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1 **TITLE: Brazil's Native Vegetation Protection Law jeopardizes wetland conservation: a**
2 **comment on Maltchik *et al.***

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49 **Keywords:** Wetland policy, Terms, Definitions, Unsustainable legislation, Biodiversity,
50 **Ecosystem services**

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52 **The future of Brazil's vast and highly biodiverse wetlands depends on interpretation of**
53 **the country's new Native Vegetation Protection Law (NVPL). Maltchik *et al.* recently**
54 **reviewed wetland-related terminologies and concepts in Brazilian legislation and**
55 **concluded that all the country's wetlands are legally protected under the NVPL. Here**
56 **we show that this is not the case. Finally, we point to a unique opportunity for scientists**
57 **to help minimize damage to wetlands by contributing to the state-level 'regulation' of**
58 **the NVPL, now underway, and we argue that the country needs a national policy**
59 **focused specifically on the conservation of these ecosystems.**

60 Brazil's vast and highly biodiverse wetlands are under relentlessly increasing threat,
61 and input from the scientific community is crucial to help minimize the impact of recent
62 legislative setbacks. Terminologies and concepts in laws affecting wetlands is part of this, and
63 Maltchik *et al.* (2018) have contributed a comprehensive review of such elements. However,
64 their treatment needs reinterpretation.

65 Maltchik *et al.* (2018) evaluated wetland-related terms and definitions in Brazil's
66 federal and state legislations to contribute to the assessment of the efficacy of wetland
67 conservation policies. Most of terminologies they found had only regional application and
68 poor or non-existent conceptualization. The generic term 'wetlands' ('*áreas úmidas*', in
69 Portuguese), which is the most basic and important term in any wetland policy, was only used
70 in one law: the Native Vegetation Protection Law (hereafter NVPL; Federal Law nº
71 12,651/2012; Brazil 2012). Based on this term being the better defined than other
72 designations, and given the precedence of the NVPL over state laws, Maltchik *et al.* (2018)
73 concluded that: (1) the term 'wetlands' represents all wetland types, (2) the clear descriptors
74 of the term's definition allow the identification of the totality of wetland ecosystems, and (3),
75 due to (1) and (2), the NVPL ensures the protection of all wetlands.

76 Maltchik *et al.* (2018) have provided important inputs for a better understanding the
77 adequacy of Brazil's legislation on wetlands. However, the generalizations that these authors
78 make regarding the NVPL's protection of all wetlands is unfounded. The term 'wetlands'
79 appears only twice in the NVPL and is not used in any conservation policy. Its first
80 appearance is before its definition (Chapter I, Article III, Subsection XXV) and the second
81 (Chapter II, Section I, Article VI, Subsection IX) is in a clause that specifies that wetlands
82 (especially those of international relevance) may become protected only if declared to be of
83 'social interest' by an act of the President of the Republic. The term 'wetlands' and its
84 definition therefore do not guarantee the protection of any wetland in Brazil.

85 Regardless of the effective use of terminologies, the elements reviewed by Maltchik *et al.*
86 *et al.* (2018) lead to conclusions different from the ones they drew. The term 'wetlands',
87 although generic when considered in isolation, does not represent all wetland types in the
88 context of the NVPL; because its definition is highly exclusionary, using this term cannot
89 ensure the effectiveness of wetland-related conservation policies. Examples of wetlands that
90 clearly do not fit the NVPL's definition are those subject to unpredictable (i.e., non-periodic)
91 flood pulses (e.g., riparian wetlands adjacent to streams and low-order rivers), all areas that
92 are permanently flooded (e.g., permanent ponds, lakes and lagoons), and all or any parts of
93 these areas that are not subject to flooding but are temporarily or permanently saturated (Junk
94 *et al.* 2014; Mitsch & Gosselink 2015).

95 An inclusive definition of 'wetlands' would also not guarantee the efficacy of wetland
96 conservation strategies. As shown by Maltchik *et al.* (2018), Brazilian legislation is
97 remarkably insufficient with regards to the representation and detection of singular wetland
98 types (which is especially worrying in view of the extreme diversity and complexity of the
99 country's wetlands; see Junk *et al.* 2014). These shortcomings cannot be masked or overcome
100 only by adoption of the generic term 'wetlands' (and hence its definition), since each wetland

101 type has unique characteristics and therefore specific conservation needs (e.g., buffer zone
 102 width) that can only be met through their being recognized as particular landscape features. A
 103 single conservation measure cannot serve for ecosystems ranging from the vast Amazonian
 104 floodplains to small temporary ponds in the semi-arid zone. One of the main functions of the
 105 term ‘wetlands’ (if not the main one) is not to replace terms for specific wetland types, but
 106 constitute elements representing and/or describing them (e.g., ‘upland-embedded wetlands’ as
 107 a description of ponds and lakes; Calhoun *et al.* 2017a) to ensure that they cover the full range
 108 of wetland subtypes (e.g., from temporarily saturated to permanently flooded areas).
 109 However, this crucial auxiliary function is not fulfilled in any Brazilian law (Maltchik *et al.*
 110 2018). Potentially negative consequences of the lack of this kind of application of the term
 111 ‘wetlands’ is exemplified by NVPL’s term ‘ponds’ (*‘lagoas’*, in Portuguese), which lacks
 112 conceptualization. As comprehensively defined, ponds are upland-embedded wetlands with
 113 ≤ 2 ha (Hamerlík *et al.* 2014). However, some researchers alternatively use the term ‘pools’
 114 (*‘poças’*, in Portuguese) in place of ‘temporary ponds’ (e.g., De Meester *et al.* 2005). It is
 115 therefore unclear if temporary ponds are protected by the NVPL, which may lead to
 116 exclusionary conservation policies and, consequently, to the collapse of unique ecosystem
 117 services (Calhoun *et al.* 2017b) and communities (Hill *et al.* 2017; Volcan & Lanés 2018) (in
 118 fact, the NVPL does not ensure the protection of any pond; Grasel *et al.* 2018). Given the
 119 paramount importance of appropriate terms and definitions of wetland types in environmental
 120 policies, it should be recognized that Brazil’s legislation seriously jeopardizes wetland
 121 conservation.

122 Deficiencies related to the elements used to represent and identify wetland systems,
 123 however, are not the only problems that compromise the conservation of these ecosystems in
 124 Brazil. While a detailed analysis of the country’s wetland-related policies is beyond the scope
 125 of this comment, it is also important to highlight that the NVPL’s enactment in 2012 (when it
 126 replaced the old 1965 ‘Forest Code’) imposed catastrophic risks to Brazil’s wetland heritage.
 127 Setbacks or inadequacies in the NVPL that diverge from Maltchik *et al.*’s conclusions
 128 include:

- 129• Removal of the protection conferred to ponds with <1 ha and wetlands associated with
 130 intermittent springs and ephemeral streams;
- 131• Dramatic reduction in the requirements for restoration of ‘buffer zones’ (legally considered
 132 ‘Permanent Preservation Areas’; hereafter PPAs) cleared before 22 July 2008, especially for
 133 those around ponds and lakes (for which protection with PPAs is now only 5-30 m) and
 134 adjacent to streams and rivers (where protection is only 5-100 m). This protected vegetation is
 135 now delimited according to the size of the property, regardless of the size or width of the
 136 wetlands or waterbodies;
- 137• Alteration of the basis for delimiting PPAs adjacent to streams and rivers from the maximum
 138 water level to the ‘regular bed’ of watercourses, thus reducing or removing protection from
 139 many riparian areas, especially from the vast Amazonian floodplains, which can reach widths
 140 of tens of kilometers and be ‘protected’ by PPAs as narrow as 5 m (Souza Jr *et al.* 2011;
 141 Brancalion *et al.* 2016);
- 142• Authorization of aquaculture (including raising alien species) in converted PPAs around
 143 ponds and lakes and adjacent to either intermittent and permanent watercourses on rural
 144 properties with ≤ 15 fiscal modules (for details about fiscal modules, see Brancalion *et al.*
 145 2016);
- 146• Non-protection of mangroves, salt marshes and hypersaline areas (*sensu* Junk *et al.* 2014)
 147 though upland PPAs (mangroves are themselves considered PPAs, but salt marshes and
 148 hypersaline areas are not);
- 149• Permission to use salt marshes and hypersaline areas for shrimp farming (including exotic
 150 species) and salt production (10% of the area of these ecosystems can be used in the Amazon

- 151 biome and 35% in other Brazilian biomes) (see also Rovai *et al.* 2012; Oliveira-Filho *et al.*
 152 2016);
- 153● Allowing 50% of any required restoration of PPAs around ponds, lakes and perennial springs
 154 and adjacent to intermittent/permanent watercourses and *veredas* (wetlands in the *Cerrado*
 155 biome) to be done using exotic woody species (even in grassy biomes);
 - 156● Establishment of the Rural Environmental Registry (known as the ‘CAR’) with poor
 157 provisions for monitoring compliance with the rules for protection of waterbodies and
 158 wetlands, especially in the case of narrow or small aquatic ecosystems (e.g., Taniwaki *et al.*
 159 2018).

160 Recognizing the limitations and problems of the NVPL is a pressing need in the
 161 current Brazilian political scenario. Although in force since 2012, the NVPL’s ‘regulation’
 162 (setting of rules to implement a law) at the state level is still underway, offering a unique
 163 opportunity to supplant its inadequacies. Therefore, scientists and policymakers must engage
 164 in dialogue to regulate environmental legislation with evidence-based criteria (Azevedo-
 165 Santos *et al.* 2017).

166 However, the legal mechanisms provided by the NVPL, even if improved at the state
 167 level, are clearly insufficient to promote wetland conservation in Brazil. Overcoming
 168 environmental challenges imposed, for example, by climate change (Junk *et al.* 2013), high
 169 rates of wetland loss (Creed *et al.* 2017), and spread of exotic species (e.g., Stenert *et al.*
 170 2016) will require adoption of effective integrated strategies for the protection, restoration,
 171 management, creation, mapping, and monitoring of wetlands (e.g., Grasel *et al.* 2018). We
 172 emphatically recommend the creation of a national policy specifically focusing on wetland
 173 conservation.

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182 **CONFLICT OF INTEREST**

183 None.

184 **ETHICAL STANDARDS**

185 None.

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