

Here is the consolidated summary of the biological mechanisms, analogies, and the scientific resources used to verify the information.

Red Mangrove Adaptation & Resource Summary

Feature	Biological Mechanism	The "Simple Explanation"	Scientific Resource
Water Intake	Ultra-filtration via Suberin: A waxy, waterproof layer in the root cells acts as a molecular sieve.	A high-tech membrane that lets water in but blocks 95% of salt.	Smithsonian Ocean
Water Movement	Transpiration Pull: Evaporation from leaves creates negative pressure (vacuum) in the xylem.	A "suction pump" that pulls water up against the pull of salt.	ResearchGate: Root Barriers
Gas Exchange	Lenticels: Microscopic, breathable pores on the bark of the prop roots.	Thousands of tiny "snorkels" that breathe air directly.	Living Oceans Foundation
Internal Air Flow	Aerenchyma: Spongy, hollow tissue that runs through the roots.	Internal "oxygen pipes" that carry air down to the buried roots.	Florida Museum of Natural History
Salt Management	Sacrificial Leaves: Salt is sequestered in old leaves, which then fall off.	The tree "dumps its trash" by throwing away its saltiest leaves.	GLOMIS: Sacrificial Leaf Hypothesis
Hydration	Succulence: Leaves are thick	A built-in "water tank" to dilute any	PubMed Central

	and fleshy to store excess fresh water.	salt that sneaks in.	(PMC)
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