

Short Communication

Restoration of Permanent Preservation Areas at springs in consolidated-use areas: a legal contradiction

Recomposição de APPs em áreas consolidadas em nascentes: uma contradição legal

Poliana Marília Cursino Betella^I , Maria José Brito Zakia^I ,
Maria Fernanda do Prado^{II} , Pedro Cursino Betella Gomes^I 

^IUniversidade Estadual Paulista , Botucatu, SP, Brazil

^{II}Fundação de Estudos e Pesquisas Agrícolas e Florestais, Botucatu, SP, Brazil

RESUMO

Este estudo analisa a recomposição de Áreas de Preservação Permanente (APP) em áreas de uso consolidado, conforme disposto na Lei n. 12.651/12 e suas alterações. Essa legislação define 22 de julho de 2008 como marco temporal para a caracterização de áreas rurais consolidadas, estabelecendo a diferentes faixas mínimas de recomposição obrigatória da vegetação nativa (FMRO). Para cursos d'água, a FMRO varia de 5 a 30 metros, conforme o tamanho do imóvel rural, enquanto para nascentes é fixada em 15 metros. Essa diferença pode levar a situações em que a recomposição exigida para as nascentes seja inferior à dos cursos d'água que delas se originam. Para investigar essa aparente contradição, foram simuladas interpretações legais, discutido o conceito de nascente e analisado o contexto de promulgação das alterações na lei. Conclui-se que a Lei n. 12.651/12 apresenta uma incoerência e, portanto, entende-se que a FMRO das nascentes em imóveis com mais de quatro módulos fiscais seja de 30 metros, igualando-se à dos cursos d'água.

Palavras-chave: Lei n. 12.651/12; Proteção da vegetação nativa; Área de preservação permanente

ABSTRACT

This study analyzes the restoration of Permanent Preservation Areas (PPAs) in consolidated-use areas, as provided for in Federal Law No. 12,651/2012 and its amendments. This legislation establishes July 22, 2008, as the cutoff date for the characterization of consolidated rural areas, defining different minimum restoration widths for native vegetation (MRWN). For watercourses, the MRWN ranges from 5 to 30 meters depending on the size of the rural property, while for springs it is fixed at 15 meters. This discrepancy can lead to situations where the restoration requirement for springs is smaller than that for the watercourses originating from them. To investigate this apparent contradiction, legal interpretations were simulated, the concept of a spring was discussed, and the context in which the amendments were enacted was analyzed. It is concluded that Law No. 12,651/2012 presents an internal inconsistency. Thus, it is recommended that the MRWN for springs on properties larger than four fiscal modules be set at 30 meters, equal to that of watercourses.

Keywords: Law No. 12,651/2012; Native vegetation protection; Permanent preservation area

1 INTRODUCTION

Law No. 12,651/2012 (Brasil, 2012a), which governs the protection of native vegetation, lists the areas to be conserved and regulates their use and management (Silva et al., 2018) through administrative restrictions established within its legal framework. The Native Vegetation Protection Law (NVPL) is often presented to other countries as an example to be followed (Chiavari; Lopes, 2017), owing to its well-established restrictions (Nunes et al., 2019) aimed at protecting native vegetation on private lands, which harbor approximately 53% of Brazil's remaining native vegetation (Soares-Filho et al., 2014)

The Permanent Preservation Area (PPA) is the most restrictive environmental protection instrument established by Law No. 12,651/2012. Its delimitation is unrelated to the presence or absence of native vegetation but is instead based on the preservation function associated with water resources or terrain features. Conversion to alternative land use is prohibited within these areas, and where native vegetation is absent, it must be restored.

In water-related PPAs containing a so-called “consolidated rural area” — defined as a portion of the rural property with buildings, improvements, or agrosilvopastoral

activities predating July 22, 2008 (BRASIL, 2012a) — a minimum restoration width for native vegetation (MRWN) applies.

For PPAs along watercourses, this width ranges from 5 to 30 m depending on the size of the rural property, whereas for springs it is fixed at 15 m.

It should be noted that the portion of the strip not subject to mandatory restoration does not cease to be a PPA, and its continued use is conditional on the adoption of water and soil conservation practices.

As previously noted, in establishing the MRWN, the legislator took property size into account, such that the smaller the property, the lower the required effort to restore native vegetation. To this end, the concept of the fiscal module (FM) was adopted as the unit of measurement, and a “staircase” criterion was applied to define the protective width along watercourses. This means that this width may be 5, 8, 15, or 30 m, whereas the radius around springs remains fixed at 15 m (Brasil, 2012a).

The central question is whether a spring should be considered part of the watercourse. If so, the marginal protection width would also apply to the spring; otherwise, the spring could be subject to a smaller restoration width than that required for the watercourse’s margins.

In other words, this study aims to discuss whether Law No. 12,651/2012 and its amendments present a legal contradiction by establishing a smaller MRWN for springs than that established for the watercourses originating from these same springs.

2 MATERIALS AND METHODS

The methodology, detailed below, consisted of simulating, using ArcMap version 10.2.2, two distinct interpretations (literal and systemic) of the delimitation of the Minimum Restoration Width for Native Vegetation (MRWN) for springs and watercourses, as established by Law No. 12,651/2012 and its amendments (BRASIL, 2012a). This approach was used to discuss the legal and scientific concept of a spring and the circumstances under which the amendments were enacted.

According to Article 61-A of Law No. 12,651/2012, springs and watercourses in consolidated-use areas have their restoration widths defined as shown in Table 1.

Table 1 – Delimitation of the Minimum Restoration Width for Native Vegetation (MRWN) for springs and watercourses in consolidated-use areas (Article 61-A)

Rural property size	Up to 1 FM ¹	From 1 to 2 FM	From 2 to 4 FM	From 4 to 10 FM	Greater than 10 FM
MRWN for springs	15 m	15 m	15 m	15 m	15 m
MRWN for watercourses	5 m	8 m	15 m	20 m	30 m

Source: Brasil (2012^a)

In where: FM: Fiscal Modules.

The possible interpretations of the legal provision are summarized in Chart 1. These interpretations were simulated using ArcMap software version 10.2.2, and the resulting MRWN areas for each simulation were calculated in QGIS (version 3.22) using the field calculator in edit mode, applying the expression “\$area”.

Chart 1 – Possible delimitations (P1 and P2) of the Minimum Restoration Width for Native Vegetation (MRWN) based on two interpretations of Law No. 12,651/2012

	P1: Literal interpretation	P2: Logical-systemic interpretation
Spring	MRWN fixed at 15 m.	MRWN for springs delimited at 15 m where the watercourse's MRWN is 5, 8, or 15 m, and delimited at 20 or 30 m, matching the watercourse's MRWN, for properties larger than 4 FM.
Watercourse up to 10 m wide	MRWN delimited at 5, 8, 15, 20, or 30 m depending on rural property size, in Fiscal Modules (FM).	MRWN delimited at 5, 8, 15, 20, or 30 m depending on rural property size, in FM.
ArcMap version 10.2.2 tool used to delimit the watercourse	Buffer tool configured with a flat end type (<i>buffer type flat</i>).	Buffer tool configured with round end type (<i>buffer type round</i>).

Source: Authors (2025)

In where: MRWN: Minimum Restoration Width for Native Vegetation; FM: Fiscal Module.

3 RESULTS AND DISCUSSIONS

Figure 1 illustrates the literal and systemic interpretations of the legislation: the former treats the spring as a point dissociated from the watercourse (P1), while the latter treats the spring as an integral part of the watercourse (P2).

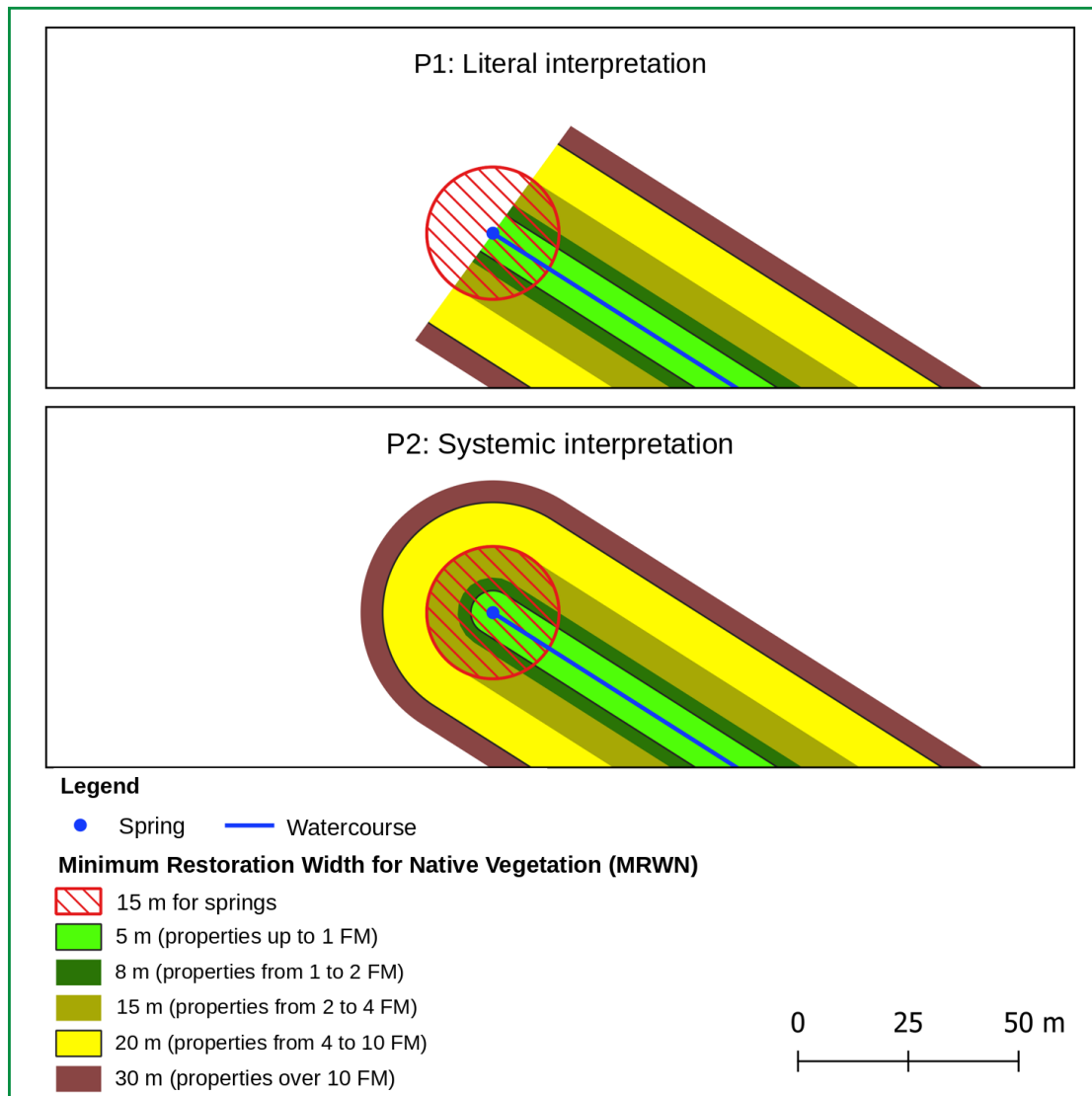
As shown, there are two possible legal interpretations for delimiting the MRWN of springs; the reasons for recommending the systemic interpretation are discussed below. The first issue concerns the legal and scientific concept of spring.

The legislation expressly defines “spring” and distinguishes it from “seep” based on whether it constitutes the origin — and therefore a part — of a watercourse (Brasil, 2012a) – “Art. 3 For the purposes of this Law, the following definitions apply: XVII – spring: a natural outcrop of the water table that is perennial and gives rise to a watercourse [...] XVIII – seep: a natural outcrop of the water table, even if intermittent.”

This legal concept is consistent with the scientific concept proposed by Felipe and Magalhães Júnior (2013), who state that *“a spring therefore encompasses the most diverse hydrological, hydrogeological, and geomorphological processes that culminate in the exfiltration of water and the formation of a watercourse”*. Thus, a spring is a complex concept that encompasses, among other processes, the origin of a watercourse from the natural outcrop of the water table.

However, the NVPL dissociated these terms by allowing the spring to have a smaller MRWN than its corresponding watercourse on properties larger than 4 FM. As a result, the MRWN for springs is smaller than that for their watercourses on rural properties larger than 4 FM, as shown in Figure 1, resulting in markedly different areas to be restored (Table 2).

Figure 1 – Possible delimitations of the MRWN¹ according to the FM² in two scenarios: considering the watercourse and spring as dissociated parts (P1), and considering the spring as an integral part of the watercourse (P2)



Source: Authors (2025)

In where: ¹Minimum Restoration Width for Native Vegetation; ²Fiscal Module.

Although their continued use is conditioned on the adoption of water and soil conservation practices (Brasil, 2012a), it can impair the functioning of the system (Bruno et al., 2016), and several authors have reported associations between the reduction of vegetation cover, driven by the increased use of consolidated areas, and the potential disappearance of springs (Bierhals et al., 2020; Pinheiro, 2016; Soares; Troleis, 2017).

Table 2 – Difference in the delimited MRWN¹ area of springs according to the number of FM² under two scenarios: considering the spring and watercourse as dissociated parts (P1), and considering the spring as an integral part of the watercourse (P2)

MRWN	Up to 1 FM	1 to 2 FM	2 to 4 FM	4 to 10 FM	Greater than 10 FM
Around springs (m) – literal interpretation	15	15	15	15	15
Along watercourses (m)	5	8	15	20	30
Around springs (m) – systemic interpretation	15	15	15	20	30

Source: Authors (2025)

In where ¹Minimum Restoration Width for Native Vegetation; ²Fiscal Module.

It should be emphasized that this study does not address whether the size of the MRWN is adequate; rather, it puts forward a recommendation for delimiting the MRWN of springs, based on the understanding that Law No. 12,651/2012 appears to contradict itself by proposing a smaller MRWN for springs than that proposed for the watercourse, as though the spring were not part of it.

A second issue worth raising concerns the discussions that preceded the enactment of Law No. 12,651/2012.

The NVPL was enacted with partial vetoes and the issuance of Provisional Measure No. 571/2012, which introduced 32 amendments to the approved text. Of these, 14 restored text that had previously been approved by the Senate, five were new provisions, and 13 were adjustments or refinements of content.

Among the new provisions were those intended to replace Article 61 of the text approved by the Chamber of Deputies, which had required the restoration of vegetation in PPAs only along rivers up to 10 meters wide, with no obligation to restore these areas along the margins of wider rivers. In the veto message, Article 61 was deemed imprecise and vague, and considered contrary to the public interest, generating substantial legal uncertainty regarding its application (Brasil,

2012c): “The proposal fails to reconcile environmental parameters with social and productive criteria, requiring restoration levels for all rural properties, regardless of their size, to be virtually identical. Such an approach disregards the unequal reality of Brazilian land distribution, where, according to the National Institute for Colonization and Agrarian Reform (INCRA), 90% of rural establishments have up to four fiscal modules and occupy only 24% of the country’s rural area.”

This led to the proposal of the so-called “staircase” approach — a graduated scale of obligations for restoring water-related PPAs based on property size and river width, introduced through Article 61-A, which is the object of analysis in the present study. This graduated scale was intended to reduce Brazil’s land-distribution inequality, as reflected in the veto message for Article 61 (Brasil, 2012c).

However, Article 61-A was incorporated into Law No. 12,651/2012 through a Provisional Measure that was converted into Law No. 12,727/2012 on the very same day in October 2012 (Brasil, 2012b). Thus, unlike the general rules of the NVPL, which were extensively debated, the amendments proposed in Provisional Measure No. 571/2012 were, in this case, issued on the very same day as the enactment and publication of Law No. 12,727/2012, as a consequence of the veto of the originally proposed Article 61.

It can therefore be inferred that the legislator did not have sufficient time to identify the contradiction — both legal and technical — arising from establishing a smaller MRWN for springs than for the watercourses originating from them on properties larger than 4 fiscal modules (FM). Table 3 summarizes the difference between the literal and systemic interpretations of the law.

Table 3 – Delimitation of the MRWN¹ for springs according to property size and the difference between the two interpretations

MRWN	Up to 1 FM	1 to 2 FM	2 to 4 FM	Greater than 4 FM
Around springs (m) – literal interpretation	15	15	15	15
Along watercourses (m)	5	8	15	30
Around springs (m) – systemic interpretation	15	15	15	30

Source: Authors (2025)

In where: ¹Minimum Restoration Width for Native Vegetation; ²Fiscal Module.

Variation in the protected width according to property size introduces instability, increasing the likelihood that water-related PPAs will lose their function (Campagnolo et al., 2017). Furthermore, the areas addressed by the NVPL are located on private properties, where native vegetation is threatened by increasing levels of land-use change and climate change (Kovach et al., 2019), resulting in increasingly prolonged periods of intermittency (Stromberg; Merritt, 2016). Nevertheless, appropriate use of the areas provided for under the NVPL can mitigate some of these effects (Tolkkinen et al., 2020).

It is therefore important to resolve possible legal contradictions, as a lack of clarity in applying the MRWN for water-related PPAs may hinder its implementation. For this reason, adoption of the systemic interpretation is recommended for the application of the MRWN.

4 CONCLUSIONS

In view of the potential legal contradiction identified, the systemic interpretation is recommended for delimiting the MRWN of springs. Accordingly, the radius used to delimit the MRWN of springs on properties larger than 4 FM and up to 10 FM should be 20 m, and 30 m for properties larger than 10 FM. For properties up to 4 FM, the MRWN remains 15 m.

ACKNOWLEDGMENTS

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

REFERENCES

- BIERHALS, D. F.; CORRÊA, B. D. L.; SIQUEIRA, T. M. Cadastro Ambiental Rural frente aos remanescentes vegetais nativos das pequenas propriedades rurais do município de Pelotas – RS. **Ciência Florestal**, [s. l.], v. 30, n. 2, p. 335, 2020.
- BRASIL. Presidência da República. Dispõe sobre a proteção da vegetação nativa. **Diário Oficial da União**, n. Lei n. 12.651, 25 maio 2012a.
- BRASIL. Presidência da República. Altera a Lei nº 12.651, de 25 de maio de 2012. **Diário Oficial da União**, n. Lei n. 12.727, 25 maio 2012b.
- BRASIL. Presidência da República. Mensagem n. 212, de 25 de maio de 2012c. **Diário Oficial da União**, n. Mensagem n. 212, 25 maio 2012c.
- CAMPAGNOLO, K.; SILVEIRA, G. L. D.; MIOLA, A. C.; SILVA, R. L. L. D. ÁREA DE PRESERVAÇÃO PERMANENTE DE UM RIO E ANÁLISE DA LEGISLAÇÃO DE PROTEÇÃO DA VEGETAÇÃO NATIVA. **Ciência Florestal**, [s. l.], v. 27, n. 3, p. 831–842, 2017.
- CHIAVARI, J.; LOPES, C. L. FOREST AND LAND USE POLICIES ON PRIVATE LANDS: AN INTERNATIONAL COMPARISON. **FOREST AND LAND USE POLICIES ON PRIVATE LANDS: AN INTERNATIONAL COMPARISON**, [s. l.], 2017.
- FELIPPE, M. F.; MAGALHÃES JUNIOR, A. P. Conflitos conceituais sobre nascentes de cursos d'água e propostas de especialistas. **Revista Geografias**, [s. l.], v. 9, n. 1, p. 70–81, 2013.
- KOVACH, R. P.; MUHLFELD, C. C.; AL-CHOKHACHY, R.; OJALA, J. V.; ARCHER, E. K. Effects of land use on summer thermal regimes in critical salmonid habitats of the Pacific Northwest. **Canadian Journal of Fisheries and Aquatic Sciences**, [s. l.], v. 76, n. 5, p. 753–761, 2019.
- NUNES, S.; BARLOW, J.; GARDNER, T.; SALES, M.; MONTEIRO, D.; SOUZA, C. Uncertainties in assessing the extent and legal compliance status of riparian forests in the eastern Brazilian Amazon. **Land Use Policy**, [s. l.], v. 82, p. 37–47, 2019.
- PINHEIRO, C. U. B. Riparian forests and conservation of water sources of the rivers Anil, Bacanga e Tibiri, Island of São Luís, Maranhão. **Revista Brasileira de Geografia Física**, [s. l.], v. 9, n. 4, 2016.
- SILVA, L. G. D.; MENDONÇA, B. A. F. D.; SILVA, E. M. R. D.; FRANCELENO, M. R. Atlantic Forest scenarios under the parameters of forestry laws. **Ciência e Agrotecnologia**, [s. l.], v. 42, n. 1, p. 21–32, 2018.
- SOARES, A. B.; TROLEIS, A. L. IMPACTOS AMBIENTAIS NA QUALIDADE DA ÁGUA DA NASCENTE PAU AMARELO EM GARANHUNS-PE. **Revista de Geografia**, [s. l.], v. 34, n. 3, 2017.
- SOARES-FILHO, B.; RAJÃO, R.; MACEDO, M.; CARNEIRO, A.; COSTA, W.; COE, M.; RODRIGUES, H.; ALENCAR, A. Cracking Brazil's Forest Code. **Science**, [s. l.], v. 344, n. 6182, p. 363–364, 2014.
- STROMBERG, J. C.; MERRITT, D. M. Riparian plant guilds of ephemeral, intermittent and perennial rivers. **Freshwater Biology**, [s. l.], v. 61, n. 8, p. 1259–1275, 2016.
- TOLKKINEN, M. J.; HEINO, J.; AHONEN, S. H. K.; LEHOSMAA, K.; MYKRÄ, H. Streams and riparian forests depend on each other: A review with a special focus on microbes. **Forest Ecology and Management**, [s. l.], v. 462, p. 117962, 2020.

Authorship Contribution

1 Poliana Marília Cursino Betella

Forestry Engineer, MSc. in Forestry Science

<https://orcid.org/0000-0002-4773-6782> • poliana.betella@unesp.br

Contribution: Writing – original draft preparation

2 Maria José Brito Zakia

Forestry Engineer, Doctor in Environmental Engineering Sciences

<https://orcid.org/0000-0002-9920-6230> • zeze.zakia@gmail.com

Contribution: Writing – review & editing

3 Maria Fernanda do Prado

MSc. in Biodiversity Conservation and Sustainable Development

<https://orcid.org/0009-0008-2117-1729> • feprado1@gmail.com

Contribution: Data curation; Methodology

4 Pedro Cursino Betella Gomes

Forestry Engineer

<https://orcid.org/0000-0002-2583-4955> • pedro.cursino@unesp.br

Contribution: Data curation; Writing – review & editing

How to quote this article

BETELLA, P. M. C.; ZAKIA, M. J. B.; PRADO, M. F.; GOMES, P. C. B. Restoration of Permanent Preservation Areas at springs in consolidated-use areas: a legal contradiction. **Ciência Florestal**, Santa Maria, v. 36, e92205, p. 1-12, 2026. DOI 10.5902/1980509892205. Available from: <https://doi.org/10.5902/1980509892205>. Accessed in: day month abbr. year.

Data Availability Statement:

Datasets related to this article will be available upon request to the corresponding author.

Evaluators in this article:

Prof. Dr. Djoney Procknow, *Section Editor*

Editorial Board:

Prof. Dr. Cristiane Pedrazzi, *Editor-in-Chief*

Prof. Dr. Dalton Righi, *Associate Editor*

Miguel Favila, *Managing Editor*