



CHANGING CEMETERY DESIGN AND ECOLOGICALLY INFORMED DEATH PRACTICES

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ETHICAL DECLARATION

I hereby declare that I am the sole author of this thesis and that I have conducted my work in accordance with academic rules and ethical behavior at every stage from the planning of the thesis to its defense. I confirm that I have cited all ideas, information and findings that are not specific to my study, as required by the code of ethical behavior, and that all statements not cited are my own.

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ABSTRACT

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This thesis examines the spatial and functional characteristics of ecologically conscious cemetery designs, analyzing the evolution of cemeteries from sacred sites to urban green spaces since the 19th century. The objective is to comprehend this transformation and identify key changes and typologies reflecting these transitions. The study's significance lies in analyzing the historical and spatial changes of cemeteries, offering guidance to designers to incorporate ecologically conscious cemetery approaches into sustainable urbanization processes. It reveals that as cemeteries evolved into urban green spaces, they began to function as recreational areas, reflecting societal shifts towards secularism alongside growing environmental consciousness. In this thesis, literature review and spatial analysis methods were used, exploring traditional cemetery typologies and ecological practices, while conducting comparative spatial analyses of cemeteries with Green Burial Council (GBC) certification. GBC standards ensure ecological adherence in cemeteries, allowing designers to spatially analyze ecological principles through certified cemeteries also

to anticipate future possibilities and rethink humanity's relationship with nature. The findings offer a theoretical foundation for future cemetery designs, emphasizing the significance of ecologically conscious death practices. They allow further research for ecological cemeteries in urban planning and landscape design, encouraging innovative design approaches while regarding cemeteries as vital components of ecologically conscious urban green spaces. This research highlights the role of ecological cemeteries in sustainable urbanization and aim to inform future designs by understanding the historical and ecological importance of cemeteries.

Keywords: Cemetery design, Urbanization, Ecological burial practices, Green cemetery, Spatial analyses.



ÖZET

DEĞİŞEN MEZARLIK TASARIMLARI VE EKOLOJİK BİLİNÇLİ DEFİN MEKANLARI

Ölçer, Ece

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Bu tez, ekolojik bilinçli mezarlık tasarımlarının mekansal ve işlevsel özelliklerini incelemekte ve mezarlıkların 19. yüzyıldan bu yana kutsal alanlardan kentsel yeşil alanlara doğru evrimini analiz etmektedir. Amaç, bu dönüşümü anlamak ve bu geçişleri yansıtan temel değişiklikleri ve tipolojileri belirlemektir. Çalışmanın önemi, mezarlıkların tarihsel ve mekânsal değişimlerini analiz ederek, tasarımcılara ekolojik açıdan bilinçli mezarlık yaklaşımlarını sürdürülebilir kentleşme süreçlerine dahil etme konusunda rehberlik sunmaktır. Mezarlıkların kentsel yeşil alanlara dönüştükçe rekreasyon alanları olarak işlev görmeye başladıklarını ve artan çevre bilincinin yanı sıra seküler dünya görüşünün artış gösterdiği toplumsal değişimi de yansıtmaktadır. Bu tezde, literatür taraması ve mekansal analiz yöntemleri kullanılmıştır. Geleneksel mezarlık tipolojileri ve ekolojik uygulamalar araştırılarak, Green Burial Council (GBC) sertifikasına sahip mezarlıkların karşılaştırmalı mekansal analizleri yapılmıştır. GBC standartları, mezarlıklarda ekolojik uyumu sağlayarak tasarımcıların sertifikalı mezarlıklar aracılığıyla ekolojik ilkeleri mekansal olarak analiz etmelerine, ayrıca gelecekteki olasılıkları tahmin etmelerine ve insanlığın doğayla ilişkisini yeniden

düşünmelerine olanak tanır. Bulgular, ekolojik açıdan bilinçli defin uygulamalarının önemini vurgulayarak gelecekteki mezarlık tasarımları için teorik bir temel sunmaktadır. Mezarlıkları ekolojik açıdan bilinçli kentsel yeşil alanların temel bileşenleri olarak görürken yenilikçi tasarım yaklaşımlarını teşvik ederek, kentsel planlama ve peyzaj tasarımında ekolojik mezarlıklar için daha fazla araştırmaya olanak tanır. Bu çalışma, ekolojik mezarlıkların sürdürülebilir kentleşmedeki rolünü vurgulamakta ve mezarlıkların tarihi ve ekolojik önemini anlayarak gelecekteki tasarımlara ışık tutmayı amaçlamaktadır.

Anahtar Kelimeler: Mezarlık Tasarımı, Kentleşme, Ekolojik Defin Pratikleri, Yeşil Mezarlıklar, Mekansal Analiz.



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TABLE OF CONTENTS

ABSTRACT.....	iv
ÖZET.....	vi
ACKNOWLEDGEMENTS	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xi
LIST OF FIGURES	xii
CHAPTER 1: INTRODUCTION	1
1.1 Problem Statement	1
1.2 Significance of the Research.....	2
1.3 Research Questions	3
1.4 Methodology	3
1.5 Structure of Thesis	4
CHAPTER 2: TRANSFORMATION OF BURIAL SPACES UNDER THE INFLUENCE OF URBANIZATION	6
2.1 Transformation of 19 th century Cemeteries: Sacred sites to Urban greens..	7
2.2 Changing Roles of Cemeteries in Urban Context.....	10
2.3 Milestones in Cemetery Transformation.....	14
2.4 Cemeteries as recreational Green Spaces.....	17
2.5 Cemeteries as Design elements.....	22
2.6 Spatial properties of Urban cemeteries	29
2.6.1 Hard landscape	30
2.6.2 Soft landscape	31
CHAPTER 3: ECOLOGICAL CONSIDERATIONS ABOUT “BURIALS”.....	35
3.1 From Recreational to Ecological Cemeteries: Examples and Debates	36
3.2 Environmental Discussions and Cemeteries: An Overview	38
3.3 Environmental Impact of Traditional vs Green (Natural) Burial Practices	45

3.4	Ecological Impacts and Benefits of Cemeteries as Forested Areas and Recommendations for Ecologically Conscious Burials	49
CHAPTER 4: THE EVOLVING CONCEPT: UNDERSTANDING GREEN (NATURAL) BURIAL		55
4.1	Green (natural) burial practices and Green Cemeteries: A Contemporary Approach to Burial	58
4.2	Ecological Cemetery Principles and Green Burial Council Certification..	60
4.2.1	Hybrid Cemeteries	66
4.2.2	Natural Burial Grounds	71
4.2.3	Conservation Burial Grounds.....	76
4.3	Spatial analyses of green cemeteries.....	80
4.3.1	Hardscape vs Softscape.....	82
4.3.2	Landscaping	91
CHAPTER 5: CONCLUSION.....		96
REFERENCES.....		100

LIST OF TABLES

Table 1. Subcategories of the environmental value of cemeteries	42
Table 2 : The GBC's Certification Types and Standards	64
Table 3. Categorized list of selected certified green cemeteries.....	65
Table 4. Cayetano Natural Burial Ground at Tulocay Cemetery.....	68
Table 5. Mount Auburn Cemetery, Massachusetts	70
Table 6. Fernwood Cemetery, California	73
Table 7. Whispering Hills Memorial Nature Preserve	75
Table 8. Carolina Memorial Sanctuary, North Carolina, Rules and Regulations	78
Table 9. Carolina Memorial Sanctuary, North Carolina, Spatial Features	79
Table 10. Spatial analysis of GBC certified cemeteries' features	95

LIST OF FIGURES

Figure 1. The Woodland Cemetery in Stockholm by Erik Gunnar Asplund & Sigurd Lewerentz	24
Figure 2. The Woodland Chapel	25
Figure 3. The Woodland Cemetery Main Entrance	25
Figure 4. Landscape in front of The Woodland Crematorium and Memorial Hall	26
Figure 5. The Mariebjerg cemetery in Copenhagen by Gudmund Nyeland Brandt ..	27
Figure 6. Gravestone photos taken from The Mariebjerg cemetery by Jakob Skou-Hansen	28
Figure 7. Obtained benefits of forested areas through willingness-to-pay (WTP) analysis in the study conducted in Finland	53
Figure 8. Stone slab walkway from the Historic Congressional Cemetery	83
Figure 9. Unpaved walkway from the Historic Congressional Cemetery	83
Figure 10. Slab and unpaved walkways from the Hollywood Forever Cemetery	84
Figure 11. Green Burial area of Saint Joseph Cemetery	85
Figure 12. The road between the historic cemetery and the natural burial areas in Fernwood cemetery	86
Figure 13. Granite markers in White Haven Memorial Park,Traditional Area,Section R	87
Figure 14. Section C, Fountain Niches, Outdoor Cremation Zone of Non-traditional Area.....	87
Figure 15. Historical memorial remnant sample from Purissima Cemetery	87
Figure 16. Fern Ridge Trail in Kings Mountain Preserve	89
Figure 17. Natural stone memorial in Steelmantown Cemetery	90
Figure 18. Foxfield Preserve marker sample	90
Figure 19. Kings Mountain Preserve “The Forest Chapel”	90
Figure 20. Halcyon Lake at Mount Auburn Cemetery	92
Figure 21. Asa Gray Garden at Mount Auburn Cemetery	92
Figure 22. The Consecration Dell at Mount Auburn	92
Figure 23. White Haven Memorial Park,Traditional and Non-traditional area plan .	94

CHAPTER 1: INTRODUCTION

1.1 Problem Statement

Cemeteries have held significant importance throughout history as places for preserving memories, honoring the deceased, and coping with death. However, the modern urbanization process, influenced by the industrial revolution, has caused functional and spatial changes in these areas, transforming cemeteries from sacred spaces into urban green spaces since the 19th century. This transformation has expanded the perception of cemeteries beyond being just burial grounds to spaces that meet the recreational and open space needs of urban citizens.

In recent times, climate crises and increasing environmental awareness have become prominent subjects in design. Consequently, the need to reshape cemetery designs in alignment with sustainability principles has emerged, regarding cemeteries as integral components of a newer urban transformation process that prioritizes sustainability. Traditional cemetery designs, with their environmentally harmful materials and methods, have created a need for ecologically sensitive practices and initiatives that aim to conserve natural resources and enhance biodiversity. Ecological cemeteries represent a fresh design approach that emphasizes sustainability principles such as preserving natural habitats, enhancing water and energy efficiency, and promoting biodiversity.

This study examines the spatial and functional transformations of cemeteries during the urbanization process and discusses the spatial features and functions of ecologically conscious cemetery designs using examples. The focus is on tracing the spatial, semantic, and functional evolution of cemeteries from traditional typologies to contemporary ones. The exploration of cemeteries' transformation from sacred spaces to urban green spaces since the 19th century highlights significant milestones and changing roles in this process. This framework enables designers to compare cemetery designs across time and provides a detailed examination of future ecological cemetery practices, considering their environmental, social, and spatial context.

The study also provides landscape design lessons by examining the design and spatial characteristics of cemeteries through both hardscape and softscape elements. It

discusses these elements in both 20th-century cemeteries and in green burial practices. This way, the landscape designer's perspective will be enhanced by gaining more long-term spatial data. The aim is to lay a theoretical foundation for potential future cemetery designs by investigating the integration of ecological cemetery designs into urban planning processes and their potential impact on environmental consciousness. By reshaping cemeteries with ecological consciousness, integrating them into sustainable urbanization processes, and evaluating their effects on landscape design and urban planning, this study seeks to contribute to sustainable design practices for the future.

1.2 Significance of the Research

This study summarizes the transformation in the meaning, function, and spatial changes of cemeteries in the urban context and discusses the importance of ecologically conscious death practices. Understanding the ecological values of cemeteries and their historical evolution is crucial for shaping future designs based on lessons from the past and embracing environmental consciousness. In architecture, this study helps us understand how traditional cemetery designs have undergone spatial transformations in urban areas and how architectural design principles have evolved accordingly. It also emphasizes the importance of cemeteries within the concept of sustainability in architectural practice by exploring how cemeteries can become more ecologically sustainable and how green (natural) burial practices can be integrated.

Additionally, it allows architects to develop new design approaches to cemeteries through green cemeteries and ecological burial practices, considering them as “fringe practices” that do not yet have established typologies. The study discusses how the design requirement, which increased in the past with the growing awareness of the green space values of cemeteries, now acts inversely with ecological cemeteries. It references GBC certification standards, noting that these standards consider conservation natural burial grounds as the “most ecological” standard for green cemeteries but also the least designed version in the architectural context. By highlighting that the role of design decreases as ecological consciousness increases, this study allows us to question in a broader context whether green spaces really need human intervention and management. It examines the relationship between ecological

balance and human intervention through cemetery typologies. In this way, the study encourages more ecologically conscious and sustainable death practices while opening new opportunities for research on ecological cemeteries. By enabling society to question and redefine its relationship with death and nature, it also encourages further research in the field.

1.3 Research Questions

- How did the urban transformation process change cemeteries and what intermediate forms can be identified as examples of these changes, what are their spatial characteristics and what are the effects of these changes on the use, design and perception of cemeteries?
- How can we achieve ecological and sustainable design in cemeteries, and what advantages do green (natural) burial practices and ecological cemeteries offer in terms of environmental sustainability and biodiversity protection compared to traditional burial methods?
- Within the framework of the Green Burial Council Certification, how can Green (natural) burial practices and Green Cemeteries, Ecological Cemetery Principles be analyzed ecologically and spatially, and how can a spatial analysis be obtained through the typologies determined by this certification, considering the hardscape and softscape components in terms of landscape design?

1.4 Methodology

This research will include literature review, case studies and spatial analysis methods using secondary sources. Firstly, we will examine the development and transformation of traditional cemetery typologies in terms of semantic, functional and spatial aspects, starting from the 19th century. We will mention examples that illustrate these developments and changes as representative forms. Subsequently, we will review the existing literature on green burial practices and ecological cemeteries. In this regard, we will evaluate the design principles and environmental impacts of green cemeteries by conducting comparative spatial analysis of green cemeteries certified according to different standards by the Green Burial Council.

1.5 Structure of Thesis

This study discusses cemeteries in a specific order, which does not necessarily follow a chronological timeline or a particular geography. The main topic, ecological cemeteries, lacks a local typology and universal rules, yet they are considered "fringe practices." Therefore, this study references various time scales and different geographies as needed. Moreover, since cemeteries relate to various disciplines by nature, their spatial features' origins are discussed by citing sources beyond the design field to provide background context for their design explanations.

The second chapter, "Transformation of Burial Spaces under the Influence of Urbanization," examines the evolution of cemetery areas since the 19th century. It explains how cemeteries have transformed from sacred spaces to urban green areas. This chapter discusses the changing role of cemeteries in urban contexts, highlights significant milestones in their evolution, and emphasizes the process of repurposing cemeteries into recreational green areas. It focuses on their design elements and characterizes the spatial features of traditional urban cemeteries, considering both hard and soft landscape elements.

The third chapter, "Ecological Considerations About Burials," analyzes the shift from recreational cemeteries to ecological cemeteries. It provides a general overview of how environmental debates have influenced cemeteries and explores the environmental impacts of traditional burial practices, solutions of green (natural) burial practices, as well as the ecological effects and benefits of cemeteries. This chapter also discusses ecologically conscious cemetery suggestions.

The fourth chapter, "Understanding Green (Natural) Burial," highlights the significance of green burial practices and green cemeteries. It discusses topics such as ecological cemetery principles and the Green Burial Council certification system. Additionally, it conducts spatial analyses of green cemeteries using samples from different categories that meet these certification standards.

Finally, the fifth chapter, "Conclusion," synthesizes the issues addressed in the previous chapters. It offers a comprehensive perspective on considering cemeteries as

ecological design issues and proposes changes to cemetery design while advocating for the adoption of green burial practices.



CHAPTER 2: TRANSFORMATION OF BURIAL SPACES UNDER THE INFLUENCE OF URBANIZATION

In this section, the study examines the transformation of cemetery typology with urbanization, focusing on the semantic and physical changes within the urban fabric. The 19th century was selected as the starting point for this research, as it reflects a period when the effects of urbanization on cemeteries became particularly evident (Kay, 1998). In the scope of the section, the aim is to analyze the changing roles of cemeteries in cities and their new functions as urban facilities, resulting from the social and spatial practices of the Industrial Revolution. Cemeteries are traditionally considered as sacred areas, defined by religions and cultures, despite the negative prejudices, such as cemeteries being health threats. In order to understand the transformation of cemeteries that have gone through a series of changes, addressing issues like population growth and urban expansion is crucial to comprehend their interaction with cemeteries urban surroundings. Based on factors such as ritual practices, spatial characteristics and contained structures, burial areas differentiate and cemeteries define a certain typology. The traditional cemeteries started to reflect the increasing secularism and shifted in social values, and these changes have manifested in their physical attributes. The Industrial Revolution brought significant changes to urban spaces, including rapid industrial growth, city expansion, increased population density and new infrastructure development. These changes required new approaches to urban planning and public spaces, including cemeteries. Also, discussions on infrastructure needs within the context of health reforms drew attention to the physical and psychological impacts of cemeteries.

Consequently, cemeteries evolved from burial grounds to urban green spaces, afterward also gained secondary purposes and became the recreational areas of the urban landscape. These new cemetery design forms have integrated disciplines and started a transformation process in the field of cemetery design. This chapter identifies and exemplifies significant milestones that indicate notable shifts in these transformations, and analyzes how designers approached the integration of cemeteries into urban planning. In addition, it emphasizes the designer's increasing treat to

cemeteries as recreational-green space through selected projects and their spatial features in the context of urban green space approaches.

2.1 Transformation of 19th century Cemeteries: Sacred sites to Urban greens

Cemeteries are conventionally considered as sacred spaces, influenced by religions and cultures. They are not only places for burials, but also places for respect, as they reflect different post-mortem belief systems of societies. The sanctity of burial spaces made them a “taboo”, untouchable parts of the urban fabric and ensured their physical continuity. Their maintenance has been preserved by traditions, despite their disreputation for being potential health threats in the cities, are results of former malpractices applied in history, such as the usage of Chicago River banks as burial grounds by including the victims of the cholera epidemic in 1840. (Pattison, 1955; Uslu et al., 2009) Their permanence in despite of negative perceptions, gave burial areas a point of view as the inevitable form of land use in cities (Harvey, 2006). In order to grasp the status of burial spaces as components of urban fabric, it is essential to understand their interactions with developing cities. This understanding will enable the comprehension of the burial site alternations that is characterized by urban transformations.

The urban transformation movements emerged under the influence of industrial revolution, began during the late 18th and early 19th century. A variety of problems, such as population growth, expansion of cities and growing need for open spaces in intense urban environments has emerged. The authorities were forced to improve the quality of urban life in order to maintain the social stability, and a number of solutions in order to overcome these problems have been developed. For instance, green spaces were aimed to be provided for the working classes, in order to improve their quality of health. Therefore, parks and gardens, took an important role in the development of the public health movement. Thus, they became a popular element of urban planning and gained the reputation of being the “lungs of the city.”

Urban peripheries were mostly been regarded as the victims that resisted the pressures of urban growth (Alexandre, 2013). Land use planning alternatives were promoted and established in this scope, such as the urban growth boundary (UGB), defined by the

State of Oregon in 1973, in order to protect farm and forest lands from urban encroachment (Harvey, 2006). Planning concepts as a response to urban expand and population growth were proposed such as “new towns”, newly created communities that can exist entirely independent of the old city, philosophically as well as physically. Unfortunately, those sophisticated, ideal self-sufficient new towns, reflected the lack of long-term considerations and ended up being the “outskirts” of the city, that lost their accessibility. Connecting urban clusters by road and railways were tried, but sufficient solutions that enable the residents’ needs were not provided. As a result, these attempts also couldn’t overcome the problem of being dependent on the main city. Far from being a solution, they even led to expand and spread through new, multiple, high-density centers along the periphery of old cities, on the contrary (Whyte, 2002).

Other experimental urban concepts were proposed in this scope, even promising to be more advanced versions, such as the “Minnesota Experimental City” (MCX), proposed around the 1960s. MCX was also an independent city concept like ‘new towns’, but also promote to contribute to the potential future needs of cities by accommodating technological innovations. Despite its intends, MCX project was also turned out to be a utopia that didn’t match the reality (Vivrett, 1972; Whyte, 2002).

All these initiatives, that primarily emerged to protect green spaces in growing cities, led to further urban sprawl on the contrary. The extent of the problem was increased in one respect. In this accelerating demand for “greenness”, which increased even more as a result of unconsciously taken new decisions, the need for a holistic approach was realized and managed to get on the agenda of the administrations. This generated dilemma, forced residents to make a choice between city offerings and access to nature. If they choose to live in cities, they should release their need for urban space, or vice versa. That hesitation of communities became an issue and authorities were forced to get into the habit of “urban space considerations in the city planning stage.”

The need for more well-balanced metropolitan areas, resulted also in a variety of public programs that aims to take action in the field of land-use habits. For instance, Outdoor Recreation Resources Review Commission (ORRRC) was established in 1958, in the

United States, focusing on the next-door recreational needs of people that lives in cities and aim to enable the open spaces to be taken into constitutional consideration. As another example in the United States, The Land and Water Conservation Fund (LWCF) was established by President Johnson, in 1964, with the aim to protect the landscape areas. This program was more about the “natural beauty”, focusing on the man-made aesthetics by also considering those landscape areas’ recreational values (Whyte, 2002).

The public programs, that initially emerged with the aim of preserving the amenity values of green spaces and evolved with the considerations of their recreational benefits, have become more diversified with the integration of environmental concerns. Comprehensive strategies have been developed, in order to establish sustainable cities. The aim extended beyond the preservation of existing nature. Open green spaces in cities, such as parks and green ways, were considered as interconnected components of an ecological network. The intention was not only to preserve the existing nature, but also to enable these spaces to function as a part of a continual system. Developed concepts were started to be implemented in cities, such as Strategic Open Space Network in London. Urban growth was accepted as an irresistible fact within the concept, and continual open spaces with environmental sustainability concerns were promoted. As another example, the concept of *trame verte et bleue* (green-and-blue-way) has started to applied in France. Objectives were to provide ecosystem services to protect both green and blue natural heritages within the urbanization process, while also considering the biodiversity of habitats by purposing a sustainable urban planning with the engagement of local communities (Alexandre, 2013).

All these movements initially perceived urbanization as a threat and aimed to draw boundaries to cities in order to prevent future expansions. However, they have come to accept the reality that this growth cannot be prevented. A universal consensus on these various solutions could not be achieved, thus generally applicable rules could not be defined. However, this gradual progress has shifted towards preserving and developing existing resources rather than proposing new ones, mainly due to the growing land consumption. Cemeteries have also become the subject of these

discussions due to their green structures and open space features, as they are the preserved landscape areas that have been least disturbed by anthropogenic factors through a long period of time (Barrett and Barrett, 2001).

Cemeteries were defined as the most frustrating areas of the cities. Despite their potential as open spaces in the urban context, planners have avoided any physical disturbance, due to the concern of causing major political controversy (Whyte, 2002). However, with the shortage of open spaces during the urbanization process, the conditions made it obligatory to plan cemeteries as green areas (Uslu, 2010). Although cemeteries were seldomly planned as an urban land use previously, aside from small churchyard burial grounds and family plots, and even though no space was allotted to them in new town plans, they soon became surrounded by urban development and transformed into intimate parts of the urban fabric during the urbanization process (Harvey, 2006; Whyte, 2002).

2.2 Changing Roles of Cemeteries in Urban Context

Traditional cemeteries differentiate and diversify both semantically, by the ritual practices applied and spatially, by the structures they contain, such as churches or temples. A common grammar that clarifies the distinctions of burial space types are defined according to the differences between features, such as ownership, meaning or physical characteristic. Through comparisons, definitions of burial spaces, such as cemeteries, churchyards, burial grounds or mass graves are clarified. Cemeteries signify just a particular type of burial space.

A comparison of cemeteries with churchyards would briefly clarify their distinctions. For instance, comparing their physical characteristics, in the urban planning, while cemeteries are larger areas, located close but not necessarily within the settlements, churchyards tend to be smaller and located at the center of the communities rather than their periphery. Layout of cemeteries is more formal, divided by roads and paths and each grave have an established address, while in churchyards, paths and roadways makes the movement inside the field and around the graves easier. Both cemeteries and churchyards are marked by boundaries (Rugg, 2000).

Traditional cemeteries are not the main objective of this study. Therefore, it is neither necessary nor possible to describe all traditional typologies. However, the information gained from the previous comparisons enables some observations about cemeteries beyond their physical attributes. Nonetheless, these parameters ultimately influence the physical properties of the cemeteries. For instance, according to the belief systems they are affiliated with, while churchyards are tied to a specific religion, cemeteries accommodate a variety of religions and denominations. This inclusiveness makes cemeteries more secular and allows for diverse burial practices, serving the needs of a complete community.

In terms of their management, while churchyards are managed according to decisions made by religious institutions to which they belong, management rules for cemeteries can be established according to the needs of communities, as cemeteries can be privately owned (Rugg, 2000).

The previous comparisons summarize the basics of cemetery management. One could argue that the characteristics of cemeteries enable them to resist the influence of strict beliefs and rigid rules, affording them a flexibility that allows them to adapt to changing conditions. This adaptability has led cemeteries to acquire new attributes, similar to other open spaces in cities, such as green and recreational areas, thereby adapting themselves to emerging trends during urbanization. As previous summaries of urbanization have demonstrated, changes in the definitions and uses of cemeteries can be asserted as both necessary and obligatory. The excessive consumption of land throughout the urbanization process, has led to the rapid depletion of green areas not only in city centers but also in the outskirts. Cemeteries within the urban landscape have sustained their existence, supported by their spiritual significance. As a result, they have begun to respond to contemporary urban needs, aligning with evolving trends.

The primary desire was to maintain remembrance, the conservation of the body rather than its decomposition was targeted in the beginning of the 20th century (Santarsiero et al., 2000). As the cities expanded outward, more cemetery areas were defined to serve these peripheries. Consequently, the numbers of cemeteries increased,

parallel to urban expansion. The historical records, such as the one concerning Chicago cemeteries during the 1850s, are also evincing the minority of cemetery locations within the legal limits of the city, mostly serving the suburbs. The lack of conscious coordination of governments, overlooking demands of public and different nationalities for religious segregation and independent areas, not sorting accessibility out and missing changing trends, also produced a multiplication of cemeteries (Pattison, 1955).

Cemeteries, as part of the land-use challenge during the urbanization process, were not only linked to city expansions. With population growth, the number of deaths also increased, necessitating more burial space. This increase intensified the land-waste problem by creating a greater demand for burial plots. More recent studies, such as the study conducted in China, in 2008, indicate the situation of cemeteries, where the dead almost cover the spaces of the living, due to the lack of proper guidance and effective control, which indicates that the land-use problems still persist and remains unsolved in various geographies despite the passage of time (Wu and Sun, 2008).

The urban developments operated against the principles of sustainable cities have resulted in a variety of problems, such as land waste, as mentioned previously. It can be argued that cemeteries are somehow trapped within the whole set of urban problems. While this process of urban transformation has primarily been observed in the West, its effects have been globally evident over time. The changes did not occur simultaneously or in identical ways, but they are interrelated. Therefore, while explaining the variables that influence the urban transformation process and the role of cemeteries within that frame, it is not possible to limit the discussions within a specific timeline, period or geographical context.

In the 19th century, cemeteries in inner-city locations were seen as health treats for the public, which resulted in their being pushed to outskirts of cities (Murray, 2003). This perception of cemeteries as health treats can be considered as the initial step in defining them as factors causing land consumption. However, this perception alone did not fully explain the cause-and-effect relation between burials and land use. On the other hand, traditional burials were examined, and new techniques were introduced, promoting “a

more hygienic” disposal as an alternative to the conventional burial practices. Correspondingly, with the establishment of Cremation Society of England, in 1874, cremation became an acceptable way of disposal technique. It has gained an increasing attention throughout the 20th century and ended up being the dominant method of disposal by 1968 and the first crematory was opened in Chicago in 1905. In addition to its health benefits, cremation was also claimed to solve the problem of excessive land use, in comparison with the traditional methods (Rugg, 2006; Pattison, 1955).

Beside the urban scale, traditional burial practices and religious principles were also influencing the layout design of the cemeteries. Parameters such as the estimated burial area required for the deceased, burial depth and location, type of markers and tombstones used, as well as their material and dimensions, collectively determine the layout of the cemetery and the area of land it will occupy. Since population growth and consequently the number of deaths could not be controlled, the question of “how the surface area of cemeteries can be reduced” emerged. It was believed that reducing the area of burial plots would also decrease the overall size of cemeteries in urban areas. Therefore, cremation was expected to respond to land consumption problems also at a smaller scale, which was did not seem possible with traditional methods.

Although cremation was beneficial by reducing the burial plot area, it was not effective enough to prevent the expansion of cemetery areas as expected on an urban scale (Pattison, 1955). For instance, in Britain, cremation remained as the dominant disposal technique throughout the 20th century, yet the need for burial spaces continued to increase. Although crematory didn’t provide a land use solution as envisioned in the first place, it has been an encouragement to reconsider the commonly accepted ways of dealing with the disposal and started the shifts in perception and management for disposal of the death through specifications of divergences in the practices (Rugg, 2006).

Even though cemeteries gained a status on the urban agendas with the discussions of their land use, there were still obscurities. For instance, in Oslo municipality plan, cemeteries counted in “buildings and facilities” but not in “green” categories. This points out how the cemeteries were perceived by governance (Skår et al., 2018). Yet, there has been a growing public adoption of cemeteries, as the amenity landscapes and

view corridors, that provide breaks from the built environment in the cities. For instance, in Portland, in 1994, Metro (the regional land-use planning agency of Portland) included cemeteries in its regional parks and green spaces program (Harvey, 2006). Also in Chicago, the city cemetery which was established around 1850, was unable to stand alone against the influences of rapid population growth by only maintaining its primary sacred value, repurposed and became the center of Chicago's first public park by 1900 (Pattison, 1955).

2.3 Milestones in Cemetery Transformation

Cemeteries, due to the sacred values and cultural identities, have traditionally resisted significant changes to their established typologies. However, alternations in their religious context have ultimately triggered some changes in their physical characteristics. For instance, in 1845, the Australian government proposed a "general cemetery" concept and aimed to make the internments indiscriminately, in contrast to the discrete layout of the existing burial ground, where denominations were subdivided into sections. While this project failed to gain support, it inspired the new "general cemetery" productions, impacting the 19th century cemetery layouts and becoming a cornerstone for today's multi-religious burial grounds (Murray, 2003).

Studies, conducted in the first half of the 19th century, were also pointing to future cemetery discussions. For instance, Dr. George Alfred Walker, a sanitary reformer, associated the health threats of burials with the infrastructure such as drainage and sewer systems (Walker, 1839). However, these studies primarily aimed to evaluate cemetery movements within the framework of public health reforms (Johnson, 2008). Later, in the mid-19th century, urban planners and garden designers, such as John Claudius Loudon, discussed cemeteries within the context of burial reform issues. They argued that the primary purpose was to protect the living from the negative impacts resulting from the disposal of remains, both physically and psychologically. This process began by addressing hygiene obligations and later evolved into a process involving interdisciplinary interactions, including subjects such as space aesthetics, functions and urban environments (Johnson, 2008; Loudon, 1843).

Loudon's book *On the Laying Out, Planting, and Managing of Cemeteries* (1843) reflects this evolving interdisciplinary perspective by discussing various topics. The subjects were related to the decomposition of dead bodies, that create unhealthy situations and their connections with natural resources such as soil. Loudon addresses structural elements of cemeteries such as boundary fences, gravestone arrangements, roads, walks and green paths, as well as landscape elements like tree species and types of plantings such as the use of shrubs as borders. He also mentions security and management issues, such as the protection of the headstones and implementations of grave depths (Loudon, 1843).

Loudon was also characterizing cemeteries by their aesthetic values, suggesting that cemeteries should be "rendered inviting" with elements such as attractive monuments and well-maintained lawns (Johnson, 2008). As Alexandre (2013) stated, green spaces were already designed and perceived primarily for aesthetic purposes since the second half of the 19th century. Despite Loudon's comprehensive considerations in viewing cemeteries as green spaces, his visual description of cemeteries was still serving the same aesthetic appreciation purpose (Elliott, 1982). This shows that, regardless of the broad perspective taken, aesthetic values of cemeteries remained prominent. However, Loudon's proposed principles for orderly arranged cemetery designs has been a step that paved the way for discussions about cemetery typologies (Johnson, 2008).

In the first half of the 20th century, other practices that disrupted religious traditions began to be implemented. Crematorium buildings began to be located within existing traditional Victorian cemeteries, despite the risk of possible public resistance. While this arrangement made it easier for the public to accept cremation as a new disposal technique by increasing familiarity, it also caused Victorian cemeteries to be perceived as old-fashioned. However, this cannot be described as a negative impact, as it initiated a spatial demonstration for the "reinvention" of burial practices (Rugg, 2006).

The reinvention process led to a series of changes resulting in a variety of interpretations. One such attempt was the introduction of lawn cemeteries, regarded as the "reinvention of the cemetery aesthetic." By rejecting the traditional Victorian style, with uniform, monumental elements and distinctive entrance gates, situated on higher

settlements, lawn cemeteries established themselves as the typology foundation for future layouts in the early 20th century. Lawn cemeteries were described as the most important progress towards the ideal in public cemetery administration, at a conference in 1953, by E.F. Coward, the Superintendent and Registrar of Cemeteries and Crematoria at the Metropolitan Borough of Fulham (Rugg, 2006).

The conception of cemeteries changed from primarily being perceived as burial sites with commemorative purposes to being seen as green areas. Although physical transformations in cemeteries have begun, their aesthetic and visual values were still at the forefront, as seen in Victorian cemeteries, which were gradually accepted as landscape forms while still primarily serving the purpose of appreciating cemeteries as an art form (Elliott, 1982). Although cemeteries were previously perceived as such, lawn cemeteries have been the earliest forms that made it possible to observe the changes in attitudes through physical elements. As increasing secularism and the adoption of new disposal techniques have relieved cemeteries from religious pressures and traditional obligations, the multidisciplinary discussions on their physical characteristics, have started a new era for cemeteries. For instance, Loudon criticized existing cemetery designs. His critiques were important because, as we previously mentioned, he had significant works related to cemeteries, especially from the landscape perspective.

In fact, Loudon's proposal of London Plan, his first design on urban planning at the time, was likened to Ebenezer Howard's "Garden City" concept. Just like Howard's concept, Loudon aimed to offer a demonstration to serve as a foundation for an ideal city concept, visualizing alternating circles, concentrating built-up areas with green belts (Schumann, 2003). One of his critiques was about Abney Park Cemetery in London, for being "highly ornamented." Abney Park was known as the first arboretum cemetery, opened in 1840 as a model garden cemetery, which applied standardized park-like landscaping principles (Trust, 2014; London Natural History Society, 2024a). Now it is designated as a woodland memorial park and Local Nature Reserve, managed by the London Borough of Hackney (Abney Park Trust, 2021). It is also one of the "Magnificent Seven", a group of seven Victorian Gothic garden cemeteries, that

provide some of the few substantial areas of woodland, scrub, and rough grassland, managed to some degree for their wildlife (London Natural History Society, 2024b).

Another example of his suggested “improvements” is Norwood Cemetery in London, one of the earliest private cemeteries, designed by the architect William Tite, opened in 1837. Loudon criticized the planting for being inappropriate, stating that cemeteries don't require shelter and shade; trees should be “scattered” to make the most efficient use of the land. He also objected to deciduous trees and preferred “fastigate conical dark needle-leaved evergreens” instead, which shade much less ground and produce much less litter when the leaves drop. He claims his approach as “keeping the contemporary continental design while also preserving the historical tradition of the ancients”, who used trees like cypresses extensively in burial sites, as well as in oriental cemeteries. In general, Loudon declared cemeteries should be considered as gardens, and they should either be planned like this in the first place (Trust, 2014).

Cemeteries, as mature and densely vegetated open spaces, have naturally become integrated into the urban fabric and subjects of urban, architectural and landscape design. This evolving perspective has allowed them to transcend their perception as amenity spaces and become repurposed areas that gain new functions while preserving their sanctity. As Whyte (2002, p.166) stated, “open space has to have a positive function. It will not remain open if it does not. People must be able to do things on it or with it - at the very least, to be able to look at it.” From this perspective, existing cemeteries, formerly seen as areas of dignity, are now being regarded as open public spaces due to their well-maintained and mature green infrastructure. Additionally, features such as their position within the dense urban fabric, enabled them to be accessible for everyday green space use and allowed them to be perceived as potential outdoor recreation areas.

2.4 Cemeteries as recreational Green Spaces

As Skår et al. (2018) emphasizes, it's crucial to respect the sacred values of cemeteries while planning. Contrary to other forms of urban land use, according to their religious and philosophical contents, cemeteries are not places that can easily be converted into different functions, even where urban profitability is high (Uslu et al., 2009). Due to

the reason that cemeteries have cultural and recreational significance, there are negative perceptions about assigning secondary purposes to cemeteries through new practices. Some still do not use cemeteries in their daily routines due to the belief that cemeteries only belong to those who visit graves for mourning. This situation highlights the insufficient public acceptance of cemeteries' green infrastructure as sources for recreation, as well as their neglect in green space discourse, despite their high vegetation levels and ecosystem service contributions (Skår et al., 2018; Quinton and Duinker, 2019).

Yet, there were not only negative public opinions on the subject, as the public was not the only determinant of this process. Simultaneously, there was an increasing public demand for the recreational uses of cemeteries. Administrative units were also justifying their restrictions regarding recreational uses in response to the increased demands by attempting new regulations and practices to make the concept of recreational cemeteries more attractive (McPherson and Nilon, 1987). However, due to the lack of foresight in planning by administrative units, situations such as poor-quality maintenance and design arose, caused by reasons such as lack of appropriate funding, leading to unpleasant situations which revived previous public resistances (Clayden and Woudstra, 2003). The varying physical conditions of old cemeteries, including some that accept interments, others that remain inactive yet maintain their existing structure, and still others that have been completely abandoned, indicate that comprehensive management principles addressing the diverse challenges faced by cemeteries have not yet been established (Uslu, 2010).

Governmental processes concerning the newly acquired green space use of cemeteries occurred not only in Western countries but also in other regions. For instance, around 1980, the Ministry of the Interior in Taiwan initiated a Public Cemetery Improvement Project to enhance the dignity of cemeteries by creating a “park-like” environment, while also considering overall environmental quality. However, even twenty years after the implementation of the project, studies conducted to assess the extent to which the past targets have been achieved, show that the recreational purposes of cemeteries have not yet been normalized by the public, to the same extent as urban parks. Additionally, traditional Chinese beliefs that portray cemeteries as frightening and

filthy, advocating for their separation from the living, still persist (Huang, 2007). These various observations and studies, carried out in various regions, indicate that there was still no universal consensus on the green space values of cemeteries and no clear definition for “cemeteries with green space features.”

What we have summarized so far outlines the dual process of public-government involvement regarding the green space values of cemeteries and provides insight into the potential perspective for their recreational uses within the atmosphere of that era. As previously mentioned, cemeteries can be either private or state-owned (Rugg, 2000). This factor, includes them to public-private division debates. These debates consider the accessibility of cemeteries for public use within the framework of property rights and ownership. Additionally, the equitable distribution of cemeteries for public access have been evaluated within the framework of spatial democracy. However, it has been determined that management models, rules and regulations alone do not suffice. Physical and visual boundaries of cemeteries also influence their privacy regulation. Considering these variable factors, cemeteries exist on a floating border between private and public space and are still perceived as a kind of in-between area within this private-public realm (Swensen and Brendalmo, 2018).

The literature projected that cemeteries have the potential to acquire characteristics similar to those of local parks. For instance, Tunnard, C. and B. Pushkarev (1963) described NY and LA cemeteries, as places that have similar states with parks, providing visual relaxation in the cityscape's density. Depending on various factors, such as ownership and management practices, which may evolve through future generations' definitions for the disposal of the dead, Rugg (2000) suggested that the perception of cemeteries could become increasingly sacred or less. Studies comparing urban parks and cemeteries also support this view. For instance, Skår et al. (2018) described cemeteries established in the 1800s as “park-like” designs, based on practices applied such as planting trees and flowers to honor the place and the deceased also arguing that they were influenced by the English landscape park ideal. Also, Kowarik et al. (2016) indicates the similarity between cemeteries and tree dominated areas and Evensen et al. (2017) mentions the adopted perspective of cemeteries having park-like qualities in Scandinavia.

Despite the process, which included various dilemmas and debates that caused public conflicts and disagreements, the park-like values of cemeteries and their suitability for public use were increasingly accepted as predicted. Recreational cemeteries succeeded in becoming a modern-day narrative with their rich and diverse leisure offerings (Deering, 2010). This challenging reinvention process of burial spaces, transforming into landscape areas, achieved to maintain both their historical and cultural values, as well as serve the changing needs of an increasingly dense world (Rugg, 2006; Rae, 2021). In addition to parks and cemetery comparisons, they also began to be seen as collaborators meeting different needs within the urban fabric. While cosmopolitan cities' public spaces encourage vitality and creativity, urban cemeteries fill the need for secluded places, providing silence, calmness and retreat (Swensen and Brendalsmo, 2018). As Deering (2010, p.90) stated, "the more that cemeteries and churchyards are understood as multiple-use landscapes and managed to that end, the better one can hope to improve the sites for all users and circumvent conflict."

Cemeteries always differ from urban parks due to their sacred main purpose of grief, therefore reveals public contradictions for the convenience of activities (Evensen et al., 2017). Through the recreational transformation of existing cemeteries, wanted/unwanted, prohibited/permitted activity and usages have been defined by the public and managements in this scope. For instance, horse riding, cycling, walking dogs without leads were described as unwanted activities by Gamlebyen cemetery management in Oslo, "maintaining the grave, attending funerals, passage walking, walking the dog, strolling with baby pram and children, strolling, resting, exploring, social gathering with family and friends, picnic/ having lunch, skateboarding, arrivals to the chapel and playing" were the activities observed through the study, reflecting the public acceptance of recreational values in cemeteries (Swensen and Brendalsmo, 2018). Also, Evensen et al. (2017) defined the activities dog walking, socializing, resting on benches, strolling and physical exercise, observed through the study in Scandinavian cemeteries, as an invitation to people for recreational use beyond visiting graves. Yet, the same study also listed other activities, such as jogging, skiing, driving without a special permit, sunbathing and playing as prohibited uses in Gamlebyen cemetery, determined by the Cemetery Officials.

Beside from the permitted recreational activities, there were also events and organizations, conducted by the cemetery managements. For instance, Harvey (2006) mentions the walking tours organized by Metro agency in Lone Fir Cemetery in Portland. Also, there are the tree-identification workshops, educational and guided historical tours, arranged by the advocacy group of the cemetery (Friends of Lone Fir Cemetery, n.d). The Spring Grove cemetery, in Ohio, has an event center, offering social organizations such as, horticulture walking tours, parades, sunrise and twilight walkabouts, movie nights, concerts, plant identification tours, beer & music events, lantern ceremonies, volunteering organizations and stage performances such as theaters (The Spring Grove Family, 2024). Also, in Oakland Cemetery, in Georgia, the help of technology is being used. A self-guided audio tour, provided by a computing program, is offered in order to promote the public engagement (Uslu, 2010).

The reinvention process, which started with lawn cemeteries, has shifted public opinions and repurposed cemeteries, transforming them into multi-functional spaces. These emerging trends, which strengthen the identity of cemeteries as city parks, have led to their recognition as “urban design elements” and “urban landscape areas.” Consequently, cemeteries have now become part of the design discourse among urban, landscape and architectural professionals. Professional have begun to redefine for cemeteries as urban parks. For instance, Art Cowie, a Canadian landscape architect and urban planner performed in the 20th century, described cemeteries as “undiscovered urban parks that needs redesigning” (Uslu, 2010). Additionally, the Spring Grove cemetery, was announced as the best designed landscape in the United States with its park-like design by Adolf Strauch, in 1900, winning the gold medal at the Paris International Exposition and have been qualified as the best cemetery in the nation by Frederick Law Olmsted in 1875 from a professional point of view. It was still called to be the leader in the field of cemetery design and management, serving for recreational and educational purposes along with their sacred duties (The Spring Grove Family, 2024).

2.5 Cemeteries as Design elements

Traditional cemetery designs reflected the influences of the religions they are affiliated with through their physical elements. For instance, churchyards include spatial elements that reflect specific belief systems tied to their respective religious ethics (Rugg, 2000). These elements constitute a universal language. However, religions are not the only influence; societies' traditional beliefs also manifest in the spatial characteristics of cemeteries. In this context, ordinary implementations made by individuals, without adhering to any general rule, also impacted to the lack of planning in cemeteries. For instance, the traditional practice of Feng Shui worsened the irregularity of traditional cemeteries in Taiwan by allowing individuals to choose the most suitable locations for their deceased (Huang, 2007). As stated by Clayden and Woudstra (2003), giving individuals the freedom to arrange graves often leads to chaos, and a "limited chaos" can only be achieved in relatively small burial spaces. As mentioned, religions and traditions have negatively affected the designs of cemeteries. However, on the other hand, there were also practices that provide historical documentary quality to cemeteries, such as the use of characteristic furniture, "*kuşluk*" (water bowls for birds) (Uslu, 2010).

It is neither necessary nor possible to explain all the spatial features of traditional cemeteries. However, as just mentioned, they are established under the influence of religions and traditions. Instead of considerations on the scale of "urban design", the main effort is to reflect the symbolic meanings of the religion they represent with design elements. However, as explained in the previous section, cemeteries have managed to be accepted as an "urban design" element. In this context, they were addressed as a design issue both on an urban scale and by architecture and landscape professionals. This new multidisciplinary design approach can be observed through their spatial features. Recreational concerns have become integral to the design of cemeteries throughout the 20th century. Cemeteries began to be designed with the additional aim of creating functional green spaces, to improve the quality of life in cities and contribute to natural beauty and wildlife (Skår et al., 2018).

The previously mentioned approaches were applied both to newly designed cemeteries and to established ones through certain physical transformations. The main idea is to

adapt them to new trends while also preserving their existing elements. These new design approaches can be observed through established cemetery designs. Three cemeteries have been selected in this scope to exemplify: the Woodland Cemetery, the Mariebjerg cemetery and the General Cemetery.

- The Woodland Cemetery, Stockholm, Sweden

The original name of The Woodland Cemetery, in Stockholm, Sweden is indeed South Cemetery. However, it is generally referred to as The Woodland Cemetery because it was established within an existing pine forest (Figure 1). This award-winning cemetery design was created by Gunnar Asplund and Sigurd Lewerentz and was constructed around 1920 (Clayden and Woudstra, 2003). It was later included in the UNESCO World Heritage List in 1994 (UNESCO, 1992).

The Woodland Cemetery was designed to create a spiritual landscape, contrasting the dreary atmosphere of municipal cemeteries. The aim was to create a secularized graveyard, without prototype or patterns (Waern, 1997). Unlike formal principles that include well-groomed bushes and “*allées*” on-axis, the designers did not attempt to compete with the existing wild forest’s informality. Instead, they preserved the unique qualities of the existing landscape, and the pine forest area was planned as the main site for burials. Also, minimal and freely passing routes through the forest were allowed, rather than directing pedestrians along colonnaded pathways (Clayden and Woudstra, 2003; ArchEyes, 2016). This approach demonstrates the possibility of preserving existing nature during the cemetery design process, while maintaining the cemeteries’ potential identity in the urban landscape framework.

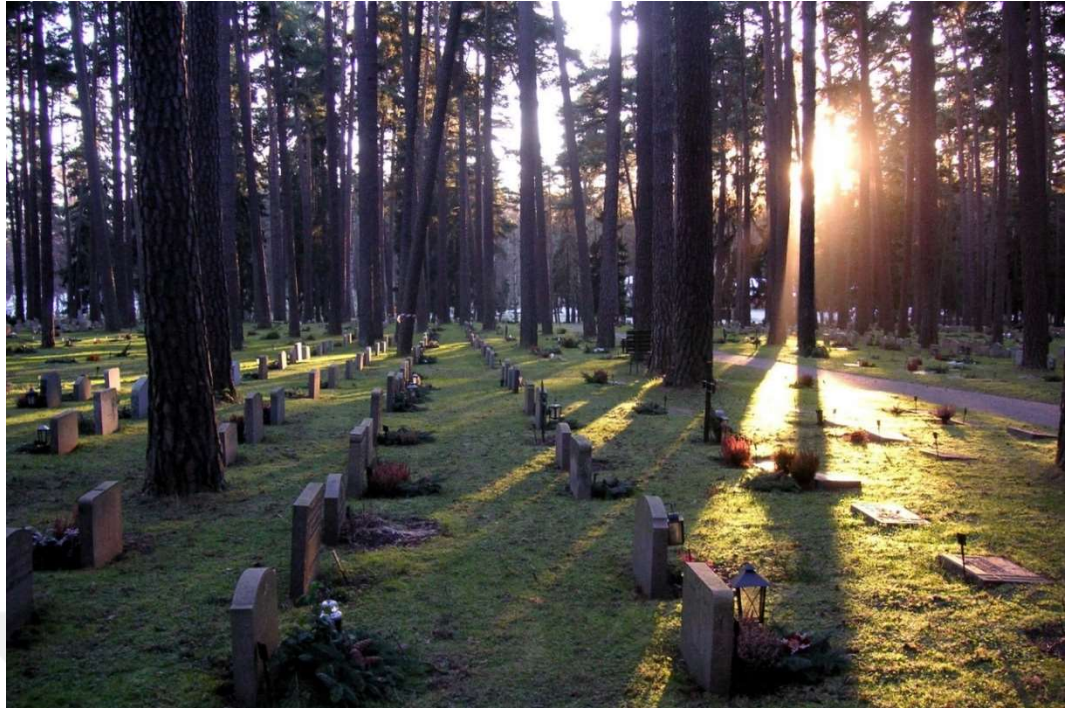


Figure 1. The Woodland Cemetery in Stockholm by Erik Gunnar Asplund & Sigurd Lewerentz (Source: ArchEyes, 2016)

Even if there was no strict regulation for headstones and traditional styles were allowed, it is observed that there's still no domination of memorials (Clayden and Woudstra, 2003). This can be regarded as the public appreciation of simplicity that inspires people without strict regulations and restrictions in both management and architectural planning. Unlike the conventional, directly routing formal attitude to chapels, at Woodland Cemetery (Figure 2), the direct avenue to chapel is not dominant. A variety of paths also lead the visitors to different directions. Some of them are paved with irregular stone slabs and orientated to enable pedestrians to experience the place separate than funerals (Clayden and Woudstra, 2003). These types of design interventions can be described as the physical transformations created by the increasing secular approach to cemetery designs. The prior layout of cemeteries where the circulation was designed as if the main purpose was to reach that religious structure, now the current design approaches offer alternatives to users.



Figure 2. The Woodland Chapel (Source: Skogskyrkogården, 2023)

The open-space effect is also achieved at the main entrance (Figure 3) by a gently sloped lawn area (Clayden and Woudstra, 2003). “The Granite Cross” is clearly visible from the main entrance, positioned within the green open space.



Figure 3. The Woodland Cemetery Main Entrance (Source: Tripadvisor, 2024)

Positioned at the top of the hill, a large pond beside “The Woodland Crematorium and Memorial Hall” further enhance the park-like visual (Figure 4)



Figure 4. Landscape in front of “The Woodland Crematorium and Memorial Hall”
(Source: Stockholms stad, 2024)

The open space effect, combined with religious symbols and structures, from the beginning and throughout the cemetery, conveys the message that the cemetery can be used not only for a religious rituals or commemorations but also for recreational purposes. With all these features, The Woodland Cemetery is regarded as an important turning point for modernism in landscape design (Waern, 1997).

- The Mariebjerg cemetery, Copenhagen, Denmark

The Mariebjerg cemetery in Copenhagen was designed by the Danish landscape architect Gudmund Nyeland Brandt, around 1930. The cemetery design took shape by considering future burial space needs and aimed to harmonize with the local nature, with minimal impact on the unused land allocated for the cemetery (Clayden and Woudstra, 2003). In The Mariebjerg cemetery, situated within a large agricultural area, the designer aimed to clearly define the entire space (Figure 5).



Figure 5. The Mariebjerg cemetery in Copenhagen by Gudmund Nyeland Brandt (Source: Yardbirdstock, 2018)

This objective was accomplished by emphasizing square areas within a rectangular grid system, with the main axes marked by avenue plantings. Gradually, smaller square sections were divided and bordered with various plant species, distinct from avenue plants. The aim was to provide clearly defined areas for future burial space needs with the help of a diverse selection of plants. These varieties of spatial experiences collaborated pedestrians to navigate inside the cemetery, further enhanced its overall wooded character (Clayden and Woudstra, 2003).



Figure 6. Gravestone photos taken from The Mariebjerg cemetery by Jakob Skou-Hansen (Source: lex.dk, 2013)

Additionally, in The Mariebjerg cemetery, tombstones crafted from small boulders were purposely positioned and planned irregularly in the site (Figure 6). Even at times, urn burials conducted without markers were observed (Clayden and Woudstra, 2003).

- The General Cemetery, Doorn, Netherlands

The General Cemetery, in Doorn, Netherlands is also another cemetery positioned within an existing pine forest like The Woodland cemetery. It was designed by the landscape architect Wim Boer around 1950. The designer's aim was to respond to the new "woodland cemetery" concept, which now defines a typology rather than the specific location of The Woodland cemetery, eponym of the "woodland cemetery concept." In The General Cemetery, Doorn, headstone options were not arbitrary and subjected to significant constraints. There were only two types: positioned upright or laid flat in grass. The aim was to avoid hierarchy so monumentality and symbolism through spatial elements was restricted, minimalism was expressed (Clayden and Woudstra, 2003).

2.6 *Spatial properties of Urban cemeteries*

These new “urban-design” forms, that emerged with lawn cemeteries, went through a physical transformation process that led professionals from various disciplines to get involved in cemetery design and challenged them to adapt to new trends while also preserving their sacred values. Recent examples illustrate the growing appreciation for professionals' participation in cemetery design in the early 20th century and their forward-looking considerations. These design approaches, initially used to enhance the feeling of open space by reducing the impact of religion, shifted conventional values from a religious perspective to a more secular state. Later, they gained functions similar to urban parks. This intertwined process, involving public opinions, design approaches and management strategies, began to be subjected to certain parameters, forcing cemeteries to go beyond their past physical characteristics.

Studies on cemeteries as recreational landscapes became a phenomenon in urban debates. Cemeteries, now turned out to be multi-functional spaces with similar physical features to public parks, have started to be examined through them. While these features are discussed, it is no longer just about the architecture of religious structures or their position within the cemetery. It is also not just about burial elements such as the materials of burial markers, their presence, or their positioning (which later become important parameters for green cemeteries as well).

The landscape features of the design and layout of cemeteries is now being discussed. These features include entrances, roads, walls, gates, pathways, sometimes fountains in open spaces, plantings, fencing and so forth (Uslu, 2010). The discussion also includes amenity features such as paths, benches, sheltering trees, and flowers that invite people for recreational use (Skår et al., 2018). Additionally, pedestrian-friendly paths and seating surrounded by trees are mentioned as possible features that might serve as visual shelters, isolating visitors from traffic and encouraging them to visit cemeteries for recreational purposes (Evensen et al., 2017).

In order to understand how recreational concerns are addressed in cemetery design through spatial features, we can categorize them into two different types: soft landscape elements, which include any vegetation such as trees, shrubs, or flowers,

and hard landscape elements that refer to paving materials and surfaces except any soft elements.

As Skår (2018, p.4) states, “Landscape planning and design reflects a particular imagination about what a space is or should be aimed for and how people should act.” In this context, studies have explored the effects of spatial elements in recreational cemeteries on human behavior, management styles and space usage through observation and interviews. In order to understand the new approaches to recreational cemeteries from the data obtained from field studies, focusing primarily on the hard landscape elements will be beneficial.

2.6.1 *Hard landscape*

The hardscape elements within cemeteries include pathways, fences, signage and burial markers. As mentioned, one parameter that determine cemeteries’ potential to serve for public recreational purposes depends on their accessibility. An important design element that defines this psychological and physical relationship of cemetery areas, thereby determining their permeability within their urban scale surrounding, is their boundaries, which consist of elements such as fences and walls.

Fences have an important role in shaping a particular sensibility toward spatial use, access, rights and privileges (Blomley, 2005). For instance, as a result of a cross-national research, comparing the Green-Wood cemetery, in New York with Östra kyrkogården cemetery, in Sweden; the Green-Wood cemetery was defined as less welcoming for public purposes with its fenced-in perimeter and a gated entrance in comparison with Östra kyrkogården cemetery that has porous borders. Fences are also observed as a feature that enable managements to control permitted visiting hours. In the Green-Wood cemetery the permitted hours are limited but Östra kyrkogården cemetery is open all night (Rae, 2021). That difference also affects the human behavior in terms of their willingness to use cemeteries. Also, Harvey (2006) qualifies the visually open fencing of the Lone Fir Cemetery, USA with a single entrance, as a deterrent factor for visits in comparison with the unfenced cemeteries.

While shaping attitudes and behaviors towards spatially defined places by directing use and access, fences also have an important role on the liberal notions of property, which affect cemeteries to become a part of the public–private division debates (Blomley, 2005).

Public behavior, regarding their willingness to visit cemeteries for recreational purposes as well as graveyards, can also be addressed by authorities. In order to structure a self-monitoring community, managements can implement social regulations in cemeteries through rules. Signage is used as a spatial marker in this regard. In Norway cemeteries, rules are posted by the officials at the entrances (Evensen et al., 2017). In the Green-Wood cemetery, large signs are posted likewise, whereas Östra kyrkogården cemetery has relatively little signage (Rae, 2021). As Rae (2021, p.8) states, “signage is particularly important in places where the visual look of being in a cemetery is less apparent.”

Burial markers are also an important hard-space elements in cemeteries, also frequently discussed in the ecological cemetery debates. From a more conventional perspective, burial monuments are humankind’s way of marking their presence, through the contribution of permanent materials (Swensen and Brendalsmo, 2018). They also have historical importance, providing written information reflecting popular motives of periods. Whether these markers exist within a managed cemetery or not, their spatial qualities inevitably alter through time due to factors such as environmental impacts (Uslu, 2010).

2.6.2 *Soft landscape*

Softscape refers to all kind of vegetation such as trees and shrubs. Like other spatial features, softscape elements also serve both for and against the design and management of the cemeteries. Similar to hardscape elements, softscape also contributes to managing the public’s willingness to visit cemeteries by guiding them physically and psychologically. For instance, interviews conducted in Gamlebyen cemetery, Oslo, show that the bushes encircling the family graves were perceived as a mental border that creates a sense of semi-private zone, while the rest of the cemetery area is considered as a public space (Swensen and Brendalsmo, 2018). Additionally,

in old cemeteries, protected extant plants help to collect historical information (Uslu, 2010).

However, although landscape management has a positive effect in terms of directing use and preserving flora, it has not always had a positive impact in every sense. For instance, results from the study conducted in the Weißensee Jewish cemetery, Berlin shows that the average age and height of shrubs increase as the maintenance decrease. This outcome reveals that the interventions made with the promise of taking care of nature may instead cause damage to its evolution.

In the same study, it was observed that the increase in the number of non-native species is parallel to regular management (Kowarik et al., 2016). This result can be considered as an intervention in the natural evolution progress of landscape. However, studies also reveal the negative effects of non-native plants species introduced by humans to existing native vegetation. For instance, in Oakwood cemetery, New York, after the Dutch Elm disease (DED), which led to the death of existing perennial trees, other plant species were preferred by individuals to replace them and considerations were only about their rapid growth (McPherson and Nilon, 1987). DED is a plant disease described by Dutch phytopathologists Bea Schwarz and Christine Buisman, in 1921. It was already a disease that spread through the interaction of non-native species with native vegetation and accidentally spread to America, Europe and New Zealand (“Dutch elm disease,” 2024). The fact that such replacement decisions are still being made despite the past damaging experiences supports the idea that human intervention can have a negative effect on the flora.

Although landscape elements are subject to management objectives regarding issues such as their degree or frequency of need of maintenance, they are primarily utilized from the perspective of landscape designers. For instance, there has been a growing desire to reduce maintenance in memorial gardens. In this regard, a less cluttered landscape was aimed through design, resulting in a change in landscape style, contrary to the monumental character of the early 19th century cemeteries (McPherson and Nilon, 1987). Visual changes in designs approaches were also implemented to express the transformation in conventional beliefs. For instance, in General Cemetery, Doorn,

the use of ornamental species and flowers has been avoided, not to detract from the existing landscape in terms of preventing species interactions, but rather to reflect the increasing secularity in society, contrasting with the imposed symbolism in traditional cemeteries (Clayden and Woudstra, 2003).

In addition to their maintenance and symbolic objectives, plant species selections in landscape design are primarily decided based on their contributions to the visual and functional design principles within the space. For instance, in General Cemetery, Doorn, fir trees are used to define equally sized rooms and yew hedges help define smaller areas. In Almere-Haven cemetery, Netherlands, small separate burial enclosures were provided by hedges, consisting of a mixture of deciduous plants such as maple, common lime, hawthorn, oak, hornbeam guelder rose, dog rose, scotch rose, winter jasmine and holly. These landscape designs, that were made for the purpose of area definition, also have psychological effects. For instance, in Almere-Haven cemetery, sycamores were planted to provide enclosure for a sense of security. They also mark the contrast of the cycle route within the open surrounding landscape. Additionally, the majority of deciduous plants encourage the sense of transparency (Clayden and Woudstra, 2003).

This intertwined process, involving different disciplines, countries, religions and traditions, has taken shape through cemetery applications and literature has also contributed to these practices. Even before recreationally valued cemeteries were succeeded in being defined by universally determined rules, ecological concerns and sustainability principles started to be discussed in urban debates. Therefore, before becoming a typology that reflects a certain period, recreational cemeteries have become part of ecological debates. Concepts in literature indicate this sudden intervention of ecological concerns in the field of recreational cemetery studies. For instance, Farina (2000) qualified the human-nature relation as a force that shapes the landscape structures and a feedback mechanism that helps us to estimate ecological management strategies for biodiversity protection, proposing the concept of “cultural landscapes.” The hierarchical disorder of these studies conducted in successive years indicate that the ecological problems of cemeteries were being addressed before their recreational values were resolved.

While cemeteries were previously evaluated within the framework of land use problems, environmental issues are now also derived as well (Santarsiero et al., 2000). During these discussions, even though nature was predominantly calculated just as a source to consume, after the transformation of cemeteries sacred values into recreational areas and their contributions in the urban context have been appreciated through their green space potentials, cemeteries have succeeded in gaining their definition for being the most stable of all green space systems (Farina, 2000; McPherson and Nilon, 1987).



CHAPTER 3: ECOLOGICAL CONSIDERATIONS ABOUT “BURIALS”

In the previous section, we explained how traditional cemetery typologies has been through certain transformations and eventually got their place in urban contexts as green urban spaces with recreational value. However, cemeteries were initially identified more with visually aesthetic and functional definitions rather than areas with ecological contributions. These perspectives did not necessarily align with ecological principles, as these areas might be highly-managed, artificial ecologies, failing to consider cemeteries' ecological values and their potential connections with wider natural cycles in cities. By considering landscapes with environmental concerns through the cemeteries' design process, cemeteries also became spaces that carry implicit messages about nature, aligning them with broader ecological discussions and strengthening their reputation in connection with nature definitions.

The main objective of this chapter is to explore the ecological significance of cemeteries. To consider cemeteries within an ecological context, we must perceive nature as a collaborative system that embraces all its components, including cemeteries. This contemporary approach to cemeteries redefines our role from being external observers of urban aesthetics to integral participants in ecological dynamics. The chapter will first introduce examples of initiatives reflecting the transition to ecological cemeteries and their impact on traditional typologies. Then, we will delve into general discussions in ecology, exploring subtopics such as biodiversity, native-non-native issues, multifunctional landscapes and landscape ecology. Subsequently, we will examine how ecology intersects with burial practices and the types of damages associated with burial sites, both in practices and areas. We will also discuss solutions developed to overcome the harms of these practices and areas. Finally, we will provide an overview of the most current version of the subject, focusing on green (natural) burial practices and the areas where they are implemented, known as “green cemeteries” and the various types they involve. Additionally, we will offer detailed explanations of the parameters implemented during practices and in burial areas within the context of ecology.

3.1 From Recreational to Ecological Cemeteries: Examples and Debates

In the previous chapter, we explained how cemeteries got integrated into daily urban life by gaining recreational green area values and becoming active spaces within the urban environment. This integration allowed cemeteries to make spatial contributions to urban design and strengthened their position in the urban fabric. The rise of ecological concerns has also influenced cemetery design decisions, leading to a trend of designing and managing cemeteries as ecological green spaces in urban landscapes.

There are early initiatives that signal a transition towards an ecologically-informed cemetery design. Two early examples can be mentioned here: Almere-Haven Cemetery in the Netherlands and Igualada Cemetery near Barcelona, Spain. The town of Almere itself was a new town established between the late 1960s and early 1970s. Dirk Frieling led the design team and advocated for an integrated urban environment that included all aspects of human life to create public awareness and acceptance of death. Christian Zalm, a member of the team, was allocated to design the Almere-Haven Cemetery. The cemetery's design reflected the town's design intentions, planning the cemetery area as a public space and an integral part of the urban fabric (Clayden and Woudstra, 2003).

In this regard, no boundary markers were used at the edge of the cemetery; instead, the designer led the cemetery to merge with the surrounding landscape. In addition to design intentions such as organically designed cycle paths and paths through grasses that attract dog walkers, the cemetery also served for a wider purpose. The design not only emphasized the landscape but also incorporated ecological considerations, such as avoiding the use of annuals or perennials to moderate the microclimate. In this regard, Almere-Haven Cemetery can be considered as an early example of cemetery design prioritizing ecological concerns (Clayden and Woudstra, 2003).

The Igualada Cemetery, near Barcelona, was designed by Enric Miralles and Carme Pinós in 1985 and opened in 1990. The design aimed to create a dynamic environment where native plants would gradually colonize the site. In this context, they selected materials with suitable lifespans for the structures within the cemetery. Instead of replicating vernacular traditions, the landscape was designed to evolve over time.

Igualada Cemetery is recognized as an early form of green burial (Clayden and Woudstra, 2003). The designs of these two cemeteries, along with many others from the late 20th century, did not initially aim to address ecological concerns. Instead, they focused on establishing a relationship with their urban surroundings. However, when the surrounding landscape is considered a significant factor in design, ecological concerns are naturally addressed as well.

Ecological contributions through landscape elements are not unique to late 20th-century cemeteries. Earlier cemeteries also provide ecological benefits through their landscape features and have gained certain titles in this context. For instance, Spring Grove Cemetery in Ohio, established in 1845, later received protection under status and has been designated as an arboretum. In fact, it is a managed urban landscape and recognized as a Level III accredited site. The site now hosts new collections of Midwest natives and nonindigenous species. Reflecting the ecological consciousness, The Spring Grove Arboretum declares its mission as developing a relationship between plants and people, and to go beyond enhancing the beauty of the garden and rather to promote environmental sustainability (“Spring Grove Arboretum,” 2024). Similarly, the Lone Fir Cemetery in Portland, established in 1855, has been identified as an arboretum-like open area for the city residents with its diverse and dense vegetation including more than 700 trees representing 67 species (Harvey, 2006; Metro, 2014).

There are other existing cemeteries, that later have been classified as heritage sites in this regard. They reflect the cemeteries’ potential as part of a larger green-blue belt in the sustainable city discourse with the increased attention on biodiversity (Swensen and Brendalmo, 2018). Due to the reason that cemeteries are the least affected landscape areas by anthropogenic factors, they are also considered as model systems suitable for investigating the relationship between biotic and cultural diversity within both artificial (such as cities) and natural landscapes (Barrett and Barrett, 2001).

Besides, studies that compare and contrast the cemeteries with urban parks due to their supply ability to provide ecosystem services have also been conducted, defining the

functions of cemeteries as outdoor natural science laboratories (Quinton and Duinker, 2019; McPherson and Nilon, 1987).

Governments have also recognized the value of cemeteries in raising awareness and gaining public acceptance of ecological concerns. As discussed in the second chapter, cemetery areas have faced resistance during their spatial transformations without corresponding social transformation. These obstacles of public resistance have slowed down the transformation. To address this, administrations have aimed to encourage public support and raise awareness. For instance, the ecological citizenship initiative declared in China in 2012 views humans not only as individuals but as a collective being that includes future generations. They aimed to achieve mutual benefit between nature and human by embracing a holistic approach that considers not only ecological parameters but also political, economic and cultural aspects. Within this context, traditional burial practices were seen as materialistic approaches that degrade human value. To reflect simplicity, green burial practices have been suggested to achieve a continuous balance and harmony between humans and nature, creating an “integral whole” (Zeng et al., 2016).

Humans are part of nature simply by existence. However, as we have noted in the literature, this fact has been disregarded during urbanization processes, resulting in domination and control over nature. “It has been argued that this is due to a modernist urban planning paradigm that sees humans as separate from and superior to nature” (Heymans et al., 2019, p.16). This desire for dominance is evident through the spatial and design elements of cemeteries, as illustrated by the examples provided. The progressive detachment of humans from nature has led to a growing realization of the harmful impacts this has inflicted. As a result, prioritizing environmentalism has become necessary to take precautions before reaching an irreversible ecological point, emerging as a mandatory agenda for prevention.

3.2 Environmental Discussions and Cemeteries: An Overview

The human value system that assumes the right to use ecological resources and change ecological processes for human benefit have threatened the stability of human societies. Reports warned about the future risks according to the interactions between

urbanization and global climate change . As a result of this growing awareness, professionals have started to be focused on environmental issues in the 1960s and 1970s and an increasing interest for ecological approaches in urban planning has emerged to prevent these effects from reaching irreversible levels (Heymans et al., 2019; McDonnell and MacGregor-Fors, 2016). In order to overcome the effects of human impact on the earth, urban planners and designers embraced “ecological wisdom” and aimed to make designs coherent with natural processes. However, ecological principles have not been in the mainstream of practice yet, but includes the aim to replace the natural resources consumed beyond necessity and to raise consciousness for future consumption habits (Wang et al., 2016). While it is impossible to mention all these fields, we aim to highlight the points where they most interact with burial topics to understand their relevance to our subject.

Ecological principles do not ignore contemporary human needs, instead has a realistic approach that aims to balance both urban and landscape features to satisfy the current demand for both types of resources (Lovell and Johnston, 2009). The solution for environmental problems became a priority on the agenda of planners, managers and designers to meet this growing demand in cities (Uslu et al., 2009). The conventional approaches for ecological values of landscape areas have mostly been focused on the contributions they offer in the human-dominated urban areas simply by their “greenness.” However, more recent studies aim to go beyond and review green areas from a more extensive perspective: on a large scale in the context of sustainability to a small scale that considers the benefits provided by individual landscape design elements (Lovell and Johnston, 2009).

The livability capacity of urban areas depends on the right configurations of the ecological processes they serve through methodological links between its functions (Andersson, 2006). These “livability” standards have come to be defined with certain concepts in the field of ecology. And all of these are concepts mentioned in ecological cemetery studies, as cemeteries are an “urban component” and at the same time they are “landscape” elements with their green areas. For example, sustainable landscape refers to the physical environments that integrate economic, environmental and social-cultural features mostly by focusing on their functions. It proposes solutions and

management approaches in order to both sustain natural resources and also increase the health quality of people. Therefore, although long-term viability is targeted and biodiversity is promoted, the process essentially involves an anthropocentric approach, as human well-being is addressed within this context (Blaschke, 2006).

While humans are just only a part of the subject in the sustainability concept, improving human well-being cannot be achieved without simultaneously protecting the earth's life-support system. In this context, Ecosystem Services (ESs) have been considered as a bridge between the environment and society (Wu, 2013). ESs offers an anthropogenic perspective by considering the ecosystem in terms of the benefits it offers to human and Millennium Ecosystem Assessment (MA) categorizes the Ecosystem Services into 4 sections: supporting (e.g. nutrient and water cycling, soil formation, primary production, photosynthesis), provisioning (e.g. food, freshwater, wood and fiber, fuel, genetic resources), regulating (e.g. climate, flood, climate, pest, disease regulation, water purification), cultural(e.g. aesthetic, spiritual, educational and recreational experiences) (Millennium Ecosystem Assessment, 2005). In this regard, Singh et al. (2022) conducted a study that especially investigates the sacred natural sites (SNS) for their potential to serve the ESs and identified globally important ESs services provided by burial areas such as regulating services (air, water and climate regulation), cultural services (aesthetic, recreational, educational and historical value, cultural heritage, social relations, sense of place) and supporting services (water cycling, habitat provision and production of oxygen).

Various global challenges such as air pollution, global warming, climate change, overuse of natural resources, loss of biodiversity have been associated with urban living habits. In order to overcome these threats, sustainability strategies and environmental interventions influenced the tendency to success urban ecosystems that are less dependent on the environment and more resistant to its fluctuations (Topal et al., 2021; Doing, 1997). Urban ecological systems investigate interactions among economic, social and environmental variables. In this context, urban developments are defined as “fragments” that isolate and degrade natural habitats. These characteristics indicate that urban areas negatively impact species composition, hydrological systems, nutrient cycling and spatial heterogeneity of the landscape (Alberti, 2005). Green

spaces are valuable in this regard and within the urban ecosystem, cemeteries are important parts of the green infrastructure network, providing habitats for urban flora and fauna as well as a wide range of ecosystem services such as improving air quality, reduce the urban heat island phenomenon and provide aesthetic and recreational value (Sallay et al., 2023). A more comprehensive data obtained from the studies that investigate the environmental values of cemeteries is shown in Table 1.

At a broad level, there are also landscape ecology studies that consider the overall landscape mosaic (broad-scale pattern), each patch (smaller-scale units), and mechanisms at the individual level, their functioning and the constant interaction between them. In order to gain broader insights across these levels, researchers examine both heterogeneous and homogeneous landscapes in contexts such as responses to disturbances (fire, erosion, human activity), population dynamics and biodiversity. The landscape ecology framework helps us to understand environmental heterogeneity and patch dynamics spatially to determine ecological problems (Wiens et al., 1993). Within the landscape ecology concept, patch-matrix studies focus on the dynamics between green spaces, defining landscape structures as a mosaic of different patches and investigating the ecological processes among them. This multidisciplinary approach suggests incorporating various professions to create resilient cities that can meet future needs, such as socio-ecological systems that propose management practices to achieve functioning ecosystems (Andersson, 2006).

Within the landscape mosaic framework, there are studies that evaluate cemeteries as holistic ecosystems that integrate natural and human factors. For instance, Rim and Hong (1999) qualifies secondary vegetations as an important source that provides information for sustainable landscape management and ecological restoration planning. In this regard, they identified the graveyards as “early structured vegetation patches” and refer to them as “human disturbed, man-made vegetations.”

Table 1. Subcategories of the environmental value of cemeteries (Summary of the three sample area cemeteries) (Source: Sallay et al., 2023)

	Nemzeti Sirkert (1847)	Új Köztemető (1886)	Zentralfriedhof (1874)
Size	56 hectares	207 hectares (largest cemetery in Hungary)	291 hectares (2nd largest in Europe)
Style	architectural cemetery	architectural cemetery	architectural cemetery
Management	National Heritage Institute	Budapest Funeral Institute	Friedhöfe, Wien GmbH
Status	functioning and closed (mostly) parts	functioning (mostly) and closed parts	functioning, closed parts and reserve area
Location in the city	in the urban fabric (earlier at the time of creation, on the outskirts of the city)	at the outskirts of the city	at the outskirts of the city
Accessibility	public transport, vehicle access allowed, no separate parking	public transport, vehicle access allowed, no separate parking	public transport, vehicle access allowed, several parking zones in the cemetery
Delimitation/entrances	solid brick wall with several gates, but only the main entrance available; no representative reception area	solid brick wall with several gates, but only the main entrance available, representative reception area at the central gate	solid brick wall with several gates, representative reception area at the central gate
Special parts of the cemetery	artists' plots, academic plots, heroes' plots, labor movement plots, Soviet military plots, military plots	heroes' plots (plots 298, 300 and 301), military plots, monastic plot, Mohammedan plot, urn pantheon	children's graves, forest cemetery, Nature Garden, Garden of Serenity and Strength, military plots, religious plots
Green space elements	Significant vegetation: alleys, landscaped plots, but also overgrown plots	Significant vegetation: alleys, lot of overgrown plots	Significant vegetation: alleys, landscaped plots, overgrown plots and forest cemetery
Recreational areas	not specified	not specified	designated areas
Green surface (reserved)	ca. 67%	ca. 25%	ca. 75%
Green space intensity	ca. 83%	ca. 91%	no data
Green infrastructure connections	green area of the Jewish cemetery on Salgótarjáni road	green areas of the Jewish cemetery of Kozma Street and the Orthodox Jewish cemetery of Granátos Street; the Keresztúr forest	green area of the Protestant cemetery Simmering and new Jewish cemetery; part of the Vienna Green Belt
Animals	birds (110 resident bird species and 40 breeding bird species), insects, bats, squirrels, other rodents, hedgehogs, foxes	50-head deer herd, birds, insects, bats, squirrels, other rodents, hedgehogs, foxes, field rabbits	birds (e.g., ducks), squirrels, field hamsters, other rodents, roe deer, stags, bees, butterflies and other insects, amphibians, hedgehogs, rabbits
Habitat conservation status and potentials	bird watching and ringing, landscaped and overgrown plots	overgrown plots	landscaped and seminatural plots, forest cemetery
Habitat developments	bird holes	nature trail in the Keresztúr forest	beehives, Nature Garden (small pond and butterfly meadows, flower hedges, trees, deadwood pile, insect hotel), natural meadow for insects, bird holes, project for the protection of hedgehogs, "Biodiversität am Friedhof" program, deadwood program
Buildings	cemetery office, museum; administration building; chapel; funeral parlor; mausoleums and arcades	cemetery office; visitor center at plot 301; funeral parlors and crematorium; bell tower; arcades; operational buildings	cemetery office; museum; funeral parlors; cemetery chapel(s); arcades; operational buildings; solar park
Works of art	mausoleums, tombs, gravestones, statues	tombs, gravestones, statues	mausoleums, tombs, gravestones, statues
Significance	yes, national pantheon	yes, Hungary's largest cemetery	yes, Vienna's most important cemetery
Touristic offers	thematic guided walks and mobile application	thematic guided walks	thematic guided walks on foot, horse-drawn carriage or e-bike; mobile application

Folke et al. (2004) define the resilience of an ecological system through its capacity to absorb ongoing external stimuli and reorganize itself while maintaining its function, structure, identity and feedback mechanisms. Farina (2000) noted that the lack of equal consideration for ecological processes in modern technology fields, which primarily structure policies based on economic feedbacks that neglect natural disturbances, leads to environmental vulnerabilities such as pollution, the invasion of alien species and reduced biodiversity.

TEEB (2012, p.45) defines biodiversity as “the reflection of the hierarchy of increasing levels of organization and complexity in ecological systems; namely, at the level of genes, individuals, populations, species, communities, ecosystems and biomes that are varied both in size and complexity.” Biodiversity protection considers native plant and animal species and the interactions between native and non-native species, aiming to protect the native flora and fauna of regions with determined strategies. The International Union for Conservation of Nature and Natural Resources (IUCN) (2018) defines invasive alien species (IAS) as animals, plants, or other organisms introduced by humans, which are one of the top causes of biodiversity loss and a growing threat to sustainable development.

Within the biodiversity studies framework, Löki et al. (2019) defines burial spaces as potential areas for biodiversity conservation. They mention that burial areas are acting as refuges for the populations of rare and endangered species, and that their high biodiversity is supported by their long-term existence and their undisturbed status. In a more specific approach, the Habitat Suitability Index (HSI) is a numerical model that evaluates habitat qualities for individual species by identifying habitat variables and alternative vegetation management strategies associated with the species' requirements. This model is used in a study conducted within an urban cemetery in New York, in order to understand and manage the habitat requirements for a specific animal species and provide management suggestions for tree planting and removals in this regard (McPherson and Nilon, 1987). Also, within species-scale studies, that conduct specific investigations on particular species, Alberti (2005) considered birds as indicators to observe urbanization-ecosystem relations due to their rapid response to changes in landscape configuration, composition and function. Studies have analyzed the relationships between urban density and bird species diversity, breeding opportunities and bird species diversity-vegetative land cover relations.

In order to use as a general indicator of urban landscape characteristics, Hope et al. (2003) proposed the term “luxury effect”, indicating the proportional relationship between economic income and plant diversity through probability-based spatial analyses. In the same study, an inverse relationship was also found, between the age of housing and plant diversity: the younger the settlement, the higher the diversity.

Furthermore, Smith et al. (2006) indicate that the ecological value of vegetation, that is planted in individual gardens are rarely taken into account, such as their influence on species pools and their effect on wildlife in urban areas. These risks require assessment during cultivation due to the interaction of these areas with the wider environment. Otherwise, these spontaneously over-represented floras, reflecting personal interests, will continue to influence species richness due to a lack of environmental awareness. These studies highlight the impact of individual decisions on landscape design. Since these individual initiatives affect ecological issues such as biodiversity and non-native species, future stages of our study will show that actions like personal planting in ecological cemeteries are controlled and often restricted by administrative rules.

Within the native-alien species discussions under the biodiversity framework, Smith et al. (2006) note that the suitability of native species is not sufficient on its own; their conservation also based on their accessibility and interaction with their associated herbivores, parasites and predators. Some of these species become established and negatively impact native biodiversity through competition, predation, biofouling, hybridization and disease transmission, resulting in soil erosion, harm to animal and plant health, habitat degradation and the decline of native species. For instance, some ornamental plants used in the U.K. (such as *Buddleja davidii*, *Crassula helmsii*, *Fallopia japonica*, *Impatiens glandulifera*, *Rhododendron ponticum* and *Viburnum spp.*) have transmitted infectious plant diseases to uncultivated flora, becoming notorious invaders. However, other studies suggest that alien plants can be as valuable as native species by providing fruit, pollen and nectar for local fauna (French et al., 2005). Due to the reason that biodiversity is one of the most important issues in ecology, directly concerning both plant and animal species, we will be frequently mentioning it in the context of ecological cemeteries in our further discussions.

The previously mentioned definitions are all subtopics of ecology, and one other concept explored within this context is the “multifunctional landscape.” This term refers to a complex definition where landscape plots actively contribute in shaping their surroundings in various aspects, such as economic, social and ecological, rather than being passive components. Lovell and Johnston (2009) and Anna and Ewa (2020)

use the term “multifunctional” to describe a “multi-faceted” cemetery, integrating natural and cultural values through its spatial and functional features.

Detailing each definition and concept individually for cemeteries requires a broader scope beyond this study. However, these definitions and topics will be the foundations for our future discussions on environmentally conscious burial practices and spaces. In addition to general discussions on ecology, we will examine the ecological damage caused by burial practices and areas, as well as the potential of burial areas to serve as green spaces. We will address these “practices and processes” in the next section.

3.3 Environmental Impact of Traditional vs Green (Natural) Burial Practices

In traditional burial practices, the body of the deceased is deposited in a way that negatively affects the environment. In order to fully grasp their impact on the environment, we need to understand the decomposition process, its damages and the factors that affect it. The decomposition process depends on internal factors (such as body conservation methods like embalming, chemicals affecting bacterial activity and pre-burial processes) and external factors (such as soil characteristics, burial depth, humidity level, climate and burial material types). Different techniques are used for body transformation, including cremation, direct burial under the ground, burial after embalming and leaving the deceased in nature. The emergence of ecological burial practices can be understood by examining the historical background of various burial practices in Western societies that primarily aimed to preserve the body. Studies have shown that depending on the form of burial and the subsequent practices at cemeteries, burial areas can threaten the environment by polluting underground water and by negatively affecting fauna and flora (Uslu et al., 2009).

Decomposing bodies create potentially polluting chemicals, such as gases produced and spread during decomposition, including indole, skatole, hydrogen sulfide and various carbon compounds (Uslu et al., 2009). Additionally, toxic materials like formaldehyde are released into the soil during embalmed body decomposition, contaminating potable water sources (Caldwell, 2016). These practices are not limited to post-burial processes. For instance, studies conducted among employees in the embalming sector have revealed a higher risk of myeloid leukemia and brain cancer

due to formaldehyde usage during embalming (Hauptmann et al., 2009). Although cremation can be regarded as an environmentally friendly method compared to many other burial methods due to its low land consumption, it still does not fully align with ecological descriptions because of the excessive energy consumed during cremation. Moreover, if the body was embalmed before cremation, the process releases additional toxic content and extra carbon dioxide into the atmosphere (Caldwell, 2016).

These post-mortem techniques used in traditional methods are also limited by religious practices. Not every religion allows the application of every method. These restrictions are evident in certain groups' burial sites. In Islamic traditions, there is naturally an ecological conception in the burial process, such as burying directly without a coffin, forbidding cremation and avoiding chemicals. According to Islam, the corpse is placed in a grave (a coffin approximately 80 cm x 200 cm, buried at a 100 cm depth), filled with soil and covered with natural materials such as rocks and wood, or a gravestone is built using lime and wood. No pesticide or insecticide is used in the soil placed in the excavated area for the tomb after burial (Uslu et al., 2009).

The subject of our study is not the relationship between practices and religions. However, because religions naturally affect the parameters of the examinations we will carry out in the later stages of the study, it has been briefly mentioned. There are also studies offering solutions in order to resolve or reduce the identified harms of these traditional practices, offering ecological solution suggestions. For instance, regarding the soil where the burial will take place, Uslu et al. (2009, p.3) noted that “the characteristics of the ground are important for digging the graves and the decomposition of the corpse” and also stated that “andesite grounds without soil must be avoided. In such grounds, the corpse must easily decompose and transform.” Furthermore, she mentions that “the slope must be between 0 to 10% and flat grounds are unsuitable as burial places since they may create drainage problems. The soil's characteristics such as humidity rate and oxygen amount affect the acceleration of the decomposition process. In graves with wet bases, the corpse can remain for a long time without decomposing.” Additionally, she highlighted that “there must be enough microorganic activity in the cemetery's soil. Very loose or rocky and very hard grounds are not suitable for a cemetery.”

Considering factors that affect underground water, Farina (2000, p.1) emphasizes that “cultivation activities, such as terracing steep slopes, optimize soil nutrients, preserve water flow and reduce erosion rates.” Porous soil types accelerate the transmission of decomposition byproducts into underground water sources, potentially causing local epidemics in areas reliant on groundwater for drinking (Ucisik et al., 1998). To decrease burial-related groundwater pollution, Uslu et al. (2009, pp.3-4) recommend placing cemeteries away from water basins and potable sources while also suggesting selecting cemetery sites with specific characteristics and ensuring a distance between coffin placement and groundwater.

In addition to the changes that might be done to achieve more ecologically-responsible processes for the decomposition of bodies, there are also certain findings and suggestions for ecological burial techniques about using natural materials. For instance, burlap-like materials may also be used for burials, which would allow for a faster decomposition process than wood (Caldwell, 2016). These ecologically-informed practices are part of an emerging debate about “green (natural) burial” and the areas where these practices are applied are called “green cemeteries.” Although these practices and areas are partially defined by certain standards, “green burial” is still a “fringe practice” and “green cemetery” is not yet an established typology. However, the debate provides guidance as an increasing number of cemeteries embrace ecological burial practices.

Green (natural) burial is an after-death practice that help us rethink our connection with nature in the context of social rituals and material practices we build around death. Moreover, it provides psychological comfort to individuals before their death, with the consciousness that they will become part of nature’s life cycle, providing nutrients for the future through decomposition. The three most important features of green burials are the use of biodegradable materials, the avoidance of toxic chemicals released in processes such as embalming and the preservation of the natural landscape by avoiding monumental structures (Caldwell, 2016). Green burial does not only include general rules and techniques to prevent damage but also includes alternative methods such as tree burial and flower burial. For instance, in tree burials, instead of underground

structures, such as used in traditional practices that harm the environment, adopting a piece of land and marking it with a natural stone or monumental tree is suggested to prevent land consumption and ecological damage while preserving natural vegetation and encouraging greenery. Flower burials combine this technique with traditional practices by proposing biodegradable urns placed within recyclable flower beds (Zeng et al., 2016). In the next section, we will see how these alternatives are used depending on individual preferences and the rules of cemetery management, and what kind of reflections these practices have on the spaces, through examples.

In addition to the spatial features used, there are also differences related to the burial positioning. In traditional burial practices, the body is typically laid at a depth of 5-6 feet, while in green burial practices, this depth is reduced to 3-4 feet. This shallower burial depth allows carrion beetles to get involved in the decomposition process, as they remain active at this depth and also enhances oxygen flow. Moreover, the shallower burial depth enables the potential reuse of areas previously used for traditional burials at deeper depths, thereby contributing to efficient land use by conserving green cover (Webster, 2023). Beyond its impact on land use, natural burials also allow access to new areas where traditional burials with headstones are not possible due to the existing topography or the presence of mature trees (Clayden et al., 2018). Although it may seem like there is an effort to maximize burials within a single land boundary, “green burials usually accommodate up to 100 bodies per acre, while traditional cemeteries typically house up to 1,000 bodies per acre” (Christy, 2007,p.3).

Despite ongoing experimental practices with various technical aspects including a set of goals, this fringe practice of green (natural) burial primarily “is a way of caring for the dead with minimal environmental impact that aids in the conservation of natural resources, reduction of carbon emissions, protection of worker health and the restoration and/or preservation of habitat” (New Hampshire Funeral Resources, Education & Advocacy, 2015). Natural burial also allows traditional cemeteries to transform into unique spaces with complex landscapes offering rich habitats (Clayden et al., 2018).

3.4 Ecological Impacts and Benefits of Cemeteries as Forested Areas and Recommendations for Ecologically Conscious Burials

As we mentioned in the previous section, the development of green burial techniques are the results of the harms caused by traditional burial practices. These techniques not only affect the burial process but also shape the design of burial spaces. When we refer to a “green cemetery,” it evokes a different visual representation compared to traditional cemeteries. To understand this process more comprehensively, we must consider both the environmental effects of these techniques and the spatial characteristics of traditional burial areas, including their impact on nature and the cemetery itself.

As Uslu et al. (2009, p.3) note, “Depending on the form of burial and the subsequent practices at the cemeteries, the burial areas can become areas threatening the environment, polluting underground water and creating negative effects on fauna and flora.” For instance, impermeable structures used for conventional burials negatively affect the decomposition process and the surrounding soil's micro-environmental characteristics. From an environmental and hygienic perspective, these structures should be permeable to air and allow for the evaporation of liquids from the decomposition of the corpse, incorporating a system that facilitates air flow and filters escaping gases (Santarsiero et al., 2000). Moreover, the cement vaults used in traditional burials contribute to the energy-intensive cement industry, causing significant climate impacts, while also inhibiting the natural decomposition process (Caldwell, 2016; Webster, 2023). Also, the permanent hard shells used in constructing tombs, replace existing vegetation and increase soil erosion (Wu and Sun, 2008).

There have also been other harms besides the ecological ones. For instance, in certain places such as China, the interest in displaying status and wealth resulted in adoption of more monumental approaches which in the end would mean a greater consumption of unsustainable construction materials. Due to this status competition, society was not just ignoring many ecological problems, but also destroying the heritage intended for future generations. These tombs, with their complex structures and many shaped accessories, were creating a gloomy terror, occupying more land and had a larger footprint. To solve these problems, Wu and Sun suggested (2008) using green

innovations and products to enhance the vitality and artistic beauty of traditional Chinese tombs.

In the first chapter, we explained that cemeteries, especially those with maturely vegetated landscapes, are generally accepted as green areas. These areas have evolved from being just “designed” spaces to “forested areas” with environmental purposes, dominated by vegetation, as environmental transformations have progressed. Therefore, when discussing the ecological benefits of cemeteries, it is useful to consider not only traditional cemeteries with mature landscapes but also the potential for these cemeteries to become more like “forested areas” in the future. This context is essential when examining the ecological benefits of cemetery areas. For instance, in terms of landscape management strategies, Hansen et al. (1991) recommended mimicking natural forest patterns to enrich diversity in managed structures by providing natural seral stages, from shrub to old-growth, for native species. This integrative approach would allow managed landscapes such as cemeteries to serve as a repository of diversity. Regardless of the species, using diverse species of trees as natural monuments also reduces the amount of foreign materials introduced into nature through cemeteries (Caldwell, 2016).

The idea of planting a tree instead of using gravestones, one of the fundamental principles of ecological cemeteries, has emerged in 1993 in England. It was an alternative solution to the financial burden caused by maintaining gravestones that are often no longer visited. Although ecological concerns did not initiate this process, it was regarded as a revolutionary act at the time, and the first species offered instead of a headstone was the oak tree. This new trend, which emerged due to financial concerns, developed in various ways, aiming to protect and diversify habitats such as making burials within mature woodlands, orchards, or wildflower meadows (Clayden and Dixon, 2007). By adopting this approach, we can achieve a harmonious relationship between humanity and nature, preserve the quality of the existing environment and prevent pollution, thus investing in future generations.

Apart from the intentionally-forested landscapes of “green cemeteries”, traditional cemeteries have also transformed into forested areas with mature landscapes. As

Barrett and Barrett (2001, p.3) observe “cemeteries may provide an area, by virtue of its past and its continued preservation, that harbors high levels of biodiversity (especially in large cemeteries over 100 years old) and manifests great potential for increased biotic diversity and expanded ecosystem services. Older cemeteries (>100 years) are integrated with natural landscapes and preserve a many mature native vegetation. Conversely, younger cemeteries (< 100 years) are integrated with artificial landscapes and mostly consisting of exotic plants. According to this difference, older cemeteries require less maintenance compared to heavily manicured younger cemeteries. Also, this difference makes younger cemeteries maintenance dependent on economic capital, where older cemeteries’ maintenance mainly just dependent on the capital of nature.”

Additionally, in the context of ecological impacts, McPherson and Nilon (1987) highlight the contributions of extensive vegetation in cemeteries. These contributions include enhancing the urban environment by providing habitat for a variety of wildlife, moderating the urban heat island, intercepting airborne particulates and reducing stormwater runoff rates (McPherson and Nilon, 1987). Other studies also emphasize the ecological benefits provided by traditional cemeteries. For example, Tunnard and Pushkarev (1963) qualified cemeteries in New York and Los Angeles, as areas that provide similar ecological contributions as natural forests and farmlands, helping to cool and clean the air in the macro-landscape, like many other researchers that recognize traditional cemeteries for their ecological benefits.

In studies where researchers describe cemetery areas as forested patches within the landscape mosaic, they also recognize cemeteries as secondary green areas that serve as habitats for species (Andersson, 2006). Cemeteries can act as remnant habitat patches to serve as models for biological conservation and native flora maintenance if managed consciously against the threats such as invasive species or regenerating plant suppression (Aziz et al., 2022). Although the current trend considers cemeteries as forested areas, effective management remains crucial. In the next chapter, we will discuss examples of green cemeteries and the type of decisions implemented with various motivations and reasons. While green cemeteries have evolved into areas that maintain their natural cycle, like conservation burial grounds, they still require proper

ecological management strategies. Examples in history shows that, ignoring or poorly making these decisions can lead to significant ecological damage.

For instance, the removal of selected large trees over 75 cm in Oakwood Cemetery, New York, by managers to prevent potential hazards from falling branches, which reduce maintenance costs but also decrease food supply for wildlife. In research on cavity-nesting birds in Chicago cemeteries shows that the social pressure made by public to remove dead trees due to their unaesthetic appearance was resulted in overlooking their resource value for nesting birds. Additionally, it is known that reduced tree canopy cover significantly limits the site's suitability for wildlife and older cemeteries also provide benefits in this context with their mature vegetation (McPherson and Nilon, 1987; Smith and Minor, 2019). There are also other management interventions that have been learned from these past cases. For instance, at Greensprings Natural Cemetery Preserve in New York, a committee of native plant-bird specialists and naturalists decided to remove non-native trees. They made this decision because non-native trees outcompete native plants and fail to provide food for wildlife (“What We Do,” n.d.)

While determining management strategies for cemeteries, in a psychological context we should also consider the restorative qualities that cemetery area offer besides their ecological benefits, as natural environments within the urban landscape. Kaplan (1995) proposed the Attention Restoration Theory (ART) in response to the negative impacts of urban environments, such as loss in cognitive performance and increased stress levels. ART focuses on the restorative qualities of natural environments, which can contribute in overcoming these negative effects. Kaplan and Kaplan (1989) further explain how people relate to nature by studying the relationship between nature and the environment, emphasizing nature's contributions to people's mental well-being under various circumstances.

To maximize the ecological and psychological benefits of cemeteries, we must process relevant data correctly and transform it into effective management strategies. Public perception of decisions in this context is crucial and should not be ignored. For example, the contingent valuation method (CVM) is widely used to determine the total

environmental value of assets through surveys. Studies using this method reveal that residents' negative perceptions of forested areas are not about their presence in urban areas, but rather about how they are managed. The highest percentage outcome, which shows the benefits of their natural value in providing necessary greening in the built environment, reflects a positive perception of their natural value (Figure 7) In the same study, however, researchers found that the lack of multi-objective management of urban forested areas causes negative perceptions. For instance, closely located conifers near housing create shading problems and raise security concerns due to low visibility caused by density. They suggest management strategies such as preferring deciduous and low-growing trees or more frequent thinning, especially near houses, can overcome these issues. These strategies can also ensure a well-controlled area impression that can also be applied in management strategies for cemeteries (Tyrväinen, 2001).

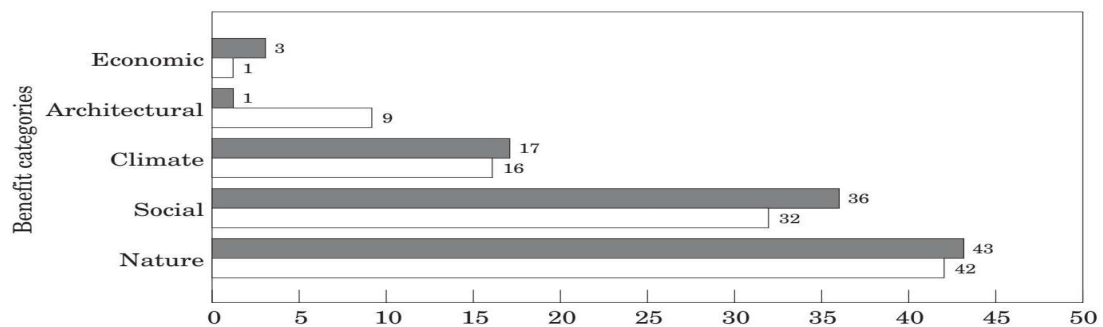


Figure 7. Obtained benefits of forested areas through willingness-to-pay (WTP) analysis in the study conducted in Finland (Source: Tyrväinen, 2001,p.7)

As Harvey (2006) states, cemeteries' value grows with increased interest in local history and genealogy and awareness of the need to preserve natural habitats. For instance, natural rocks serve as habitats for lichens, including endangered species such as *Hyperphyscia adglutinata*, *Homalothecium sericeum*, and *Cystopteris fragilis* (Kowarik et al., 2016). Cemeteries, with their vegetation, play a key role in urban environments by providing food, breeding sites, and shelter for animals and plants, and by modifying the microclimate (Smith et al., 2006). For instance, tree planting reduces wind action (Farina, 2000).

Studies also examine the cemeteries forested area values and the various benefits provided by their vegetation. Hansen et al. (1991) define snags (standing dead trees) and fallen trees as structural legacies that promote biodiversity. Retaining dead den trees also serves an opportunity for tree coverage (McPherson and Nilon, 1987). Also, Hansen et al. (1991) noted that the amounts of snags and fallen trees is equal to or greater in the youngest forests (25-80 years) compared to old-growth forests (more than 200 years), indicating increased awareness of their habitat values. Their study on unmanaged young (25-80 years), mature (80-200 years), and old-growth forests shows that animal diversity is generally highest in old growths. They also mention that the herb/shrub stage (0-20 years) in forests is at least as rich in species diversity as older stages (Hansen et al., 1991). Considering the shrub stage as the initial and dead and fallen trees as the final stage of vegetation's life cycle, these two points (opposite stages serving the common purpose of biodiversity enhancement), indicate an opportunity for landscape design in cemeteries. Preserving perennials as heritage values while incorporating young plants can express current design approaches. Both offer ecological value for biodiversity and enable flexibility for landscape designers.

In summary, if we consider cemeteries as forested areas, “studies in unmanaged forests teach us that natural disturbance maintains structural complexity within stands and that this complexity promotes plant and animal diversity” and that the forested lands provide connections for animal communities (Hansen et al., 1991, p.9; Farina, 2000). Although explicit spatial patterns are often underappreciated, both heterogeneous areas and internally homogeneous areas have been considered in patch dynamics studies (Wiens et al., 1993). Cemeteries, considered as patches, also present diversity within themselves, including traditional cemeteries preserved for centuries, re-used and re-purposed old cemeteries, intentionally designed green burial areas and conservation burial grounds where burials occur in existing nature to protect the land from future developments (Caldwell, 2016). Different types of green cemeteries will be detailed in Chapter 4.

CHAPTER 4: THE EVOLVING CONCEPT: UNDERSTANDING GREEN (NATURAL) BURIAL

As Constantino (2016) states, green burial represents a paradigm shift in burial practices, just as embalming was also considered as the next new paradigm shift in burial practices at the time. Green burial not only counters traditional practices by avoiding embalming and vaults but also aims to decrease their harms and provide additional benefits. The most significant environmental benefit of these green practices is that bodies buried in shrouds or simple pine coffins which allows the nature to access the body and the body to access nature. Burials in this manner not only avoid polluting the area but also enrich the soil through decomposition process. Furthermore, types of green burials can permanently protect land from future development and transform designated burial areas into healthy natural habitats that are legally protected (Constantino, 2016).

Green burial is not just about sustainability but also about changing meanings and improving the experiences of both life and death. As Constantino (2016) defines, green burial practices can be regarded as a “linguistic deconstruction” that challenges the binary between life/death and human/nature. As discussed in the previous chapters, humans often act as if they are separate from nature, especially during urbanization processes. Traditional practices like using caskets and vaults have also distanced the dead from nature, which is not coherent with our current level of awareness. Green burial encourages humans to stop seeing themselves as separate from nature, emphasizing that they remain a part of nature even after death. This change reinforces the idea that humans are a natural part of the ecosystem. These semantic benefits offer many new meanings for the living. For example, green burial can strengthen community bonds through processes such as the preparation and caring of the body, and the high level of involvement during the ceremony, including digging the grave and the burial process (Constantino, 2016).

As an example, that embraces the unity of humans with nature and the sense of community, “The Case of the Loretto Community” is a good representation to observe the benefits of green burials, such as sense of community and unity, and benefits of

management by commitment to environmental justice. In the case of Loretto Community, these commitments focus on two main vectors: land preservation and caring for the neighbor. The idea is that “the land is a communal and holy resource”. The community’s theology of being bound to the land is that “the land is itself life-giving” and by “land” they mean not only the soil or the property but also all the living beings on it, referring to them as the “neighbor” including even the mice. In this regard, green burial is not only a way to preserve land. The concept of community through green cemeteries unites people and addresses their relationship with nature, including both flora and fauna. This holistic approach considers everything living on the land, including all wildlife, seeing them as part of the community. This broader definition of community integrates nature and human even more by embracing an approach of “comprehensive whole” (Clayville, 2016).

There are also other studies that examine this holistic perspective from different angles as well. For instance, Feagan (2007) offers a perspective that considers human existence in a more holistic manner by describing the concepts of continuity, connection, and reciprocal responsibility as critical elements for rethinking burial rituals. He states that these concepts can serve as “useful permutations” in the “environmental thought that informs the discussions on green burial.” In addition, by the concept of “intergenerational equity” humanity is being encouraged to think and act across generations. In this context, Feagan believes that green burials have critical relevance because they encourage us to “shift our actions and behaviors in ways that benefit future generations.” He argues that considering future generations within post-death practices provides a foundation that can shape both today and tomorrow by gaining more visibility and interest. Such holistic approaches in burial practices can transform them from being fringe practices into established typologies and methods. Green burials also help to decenter the human-centered notions that describe humans as separate from nature and the sole possessors of the earth. They help us gain respect and raise awareness about the ties that bind us to nature, promoting environmental practices supported by non-anthropocentric theories. In this framework, green burial is regarded as an appropriate way of commemorating a person’s way of living—that is through their way of dying, thereby allowing a “circle of life” (Feagan, 2007).

In addition to creating perceptual transformations and altering perspectives, green burials also change burial processes and transform the spatial features of cemeteries. In the previous chapters, we explained step by step how the “green cemetery” typology emerged, starting from the 19th century. If we want to observe how this process has evolved and to understand the current situation where cemeteries are defined as ecological areas through a single example, we can examine Kensal Green Cemetery. This cemetery is the first of the garden cemeteries designed in the Victorian style, was established in that era, and John Claudius Loudon, detailed in Chapter 2, is buried there. The fact that it was designed and built at that time and is now called a “green cemetery” allows us to summarize the process through a single example between two extremes.

In the 20th century, professionals such as architects, landscape architects, artists, and sculptors engaged with death and disposal issues. This engagement reflected in the architecture of buildings, monuments, sculptures, landscapes, land uses, flora and fauna, funeral practices, as well as administration, ownership, and activities (Worpole, 2002). These aspects provide parameters for observing similarities and differences among ecological cemeteries. We will address all these aspects in our upcoming examples. However, we mentioned Kensal Cemetery independently to highlight, as we will see in the coming sections, how the concept of “green cemetery” remains fringe. Labeling Kensal as a “green cemetery” may not be accurate in many respects according to the criteria mentioned earlier. However, it is still referred to as such. This issue highlights that not every cemetery labeled “green” adheres to ecological principles and practices.

To ensure that the cemeteries we examine are genuinely green and not just named so, we have chosen cemeteries from a single country (the U.S.), all certified by the Green Burial Council, an institution that has legally developed a certification system in the field. All the examples that will be provided, have been certified according to specific categories by this institution. This approach aims to eliminate the risk of mislabeling a cemetery as “green” without it actually being an ecological cemetery.

4.1 Green (natural) burial practices and Green Cemeteries: A Contemporary Approach to Burial

“Green burials are generally defined by what they don't do” (Jibilian, 2020,p.5). A green cemetery permits green burials with the primary goal of creating an environment that both looks and functions like a natural landscape. Green burials are characterized by several eco-friendly practices: avoiding the use of formaldehyde-based embalming; eliminating environmentally harmful concrete burial vaults; employing locally sourced and biodegradable materials for shrouds, caskets, or urns; minimizing the use of heavy and large machinery for burial and landscaping; reducing reliance on gas-powered equipment like lawn mowers, fertilizers, pesticides, and herbicides; promoting the growth of native plants; utilizing natural methods for weed and pest control, such as the use of goats or controlled burns; and marking graves with engraved fieldstones or leaving them unmarked. Some green cemeteries allow native plants to grow without interference to decrease fossil fuel consumption for lawn maintenance. In all cases, green burials involve efforts to plant native species that capture carbon and enhance the landscape's aesthetics. It is important to note that each cemetery independently determines its level of "greenness," resulting in unique approaches among green cemeteries and no two “green” cemeteries are alike (Congressional Cemetery, 2017).

Burial practices that carry ecological concerns are defined as “green (natural) burials,” and the areas where these practices are carried out are called “green cemeteries.” However, neither the methods used nor the cemetery typologies are well-established, and instead, they remain as “fringe practices.” Ecological cemeteries are becoming increasingly important in terms of landscape design and planning. The use of cemeteries as parks has become widespread in many places, and there does not appear to be any conflict in cemeteries currently used as recreation areas. However, beyond just creating recreational areas, ecological cemeteries also have the potential to become “green nodes that can be linked by paths to other regional conservation areas in the urban fabric” (Searns, 2024). These fringe practices may in time create a paradigm shift in the material culture of burial.

The phrase “paradigm shift” highlights the landscape architects' need to focus on design that considers natural processes, and cemetery typology exemplifies this shift's effects. The meaning of glorifying and remembering death has changed. Likewise, death and burial rituals expressed through monumental forms have evolved. Intimate spaces with inspiring views characterized cemeteries designed in the “old way.” These spaces used design strategies like “spatial proportions that stimulate the imagination or appeal to the emotions” to provide powerful experiences for users. For instance, traditional cemeteries aimed to create a divine effect by altering the topography and arranging the vegetation and light. These approaches aimed to evoke specific emotions related to post-death processes for the living. However, while they seemed to strengthen the connection between life and death, they depicted them as independent and disconnected processes with a clear before-and-after distinction. At this point, green burial may introduce a new definition of holiness. The paradigm shift has changed the perspective from the belief that “nature, untouched by human activity, no longer exists” to the understanding that “humans are an inherent and growing part of nature” (Brezar, 2023). This shift has led to a new conception of death and the life cycle, where death is not just a departure but also an integral part of renewal and rebirth (Searns, 2024). In this context, turning remains into fertilizer after death is becoming increasingly common, and “divinity” is now found in the processes of decay managed by nature (Brezar, 2023). In this way, “natural internment” offers a broader, regenerative perspective on cemeteries (Searns, 2024).

Cemeteries are now seen not only as places of individual memories but also as examples of ecological and sustainable design principles. Landscape architects and urban planners discuss the meaning and structure of these ecological cemeteries, emphasizing interaction with nature and human life (Brezar, 2023; Searns, 2024). Traditional cemetery design methods can evolve to become more compatible with nature and based on ecological principles. In ecological cemeteries, instead of traditional structures that fragment and disrupt nature, flowers and butterflies become essential elements of these new cemetery typologies (Brezar, 2023). These cemeteries are planned and regarded as areas that respect and support nature's self-renewal. They prioritize natural and aesthetic values as well as ecological sustainability. Design solutions based on these approaches embrace closer and more meaningful

relationships between humans and nature. Landscape architects and urban planners advocate for this new paradigm, transforming cemeteries into meaningful and functional spaces for both the dead and the living. Natural internments are becoming more common, with organizations like the Green Burial Council leading the way. Searns (2024) advises landscape architects to collaborate with organizations like the Green Burial Council to pursue “green” memorial park projects. This paradigm shift enhances direct and global interaction with nature, with organizations like the Green Burial Council pioneering the promotion of “natural cemeteries.” These natural internments redefine the social roles of cemeteries, offering a new perspective on their purpose and design.

4.2 Ecological Cemetery Principles and Green Burial Council Certification

Ecological cemeteries adopt sustainable approaches compatible with nature. They use hard and soft landscape elements such as plants, gravestones, and roads, different from those in traditional cemeteries. In ecological cemeteries, designers adopt approaches that respect and support nature's self-renewing processes. They prioritize topography, vegetation, water management, and biodiversity to create sustainable structures compatible with nature. In the previous chapter, we discussed these ecological approaches. Before analyzing the spatial features of ecological cemeteries, it is useful to understand the ecological principles behind these spatial outcomes. The principles on topography, vegetation, water management, recyclable material selection and biodiversity are key topics in ecological cemeteries.

First of all, preserving the natural topography is an important criteria in maintaining ecological functions of a burial ground. Cemeteries designed in accordance with the natural shape of the land to support the water flow and drainage, prevent erosion and protect water resources. Secondly, traditional cemeteries often aimed for an aesthetic appearance and used certain vegetation to create themes and symbols in this regard. In contrast, ecological cemeteries prefer plant species compatible with local ecosystems and natural landscapes, which support biodiversity. Choosing local species increases environmental sustainability and ensures compatibility with the natural landscape. These plants also enhance the ecological value of cemeteries by improving soil health and creating habitats. Thirdly, water management is also crucial in sustainable design

for ecological cemeteries. Protecting natural water resources and managing rainwater efficiently increases cemeteries' ecological functionality. Lastly, the gravestones and monumental elements used in ecological cemeteries are also different from traditional cemeteries. Using biodegradable materials for gravestones and monuments instead of permanent materials, preserves the environment and enhances the ecological value of cemeteries. Natural materials like stone and wood, instead of traditional coffins, are common in that sense. This minimal design approach with biodegradable materials also reflects the simple beauty of nature and integrates memorials harmoniously with the surrounding environment, making them part of the natural landscape without disrupting it.

Hardscape elements in ecological cemeteries include more than just memorial structures, it also includes roads and paths. In ecological cemeteries, these pavements are made from natural materials like stone and compressed soil to prevent environmental harm and preserve the natural aesthetics of cemetery areas. These material choices create more permeable surfaces, facilitating the natural infiltration of rainwater and protecting water resources also contribute to the ecological balance of cemetery areas. Increasing biodiversity and creating natural habitats is also an important goal in ecological cemeteries. Managements create suitable habitats for local plant species and wildlife in this regard. This approach transforms cemeteries from being just burial grounds, also enables them to function as ecological reserves.

As mentioned earlier, these ecological cemeteries are considered as “fringe” practices. Since there are no established typologies, general design rules have not yet been clearly defined. Although there are examples of cemeteries that embrace all the principles, there are also cemeteries just labeled as “green cemeteries” based on individual, relative definitions. In order to avoid the ambiguity regarding many types of initiatives under the name Green (Ecological) burial, all samples for spatial analysis will be chosen from cemeteries certified by the Green Burial Council (GBC), founded in 2005 and recognized as the most comprehensive organization in categorizing green burial areas. It is a nonprofit organization, promoting sustainable and eco-friendly burial practices. Its mission is to advocate for environmentally responsible burial options,

including both practical and spatial alternatives, ensuring individuals have access to them.

To ensure spatial differences or similarities are not attributed to local factors such as geography, all samples will be selected from the same region, U.S. In this regard, will discuss the GBC, its certification standards, the cemetery categories determined by these standards and their features. This discussion will demonstrate the extent to which ecological principles are considered in the certification of ecological cemeteries. It will also reveal the diversity within the new “green cemetery” definitions, highlighting the differences between categories. This will support our characterization of these ecological cemeteries as “fringe practices.”

This section discusses the types and standards of Green Cemetery certification, referencing the GBC's certification methodology. GBC's certification system classifies cemeteries into three main categories: Hybrid Cemeteries, Natural Burial Grounds, and Conservation Burial Grounds. These categories represent specific standards for burial practices and spatial arrangements (Table 2). The GBC sets specific environmental criteria for cemeteries and product manufacturers. These standards primarily aim to minimize environmental impact by avoiding toxic chemicals, reducing carbon emissions, and conserving natural resources. All three types; Hybrid Cemeteries, Natural Burial Grounds and Conservation Burial Grounds, share standards that define environmentally responsible burial practices and regulations. In compliance with regional laws and GBC standards, individuals can participate in burial and ritual processes. These requirements include using GBC-approved, non-toxic chemicals for embalming and natural, biodegradable materials for burial containers and shrouds.

Natural and Conservation Burial Grounds must follow the burial density limitations established through ecological impact assessments and field analyses. Standards specific to Natural and Conservation Burial Grounds include detailed requirements for ecological assessments and habitat protection. These cemeteries must conduct an ecological impact assessment, with a detailed document including the existing ecological conditions and sensitive areas. This assessment must be periodically

updated, evaluating future habitat and vegetation conditions. Access and burials in sensitive areas identified in the assessment should be limited. Practices must ensure minimal disruption to soil health, plant diversity, water quality, and ecological habitats. The use of memorial signs should be restricted to types and sizes, in a way that does not disrupt the ecological and aesthetic conditions of the cemetery landscape.

Conservation Burial Grounds are regarded as the “most evolved” standards, focusing on the protection and restoration of natural and historic habitats. These cemeteries must establish and implement strategies to protect, enhance, or restore local historic or natural habitats and vegetation. They must preserve or restore a minimum of 20 acres protected land. Collaboration with a government agency or conservation organization is required in order to take legal responsibility for administration and land protection. The preservation of the cemetery must be secured through restrictions and legal definitions.

The Green Burial Council's certification system specifies standards to ensure the environmental sustainability of cemeteries and the conservation of wildlife habitats. The distinctions between Hybrid Cemeteries, Natural Burial Grounds and Conservation Burial Grounds are evident in their burial practices and spatial restrictions. While Hybrid Cemeteries follow the general environmental standards, Natural and Conservation Burial Grounds are characterized by specific ecological considerations and habitat protection measures. Conservation Burial Grounds, in particular, are governed by the most detailed regulations, emphasizing the protection and restoration of natural habitats. These standards facilitate the adoption of environmentally friendly burial practices and the preservation of natural areas. Table 2 displays the certification types and criteria of The Green Burial Council (GREEN BURIAL COUNCIL, 2023a).

Table 2 : The GBC’s Certification Types and Standards (Modified from the source, GREEN BURIAL COUNCIL, 2023b)

Criteria	CERTIFICATION TYPES		
	Hybrid Cemeteries	Natural Burial Grounds	Conservation Burial Grounds
Participation in Burial and Ritual Processes	In accordance with state laws and GBC standards		
Chemical Usage	Only accept decedents embalmed with GBC-approved, nontoxic chemicals or not embalmed		
Burial Materials	All burial containers, shrouds and products must be natural and biodegradable		
Long-Term Maintenance Fund	At least 10% of burial plot sales		
Burial Density	No restrictions	Natural Burial: max 500 burials/acre	Conservation Burial: max 300 burials/acre
Ecological Impact Assessment	Not required	Baseline document including existing ecological conditions and sensitive area analysis required	
Protection of Sensitive Areas	Not required	Restrict access and burial operations within identified sensitive areas	
Ecologically Compatible Practices	Not required	Practices must not cause long-term degradation of soil health, plant diversity, water quality and ecological habitat	
Memorial Markers	No restrictions	Limit type and size to maintain ecological conditions and natural cemetery landscape aesthetics	
Conservation and Restoration of Habitat		Not required	Strategies must conserve, preserve, enhance, or restore native habitat and flora
Land Conservation		Not required	Conserve or restore a minimum of 20 acres, or 5 acres if contiguous to other protected land

We will examine green cemetery categories certified in three categories in more detail. First, we will provide a brief explanation by giving two examples for each category. These explanations will guide our analysis of the following examples. All selected samples have been chosen from the GBC's official website (GREEN BURIAL COUNCIL, 2023c). Detailing all certified cemeteries in one study is not possible. We chose examples to highlight issues affecting standards and the spatial features and practices that distinguish ecological cemeteries from traditional ones. For more detailed information including the cemeteries listed in Table 3, researchers can visit the certified cemeteries' websites, listed on the GBC's official site.

Table 3. Categorized list of selected certified green cemeteries

		Certification		
		Hybrid Cemetery (H)	Natural Burial Grounds (N)	Conservation Burial Grounds (C)
1	Cayetano Natural Burial Ground at Tulocay	x		
2	Hollywood Forever Cemetery	x		
3	Mount Sinai Memorial Parks & Mortuaries	x		
4	Grove Cemetery	x		
5	Historic Congressional Cemetery	x		
6	Saint Joseph Cemetery	x		
7	Mount Auburn Cemetery	x		
8	Fernwood Cemetery		x	
9	Purissima Natural Burial Ground		x	
10	Crestone Cemetery		x	
11	Whispering Hills Memorial Nature Preserve		x	
12	Steelmantown Cemetery		x	
13	Greensprings Natural Cemetery		x	
14	White Haven Memorial Park		x	
15	Casper Creek Natural Cemetery			x
16	Carolina Memorial Sanctuary			x
17	Foxfield Preserve			x
18	Kokosing Nature Preserve			x
19	Preble Memory Gardens Cemetery			x
20	Kings Mountain Preserve			x
21	White Eagle Memorial Preserve			x

In this study, we selected twenty-one cemeteries, seven from each category, and listed them in Table 10. From this list, we will first explain two examples each for Hybrid and Natural categories, and one example for the Conservation category in more detail.

These explanations will focus on regulation and spatiality. While this study is in the field of architecture, understanding the spatial structures of cemeteries, which have not yet become an established typology, requires an explanation of the regulations behind them. Therefore, the regulation and spatial analyzes will be supported by images of selected cemeteries. This approach aims to create a general “green cemetery” image for the reader and show the differences among all three categories. This will help us both perceive ecological cemeteries in general and also support the notion that these are “fringe practices” by illustrating the diversity within them.

4.2.1 Hybrid Cemeteries

Hybrid cemeteries combine traditional burial customs with modern environmental considerations. They offer a mixture of conventional funerals with eco-friendly alternatives like green burials or cremation burials. These cemeteries incorporate environmentally friendly practices, such as using biodegradable coffins or urns, planting native vegetation and managing the land with conservation in mind. What distinguishes hybrid cemeteries is their ability to adapt by merging traditional cemetery practices with contemporary green burial approaches. This flexibility allows individuals to honor their traditions while also being mindful of their environmental impact. Serving as a bridge between traditional and environmentally conscious burial methods, hybrid cemeteries provide a balance between past habits and current needs (GREEN BURIAL COUNCIL, 2023a).

We selected seven Hybrid cemeteries (Table 3 and Table 10). We’ll detail two of these cemeteries: Cayetano Natural Burial Ground at Tulocay Cemetery (H-1) and Mount Auburn Cemetery (H-7). The purpose of selecting these two Hybrid cemeteries (Table 4,

Table 5) is to explain the principles and how they reflect in their spatial features and overall characteristics. This selection aims to observe how the differences between traditional practices and green burial practices affect the spatial features in Hybrid cemeteries, supported with visual representations.

Cayetano Natural Burial Ground at Tulocay Cemetery, California

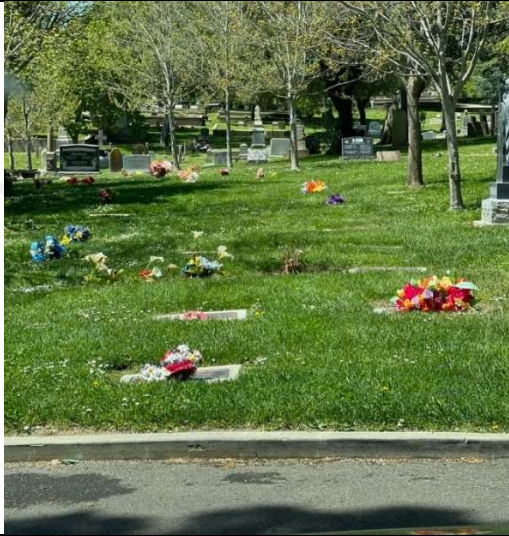
- Regulations: In Tulocay Cemetery, California, the “Traditional Burial Services” are also offered which include embalming option, both before traditional burials and cremations. During “Traditional Burial Process”, bronze, copper and steel cremation caskets are used, but wood cremation caskets are also offered as a selection beside them.

Cayetano Natural Burial Ground is the designated area within the Tulocay Cemetery, especially for green burials. Within the Cayetano Natural Burial Ground, only green burial containers are allowed. During “Green Burials”, shroud or eco-friendly caskets (made from bamboo, seagrass etc.) are used. Traditional cremation urn vaults are allowed within the Cayetano Natural Burial Ground area, but biodegradable urns are also offered beside them (Tulocay Cemetery Funeral Home & Crematory, 2024).

- Spatiality: In Tulocay Cemetery, there is also a Funeral Home and a Crematory within the property. There's no restriction for markers usage within the whole cemetery.

Cayetano Natural Burial Ground is the area on the Northeastern part of the cemetery's property where the burials area nestled under the oak trees (Tulocay Cemetery Funeral Home & Crematory, 2024).

Table 4. Cayetano Natural Burial Ground at Tulocay Cemetery (Source: Find a Grave, 2024; Tulocay Cemetery Funeral Home & Crematory, 2024)

	• In traditional burials, embalming is included both during the traditional burial process and before cremation • Wood cremation caskets are also offered beside the bronze, copper and steel selections • Bio-degradable urns are also offered, beside the traditional cremation urn vaults.
Tulocay Cemetery Traditional Burial Ground	• In Cayetano Natural Burial Ground area: ○ there's no restriction for markers usage. ○ only shroud and green burial containers are allowed which also consists eco-friendly caskets (made from bamboo, seagrass etc.)
 Cayetano Natural Burial Ground at Tulocay Cemetery	

Mount Auburn Cemetery, Massachusetts

- **Regulations:** Mount Auburn Cemetery, Massachusetts, is committed to environmentally-sensitive burial practices. Within the cemetery area, feature offerings like reflection pools and woodland gardens reflect the fundamental principle of the cemetery that nature inspires the living. Burial space options include conventional casket graves, natural burial graves and space for the burial of cremated remains. Conventional casket graves are available throughout the cemetery, including the burial of cremated remains and caskets are buried in different depths. The earth burial of cremated remains both provided in cremation burial area and in individual niches in the Story Chapel Columbarium. Cremation urns or other suitable containers are allowed beside the option of pouring remains directly into the earth. Natural burial graves are intended for un-embalmed bodies buried in biodegradable containers and additional cremated remains burial is not allowed within that area (Mount Auburn Cemetery, 2024).
- **Spatiality:** Mount Auburn Cemetery, conventional casket graves are mostly buried within a concrete liner. Memorialization options include flush/flat and upright individual markers and allowed in both conventional and cremation burial area. Within the natural burial area, markers are allowed, but many natural burial graves are unmarked or defined with memorial tree plaques. Additional plantings are allowed in some areas of the cemetery (Mount Auburn Cemetery, 2024).

Table 5. Mount Auburn Cemetery, Massachusetts (Source: Mount Auburn Cemetery, 2024)

	• Un-embalmed burial in biodegradable containers, cremated remains not allowed. • markers allowed, many graves are unmarked or defined with memorial tree plaques.
Mount Auburn Cemetery Natural Burial Graves	
	• Conventional casket grave area includes cremated remains. • Casket graves are mostly buried within a concrete liner.
Mount Auburn Cemetery Conventional Burial area	
	• Earth burial of cremated remain are allowed, beside pouring directly into the earth. • Memorialization options: flush/ flat and upright markers.
Mount Auburn Cemetery Cremation Burial area	

4.2.2 *Natural Burial Grounds*

Unlike hybrid cemeteries, natural burial ground (also called as natural cemeteries) prioritizes simplicity and harmony with the environment. They avoid using embalming fluids, concrete vaults and other artificial materials commonly found in traditional burial sites. Instead, they mostly lay bodies in a most possible direct way in the earth, allowing natural decomposition to nourish the soil. The landscaping of natural cemeteries often reflects this commitment to sustainability, incorporating native plants and causing minimal disturbance to the existing landscape. The main idea of natural burial sites values ecological concerns and embraces a connection to the cycle of life and death. Supporters of natural burial emphasize the significance of returning to the earth in a way that honors natural decay and renewal processes. For many people, this approach aligns with their spiritual or philosophical beliefs about being connected to nature and understanding that life is temporary (GREEN BURIAL COUNCIL, 2023a).

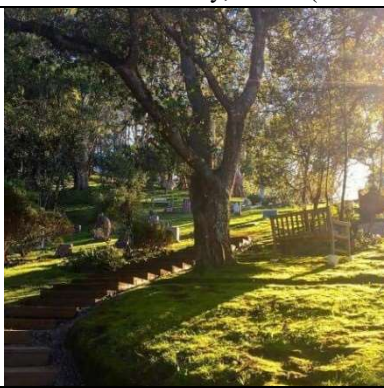
We selected seven Natural burial grounds (Table 3 and Table 10). We'll detail two of them: Fernwood Cemetery (N-8) and Whispering Hills Memorial Nature Preserve (N-11). The purpose of selecting these two Natural burial grounds (Table 6, Table 7) is to explain the principles and how they reflect in their spatial features and overall characteristics. This selection aims to observe how the differences between traditional practices and green burial practices affect the spatial features in Natural burial grounds, supported with visual representations.

Fernwood Cemetery, California

Fernwood Cemetery and Funeral Home, is a memorial landscape, where natural burial and cremation rituals are performed with the intention of land restoration and preservation. At Fernwood, engraved natural fieldstones take the place of traditional headstones, except in the historical section of the cemetery. Fernwood is a designated National Wildlife Federation Certified Habitat. The heritage landscape consists of oak and bay laurel trees, sword ferns and native grasses, and it's a home to bobcats, blue heron, wild turkey, deer, cranes and a variety of other animals, providing a sustainable habitat for wildlife. All the services are provided by taking the decrease in carbon footprint and impact on the environment into consideration.

Fernwood Cemetery is an environmentally conscious, green cemetery. Only “The Historic Section” is preferred for traditional ground burials and cremation burials. This section is situated in the middle of the property land and surrounded by remaining area's landscape, consisting of mature trees. Embalming, any type of casket, cut-and-polished headstones and monuments and bronze markers are allowed only in this part of the cemetery. In some cases, outer burial containers (vaults) are also used for ecological reasons. All the area except the historic section is for green (natural) burials. No embalming fluid such as formaldehyde or toxic chemicals of any kind is used, instead, the body is allowed to recycle naturally. In the green burial area, both full body natural burial and cremation options are provided. Only biodegradable containers are allowed. They include green caskets such as natural wood or wicker, fabric shrouds or wood cremation containers (“Fernwood Cemetery and Funeral Home,” 2024).

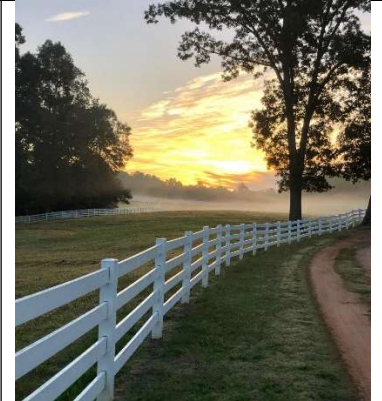
Table 6. Fernwood Cemetery, California (Source: Fernwood Cemetery and Funeral Home, 2024)

	• Traditional ground burials and cremation burials are allowed. • Embalming, any type of casket, cut-and-polished headstones and monuments, and bronze markers are allowed.
Fernwood cemetery, "the Historic section"	
	• All kind of embalming fluid and toxic chemical usage are prohibited. • Natural burial and cremation options are provided. • Only biodegradable containers are allowed, including: ○ green caskets such as natural wood or wicker ○ fabric shrouds ○ wood cremation containers
Fernwood Cemetery, Green (natural) burial area	
	• Traditional cut and polished headstones or bronze markers are prohibited. • Engraved small, natural boulders are used as markers or burial plots are marked by GPS (Global Positioning Systems) to provide burial plot location to individuals.
Fernwood Cemetery, Green (natural) burial area	

Whispering Hills Memorial Nature Preserve, Georgia

Whispering Hills is a natural “Green” cemetery contained within a memorial nature preserve. Free guided tours are arranged within the cemetery and pets are allowed on a leash. Whispering Hills is maintained as a natural area with native wildlife, trees, shrubs, wildflowers and grasses. Local flora is a mixture of hardwoods such as White Ash, White Oak, Red Oak, Redbuds, Hickory, Florida Maple, large Loblolly Pines and Dogwoods. The invasive species populations are being limited and controlled. No live plants, mulch, straw or bark is allowed to be brought into the cemetery in order to prevent the contamination of invasive species seeds. Embalmed bodies are not allowed. Metal caskets or cement vaults are prohibited. Only use of natural and biodegradable materials are allowed. Cremains only may be buried after being mixed with a “specially formulated soil composting supplement” that will encourage plant growth, and are only buried or scattered “as mulch.” Grave markers can only be made from stones found on the property (Whispering Hills Memorial Nature Preserve, 2024).

Table 7. Whispering Hills Memorial Nature Preserve (Source: Whispering Hills Memorial Nature Preserve, 2024)

		• Grave markers can only be made from stones found on the property.
Whispering Hills Memorial Nature Preserve grave marker sample		
		• Embalmed bodies are not allowed. • Metal caskets or cement vaults are prohibited. Only use of natural and biodegradable materials are allowed. • Cremains only may be buried after being mixed with a “specially formulated soil composting supplement” that will encourage plant growth, and are only buried or scattered “as mulch.”
Whispering Hills Memorial Nature Preserve		
		
Whispering Hills Memorial Nature Preserve		

4.2.3 Conservation Burial Grounds

Conservation burial sites especially focus on conservation efforts. They are typically established in ecologically important areas such as forests, meadows, or wetlands to provide a final resting place for the deceased while protecting surrounding habitats. In conservation cemeteries, planners integrate burials into existing ecosystems with minimal harm to the natural environment. The primary goal of these cemeteries is to protect nature. Individuals that choose these cemeteries know that their loved ones' graves will help preserve wildlife habitats and biodiversity. This idea attracts people who care about the environment and want to make a positive impact even after they die. Conservation burial grounds represent the highest standards within the green cemeteries' ecological classification (GREEN BURIAL COUNCIL, 2023a).

We selected seven Conservation burial grounds (Table 3 and Table 10). We'll detail one of them: Carolina Memorial Sanctuary (C-16). The purpose of selecting this Conservation burial ground.

Table 8, Table 9) is that it effectively represents the general standards of Conservation burial grounds, demonstrating the principles through a single example that reflects most of the efforts, spatial features and overall characteristics ("Carolina Memorial Sanctuary," 2024). This selection aims to observe the differences in Conservation burial grounds through practices and spatial features, supported by visual representations.

Carolina Memorial Sanctuary, North Carolina

In addition to being a green cemetery, Carolina Memorial Sanctuary is also certified as conservation burial ground, that is regarded to be the highest level of certification that exist. Sanctuary is serving the community and also protects the land against future developments.

Land conservation & restoration projects are being developed, such as:

- Removal of invasive species such as nonnative bamboos' replacement of native vegetation in order to restore native habitat.
- Designation of a specific pollinator area for bees and butterflies.
- Scattering Bluebird houses around the Sanctuary.

- Storm water in parking areas is being filtered through channels that contain specific plants and reaches the wetland which serves as a home for wildlife. The restoration of natural hydrology and vegetation of wetland increase the biodiversity of native plants and wildlife.
- The filtrated flood water is being stored in Appalachian Mountain.
- By stream bank stabilization, the eroding stream damage to the soil that contain fish eggs, was got under control by directing it at an appropriate slope in McDowell Creek. In addition, by laying 100% biodegradable control blankets with native and riparian species seeds in the stream, native trees and shrubs were planted.

The Carolina Memorial Sanctuary is home to many species of plants and animals.

Native species of animals consist of: Great Blue Heron, White-tailed deer, Spring Peeper frog and Dragonfly (in The Wetlands), Eastern bluebird, Hawk, Eastern Tiger Swallowtail butterfly, Indigo Bunting bird, Praying Mantis (in The Meadow), Carolina Chickadee bird, Red-bellied Woodpecker, Rat snake, Eastern box turtle (in The Southern woods), Belted Kingfisher bird and Snapping Turtle (in Creekside) and Red fox, Grey squirrel and Black bear (in The Northern Woods). Native species of plants consist of: Cattail, Blue Flag Iris, Purple Aster (in The Wetlands), Goldenrod and Tulip Poplar (in The Meadow), Club moss fern, Crane fly Orchid and Black pine (in The Southern woods), Coreopsis, Sycamore, Black-eyed Susan daisy and Eastern Redbud tree (in Creekside) and White pine, Turkey tail mushrooms and Elderberry (in The Northern Woods).

Entrance in The Wetland is prohibited in order not to disturb native species at that area. The fallen trees are being regarded as a vital part of the forest ecosystem and protected unless it blocks a trail. Pets are allowed on site but only on leash. In Carolina Memorial Sanctuary only conservation burial is allowed. Green (natural) burial is regarded as the foundation of conservation burial. The natural burial practices reinforce the soil and benefits the ecosystem. Conservation burials also benefit in conserving and renewing the land beside the green burial basics. Graves are hand-dug and heavy vehicles' usage is prohibited.

In green burials: Embalming fluids are not allowed; only biodegradable burials containers are allowed, but in addition local materials are preferred when possible; graves are dug to 3 feet instead of conventional depth of 6 feet, which allows the surrounding plants to benefit from the nutrients in the body more. Interment options offered during conservation burials in Carolina Memorial Sanctuary for both human and pets are: Natural burial, burial of cremated remains and scattering of ashes. Burial container options for natural burials are: Coffins and caskets - only made from renewable and sustainable materials such as wood and woven, urial shrouds - made from linen or %100 cotton and no container at all (Au Natural).

Grave markers are only allowed from the native stones, consistent with the geology of the site. They should be flat on the ground in order to protect the natural appearance of the burial ground. Granite, marble or river stones are not permitted (Carolina Memorial Sanctuary, 2024).

Table 8. Carolina Memorial Sanctuary, North Carolina, Rules and Regulations (Source: Carolina Memorial Sanctuary, 2024)

	- Land conservation & habitat restoration projects: - Removal of invasive species and replacement of native vegetation - Storm water management and filtered water storage - Restoration of natural hydrology and vegetation - Increasing the biodiversity of native plants and wildlife
Carolina Memorial Sanctuary Entryway steps	
	
Carolina Memorial Sanctuary “The Wetlands”	

	○ Stream bank stabilization and erosion control ○ Native tree and shrub plantings by biodegradable control blankets
Carolina Memorial Sanctuary fallen tree used as a signage	

Table 9. Carolina Memorial Sanctuary, North Carolina, Spatial Features (Source: Carolina Memorial Sanctuary, 2024)

	• Grave markers are only allowed from the native stones. • Markers should be flat on the ground. • Granite, marble or river stones are not permitted.
Carolina Memorial Sanctuary Grave mark	
	• Only biodegradable burials containers, local materials preferred. • Graves are dug to 3 feet instead of conventional depth of 6 feet. • Burial container options: ○ Coffins and caskets - only made from renewable and sustainable materials ○ Burial shrouds ○ No container (Au Natural)
Carolina Memorial Sanctuary Natural burial with container	

	• Interment options offered during conservation burials for both human and pets are: ○ Natural burial ○ Burial of cremated remains ○ Scattering of ashes • Embalming fluids are not allowed.
Carolina Memorial Sanctuary grave sample	

As detailed in the previous sections, these three typologies show both similarities and differences among each other and in various applications within themselves. For example, the headstone applications of a Hybrid cemetery can be applied in the exact same way in a Conservation burial ground. However, when comparing the two Natural cemeteries, the headstone applications may completely differ. Although certification standards determine these practices, they are still “fringe practices” with no strict boundaries that clearly distinguish them from each other. Some cemeteries are grouped under a specific classification due to their certification, but an examination of their features and regulations reveals that certain examples still have the potential to fall under other groups. Therefore, it is not possible to make a collective and general evaluation for the cemeteries given through examples. To understand the context in which their spatial features vary, we will examine these twenty-one cemeteries (Table 10).

4.3 *Spatial analyses of green cemeteries*

The selected cemeteries will be analyzed under two main categories: hardscape/softscape (section 4.3.1) and landscaping (section 4.3.2). Section 4.3.1 will analyze Paths/Walkways and Markings, and Section 4.3.2 will analyze the Layout plans and Vegetation. These evaluations will allow us to summarize Chapter 4 and also provide a collective characterization to compare the current state of cemeteries with the traditional cemeteries, in light of these variables. The spatial analysis and certification standards of twenty-one green cemeteries are listed in Table 10 according to their relevant features, showing their spatial characteristics. For these analyses, we

used the websites of the cemeteries and examined 3D views of their real locations on Google Maps. The investigations are entirely qualitative; although they are based on spatial data, they rely on individual observations summarized in the relevant categories.

We will explain the brief data presented in Table 10 in more detail under the qualification of Hardscape and Softscape (Section 4.3.1). As defined in Section 3.6, soft landscape elements include any vegetation such as trees, shrubs or flowers, while hard landscape elements refer to paving materials and surfaces excluding any soft elements. In Section 4.3.1, when characterizing hardscape/softscape, we will be defining whether the general character of the cemetery contains mainly hard or soft landscape elements. This conclusion will not result from calculating numbers of surface areas, but from qualitatively interpreting the spatial design created by the combination of architectural and landscape elements. In this context, we will examine Paths/Walkways in three groups according to the materials used in cemeteries: Grass/Soil, Gravel/Stone and Concrete/Asphalt. We will also categorize Markings into three groups: Headstones/Grave markers, Digital and Tree/Natural Stone-Rock.

We will further explain the data in Table 10 under the qualification of Landscaping (Section 4.3.2) by analyzing Layout and Vegetation. Furthermore, we will qualify the Layout in two categories, Organic and Formal, according to plan type. Here, Organic and Formal do not refer to rectangular shapes like in the Mariebjerg cemetery, which we discussed in Section 3.5. As stated in Section 3.2, formal layouts can be described as “divided by roads and paths, with each grave having an established address.” However, this is not the main purpose in our comparison, Organic and Formal will aim to characterize the level of general order in the space. Later, we will examine Vegetation and qualify it as Natural or Manicured. When describing Vegetation, we will not refer to formality, such as “well-groomed bushes and '*allées*' on-axis” like in The Woodland Cemetery mentioned in Section 3.5. Instead, as in Section 4.3.1, “manicured” will indicate how orderly and well-groomed the vegetal landscape elements are in the general cemetery setup, while “natural” will mean “evolved from being just designed” in terms of the cemeteries' general atmosphere, as mentioned in Section 3.4. We will describe natural or mature vegetation as a qualification supporting the idea of cemeteries being like “forested areas” rather than “managed” urban parks.

4.3.1 Hardscape vs Softscape

When discussing the hardscape and softscape elements of green cemeteries, we qualify the overall character of the cemetery area. When we examine a cemetery, we evaluate whether the items and materials used in paths, walkways and markings create a “hard” image or, conversely, an “unassuming from the street” one, as exemplified in the Grove Cemetery in Section 4.2.1. We assess whether vegetation dominates the area or not. The twenty-one Green Cemeteries’ spatial features are marked according to the Paths and Walkways materialization: Grass/Soil, Gravel and Concrete/Asphalt and Markings: Headstones/Grave marks, Digital marking, Tree/Natural Stone or Rock (Table 10). When we examine the seven Hybrid cemeteries, we observe that all of them, except for the H-5, concrete and asphalt is used for main axes and vehicle roads. In H-5, the material for the vehicle roads is concrete, but unlike the others, it is laid as “concrete pavers” rather than “poured.” These pavers are occasionally used on the roads connecting the vehicle roads within the cemetery sections, and the grass that naturally grows between the pavers gives the roads a “softer” appearance. Natural stone slabs were used for the external pedestrian paths (Figure 8) and in some places, natural “soil paths” were left among the grasses (Figure 9). Although H-5 features more “hardscape” elements due to the extensive use of monuments to “preserve, promote and protect the history”, the choice of road materials has slightly changed this image by increasing the amount of “soft” surfaces, thus softening the overall appearance (Congressional Cemetery, 2024).

Paths and Walkways from Hybrid cemeteries for Hardscape/Softscape analyzes

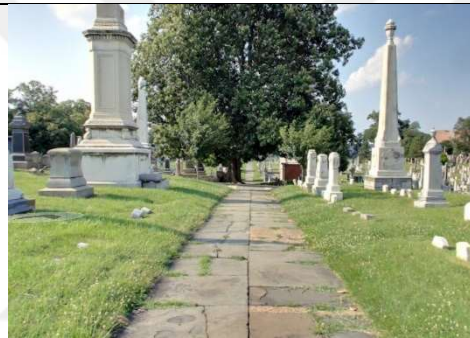


Figure 8. Stone slab walkway from the Historic Congressional Cemetery (H-5)
(Source: Google Maps, n.d.)

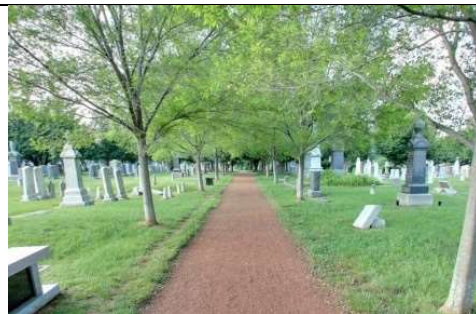


Figure 9. Unpaved walkway from the Historic Congressional Cemetery (H-5)
(Source: Google Maps, n.d.)



Figure 10. Slab and unpaved walkways from the Hollywood Forever Cemetery (H-2) (Source: Hollywood Forever & Hollywood Funeral Home, 2024)

In Hybrid cemeteries, we see the continuing similarity in headstone habits such in traditional cemeteries. We know that hybrid cemeteries reserve space for traditional burials. However, it is not always possible to observe the spatial features of natural burials in Hybrid cemeteries, as they also allow traditional marking habits in areas reserved for green burials. As shown in Table 10, using trees or natural rock for marking is rarely offered as an alternative to traditional markings. The digital marking option is only available in the green burial area of H-6 (Figure 11). While the marked burial plots are kept in the database, making management easier, it also prevents traditional marking and ensures that the area remains free from “foreign material.” Additionally, leaving the burial plot “unmarked”, which helps the area to have more “softscape” qualifications, it is only permitted in H-7 among these seven Hybrid cemeteries (Table 3). The “disuse of permanent memorialization also has the least impact on the landscape” (Mount Auburn Cemetery, n.d.). In H-2 Tree Burial area, “new tree plantings are used as memorials and California live oaks (*quercus agrifolia*) are preferred, but other native species options are also considered that are beneficial to the environment and the local flora and fauna” (Hollywood Forever & Hollywood Funeral Home, 2024).



Figure 11. Green Burial area of Saint Joseph Cemetery (H-6) (Source: Saint Joseph Funeral Homes, 2024)

When examining Natural burial grounds, we observe that grass and soil are used as pavements at all of them. Concrete surfaces are still present. For instance, in N-8, a concrete road serves as an axis separating the historic cemetery from the natural burial areas (Figure 12). Although this road is not part of the natural burial area, it enhances the hardscape effect throughout the cemetery as a spatial component. In N-14, where almost all types of burial practices, including traditional typologies, are applied, it is possible to observe various hardscape elements common in traditional cemeteries, such as monuments made from permanent materials (Figure 13), statues and mausoleums (“White Haven Memorial Park Home,” 2024). Softscape elements are more dominant in areas categorized as non-traditional. However, since these areas include sections that allow cremation, there are still hardscape elements such as fountains (Figure 14). N-14 cemetery displays a range of material uses and marking types within the hardscape-softscape grading. Generally, natural burial grounds are characterized by the dominance of softscape elements. Hardscape elements exist due to traditional practices in different parts of the same cemetery. Traditional marking styles also persist because of these practices. In all natural burial grounds, natural stones and trees are used for marking purposes and foreign materials are not permitted in these zones. Digital marking is only an alternative and is primarily used for management purposes to detect available burial plots.



Figure 12. The road between the historic cemetery and the natural burial areas in Fernwood cemetery (N-8) (Source: Fernwood Cemetery and Funeral Home,2024)

Hardscape/Softscape elements of Natural burial grounds



Figure 13. Granite markers in White Haven Memorial Park (N-14) , Traditional Area, Section R (Source: White Haven Memorial Park Home, 2024)



Figure 14. Section C, Fountain Niches, Outdoor Cremation Zone of Non-traditional Area (Source: White Haven Memorial Park Home, 2024)



Figure 15. Historical memorial remnant sample from Purissima Cemetery (N-9) (Source: Steelmantown Cemetery, n.d.)

When examining Conservation burial grounds, we observe that discussing Hardscape/Softscape is no longer necessary. As previously mentioned, conservation burial grounds represent the highest ecological standard among green cemeteries. Through reviewing examples, we found that “designed space” definition is no longer evident in conservation burial grounds. Only one site, C-16, promotes itself as both “a public park and a green cemetery, capable of hosting events such as weddings” (“Carolina Memorial Sanctuary,” 2024).

In this context, Conservation burial grounds include areas that have “built structures” contrasting with the general landscape. They serve for the recreational purposes and used during events such as celebration and gathering. However, only natural materials like wood and local stone are used for these structures or coverings (Figure 19). This demonstrates that even though it is functionally distinct from its surroundings, ecological principles are still adhered. Conservation burial grounds generally consist of natural vegetation and local habitats with minimal human intervention. It is difficult to detect any physical elements indicating they are cemeteries. Even the permitted natural stone markers occupy such small spaces in these large habitats that they are almost indistinguishable from naturally occurring stones, making it unnecessary to define them as spatial features. Additionally, it is not possible to talk about any planned paths or walkways since they consist of natural vegetation. There are only “path traces” on the green cover that naturally occur due to activities in green cemeteries, such as nature walks (Figure 16). These traces lack any intentional guidance, they are simply soil traces that have eroded over time and become paths due to human movement within the natural cover.



Figure 16. Fern Ridge Trail in Kings Mountain Preserve (C-20) (Source: Kings Mountain Preserve, n.d.)

Marking and structure samples from Natural and Conservation burial grounds



Figure 17. Natural stone memorial in Steelmantown Cemetery (N-12) (Source: Google Maps, 2022)



Figure 18. Foxfield Preserve (C-17) marker sample (Source: Foxfield Preserve, 2024)



Figure 19. Kings Mountain Preserve (C-20) “The Forest Chapel” (Source: Kings Mountain Preserve, n.d.)

4.3.2 Landscaping

We will discuss the landscaping elements of green cemeteries in two categories. First, we will analyze the layout, as mentioned in Section 4.3, to determine “the level of orderly planning” within these cemeteries. This will help us to understand the extent of design elements incorporated. Regarding vegetation, we will not focus on specific plant species, as all selected cemeteries are located within the U.S., data obtained from these cemeteries will reflect the local geography and not contribute to our purpose for examination of general design approaches. Moreover, the term “manicured” used here does not imply the presence of “topiary” plants typically associated with traditional cemeteries. While it may evoke images of well-maintained lawns, as mentioned in Section 3.4, its primary purpose is to signify the intentional use of plants to shape the overall atmosphere of the cemetery, whether it adopts a “structured” or “natural” appearance.

The spatial features of the 21 Green Cemeteries are categorized based on vegetation landscape design style: Natural and Manicured. By examining the 7 Hybrid cemeteries, it was observed that the H-2 Tree Burial area was initially designed to transform into a forest over time. This long-term vision contains the orderly arrangement of memorial tree plantings and aim to maintain a “formal” aesthetic (Figure 10), even as the landscape matures, preserving its overall “manicured” appearance. H-7 also have manicured landscape features. The cemetery already indicates their purpose as “embodiment of the garden cemetery concept that consist of plants, water, topography, monuments, structures and habitats. They aim is the combination and layering of natural and man-made elements that sustain the character of beauty and power.” In this regard, the cemetery landscape has Halcyon Lake (Figure 20) that has a surrounding landscape, reflecting late 19th-century landscape design and Asa Gray Garden (Figure 21), an ornamental garden reflecting the horticultural trends. The landscape approaches in the areas of the cemetery that were added later, reflect the general design approaches to cemetery design throughout history. For instance, the Consecration Dell (Figure 22) is a natural valley, “in contrast to the Cemetery’s otherwise manicured landscape and consist of native woodland trees, shrubs and perennials, providing shelter for wildlife” (Mount Auburn Cemetery, n.d.).

Landscapes from Hybrid cemeteries for Natural/Manicured analyzes



Figure 20. Halcyon Lake at Mount Auburn Cemetery (H-7) (Source: Mount Auburn Cemetery, n.d.)



Figure 21. Asa Gray Garden at Mount Auburn Cemetery (H-7) (Source: Mount Auburn Cemetery, n.d.)



Figure 22. The Consecration Dell at Mount Auburn (H-7) (Source: Mount Auburn Cemetery, n.d.)

As we examine the Natural and Conservation burial grounds, we observe a decrease in the notion of a “manicured” landscape. These areas lack prominent design elements, prioritizing the preservation of natural vegetation. This management approach is evident in both landscapes, where human intervention is minimal. Consequently, observing a “structured” landscape becomes nearly impossible within this context. Even new plantings lack a design intent, as human interventions aim to enhance habitat in accordance with native habitat. These interventions are mainly driven by ecological concerns. Consequently, we can say that, as the ecological value of cemeteries rises, their “manicured” effects decrease. In N-14, it is still possible to observe manicured landscapes, but they exist due to the traditional area's presence within the same cemetery boundary, rather than being based on the landscape approaches implemented in non-traditional areas.

When the cemetery layouts are examined, the spatial design of the twenty-one Green Cemeteries can be categorized into two design styles: Organic and Formal. An organic order is characterized by the placement of natural elements in a free-form or no placement at all. Vegetation and hardscape elements are predominantly arranged in a random pattern, giving the cemetery a natural appearance. The primary aim in an organic order is to preserve the balance with the nature, with minimal to no human intervention. In contrast, a formal layout offers a more structured and symmetrical aesthetic within the green cemetery area. This approach is commonly observed in traditional cemeteries. However, since some green cemeteries still have traditional areas within, such as hybrids, similar approaches can still be observed (Figure 10). In formal layout, vegetation and other landscape elements are arranged in a “determined” order, emphasizing symmetry and organization. Plants are typically planted in a systematic manner, aiming for a regular appearance and a sense of a “managed area.” Both styles, organic and formal, can be found in green cemetery areas, serving different aesthetic and functional purposes. However, it is challenging to categorize organic layouts as a “design” approach because these areas primarily involve assigning the existing natural cover as a “cemetery” by defining boundaries and managing it for this purpose. They involve minimal human intervention and spatial alteration, so they are not heavily “built.” Instead of a “well-designed” approach, organic layouts mimic natural forms and processes. These outcomes and approaches can be observed from

the map plan views. The difference can be observed in Figure 23, the non-traditional area of N-14 with organic plan is seen on the left and the traditional area with a formal plan is on the right.

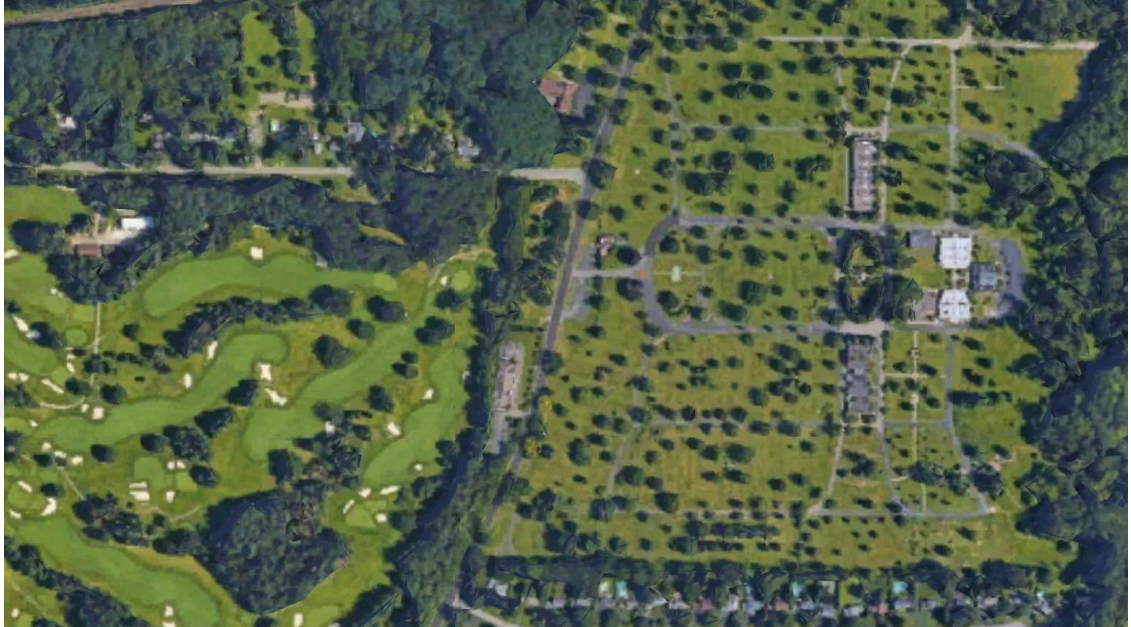


Figure 23. White Haven Memorial Park (N-14) Traditional and Non-traditional area plan (Source: Google Maps, n.d.)

In conclusion, hybrid cemeteries, natural burial grounds and conservation burial grounds represent current approaches that have emerged to repair or decrease the ecological harm caused by traditional cemeteries and conventional burial practices. By offering alternatives to traditional cemeteries, these new “fringe practices” address the evolving needs and values of contemporary society, whether through flexibility, simplicity or conservation. Their spatial features also wholly or partially reflect these attitudes within the cemetery boundaries or between different typologies. Each of these alternatives provides individuals with the opportunity to make choices that align with their values and beliefs. As long as humankind continues to struggle with environmental challenges and shifting cultural norms, these emerging alternatives are likely to become more mainstreams, increasingly determining in shaping the landscape of burial practices for future generations.

Table 10. Spatial analysis of GBC certified cemeteries' features

	Certification			Hardscape vs Softscape					Landscaping				
	Hybrid	Natural	Conservation	Paths and Walkways			Headstones- Grave marks	Marking		Layout		Vegetation	
				Grass- Soil	Gravel- Stone	Concrete- Asphalt		Digital	Tree- Natural Rock	Organic	Formal	Natural	Manicured
H-1	x					x	x				x	x	
H-2	x			x	x	x	x		x		x		x
H-3	x				x	x	x			x	x	x	x
H-4	x			x	x	x	x			x		x	
H-5	x			x	x		x				x	x	
H-6	x					x	x	x			x	x	
H-7	x				x	x	x		x	x		x	x
N-8		x		x	x	x		x	x	x		x	
N-9		x		x			x		x	x		x	
N-10		x		x					x	x		x	
N-11		x		x					x	x		x	
N-12		x		x	x		x		x	x		x	
N-13		x		x					x	x		x	
N-14		x		x	x	x	x	x	x	x	x	x	x
C-15			x	x					x	x		x	
C-16			x	x	x				x	x		x	
C-17			x	x					x	x		x	
C-18			x	x					x	x		x	
C-19			x	x					x	x		x	
C-20			x	x					x	x		x	
C-21			x	x					x	x		x	

CHAPTER 5: CONCLUSION

This thesis examines the spatial and functional transformations of cemeteries during urbanization and discusses the spatial features and functions of ecologically conscious cemetery designs with examples. We explore the evolution of cemeteries from traditional to contemporary typologies, how ecological cemetery designs align with sustainability principles, and the environmental, social, and spatial contexts of these designs. The discussion focuses on how cemeteries can align with sustainable urbanization processes and how design approaches based on ecological principles can be developed. The main purpose of this thesis is to examine how cemeteries change during urbanization and the role of ecologically conscious death practices in this process. We discuss historical processes and modern urban needs in detail to understand and highlight the spatial and functional transformation background of ecological cemeteries. The study aims to understand the transformations that cemeteries have gone through from past to present and to provide insight into how they can be reshaped with ecological design principles in the future.

Firstly, we investigate how the urban transformation process changes cemeteries, what intermediate forms can be identified as examples of these changes, their spatial characteristics, and the effects of these changes on the use, design, and perception of cemeteries. We observe that cemeteries have gained new functions since the industrial revolution due to reasons such as increasing population and urbanization, and began to be seen as green recreational areas through developments such as health reforms and social needs. From the beginning of the 19th century, cemeteries transformed from traditional sacred areas into urban green spaces, changing their role in urban planning and social life. This change also led to transformations in the spatial characteristics of cemeteries. Traditional cemeteries, designed for symbolic and ritual purposes, evolved into modern cemeteries planned as functional and multipurpose areas. This transformation altered both the visual aesthetics and uses of cemeteries, leading different design disciplines to approach them with a more holistic perspective to create more open, green, and accessible spaces within modern cemetery typologies.

Secondly, we ask how we can achieve ecological and sustainable design in cemeteries and what advantages green (natural) burial practices and ecological cemeteries offer

in terms of environmental sustainability and biodiversity protection compared to traditional burial methods. We find that ecological cemetery designs use environmentally friendly materials and methods, and these include green burial practices to varying degrees. Unlike traditional burial methods that are not environmentally sustainable, green cemeteries minimize environmental impacts, preserve natural habitats, increase water and energy efficiency, and support biodiversity. While traditional burial methods typically involve chemicals, energy-intensive processes, and large space requirements, green burial practices aim to reduce these harms by using biodegradable materials, avoiding chemicals, and maintaining natural landscapes, thereby enhancing environmental sustainability. Ecological cemeteries preserve biodiversity and protect local plant and animal species by creating natural habitats and have begun to function as part of urban ecosystems.

Thirdly, within the framework of the Green Burial Council Certification, we examine how green (natural) burial practices and green cemeteries can be analyzed ecologically and spatially, and how a spatial analysis can be obtained through the typologies determined by this certification, considering the hardscape and softscape components in terms of landscape design. We mention the Green Burial Council certification standards and the criteria set by these standards for ecological cemeteries. Although these green cemeteries, categorized as hybrid cemeteries, natural burial grounds, and conservation burial grounds, have certain differences and similarities, they generally emphasize sustainability principles such as protecting natural habitats, increasing water and energy efficiency, and supporting biodiversity.

The Green Burial Council Certification ensures that green burial practices and green cemeteries meet specific ecological and spatial criteria. This certification classifies green cemeteries according to their natural landscape characteristics, materials used, and environmental impacts, ensuring all typologies are ecologically sensitive and designed in accordance with sustainability principles. We select samples designated as green cemeteries from all three categories and conduct spatial analyses. These analyses demonstrate how cemeteries function ecologically and spatially and how they contribute to environmental sustainability principles. We analyze the spatial characteristics and landscape design elements of green cemeteries certified from different categories, investigating how these designs use both hardscape and softscape

elements to meet environmental needs. Despite the aim of environmental sustainability principles through all these typologies, we observe contradictions, inconsistencies, and uncertainties that indicate these typologies are still “fringe practices” rather than established ones.

For this study, we use spatial analysis methods based on literature review and case studies, using secondary sources. To reduce uncertainty about whether these green cemeteries, still considered “fringe practices,” are truly green, we adhere to Green Cemetery Council Certification standards and select samples only from the United States. This research develops a comprehensive understanding of how cemeteries transformed within the urban context and how to integrate ecological design principles into cemetery designs. The findings provide insights for future applications of ecologically conscious cemetery designs, offering guidance on how cemeteries can be reshaped ecologically within the fields of architecture and landscape design. By considering the historical transformation process of cemeteries and ecologically conscious design approaches together, this study offers a theoretical foundation for future ecological cemetery design projects. Additionally, the effects of the Green Burial Council Certification on cemetery design and spatial analyses on ecological cemetery principles create new research opportunities and provide cause-and-effect insights into what type of spatial results these “fringe practices” can generate when adhering to specific rules to establish a longer-term relation.

Future studies in this field can investigate new and innovative design approaches for ecological cemetery designs and establish more general rules. By examining how these designs are adopted and applied in different cultural, social, and geographical contexts, researchers can aim to make these general design principles more universal. This can encourage the development of policies and legal regulations to promote and set standards in the field of ecological cemetery design. Detailed strategies for preserving the ecological balance of cemeteries can be explored, and cooperation with local governments and non-governmental organizations can be encouraged to raise universal awareness about the importance and advantages of ecological cemeteries.

This study contributes to reshaping cemeteries with ecological awareness, integrating them into sustainable urbanization processes, and evaluating cemeteries in the context

of urban landscape design. By examining the advantages of ecological cemetery designs for environmental sustainability and biodiversity protection and integrating these spaces into landscape design processes, the study aims to raise awareness in architecture and landscape design about designing cemeteries with ecological awareness and sustainability principles. Learning from past transformations, this study establishes an important foundation for shaping future designs.

In conclusion, this thesis aims to encourage further research in the architecture of ecological cemetery designs and create a theoretical basis for a more general and universal understanding of future designs. Designing cemeteries in a more ecologically conscious and sustainable way will help both the environment and society, offering significant contributions to humanity by providing both social and ecological benefits. Promoting ecological cemetery designs and integrating them into sustainable urbanization processes offer an important opportunity for all design disciplines. It may be arguable that ecology will become one of the ethereal definitions of the afterlife in the upcoming decades. In this context, ecological burial practices would become a part of new divinity definitions, perhaps even a new cultural practice. The findings of this study help architects and landscape designers integrate ecological and sustainable approaches into cemetery designs, contributing to the goal of creating greener and more livable cities for the future.

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