

From: [Cnty 2025 Comp Plan](#)
To: tim@futurewise.org
Cc: [Oliver Orjiako](#); [Jose Alvarez](#); [Rebecca Messinger](#)
Subject: FW: Comments for TDR Work Session March 18
Date: Monday, March 16, 2026 3:31:00 PM
Attachments: [Outlook-obd1iv4m](#)
[Outlook-uf15xd5r.png](#)
[BrabecSmith2002 effectiveness of PDR TDR & Clustering.pdf](#)
[Guide for authors - Landscape and Urban...9-2046 ScienceDirect.pdf](#)
[image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)

Good day, Tim,

Confirming receipt of the additional enclosures.

These will be added to the public comment included in the Comprehensive Plan Index of Record.

Best,



Jeff Delapena
Program Assistant
COMMUNITY PLANNING

564.397.4558



NOTICE OF PUBLIC DISCLOSURE: This e-mail account is public domain. Any correspondence from or to this e-mail account may be a public record. Accordingly, this email, in whole or in part may be subject to disclosure pursuant to RCW 42.56, regardless of any claim of confidentiality or privilege asserted by an external party.

From: Tim Trohimovich <Tim@futurewise.org>
Sent: Monday, March 16, 2026 3:24 PM
To: Cnty 2025 Comp Plan <comp.plan@clark.wa.gov>; Jeffrey Delapena <Jeffrey.Delapena@clark.wa.gov>; Rebecca Messinger <Rebecca.Messinger@clark.wa.gov>; Glen Yung <Glen.Yung@clark.wa.gov>; Michelle Belkot <Michelle.Belkot@clark.wa.gov>; Wil Fuentes <Wil.Fuentes@clark.wa.gov>; Matt Little <Matt.Little@clark.wa.gov>; Sue Marshall

<Sue.Marshall@clark.wa.gov>

Subject: Re: Comments for TDR Work Session March 18

EXTERNAL: This email originated from outside of Clark County. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear County Councilors:

I apologize for the two emails. I forgot the enclosure. Here it is.

Sorry for any confusion this may have caused.

Tim Trohimovich, AICP
Director of Planning & Law
Futurewise
1201 3rd Ave #2200, Seattle, WA 98101
(206) 343-0681
tim@futurewise.org

From: Tim Trohimovich <Tim@futurewise.org>

Sent: Monday, March 16, 2026 2:21 PM

To: Cnty 2025 Comp Plan <comp.plan@clark.wa.gov>; Jeffrey Delapena <jeffrey.delapena@clark.wa.gov>; Rebecca Messinger <rebecca.messinger@clark.wa.gov>; Glen Yung <glen.yung@clark.wa.gov>; Michelle Belkot <michelle.belkot@clark.wa.gov>; Wil Fuentes <wil.fuentes@clark.wa.gov>; Matt Little <matt.little@clark.wa.gov>; Sue Marshall <sue.marshall@clark.wa.gov>

Subject: Comments for TDR Work Session March 18

Dear County Councilors:

Enclosed please find Futurewise's comments on transfer of development rights and urban growth area expansions for the March 18, 2026, Work Session and a supporting document. Thank you for considering our comments.

If you need anything else, please contact me.

Tim Trohimovich, AICP (he/him)

Director of Planning & Law



Futurewise

1201 3rd Ave #2200, Seattle, WA 98101

(206) 343-0681

tim@futurewise.org

futurewise.org

connect: [!\[\]\(e474458956c9a37fbf9586ddb60a7fa1_img.jpg\)](#) [!\[\]\(4d1d3f2547aeece54bb6babd23f4121b_img.jpg\)](#)



1201 3rd Ave Suite 2200, Seattle, Washington 98101
p. (206) 343-0681
futurewise.org

January 16, 2026

The Honorable Sue Marshall, Council Chair
Clark County Council
PO Box 5000
Vancouver, Washington 98666-5000

Dear Council Chair Marshall and Councilors Yung, Belkot, Fuentes, and Little:

Subject: Comments on transfer of development rights and urban growth area expansions for the March 18, 2026, Work Session

Sent via email: comp.plan@clark.wa.gov; jeffrey.delapena@clark.wa.gov;
rebecca.messinger@clark.wa.gov; glen.yung@clark.wa.gov;
michelle.belkot@clark.wa.gov; wil.fuentes@clark.wa.gov;
matt.little@clark.wa.gov; sue.marshall@clark.wa.gov;

Thank you for the opportunity to comment on transfer of development rights programs and urban growth area expansions. Futurewise works throughout Washington State to support land-use policies that encourage healthy, equitable and opportunity-rich communities, and that protect our most valuable farmlands, forests and water resources. We have members across Washington State including Clark County.

Well designed transfer of development rights programs can effectively conserve working farms.¹ So we support the adoption of a transfer of development rights program after the adoption of the current comprehensive plan and development regulations update, which is now months overdue, and before the next update.²

¹ Elizabeth Brabeca and Chip Smith, *Agricultural land fragmentation: the spatial effects of three land protection strategies in the eastern United States* 58 *LANDSCAPE AND URBAN PLANNING* 255, pp. 266 – 67 (2002) last accessed on March 16, 2026, at: https://www.researchgate.net/publication/223756891_Agricultural_Land_Fragmentation_The_Spatial_Effects_of_Three_Land_Protection_Strategies_in_the_Eastern_United_States and enclosed with this letter with the filename: “BrabecSmith2002 effectiveness of PDR TDR & Clustering.pdf.” *Landscape and Urban Planning* is a peer reviewed journal. *Landscape and Urban Planning* Guider for Authors last accessed on March 16, 2026, at: <https://www.sciencedirect.com/journal/landscape-and-urban-planning/publish/guide-for-authors> and at the link on the last page of this letter with the filename: “Guide for authors - Landscape and Urban...9-2046 _ ScienceDirect.pdf.”

² RCW 36.70A.130(1)(a), (5)(b).

Re: Comments on transfer of development rights and urban growth area expansions for the March 18, 2026 Work Session

March 16, 2026

Page 2

However, a transfer of development rights program cannot be used as an excuse to expand urban growth areas or dedesignate agricultural lands of long-term commercial significance.³ Interlocal agreements between the County and a city or cities also cannot be used as an excuse to expand urban growth areas or dedesignate agricultural lands of long-term commercial significance. That is because interlocal agreements must comply with state law.⁴ Further, interlocal agreements cannot override state law.⁵

That transfer of development rights programs cannot justify urban growth area expansions is particularly true where there is no need to expand the urban growth areas. A comparison of the total 2023-2045 housing unit needs in the *2025 Population, Housing and Employment Allocation – Issue Paper 5* with the “2023 VBLM Capacity” shows that existing capacity can accommodate or is within a few housing units of accommodating the planned housing growth.⁶ And the cities and unincorporated urban growth areas will likely need to increase their capacity for low-rise multifamily and mid-rise multifamily dwellings to meet the affordable housing requirements which will increase the housing capacity in the cities and unincorporated urban growth areas.⁷ Further, Vancouver, Camas, and Washougal

³ *Orton Farms, LLC, et al. v. Pierce County*, Central Puget Sound Growth Management Hearings Board (CPSGMHB) Case No. 04-3-0007c, Final Decision and Order (Aug. 2, 2004) at pp. 36 – 37, 2004 WL 3275228 pp. *28 – 29 (footnote omitted); *Friends of Agriculture v. Grant County*, Eastern Washington Growth Management Hearings Board (EWGMHB) Case 05-1-0010, Final Decision and Order (March 14, 2006) at p. *10, 2006 WL 1370957 p. *7 quoting from *Orton Farms; Town of Friday Harbor, Fred R. Klein, John M. Campbell, Lynn Bahrych, et al. v. San Juan County*, Western Washington Growth Management Hearings Board (WWGMHB) Case No. 00-2-0062c, Order on Compliance and Invalidity Re: Resource Lands Redesignation (March 28, 2002), p. *5, 2002 WL 599680 p. *3 (March 28, 2002) (“we will start with the presumption of validity that would attach to any de-designation of resource lands, examine the record to ensure that it contains sufficient analysis that the appropriate GMA criteria (conservation imperative) was applied, and make our determination based upon the presumption of validity and the record under the clearly erroneous standard.”)

⁴ *Exendine v. City of Sammamish*, 127 Wn. App. 574, 585 fn. 21, 113 P.3d 494, 499 (2005), as amended on denial of reconsideration (May 31, 2005), publication ordered (June 6, 2005).

⁵ *Id.*

⁶ Clark County Comprehensive Plan 2025 Update Planning for growth 2025 – 2045 *2025 Population, Housing and Employment Allocation – Issue Paper 5* prepared by Community Planning p. 5; Clark County 2025 Allocation based on VBLM and HAPT Method A p. *1 last accessed on March 16, 2026, at: https://clark.wa.gov/sites/default/files/media/document/2024-02/Allocation%20Housing_Method%20A.pdf and at link on the last page of this letter with the filename: “Allocation Housing_Method A.pdf.”

⁷ Washington States Department of Commerce, Local Government Division Growth Management Services, *Guidance for Updating Your Housing Element: Updating your housing element to address new requirements* p. 36 (Aug. 2023, updated Jan. 2026) last accessed on Feb. 16, 2026, at:

Re: Comments on transfer of development rights and urban growth area expansions for the March 18, 2026 Work Session

March 16, 2026

Page 3

were required to adopt their new middle housing zoning by December 31, 2025, further increasing their housing capacity.⁸ So, there is no need and no legal authority to expand the county's urban growth areas.⁹

Thank you for considering our comments. If you require additional information, please contact me at telephone 206-343-0681 or email: tim@futurewise.org.

Very Truly Yours,



Tim Trohimovich, WSBA No. 22367
Director of Planning & Law

Enclosures at this link:

<https://futurewiseorg.sharepoint.com/:f:/g/IgAIkOZVzGs9QYtZ5F3NHbVpAfX-IUuvva5bsIfPoIDLFgA?e=Ak8iso>

<https://www.commerce.wa.gov/growth-management/housing-planning/housing-guidance/> and at the link on the last page of this letter with the filename: "1220_Book2_Housing Element Update_230823_Final_updated_260112.docx."

⁸ Washing State Department of Commerce Middle Housing Update Deadlines last accessed on March 16, 2026, at: <https://deptofcommerce.app.box.com/s/bv7go3x1h176hwy2lgm8chraykr8ki5o> and at the link on the last page of this letter with the filename: "Middle Housing Update Deadlines by Year - Updated May 2025.pdf."

⁹ *Thurston County v. Western Washington Growth Management Hearings Bd.*, 164 Wn.2d 329, 351 – 52, 190 P.3d 38, 48 – 49 (2008).



ELSEVIER

Landscape and Urban Planning 58 (2002) 255–268

LANDSCAPE
AND
URBAN PLANNING

www.elsevier.com/locate/landurbplan

Agricultural land fragmentation: the spatial effects of three land protection strategies in the eastern United States

Elizabeth Brabec^{a,*}, Chip Smith^b

^a*School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI 48107, USA*

^b*Land Ethics Inc., 201 E. Liberty, Suite 16, Ann Arbor, MI 48104, USA*

Abstract

Fragmentation of agricultural land by urban sprawl affects both the agricultural production capacity of the land and its rural scenic quality. In order to assess the resulting fragmentation of the three most common types of agricultural land conservation tools in the United States, this study analyzes the spatial form of three land protection strategies: a purchase of development rights (PDR) program, a clustering program and a transfer of development rights program. By assessing a series of measures of success such as total acreage protected, size of parcels, contiguity and farming status, the study compares the effectiveness of programs that have been in place for approximately 20 years, analyzing the extent to which each program prevents or enhances fragmentation. The analysis shows that although the number of acres protected is an important factor in program success, the amount of protected land remaining in active farming is additionally influenced by any development rights that may remain with the land, the use of a variety of tools to reduce the likelihood of parcel isolation, and the adjacency and contiguity of protected parcels. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Land conservation; Agriculture; Land protection; Metropolitan agriculture; Fragmentation; Urban sprawl

1. Introduction

Urban sprawl, caused by the continued flight of homeowners out of cities to relatively inexpensive land and housing in the urban fringe, has placed a tremendous pressure on farmland resources in the United States (Heimlich and Brooks, 1989). With the fragmentation of farms in the urban fringe has come a loss of the traditional farming economic base, and a change in the character and visual quality of rural communities (Heimlich, 1989; Lapping et al., 1989). To combat this loss and fragmentation of farmland, many communities in urbanizing areas of the United States

are adopting a variety of tools to protect farms, farmland and the rural landscape. The primary responses by communities have been two-pronged: governmental or non-profit agencies purchase significant tracts of land, and local governments impose zoning and other regulatory requirements on the development of the land (American Farmland Trust, 1997). While analysis of the numbers of acres protected by each type of tool has been completed in the past, the varying effects on fragmentation of these regulatory and acquisition programs have not been analyzed or compared (Daniels, 1997).

The issues for farmland fragmentation are two-fold. First, there is the issue of regional fragmentation: the erosion of the farmland base leading to a loss of sufficient farm support operations and facilities, which raise operating costs (Lapping, 1979; Pfeffer and

* Corresponding author. Tel.: +1-734-623-0200;

fax: +1-734-623-7886.

E-mail address: ebrabec@umich.edu (E. Brabec).

Lapping, 1995). Second is the issue of parcel fragmentation:

“Development in rural/urban fringe areas creates other farm management problems. Without strict zoning regulations farmland often becomes parcelized as entire farms or parts of farms are sold to developers. This parcelization of farmlands leads to a “checkerboard distribution of farmlands, i.e. many noncontiguous fields. Farming such scattered plots is problematic. For example, field surveillance to monitor crop growth and pest populations is difficult, as is the movement of farm equipment because of transportation problems. Under these conditions consolidation of landholdings to achieve efficient scales of operation is nearly impossible.” (Pfeffer and Lapping, 1995, p. 85)

This study examines the use of the three dominant land conservation tools used in the urban fringe and urbanizing rural areas—transfer of development rights, purchase of development rights (PDR) and cluster development—to determine the effect of each type of program on fragmentation of agricultural land. The following analysis provides a brief description of each land preservation program, a history of the program in each community and then the results of the spatial analysis conducted for the targeted agricultural land.

2. A description of the programs reviewed

Three communities were chosen in the eastern United States as case studies for analysis: Montgomery County, Maryland, and the towns of Riverhead and Southampton on Long Island, in New York state. These communities were chosen based upon three primary factors which affect the ability to assess the long-term effects of a land protection strategy. First, all three have had active farmland preservation strategies and tools in place for approximately 20 years, a sufficient period of time to develop a clear analysis of the impact of the tools on the farmland resource. Secondly, while all three communities use a variety of land conservation tools, each community’s strategy relies significantly on one tool as the major leader in protection efforts: Montgomery County, Maryland relies primarily on transfer of development rights;

Riverhead, New York on PDR; and Southampton, New York on cluster development. Thirdly, all three communities have active farming economies located in or on the fringe of major metropolitan areas, therefore, each farmland protection strategy and its tools must deal with significant development pressures.

2.1. *Transfer of development rights in Montgomery County, Maryland*

A transfer of development rights (TDR) program is typically a broadly applied, regional program which defines an area to be protected from development (sending area) and an area where development will be allowed to occur (receiving area). Since the program allows landowners to transfer the rights to develop one parcel of land to another parcel of land, the parcel from which the development rights are being transferred can no longer be developed, or developed only in a limited way.

In theory, a TDR program that is mandatory in the sending area should result in a low rate of farmland fragmentation. Since all of the parcels in the sending area transfer development rights outside of the area, little to no fragmentation should result. Thus, TDR programs have been touted as a primary tool for protecting agricultural land (Lapping et al., 1989; Merriam, 1978).

In 1980, Montgomery County became one of the first municipalities in the nation to adopt a countywide TDR program for agriculture preservation through its 1980 master plan (M-NCPPC, 1980). The county articulated a number of public policies underlying the TDR program, among them: a desire to control public costs associated with sprawl by channeling growth to existing population centers and setting aside lands for agriculture preservation; a goal of ensuring the continued viability of farming for regional food supplies; and a desire to maintain rural open space and the rural character of the area (M-NCPPC, 1980).

The county delineated an agricultural reserve (the sending area) of approximately 96,000 acres in the northern portion of the County. The extent of the agricultural reserve was based on soil quality, existing agricultural use, amount of existing development, size of farm parcels, and the threat of projected future development (M-NCPPC, 1980) with the goal of preserving a “critical mass” of farmland. Within the

boundaries of the reserve, the TDR program was mandatory, and created easement restrictions on property from which development rights were transferred. In establishing the program, the county allowed landowners to sell development rights at the rate of one development unit per 5 acres, but decreased the allowable building density in the sending area to 1 unit per 25 acres (Montgomery County Code, 1997, Article 28, Section 59-C-9.6). The county allotted one development right for every 5 acres of land (no fractional development rights) regardless of the quality of land, proximity to existing development, or other factors. Once a landowner transferred the development rights, the county acquired a permanent easement on the land, limiting residential development and restricting that parcel to agricultural uses except for the residual 1 unit per 25 acres which the landowner retained (M-NCPPC, 1980).

The county created approximately 15,000 development rights on land within the Agriculture Reserve. As of 1997, 6629 development rights had been removed from the underlying parcels and 5123 transferred to receiving areas (leaving 1506 development rights that had been removed, but not transferred). Approximately 2170 development rights remain attached to the underlying land in the form of small, pre-existing parcels or the 1 unit per 25 acres underlying right the county permits for actual development in the area.

Today the county's active farms are primarily located in the northern portion of the county, in the agricultural reserve. Agricultural production remains a strong segment of the economy in Montgomery County, with approximately US\$ 28.6 million of agricultural products produced in 1997, up from US\$ 27.7 million in 1992 (US Census, 1997). Crops, including field and nursery crops, are the major agricultural land use with a value of almost US\$ 20 million in 1997 (US Census, 1997). Field analysis indicates that these crops are predominantly cereal and grain crops, with nursery and row crops composing a minor portion of the production. Livestock production, although still a strong component of the agricultural economy, is valued just under US\$ 9 million (US Census, 1997).

Of the approximately 96,000 acres that make up the agricultural reserve in Montgomery County, 30,062 acres are protected under the TDR program, alongside an additional 15,000 acres of public lands and 9058

acres of land protected under the county's other four preservation tools (see Fig. 1). Judging from these figures, the TDR program has been the most aggressive in terms of preserving the farmland base in the county and provides a point of comparison for the predominant PDR program in Riverhead and the Southampton cluster development program.

2.2. *Purchase of development rights in the town of Riverhead, New York*

A PDR program typically uses public funds—tax revenues or municipal or state bonds—to fund the purchase and retirement of development rights on agricultural land. They are a commonly used farmland preservation tool, and are touted as being highly efficient at farmland retention (Lapping et al., 1989), equitable for landowners (Daniels, 1991), and generally a permanent preservation solution (Daniels, 1991). Since the tool is voluntary on the part of the landowner, a PDR program does not hold the inherent protection against fragmentation of a TDR program. In addition, the tool's most often cited drawback is its expense (Daniels, 1991; American Farmland Trust, 1997; Nelson, 1994), therefore, its potential to avoid fragmentation is tied to the amount of public funds that are available for development rights purchase.

The town of Riverhead is an historic agricultural community on the eastern end of Long Island. Riverhead has abundant, high quality agricultural soils and is one of the most important agricultural areas in New York state. However, thus far, Riverhead has experienced only a fraction of the tourism and resulting resort economy that has come to define Southampton, located on its southeastern border. Of Riverhead's more than 46,000 acres, and 16,862 acres are in agricultural use, although only 14,584 acres are zoned for agriculture. Approximately 12,300 acres, or 84% of the agricultural zone, are currently engaged in agricultural production, while the remainder are engaged in other uses such as golf courses, camps and private hunting reserves.

Riverhead's agricultural economy is focused primarily on row crops and nurseries. Of the total land in agricultural production, 1970 acres are in nursery production, 1924 in potatoes, 3211 in row crops and 1610 in sod. According to the 1997 census for the

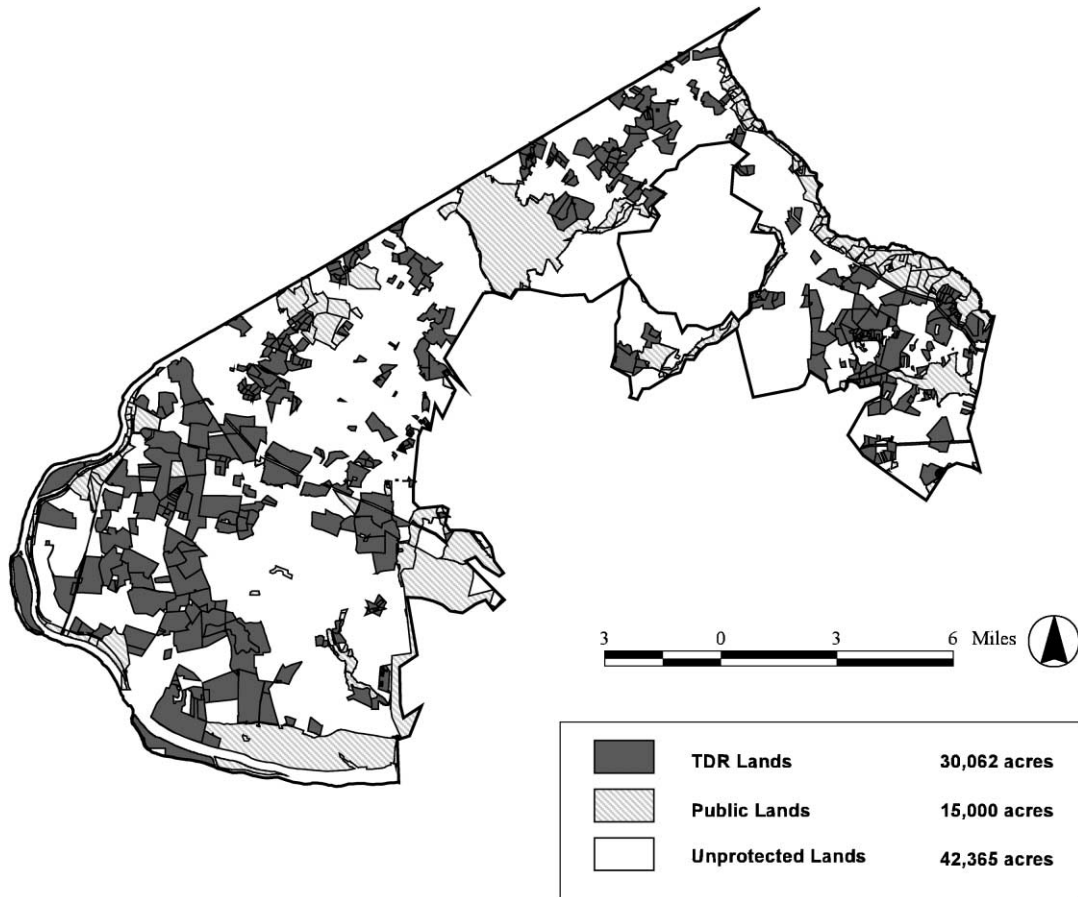


Fig. 1. Montgomery County's agricultural reserve area showing protected and unprotected lands.

entire area of Suffolk County, the agricultural economy relies on crop production, which includes potatoes, vegetables and orchards. The number of farms producing livestock is very small, producing only US\$ 12 million compared to the US\$ 155 million produced by crops (including nursery and greenhouse crops).

Unlike its neighbor Southampton, Riverhead depends primarily upon the Suffolk County PDR program to preserve agricultural land (see Fig. 2). Though Riverhead has established a town PDR program, the town has only purchased the development rights on two agricultural parcels. By contrast, the county PDR program has purchased the development rights on 70 parcels, preserving 3889 acres to the 61.5 acres preserved through the town program. Other tools have not been used effectively in Riverhead's strategy

to add to the protected pool of farmland. Local land trusts have not been active in Riverhead in the purchase of farmland or farmland development rights as they have in Southampton. While, the town has a transfer of development rights program on the books, it is not mandatory in the sending area, and the town has only designated a very small receiving zone, resulting in the lack of use of this tool.

The county PDR program, one of the nation's first PDR program, was implemented in 1977 (American Farmland Trust, 1997). According to the Suffolk County Planning Department, between 1977 and 1996, US\$ 40 million was spent to fund the acquisition of development rights, preserving over 7000 acres of land in the county. Another US\$ 9 million was spent in conjunction with partnerships between Suffolk County, town governments and non-profits to purchase

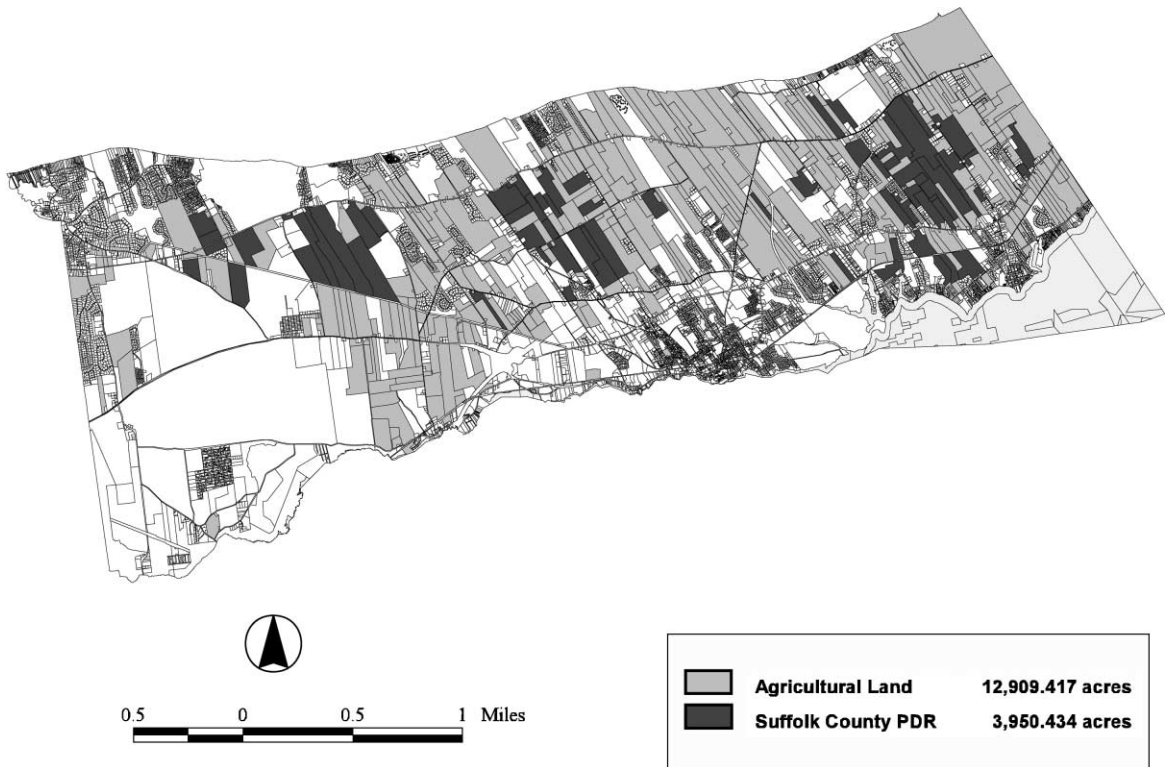


Fig. 2. The town of Riverhead showing extent of agricultural land, along with county PDR parcels.

development rights and conservation easements (Suffolk County Planning Department, 2000). The amount of land preserved in Riverhead by the county PDR program represents more than half of the total land preserved in the county through the program.

The county program used five factors in determining where to buy development rights: soils, current land use, contiguity of farmland, development pressure and the price of land (Suffolk County, 1996). Highest priority for acquisition was given to land in designated county Agricultural Districts, parcels over 10 acres in size and those with high-quality agricultural soils. In addition, parcels under consideration for purchase must have been engaged in active farming for at least 2 years prior to purchase.

2.3. Cluster program in Southampton, New York

In contrast to the regional focus and planning inherent in transfer and PDR programs, cluster development programs typically deal with development on

a site by site basis. While cluster programs may be mandated in a prescribed geographical area, development and preservation decisions are made on an individual site basis, providing the opportunity for significantly more fragmentation than in transfer or purchase programs, a tendency noted in previous reviews (Arendt, 1997; American Farmland Trust, 1997). Cluster programs work with the underlying zoning density, reducing minimum lot sizes and requiring that a portion of the site remain as open space. Obviously, the percentage of open space required to be set aside in any cluster program is a major determining factor in the overall effectiveness of that program, as is whether the program is mandatory or voluntary, and the degree of discretion granted to the statutory review body. In terms of the potential for fragmentation, the question of whether protected open space on adjacent clusters is contiguous is critical.

Fragmentation of the remaining open space into a patchwork that has limited use as agricultural land or

habitat is also a critical issue (Whyte, 1964; Arendt et al., 1994; Dramstad et al., 1996). Although, it is a very popular tool, clustering is not regarded by farmland protection advocates as a front-line means to protect agricultural land bases (Arendt, 1997; American Farmland Trust, 1997). Previous reviews have suggested that clustering may be better designed for preserving niche farms on the urban fringe that produce high-value specialty crops for sale to urban areas (Arendt, 1997) and as a means to protect rural character and scenic quality (Daniels, 1997; Arendt, 1991), even though clustering may produce development results that are visually and functionally incompatible with surrounding land uses (Arendt, 1991).

The town of Southampton, located on the eastern end of Long Island, has been an agricultural community since its settlement in the late 1600s. By the 1970s, tourism and second home development were beginning to fragment the existing farming areas. Mandated in the 1970 master plan for the town, residential clustering was adopted in 1979 and substantially revised in the early 1980s. The town defined an agricultural overlay district, that coincided with the concentrations of agricultural land in the town and prime agricultural soils. By mandating the use of planned residential development (PRD) subdivisions within the agricultural overlay district, the town granted the planning board the discretion to require that a subdivision cluster the development units on the portion of the parcel containing the least productive soils. The percentage of open space to be set aside in

Table 1

Prime agricultural soil preservation guidelines in the town of Southampton for the various development densities allowed in the agricultural overlay zone (Town of Southampton, 1989)

Zone	Minimum lot size requirements	Required percentage of prime soil preservation (%)
R-10	0.23 ac	35
R-15	0.34 ac	35
R-20	0.46 ac	35
R-40, CR-40	0.92 ac	35
R-60, CR-60	1.37 ac	35
CR-80, R-80	1.84 ac	50
CR-120, R-120	2.75 ac	65
CR-200	4.59 ac	65

the subdivision was governed by a sliding scale based on the minimum lot size of the underlying zoning (see Table 1).

Despite intense development pressure, farming continues in the town. Paradoxically perhaps, the most important farming areas are also located in the areas of highest land value located in the southeastern portion of the town adjacent to the prime beaches, comprising the highly desirable resort hamlets of Sagaponack, Bridgehampton and Water Mill. Cropping patterns provide evidence of the shift from traditional farming to metropolitan niche farming: row crops, particularly potatoes are being edged out by truck farming and nurseries as the predominant agricultural products.

Land in the agricultural overlay zone in the town of Southampton is protected under three different

Table 2

A breakdown of protected land by acres in the agricultural overlay zone, town of Southampton

Land type or protection tool	Total acres	Percent of total area	Average parcel size (acres)
Total land in farming use	6397.1	48.8	11.0
Total protected	2274.6	17.8	18.5
Subdivision reserve areas	755.7	5.8	13.7
County PDR	669.4	5.1	30.4
Town PDR	757.1	5.8	30.3
Local land trusts	149.1	1.1	3.4
Unprotected	4122.5	31.0	8.2
Total land not in farming use	6704.2	51.1	–
Protected	97.8	0.9	8.9
Developed and vacant land	6575.6	50.0	1.7
Public land	30.8	0.2	1.6
Total agricultural overlay	13101.3	100	–

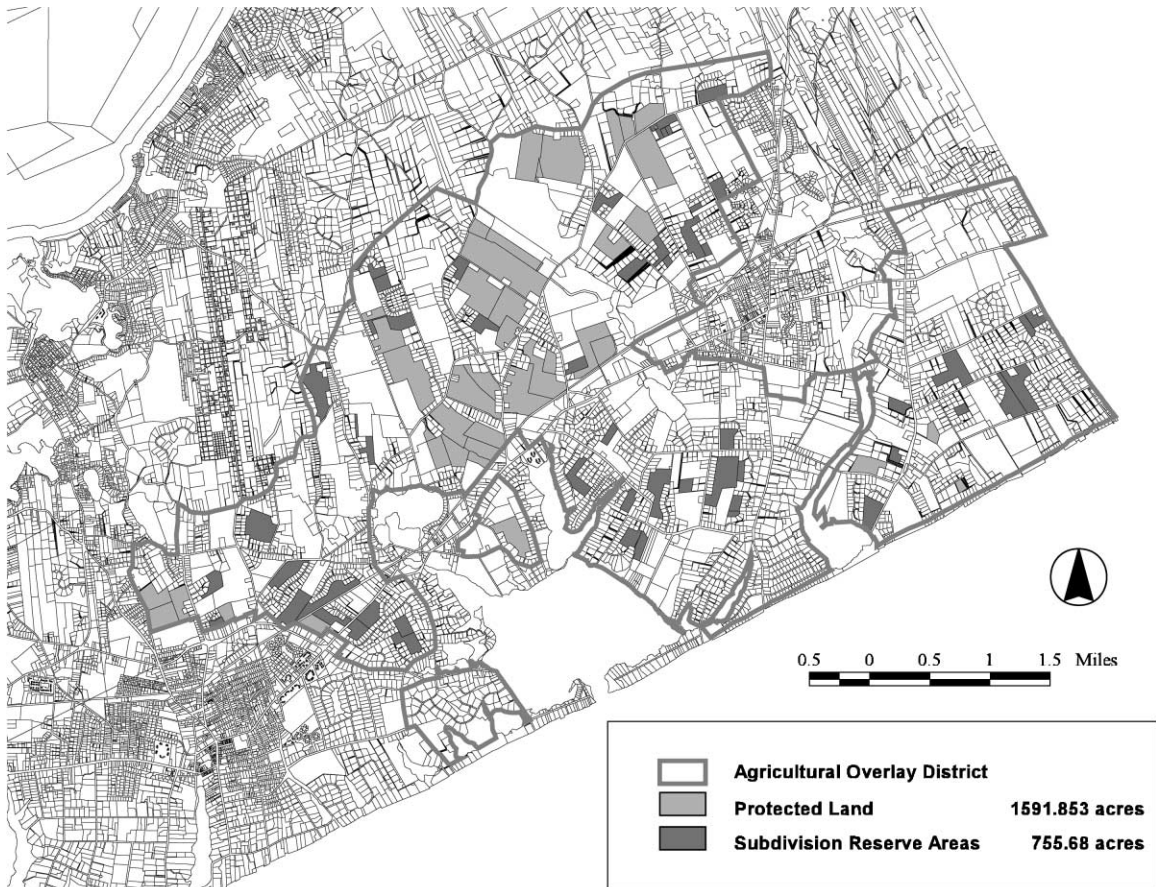


Fig. 3. The agricultural overlay zone in the eastern portion of the town of Southampton showing protected land and subdivision reserve areas.

tools: planned residential development (cluster), county and town PDR, and local land trusts. As of 1997, total preserved land accounted for 18% (2372 acres) of the total land acreage within the agricultural overlay, while unprotected land accounted for 4123 acres, or 31%. The remaining 6576 acres (50%) were developed (see Fig. 3 and Table 2).

3. The effects of the three programs on resource fragmentation

In order to compare the effect of the land protection tools and programs on fragmentation of the farmland resource, each major tool was analyzed according to the two major issues of fragmentation: (1) the erosion of the farmland base leading to a loss of sufficient farm

support operations and facilities; and (2) the issue of parcel fragmentation. These two issues give rise to three measures or indicators of fragmentation in the resource, described below.

First, to assess the issue of the erosion of the farmland base, the total number of acres protected by the program was determined according to each of its associated tools. In order to allow the comparison of programs with widely differing amounts of resource land, this number was compared to the total number of acres of targeted land, giving a relative percentage of land protected.

Second, to assess the issue of parcel fragmentation, two measures were analyzed: parcel size and parcel contiguity. The average protected parcel size was assessed as a key indicator of the continued viability of the protected parcels for farming. Parcel size is an

indicator for large-scale, traditional farming enterprises, and is often relied upon as an indicator of fragmentation and degradation of the resource (Daniels, 1997; Gerard, 1984). However, in metropolitan fringe areas, there is some indication that parcel size may not be as important an indicator of continued farm production, due to a change in focus from field crops to high yield specialty crops (Pfeffer and Lapping, 1995; Scarfo, 1990).

Contiguity, or the degree to which the protected parcels connect to other protected parcels, creating a large agglomeration of land available for farming (Lapping et al., 1989) is a key measure of fragmentation. Other reviewers have noted that isolated farm parcels that are not contiguous with other farmed parcels often experience negative impacts such as complaints from neighbors and lack of support that negatively affect farming operations (Bryant and Johnston, 1992; Scarfo, 1990) in addition to the management issues associated with farming isolated parcels of land.

Finally, to test the effects of fragmentation on active farming, all protected lands for the three major tools were checked for active farming status through a field inventory conducted during the summer of 1999.

3.1. Regional fragmentation: total acreage protected

The three tools show a wide variety in the total number of acres protected over the lifetime of the program (see Table 3). However, since the total acreage targeted for protection in each jurisdiction varies so dramatically, the percent of the total acreage protected and the average acres protected per year provide a clearer indication of the preservation potential of each program.

In these respects, the TDR and PDR programs are the clear forerunners, protecting 31 and 23% of their

respective land areas over the life of the program (see Table 3). However, when comparing the average acres protected per year, the TDR program at 1768 acres to the PDR program's 195 acres illustrates the TDR program's potential to protect large acreages of farmland. The cost of acquiring the development rights to large amounts of farmland (to acquire the amount of farmland preserved under Montgomery County's TDR program would require an almost 10-fold increase over the Riverhead totals) could make the goal of preservation almost prohibitive. It is interesting to note that in Montgomery County, an additional 10% of the land base (9058 acres) above that protected by TDR has been protected through the use of state and county PDR programs. The failure of clustering to protect a significant amount of the farmland base is underscored by the small amount (6%) protected in the Southampton program.

3.2. Parcel fragmentation

3.2.1. Size of parcels

Parcel sizes vary widely under the three tools, again with the TDR and PDR programs showing the most congruency. The greatest difference between these two tools is in the size of unprotected parcels, which in Montgomery County was 47.7 acres and in Riverhead, 28.5 acres. This reflects the fact that the PDR program has targeted the largest parcels for protection, leaving many of the smaller parcels for either future protection or development.

Pre-protection parcel sizes are relevant to the analysis only in terms of comparison between the cluster program and the other two programs. In Southampton, pre-protection parcel sizes ranged from the smallest at 6.6 acres to the largest at 71 acres. The mean pre-development or pre-protection parcel size was 37 acres, compared to 74.1 in Montgomery County

Table 3

Comparison of land protection achieved in acres for the three preservation programs: transfer of development rights, PDR and cluster

Program	Date of program inception	Total acreage targeted for protection ^a	Protected acreage ^b	Percent of total acreage protected (%)	Average acres protected per year
TDR, Montgomery County	1980	96485	30062	31	1768
PDR, Riverhead	1977	16862	3889	23	195
Cluster, Southampton	1979	13093	771	6	41

^a Acreage contained within the target protection zone.

^b Acreage permanently protected by the program: TDR by 1997, PDR by 1999; cluster by 1998.

Table 4

Comparison of parcel sizes across the three programs: transfer of development rights, PDR and cluster

Program	Affected parcel size		Unprotected parcel size ^a (mean acres)
	Pre-development or protection (mean acres)	Protected (mean acres)	
TDR, Montgomery County	74.1	74.1	11.3
PDR, Riverhead	51.1	51.1	37.5
Cluster, Southampton	37.0	13.7	8.5

^a Parcels in agricultural use.

(50% larger) and 51.1 acres in Riverhead (28% larger). In Southampton, the relatively small pre-development parcel size exacerbated the results of the mean protected development parcel. At 13.7 acres, the mean protected development parcel was less than half the size of the original parcel (see Table 4). Loss of parcel size is an inherent result of the clustering tool since only a portion of the affected parcel is protected from development, while in TDR and PDR, the entire affected parcel is protected.

3.2.2. Contiguity

Contiguity with other protected land can be an important factor in the long-term farming status of a particular parcel of land. In addition to the measure of adjacency of protected land is the question of how the tools and coordinated farmland protection strategies achieved an aggregation of protected parcels across the targeted protection area. Two measures are key: adjacency of a protected parcel with another protected parcel, and secondly, the extent to which

those protected parcels form a large mass of contiguous protected land. In assessing the results of the aggregations, the key factor is the average size of the resulting aggregations (see Table 5) and the overall percentage of protected land that remains isolated from other protected land (see Table 6).

In reviewing the adjacency of protected parcels in the three programs, the TDR and PDR showed the strongest results, with 91 and 75% of parcels adjacent to other protected parcels under the same program (see Table 7). In Southampton, only 36% of the protected parcels were adjacent to other subdivision reserve areas, and 46% were adjacent to only unprotected parcels. This result illustrates the failure of discretionary review to ensure contiguous protected land in a cluster program. Exacerbating the issue of adjacency in Southampton, 17% of the protected parcels (8 of the 47 subdivision reserve areas) were completely surrounded by residential subdivisions.

Due to its large target protection area, Montgomery County's TDR program produced the largest aggrega-

Table 5

Aggregations of protected land achieved by the various tools and three preservation strategies of the study sites

Program	Percent of aggregations	Total acres	Average percent of parcels	Mean size of aggregation in acres	Maximum acres of aggregation	Minimum acres of aggregation
Montgomery County						
TDR	59	27406.2	10.0	464.5	11675.1	3.9
PDR	20	7758.8	6.25	387.9	2183.0	48.8
TDR and PDR	59	36963.1	12.7	626.5	14906.7	3.9
Riverhead						
PDR	12	2952.3	4.0	246.0	857.0	21.7
Southampton						
Cluster	18	275.9	2	30.7	56.7	9.7
PDR and land trust	75	1165.5	4.4	68.6	261.9	4.7
Cluster, PDR and land trust	27	1606.7	3.8	54.2	142.8	4.7

Table 6

Relative area of the protected parcels that were aggregated and isolated by the tools used in the three study sites

Program	Percent of parcels	Total acres	Mean size of parcels (in acres)	Percent of protected area by tool
Montgomery County				
TDR				
Aggregated	593	27406.2	46.2	91
Isolated	50	2655.6	53.1	8
Total	643	30061.8	–	100
PDR				
Aggregated	125	7758.8	62.1	86
Isolated	18	1299.6	72.2	14
Total	143	9058.4	–	100
Riverhead				
PDR				
Aggregated	48	2952.3	61.5	75
Isolated	22	981.1	44.6	25
Total	70	3933.4	–	100
Southampton				
Cluster				
Aggregated	18	275.9	15.3	36
Isolated	30	496.9	16.6	64
Total	48	772.8	–	100
PDR and land trust				
Aggregated	75	1165.5	15.6	88
Isolated	8	161.5	20.3	12
Total	83	1327.0	–	100

tions of protected land. However, it is clear from Table 6 that the farmland protection strategies that use more than one tool—Montgomery County and Southampton—achieve a positive effect in protected land aggregation. In Southampton, aggregations of protected land increased in total acreage almost six-fold, while the average aggregation size increased by 43%. Montgomery County's aggregation size increased by 25%.

When looking at the effects of the individual tools (Table 7), the TDR program showed a positive effect on fragmentation, resulting in the aggregation of 91% of the parcels into protected areas with an average size of 46.5 acres. The PDR programs also fared well, aggregating 86% of the total protected land area in Montgomery County, 75% in Riverhead, and 88% of the PDR and land trust parcels in Southampton. The parcel aggregations in Montgomery County and

Table 7

Breakdown of percentage of parcels contiguous with other protected parcels or unprotected land in agriculture

Program	Contiguous with other protected parcels ^a		Contiguous with only unprotected parcels (%)
	Same program (%)	Other programs (%)	
TDR, Montgomery County	92	2	7
PDR, Riverhead	78	–	20
Cluster, Southampton	38	19	46

^a A parcel may be contiguous with more than one type of protected parcel.

Table 8
Breakdown of programs detailing accessibility of preserved lands

Program	Accessible by (percent of parcels)		
	Road (%)	Protected (mean acres) (%)	Unprotected land in farm use (%)
TDR, Montgomery County	88	60	2
PDR, Riverhead	66	43	7
Cluster, Southampton	67	15	17

Riverhead communities averaged 387 and 246 acres, respectively.

The cluster program in Southampton did not fare as well. Of the protected parcels, 64% were isolated, with an average protected aggregation of only 30 acres. The additive effect of other tools in reducing fragmentation is particularly obvious here, since the average aggregation size rose to 54.2 acres with the addition of county and town owned PDR parcels and acquisitions by local land trusts.

3.3. Farming status

In order to test the effects of fragmentation on active farming, all protected lands for the three major tools were checked for active farming status. Farming status was determined for Montgomery County from tax

parcel information with field checks. In Riverhead and Southampton, status was based solely on field observations.

All three farmland preservation tools showed high rates of active agricultural use. In Riverhead, 97% of PDR protected land were in active farm use (see Table 8). Parcel size had a direct effect on the agricultural status of land in Riverhead. Analysis of the parcels identified that 40% of parcels under 5 acres were actively farmed, 92% of parcels between 10 and 25 acres were actively farmed and 96% of parcels larger than 25 acres were actively farmed; there are no PDR parcels between 5 and 10 acres. This analysis indicates that in Riverhead parcel size is factor in agricultural status: the larger the preserved parcel, the greater the likelihood it remains in agricultural use (Tables 9 and 10).

Table 9
Comparison of lands in active farm use

Program	Protected land in active farm use			Not in active farm use mean parcel size (acres)
	Acres	Percent (%)	Mean parcel size	
TDR, Montgomery County	24641	82	77.7	16.6
PDR, Riverhead	3786	97	59.2	32.6
Cluster, Southampton	709	92	13.7	8.9

Table 10
Summary comparison of land protection for the three programs^a

Program	Total acres protected	Percent of land base protected (%)	Average protected parcel size (acres)	Percent of protected parcels in active agriculture (%)	Percent of protected land in aggregations (%)
TDR, Montgomery County	30062	31	74.1	82	91
PDR, Riverhead	3889	23	51.1	97	75
Cluster, Southampton	771	6	13.7	92	36

^a In the TDR program, the land parcel retains development rights at the rate of 1 unit per 25 acres after transfer.

In Southampton, 92% of all subdivision reserve areas were actively farmed. For the purposes of this study, land in agricultural production includes equestrian land (153 acres), land used by commercial nurseries and orchards (45 acres), and farmland producing row or specialty crops (511 acres). The status of two SRA parcels (11.5 acres) was undeterminable due to the visual and/or physical inaccessibility of the lots from public property. It is important to note that in addition to equestrian uses, several of the subdivision reserve areas were used as wildflower meadows, both of which take land out of traditional agriculture. Riding arenas and academies, while popular, have a high ratio of built structures and impervious surfaces, therefore, these uses do not preserve the prime agricultural soils as intended by the goals of the program.

In Southampton, larger parcels are more likely to be farmed than smaller parcels. Half of parcels under 5 acres were actively farmed; 91% of parcels 5–10 acres in size were actively farmed; 79% of parcels 10–20 acres were actively farmed; and 100% of parcels larger than 20 acres were actively farmed. One explanation for the dip in percentage of parcels actively farmed in the 10–20 acres category is that 10 acres may be too large to be leased for efficient truck farming and 20 acres too small to support efficient row crop production.

The analysis of active farming status in Montgomery County indicates one flaw of TDR program as applied in the county. While 82% of the protected land continues in agricultural use, it is the lowest percentage of the three programs. Part of the reason for this can be found in the mean parcel size of land not in active farm use, 16.6 acres. This supports the finding that the remaining development right of 1 unit per 25 acres encourages the creation of smaller parcels that have a residential function.

4. Conclusions

Avoiding fragmentation—the isolation of farmland parcels—is a key aspect of any farmland preservation strategy. Therefore, it is critical to understand the triggers and the effects of fragmentation inherent in any farmland preservation strategy. The results of this initial investigation into the spatial forms produced by

three farmland preservation programs identify several key triggers of fragmentation.

At the regional level, when looking strictly at the numbers of acres of farmland protected by the three programs, transfer of development rights appears to be the most successful agricultural land protection method. Montgomery County's transfer of development rights program resulted in a higher rate of land conservation than either of the other two programs—31% of the land base from transfer of development rights in Montgomery County, compared to 23% from PDR in Riverhead and 6% for Southampton's cluster program. The most significant weakness in the cluster program is the issue of preservation of the agricultural land base: only 6% of the original agricultural land base has been protected through the use of clustering, and only an average of 36% of an original parcel is protected under the requirements of the program. Thus, the effect of the cluster program is increasing fragmentation and loss of the land base.

However, the number of acres protected provides only an initial indication of the success of any of the three programs in avoiding land fragmentation. The success or failure of each program is clarified by the amount of protected land that continues to remain in active farming. The PDR program resulted in 97% of the preserved parcels in active agricultural production, compared to 82% for the transfer of development rights program. This is due at least in part to the remaining development rights in the transfer program (at the rate of 1 unit per 25 acres) that allow for further subdivision of the land into residential estates, a popular commodity in the metropolitan real estate market. Even in Southampton, where the parcel sizes are much smaller, the active agricultural use is 92%, underscoring the importance of severing all future development rights from the protected parcel.

As important to the issue of fragmentation is the question of how the farmland preservation programs achieve contiguous blocks of protected farmland. Again, the transfer of development rights program in Montgomery County is the most successful in achieving large contiguous blocks. However, the results also underscore the importance of developing a coordinated strategy utilizing a variety of farmland protection tools. Two of the case studies, Montgomery County and Southampton, which used a variety of tools for protecting farmland showed both a dramatic

increase in size of protected areas and reduction of protected parcel isolation when all of the farmland protection tools are included in the analysis. Meanwhile, Riverhead did not have a variety of active tools. While the PDR program in Riverhead used adjacency in its selection criteria, isolated parcels remained a problem in the program.

Further, research and comparison between programs is certainly needed, however, this analysis illustrates key criteria for effectively reducing fragmentation in a farmland protection strategy. First, an emphasis on protecting large parcels is critical to reducing fragmentation as much as possible during the protection process. Secondly, using adjacency and contiguity criteria in making preservation decisions improves the ability to protect large contiguous blocks of land and are key in ensuring that farming can continue effectively in the targeted area. In this respect, severing all development rights from the land will ensure the continued viability of farming, lessening the potential of conversion to residential uses. In cluster programs, effectiveness is also influenced by the amount of review discretion granted to the site plan approval board, and the threshold of open space protection required in the ordinance. Finally, the analysis and comparison of the three land preservation strategies reinforces the importance of utilizing and coordinating a variety of protection tools to achieve optimum protection of the land base.

Acknowledgements

The paper relies in part on initial research collected by a team of graduate students at the University of Michigan School of Natural Resources and Environment: Richard Caplan, Christopher Holben, Johns Hopkins, Matthew Kowalski, Jason Navota and Chip Smith. James T. Newton compiled the final GIS analysis for the project.

References

- American Farmland Trust, 1997. *Saving American Farmland: What Works*. American Farmland Trust, Washington, DC.
- Arendt, R., 1991. Cluster Development: A Profitable Way to Save Open Space. *Land Development*: 26–30.
- Arendt, R., 1997. Basing cluster techniques on development densities appropriate to the area. *J. Am. Plann. Assoc.* 63 (1), 137.
- Arendt, R., Brabec, E.A., Dodson, H., Reid, C., Yaro, R.D., 1994. *Rural by design: maintaining small town character*. American Planning Association, Chicago.
- Bryant, C., Johnston, T., 1992. *Agriculture in the City's Countryside*. Belhaven Press, London.
- Daniels, T.L., 1991. The purchase of development rights: preserving agricultural land and open space. *J. Am. Plann. Assoc.* 57, 421–431.
- Daniels, T.L., 1997. Where does cluster zoning fit in farmland protection? *J. Am. Plann. Assoc.* 63, 129–137.
- Dramstad, W.E., Olson, J.D., Forman, R.T.T., 1996. *Landscape ecology principles in landscape architecture and land-use planning*. Harvard University Graduate School of Design, Island Press, and the American Society of Landscape Architects, Boston, MA.
- Gerard, J., 1984. *Criteria for Agricultural Land Protection, Land Saving Action*. Island Press, Covelo, CA.
- Heimlich, R.E., 1989. Metropolitan agriculture: farming in the city's shadow. *J. Am. Plann. Assoc.* 55, 457–466.
- Heimlich, R.E., Brooks D.H., 1989. Metropolitan growth and agriculture: farming in the city's shadow. Resources and Technology Division, Economic Research Service, US Department of Agriculture. *Agricultural Economic Report no. 619*.
- Lapping, M., 1979. Underpinnings for an agricultural land reformation strategy. *J. Soil Water Conserv.* 34 (3), 124–126.
- Lapping, M.B., Daniels, T.L., Keller, J.K., 1989. *Rural Planning and Development in the United States*. Guilford Press.
- Maryland-National Capital Park and Planning Commission, 1980. *Functional Master Plan for the Preservation of Agriculture and Rural Open Space in Montgomery County*. Maryland-National Capital Park and Planning Commission, Silver Spring, Maryland.
- Merriam, D.H., 1978. Making TDR work. *NC Law Rev.* 56, 77–139.
- Montgomery County Code, 1997. *Montgomery County Code*. American Legal Publishing Corporation, Cincinnati.
- Nelson, A.C., 1994. Preserving prime farmland in the face of urbanization: lessons from Oregon. *J. Am. Plann. Assoc.* 58, 467–488.
- Pfeffer, M.J., Lapping, M.B., 1995. Prospects for a sustainable agriculture in the northeast's rural/urban fringe. *Res. Rural Sociol. Dev.* 6, 67–93.
- Scarfo, R.A., 1990. *Cultivating Agriculture: A Report of Current Trends and Future Viability of Farming in Maryland's Metropolitan Fringe*. Maryland Office of Planning and The University of Maryland, College Park.
- Suffolk County, 1996. *Suffolk County Agricultural Protection Plan*. Suffolk County, New York.
- Suffolk County Planning Department, 2000. http://co.suffolk.ny.us/planning/acq_progrs.html.
- Town of Southampton, 1989. *Code of the Town of Southampton*. General Code Publishers Corp., Rochester, New York.
- US Census, 1997. *Census of Agriculture*.
- Whyte, W.H., 1964. *Cluster Development*. American Conservation Association, New York.

Elizabeth Brabec is an associate professor of Landscape Architecture in the School of Natural Resources and Environment at the University of Michigan. With degrees in both landscape architecture and law, she focuses her research on the legal and spatial problems and solutions of land conservation. She is also President of Land Ethics Inc., a resource and community planning consulting firm.

Chip Smith is a senior associate at Land Ethics Inc., and holds a Master's degree in landscape architecture from the University of Michigan. With a strong background in public participation, he focuses on writing land conservation policies and developing strategies for public participation in land conservation efforts.



Landscape and Urban Planning

Supports open access

Guide for authors

About the journal

- Aims and scope
- Article types
- Peer review
- Open access

Ethics and policies

- Ethics in publishing
- Submission declaration
- Authorship
- Changes to authorship
- Declaration of competing interests
- Funding sources
- Declaration of generative AI use
- Preprints
- Use of inclusive language
- Reporting sex- and gender-based analyses
- Jurisdictional claims
- Delayed publication

Writing and formatting

- File format
- Title page
- Double anonymized peer review
- Abstract
- Keywords
- Highlights
- Tables
- Figures, images and artwork
- Generative AI and Figures, images and artwork
- Supplementary material
- Video
- Research data
- Data statement

- Data linking
- Article structure
- References

Submitting your manuscript

- Submit online

After receiving a final decision

- Article Transfer Service
- Publishing agreement
- License options
- Open access
- Permission for copyrighted works
- Proof correction
- Share Link
- Responsible sharing

Resources for authors

- Elsevier Researcher Academy

Getting help and support

- Author support

About the journal

Aims and scope

An Interdisciplinary Journal of Landscape Science, Planning and Design.

Landscape and Urban Planning is an international journal aimed at advancing conceptual, scientific, and applied understandings of **landscape** in order to promote **sustainable** solutions for **landscape change**. Landscapes are visible and integrative social-ecological systems with variable spatial and temporal dimensions. They have expressive aesthetic, natural, and cultural qualities that are perceived and valued by people in multiple ways and invite actions resulting in landscape change. Landscapes are increasingly urban in nature and ecologically and culturally sensitive to changes at local through global scales. Multiple disciplines and perspectives are required to understand landscapes and align social and ecological values to ensure the sustainability of landscapes. The journal is based on the premise that landscape science linked to **planning** and **design** can provide mutually supportive outcomes for people and nature.

Landscape science brings **landscape ecology** and **urban ecology** together with other disciplines and cross-disciplinary fields to identify patterns and understand social-ecological processes influencing landscape change. *Landscape planning* brings landscape architecture, urban and regional planning, landscape and ecological engineering, and other practice-oriented fields to bear in processes for identifying problems and analyzing, synthesizing, and evaluating desirable alternatives for landscape change. *Landscape design* brings plans, designs, management prescriptions, policies and other activities and form-giving products to bear in effecting landscape change. The implementation of landscape planning and design also generates new patterns of evidence and hypotheses for

further research, providing an integral link with landscape science and encouraging transdisciplinary collaborations to build robust knowledge and problem solving capacity.

Article types

Landscape and Urban Planning publishes original, empirical research on important international and regional issues in landscape science, with an emphasis on applied work that provides solutions for landscape design. Most manuscript submissions take the form of full-length Research Papers. Shorter Research Notes are also encouraged as described below.

2.1. Research Papers

Given the problem-driven nature of landscape science and the journal's commitment to linking research and practice, most Research Paper submissions will fall within the area of applied research. Purely conceptual or theoretical work will be considered on a limited basis under the Perspective Essay article type (see below). Otherwise, Research Papers focused on modeling and other "basic" research efforts should include at least a small sample of data to demonstrate proof-of-concept. Whether basic or applied, all Research Papers should describe the relevance of the work and its implications for landscape and urban planning, design, management and/or policy. Research Papers are typically between 4000 and 8000 words, including manuscript text and references (use 25-60 references as a guideline). Some exceptions to the upper length limit may be allowed for reports of large-scale interdisciplinary and transdisciplinary projects or for qualitative research where in-text quotations provide evidence in lieu of tables and figures. An abstract (250 words or less), keywords (3-6), and research highlights (3-5) are also required. Tables and figures should be used with economy to convey essential aspects about study concepts and findings. One or two contextual photos may be optionally included as figures to convey to readers the essential nature of the landscape and issues examined in the article. Other informative materials may also be optionally submitted, including Appendices, Acknowledgments, short Author Biographies, Graphical Abstracts, Google Maps (KML files), Embedded Audio and Video files, and Supplementary Material for online-only publication (see Section 3.8 below).

2.2. Research Notes

A Research Note is a concise but complete description of a limited investigation that will not be included in a later paper. It provides one of the following functions: (1) presenting initial proof-of-concept results on new ideas, timely issues, or innovative approaches; (2) reporting replications or extensions of previously published research that does not merit another full-length treatment yet provides results that contribute to a greater understanding of the phenomena under study. Research Notes should typically be limited to 2000 words and a total of 3 tables and figures, yet be sufficiently documented, both by reference to the essential literature and description of methods employed, for readers to be able to assess the scholarly rigor of the research. A Research Note should include a brief (150 words or less) abstract, keywords (3-6), and research highlights (3-5). The title of the submission should be prefaced with the words "Research Note."

2.3. Review Articles

Review Articles examine a coherent and comprehensive set of published research studies or other works (e.g., policies, reports, case studies) covering a subject area of current or emerging interest. They can take one of two forms: (1) Narrative Reviews identify, synthesize, and/or offer critical assessments of the state-of-the-art in knowledge about a subject, highlighting important concepts, variables, and theories under study, problems and knowledge gaps yet to be addressed, and guidance for future research. (2) Analytical Reviews involve systematic assessments of the literature, often using bibliographic database search and retrieval systems such as Scopus or Web of Science, alone or in combination with full-text searching, mining, and analysis software. These include

Systematic Reviews and meta-analyses that follow a standardized format aimed at building a base of knowledge for evidence-based design (e.g., <http://www.environmentalevidence.org/EBConservation.htm>). They also include quantitative, bibliometric techniques such as citation analysis and qualitative analyses of content themes aimed at identifying the structure of and trends in knowledge about an area of inquiry. Review Articles are typically between 6000 and 10,000 words in length, including references and tables. Please include an abstract (250 words or less), keywords (3-6), and research highlights (3-5), and follow APA 6th Edition guidelines (Section 6.26) for referencing documents included in your analysis. Review Articles need to explicitly indicate the originality and need for the review, cover a wide and international range of literature and provide a brief assessment of previously published reviews related to the topic.

2.4. Perspective Essays

Perspective Essays present new ideas or frameworks; challenge current thinking, policies, or approaches; or otherwise offer thoughtful reflections aimed at improving our understanding of the interactions between people and natural and built environments and their implications for landscape planning, design, management, and policy. Perspective Essays should be grounded in the existing literature and adequately referenced but with an emphasis on original thought rather than an exhaustive accounting of the ideas of others. Perspective Essays may range from 2000 to 8000 words in length with a limited number of tables and figures. Except for short essays, submissions should be structured with section headings that convey to readers key themes and a logical flow of ideas. An abstract (250 words or less), keywords (3-6), and highlights (3-5) are required.

2.5. Comments and rejoinders

A Comment is a critical or explanatory note on an article published in *Landscape and Urban Planning*. It may be invited or proposed but must be approved by one of the Co-Editors-in-Chief prior to submission. Comments should typically be of 2000 words or less with a limited number of references. Please include a short abstract (150 words or less), 3-5 highlights, and 3-6 keywords. The title of the submission should be prefaced with the words: "Comment on", followed by the title of the previously published article and the authors' names. Should one or more Comments be accepted for publication, the handling editor may invite the author(s) of the previously published article to write a Rejoinder, which may be published along with the Comments.

2.6. Editorials

The Co-Editors-in-Chief, Associate Editors, Editorial Board members, and invited guests may occasionally provide brief commentaries on significant issues of relevance to the journal's aims and scope, introductory essays to special issues, as well as news and information relevant to the journal and its readers.

2.7. Book Reviews

The editorial team is not accepting books for review at this time. Please consult the online Guide for Authors for future updates.

2.8. Special Issue (SI) policy in Landscape and Urban Planning (LAND)

A Special Issue (SI) in *Landscape and Urban Planning* is a coherent collection of articles on a specific theme of research and scholarship that falls within the aims and scope of the journal and has a broad international appeal. SIs are now published as "virtual" SIs, meaning an article is published in the journal's first available volume/issue once it reaches the final stage, and will be added simultaneously in the SI of the journal (which is an Article Collection of these papers published across different volumes/issues).

SIs are especially intended for those topic areas where there is added value in bringing together multiple papers, leading to increased complementarity and attention for a specific topic area. A principal goal of the SI is to draw upon the outstanding talents and ideas of guest editors who are removed from the day-to-day journal operations and willing to channel a high level of energy and enthusiasm into an effort of finite duration. In this respect, the editors welcome innovative proposals of high quality and relevance from prospective individuals or teams.

1. SI themes

Typically, an SI addresses a theme of research that is too large and/or too complex to be thoroughly examined from the perspective of a single article within the scope of a regular issue. Such themes can fall into one of two categories. An **emerging theme** addresses a novel or rapidly evolving area of inquiry that is gaining momentum within science, technology, policy, or society, and has clear implications for landscape and urban planning. Such themes typically engage pressing challenges, introduce new conceptual framings or methodological approaches, or extend the field into previously underexplored domains. Emerging themes are expected to be agenda-setting and analytically rigorous, while remaining grounded in the journal's integrative focus on ecological, spatial, and governance dimensions. Examples may include the integration of artificial intelligence in spatial planning analytics or the governance implications of digital twins for urban landscape management. An **enduring theme** addresses a foundational and persistent area of inquiry within landscape and urban planning. It engages structural challenges of planning theory, methodology, or knowledge integration that extend beyond short-term topical trends. Such a theme operates at the level of meta-knowledge – advancing understanding of how knowledge in the field is conceptualized, integrated across scales and disciplines, and translated into planning practice (e.g. conceptualizations of social-ecological resilience). The research reported in an SI in either category of themes promises to substantively advance our understanding of the subject area and inspire further exploration.

2. SI article types

An SI is more than a random collection of articles and should exhibit the level of coherence expected of a well-edited book volume. Accordingly, beyond thematic alignment, careful attention must be given to the range and mix of article types. Proposals should therefore include a structured overview of the planned contributions. LAND does not publish SIs based on an open call for contributions or through an invitation to all authors of a specific conference or seminar.

An **emerging theme issue** should be composed mainly of research papers but might also include review articles and/or one or two perspective essays. An **enduring theme issue** could include research papers but might focus more on extending current dialogue with perspective essays, comments and rejoinders. An SI under either thematic category should preferably include a review article that aims to provide a synthetic assessment of the-state-of-the-art of the intellectual field(s) integral to the SI's theme, and is developed or led by a senior author. For further details on article types, see the guidelines on the LAND website.

3. SI contributors and contributions

In order to ensure that an SI has a broad international appeal and provides a diversity of perspectives, the guest editor(s) should make a genuine effort to attract contributors with different professional and/or academic backgrounds, and from different parts of the world. Therefore, proposals developed from specific professional workshops or regional symposia are generally discouraged unless their international relevance and scholarly diversity are clearly demonstrated. An SI typically consists of 6 to 15 papers, including an introductory editorial or

review paper by the guest editor(s). If an SI has fewer papers than a normal journal issue, the SI may be published as a “virtual special section” instead of a virtual SI. If fewer than five papers are accepted, the Co-Editors-in-Chief may cancel the SI entirely and proceed to publish those accepted papers as part of regular issues, but will not highlight them as a virtual SI or virtual special section on the journal’s website.

4. SI proposal selection procedure and timeline

We encourage research teams to suggest SI proposals to LAND. Proposals are welcome at any time, but twice a year – after May 1 and after November 1 – proposals will be evaluated by the editors-in-chief.

The process of SI proposal selection is systematic and competitive. Proposal authors will be **notified within 8 weeks** after submitting a proposal by the Co-Editors-in-Chief of their decision, and those whose proposals are conditionally accepted will have three to four weeks before resubmitting the revised proposal.

Upon the proposal acceptance, one of the Co-Editors-in-Chief will be designated as the handling editor of the SI, and will work with the guest editor(s) on the SI development to its completion. The assigned Co-Editor-in-Chief has final responsibility for the decisions on all papers to be included and will ensure proper review procedures are maintained, and all papers meet the quality requirements of the journal. Guest editors manage the process of soliciting submissions from the authors they would like to invite, selecting reviewers for all papers submitted to the SI, providing additional review of papers and advice on final decisions. Guest editors are responsible for meeting planned publication schemes and reasonable review time.

5. SI manuscript preparation, submission, review, and revision

The process of SI manuscript preparation, submission and revision is handled by the guest editor(s). Responsibilities include, but are not limited to, identifying authors, building synergy and coherence among all contributions with respect to the SI theme and article types, securing the on-time submissions of all manuscripts, suggesting reviewers, working with the authors on manuscript revisions and making editorial recommendations to the handling editor.

The peer review of SI contributions shall be handled directly by the guest editor(s) with assistance from the LAND editorial team. At each stage throughout the review process, guest editor(s) are responsible for providing editorial recommendations upon which the handling Co-Editor-in-Chief makes a decision and communicates with the author(s). Manuscripts submitted to an SI will be reviewed exclusively by scholars who are not contributors.

6. SI proposal preparation guidelines

A SI proposal, limited to 10 pages, should contain the following contents:

1. **Title and theme** of the SI, indicating whether it fits within the emerging or enduring theme category (see Section 1: SI themes for definitions).
2. **Objectives:** What purposes does the SI intend to serve? Who is the primary audience?
3. **Justifications:** Why should LAND, rather than another journal, dedicate an entire issue to this theme? How innovative and original are the proposed ideas? What is the breadth of appeal (international, disciplinary) and the potential contribution of the proposed SI? What is the added value of publishing these papers as an SI?

A successful proposal should include a brief survey of related SIs or edited volumes published within the past decade, explaining how the proposed SI differs from and advances beyond existing work. This must include references to relevant scholarly journal articles that serve as the core knowledge domain upon which the proposed SI will be based.

4. **The proposed content and structure of the SI:** Outline the planned composition of the SI, including:

A list of proposed (potential) contributions, arranged by SI themes and/or objectives.

Please include paper titles, potential author names, affiliations and a short description (e.g., 1 paragraph) of how each paper contributes uniquely to the overall SI theme and objectives.

Please also provide the theme of the required review article, lead author and author team.

5. **A realistic time-planning for the SI.** Please note that LAND aims at finishing the publication of an SI within 18 months after submission of the first paper, and that in case of delays, remaining papers will not be published as part of the SI. This procedure aims to help guest editors to implement strict deadlines in the editorial process.

6. **Short CVs** of the proposed guest editor(s) (each limited to two pages; not included in the 10-page proposal limit). Please indicate prior editorial experience. Please note that LAND does not accept proposals led by more than 3 guest editors. From experience, large teams of editors often lead to less consistency in the SI and a lack of responsibility with each of the guest editors.

7. References (not part of the 10-page word limit).

Note: Translated articles originally published in a language other than English will not be considered.

Please submit your proposal to Prof. Christian Albert at the email address albert.landedit@gmail.com and include the term "SI proposal" in the subject line.

Peer review

This journal follows a double anonymized review process. Your submission will initially be assessed by our editors to determine suitability for publication in this journal. If your submission is deemed suitable, it will typically be sent to a minimum of two reviewers for an independent expert assessment of the scientific quality. The decision as to whether your article is accepted or rejected will be taken by our editors.

Read more about peer review.

Our editors are not involved in making decisions about papers which:

- they have written themselves.
- have been written by family members or colleagues.

- relate to products or services in which they have an interest.

Any such submissions will be subject to the journal's usual procedures and peer review will be handled independently of the editor involved and their research group. Read more about editor duties.

Authors may submit a formal appeal request to the editorial decision, provided it meets all the requirements and follows the procedure outlined in Elsevier's Appeal Policy. Only one appeal per submission will be considered and the appeal decision will be final.

Special issues and article collections

The peer review process for special issues and article collections follows the same process as outlined above for regular submissions, except, a guest editor may send the submissions out to the reviewers and may recommend a decision to the journal editor. The journal editor oversees the peer review process of all special issues and article collections to ensure the high standards of publishing ethics and responsiveness are respected and is responsible for the final decision regarding acceptance or rejection of articles.

Open access

We refer you to our open access information page to learn about open access options for this journal.

Ethics and policies

Ethics in publishing

Authors must follow ethical guidelines stated in Elsevier's Publishing Ethics Policy.

Submission declaration

When authors submit an article to an Elsevier journal it is implied that:

- the work described has not been published previously except in the form of a preprint, an abstract, a published lecture, academic thesis or registered report. See our policy on multiple, redundant or concurrent publication.
- the article is not under consideration for publication elsewhere.
- the article's publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out.
- if accepted, the article will not be published elsewhere in the same form, in English or in any other language, including electronically, without the written consent of the copyright-holder.

To verify compliance with our journal publishing policies, we may check your manuscript with our screening tools.

Authorship

All authors should have made substantial contributions to all of the following:

1. The conception and design of the study, or acquisition of data, or analysis and interpretation of data.

2. Drafting the article or revising it critically for important intellectual content.

3. Final approval of the version to be submitted.

Authors should appoint a corresponding author to communicate with the journal during the editorial process. All authors should agree to be accountable for all aspects of the work to ensure that the questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Changes to authorship

The editors of this journal generally will not consider changes to authorship once a manuscript has been submitted. It is important that authors carefully consider the authorship list and order of authors and provide a definitive author list at submission.

The policy of this journal around authorship changes:

- All authors must be listed in the manuscript and their details entered into the submission system. Changes can only be made prior to acceptance, and only if approved by the journal editor. This includes additions, deletion, or rearrangement of author names.
- Requests to change authorship must be made by the corresponding author using [this form](#). The corresponding author must provide the reason for the request to the journal editor with written confirmation from all authors, including any authors being added or removed, that they agree with the changes. Requests which do not comply with the instructions outlined in the form will not be considered.
- This journal does not allow authorship changes after acceptance. This includes additions, deletions, or the rearrangement of author names, including changes to the corresponding author.
- The review process may be paused while a change in authorship request is being considered.
- Approved authorship changes will result in a corrigendum if the manuscript has already been accepted.
- Any unauthorized authorship changes may result in the rejection of the manuscript or retraction if the article has already been published.

Declaration of competing interests

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence or bias their work. Examples of potential competing interests include:

- Employment
- Consultancies
- Stock ownership
- Honoraria

- Paid expert testimony
- Patent applications or registrations
- Grants or any other funding
- Affiliation with the journal as an Editor or Advisory Board Member

The declarations tool should always be completed.

Authors with a journal affiliation to declare should enter the following text under “Other Activities” within the declarations tool and should inform the journal and publisher prior to completing the submission process: *Given their role as [insert journal role title], [insert your name] had no involvement in the peer-review of this article and has no access to information regarding its peer-review. Full responsibility for the editorial process for this article was delegated to another journal editor.*

Editorial disclosure statements will be included as a footnote and/or in the declaration of competing interest section of the article.

Authors with no competing interests to declare should select the option "I have nothing to declare".

The resulting Word document containing your declaration should be uploaded at the "attach/upload files" step in the submission process. It is important that the Word document is saved in the .doc/.docx file format. Author signatures are not required.

Funding sources

Authors must disclose any funding sources who provided financial support for the conduct of the research and/or preparation of the article. The role of sponsors, if any, should be declared in relation to the study design, collection, analysis and interpretation of data, writing of the report and decision to submit the article for publication. If funding sources had no such involvement this should be stated in your submission.

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants, scholarships and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, it is recommended to include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of generative AI use

Authors must declare the use of generative AI in the manuscript preparation process upon submission of the paper.

Elsevier recognizes the potential of generative AI and AI-assisted technologies (“AI Tools”), when used responsibly, to help researchers work efficiently, gain critical insights fast and achieve better outcomes. Increasingly, these tools, including AI agents and deep research tools, are helping researchers to synthesize complex literature, provide an overview of a field or research question, identify research gaps, generate ideas, and provide tailored support for tasks such as content organization and improving language and readability.

Authors preparing a manuscript for this journal can use AI Tools to support them. However, these tools must never be used as a substitute for human critical thinking, expertise and evaluation. AI technology should always be applied with human oversight and control.

Ultimately, authors are responsible and accountable for the contents of their work. This includes accountability for:

- Carefully reviewing and verifying the accuracy, comprehensiveness, and impartiality of all AI-generated output (including checking the sources, as AI-generated references can be incorrect or fabricated).
- Editing and adapting all material thoroughly to ensure the manuscript represents the author’s authentic and original contribution and reflects their own analysis, interpretation, insights and ideas.
- Ensuring the use of any tools or sources, AI-based or otherwise, is made clear and transparent to readers. If AI Tools have been used, we require a disclosure statement upon submission; please see example below.
- Ensuring the manuscript is developed in a way that safeguards data privacy, intellectual property and other rights, by checking the terms and conditions of any AI tool that is used.

Finally, authors must not list or cite AI Tools as an author or co-author on the manuscript since authorship implies responsibilities and tasks that can only be attributed to, and performed by, humans.

The use of AI Tools in the manuscript preparation process must be declared by adding a statement at the end of the manuscript when the paper is first submitted. The statement will appear in the published work and should be placed in a new section before the references list.

An example:

- Title of new section: *Declaration of generative AI and AI-assisted technologies in the manuscript preparation process.*
- Statement: *During the preparation of this work the author(s) used [NAME OF TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.*

The declaration does not apply to the use of basic tools, such as tools used to check grammar, spelling and references. If you have nothing to disclose, you do not need to add a statement.

Please read Elsevier's author policy on the use of generative AI and AI-assisted technologies, which can be found in the generative AI policies for journals.

Please note: to protect authors' rights and the confidentiality of their research, this journal does not currently allow the use of generative AI or AI-assisted technologies such as ChatGPT or similar services by reviewers or editors in the peer review and manuscript evaluation process, as is stated in Elsevier's generative AI policies for journals. Elsevier is actively evaluating compliant AI Tools and may revise this policy in the future.

Preprints

Preprint sharing

Authors may share preprints in line with Elsevier's article sharing policy. Sharing preprints, such as on a preprint server, will not count as prior publication.

We advise you to read our policy on multiple, redundant or concurrent publication.

Use of inclusive language

Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Authors should ensure their work uses inclusive language throughout and contains nothing which might imply one individual is superior to another on the grounds of:

- age
- gender
- race
- ethnicity
- culture
- sexual orientation
- disability or health condition

We recommend avoiding the use of descriptors about personal attributes unless they are relevant and valid. Write for gender neutrality with the use of plural nouns ("clinicians, patients/clients") as default. Wherever possible, avoid using "he, she," or "he/she."

No assumptions should be made about the beliefs of readers and writing should be free from bias, stereotypes, slang, reference to dominant culture and/or cultural assumptions.

These guidelines are meant as a point of reference to help you identify appropriate language but are by no means exhaustive or definitive.

Reporting sex- and gender-based analyses

There is no single, universally agreed-upon set of guidelines for defining sex and gender. We offer the following guidance:

- Sex and gender-based analyses (SGBA) should be integrated into research design when research involves or pertains to humans, animals or eukaryotic cells. This should be done in accordance with any requirements set by funders or sponsors and best practices within a field.
- Sex and/or gender dimensions of the research should be addressed within the article or declared as a limitation to the generalizability of the research.
- Definitions of sex and/or gender applied should be explicitly stated to enhance the precision, rigor and reproducibility of the research and to avoid ambiguity or conflation of terms and the constructs to which they refer.

We advise you to read the Sex and Gender Equity in Research (SAGER) guidelines and the SAGER checklist (PDF) on the EASE website, which offer systematic approaches to the use of sex and gender information in study design, data analysis, outcome reporting and research interpretation.

For further information we suggest reading the rationale behind and recommended use of the SAGER guidelines.

Definitions of sex and/or gender

We ask authors to define how sex and gender have been used in their research and publication. Some guidance:

- Sex generally refers to a set of biological attributes that are associated with physical and physiological features such as chromosomal genotype, hormonal levels, internal and external anatomy. A binary sex categorization (male/female) is usually designated at birth ("sex assigned at birth") and is in most cases based solely on the visible external anatomy of a newborn. In reality, sex categorizations include people who are intersex/have differences of sex development (DSD).
- Gender generally refers to socially constructed roles, behaviors and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across societies and over time. Gender influences how people view themselves and each other, how they behave and interact and how power is distributed in society.

Depending on the focus of a paper, sex and/or gender may or may not be relevant to the content of the paper. We recognize that beliefs, attitudes, and laws relating to sex and gender may vary. These articles do not attempt to dictate author beliefs but rather require that, where relevant to an author's research or paper, the author must provide clear explanations of how the paper and research define and use sex and gender.

Jurisdictional claims

Elsevier respects the decisions taken by its authors as to how they choose to designate territories and identify their affiliations in their published content. Elsevier's policy is to take a neutral position with respect to territorial disputes or jurisdictional claims, including, but not limited to, maps and institutional affiliations. For journals that Elsevier publishes on behalf of a third party owner, the owner may set its own policy on these issues.

- **Maps:** Readers should be able to locate any study areas shown within maps using common mapping platforms. Maps should only show the area actually studied and authors should not include a location map which displays a larger area than the bounding box of the study area. Authors should add a note clearly stating that "*map lines delineate study areas and do not necessarily depict accepted national boundaries*". During the review process, Elsevier's editors may request authors to change maps if these guidelines are not followed.
- **Institutional affiliations:** Authors should use either the full, standard title of their institution or the standard abbreviation of the institutional name so that the institutional name can be independently verified for research integrity purposes.

Delayed publication

If you need to delay the publication of your article for any reason, please contact the editorial office of the journal or our Journal Article Publishing Support Center at the earliest possible opportunity. While we will try to ensure that your article is not published before a certain date if you make your request on a timely basis, we cannot guarantee this. Please also note that once the agreed period of delay has expired the article may be published at any time thereafter.

Writing and formatting

File format

We ask you to provide editable source files for your entire submission (including figures, tables and text graphics). Some guidelines:

- Save files in an editable format, using the extension `.doc/.docx` for Word files and `.tex` for LaTeX files. A PDF is not an acceptable source file.
- Format Word files in a single-column layout. Double-column formatting is only permitted for LaTeX submissions.
- Remove any strikethrough and underlined text from your manuscript, unless it has scientific significance related to your article.
- Use spell-check and grammar-check functions to avoid errors.

We advise you to read our [Step-by-step guide to publishing with Elsevier](#).

Title page

You are required to include the following details in the title page information:

- **Article title.** Article titles should be concise and informative. Please avoid abbreviations and formulae, where possible, unless they are established and widely understood, e.g. DNA.
- **Author names.** Provide the given name(s) and family name(s) of each author. The order of authors should match the order in the submission system. Carefully check that all names are accurately spelled. If needed, you can add your name between parentheses in your own script after the English transliteration.

- **Affiliations.** Add affiliation addresses, referring to where the work was carried out, below the author names. Indicate affiliations using a lower-case superscript letter immediately after the author's name and in front of the corresponding address. Ensure that you provide the full postal address of each affiliation, including the country name and, if available, the email address of each author.
- **Corresponding author.** Clearly indicate who will handle correspondence for your article at all stages of the refereeing and publication process and also post-publication. This responsibility includes answering any future queries about your results, data, methodology and materials. It is important that the email address and contact details of your corresponding author are kept up to date during the submission and publication process.
- **Present/permanent address.** If an author has moved since the work described in your article was carried out, or the author was visiting during that time, a "present address" (or "permanent address") can be indicated by a footnote to the author's name. The address where the author carried out the work must be retained as their main affiliation address. Use superscript Arabic numerals for such footnotes.

Double anonymized peer review

As this journal follows a double anonymized review process, author identities are concealed from reviewers and vice versa. To facilitate this process, submit your title page (including author details) and anonymized manuscript (excluding author details) as separate files. Next to the items mentioned in the title page section of this guide, the title page should also include:

- **Acknowledgements.** Include any individuals who provided you with help during your research such as help with language, writing or proof reading in the acknowledgements section. Include acknowledgements only in the title page, do not add them as a footnote to your title, or anywhere else in your article.
- **Declaration of competing interests** (when a separate declaration of interest file is not submitted)
- **Corresponding author address** (full address is required)
- **Corresponding author email address**

The anonymized manuscript should contain the main body of your paper, including references and tables. It is important that your manuscript does not contain any identifying information such as author names or affiliations, or acknowledgements.

Read more about peer review.

Abstract

You are required to provide a concise and factual abstract which does not exceed 250 words. The abstract should briefly state the purpose of your research, principal results and major conclusions. Some guidelines:

- **Abstracts must be able to stand alone** as abstracts are often presented separately from the article.
- **Avoid references.** If any are essential to include, ensure that you cite the author(s) and year(s).

- Avoid non-standard or uncommon abbreviations. If any are essential to include, ensure they are defined within your abstract at first mention.

Keywords

You are required to provide 1 to 7 keywords for indexing purposes. Keywords should be written in English. Please try to avoid keywords consisting of multiple words (using "and" or "of").

We recommend that you only use abbreviations in keywords if they are firmly established in the field.

Highlights

You are required to provide article highlights at submission.

Highlights are a short collection of bullet points that should capture the novel results of your research as well as any new methods used during your study. Highlights will help increase the discoverability of your article via search engines. Some guidelines:

- Submit highlights as a separate editable file in the online submission system with the word "highlights" included in the file name.
- Highlights should consist of 3 to 5 bullet points, each a maximum of 85 characters, including spaces.

We encourage you to view example article highlights and read about the benefits of their inclusion.

Tables

Tables must be submitted as editable text, not as images. Some guidelines:

- Place tables next to the relevant text or on a separate page(s) at the end of your article.
- Cite all tables in the manuscript text.
- Number tables consecutively according to their appearance in the text.
- Please provide captions along with the tables.
- Place any table notes below the table body.
- Avoid vertical rules and shading within table cells.

We recommend that you use tables sparingly, ensuring that any data presented in tables is not duplicating results described elsewhere in the article.

Figures, images and artwork

Figures, images, artwork, diagrams and other graphical media must be supplied as separate files along with the manuscript. We recommend that you read our detailed artwork and media instructions. Some excerpts:

When submitting artwork:

- Cite all images in the manuscript text.
- Number images according to the sequence they appear within your article.
- Submit each image as a separate file using a logical naming convention for your files (for example, Figure_1, Figure_2 etc).
- Text graphics may be embedded in the text at the appropriate position. If you are working with LaTeX, text graphics may also be embedded in the file.

Figure captions

All images must have a caption. A caption should consist of a brief title (not displayed on the figure itself) and a description of the image. We advise you to keep the amount of text in any image to a minimum, though any symbols and abbreviations used should be explained.

Read how to add captions to your submission [here](#).

Artwork formats

When your artwork is finalized, "save as" or convert your electronic artwork to the formats listed below taking into account the given resolution requirements for line drawings, halftones, and line/halftone combinations:

- Vector drawings: Save as EPS or PDF files embedding the font or saving the text as "graphics."
- Color or grayscale photographs (halftones): Save as TIFF, JPG or PNG files using a minimum of 300 dpi (for single column width: min. 1063 pixels, full page width: 2244 pixels).
- Bitmapped line drawings: Save as TIFF, JPG or PNG files, using a minimum of 1000 dpi (for single column width: min. 3543 pixels, full page width: 7480 pixels).
- Combinations bitmapped line/halftones (color or grayscale): Save as TIFF, JPG or PNG files using a minimum of 500 dpi (for single column: min. 1772 pixels, full page width: 3740 pixels).

Please do not submit:

- Files that are too low in resolution.
- Disproportionally large images compared to font size, as text may become unreadable.

Color artwork

If you submit usable color figures with your accepted article, we will ensure that they appear in color online.

Please ensure that color images are accessible to all, including those with impaired color vision. Learn more about color and web accessibility.

Generative AI and Figures, images and artwork

Please read our policy on the use of generative AI and AI-assisted tools in figures, images and artwork, which can be found in Elsevier's [GenAI Policies for Journals](#). This policy states:

- We do not permit the use of Generative AI or AI-assisted tools to create or alter images in submitted manuscripts.
- The only exception is if the use of AI or AI-assisted tools is part of the research design or methods (for example, in the field of biomedical imaging). If this is the case, such use must be described in a reproducible manner in the methods section, including the name of the model or tool, version and extension numbers, and manufacturer.
- The use of generative AI or AI-assisted tools in the production of artwork such as for graphical abstracts is not permitted. The use of generative AI in the production of cover art may in some cases be allowed, if the author obtains prior permission from the journal editor and publisher, can demonstrate that all necessary rights have been cleared for the use of the relevant material, and ensures that there is correct content attribution.

Supplementary material

We encourage the use of supplementary materials such as applications, images and sound clips to enhance research. Some guidelines:

- Supplementary material should be accurate and relevant to the research.
- Cite all supplementary files in the manuscript text.
- Submit all supplementary materials at the same time as your manuscript.
- Include a concise, descriptive caption for each supplementary file, describing its content.
- After submission supplementary files can only be added or replaced in the revision stage of the editorial process.
- Be aware that all supplementary materials provided will appear online in the exact same way as received. These files will not be checked, formatted or typeset by the production team.

Video

This journal accepts video material and animation sequences to support and enhance your scientific research. We encourage you to include links to video or animation files within articles. Some guidelines:

- When including video or animation file links within your article, refer to the video or animation content by adding a note in your text where the file should be placed.
- Clearly label files ensuring the given file name is directly related to the file content.
- Provide files in one of our recommended file formats. Files should be within our preferred maximum file size of 150 MB per file, 1 GB in total.

- Provide "stills" for each of your files. These will be used as standard icons to personalize the link to your video data. You can choose any frame from your video or animation or make a separate image.
- Provide descriptive text in your manuscript to refer to the video content. This text helps ensure accessibility for visually impaired readers who rely on descriptive information. For journals publishing in print this is also essential, as video and animation files cannot be embedded in the print version.

We publish all video and animation files supplied in the electronic version of your article.

For more detailed instructions, we recommend that you read our guidelines on submitting video content to be included in the body of an article.

Research data

We are committed to supporting the storage of, access to and discovery of research data, and our research data policy sets out the principles guiding how we work with the research community to support a more efficient and transparent research process.

Research data refers to the results of observations or experimentation that validate research findings, which may also include software, code, models, algorithms, protocols, methods and other useful materials related to the project.

Please read our guidelines on sharing research data for more information on depositing, sharing and using research data and other relevant research materials.

Research data deposit, citation and linking

For this journal, **Option C** instructions from our research data guidelines apply. This means that you are **required** to:

- Deposit your research data in a relevant data repository.
- Cite and link to this dataset in your article.
- If this is not possible, make a statement explaining why research data cannot be shared.

Data statement

To foster transparency, you are required to state the availability of any data at submission.

Ensuring data is available may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you can state the reason why (e.g., your research data includes sensitive or confidential information such as patient data) during the submission process. This statement will appear with your published article on ScienceDirect.

Read more about the importance and benefits of providing a data statement.

Data linking

Linking to the data underlying your work increases your exposure and may lead to new collaborations. It also provides readers with a better understanding of the described research.

If your research data has been made available in a data repository there are a number of ways your article can be linked directly to the dataset:

- Provide a link to your dataset when prompted during the online submission process.
- For some data repositories, a repository banner will automatically appear next to your published article on ScienceDirect.
- You can also link relevant data or entities within the text of your article through the use of identifiers. Use the following format: Database: 12345 (e.g. TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).

Learn more about linking research data and research articles in ScienceDirect.

Article structure

Article sections

Divide your manuscript into clearly defined sections covering all essential elements using headings.

Author contributions: CRediT

Corresponding authors are required to acknowledge co-author contributions using CRediT (Contributor Roles Taxonomy) roles:

- Conceptualization
- Data curation
- Formal analysis
- Funding acquisition
- Investigation
- Methodology
- Project administration
- Resources
- Software
- Supervision
- Validation

- Visualization
- Writing – original draft
- Writing – review and editing

Not all CRediT roles will apply to every manuscript and some authors may contribute through multiple roles.

We advise you to read more about CRediT and view an example of a CRediT author statement.

Appendices

We ask you to use the following format for appendices:

- Identify individual appendices within your article using the format: A, B, etc.
- Give separate numbering to formulae and equations within appendices using formats such as Eq. (A.1), Eq. (A.2), etc. and in subsequent appendices, Eq. (B.1), Eq. (B. 2) etc. In a similar way, give separate numbering to tables and figures using formats such as Table A.1; Fig. A.1, etc.

References

References within text

Any references cited within your article should also be present in your reference list and vice versa. Some guidelines:

- References cited in your abstract must be given in full.
- We recommend that you do not include unpublished results and personal communications in your reference list, though you may mention them in the text of your article.
- Any unpublished results and personal communications included in your reference list must follow the standard reference style of the journal. In substitution of the publication date add "unpublished results" or "personal communication."
- References cited as "in press" imply that the item has been accepted for publication.

Linking to cited sources will increase the discoverability of your research.

Before submission, check that all data provided in your reference list are correct, including any references which have been copied. Providing correct reference data allows us to link to abstracting and indexing services such as Scopus, Crossref and PubMed. Any incorrect surnames, journal or book titles, publication years or pagination within your references may prevent link creation.

We encourage the use of Digital Object Identifiers (DOIs) as reference links as they provide a permanent link to the electronic article referenced.

Reference style

Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the *Publication Manual of the American Psychological Association*, Seventh Edition (2020) ISBN 978-1-4338-3215-4.

The reference list should be arranged alphabetically and then chronologically. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication.

Examples:

Reference to a journal publication:

Van der Geer, J., Handgraaf T., & Lupton, R. A. (2020). The art of writing a scientific article. *Journal of Scientific Communications*, 163, 51–59. <https://doi.org/10.1016/j.sc.2020.00372>.

Reference to a journal publication with an article number:

Van der Geer, J., Handgraaf, T., & Lupton, R. A. (2022). The art of writing a scientific article. *Heliyon*, 19, Article e00205. <https://doi.org/10.1016/j.heliyon.2022.e00205>.

Reference to a book:

Strunk, W., Jr., & White, E. B. (2000). *The elements of style (4th ed.)*. Longman (Chapter 4).

Reference to a chapter in a book:

Mettam, G. R., & Adams, L. B. (2020). How to prepare an electronic version of your article. In B. S. Jones, & R. Z. Smith (Eds.), *Introduction to the electronic age* (pp. 281–304). E-Publishing Inc.

Reference to a website:

Powertech Systems. (2022). Lithium-ion vs lead-acid cost analysis. Retrieved from <http://www.powertechsystems.eu/home/tech-corner/lithium-ion-vs-lead-acid-cost-analysis/>. Accessed January 6, 2022.

Reference to a dataset:

Oguro, M., Imahiro, S., Saito, S., & Nakashizuka, T. (2015). Mortality data for Japanese oak wilt disease and surrounding forest compositions [dataset]. *Mendeley Data*, v1. <https://doi.org/10.17632/xwj98nb39r.1>.

Reference to a conference paper or poster presentation:

Engle, E.K., Cash, T.F., & Jarry, J.L. (2019, November). *The Body Image Behaviours Inventory-3: Development and validation of the Body Image Compulsive Actions and Body Image Avoidance Scales*. Poster session presentation at the meeting of the Association for Behavioural and Cognitive Therapies, New York, NY.

Reference to software:

Coon, E., Berndt, M., Jan, A., Svyatsky, D., Atchley, A., Kikinzon, E., Harp, D., Manzini, G., Shelef, E., Lipnikov, K., Garimella, R., Xu, C., Moulton, D., Karra, S., Painter, S., Jafarov, E., & Molins, S. (2020). *Advanced Terrestrial Simulator (ATS) (Version 0.88) [Computer software]*. Zenodo. <https://doi.org/10.5281/zenodo.3727209>.

Web references

When listing web references, as a minimum you should provide the full URL and the date when the reference was last accessed. Additional information (e.g. DOI, author names, dates or reference to a source publication) should also be provided, if known.

You can list web references separately under a new heading directly after your reference list or include them in your reference list.

Data references

We encourage you to cite underlying or relevant datasets within article text and to list data references in the reference list.

When citing data references, you should include:

- author name(s)
- dataset title
- data repository
- version (where available)
- year
- global persistent identifier

Add [dataset] immediately before your reference. This will help us to properly identify the dataset. The [dataset] identifier will not appear in your published article.

Preprint references

We ask you to mark preprints clearly. You should include the word "preprint" or the name of the preprint server as part of your reference and provide the preprint DOI.

Where a preprint has subsequently become available as a peer-reviewed publication, use the formal publication as your reference.

If there are preprints that are central to your work or that cover crucial developments in the topic, but they are not yet formally published, you may reference the preprint.

Reference management software

Most Elsevier journals have their reference template available in popular reference management software products. These include products that support Citation Style Language (CSL) such as Mendeley Reference Manager.

If you use a citation plug-in from these products, select the relevant journal template and all your citations and bibliographies will automatically be formatted in the journal style. We advise you to remove all field codes before submitting your manuscript to any reference management software product.

If a template is not available for this journal, follow the format given in examples in the reference style section of this Guide for Authors.

Submitting your manuscript

Submit online

Our online submission system guides you through the process steps of entering your manuscript details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process.

Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the editor's decision and requests for revision, is sent by email.

Please follow this link to submit your paper.

After receiving a final decision

Article Transfer Service

If your manuscript is more suitable for an alternative journal published by Elsevier, you may receive an email asking you to consider transferring your manuscript via the Elsevier Article Transfer Service.

The recommendation could come from the journal editor, a dedicated in-house scientific managing editor, a tool-assisted recommendation or a combination.

If you agree with the recommendation, your manuscript will be transferred and independently reviewed by the editors of the new journal. You will have the opportunity to make revisions, if necessary, before the submission is complete at the destination journal.

Publishing agreement

Authors will be asked to complete a publishing agreement after acceptance. The corresponding author will receive a link to the online agreement by email. We advise you to read Elsevier's policies related to copyright to learn more about our copyright policies and your, and your employer's/institution's, additional rights for subscription and open access articles.

License options

Authors will be offered open access user license options which will determine how you, and third parties, can reuse your open access article. We advise that you review these options and any funding body license requirements before selecting a license option.

Open access

We refer you to our open access information page to learn about open access options for this journal.

Permission for copyrighted works

If excerpts from other copyrighted works are included in your article, you must obtain written permission from the copyright owners and credit the source(s) within your article using Elsevier's permission request and license form.

Proof correction

To ensure a fast publication process we will ask you to provide proof corrections within two days.

Corresponding authors will be sent an email which includes a link to our online proofing system, allowing annotation and correction of proofs online. The environment is similar to Word. You can edit text, comment on figures and tables and answer questions raised by our copy editor. Our web-based proofing service ensures a faster and less error-prone process.

You can choose to annotate and upload your edits on the PDF version of your article, if preferred. We will provide you with proofing instructions and available alternative proofing methods in our email.

The purpose of the proof is to check the typesetting, editing, completeness and correctness of your article text, tables and figures. Significant changes to your article at the proofing stage will only be considered with approval of the journal editor.

Share Link

A customized Share Link, providing 50 days free access to the final published version of your article on ScienceDirect, will be sent by email to the corresponding author. The Share Link can be used to share your article on any communication channel, such as by email or on social media.

A Share Link will not be provided if your article is published open access. The final published version of your open access article will be openly available on ScienceDirect and can be shared through the article DOI link.

Responsible sharing

We encourage you to share and promote your article to give additional visibility to your work, enabling your paper to contribute to scientific progress and foster the exchange of scientific developments within your field. Read more about how to responsibly share and promote your article.

Resources for authors

Elsevier Researcher Academy

If you would like help to improve your submission or navigate the publication process, support is available via Elsevier Researcher Academy.

Elsevier Researcher Academy offers free e-learning modules, webinars, downloadable guides and research writing and peer review process resources.

Getting help and support

Author support

We recommend that you visit our Journal Article Publishing Support Center if you have questions about the editorial process or require technical support for your submission. Some popular FAQs:

- How can I track the status of my submitted article?
- When will my article be published?



All content on this site: Copyright © 2026 Elsevier B.V., its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

