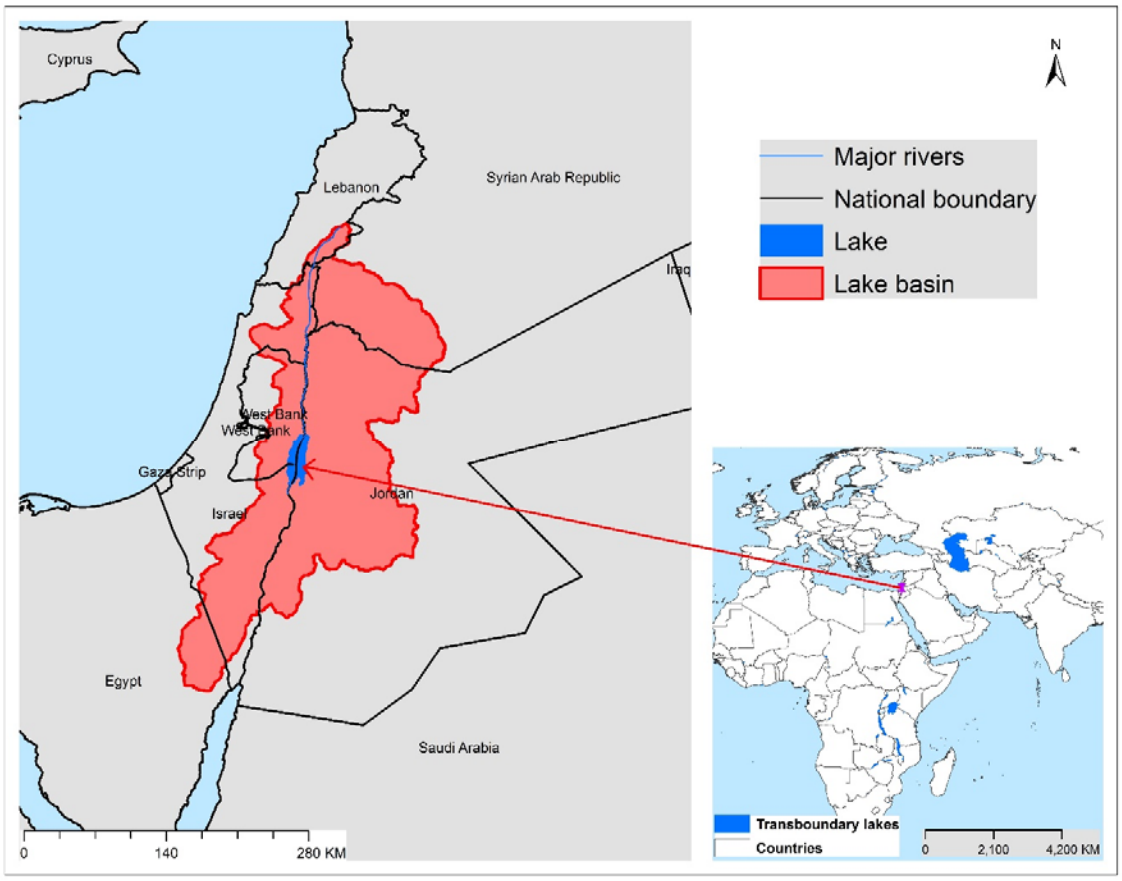
Lake Profile Brief

This is based on the results of Multiple Lake Threat Assessment and its Scenario Analysis. Refer to the Technical Report for details.

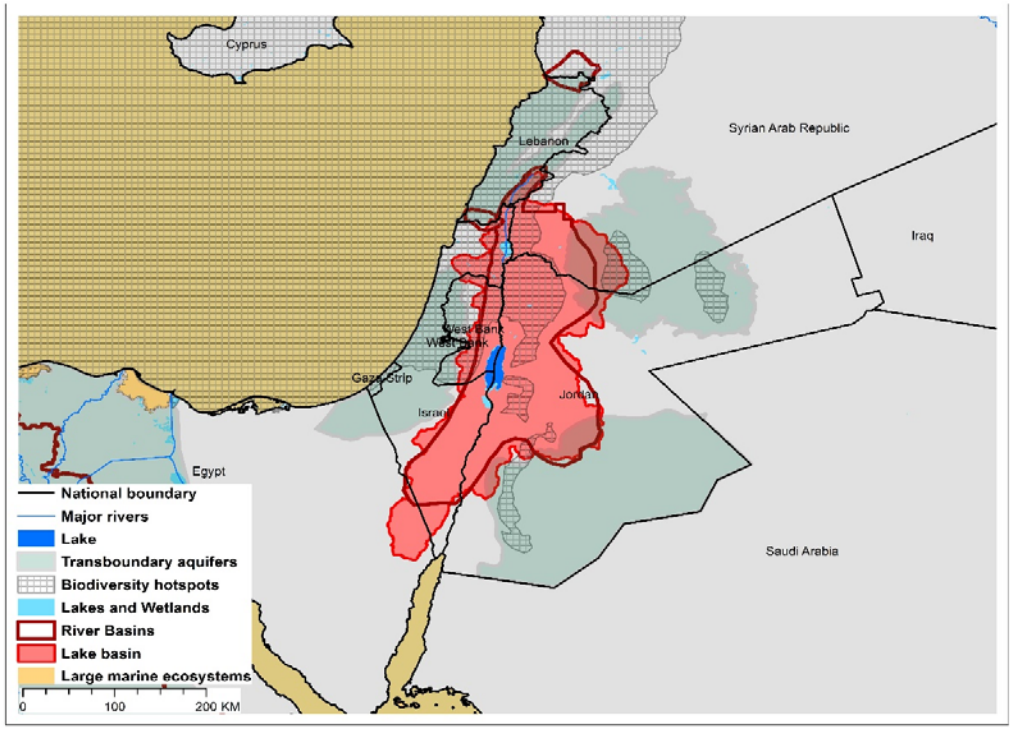
Dead Sea — Geographic Information

The Dead Sea is an endorheic salt lake located in the Jordan Rift Valley. It exhibits the lowest elevation and being the lowest body of water on Earth's surface. It is also the deepest hypersaline lake in the world, being about ten times as salty as the ocean. The salinity results in a harsh aquatic environment supporting little biodiversity. The major water inflow is the Jordan River to the north. The rainfall is irregular and scarce. The lake's water level began to decrease in the 1960s, when Israel and Jordan increased use of the lake water for commercial purposes. The lake has an enormous salt reserve, being sufficiently buoyant to support swimmers in the lake. The southern basin eventually was sub-divided into large evaporation ponds for salt extraction, resulting in the basin ceasing to be a natural body of water by the 21st Century, notably changing the physical appearance of the whole lake.

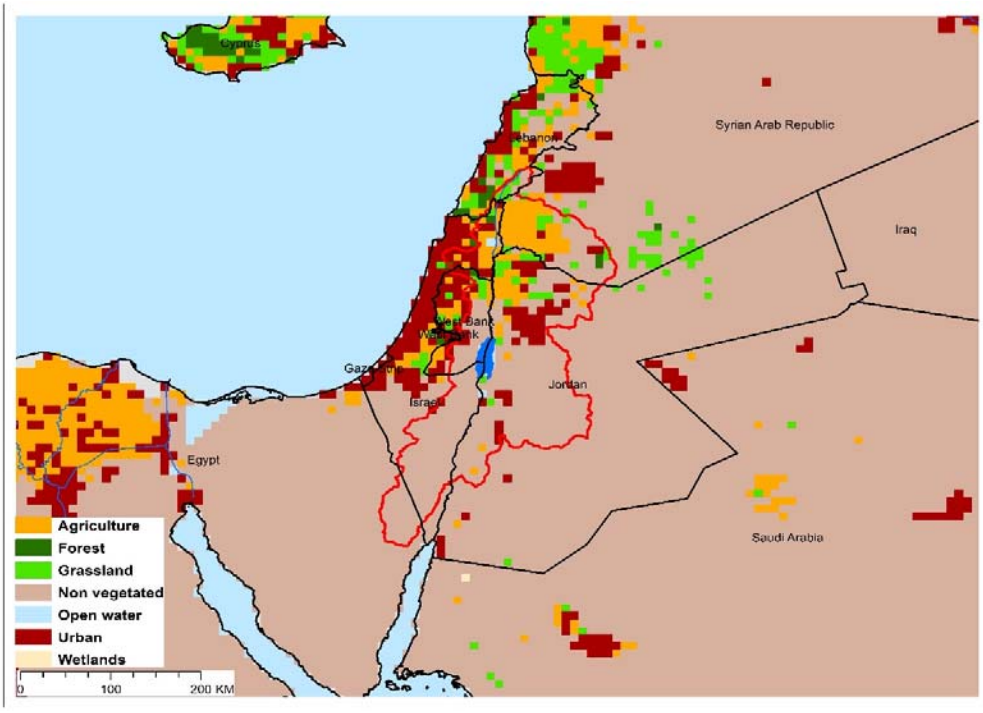


TWAP Regional Designation	Northern Africa & Western Asia; Southern Asia		**Lake Basin Population (2010)**	9,454,130
River Basin	Jordan		**Lake Basin Population Density (2010; # km^{-2})**	161.0
Riparian Countries	Israel, Jordan, Palestine		**Average Basin Precipitation (mm yr^{-1})**	241.7
Basin Area (km^2)	40,013		**Shoreline Length (km)**	189.7
Lake Area (km^2)	642.7		**Human Development Index (HDI)**	0.72
Lake Area:Lake Basin Ratio	0.015		**International Treaties/Agreements Identifying Lake**	

Dead Sea Basin Characteristics



(a) Dead Sea basin and associated transboundary water systems



(b) Dead Sea basin land use

Dead Sea Threat Ranking

A serious lack of global-scale uniform data on the TWAP transboundary in-lake conditions required their potential threat risks be estimated on the basis of the characteristics of their drainage basins, rather than in-lake conditions. Using basin characteristics to rank transboundary lake threats precludes consideration of the unique features that can buffer their in-lake responses to basin-derived disturbances, including an integrating nature for all inputs, long water retention times, and complex, non-linear response dynamics.

The lake threat ranks were calculated with a spreadsheet-based interactive scenario analysis program, incorporating data and information about the nature and magnitude of their basin-derived stresses, and their possible impacts on the sustainability of their ecosystem services. These descriptive data for Dead Sea and the other transboundary lakes included lake and basin areas, population numbers and densities, areal extent of basin stressors on the lake, data grid size, and other components considered important from the perspective of the user of the data results. The scenario analysis program also provides a means to define the appropriate context and preconditions for interpreting the ranking results.

The Dead Sea threat ranks are expressed in terms of the Adjusted Human Water Security (Adj-HWS) threats, Reverse Biodiversity (RvBD) threats, and the Human Development Index (HDI) score, as well as combinations of these indices. However, it is emphasized that, being based on specific characteristics and assumptions regarding Dead Sea and its basin characteristics, the calculated threat scores represent only one possible set of lake threat rankings. Defining the appropriate context and preconditions for interpreting the lake rankings remains an important responsibility of those using the threat ranking results, including lake managers and decision-makers.

Table 1. Dead Sea Relative Threat Ranks, Based on Adjusted Human Water Security (Adj-HWS) and Reverse Biodiversity Threats, and Human Development Index (HDI) Score

(Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adjusted Human Water Security (Adj-HWS) Threat Score	Relative Adj-HWS Threat Rank		Reverse Biodiversity (RvBD) Threat Score	Relative RvBD Threat Rank		Human Development Index (HDI) Score	Relative HDI Rank
0.90	13		0.51	41		0.72	34

It is emphasized that the Dead Sea rankings above are discussed here within the context of the management and decision-making process, rather than as strict numerical ranks. Based on its geographic, population and socioeconomic assumptions used in the scenario analysis program, the calculated Adj-HWS score for Dead Sea indicates a moderately high threat rank compared to other priority transboundary lakes.

The Reverse Biodiversity (RvBD) for Dead Sea, which is meant to describe its biodiversity sensitivity to basin-derived degradation, decreases the lake to a moderately low threat rank, compared to the other transboundary lakes. Management interventions directed to improving the biodiversity status must be

viewed with caution, however, since we lack sufficient knowledge and experience to accurately predict the ultimate impacts of biodiversity manipulations and preservation efforts. Further, the RvBD scores indicate the relative sensitivity of a lake basin to human activities, and high threat scores *per se* do not necessarily justify management interventions. Such interventions may actually increase biodiversity degradation, noting that many developed countries have already fundamentally degraded their biodiversity because of economic development activities. Thus, activities undertaken to address the Adj-HWS threats may actually degrade the biodiversity status and resources, even if the health and socioeconomic conditions of the lake basin stakeholders are improved as a result of better conditions, thereby increasing stakeholder resource consumption.

The relative Human Development Index (HDI) places the Dead Sea basin in a medium threat rank in regard to its health, educational and economic conditions.

Table 2. Dead Sea Threat Ranks, Based on Multiple Ranking Criteria

(Scores for Adj-HWS, RvBD and HDI ranks are presented in Table 1; the ranks may differ in some cases because of rounding of tied threat scores; Estimated risks: red – highest; orange – moderately high; yellow – medium; green – moderately low; blue – low)

Adj-HWS Rank	HDI Rank	RvBD Rank		Sum Adj-HWS + RvBD	Relative Threat Rank		Sum Adj-HWS + HDI	Relative Threat Rank		Sum Adj-HWS + RvBD + HDI	Overall Threat Rank
14	34	38		52	29		48	24		86	30

When multiple ranking criteria are considered together in the threat rank calculations, the Adj-HWS and HDI scores considered together place Dead Sea in the upper half of the threat ranks. The relative threat is slightly lower when the Adj-HWS and RvBD threats are considered together. Considering all three ranking criteria together, Dead Sea exhibits a medium threat ranking.

Further, a series of parametric sensitivity analyses of the ranking results also was performed to determine the effects of changing the importance of specific criteria on the relative transboundary lake rankings. This analysis involved increasing or decreasing the weights applied to the threat ranks derived from multiple ranking criteria to reassess the relative impacts of the weight combinations on the threat ranks. For example, in determining the sensitivity of the Adjusted Human Water Security (Adj-HWS) and Biodiversity (BD) ranking criteria, the threat rank associated with the first was assumed to be of complete (100%) importance (i.e., rank weight of 1.0), while the other was assumed to be of no (0%) importance (i.e., rank weight of 0.0). The relative importance of the two ranking criteria was then successively changed, with weight combinations of 0.9 and 0.1, 0.8 and 0.2, etc., until the first ranking criteria (Adj-HWS) was assumed to be of no importance (rank weight of 0.0) and the second (BD) was of complete importance (rank weight of 1.0). In the case of Dead Sea, the 0.5 and 0.5 weight combinations for three cases of parametric analysis for Dead Sea resulted in respective threat rankings of 4th, 2nd and 7th, respectively, among the total of 9 European transboundary lakes in the TWAP study (see Technical Report, Section 4.3.3, pp44-48 and Appendix 6(1)).

In essence, therefore, identifying potential management intervention needs for Dead Sea must be considered on the basis of both educated judgement and accurate representations of its situation. A fundamental question to be addressed, therefore, is how can one decide that a given management intervention will produce the greatest benefit(s) for the greatest number of people in the Dead Sea

basin? Accurate answers to such questions for Dead Sea, and other transboundary lakes, will require a case-by-case assessment approach that considers the specific lake situation and context, the anticipated improvements from specific management interventions, and its interactions with water systems to which the lake is linked.