands have generated significant contributions to global environmental sciences.	[30]
			Educational	V	V	V	Dry streams (e.g. ramblas) are used to develop many educational projects.	https://www.murcia.es/me dio-ambiente/me dio-ambiente/publicaciones.asp
			Heritage, cultural	V	V	V	Nomadic cultures have been generated in the arid lands.	[31]
			Entertainment	V	§	V	Dry rivers offer recreation activities such as hiking, hunting, observation of animal species, etc.	[29]
			Aesthetic	V	V	V	Dry rivers are attractive for tourism, based on biodiversity and scenery.	[32]

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	Spiritual, symbolic and other interactions with biota, ecosystems, and land-/seascapes [environmental settings]	Spiritual and/or emblematic	Symbolic	V	V	V	The seeds of the shrub <i>Anadenanthera colubrina</i> have a shamanic use in the arid zones of South America.	[33]
			Sacred and/or religious	V	V	V	On the arid lands tree species, and individual trees have spiritual significance to people.	[30]
		Other cultural outputs	Existence	V	V	V	The arid landscapes are experimental spaces that generate human well-being.	[34]
			Bequest	V	V	V	The creation of three major religions, Judaism, Christianity, and Islam, is associated with arid landscapes.	[35]

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