Global wetland data & maps

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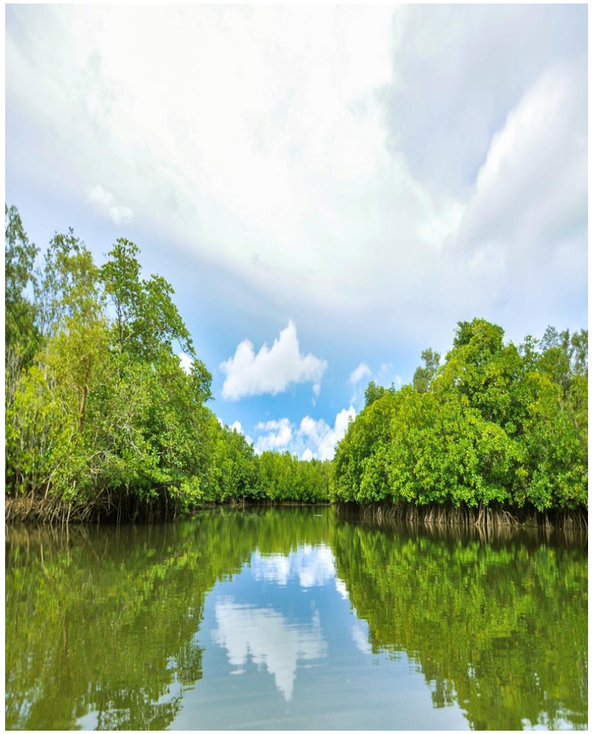
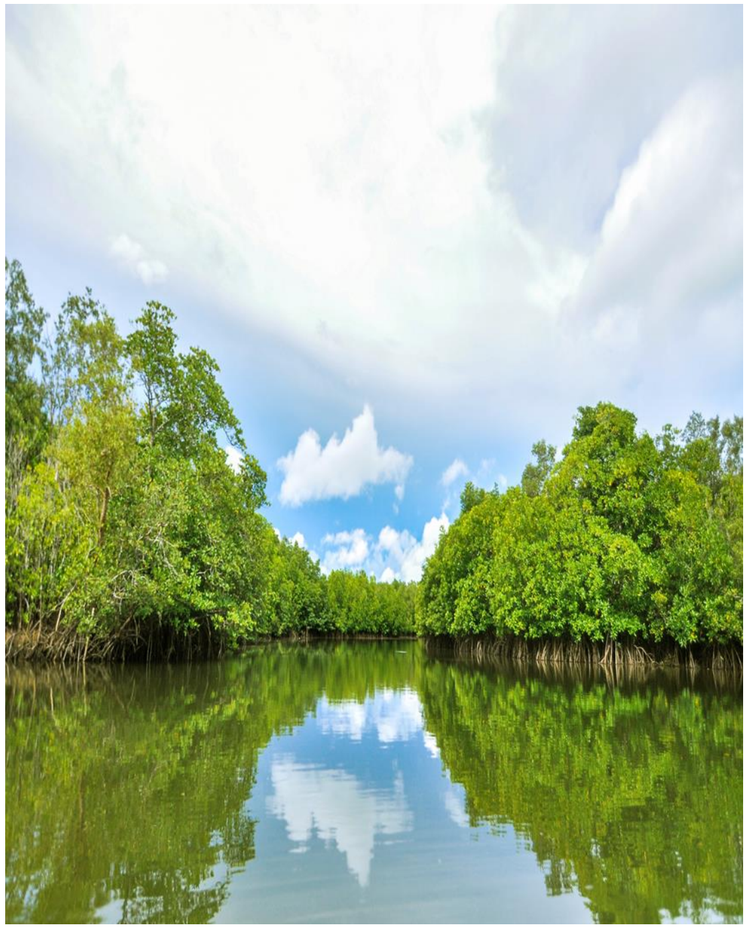


The task of evaluating the extent of wetlands is challenging



- many vary greatly in extent over time, both seasonally and longer time periods with many in arid zones being only occasionally (although often dramatically) inundated
- large areas of wetlands are forested, and some widely used optical remote sensing sources cannot readily distinguish these areas as wetland rather than forest

Numerous efforts to assess the global and regional extent of wetlands for a variety of purposes, including:

- estimating the extent of greenhouse gas emissions (methane, carbon dioxide) from wetlands
- identifying potential Wetlands of International Importance for designation under the Ramsar Convention
- assessing changes in wetland and inundation areas over time
- knowledge base for broader water and environmental management purposes

Global area of wetlands

Marine and Freshwater Research
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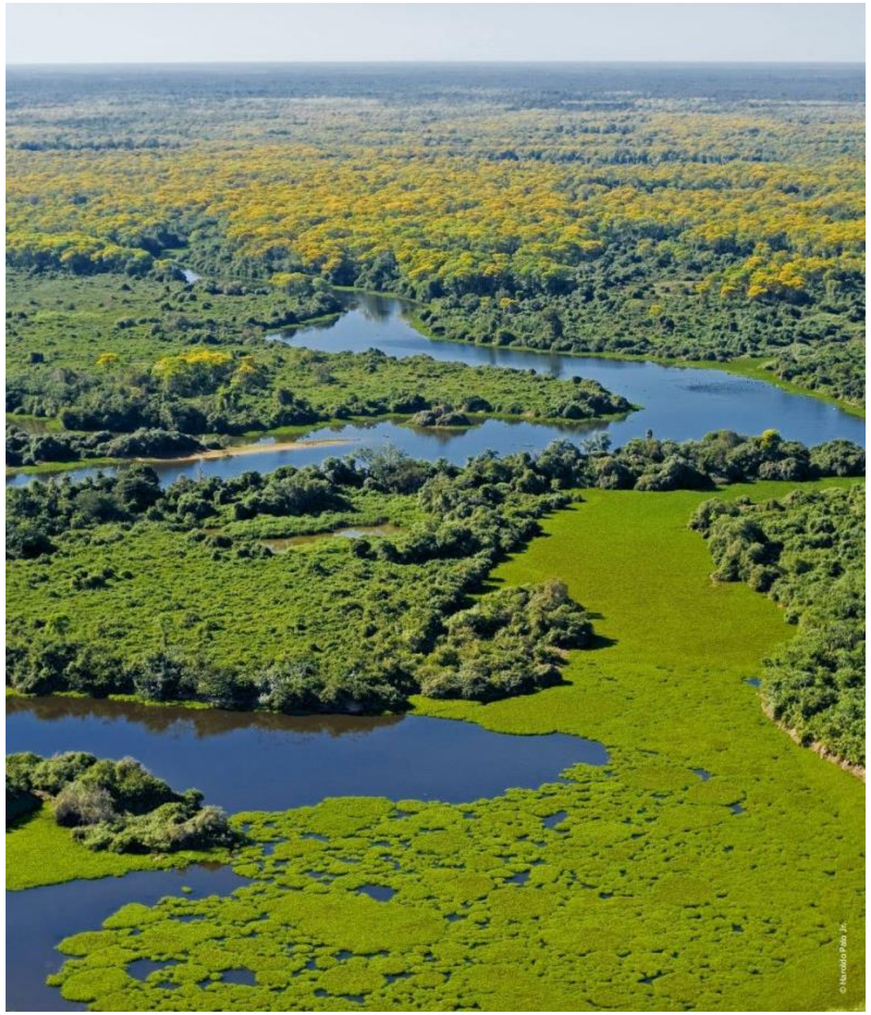
Global extent and distribution of wetlands: trends and issues



With the limitations of data sources in mind, compared global estimates of wetland areas from different published sources over time.

Wetland area extent estimates from site-based (bottom-up) sources were higher than many of the top-down global mapping and remotely sensed estimates.

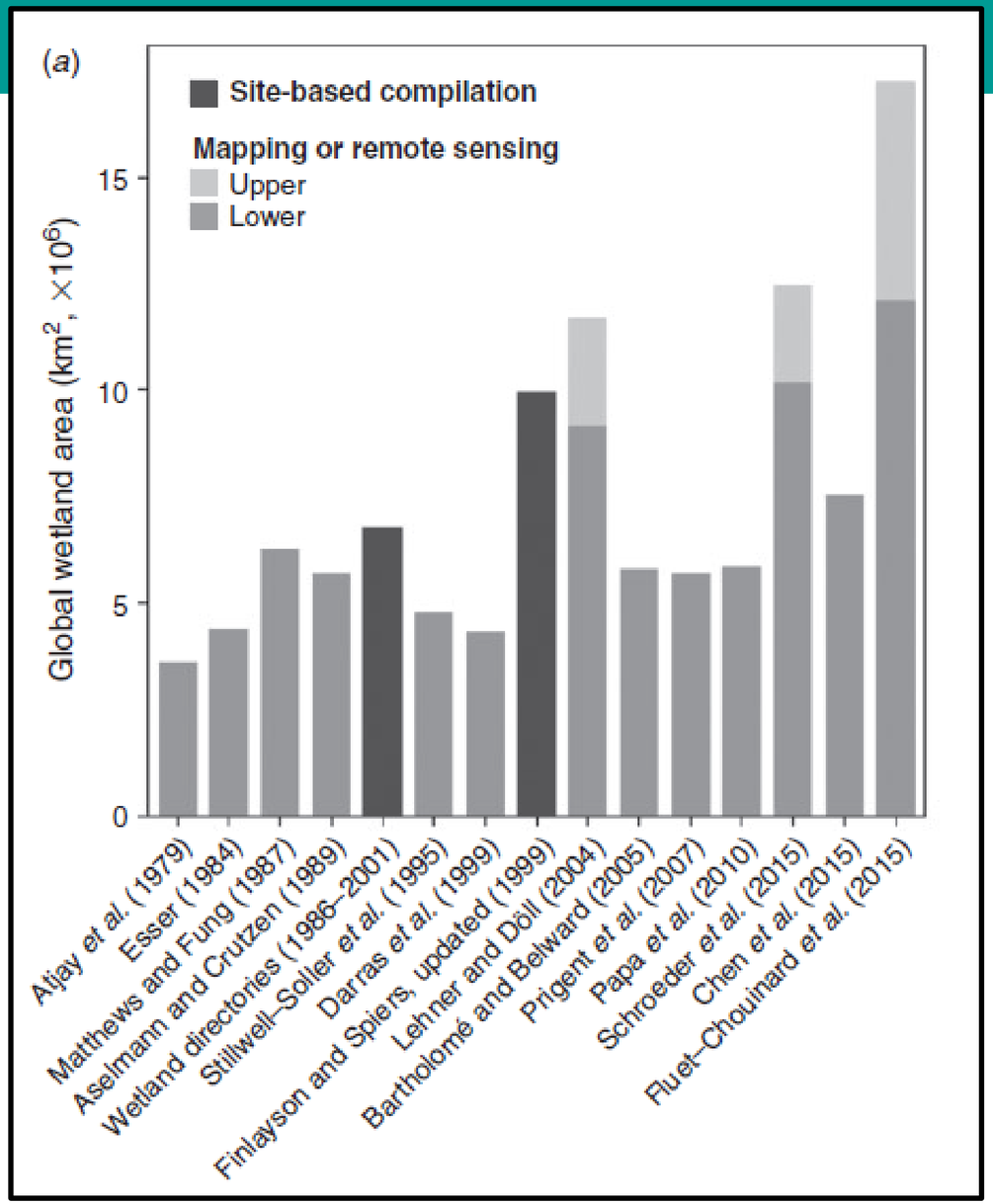
Because site-based areas underestimate the global extent it follows that many of the top-down estimates are also major underestimates of extent. Of the top-down estimates, only Lehner & Doll 2004 [and Lehner et al - under review] from their wetland maps, provide global area estimates exceeding those derived from national wetland inventories.

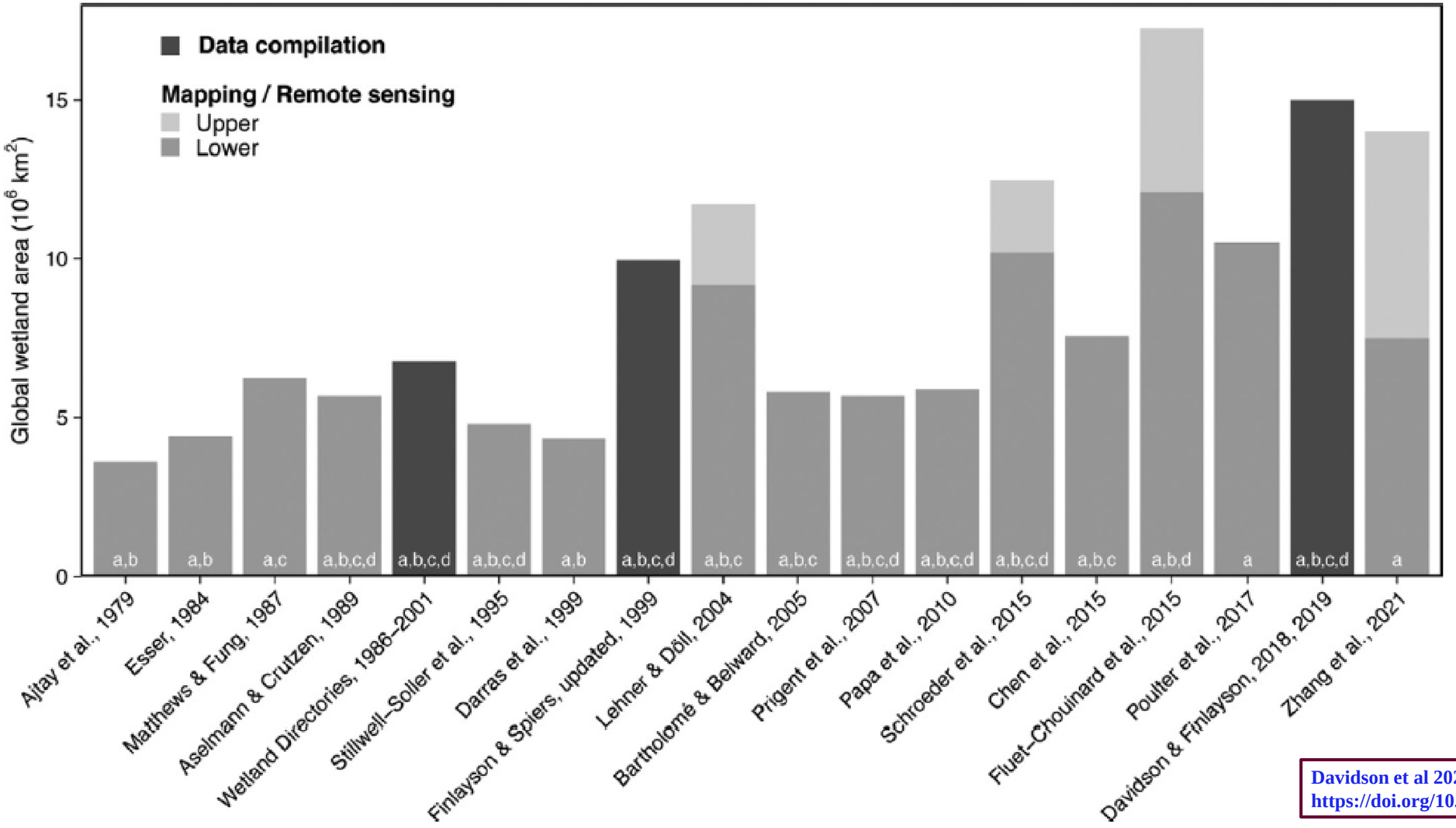
Global wetland area

Chronology of global wetland area estimates ordered by year of publication for estimates derived from ‘bottom-up’ site-based inventories or global mapping or remote sensing sources

The different purposes and sources and observation methods have produced a wide range of areal estimates that vary because, *inter alia*, of their data sources and the types of wetland they cover.

Conclude that the increasing trend since the 1970s in reported global area of wetlands over time is a consequence of improving technologies and not a real increase in wetland area. This is supported by a continuing conversion/loss over the same time period.





Davidson et al 2023a. Ramsar Wetlands.
https://doi.org/10.1016/B978-0-12-817803-4.00006-1

Fig. 4.1 The chronology of global wetland area estimates ordered by the year of publication, for estimates derived from 'bottom–up' site-based inventories and global mapping or remote sensing source. Wetland Directories 1996–2001 are from Scott and Carbonell (1986); Scott (1989, 1993, 1995); Cromarty and Scott (1995); Krivenko (1999, 2000); Botsch (2000); Environment Australia (2001). Upper and lower bounds of estimates are shown where available. Wetland categories included in each data source (a) inland natural vegetated wetlands, (b) inland open water bodies, (c) wet rice cultivation, and (d) coastal natural wetlands.
Updated and amended from Davidson, N.C., Fluet-Chouinard, E., Finlayson, C.M., 2018. Global extent and distribution of wetlands: trends and issues. Mar. Freshw. Res. 69, 620–627, with permission

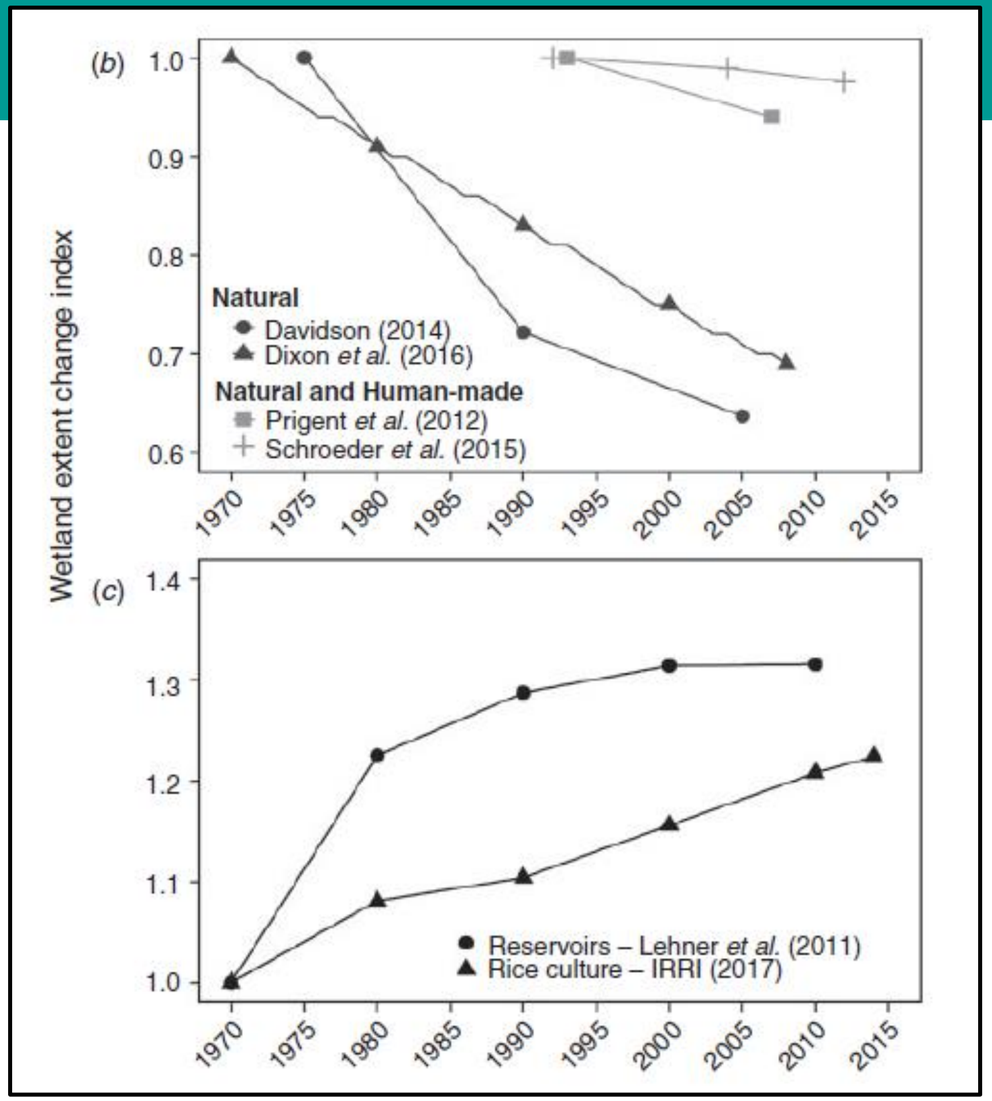
(*b*) Published trends in global wetland or inundation area within the time period covered by the wetland extent sources for natural wetlands

Area of wetland loss has increased – questions around these data as well

(*c*) Trends for global human-made wetland areas within the time period covered by the wetland extent sources for rice production area

Areas of human-made wetlands, e.g. rice paddies and reservoirs (dams), have increased - does not explain the increases in global wetland area estimated.

Area increases of these wetland types is comparatively small (rice cultivation, 0.299 x 10^6 km^2 increase from 1970 to 2014; reservoirs, 0.106 x 10^6 km^2 increase from 1970 to 2010) in contrast to the overall increase in global wetland area reported.

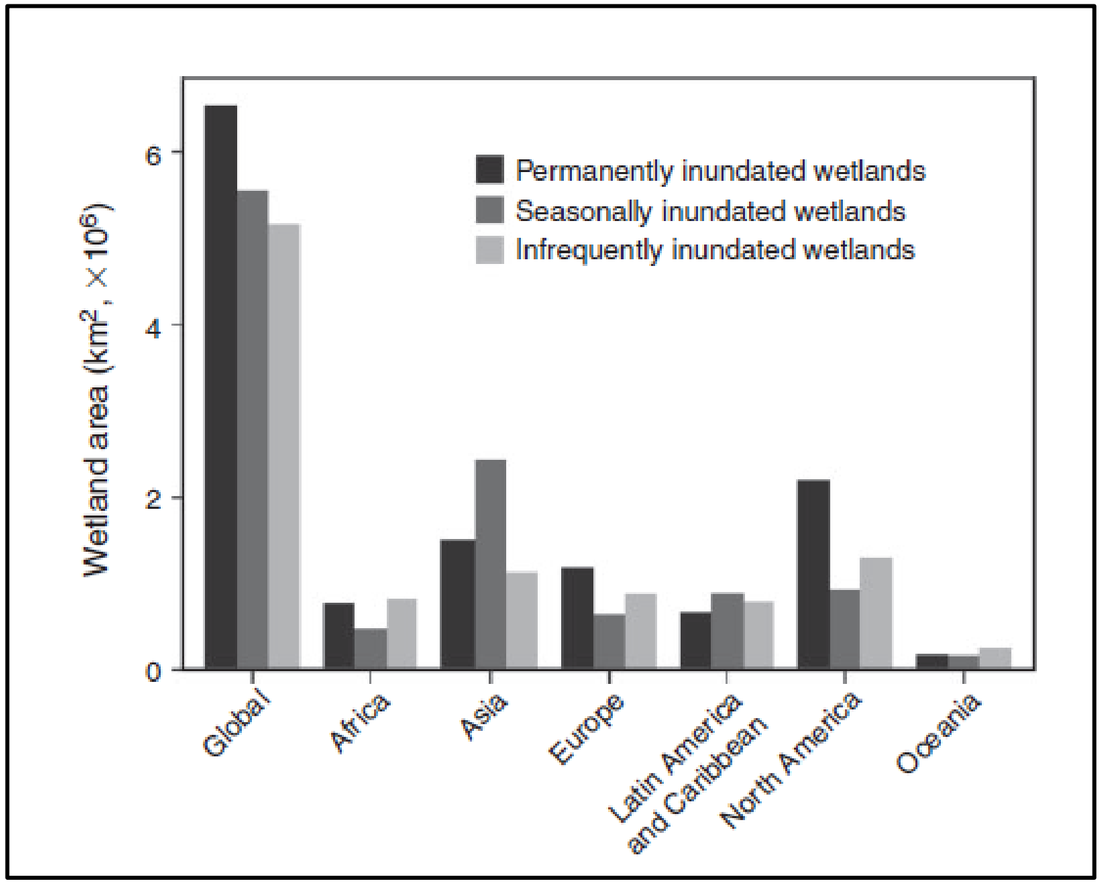


Although many wetlands are permanently inundated, many others, or parts of them, are inundated only seasonally, temporarily or periodically.

The different temporal states of inundation from the data of Fluet-Chouinard *et al.* (2015) show that, for most regions, the extent of each of these categories of wetland is similar, but there is a larger area of temporarily than permanently inundated wetlands in Asia (large area of seasonally inundated rice paddies), and slightly smaller temporarily than permanently inundated areas in Africa, Europe and North America.

Global area estimates from Fluet-Chouinard *et al.* (2015) are:

- **6.54 10^6 km^2 of permanently inundated wetlands**
- **5.55 x 10^6 km^2 of seasonally inundated wetlands**
- **< 5.17 x 10^6 km^2 of intermittently inundated wetlands**



It is also important to make a distinction in these area estimates between wetland area and area of water inundation. The largest inundation area estimated among high-resolution sources, a long-term inundated maximum extent of 17.255 10^6 km^2 (Fluet-Chouinard *et al.* 2015), is likely to overestimate wetland area.

The lower area estimate of Fluet-Chouinard *et al.* (2015) of 12.1 x 10^6 km^2 can be considered a representative estimate of permanently and seasonally inundated global wetland extent.

The current best estimate of the global area of permanent, seasonal and intermittent wetlands is in excess of 12.1 x 10^6 km^2 but less than 17.3 x 10^6 km^2.

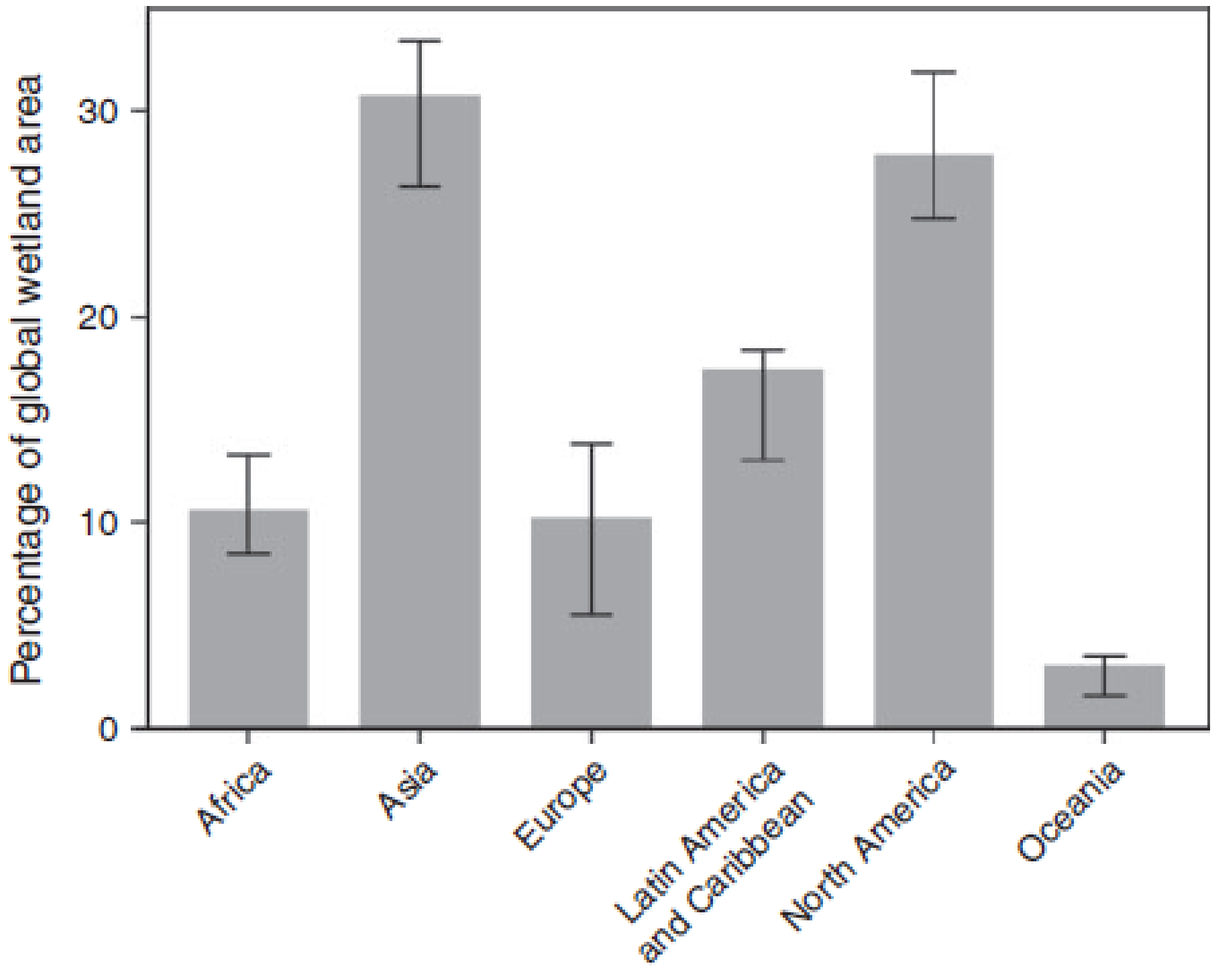


Fig. 3. Percentage of global wetland area by region. Columns show the mean percentage from the 13 estimates from 12 sources (listed in Table S1) that provide regional estimates; whiskers are the 25th and 75th percentiles.

Assessing the areas of specific wetland types (e.g. forested peatlands, swamps and marshes, intertidal vegetated wetlands etc.) poses additional difficulties because of differing definitions of wetland types.

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Table 4.1 Estimates of the global areas of different classes of inland, coastal/marine, and human-made wetlands.

Wetland class	Global wetland class area $\times 10^6$ km^2
Inland natural wetlands	
Rivers and streams	0.62–0.66
Lakes ≥ 10 ha	2.67–2.91
Lakes and pools < 10 ha	0.56–1.30
Nonforested peatlands	3.12[a]
Forested peatlands	0.70[a]
Marshes and swamps (alluvial soils)	2.53
Forested wetlands (alluvial soils)	1.17
Coastal/marine natural wetlands	
Unvegetated tidal flats	0.12–0.13
Salt marshes	0.06
Mangroves	0.14
Seagrass beds	0.16–0.27
Coral reefs (warm water systems)	0.28
Sandy beaches	< 0.01
Human-made wetlands	
Reservoirs	0.44
Small ponds	0.08
Rice paddy	1.28
Aquaculture ponds	0.08
Wastewater treatment ponds	0.01–0.05
Palm oil/pulpwood plantations (on peat soils)	< 0.01[b]

[a] These areas may be too low (see Section 4.2 for a recent higher area estimate for northern peatlands) but are not updated here because that source (Hugelius et al., 2020) does not provide separate areas for nonforested and forested peatlands.
[b] Southeast Asia only.
Updated from Davidson, N.C., Finlayson, C.M. 2018. Extent, regional distribution and changes in area of different classes of wetlands. Mar. Freshw. Res. 69, 1525–1533; Davidson, N.C., Finlayson, C.M., 2019. Updating global coastal wetland areas presented in Davidson and Finlayson (2018). Mar. Freshw. Res. 70, 1195–1200. https://doi.org/10.1071/MF19010.

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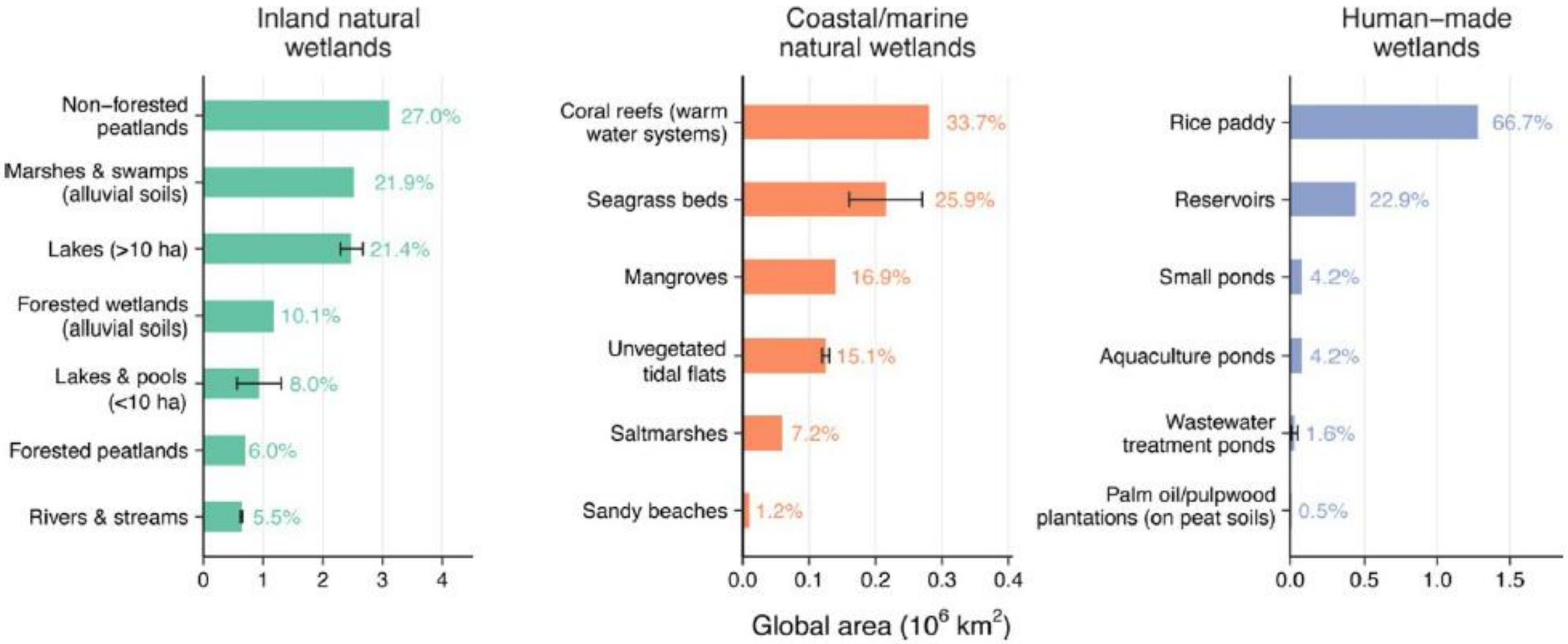

Fig. 4.2 Relative areas of different wetland classes across the three main categories of wetlands. The percentage of area within each wetland category is labelled in each panel. Note that peatland areas may be too small (see Section 4.2 for a recent higher area estimate for northern peatlands) but peatland areas are not updated here because that source (Hugelius et al., 2020) does not provide separate areas for nonforested and forested peatlands. Palm oil/pulpwood area is for Southeast Asia only.

Thanks for your attention

Questions?