



Mountains in Symphony:

Rewilding the Summer Pasture Mosaic for Cohabitation in the Pyrenees

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COLOPHON

Mountains in Symphony

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Abstract

Rewilding in this project is understood as a method of ecological restoration and land management that cultivates wildness within the inhabited pastoral landscape of the Pyrenees. It reconfigures the open mountain pasture system toward negotiated cohabitation among humans, livestock, wildlife, and self-willed ecological processes. The open mountain pasture(OMP) mosaic is understood as a cultural-ecological system historically sustained by the interaction between cultural legacies and ecological processes: pastoral rhythms, paths, grazing, and maintenance provided disturbance, while the resulting mosaic in turn became the ground these practices depended on. As pastoral presence weakens, this continuity is disrupted. By reorganizing disturbance, succession, movement, access, and perception, the project proposes a spatial framework through which the mosaic can continue in a transformed state, allowing ecological processes and cultural legacies to support each other again.

The project develops this framework through three levels. A dynamic zoning of Use, Negotiating, and Letting-go modes redistributes disturbance and succession across the OMP mosaic; a set of graded coexistence interfaces reorganizes where human use and bear activity meet; and actor-based interventions give shepherds, wildlife protectors, and visitors routes through which cohabitation becomes legible, usable, and meaningful. Rewilding in a cultural landscape is thus shown as a designed condition of negotiated cohabitation.

Acknowledgement

I would like to express my sincere gratitude to my mentors, Prof. Eric Luiten and Dr. Diwen Tan, for their encouragement and guidance throughout this project. With their help, an initial fascination gradually grew into a deeper engagement with mountain cultural landscapes, leading me to study alpine pastoral systems in ways I had never imagined, and, in reading other mountains and the people who live with them, to find that something of the mountains had been working in me all along.

I am grateful to Dr. Martin D. Locker for generously sharing his compelling work and local materials, which helped me build an understanding of and a connection to the site.

I also thank Milka van der Valk Bouman for her kind words and encouragement, and Xinyi, Sihui, Yingxuan and the LAR Lab for the fresh perspectives and thoughtful suggestions they brought to my work.

Finally, I thank my parents and family for their constant support over the past eight months. With you, I have always found warmth and motivation in the midst of long work.

Fascination

Familiarity,affection and empathy

My fascination with the Pyrenees is first rooted in a subtle sense of familiarity. The semi-natural pastures in the alpine, golden eagles ,wolves and transhumance customs all echo those of my hometown Xinjiang, where people have deep connection with nature and the modest life style its rhythms lead to. At the same time, I am drawn to these landscapes not only for their beauty, but also out of my empathy for nomadic people living in the marginal mountain. They love the land but their life is trapped by it, and as a result, more and more young generations left for studying and finally chose not to come back. The tourism in recent years brought opportunities for better life, but the unreasonable exploitations are also consuming the landscape,people and local identity. And through reading local interviews and narrative sources, in Pyrenees, I realized people are also experiencing this 'fatalism' of modernization. This affection shaped my research question as the landscapes I admire are precisely those now disappearing.

Myth, traditions and locality

The Pyrenees, as a border mountain range, is a mysterious complex that has attracted numerous explorers and has witnessed the interflow and evolution of history and culture. There are many archaeological remains, legends, folklores, and myths that record interpretations of the relationship between humans and nature over thousands of years. These cultural legacies have deeply shaped the unique place of spirit in the Pyrenees: a self-willed, indomitable, and dynamic mountain landscape.



Fig0-1|Golden eagle and Kyrgyz people, Kizilsu Kyrgyz Autonomous Prefecture,Xinjiang,China, Imaged by Kizilsu government(n.d.).

Fig0-2|Kazakhs people's yurts Ili Kazakh Autonomous Prefecture, Xinjiang,China, Imaged by author(2025) .

Fig0-3|An cave painting of ibex, Niaux, Ariège,France, Imaged by Prehistoric Rock Art Trails(n.d.).

From up to down



Fig0-4|A Summer pasture and a Shepherd's Refuge in winter, Gavarnie ,France, Imaged by author(2025).



Fig0-5|A winter pasture in the rain,
Gavarnie, France.
Imaged by author(2025).

Glossary

Cohabitants:

Humans and non-humans who share space, ecological processes, risks, and responsibilities within a cultural landscape. In this project, cohabitation is supported through spatial and temporal negotiation rather than full control or full withdrawal.

Cultural Keystone Species:

Keystone species in culture are those that play a central and irreplaceable role in a culture's identity as well as in ecological process.

Open Mountain Pasture System

This system(OMP) refers to the semi-natural alpine and subalpine summer pasture mosaic(in french:estives), and cultural legacies and ecological processes that sustain it.

Negotiated Coexistence

A spatial condition in which human use, wildlife habitats and risk management are coordinated through differentiated access, visibility, seasonal rules, and maintenance.

Palimpsest

A layered reading of landscape over time, tracing how spatial structures, ecological processes, and social practices evolve, persist, or become disrupted, and identifying what can be carried forward into future rewilding strategies.

Pastoralism Proxy

This refers to how transhumant pastoralism func-

tionally substitutes for the ecological role once played by wild herbivores, maintaining landscape openness through managed grazing disturbance regimes.

Passive Rewilding / Natural Regrowth

A form of rewilding driven mainly by land abandonment and reduced management, allowing succession, shrub encroachment, and forest expansion to proceed with limited intervention.W

Rewilding Baseline

A process-based reference for rewilding. In this project, the baseline is the disturbance–succession balance that sustained the open mountain pasture mosaic.

Wilderness

A landscape ideal often associated with minimal human presence, autonomy of nature, and protection through withdrawal or exclusion.

Wildness

The presence of self-willed ecological processes within a landscape. Wildness does not require human absence, but can be cultivated within inhabited cultural landscapes.

The Biens Communaux System

A communal landholding and management system through which local communities collectively used and regulated shared pastures, forests, paths, water sources, and other resources. It structured grazing rights, seasonal calendars, access, boundaries, and maintenance responsibilities.

Transhumance

This phenomena can be seen in many different mountain areas all over the world. It refers to a grazing tradition based on seasonal use of pastures(used in spring,autumn and winter) and open mountain pastures from different altitude zonations.

Rewilding in the Pyrenees: From Letting-Go to Negotiated Cohabitation

Rewilding as a Restoration and Land Management Approach

Against the European background of land abandonment, rural depopulation, and agricultural marginalization, rewilding has become an increasingly influential approach to nature restoration. In a broad sense, it aims to restore ecological processes and strengthen the self-organization of nature by reducing continuous management, allowing uncertainty, and, where relevant, supporting the return of missing species and trophic functions. However, in cultural landscapes, rewilding does not operate only as an ecological project. As Tokarski and Gammon (2017) suggest, rewilding is closely entangled with questions of land abandonment, heritage, belonging, and changing human-land relations. In this sense, rewilding can also function as a land management approach: reduced intervention, natural regrowth, and species return become ways of reorganizing land that is no longer maintained through intensive production. In the Pyrenees, therefore, rewilding should be understood not only as ecological restoration, but also as a spatial and social transformation of the pastoral landscape.

Why Does Rewilding Narrative Becomes Problematic in the Pyrenees?

This general narrative has been powerful, but it can also produce a simplified public imagination of rewilding as the restoration of wilderness: a landscape where humans withdraw and natural succession proceeds toward a closed, autonomous state. In France, both “rewilding” and “ensauvagement” remain socially contested terms, particularly among farming unions, where they are sometimes associated with land grabbing and the exclusion of rural livelihoods (Barraud et al., 2019).

The Pyrenees are not empty terrains to be reclaimed by nature.

They are inhabited cultural landscapes in which ecological dynamics and pastoral practices have historically shaped each other. The open mountain pasture system depends on recurring disturbance regimes, including seasonal grazing, trampling, movement, and maintenance. When rewilding is understood mainly as human withdrawal, these practices risk being framed as obstacles to nature rather than as part of the cultural-ecological processes that sustained the mountain mosaic. As natural regrowth advances, pasture edges thicken, visibility decreases, access becomes less legible, and the conditions of human-wildlife encounter become more uncertain. Rather than arguing for either more withdrawal or more control, this project treats this uncertainty as a design problem: how can boundaries, risks, and responsibilities become readable and negotiable across human and non-human actors?

From Wilderness to Wildness

A useful distinction can therefore be made between wilderness and wildness. Robert Chapman (2006, as cited in Massenberg et al., 2023) rehearses the language of the Wilderness Act, stating that “wilderness is where the earth and its community of life are untrammelled by man, and it can be reduced, acre by acre.” Wilderness is therefore often associated with human absence, protection, and the exclusion of disturbance. Wildness, by contrast, refers to the presence of self-willed ecological processes that can also exist within inhabited landscapes and in which humans may participate. For the Pyrenees, the aim is not to replace pastoral presence with closed wilderness, but to allow more ecological autonomy while keeping the landscape socially operable.

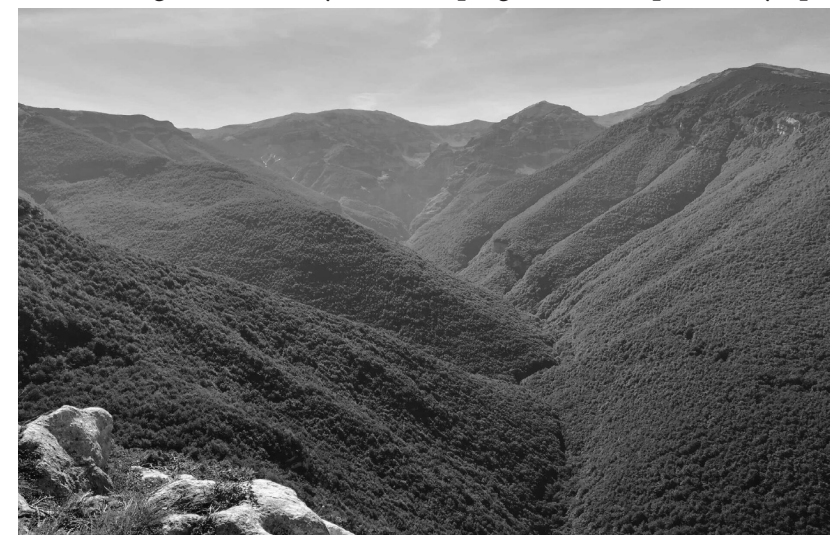


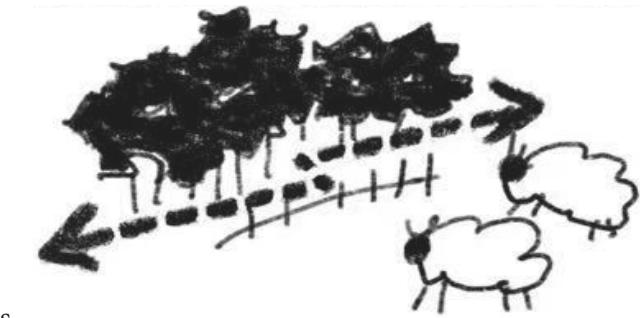
Fig1-1|Majella Wilderness, Majella National Park, Italy, Imaged by Lika Kvizhashvili via European Wilderness Society(2025).

Making Uncertainty Negotiable

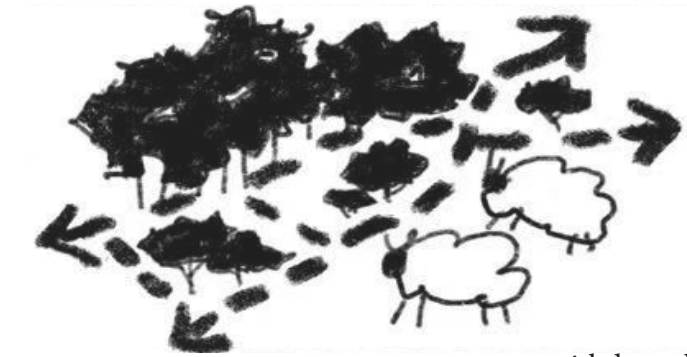
This project uses the distinction between wilderness and wildness as a practical design lens. In the Pyrenees, the challenge is less about producing wilderness through human withdrawal than about cultivating wildness within an operating mountain mosaic that still retains social and cultural functions while allowing more ecological autonomy.

This leads to my critical stance: rewilding has already introduced uncertainty, not only ecological change, but also uncertainty in where boundaries are, how people and livestock move, what encounters are likely, and who is responsible for care, safety, and maintenance. So how can rewilding become understandable and acceptable for those who live, work and visit here (such as pastoralists, residents, tourists and wildlife managers)?

The conventional binary description of rewilding as between control and withdrawal leaves these actors without shared rules, intensifies conflict and accelerates the loss of open mountain pastures. However, landscape strategies and interventions can translate the uncertainty of letting-go into readable and negotiable coexistence conditions, through readable edges, reestablished disturbance regimes, and cues for care so that changes in grazing pressure, vegetation structures and wildlife presence become more legible, risks become discussable, and responsibilities can be aligned across actors. Thus, ecological processes restored by rewilding need not erase cultural legacies, allowing cohabitation to become a real future instead of an abstract ideal.



control



withdrawal



Negotiable cohabitation with uncertainty

Fig1-2|Control, withdrawal and Coexistence, Imaged by author.

Motivation and Position

Against Fatalism

I gradually clarified my position through a personal fascination with the cultures and traditions of the Pyrenees, and through the laboratory's research theme of rewilding. Cultural landscapes can be understood as socio-ecological systems co-produced by human and non-human actors. Although the Pyrenean region has experienced industrialization, tourism development, and modernization, its landscape palimpsest has remained relatively continuous. Unlike many urban areas, there have been no abrupt replacements of landscape patterns or spatial fabric. In this sense, the Pyrenean mountain cultural landscape offers a valuable case through which long-term landscape evolution can still be read, together with the traditional knowledge of living with the land and the human–non-human relationships it has sustained.

Within the broader context of ecological transition in the Anthropocene, rewilding has emerged as an increasingly influential response to land abandonment, rural depopulation, and climate-oriented land management. Across Europe's marginal mountain regions, land is increasingly valued for carbon sequestration, wildfire regulation, biodiversity recovery, and ecological connectivity. Yet these territories are not empty ecological surfaces; they remain inhabited cultural landscapes, where communities, practices, memories, and responsibilities are embedded in the land. Building on this observation, the project does not treat rewilding as a retreat to “pure nature,” but as a question of how people can remain positioned within an inhabited cultural landscape where ecological autonomy increases, and how letting-go can become socially operable rather than excluding.

In the Pyrenees, this transition is experienced not only as ecological change, but also as a change in everyday life. In *Mountain People*, Wilson and Cracknell (2021) document the lived experience of fifteen families in the Cardós Valley in the Spanish Catalan Pyrenees and in the Ariège department of the French Pyrenees, where a recurring sense of fatalism is evident among local communities. People appear as powerless participants in a wider world: they cannot make the rules, much less change them, yet they must continue to participate in them. Since the onset of industrialization over two centuries ago, human mobility in mountain regions has been shaped by overlapping economic and



political processes, which have intensified under post-industrialization and globalization. Depopulation, agricultural marginalization, tourism, shifting conservation policies, natural regrowth, and large-carnivore return all reshape accessibility, safety perceptions, livelihood rhythms, and the will and ability to live and work with the land.

This raises a question of justice as well as ecology. Drawing on David Schlosberg's expanded framework of environmental justice (2007), I argue that rewilding cannot be understood only through the distribution of environmental benefits, such as biodiversity, carbon storage, or habitat connectivity. It also requires the recognition of lived identities, local knowledge, and ways of life. The question is not simply whether rewilding is ecologically beneficial, but who benefits from climate-oriented land management, and who bears its social and cultural costs. Where recognition is missing, rewilding risks being experienced as one more force

that deepens uncertainty and reinforces fatalism, especially when it is framed as human withdrawal from a lived cultural landscape. In this context of structural fatalism and transformation, my position as a landscape architecture student, and as someone from a marginal mountain background, leads me to value the traditions and local practices that resist homogenizing, top-down transformations.

Following James Corner's understanding of landscape as a dynamic field of processes and forces rather than a fixed object (1999), I see landscape architecture as a practice of spatial coordination, working within the tension between ecological autonomy and human dwelling. If, as Elizabeth K. Meyer argues, ecological performance alone cannot define landscape value, since ecological design is inseparable from cultural meaning, perception, and the capacity to move people toward care (2008), then this project aims to counter fatalism not by promising full control, but by translating the uncertainty brought by rewilding into readable and negotiable coexistence conditions. Landscape architecture cannot solve depopulation or large-carnivore politics, but it can spatially coordinate the relation between global climate objectives and local lived realities. Through legible boundaries, re-established disturbance regimes, seasonal access rules, visibility gradients, and cues for care, rewilding can become a lived practice of cohabitation: a real future rather than an abstract ideal.



Fig1-3|A shepherd is explaining the transhumance to tourists.
High Ariège,France.
Imaged by Gordon Wilson and Steve Cracknell(2021).

Fig1-4|prophetic graffiti on the wall of the abandoned tungsten mine .
Salau,Ariège department,France.
Imaged by Gordon Wilson and Steve Cracknell(2021).

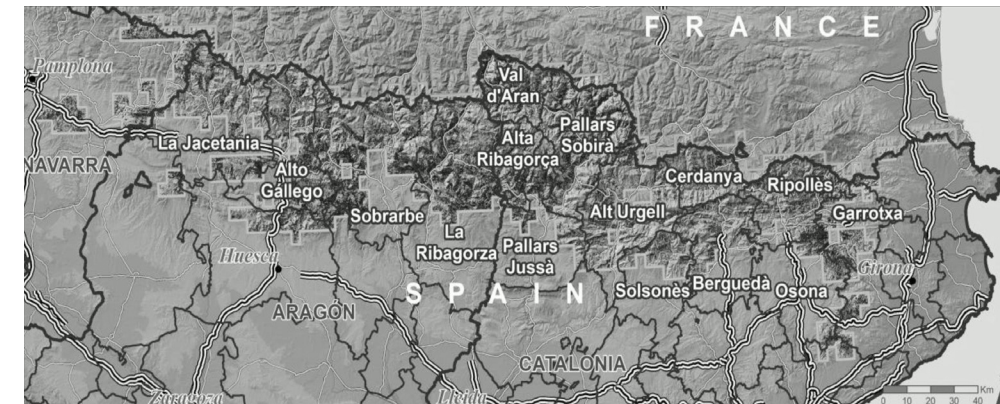
I.Introduction| Problem Statement
1.3 Problem statement

Agro-silvo-pastoral System in Transition

Decline of production-based pastoralism

The agro-silvo-pastoral system of the Pyrenees has undergone profound transformation through long-term depopulation, agricultural restructuring, and land abandonment. Since the 1960s, this process has been accelerated by agricultural mechanization and the declining competitiveness of marginal mountain production. Sloping farmland, remote plots, traditional pastures, and especially high-altitude summer pastures have gradually been withdrawn from cultivation and regular pastoral use (European Commission, n.d.; Errea et al., 2023).

The European Union's Common Agricultural Policy (CAP) further reshaped this uneven geography of use. Agricultural management and intensification were reinforced in valley bottoms and easily mechanized plots, while remote slopes and summer pasture areas continued to lose labour, maintenance, and productive centrality (European Council, n.d.). As a result, the former continuity between valley settlements, seasonal movement, and high mountain pastures has become increasingly fragmented.



From production to multi-functional land management

During the late 1990s, the CAP introduced Agri-Environmental Schemes (AES), integrating environmental requirements and incentives into agricultural subsidies. This marked a shift whereby areas with low agricultural potential were no longer valued solely for production, but increasingly compensated for their environmental functions, such as biodiversity maintenance, landscape openness, and risk regulation. In more recent decades, carbon sequestration and wildfire management have become explicit policy objectives, and natural regrowth has been incorporated into climate strategies and carbon accounting frameworks. (Ministère de la Transition écologique, n.d.) For remote mountain agropastoral landscapes, this shift in governance has led to spatial consequences. Low-intensity grazing is no longer the only land maintenance approach with policy-recognised value. Instead, landscapes may change between active use, extensive management, and partial natural regrowth, depending on accessibility, human resources and policies.

As a result, pasture abandonment, forest succession, and rewilding are not merely ecological outcomes, but are increasingly incorporated within the governance and management regimes. More recently, climate-oriented land management has further reinforced the value of natural regrowth and forest expansion within carbon accounting and ecosystem-service frameworks.



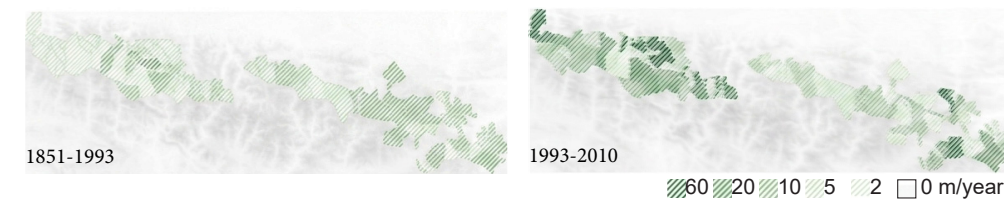
Fig1-5| Spatial distribution of previously abandoned areas in recent 30 years in the Spanish Pyrenees, showing the uneven retreat of agricultural use from marginal mountain areas. Reproduced from Spatially explicit modeling of the probability of land abandonment in the Spanish Pyrenees by Gelabert et al. (2022).

Fig1-6|Goutets summer pasture village abandoned in 1960s, illustrates the weakening of seasonal occupation and high-altitude pastoral maintenance. Le Port, Ariège department, France. Imaged by Patrice Teisseire-Dufour(2025).

Natural Regrowth and Species-focused Rewilding

Revaluing marginal mountain land

Following the decline of production-based pastoralism, marginal mountain land is increasingly revalued through environmental and climate-oriented policies. Natural regrowth, forest expansion, and the return of key species are no longer treated only as unmanaged consequences of abandonment, but also as potential contributions to carbon sequestration, biodiversity recovery, wildfire regulation, and ecological connectivity. At the same time, pastoral conservation policies still recognize the need for selective grazing to maintain open habitats and cultural landscapes. This creates a new governance condition in which letting-go, partial management, and continued pastoral use coexist within the same mountain landscape.



Natural regrowth and its double effects

Within this context, natural regrowth produces contradictory effects. On the one hand, shrub encroachment and forest expansion can strengthen habitat continuity, support wildlife movement, and contribute to carbon sequestration. These regrowth dynamics can be further amplified by climate warming, as documented forest-line shifts indicate the upward movement of woody vegetation in parts of the French Pyrenees. On the other hand, natural regrowth also advances into open meadows and summer pastures that are closely linked to grazing practices, transhumant cultural legacies, and open-habitat biodiversity. As woody vegetation expands, pasture edges thicken, visibility decreases, and the spatial openness that once sustained pastoral movement, shared use, and landscape legibility gradually weakens.

Species-focused rewilding and human-carnivore conflict

In parallel with natural regrowth, species-focused rewilding has added another layer of transformation. Since the late 1990s, the French government has reintroduced certain key species, such as brown bears and ibex in the French Pyrenees, in order to restore missing ecological functions and trophic processes. However, as returning large carnivores overlap with summer pastures and pastoral infrastructures, encounters between wildlife and pastoral activities become more frequent and less predictable. As a result, conflicts between local communities and returning large carnivores have intensified. In Ariège, public reactions to bear presence, including anti-bear rallies and pro-bear demonstrations, show that the bear is not only an ecological actor, but also a cultural and political figure through which competing visions of landscape futures become visible.



Fig1-7| Forest-line shift velocities in French Pyrenees. Adapted from: forest-line shift analysis, Biogeosciences(2025).
 Fig1-8| Killed female bear 'caramelles' in a conflicts within Ariège area in 2021 is now on display at the Toulouse Natural History Museum, Toulouse, France .
 Imaged by Agence France-Presse via Getty Images (2025).
 Fig1-9| A peaceful gathering to express concern about the presence of bears .
 Étang de Lers, Ariège department, France.
 Imaged by Laurent Ferriere(2020).

Decline of the Open Mountain Pasture system

The open mountain pasture system is not a static grassland surface, but a dynamic landscape structure maintained through recurring disturbance. Seasonal grazing, trampling, herd movement, path maintenance, and pastoral infrastructures kept the balance between open grassland, shrubland, forest edge, and wetland habitats. This disturbance–succession balance sustained spatial openness, clear pasture boundaries, habitat heterogeneity, and pastoral livelihoods. Today, as pastoral practices decline and natural regrowth accelerates, this balance is disrupted. Shrub encroachment and forest succession replace open meadows, while forest edges become denser and thicker. Combined with documented forest-line shifts, this transformation compresses the open mountain pasture mosaic from two directions at once: succession expands from lower and lateral forest edges as pastoral disturbance recedes, while climate-enabled woody vegetation advances toward higher elevations. The pasture mosaic becomes less visible, less accessible, and less manageable. The decline is therefore not only a loss of pasture area, but a loss of the spatial conditions that allowed humans, livestock, and wildlife to share the landscape.

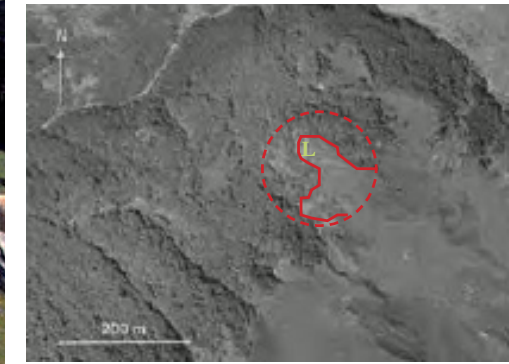
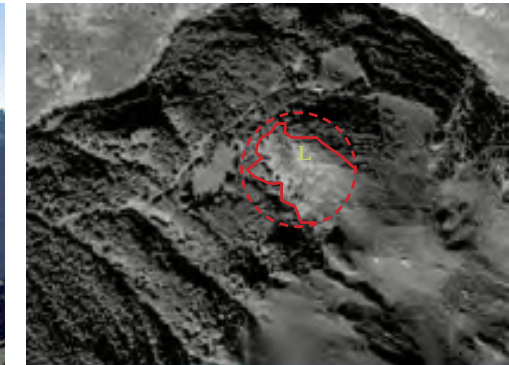


Fig1-10| A shepherd is moving flocks across a summer pasture. Val d'Azun, France. Imaged by E.Follet(2014).
 Fig 1-11,12| Comparison of summer pasture and forest edge dynamics, illustrating shrub and tree encroachment between 1959 and 2001. Séoube de Barbet, France. Source: Parc national des Pyrénées – Une cartographie.
 Fig1-13| Endangered species related to open habitats: Tetrao tetrix (Black Grouse) Imaged by Kenny Smith(2013)
 Fig1-14| Endangered species related to open habitats: Erebia christi(Christie's Ringlet) Imaged by Christoph Moning(2021) des paysages (Lagasuquie et al., 2012, p. 63).

From Pasture Decline to a Spatial Cohabitation Problem

As grazing disturbance weakens and natural regrowth advances, the problem is no longer only the loss of open pasture area or the increase of human–carnivore conflict. What also changes are the spatial conditions that once allowed different actors to share the same mountain landscape.

Pasture boundaries become less legible, forest edges thicken, paths are less maintained, and visibility across the landscape decreases. These changes affect how shepherds move with flocks, how visitors understand safety and wildness, how wildlife protectors organize care and monitoring, and how bears and other species move through the forest–pasture interface. In this sense, cohabitation is not simply a moral ideal of humans and non-humans living together. It is a spatial condition that depends on readable boundaries, negotiated access, seasonal rhythms, disturbance regimes, visibility, and shared responsibilities. When these conditions weaken, rewilding risks becoming either uncontrolled withdrawal or intensified conflict. The central design problem is therefore how to restore or substitute the disturbance–succession balance of the open mountain pasture system, while making the transformed landscape legible, negotiable, and inhabitable for multiple cohabitants.



Fig. 1-15 | Cohabitation as spatial condition. Shepherds, sheep, dogs, and enclosure at the Ibarroñdua kayolar shepherd house near Mount Orhy, where seasonal protection practices respond to bear-attack risk. Imaged by Iroz Gaizka / AFP via Getty Images(2019).

The transhumance landscape of the Pyrenees consists of a chain of pasture spaces used across different altitudes and seasons: winter pastures in the lower foothills and submontane areas, spring and autumn pastures at mid-altitudes, and summer pastures in the subalpine and alpine areas. This project acknowledges the whole seasonal grazing system, but focuses on the open mountain pasture system, as it is the most ecologically vulnerable component, has the strongest overlap between human activity and wildlife habitat, and faces intensified socio-cultural and ecological tensions under natural restoration.

The open mountain pasture system refers to the semi-natural summer pasture mosaic, together with its associated cultural legacies and ecological processes. It includes pastoral paths, refuges, water sources, boundaries, grazing rhythms, communal management, and maintenance practices. This system is directly affected by abandonment-driven succession, forest-edge expansion, climate-amplified woody encroachment, and changes in wildlife distribution.

This study unfolds across three scales. At the Pyrenees scale, it establishes the broader logic of the mountain's historical social-ecological system, altitudinal zonation, pastoral heritage, and ecological processes. At the Ariège / PNR scale, it examines where summer pasture management areas, forest edges, movement systems, and brown bear habitats overlap. At the design scale, it focuses on summer pastures in and between the Arac and Vicdessos valleys, further exploring pasture–forest boundaries, pastoral paths, and nodes through the spatial needs of different human and non-human actors, in order to make the rewilded landscape inhabitable.

The project does not aim to restore the transhumance system of a specific historical period. Instead, it explores how the open mountain pasture mosaic can be reconfigured as a cultural-ecological structure within a constantly changing mountain landscape, supporting cohabitation among pastoral practices, wildlife movement, natural succession, and human dwelling.

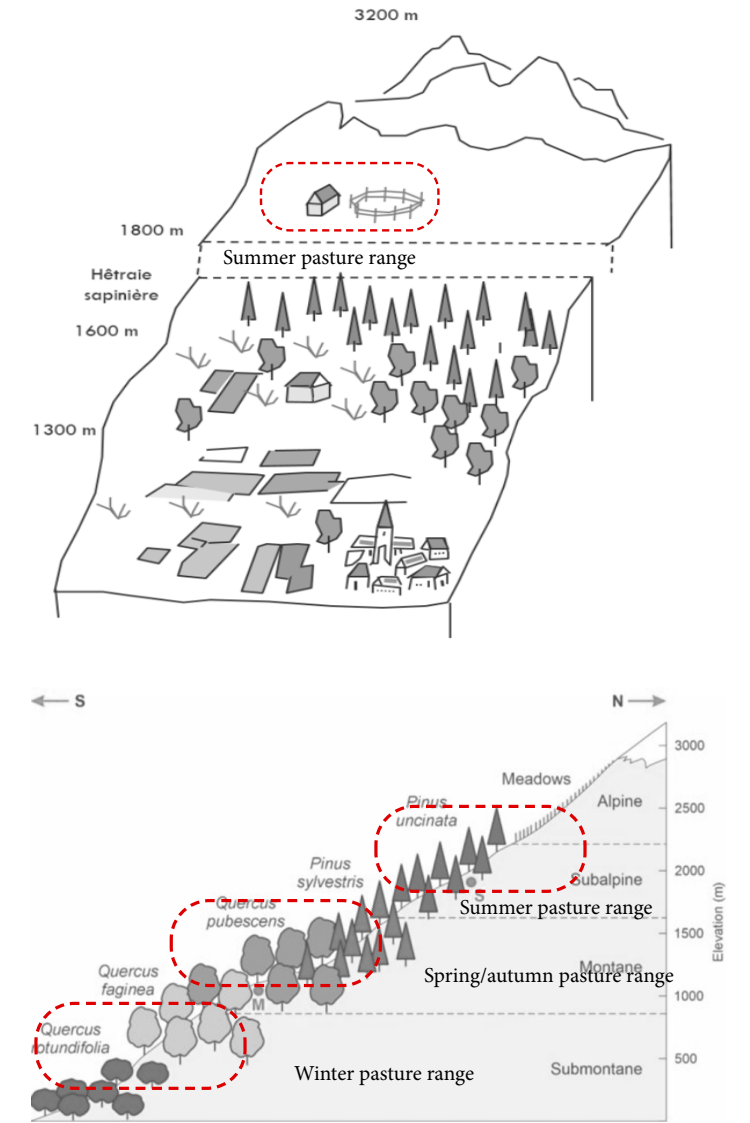


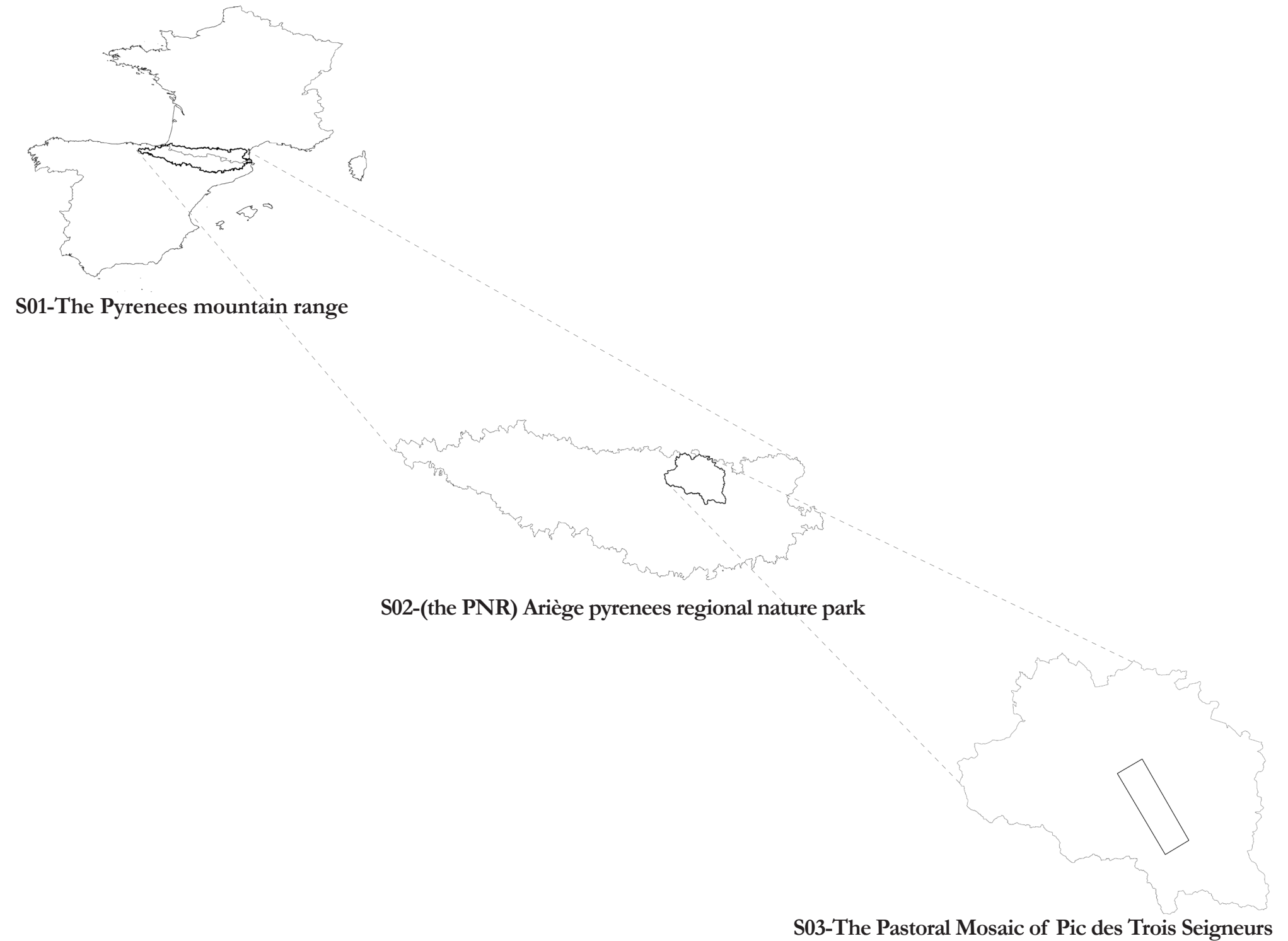
Fig1-16|Altitude zonation and related land use in Ariège. Reproduced from Fédération pastorale de l'Ariège (n.d.).
Fig1-17|Altitudinal zonation distribution of seasonal pastoral zones in the Pyrenees, adapted from a vegetation zonation diagram. Adapted from Rull and Vegas-Vilarrúbia (2021).

Relevance

This project contributes to rewilding the course by repositioning humans as cohabitants with in cultural landscapes. It explores how letting go can be translated into spatially legible and socially negotiable conditions. For landscape architecture, this means clarifying where ecological processes can be allowed, where risks concentrate, and how daily practices such as grazing, movement, visiting, and wildlife management can be coordinated.

The project also offers a process-based approach to sustaining the open mountain pasture system as a dynamic mosaic. By linking ecological dynamics with transhumant cultural legacies, it reframes the open pasture as a socio-ecological structure maintained through re-established disturbance-succession balance, as well as seasonal use and shared responsibility for human. Ultimately, the project proposes a spatial framework for reducing conflict, clarifying responsibilities, and supporting cohabitation among locals, visitors, wildlife protectors, and non-human species in a transforming mountain landscape.

Fig1-18| A vulture flying over the canyon. Ordesa y Monte Perdido National Park, Spain. Imaged by author(2025).



Research Question

How can a rewilding approach that repositions humans as cohabitants inform a new configuration between evolving ecological processes and continued cultural legacies in the Pyrenees' transforming landscape?

Design Assignment

To develop a set of landscape strategies and spatial interventions that integrate rewilding processes, such as disturbance regimes, selective Succession, and multi-species movement corridors into the Pyrenees' transhumant cultural landscape, restoring the open mountain pasture system and enabling coexistence among humans, wildlife, and evolving land uses.



Disturbance regimes



Selective Succession



Multi-species Movement Corridors

Sub-question01

What ecological processes and cultural legacies historically sustained the open mountain pasture system, and how this continuity is being disrupted by abandonment-driven succession?

Sub-question02

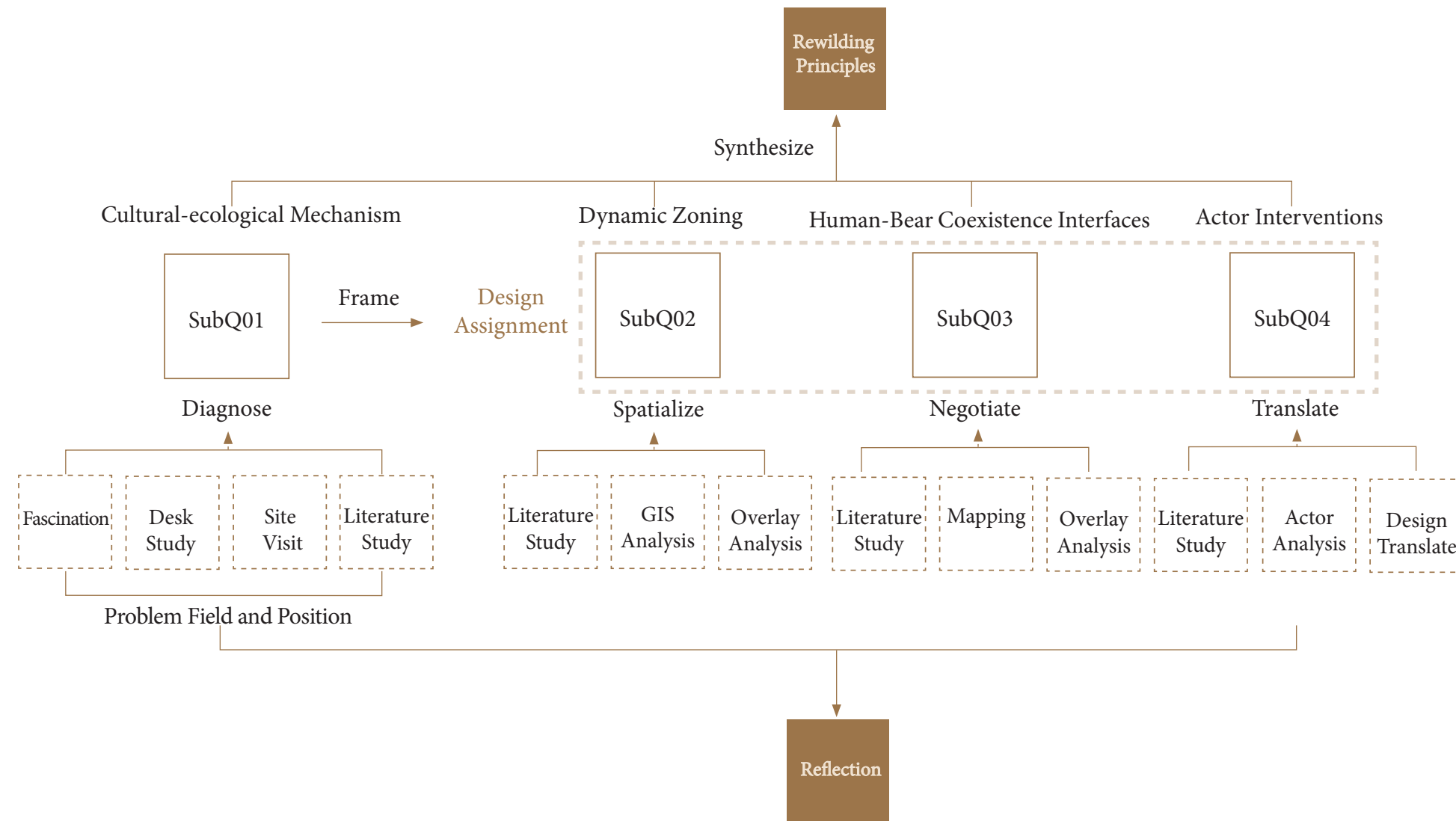
How can landscape strategies restore the open mountain pasture system as a dynamic cultural-ecological mosaic?

Sub-question03

How can bear-related confrontation interfaces be reorganized into coexistence interfaces that support coexistence between humans, livestock, and bears?

Sub-question04

How can actor-based spatial interventions make cohabitation legible, usable, and meaningful along the routes, edges, and nodes shaped by pastoral use, public access, and bear habitats?



Methods

Sub research question 01:

This part uses literature study, site experience, and landscape biography to understand the open mountain pasture system as a cultural-ecological mechanism.

Literature on rewilding in cultural landscapes, wildness, historical socio-ecological systems, and rewilding baselines was reviewed to frame the relation between ecological processes and cultural legacies.

Site visit observations, visual materials, historical references, and landscape elements such as paths, refuges, water points, boundaries, and pastoral facilities were then read through a palimpsest approach.

This reading traces how construction legacies, management legacies, grazing rhythms, and ecological processes interacted across different historical periods.

Sub research question 02:

This part uses literature study, GIS-based spatial analysis, and design synthesis to explore where different landscape strategies can restore the open mountain pasture mosaic.

Literature on disturbance dynamics, succession, natural grazing, and targeted grazing was used to define the ecological logic of grazing as a process-based intervention.

Vegetation succession stages were mapped by combining land cover data, tree cover density, pastoral use information, and historical aerial imagery. Current management intensity was assessed through active and low-management pasture areas. Grazing tolerance was derived from ecological sensitivity, including land cover, slope, wetlands, water bodies, and protected areas.

These layers were overlaid and translated into management-scale spatial units.

Sub research question 03:

This part combines bear habitat interpretation, dynamic zoning overlay, and footpath-network analysis to identify where human-bear coexistence requires spatial negotiation.

Brown bear presence data, land cover, elevation, slope, aspect, vegetation, food resources, and grazing-season activity patterns were used to map seasonal habitats across four categories: refuge, foraging and interaction, hyperphagia, and passage. These layers were overlaid with the dynamic zoning from SubQ02; overlaps with summer pasture management were defined as confrontation interfaces.

The existing footpath system was assessed against these interfaces and reconfigured through access hierarchy, pastoral gradient, seasonal restriction, and low-disturbance routing to support ecological connectivity. Confrontation interfaces were then translated into coexistence interfaces through four spatial variables: movement, facilities and activities, visibility, and maintenance.

Together, the reconfigured network and redefined interfaces form the spatial framework for coexistence in SubQ04.

Sub research question 04:

This part combines actor analysis, landscape perception theory, and research-through-design to translate territorial strategies into human-scale spatial interventions.

The intervention area was first introduced through existing operational patterns of three actor groups along four shepherd routes across two valleys.

Three design routes were then defined, each led by one actor group while shared with others. For selected nodes for each group, three layers of needs were addressed: operational (what each actor does), psychological (interpreted through Yi-Fu Tuan's topophilia, topophobia, and escapism), and spatial (the synthesis that generated design strategies).

Land Art further framed perception, bodily movement, and in-situ experience for visitor-led interventions.

In the introduction, rewilding was positioned not as simple human withdrawal, but as a spatial and social transformation of an inhabited pastoral landscape. This literature review therefore focuses on how rewilding can be read and operated within cultural landscapes, where ecological processes, cultural legacies, land use, and everyday practices are entangled.

Rewilding and cultural identity

only a question of ecological outcomes, but also one of meaning and legitimacy. Tokarski and Gammon (2017) show that farmers, herders, and local representatives often understand landscape as the outcome of long-term human–nature interaction. When rewilding is framed as the restoration of an uninhabited wilderness, local practices may be treated as disturbances to remove rather than as cultural-ecological legacies to carry forward. For this project, this means that rewilding strategies must work with pastoral memory, access, responsibility, and livelihood, rather than focusing only on natural processes.

Wildness as a process-based target

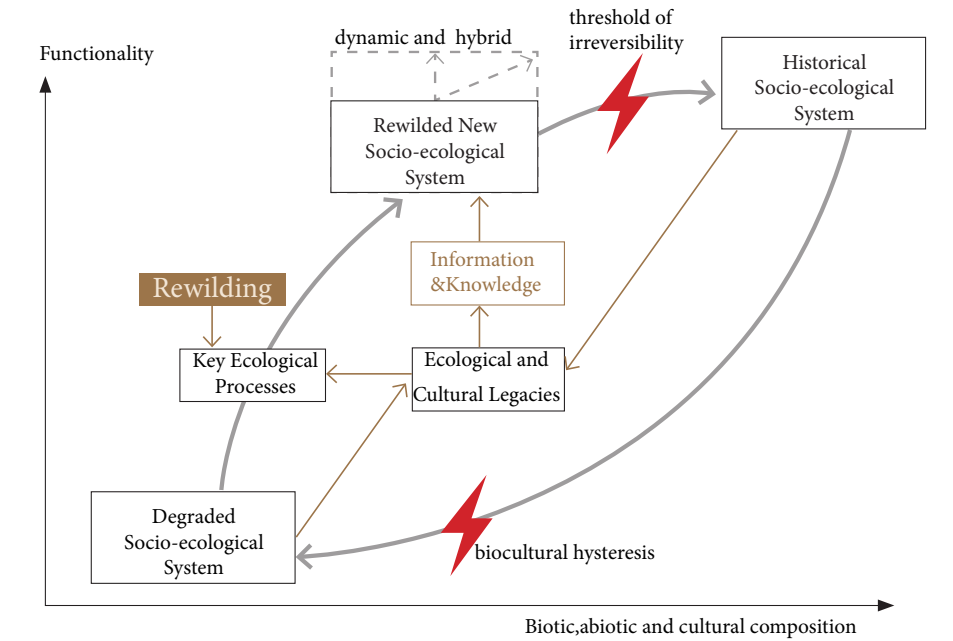
The distinction between wilderness and wildness clarifies the target of rewilding in this project. Wilderness is often associated with human absence, protection, and exclusion, while wildness refers to self-willed ecological processes that can also exist within inhabited landscapes. This study therefore aims to cultivate wildness within a transforming mountain pastoral mosaic. Methodologically, this shifts the focus from restoring a fixed historical landscape to supporting rewilding processes, such as disturbance regimes, selective succession, and multi-species movement connectivity, while also considering human practices, seasonal rhythms, and negotiated access.

Landscape architecture as spatial coordination

If rewilding is both ecological and cultural, it requires coordination across different interpretations of the same place. Drenthen’s reading of cultural landscapes as palimpsests (2015, 2018) suggests that rewilding can destabilize identities built on cultural and historical ties to landscape. Conflicts are often rooted in competing narratives about what the landscape is and what it should become. This means that rewilding needs a way to work with layered histories and contested meanings. This project therefore understands landscape architecture as a form of spatial coordination. Its role is to translate the uncertainty of wildness into legible and negotiable spatial conditions: process-permitting zones, access-limitation rules, disturbance-reintroduction areas, and co-movement interfaces for human and non-human actors. This literature position directly informs the later methods of landscape biography, dynamic zoning, confrontation-interface mapping, and actor-based spatial design.

Historical Social-Ecological system and Rewilding Baseline

In cultural landscapes, the historical ecosystem cannot be treated as a single fixed reference state. What counts as a meaningful baseline is shaped by which past is being recalled, such as ecological trajectories, land-use histories, and the time depth of cultural practices, and by for whom that past matters. Higgs et al. (2014) argue that history has multiple roles beyond “fidelity”: it can guide interpretation, reveal legacies and constraints, and help frame choices under ongoing environmental and cultural change rather than prescribing a single end-state. Mutillod et al. (2024) provided a clear path model for rewilding in ecosystem restoration. They emphasized that historical ecosystems serve as learning references, not replication targets. Restoration trajectories are limited and cannot fully revert to historical ecosystems. Furthermore, the outcome of rewilding may be a near-historical state, a mixed state, or a completely new state, depending on local conditions. In the process, ecological heritage (e.g., past species composition, soil, structure, disturbance history, etc.) helps understand the historical functioning of ecosystems and further guides rewilding decisions. The authors contextualized rewilding based on cultural landscapes, making the object of rewilding a socio-ecological complex instead of a simple ecosystem and considering the human and non-human cohabitation timeline. Cultural heritage together with ecological heritage constitutes the information and knowledge base for rewilding. This further supports a baseline based on key ecological processes: rather than aiming to reconstruct past composition, rewilding is viewed as restoring key ecological processes and nutrient functions, with no definite endpoint other than functional restoration.



Here, following Lyver et al. (2019), biocultural hysteresis refers to the presence of ecological and cultural thresholds that prevent a degraded social–ecological system from returning to its historical configuration, even when some of the original pressures are removed. This persistence results from the weakening of long-standing human–environment relationships and the associated constraints on adaptive responses.

Fig 2-1| Conceptual pathway from social-ecosystem degradation to recovery through rewilding in a cultural landscape, reinterpreted for this study. Adapted from Mutillod et al. (2024).

Disturbance dynamic and succession

Mountain cultural landscapes such as the Pyrenees can be read as disturbance-shaped mosaics, not stable end-states. Disturbance ecology explains landscapes as patchworks continually reorganized by recurring disturbances and subsequent recovery, so heterogeneity depends on regimes (frequency, intensity, spatial pattern) rather than a fixed vegetation state (Pickett & White, 1985, pp. 3–13). When long-standing pastoral disturbances decline, the system does not simply return to a past nature but shifts in patch structure and succession pathways. Across European mountain regions, agricultural and pastoral abandonment typically accelerates succession often through scrub encroachment followed by woodland expansion with broad consequences for habitats and landscape functions (MacDonald et al., 2000).

For rewilding in an inhabited cultural landscape, this is critical because succession also reshapes spatial legibility: open patches fragment, edges lengthen and thicken, and accessibility and encounter conditions change. These insights also support a process-based baseline: rewilding should focus on restoring or substituting key processes and disturbance rhythms that sustain a functional mosaic, rather than targeting a precise historical composition.

Grazing as a nature process

Large herbivore grazing can be framed as a natural process that maintains heterogeneity in open and semi-open landscapes. The PONC handbook (Linnartz et al., 2023) defines natural grazing as systems where large grazers live in socially structured groups, remain outside year-round, and self-select where to feed and rest; grazing then suppresses grass dominance and limits woody encroachment, producing a patchy mosaic of grasses, herbs, shrubs, and trees. In fragmented cultural landscapes, the handbook (Linnartz et al., 2023) argues that managers can steer this process through species choice and movement patterns (e.g., mimicking migration or rotational use), treating grazing as a controllable driver of vegetation dynamics and related ecosystem functions.

For this study, grazing as a process-based tool will be applied to sustain the open mountain pasture mosaics dynamics in the rewilded landscape.



Fig 2-2| Hardy domesticated races such as konik horses are used for grazing in nature areas. Imaged by Leo Linnartz(2023).

Targeted grazing for vegetation management

Targeted grazing can be understood as a form of process-based vegetation management rather than conventional livestock production. Marchetto et al. (2021) define targeted grazing as the manipulation of livestock density, grazing duration, and grazing timing to achieve a particular ecological outcome, such as reducing undesired plant species. Their meta-analysis shows that targeted grazing is usually not a one-off intervention: multiple grazing sessions within a year or repeated treatments over multiple years are often recommended, and the studies they reviewed had a median grazing duration of three years, with a maximum of ten years. This supports the idea that targeted grazing can be applied periodically to specific management patches rather than continuously across the whole pasture. The authors also note that interest in targeted grazing is partly driven by its lower demand for human labour compared with other vegetation-control practices, and by its suitability for slopes or difficult terrain. For this project, targeted grazing therefore provides a useful model for reintroducing disturbance in selected areas of the open mountain pasture mosaic, reducing shrub encroachment without requiring continuous intensive management.

Functional Connectivity across a Heterogeneous Landscape

Following Rudnick et al. (2012), landscape connectivity is understood as the degree to which landscape structure and composition facilitate the movement of organisms and genes. The distinction between structural and functional connectivity is important for this project: structural connectivity refers to physical landscape conditions such as topography, hydrology, vegetation cover, and human land-use patterns, while functional connectivity describes how well organisms actually move through these conditions. In the open mountain pasture mosaic, connectivity is therefore not a single corridor line, but a species- and context-dependent condition shaped by forest edges, shrub belts, grasslands, paths, and disturbance. This supports the project's dual-layered access strategy: human movement is guided along legible routes, while adjacent shrub buffers, forest edges, and low-disturbance belts provide concealed movement for bears and wild grazers. By reducing disturbance in sensitive sections and reorganizing access rather than simply adding new corridors, the strategy enhances functional connectivity within a heterogeneous cultural landscape.

Bear Recolonization and Coexistence

Spatial and temporal patterns of human-bear conflicts

Jerina et al. (2015), using Slovenia as an example, employed spatial models to show that pointed-out habitat fragmentation, distance from the forest edge, and the presence of orchards (as bait) significantly increased the probability of conflict. Pasture conflict peaked in summer and early autumn, while livestock primarily occupied open mountain pastures at elevations between 1500 and 2500 meters during summer and autumn. The authors explicitly stated that the vast majority of conflicts occurred outside the forest edge or forested areas, and that forest edge length and the distance between the non-forested area and the nearest forest edge were key variables predicting conflict occurrence; the longer the forest edge and the more fragmented the landscape, the higher the probability of conflict. Furthermore, research indicates that European brown bears in the Pyrenees generally exhibit nocturnal or twilight behavior to avoid peak human activity periods (typically 10:00–18:00), with activity peaks usually occurring in the early morning (06:00) and late at night (22:00) (Parres et al., 2020).

These studies have provided a theoretical basis for identifying the summer pasture and its boundaries as hotspots for human-bear conflict in this project, and for proposing a coexistence strategy that coordinates time and space.

Spatial Patterns of Brown Bear Predation

Gastineau et al. (2019) found that brown bear predation hotspots are highly likely to remain hotspots in the coming years unless there are significant changes in the environment or management practices. These hotspots are located in open mountain pastures with high prey density, near forest edges (providing cover), and in rugged or steep terrain (facilitating movement). Furthermore, in summer pastures, hotspots are often near buildings, which may reflect that herds congregate near human-made facilities at night, increasing their susceptibility to predation. Ac-

ording to Koreň et al. (2011)'s study on habitat suitability for Slovakian brown bears, although brown bears are forest-dwelling species, they utilize not only continuous forests but also open areas near forest edges. Researchers used remote sensing data to support the adoption of an empirical value of 500 meters as a buffer zone from the forest edge to the open area for brown bear foraging activities. Furthermore, Gastineau et al. (2019), in their study of brown bear predation hotspots in the French Pyrenees, used a 250x250 grid as a research scale to eliminate interference from administrative boundaries, identify heterogeneity within pastures, and accurately correlate microhabitat features (such as forest edges and slopes). These two studies provide a basis for analyzing the inference of the specific spatial location of potential human-bear conflict in summer pastures and a scale reference for designing experiments in this study.

Trail-based Monitoring Strategies for Elusive Carnivores

Greco et al. (2025), comparing trail-based and random camera-trap deployment in a central Italian National Park, found that site species richness was significantly greater on trails than off-trails, with elusive carnivores in particular more frequently detected along established trails. They further demonstrated that trail-based sampling permits the simultaneous collection of data on wildlife and on potential sources of disturbance — livestock and humans — at the same spatiotemporal resolution. The trunk-branch hierarchy translates these findings into landscape form: trunk paths commit to the fixed, repeatable transect logic that maximises detection of solitary species such as the brown bear, while branches accommodate the opportunistic exploration of indices indirects on either side.

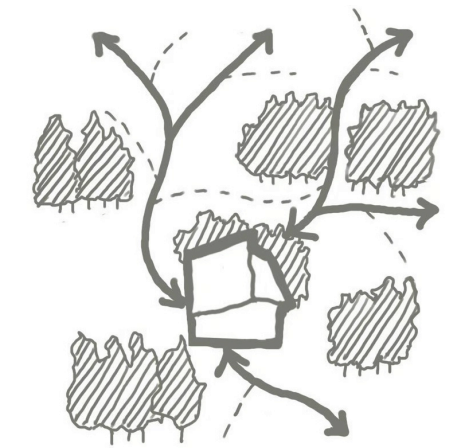


Fig2-3| Trunk-Branch Hierarchy, fixed primary paths radiating from the cabane, secondary branches extending opportunistically. Imaged by author.

Topophilia

Topophilia refers to the emotional bond between people and place, ranging from fleeting aesthetic pleasure to deep attachment rooted in livelihood and everyday practice (Tuan, 1974, pp. 1–4). Such attachment is typically cultivated through long-term physical involvement and material dependence, where accumulated familiarity provides a sense of security and orientation (Tuan, 1974, pp. 92–112). In this project, topophilia explains why certain actors remain bound to the Pyrenean pastoral landscape even when it becomes economically marginal. For pastoral communities, attachment is produced through working with the land: knowing routes and water points, managing animals, reading weather, returning seasonally to the same slopes. Rewilding may unsettle these relations through denser vegetation, wildlife presence, and new movement rules. The design question is how to offer new spatial conditions through which actors continue to feel oriented in a changing landscape. This reading is later translated into strategies such as anchored space, readable routes, and thresholds to wilderness.

Topophobia

Topophobia, or landscape fear, describes the anxiety produced when the environment is perceived as threatening, disorienting, or beyond control. In *Landscapes of Fear*, Tuan argues that humans respond to insecurity by establishing boundaries, shelters, and cultivated spaces to contain chaos and defend against wilderness (Tuan, 1979/2013, pp. 3–10, 45–55). Yet for modern educated groups, fear becomes paradoxical: it also arises from the possibility that plants, animals, and water systems may be lost through human violence, neglect, or misuse. The fragility of nature, not only its force, becomes a source of anxiety (Tuan, 1979/2013, p. 212). In this project, topophobia is used to interpret wildlife protectors in the rewilded Pyrenean landscape. Their fear is double: they operate in uncertain terrain where carnivores, dense vegetation, and remoteness produce bodily risk, while their professional responsibility makes them anxious about non-human life vulnerable to human disturbance. They are positioned between fear of uncontrolled wildness and of fragile wildness. Unlike shepherds, whose fear centres on livestock and predator risk, wildlife protectors experience fear through care. This double anxiety creates a need to transform unknown danger into manageable risk, informing the later design of monitoring nodes, prospect–refuge positions, and hier-

archical wayfinding.

Escapism

Yi-Fu Tuan understands escapism as a basic human tendency to refuse reality as it is and to seek alternative worlds. This impulse is driven by two forces: the “push” of an unbearable present, such as uncertainty, routine, or social pressure, and the “pull” of idealized images, such as harmony, freedom, or pristine wilderness (Tuan, 1998, pp. 17–34, 64–66). In this project, escapism is used to interpret tourists and seasonal visitors. They are pushed by the emptiness and weightlessness of urban life, and pulled toward the harshness and remoteness of wild mountain landscapes because these qualities seem more real. Yet this desire can resolve in two directions. It may collapse into consumption, where wildness becomes scenery, backdrop, and refined aesthetic image; or it may deepen into care, where the same reenchantment becomes attention to ecological process, acceptance of restriction, and respect for non-human presence. Landscape architecture cannot suppress escapist desire, but it can shape the conditions under which it lands. In the later design, this reading informs the visitor route as a path of awe. Through bodily movement, restricted access, and attention framing, the visitor experience is composed as a reading of wildness that stays real, respectful, and reflective rather than consumptive.

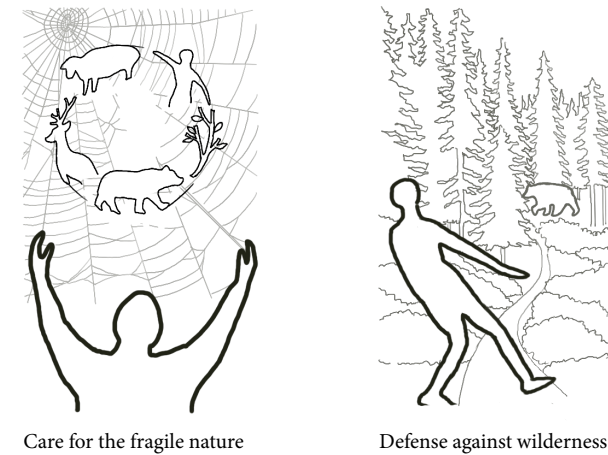


Fig 2-4| Topophilia and Topophobia: body, sheathing and wilderness. Imaged by author.

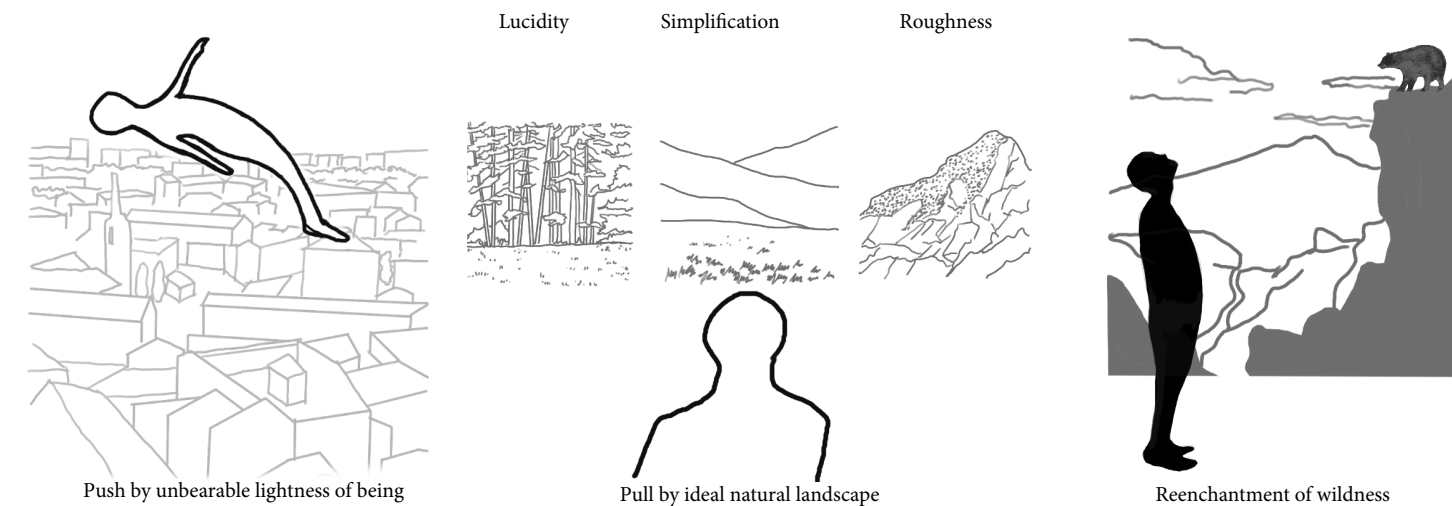


Fig 2-5| Modern people's topophobia: Double Anxieties toward nature. Imaged by author.

Fig 2-6| Escapist desire toward wildness. Imaged by author.

II.Literature Study| Landscape Perception

Landscape Perception

Cues for care

Nassauer(1995) discusses that people do not perceive ecological function directly; instead, they perceive landscapes through cultural expectations of a proper landscape. Thus, when ecological change is not visually legible, it risks being read as neglect rather than stewardship, triggering rejection and fear. Nassauer therefore reframes applied landscape ecology as a design problem: ecological patterns must be translated into a cultural language of form, using “orderly frames” for “messy ecosystems.”

For a rewilded cultural landscape, this suggests that legibility is an enabling condition for long-term maintenance and shared responsibility. In this project, light maintenance, seasonal closure, narrow paths, cairn markers, protected nodes, and readable thresholds help communicate that reduced intervention is intentional. They allow visitors, shepherds, and wildlife protectors to understand where access is available, where disturbance should be limited, and where ecological processes are being given space. In this sense, cues for care become an enabling condition for shared responsibility and long-term coexistence.

Sustaining beauty

Meyer (2008) argues that beauty is not a superficial addition to ecological design, but part of how sustainable landscapes become understood, accepted, cared for, and maintained over time. In this sense, sustaining beauty links ecological performance with cultural perception: a landscape can only sustain new human–environment relations when its processes are made perceptible and emotionally meaningful.

In this project, sustaining beauty is translated through three dimensions: form, approach, and target. In terms of form, the design uses hypernature and constructed experience. Natural elements are intensified, framed, or arranged so that subtle ecological signs become more visible. In terms of approach, the design follows the idea of natural process revelation and constructing experience. It does not simply imitate the appearance of nature, but reveals ecological processes through movement, pause, attention, and read. Bear foraging traces, dispersal routes, forest–pasture thresholds, and seasonal restrictions become perceptual events within the visitor’s route. In terms of target, the aim is to evoke attitudes: visitors are guided from an egocentric appreciation of wild scenery toward a more biocentric attitude of respect, restraint, and shared responsibility.

This framework directly informs the land-art interventions in Reading the Rewilding: A Path of Awe. The stone field, restricted edges, framed views, and sequence make the invisible or easily misunderstood processes of rewilding readable. In this way, wildness becomes not only something to be seen, but something to be approached carefully, interpreted, and respected.



Form

- Hypernature
- Constructed Experience



Approach

- Natural Process Revelation
- Constructing Experience



Target

- Evoke Attitudes
- Egocentric → Biocentric

Fig 2-7| Teardrop Park, New York City.
Imaged by Landezine (n.d.).
Fig 2-8| Duisburg nord park.
Imaged by author (2022).
Fig 2-9| Stadspark West.
Imaged by author (2025).

Land Art as A Reading Lens

Lailach (2007) frames Land Art as a shift from the gallery object toward landscape as medium, site, process, and perception. In this case, land art can work through spatial intervention, bodily movement, and in-situ experience to change how a place is read. At the same time, it should not be confused with ecological art: the use of land or natural materials does not automatically make a work environmentally restorative. This distinction is important for this project. The land-art intervention is used as a spatial frame for reading rewilding processes.

In this project, the spiral becomes the main spatial form through which rewilding is made perceptible. Its shifting density, restricted edges, stone arrangements, and central refuge translate a series of spatial contrasts: dense and open, forest and pasture, refuge and exposure, human presence and wider non-human activity. Stones act as markers within this sequence, guiding movement and fostering bodily interaction with the ground and landscape. Rather than presenting wildness as scenery, the intervention guides bodily movement and attention through these transitions, allowing visitors to approach bear traces, dispersal routes, and seasonal limits as perceptual and spatial experiences. In this way, land art helps transform wildness from something merely seen into something carefully approached, interpreted, and respected.

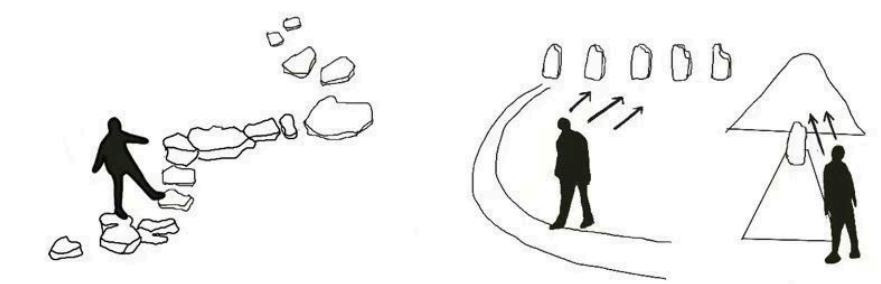
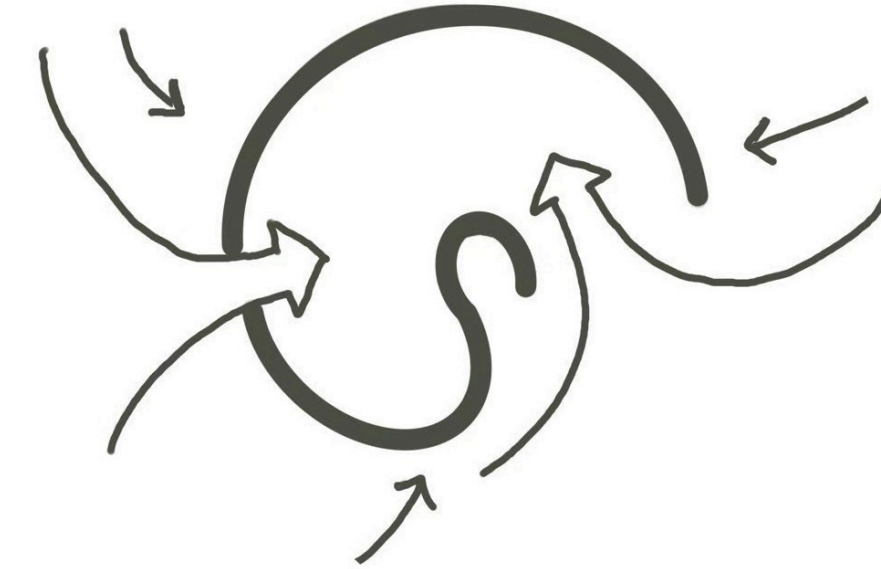


Fig 2-10| Spiral as a form to reveal and organize multiple dualities on site.
Imaged by author.

Fig 2-11 Stone markers as guides for bodily movement and attention.
Imaged by author.

Chapter III: What the Mountains Hold



This chapter reads the open mountain pasture as a palimpsest written across deep time by human and non-human hands. It traces three layers. First, the cultural legacies of construction and management that came to operate the mosaic. Second, the ecological processes through which that operation took spatial form. Third, the disruption that emerges as seasonal rhythms shrink and pastoral presence withdraws. What carries forward from this reading is not a historical state to recover, but a disturbance–succession balance to keep in motion, and a clear place for landscape architecture to act.



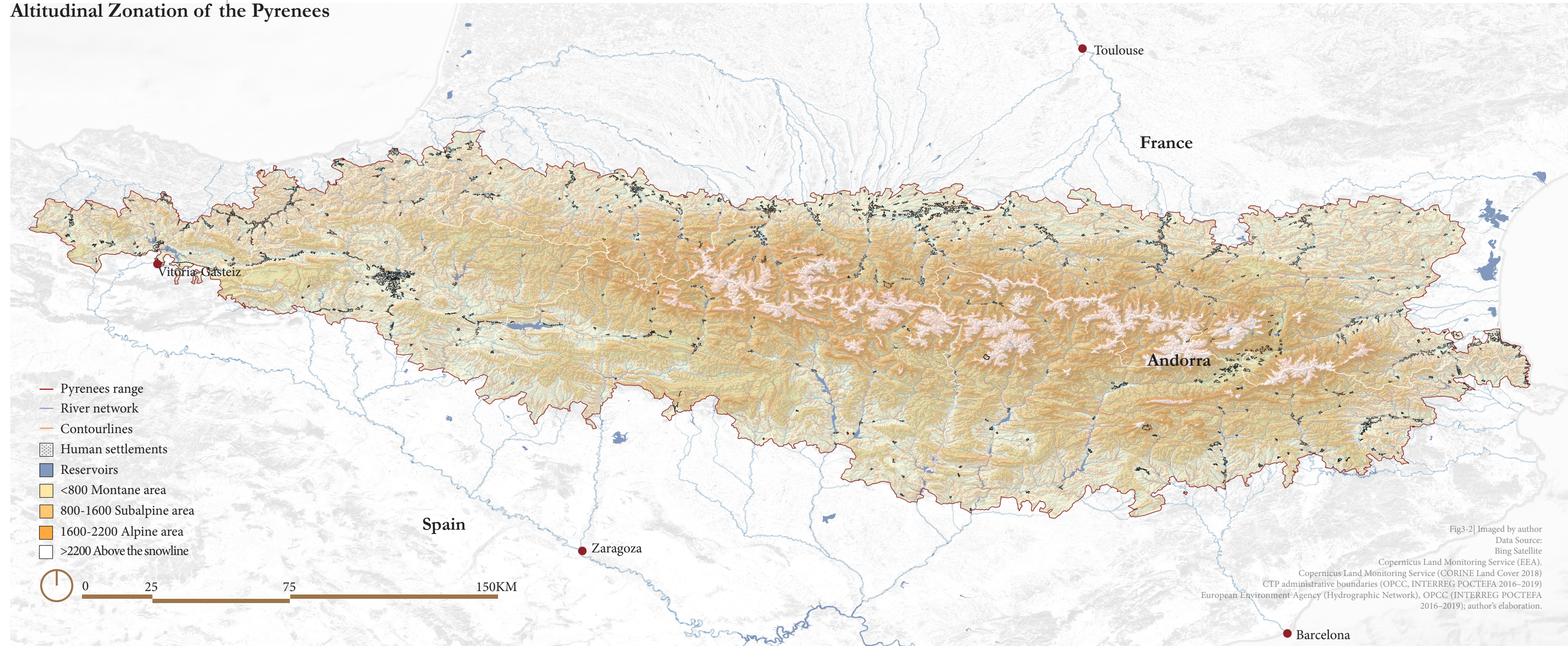
- 3.1 Site Introduction
- 3.2 Landscape Biography
- 3.3 Cultural Legacies in Time
- 3.4 Ecological Processes and Ruptures
- 3.5 Continuity and Disruption
- 3.6 What to Carry Forward

The waters whispered to the sky. Black deers, you have crossed the millennia-old space. From the darkness of the rock to the caresses of the air. The hunter who drives you, the spirit who sees you, How I love their passion, from my broad shore!

—René Char, LES CERFS NOIRS, 1952

Fig3-1|A cave painting of prehistoric herbivores in the Pyrenees
Grotte de Niaux, Ariège, France
Adapted from R.Kann(2025)

III. What the Mountains Hold | Site Introduction
Altitudinal Zonation of the Pyrenees



Today, In the Pyrenees, although the region has experienced the impacts of industrialization and tourism economies brought by modernization, the landscape palimpsest has remained relatively continuous. With no abrupt replacements of landscape patterns or spatial fabrics, this mountain represents a valuable case through which long-term landscape evolution can be read clearly. In this study, the mountain range is divided into 4 altitude zonations from montane, subalpine, alpine to areas above snowline.

III. What the Mountains Hold | Site Introduction
Altitude Zonation and Transhumance

Fig3-3 to5| Mosaic landscape of villages,terrace farmlands and pastures.
 Broto and Torle-ordesa,Spain.
 Imaged by author(2025).



<800 Montane area



800-1600 Subalpine area



Fig3-6 to 9| Small farm,flocks and vegetations
 on the subalpine mountainside.
 Gavarnie town,France.
 Imaged by author(2025).
 Central column

Fig3-10| A 'refuge' for shepherds and hikers.
 Fig3-11|A summer pasture and hikers.
 Fig3-12|A snowmelt creek in summer pasture.
 France, Gavarnie town.
 Imaged by author.
 Right column

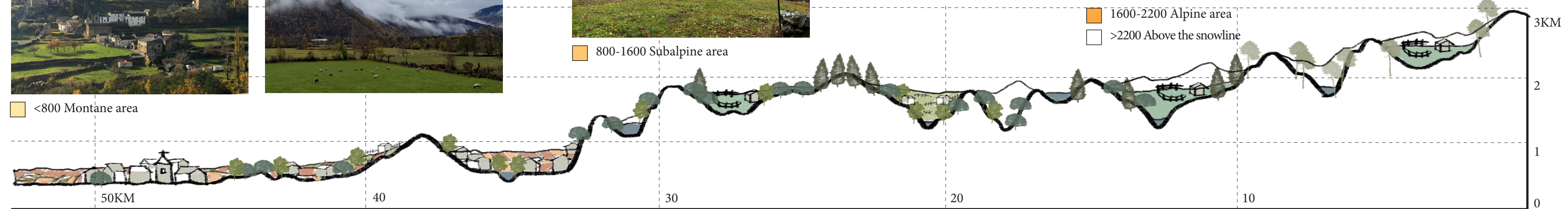


Fig3-13| Typical altitude zonation section.
 Imaged by author.

III. What the Mountains Hold | Site Introduction
The Open Mountain Pasture System



Fig3-14| Pastoral path.
 Basque area, Spain.
 Source: RURALIXA! project website (n.d.).



Fig3-15| Drystone hut (Orri).
 Ariège department, France.
 Source: Wiki.



Fig3-16| Drystone border wall.
 Gavarnie town, France.
 Source: Imaged by author.



Fig3-17| Fontaines (Abreuvoirs).
 Occitanie, France.
 Source: © Institut occitan de l'Aveyron.



Fig3-18| Mountain sheepfold.
 Hautes Pyrénées, France.
 Source: Imaged by author (2025).



Fig1-19| Traditional cayolar hut.
 Basque Country, France.
 © Shutterstock.



Fig3-21| Transhumant pastoralism in summer pasture.
 Ariège Pyrenees, France.
 Source: Ariège Pyrenees Tourism Board.

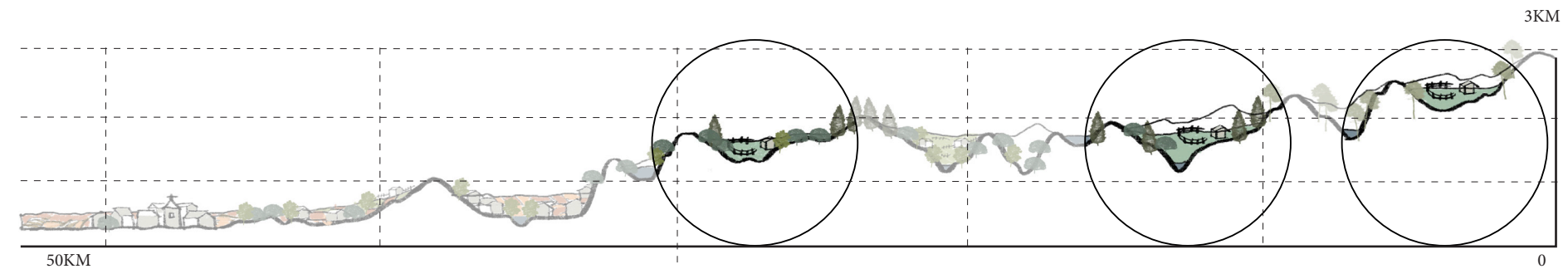
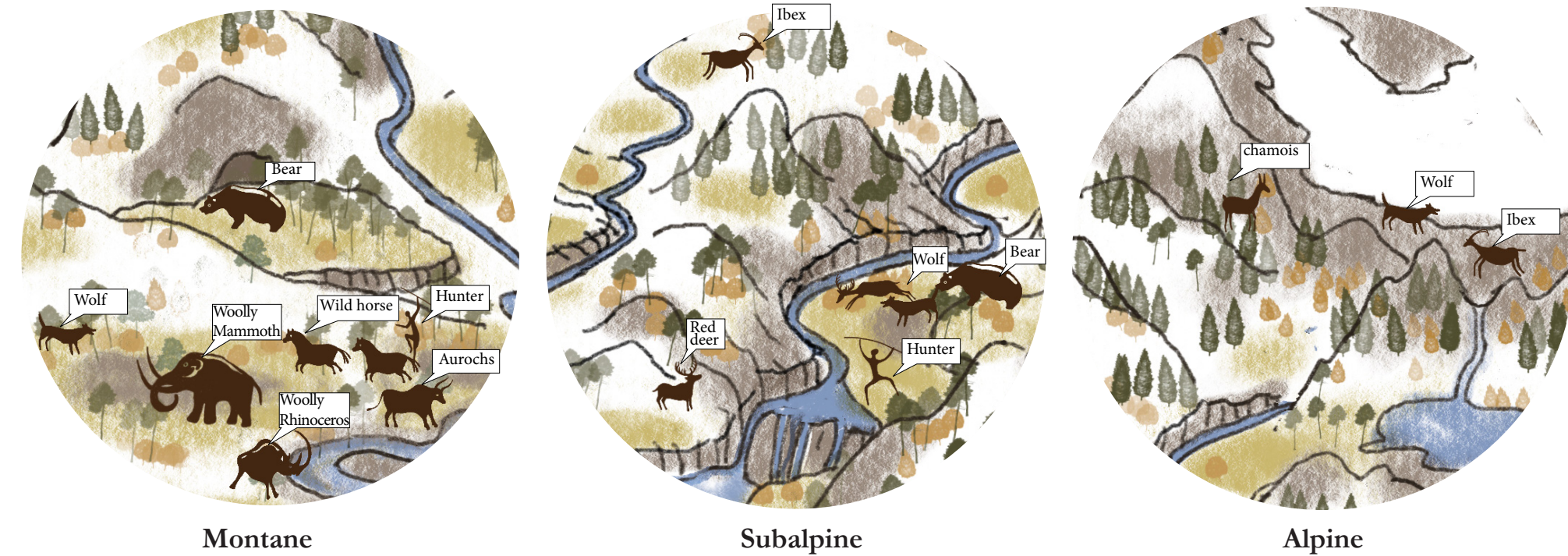


Fig3-20| Typical altitude of summer pasture.
 Imaged by author.

III. What the Mountains Hold | Landscape biography
Deep Mapping the Socio-ecosystem

Actors



From the Late Pleistocene to the Early Holocene, glacial retreat exposed U-shaped valleys, moraines, wetlands, rocky slopes, lakes, and newly formed grasslands. As the climate warmed, forests began to expand upwards, but the Pyrenees did not immediately become a single, enclosed forest. Large herbivores occupied different altitudinal zones: cold-adapted large grazers such as aurochs, woolly rhinoceroses, and mammoths utilized open mountain valleys and alluvial plains in grassland-shrubland zones; red deers and roe deers roamed the subalpine forest-grassland transition zone; and ibex and chamois inhabited the rocky high mountains and subalpine slopes. These large herbivores maintained clearings within the expanding forest through grazing, trampling, seed dispersal, nutrient deposition, and seasonal migration. Predators such as bears and wolves also shaped this pattern by influencing herbivore activity and habitat use. Humans had not yet settled down and lived as hunters and gatherers. This early condition suggests that the open mountain landscape was not only a product of human culture but also an ecological mosaic maintained by animal activity and nutritional relationships.

From the Late Pleistocene to the Early Holocene

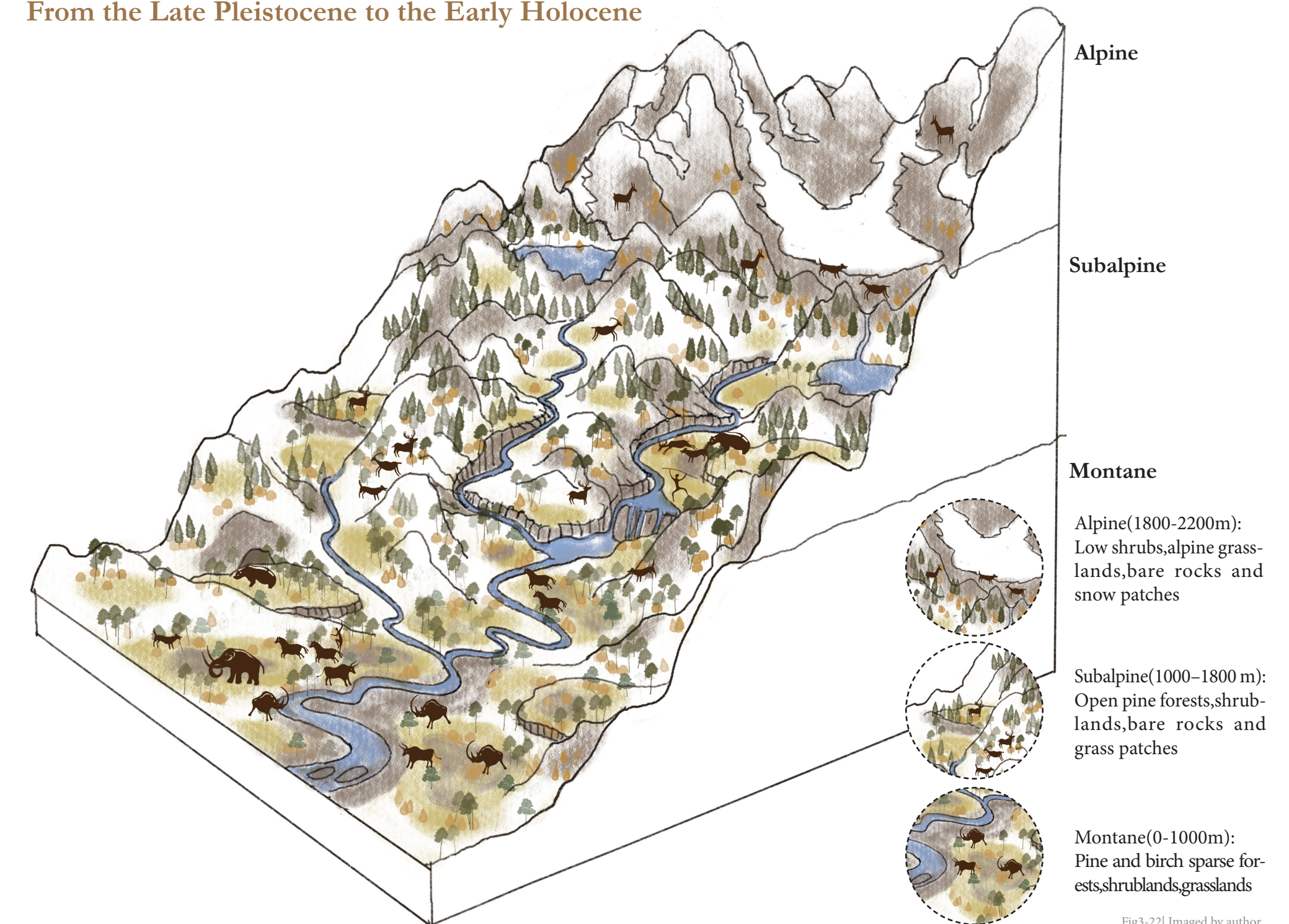
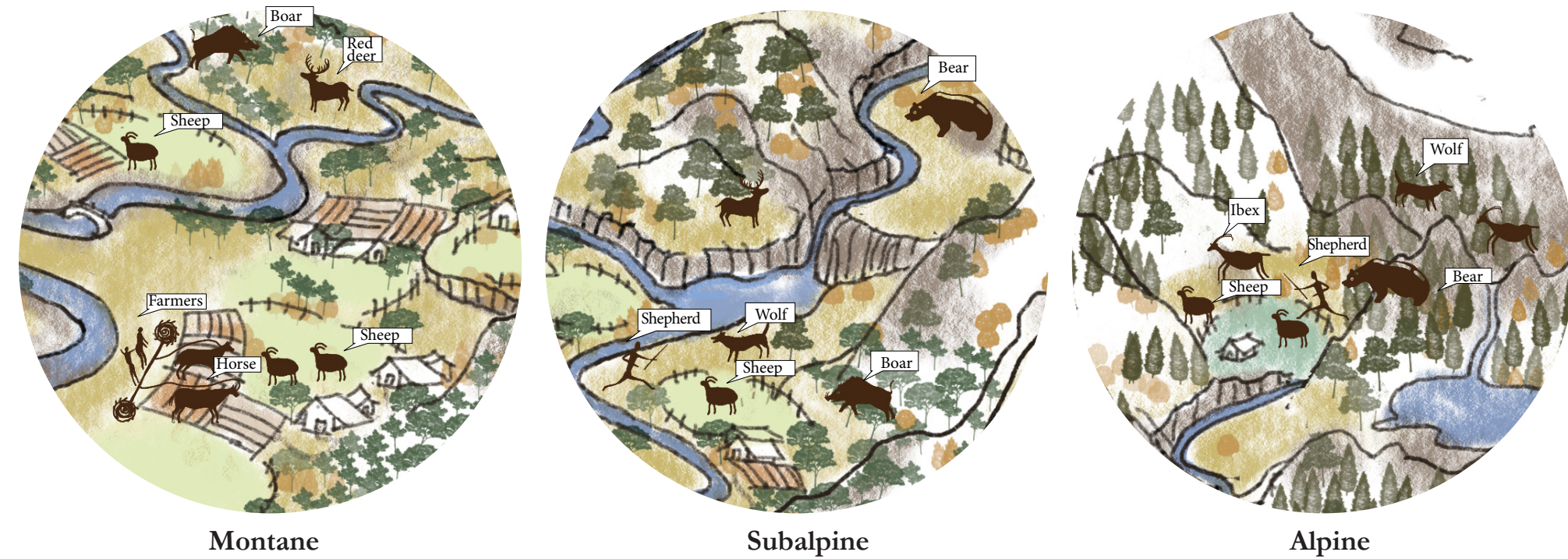


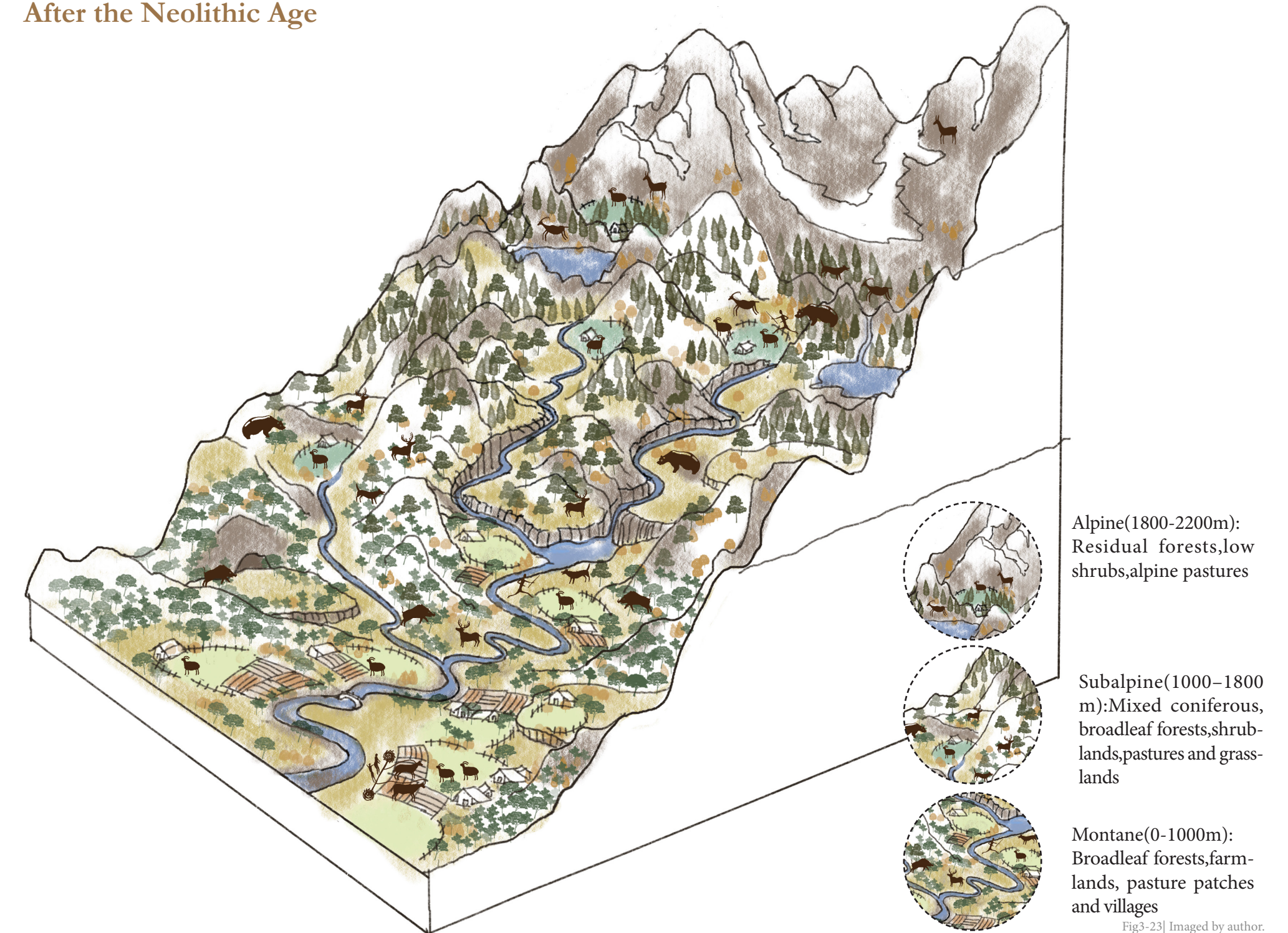
Fig3-22 | Imaged by author.

Actors



Following the Neolithic period, human-managed pastoral systems gradually replaced wild large animals as the primary maintainers of the open landscape of the Pyrenees. With the expansion of agriculture and settlements in the valleys, livestock such as sheep, goats, cattle, and horses were introduced into the mountains, subalpine, and alpine regions through seasonal migrations, becoming representative of the ecosystem: their grazing, trampling, and repeated passage maintained open meadows of grassland, forest edges, and scrubland. Meanwhile, wild animals such as deer, ibex, chamois, wild boar, bears, and wolves still inhabited forests, rocky slopes, and remote refuges, and overlapping areas began to form between human and pastoral activities and wildlife migration. This period marks the beginning of the cultural-ecological mountain landscape, where open meadows were no longer primarily maintained by wildlife disturbance, but rather by the combined effects of livestock, shepherds, farmers, roads, and seasonal pastoral rhythms.

After the Neolithic Age



Alpine(1800-2200m):
Residual forests, low shrubs, alpine pastures

Subalpine(1000-1800 m): Mixed coniferous, broadleaf forests, shrublands, pastures and grasslands

Montane(0-1000m): Broadleaf forests, farmlands, pasture patches and villages

Fig3-23 | Imaged by author.

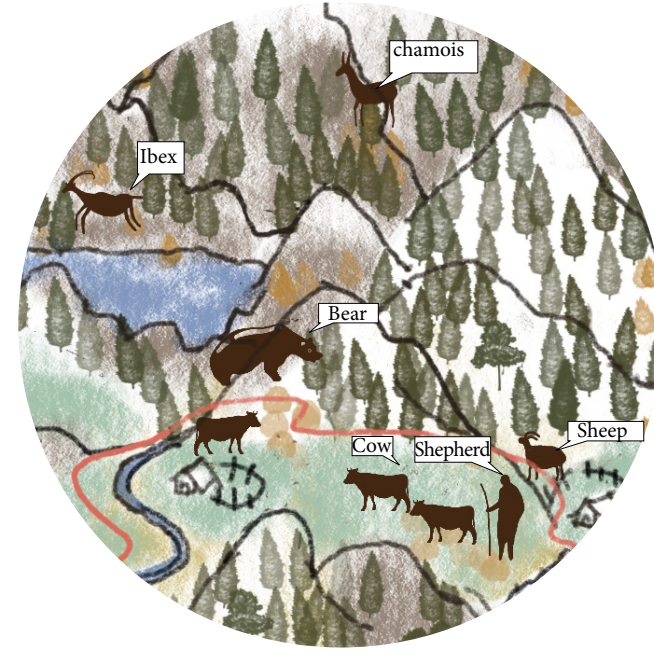
Actors



Montane



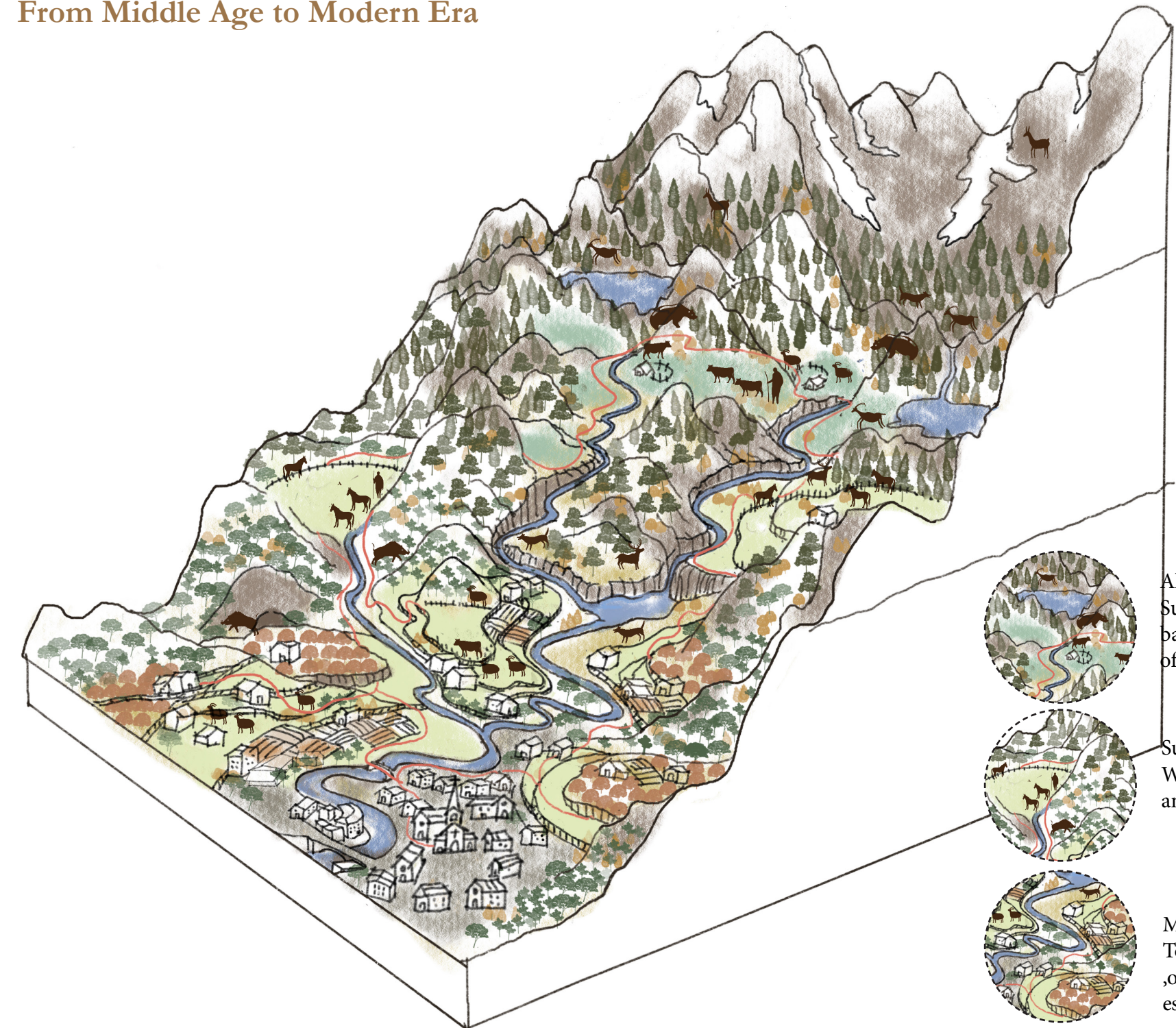
Subalpine



Alpine

From the Middle Ages to the modern era, the landscape pattern of the Pyrenees was increasingly influenced by human settlements and seasonal grazing practices. Villages, terraces, orchards, mown slopes, pastoral paths, and summer pastures constituted a vertical Agro-silvo-pastoral system extending from mountain valleys to high-altitude pastures. Pastoralism replaced wild herbivores as the proxy and the primary source of disturbance to maintain open habitats, and was now organized by shepherds, seasonal routes, and collective management. Through grazing, mowing, burning, and path maintenance, pastoral activities maintained open slopes, forest edges, and pastures. Simultaneously, wild animals such as wild boar, deer, ibex, chamois, bears, and wolves retreated into forests, rocky slopes, and secluded hiding places, but their ranges still overlapped with pastoral activities. This period solidified the open pasture-forest landscape pattern, making it a socio-ecological system and a cultural landscape.

From Middle Age to Modern Era



Alpine(1800-2200 m):
Summer alpine pastures,
bare rocks, and remnants
of mountain pine forests.

Subalpine(1000-1800 m):
Woodland,mowing slope
and small pastures

Montane(0-1000m):
Towns,villages,farmlands
,orchards, and residual for-
ests

Fig3-24| Imaged by author.

Construction Legacies

1200BC

12-14th Century
Community Agreements and Paths

16-18th Century
Expansion of High-altitude Transhumance Construction Legacies

19th Century
National borders and engineering

1950s-1990s
Decline and Abandonment

2026

2000s-present:
Heritage and Coexistence Governance



Summer Pasture in the Ossoue Valley
The cattle herds crossed the border to graze, as a symbol of Franco-Spanish pastoral cooperation.

Pastoral Path

Livestock Pen

Orri/Cabane

Water point

Pont Moutonnier

Infrastructure built for transhumance and passage, such as bridges and main pastoral trails.

Melting Creek

Refuge

Production and settlement facilities were gradually abandoned or transformed into open refuges used seasonally with few people, or by hikers and tourists.

Electrified night protection pens to prevent bears and wolves.

Protection Facilities

The government is using helicopters to transport ranchers to shelters during the summer in response to bear attacks.

La Pierre-Saint-Martin

This ceremonial site witnessed the formation of transvalley agreements and the commons system, defining the shared use and grazing periods, right-of-way, resources, and boundaries of alpine pastures.

International Boundary Marker

The national border marker system was systematized, while acknowledging some local passage and pasture-sharing arrangements.

PJEPPE
262
STM/RTJN
1858

Encroached Summer Pasture

As shrubland and forest lands rapidly succession, the traditionally clearly defined boundaries of cultural landscapes begin to blur.

Ceremony

The prayer service for the safety of the herds going up the mountain is held in the church since the 17 century, and it becomes more combined with heritage tourism. Similarly, transhumance celebrations turn some sections of pastoral route into a public event space.

51

Management Legacies

1200BC

12-14th Century

16-18th Century

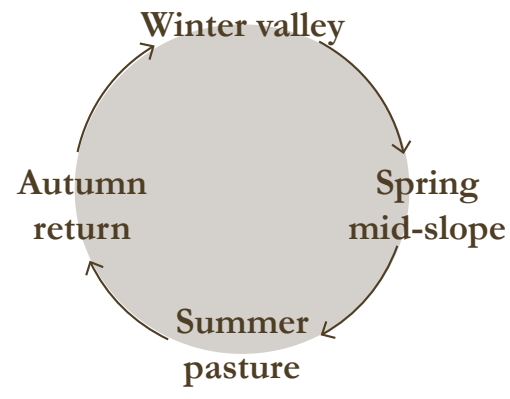
19th Century

1950s-1990s

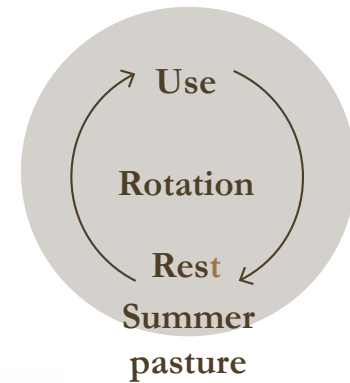
2000s-present

2026

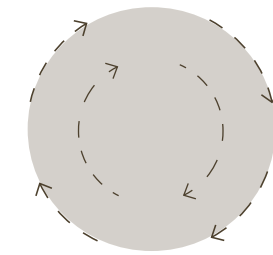
TRANSHUMANCE RHYTHMS



ANNUAL CYCLE

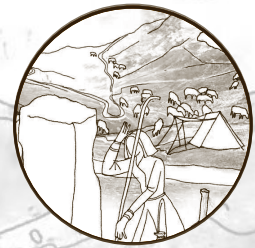


INNER ROTATION

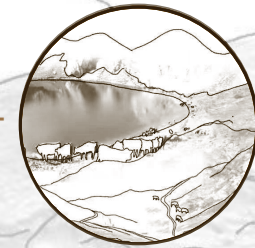


SHRUNK AND INTERRUPTED

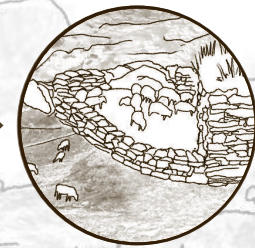
THE BIENS COMMUNAUX SYSTEM



Define shared pasture rights



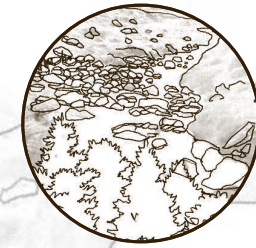
Boundaries by natural features



Codified grazing regulations and calendar



National standardized boundaries

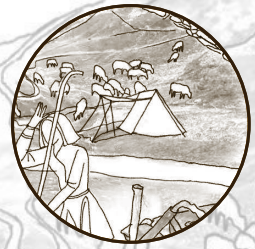


Commons underused and ecological targeted rotation

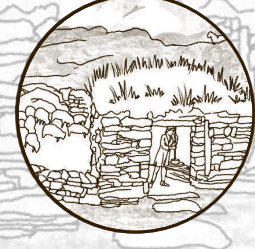


Conflicts with new land management policies

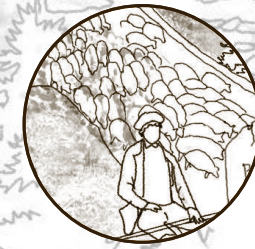
CARE GIVING AND RISK RESPONSE



Intimate presence



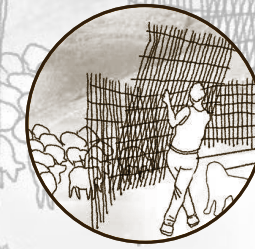
Established care infrastructure



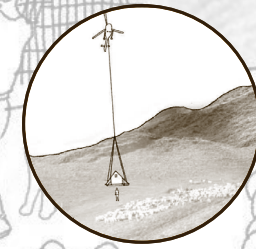
Developed knowledge and stable hired shepherds



Part-time and absent shepherding



Electric night pens



Ranchers transported by helicopters



GPS tracking

III. What the Mountains Hold | Ecological Processes and Ruptures
Ecological Processes

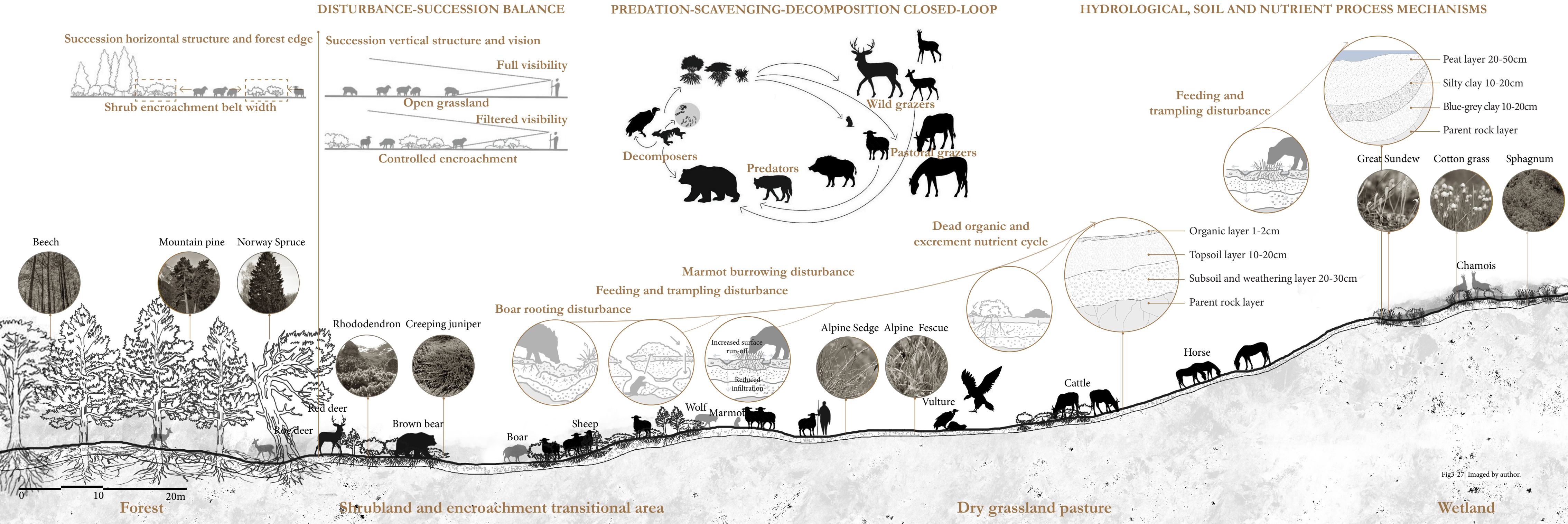
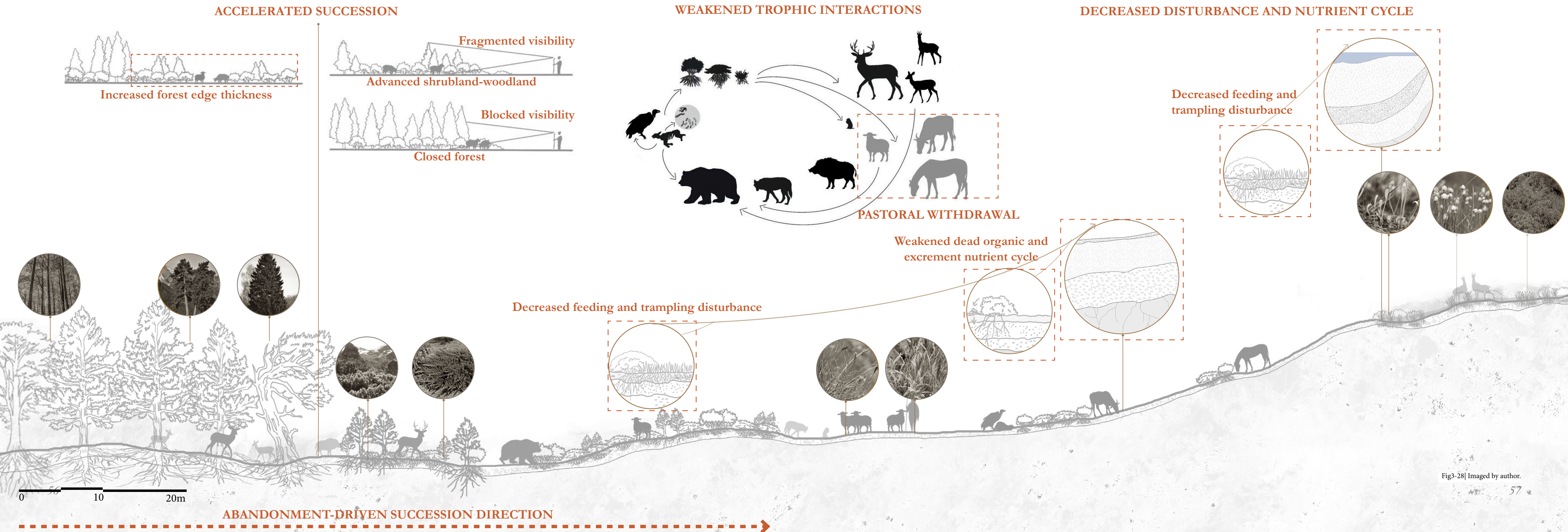
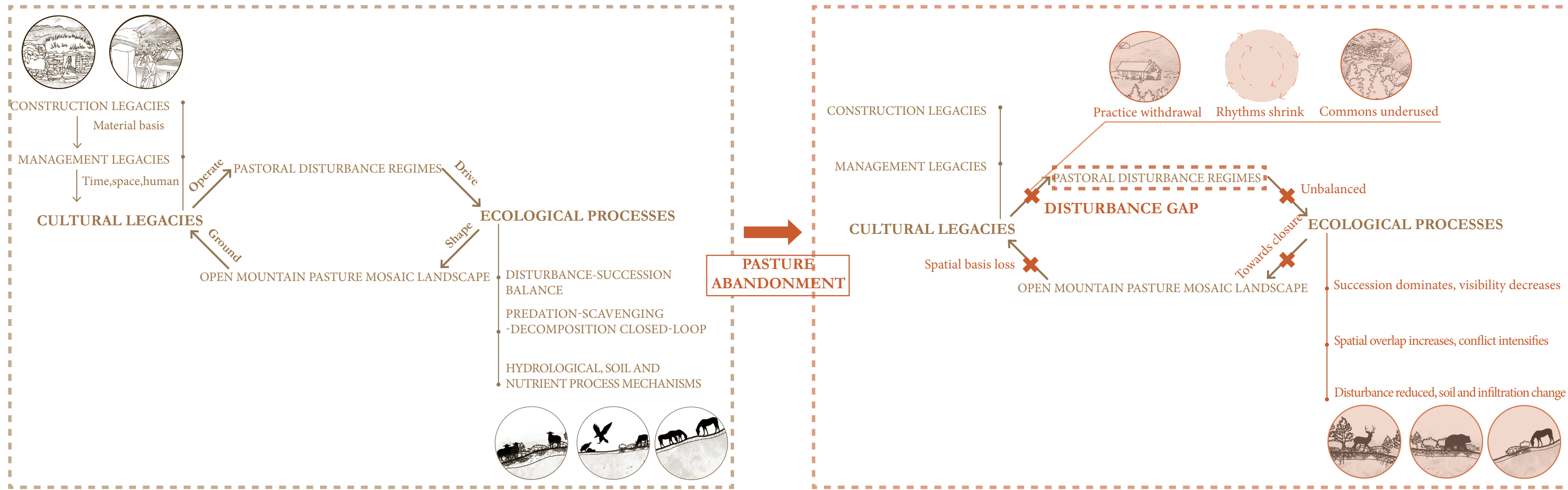


Fig3-27 | Imaged by author.

III. What the Mountains Hold | Ecological Processes and Ruptures
Ecological Process Ruptures Due To Abandonment





Continuity

The open mountain pasture mosaic is sustained by the interaction between cultural legacies and ecological processes. Construction legacies provide the material ground, while management legacies organize time, space, and human presence. Through pastoral disturbance regimes, these cultural practices shape vegetation dynamics, maintaining a balance among open grassland, shrubland, forest edge, hydrological processes, and trophic relations within an inhabited mountain landscape.

Disruption

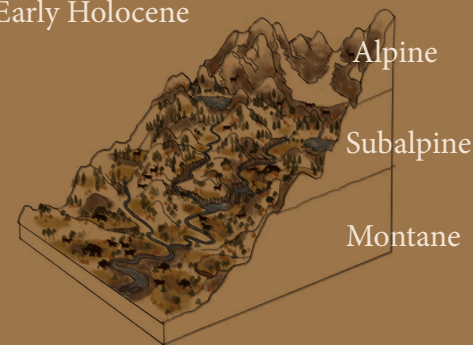
Pasture abandonment disrupts this cultural-ecological circuit. As seasonal rhythms shrink, commons are underused, and human presence withdraws, pastoral disturbance no longer operates effectively. A disturbance gap emerges: succession begins to dominate, visibility declines, habitat overlaps intensify conflict, and soil and water processes shift. Cultural identity loses spatial support while ecological processes move toward closure rather than a negotiated open mosaic.

III. What the Mountains Hold | What to Carry Forward

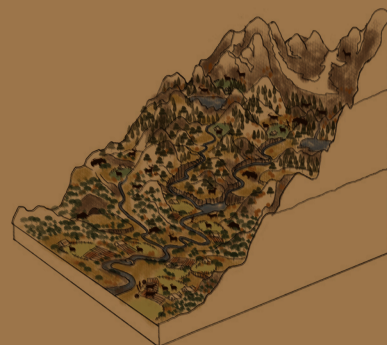
Rewilding Baseline and Processes

HISTORICAL SOCIO-ECOSYSTEM

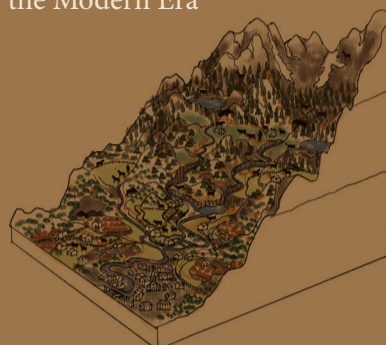
From the Late Pleistocene to the Early Holocene



After the Neolithic Age



From the Middle Ages to the Modern Era



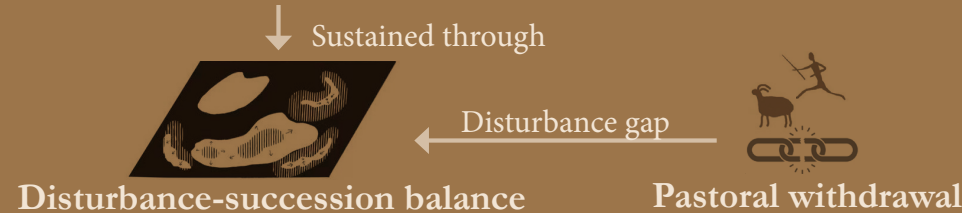
MAIN ACTORS



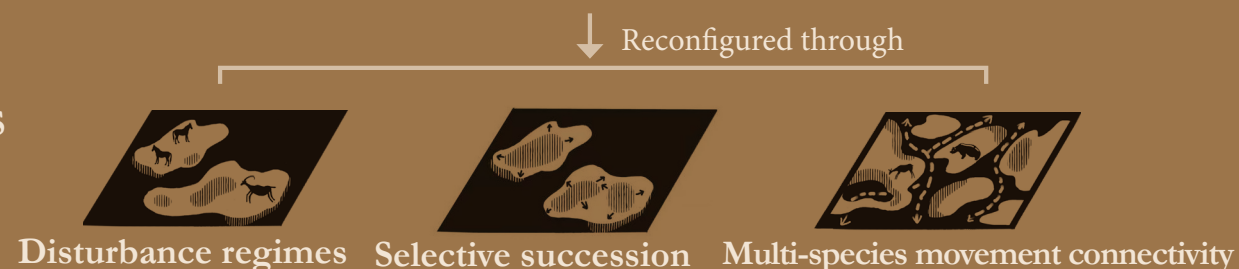
SPATIAL OUTCOMES



REWILDING BASELINE



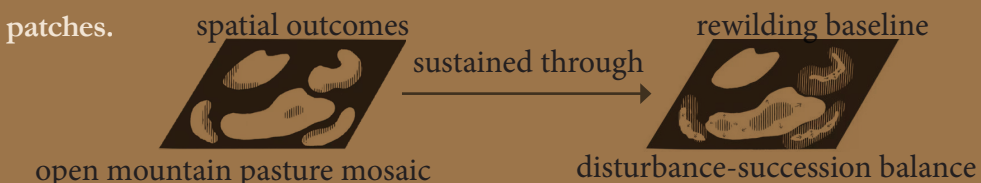
REWILDING PROCESSES



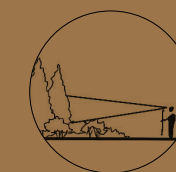
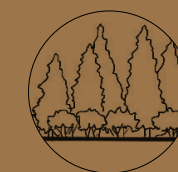
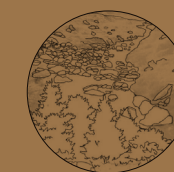
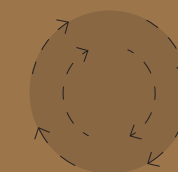
What to Carry Forward

I. Baseline: what should be restored?

Not a fixed historical landscape, but the disturbance–succession balance that sustained the open mountain pasture mosaic. This implies that restoration should maintain a shifting mosaic condition rather than preserve fixed pasture patches.



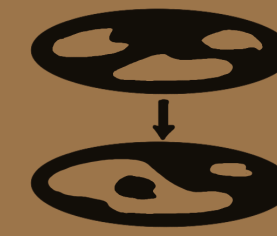
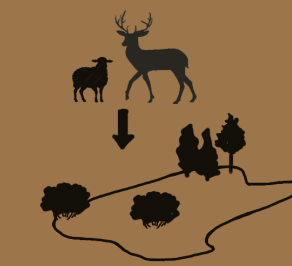
II. Disturbance gap: what are impacts of disrupted pastoral disturbance regime?



Pasture abandonment weakens the link between cultural legacies and ecological processes. Construction remains, but use declines; ecological processes continue, but tend toward closure, reduced visibility, and intensified conflict.

III. Design levers: where to intervene?

1. Disturbance — reintroduce or guide grazing and trampling by livestock and wild grazers where openness are needed.
2. Mosaic dynamics — rotate disturbance patches over time, not to preserve fixed open patches, but to maintain a shifting balance.
3. Succession — allow forest and shrub development where withdrawal supports refuge or connectivity.
4. Interfaces — design forest–pasture edges as zones of coexistence rather than unmanaged conflict.
5. Access and movement — organize human, livestock, and wildlife routes as spatial tools for distributing disturbance, reducing conflict, and maintaining connectivity.
6. Anchors — reuse paths, refuges, water points, boundaries, and commons as spatial supports for renewed management.



Chapter IV: Restoring the Open Mountain Pasture System

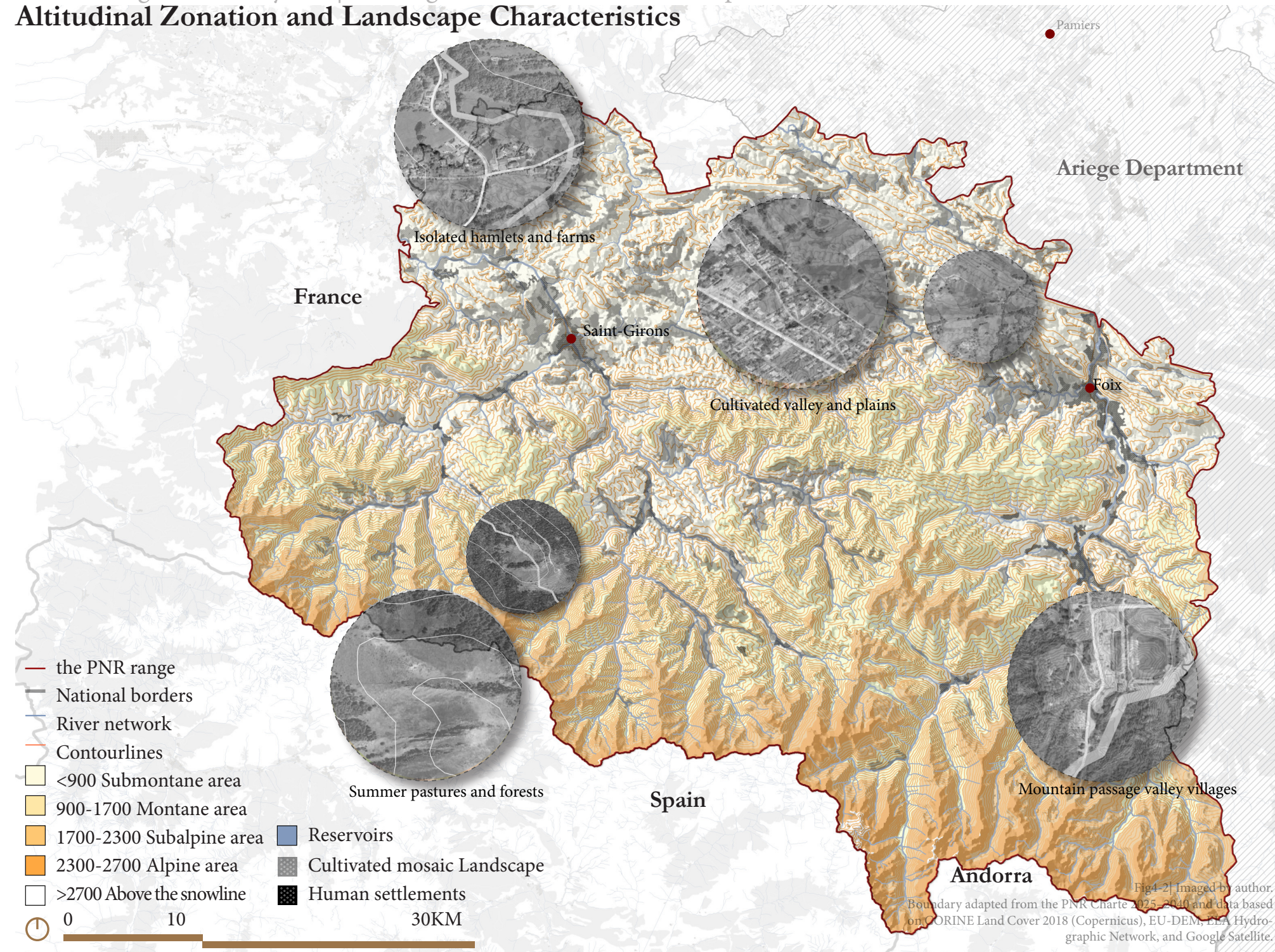


The previous chapter concluded with the rewilding baseline; this chapter elaborates on it. First, it interprets the regional structure of seasonal grazing within the study area, then focuses on summer pastures, exploring three aspects: the patchy mosaic structure of transitional pastures, management intensity, and tolerance of grazing intervention. Based on this, a dynamic zoning is constructed, distinguishing between three modes: utilization, negotiation, and rewilding. These modes collectively restore open alpine pastures into a process-oriented mosaic structure.

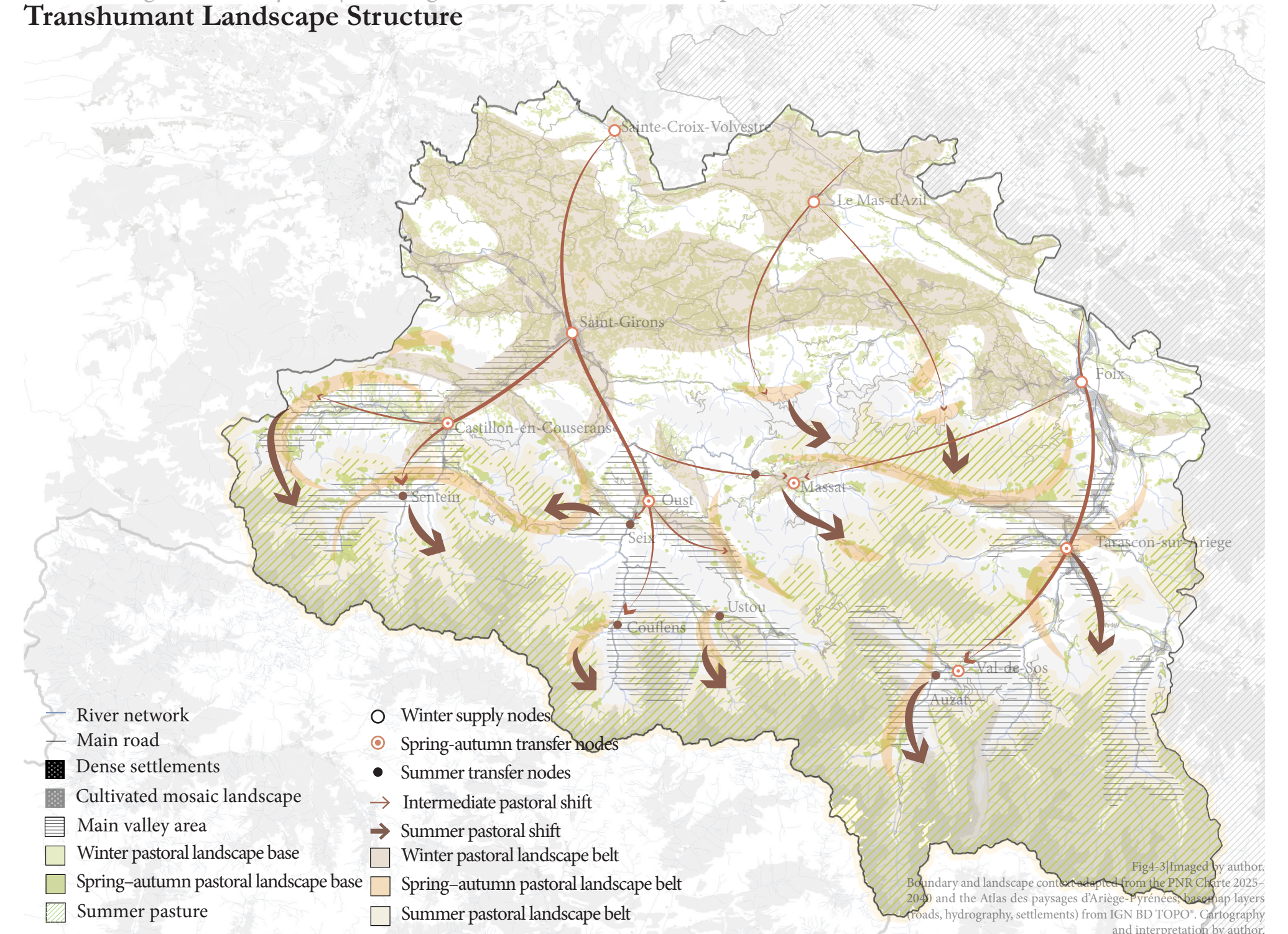
- 4.1 Reading the Transhumant Landscape
- 4.2 Mapping the OMP system in Transition
- 4.3 Composing the Dynamic Zoning

Fig4-1|Transhumant path.
Ariege department, France.
Adapted from Charles Ripon , via Parc naturel régional des Pyrénées Ariégeoises (n.d.).

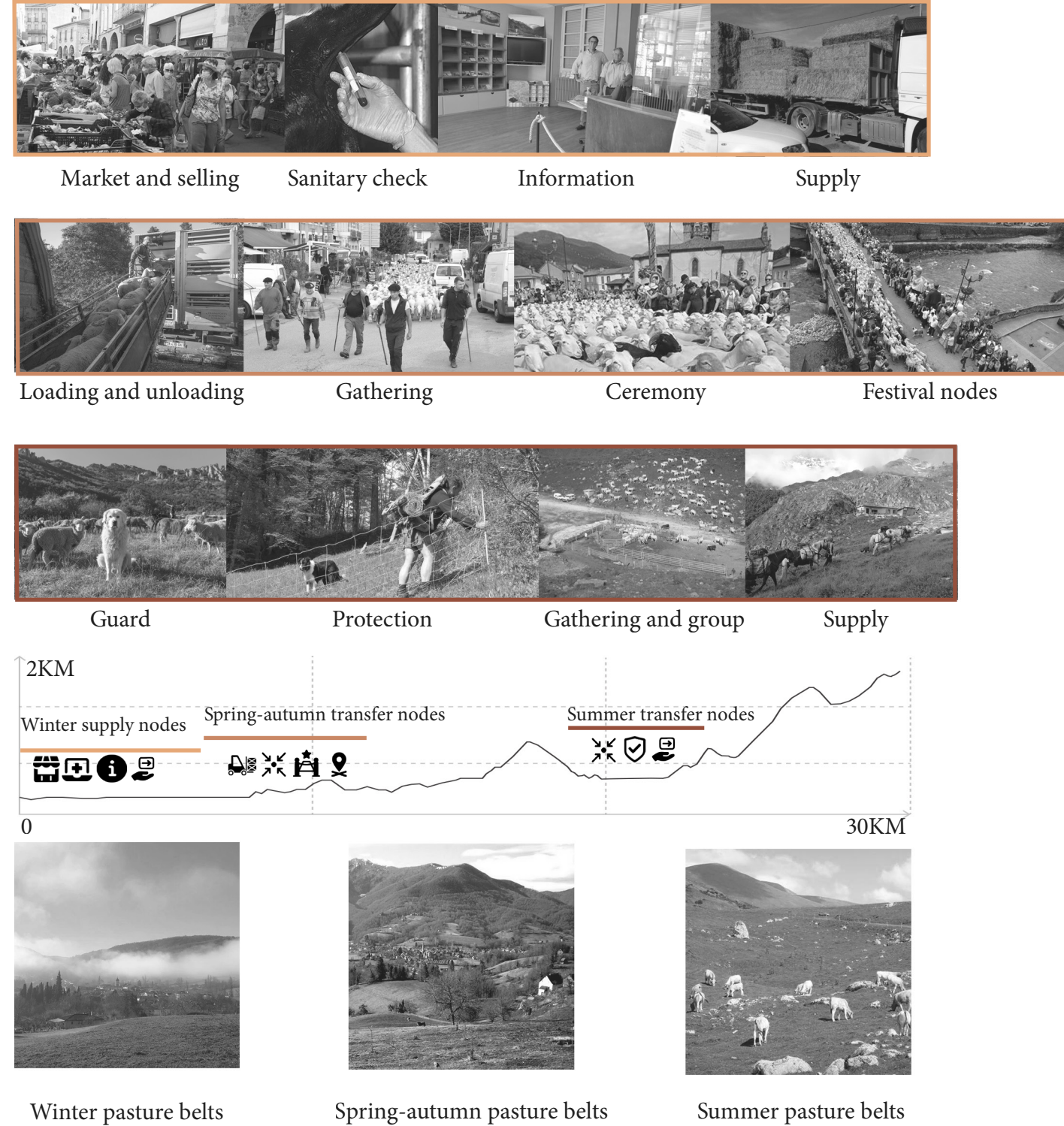
IV. Restoring the OMP system | Reading the Transhumant Landscape
Altitudinal Zonation and Landscape Characteristics



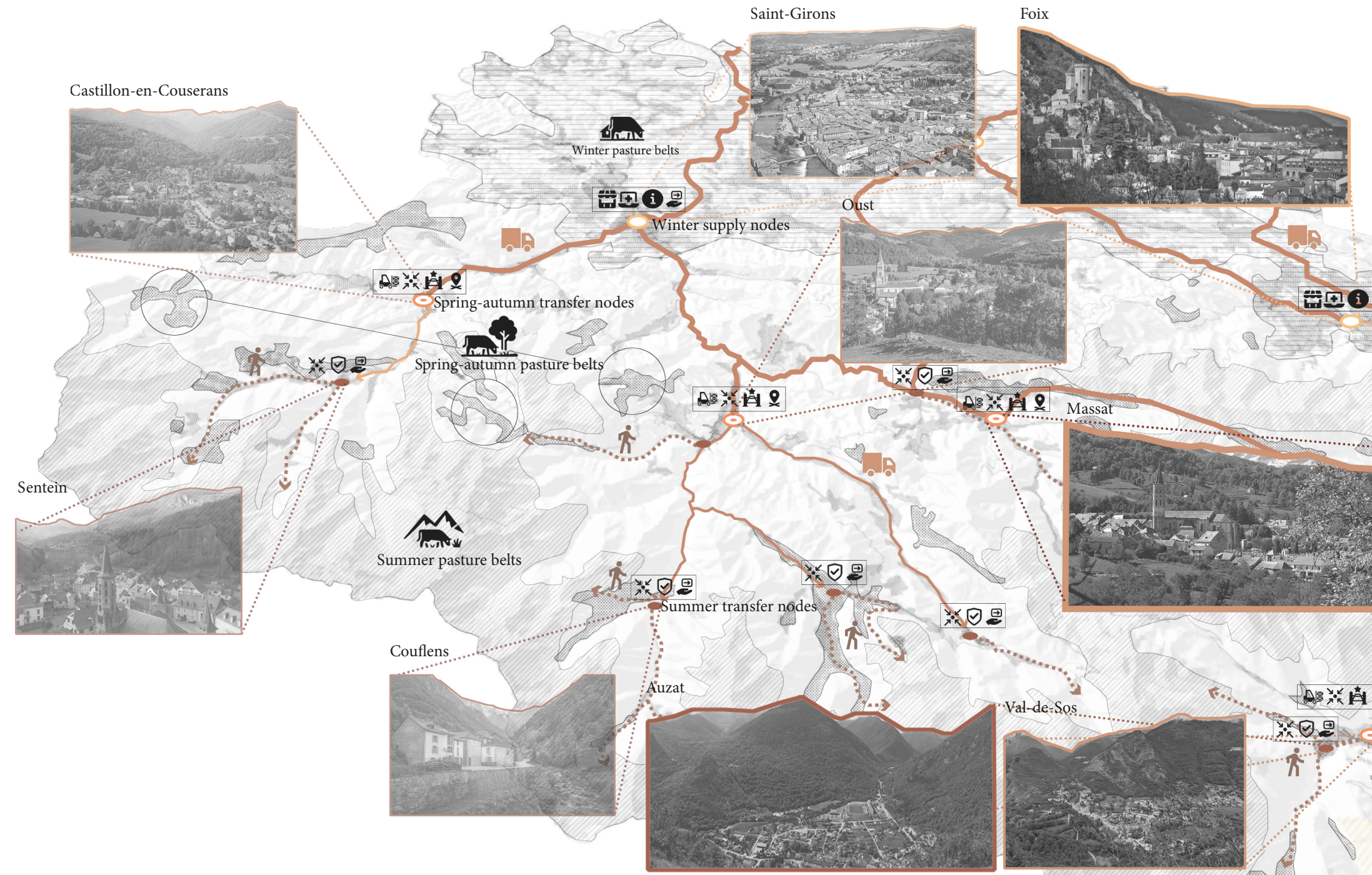
IV. Restoring the OMP system | Reading the Transhumant Landscape
Transhumant Landscape Structure



IV. Restoring the OMP system | Reading the Transhumant Landscape



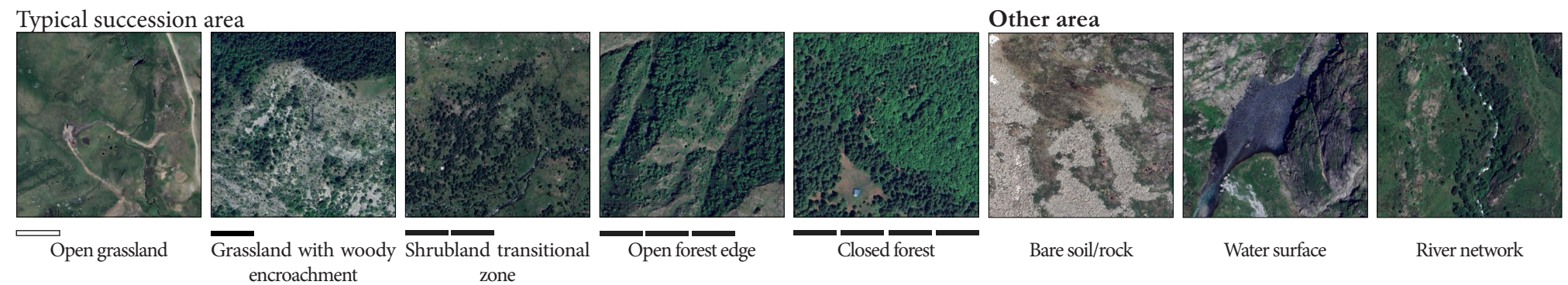
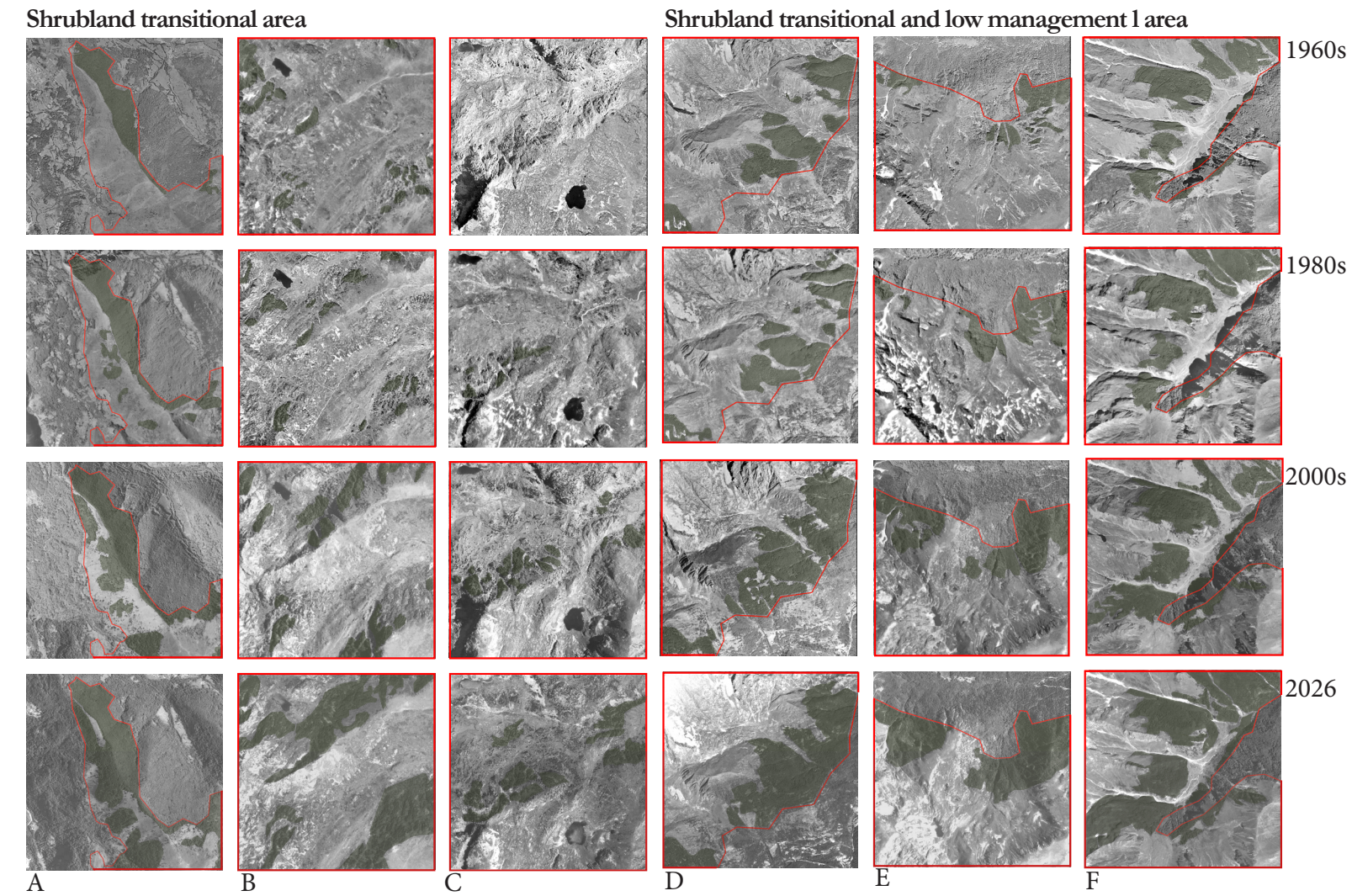
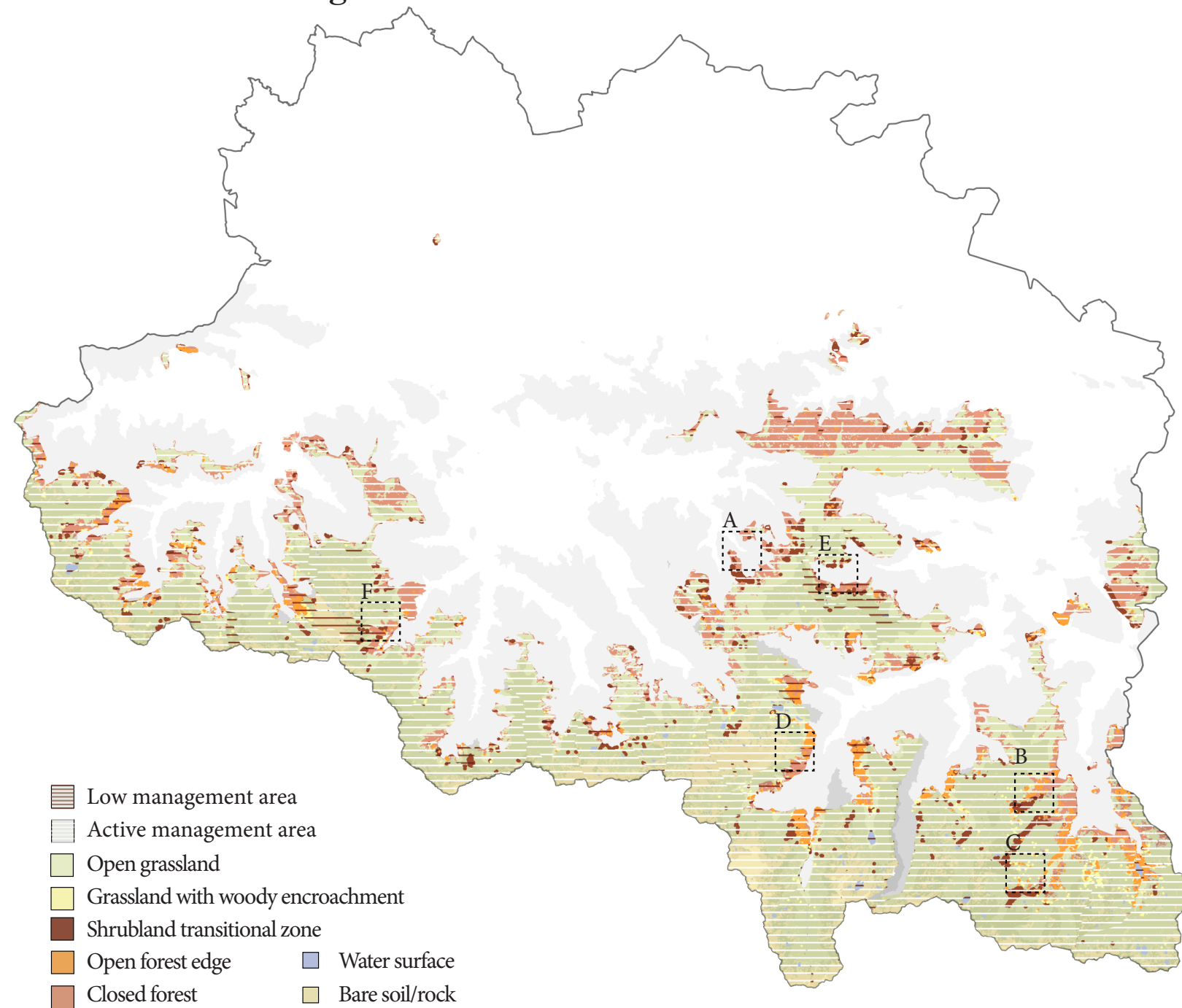
Transhumant Nodes and Activities



Transhumance in the PNR operates through a three-tier settlement network that matches both altitude and seasonal pasture use. Winter supply nodes (e.g., Foix, Saint-Girons, Tarascon-sur-Ariège) sit in the low valleys and foothills, where herds overwinter near farms and settlements. These towns provide the backstage functions of pastoralism: markets and procurement, administrative and veterinary procedures linked to herd movements, and logistical coordination for the coming season including supplies. Spring-autumn transfer nodes (e.g., Oust, Massat, Castillon-en-Couserans) are located in the upper valleys and act as connections between the lowland base and the mountain belts. Here herds are assembled, temporarily held, and reorganised, while also along with some traditional ceremonies and festivals relating to customs; with post-1950s road infrastructure, longer-distance segments are often handled by truck, while the final approach remains on foot along pastoral paths. Summer transfer nodes (e.g., Val-de-Sos and other upper-valley gateways) mark entry into the estives above the forest belt, where herds stay for roughly three to four months. After passing these high-altitude nodes, animals are distributed across grazing sectors by day, gathered and protected at night, and periodically shifted to allow forage recovery.

Fig4-4| Transhumant nodes and activities across the PNR des Pyrénées Ariégeoises. Base map and diagrams by the author. Photographs compiled from various online sources; full image credits are provided in Appendix A.

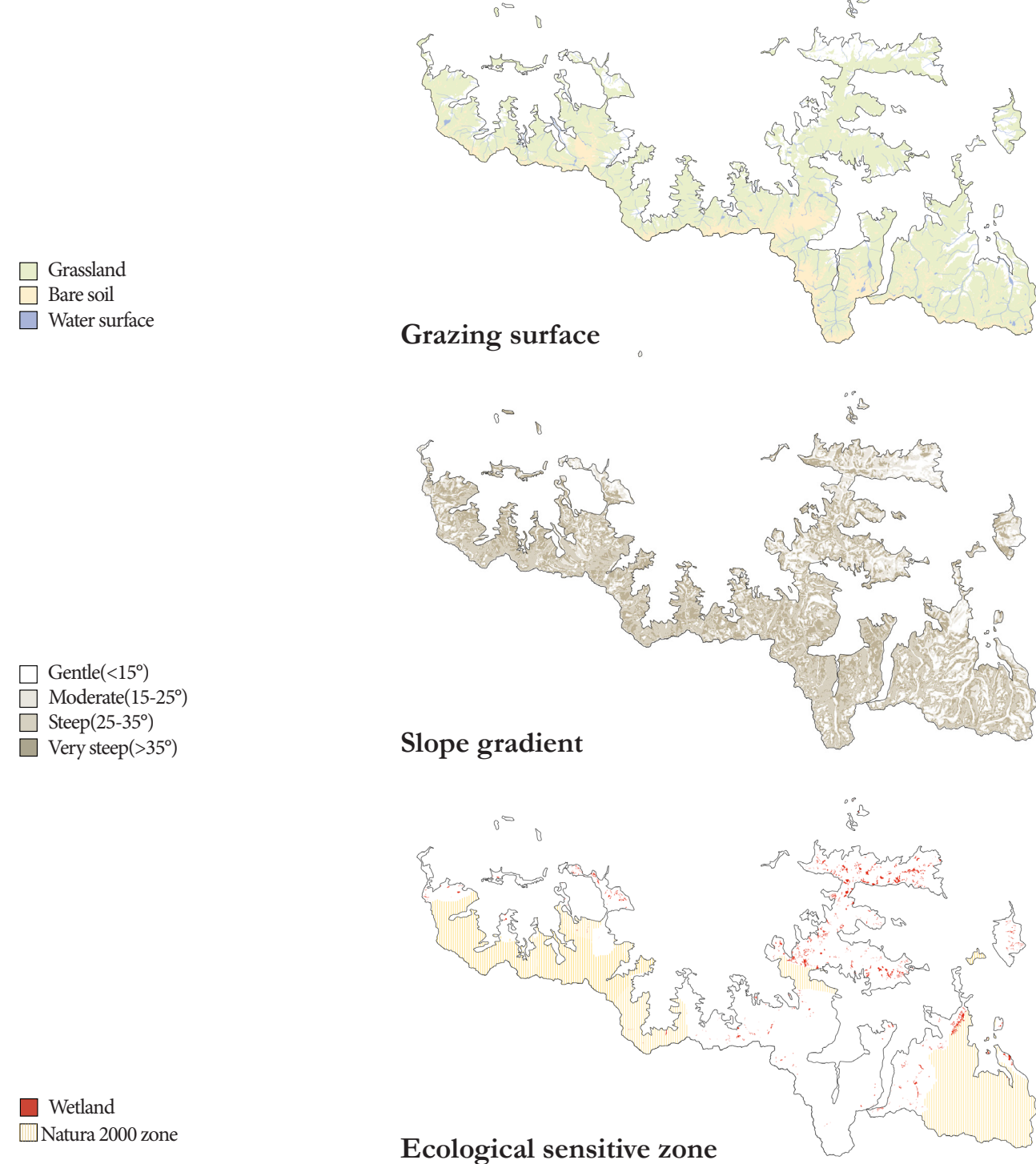
IV. Restoring the OMP system | Mapping the OMP System in Transition
Succession and Management Gradients



The vegetation types were derived by combining land cover data with indicators of structural openness, distinguishing a gradient from open grassland, grassland with woody encroachment, shrubland transitional zones, to open forest edge and closed forest. These categories reflect different stages of pasture succession, from actively maintained open systems to advanced woody encroachment. Management intensity was inferred by overlaying pastoral use data and identifying areas with active versus low or absent management. By intersecting vegetation structure with management intensity, the map reveals spatial patterns where succession processes are either counteracted or reinforced by human activity. In particular, the shrubland and the co-occurrence of shrubland and low-management areas highlight zones of accelerated transition, forming the basis for identifying areas suitable for different intervention strategies in subsequent analysis.

Fig4-5| Imaged by author.
 Data Source:
 Copernicus Land Monitoring Service (Tree Cover Density),
 OCS GE,RPG
 and IGN historical imagery via Remonter le temps;
 author's elaboration.

Ecological Sensitivity

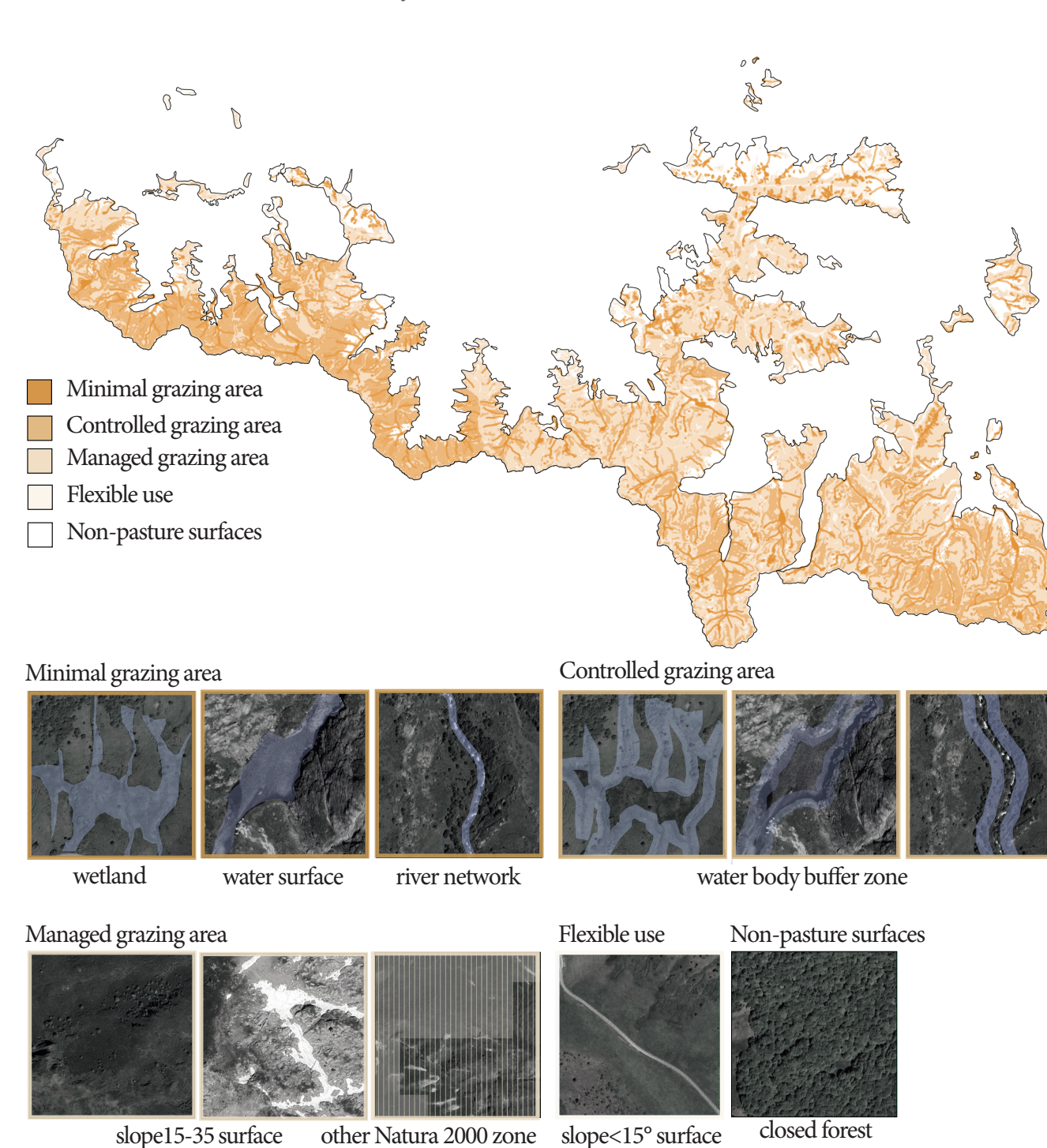


The grazing tolerance assessment was limited to pasture-relevant open surfaces, namely open grassland and bare soil. Shrubland and forest were excluded, as they fall outside the primary operational domain of grazing-based intervention in this stage of the analysis.

Given the predominance of steep terrain in the Pyrenean pasture landscape, slope was not used as a sole exclusion criterion, instead it was differentiated into four bands (<math><15^\circ</math>, $15-25^\circ$, $25-35^\circ$, $>35^\circ$), with only the steepest class (>math>35^\circ</math>) functioning as a direct constraint on grazing. The intermediate band ($25-35^\circ$) was treated as conditionally sensitive and upgraded only when combined with erosion-prone or hydrologically sensitive surfaces.

Wetlands represent the highest ecological sensitivity due to their hydrological fragility, high susceptibility to trampling, and slow recovery capacity. In contrast, Natura 2000 indicates areas of elevated ecological value and regulatory protection rather than uniform physical vulnerability. While wetlands are least tolerant to disturbance, Natura 2000 areas require cautious management, with sensitivity varying according to specific habitats and conditions.

Deriving Grazing Intervention Tolerance from Ecological Sensitivity



Grazing intervention tolerance is based on the interaction between land cover, topography, hydrological proximity, and conservation constraints.

The assessment focuses on pasture-relevant open surfaces, namely open grassland and bare soil, while wetlands, water bodies, and river networks are assigned to minimal grazing due to their high hydrological sensitivity, fragile soil conditions, and very low tolerance to disturbance.

Controlled grazing applies to hydrological buffers, steep slopes (>math>35^\circ</math>), and pasture surfaces within Natura 2000 where ecological sensitivity or protection constraints require stricter limitation of grazing pressure.

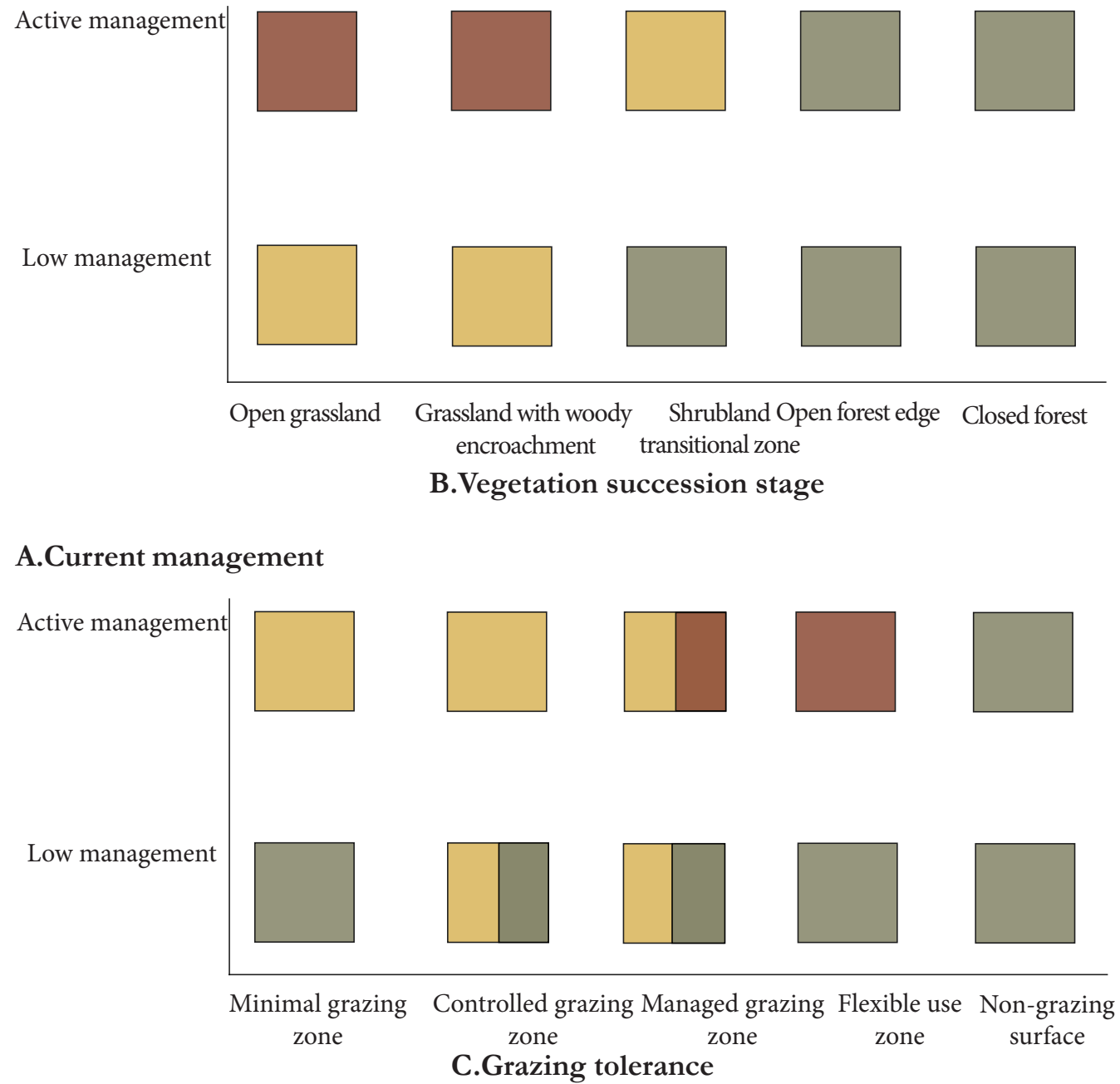
Managed grazing includes moderately sloped open grassland and bare soil ($15-35^\circ$), as well as conditionally stable surfaces where disturbance can still support open-land maintenance.

Flexible use refers to the gentle slopes (<math><15^\circ</math>) with relatively low ecological sensitivity, higher resilience, and better accessibility. In this way, each grazing level reflects a different degree of ecological sensitivity, from highly fragile process cores to more stable and disturbance-tolerant pasture surfaces.

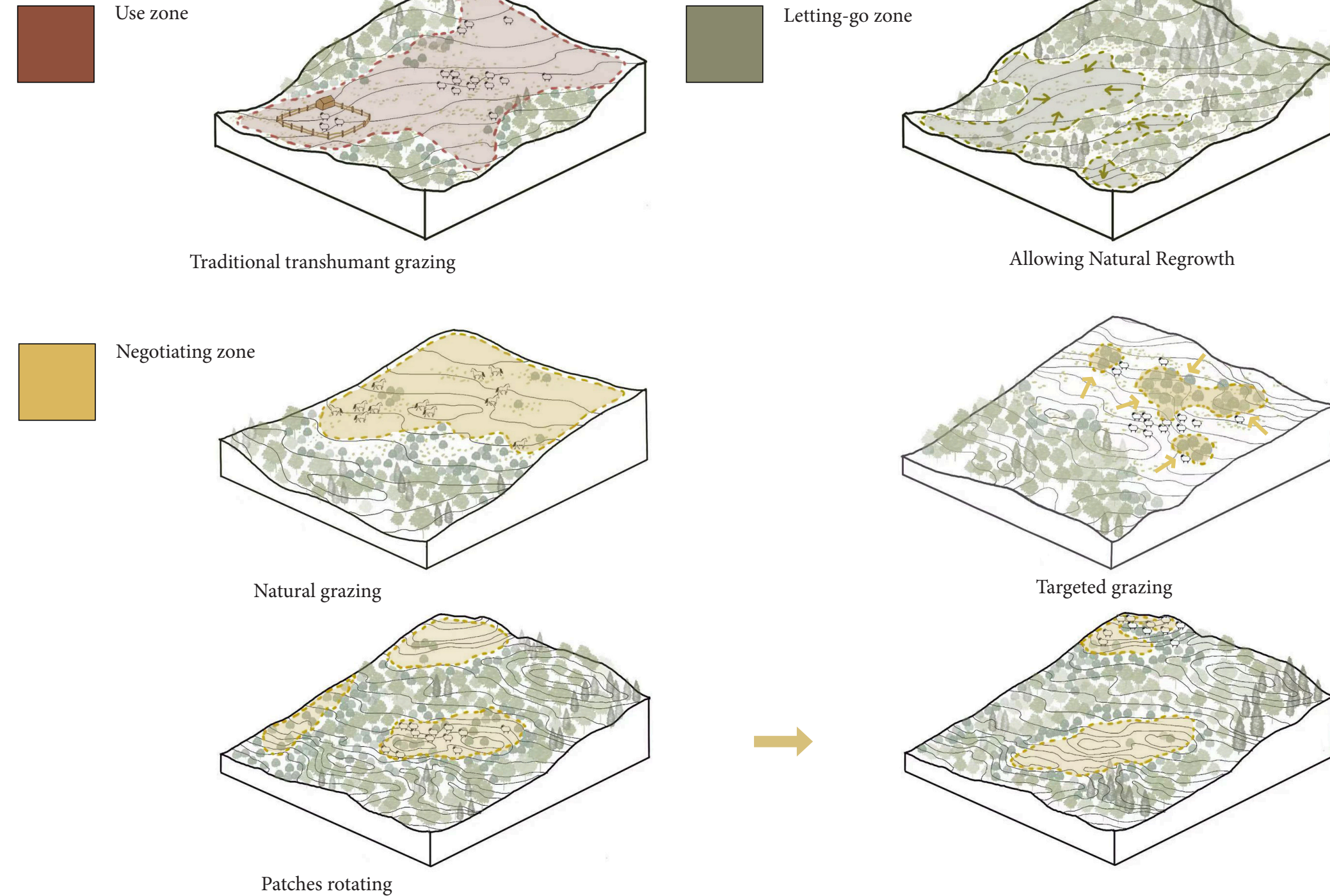
Fig4-6| Imaged by author.

Data Source:
Copernicus Land Monitoring Service (Tree Cover Density),
OCS GE, RPG
and IGN historical imagery via Remonter le temps,
author's elaboration.

Input Layers Combined to Evaluate Intervention Potential



Zoning and Management Intervention

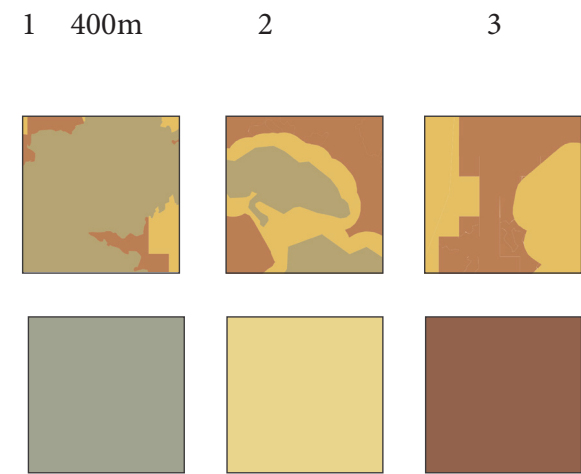


The zoning framework is structured through three layers that include: the intersection of vegetation succession stage, grazing tolerance based on ecological sensitivity, and current management intensity. These regimes reflect different configurations of human-ecological relations, ranging from process-led landscapes to actively maintained productive systems. The zoning distinguishes three intervention logics. “Use” areas maintain continuous open pasture through traditional transhumant grazing. “Negotiating” areas aim to sustain a dynamic grassland-forest mosaic, where grazing is adjusted through low-intervention, seasonal, and spatially flexible practices such as natural grazing, rotating patches, and targeted grazing. “Letting-go” areas do not imply a return to a pre-human condition, but a selective and pragmatic withdrawal of maintenance, allowing succession processes to unfold beyond pastoral management boundaries.

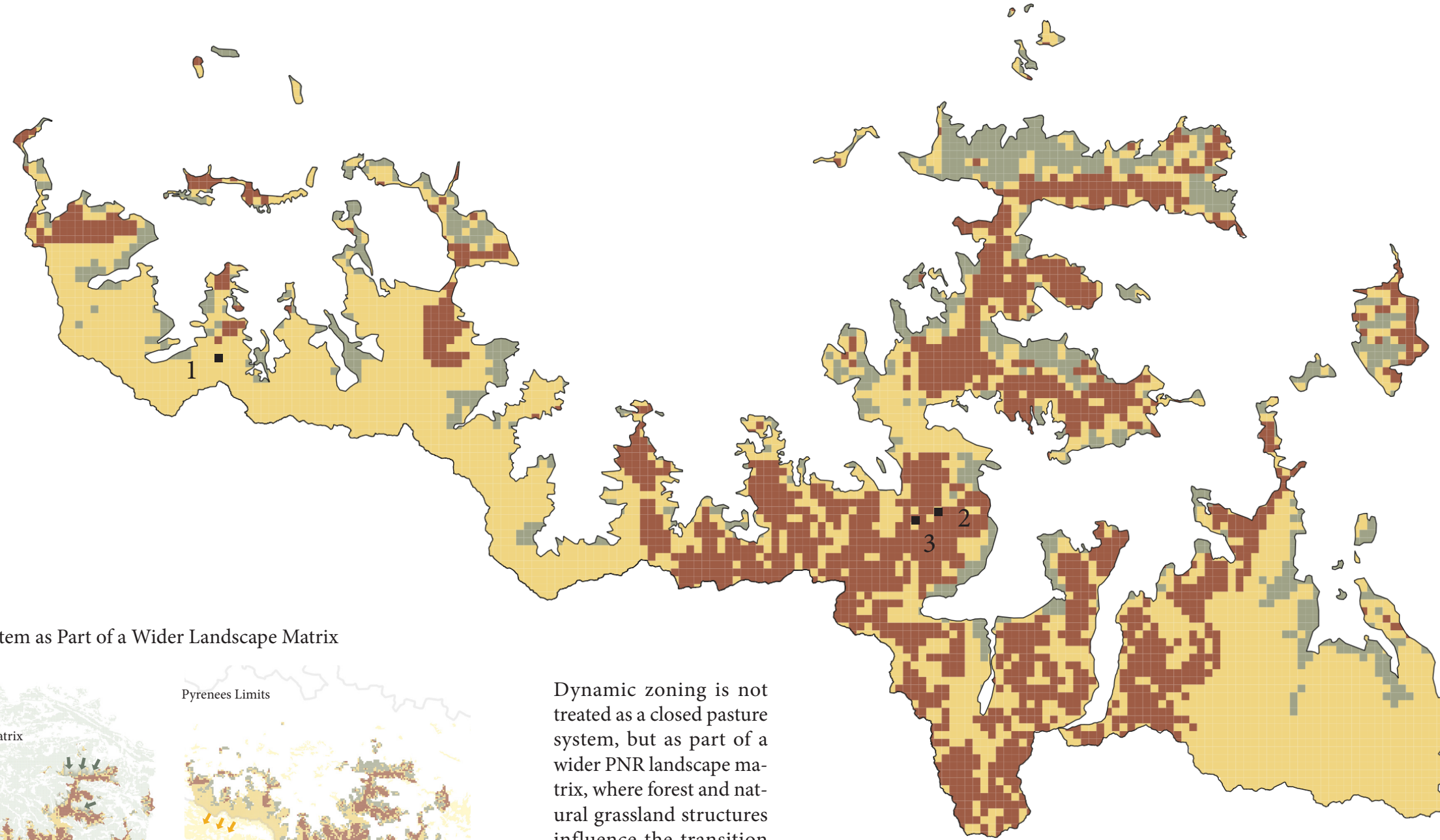
IV. Restoring the OMP system | Composing the Dynamic Zoning
Fine-grained Intervention Potential



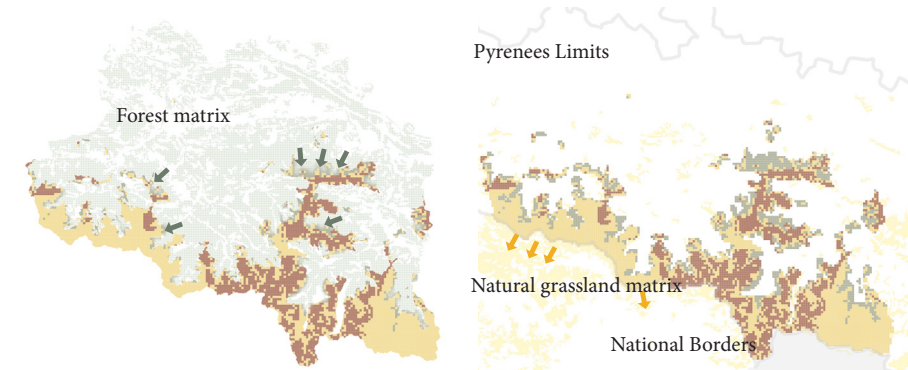
The first U/N/L zoning emerged from the meeting of three conditions: how the land is currently managed, how much grazing pressure it can ecologically tolerate, and how far vegetation succession has already progressed. Read at this fine scale, the landscape appeared as a dense mosaic of small shifts and overlaps. This pattern was meaningful: it revealed that the summer pasture is no longer a continuous and uniformly maintained surface, but a field of uneven transitions, where active use, ecological limits, and succession are wavering. Yet this also meant that the first zoning could not be used directly to define management areas, because pastoral decisions are not made patch by patch at such a minute scale.



Management-scale Dynamic Zoning



The OMP System as Part of a Wider Landscape Matrix



Dynamic zoning is not treated as a closed pasture system, but as part of a wider PNR landscape matrix, where forest and natural grassland structures influence the transition between Use, Negotiating, and Letting-go zones.

To turn this reading into an operative framework, a second step was introduced. A 400 m grid was used to establish decision units, and within each unit the relative share of Use, Negotiating, and Letting-go conditions was compared. The dominant condition was then assigned to the whole cell. In this way, the earlier mosaic was not erased, but translated into larger and more legible zones. The final dynamic zoning is actionable for future management: Use areas continue seasonal transhumant grazing, Negotiating areas adjust grazing to sustain the meadow-forest mosaic, and Letting-go areas mark where intervention is reduced and succession is allowed to continue.

Fig4-8| Imaged by author
 Data Source:
 Copernicus Land Monitoring Service (Tree Cover Density),
 OCS GE,RPG
 author's elaboration.

IV. Restoring the OMP system | Composing the Dynamic Zoning
Rewilding Outcomes after Dynamic Zoning

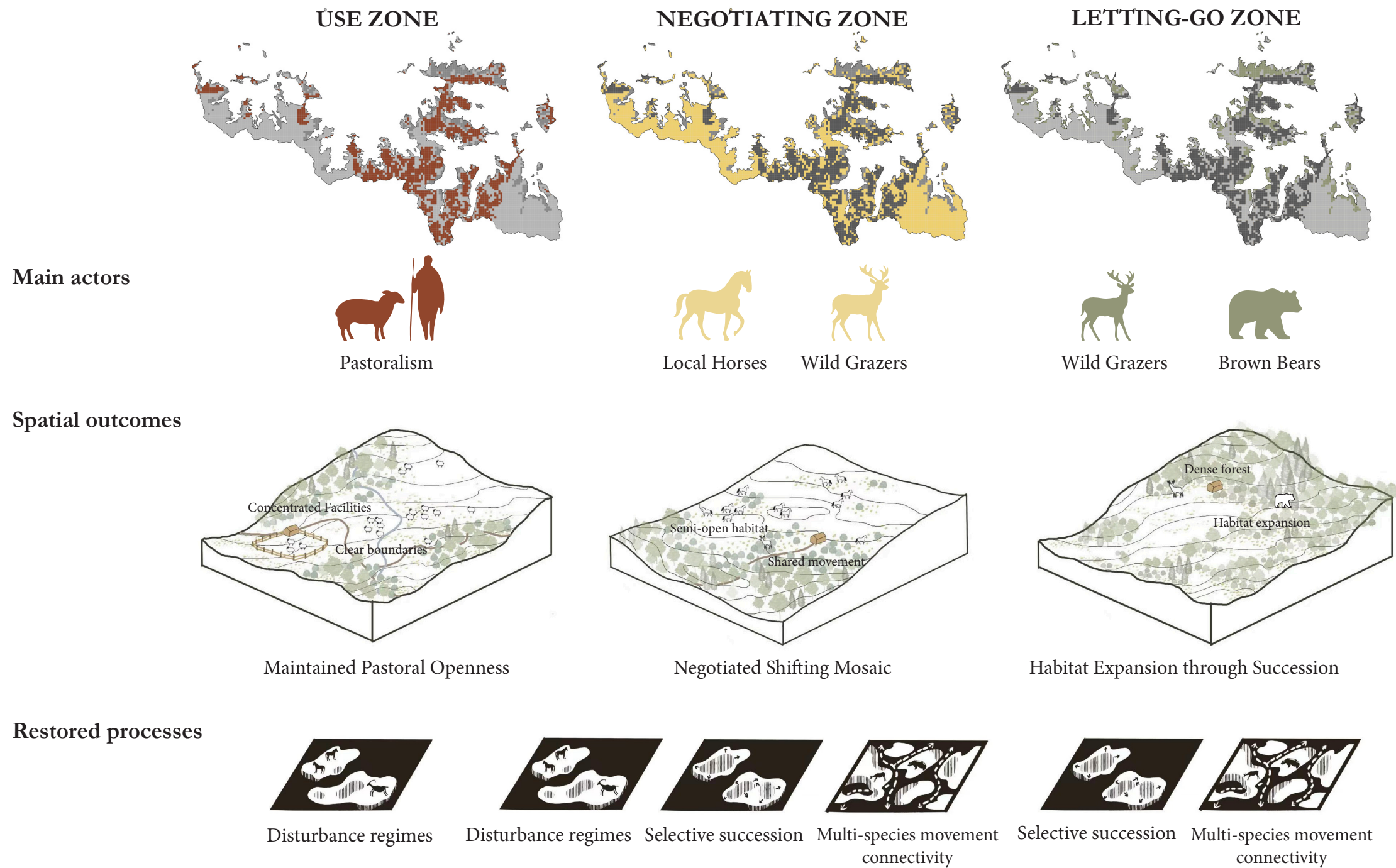


Fig4-9 | Imaged by author.



Chapter V: Coexistence with Bears



Chapter Four reconfigures the open mountain pasture system through three dynamic conditions: Use, Negotiation, and Letting-go. These conditions redistribute pastoral disturbance, natural succession, and management intensity across the pasture mosaic. However, bears do not follow pasture boundaries or human zoning. They respond to forest cover, seasonal food sources, refuge conditions and human disturbance. Their habitats extend across and beyond the rewilded pasture system, creating situations where pastoral use, visitor access, and bear activity may overlap.

This chapter explores how these overlaps can become spatial conditions for coexistence. It first maps brown bear habitat and seasonal activity, then identifies confrontation interfaces between bear habitats, and U/N/L summer pasture management zoning. The existing footpath network is then reconfigured through access roles and habitat-sensitive regulation, producing new movement layers and enhanced multi-species connectivity. Finally, the four interface types are translated into design principles for paths, facilities, visibility, maintenance, and seasonal access, preparing the site-scale exploration in the following chapter.



- 5.1 Mapping the Bear Territory
- 5.2 Mapping the Confrontation Interface
- 5.3 Reconfiguring the Grazing Season Movement
- 5.4 Enhanced Multi-species Movement Connectivity
- 5.5 From Confrontation to Coexistence

Fig5-1 | Problem bear M129 that got too close to human areas. Auzat, Ariège department, France. Adapted from Association Pays de l'ours (2023).

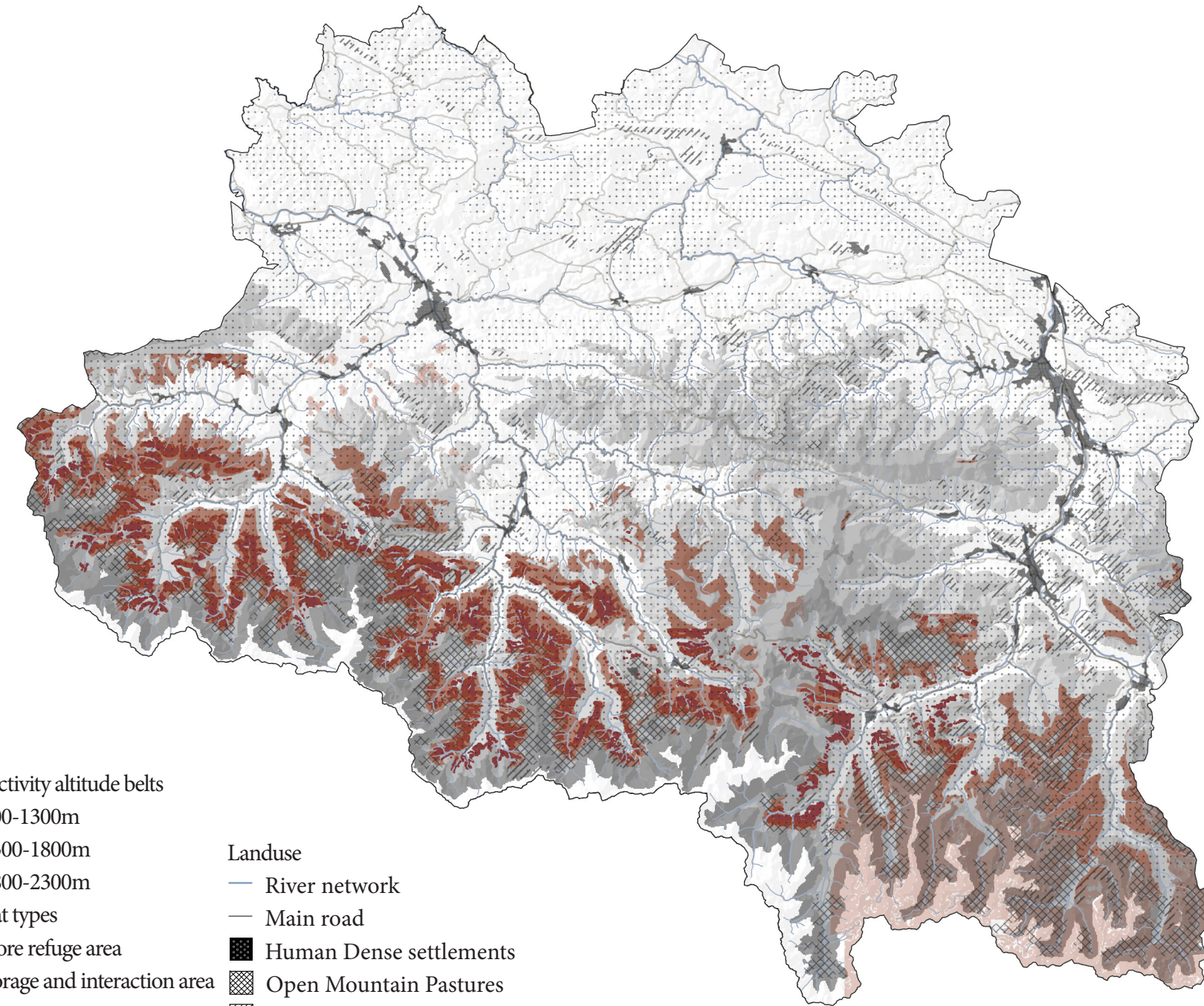
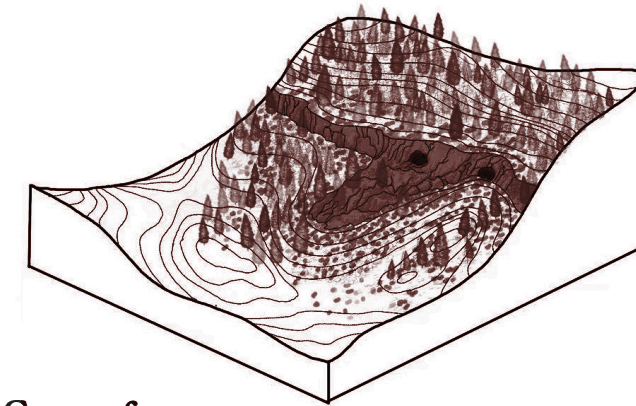
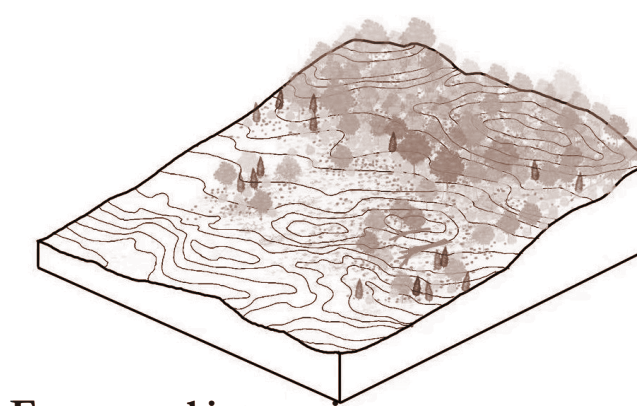


Fig5-2| Imaged by author.
 Data Source:
 CORINE Land Cover; brown bear distribution data (OFB, 2021);
 habitat interpretation based on Quenette (2000) and national conservation reports; author's elaboration.



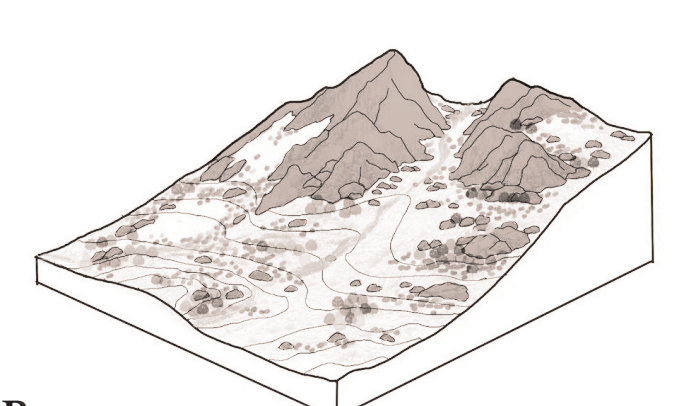
Core refuge area

Refuge areas provide seasonal shelter for brown bears during the most sensitive phases of their annual cycle, including winter hibernation, maternal denning, and summer daytime resting. These areas are typically located on steep, secluded slopes with dense forest cover, caves, or complex terrain that offers concealment and thermal stability. Because these habitats are vital for bears' core activities, these areas require strict seasonal protection and minimal human presence to reduce disturbances.



Forage and interaction area

Foraging and interaction areas are landscapes where bears actively search for food and where ecological interactions with livestock, vegetation, and human land use may occur. These include berry shrublands, beech forests with food resources, and summer pastures boundaries where bears exploit seasonal food availability. While these areas support key feeding processes such as spring foraging and autumn hyperphagia, they also represent potential conflict interfaces with pastoral activities, requiring careful spatial management and coexistence strategies.



Passage area

Passage areas enable seasonal movement and spatial connectivity across the mountain landscape. These areas include mountain ridges, passes, and valley bottoms that function as natural travel corridors for bears moving between refuge and feeding habitats. Although bears typically spend less time in these areas, maintaining their permeability is crucial for dispersal, genetic exchange, and access to seasonal resources. Planning strategies will therefore ensure landscape connectivity while accommodating low-impact human mobility such as hiking trails.

Fig5-3|Brown bear habitat typologies.
 Imaged by author.



Fig 5-4| Hibernating mother bear and cubs.
 Katmai National Park, Alaska.
 Imaged by Norbert Wu,
 via National Geographic (2025).



Fig 5-5| Brown bear eating blueberries.
 Imaged by WildMediaSK,
 via Adobe Stock (2018).



Fig 5-6| Brown bear in dispersal,
 Nuka Pass, Alaska.
 Imaged by National Park Service,
 via Wikimedia Commons (2005).

Seasonal and Spatial Bear Activities

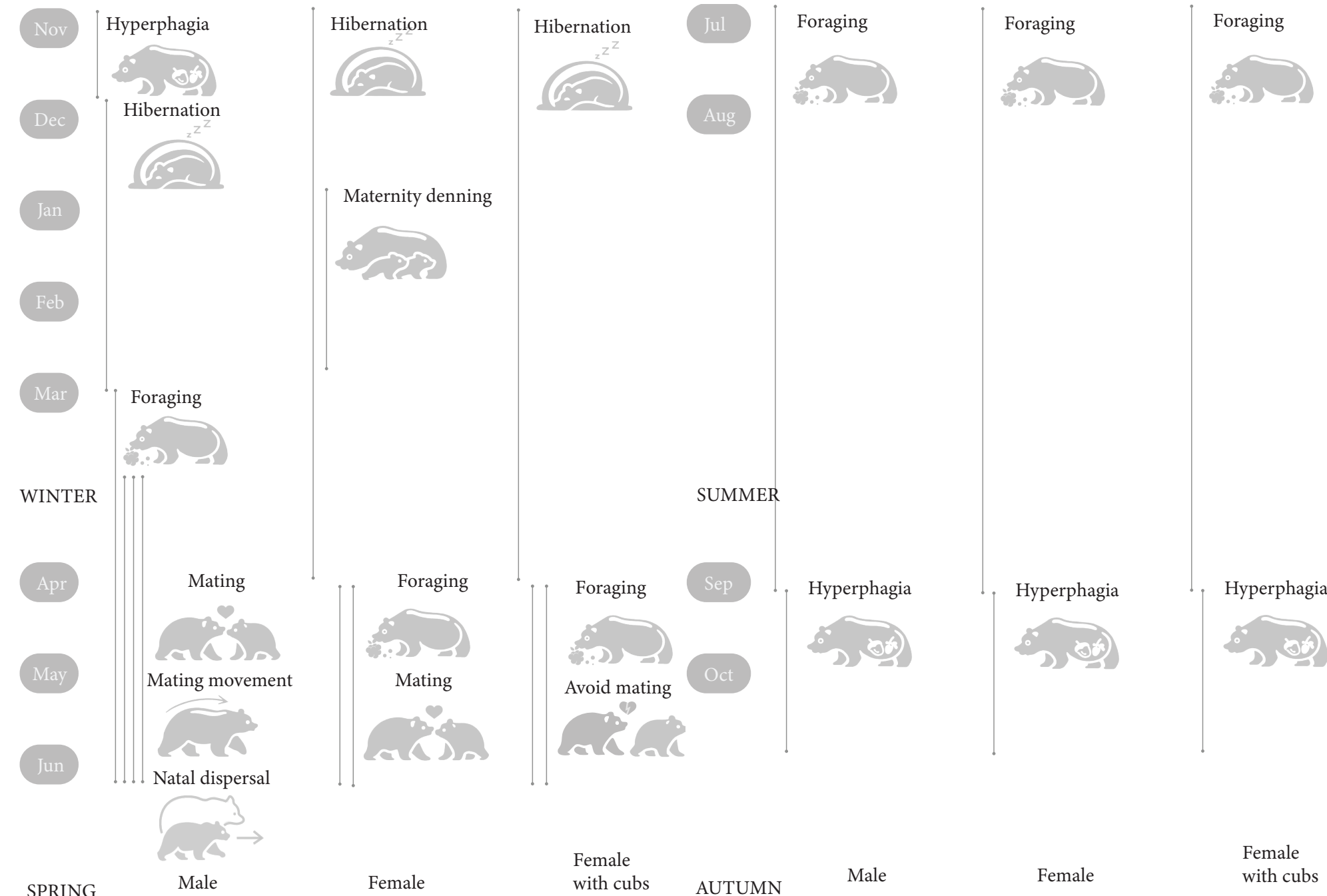


Fig5-7| Imaged by author.

Data Source: seasonal activity interpretation based on Quenette (2000) and national conservation reports; author's elaboration.

Winter

Winter refuge areas refers to denning habitats used by brown bears during hibernation. Typically located on steep, north-facing slopes between 1100–2000 m, these areas combine dense forest cover, rocky terrain, and caves or sheltered sites that provide thermal stability and concealment. As disturbance may lead to den abandonment and cub mortality, as well as awakening and energy loss of bears, these areas require strict protection and exclusion of human activities during the winter months.

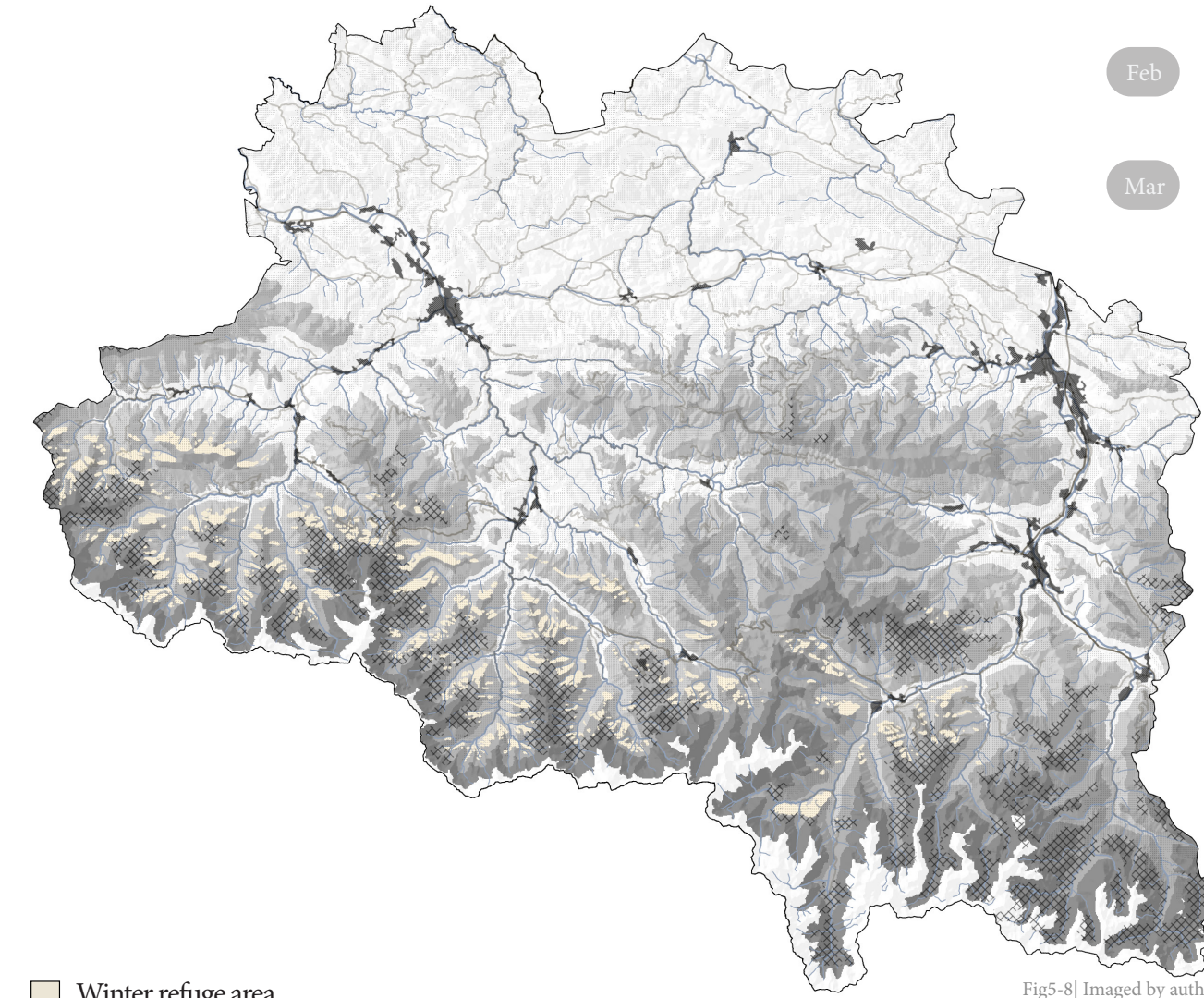


Fig5-8| Imaged by author.

Data Source: CORINE Land Cover; brown bear distribution data (OFB, 2021); habitat interpretation based on Quenette (2000) and national conservation reports; author's elaboration.

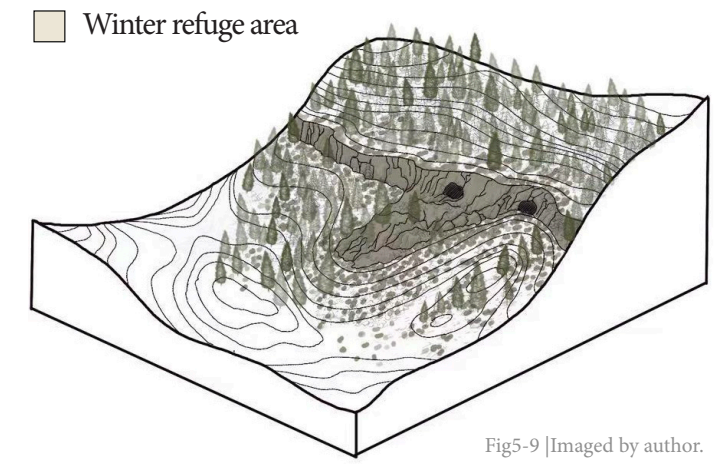
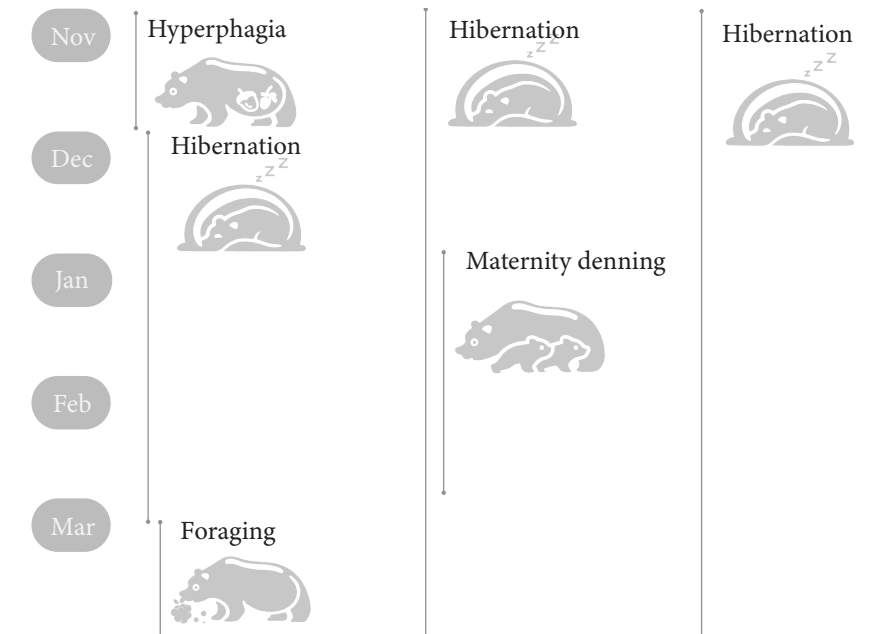
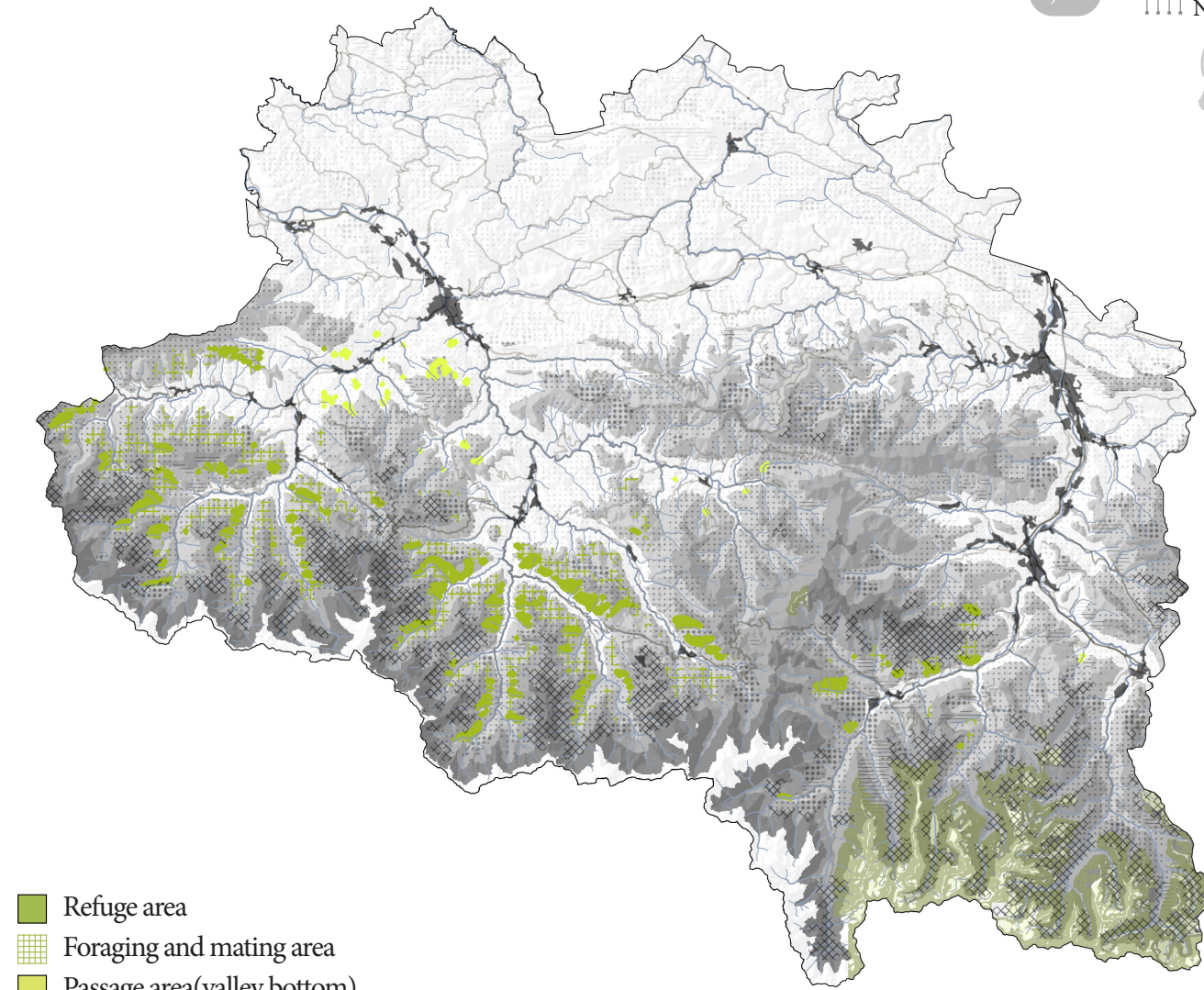


Fig5-9 |Imaged by author.





- Refuge area
- Foraging and mating area
- Passage area(valley bottom)
- Passage area(mountain ridge)
- Passage area(mountain pass)

Fig5-10| Imaged by author.

Data Source:
CORINE Land Cover; brown bear distribution data (OFB, 2021);
habitat interpretation based on Quenette (2000) and national conservation reports; author's elaboration.

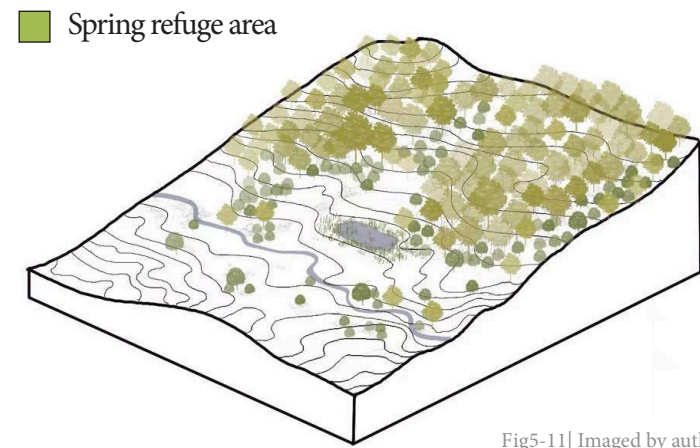
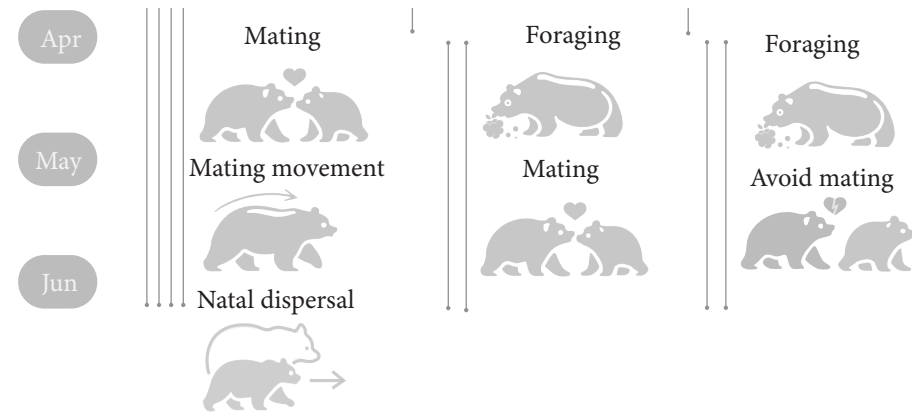


Fig5-11| Imaged by author.

- Aspect: South-facing
- Slope: 15-35°
- Elevation: 800-1300
- Vegetation: Broad-leaved
- Openness: Dense

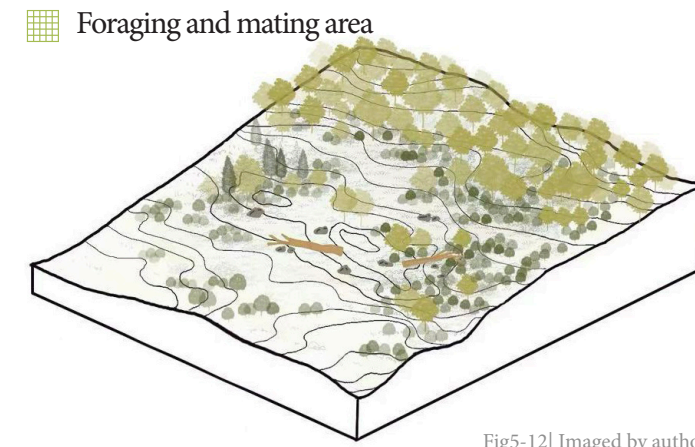


Fig5-12| Imaged by author.

- Elevation: 800-1300
- Vegetation: Broad-leaved
- Openness: Semi-open

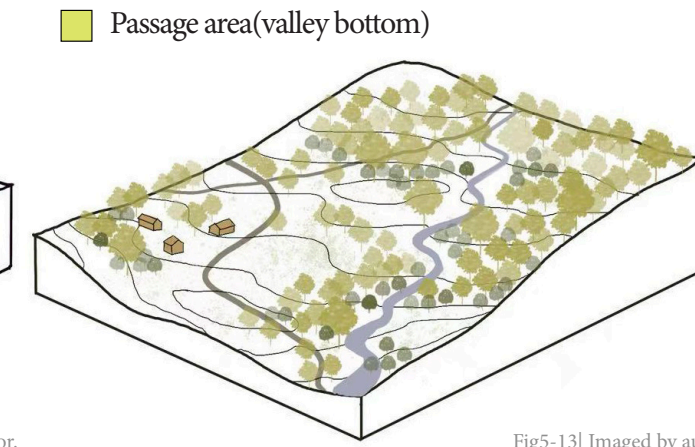


Fig5-13| Imaged by author.

- Elevation: <800
- Vegetation: Broad-leaved
- Openness: Semi-open

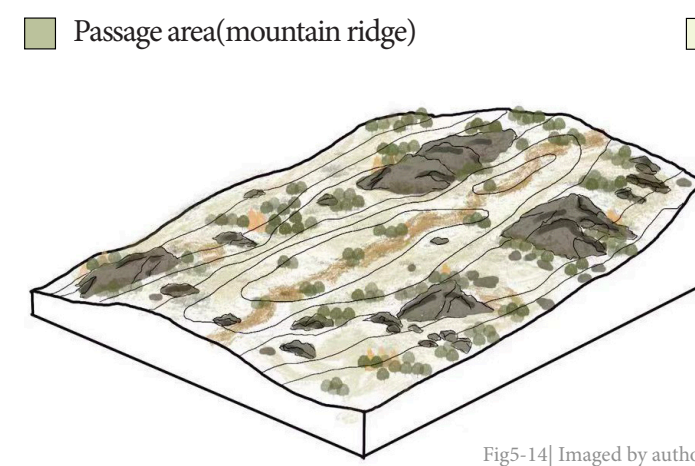


Fig5-14| Imaged by author.

- Elevation: >1800
- Vegetation: Bare rock and heatherlands
- Openness: Open

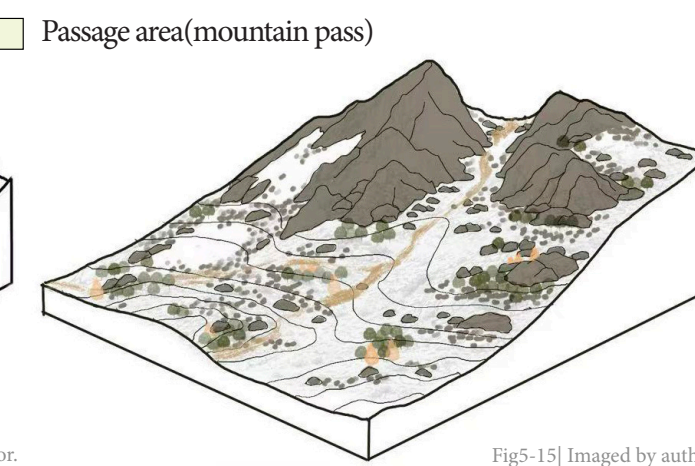
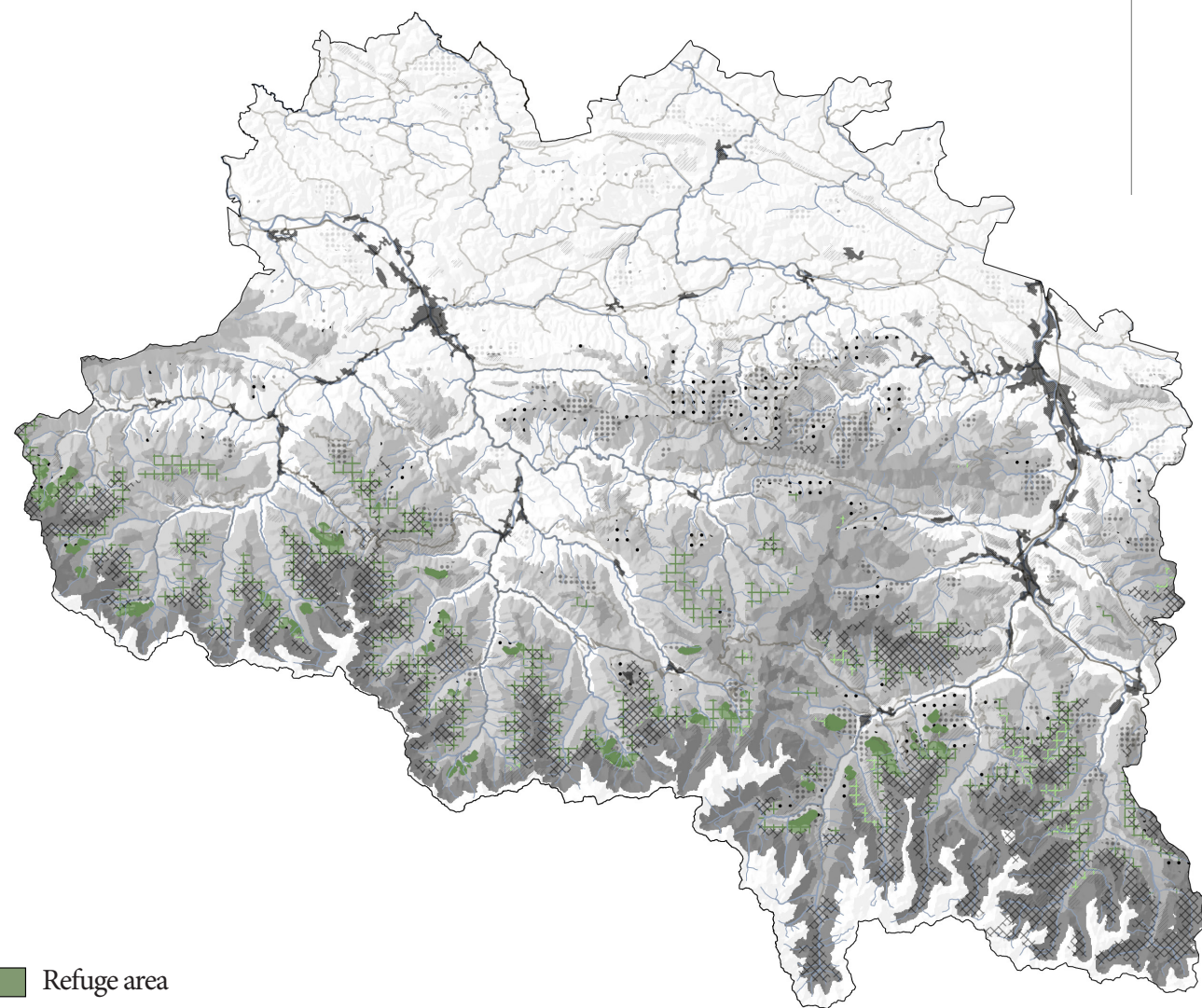


Fig5-15| Imaged by author.

- Elevation: >1800
- Vegetation: Bare rock and heatherlands
- Openness: Open

In spring, refuge areas are typically located in dense beech forests on sheltered slopes (800–1300 m), providing shelters and thermal comfort for resting after hibernation. Foraging and activity area located in more open woodland and beech forest edges, where bears actively search for emerging vegetation, insects, and carrion, while also engaging in mating activities. Passage areas, including mountain ridges, passes, and valley bottoms, support natal dispersal and mating movement, enabling bears to transfer between habitats.

Summer



- Refuge area
- ▣ Hyperphagia area(summer pasture interfaces)
- ▣ Foraging area(Berry shrublands)

Fig5-16| Imaged by author.

Data Source:
CORINE Land Cover; brown bear distribution data (OFB, 2021);
habitat interpretation based on Quenette (2000) and national conservation reports; author's elaboration.

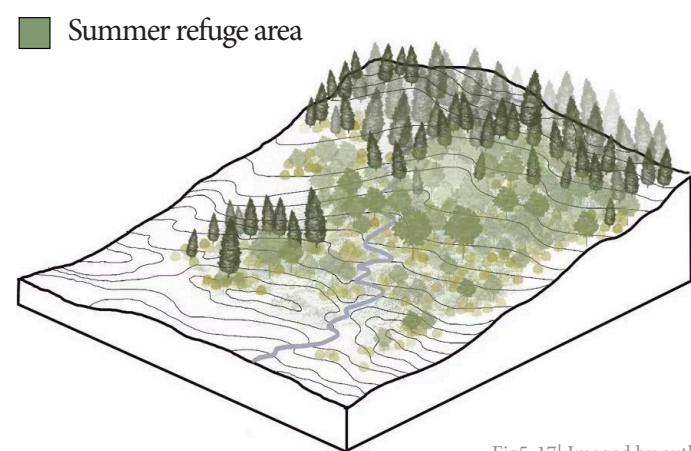


Fig5-17| Imaged by author.

- Aspect: North-facing
- Slope: 15-35°
- Elevation: 800-1300
- Vegetation: Coniferous/mixed
- Openness: Dense

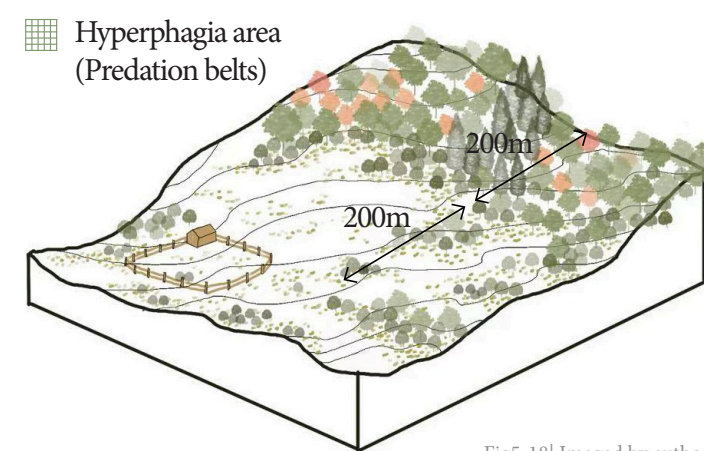


Fig5-18| Imaged by author.

- Elevation: 800-1300
- Vegetation: Grassland
- Openness: Open

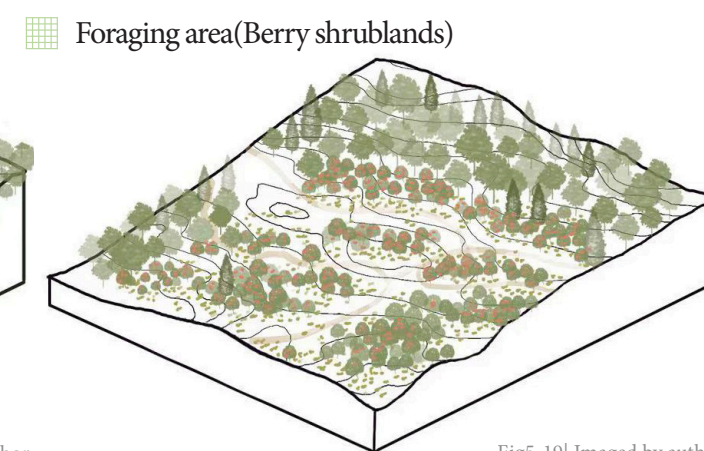
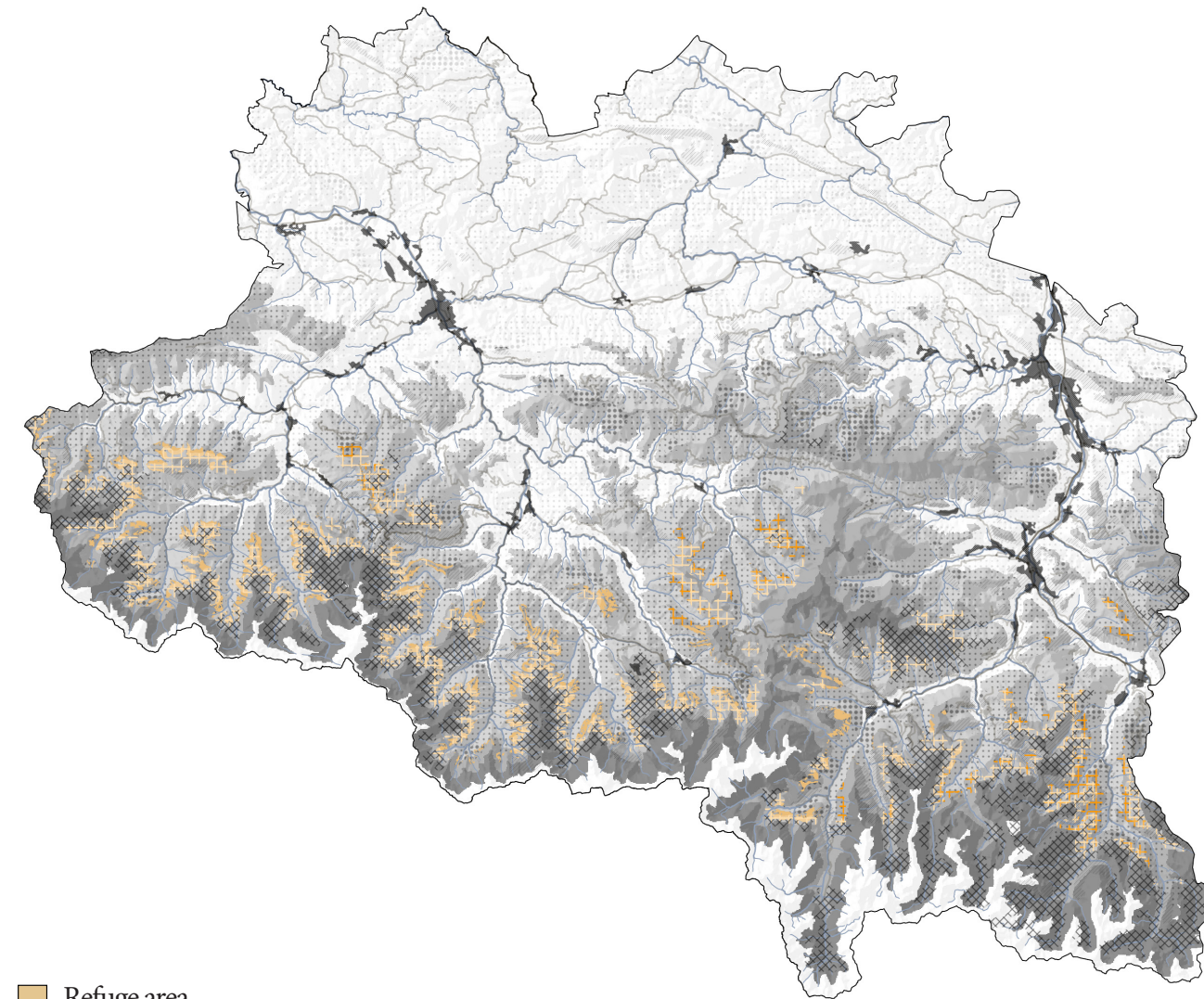
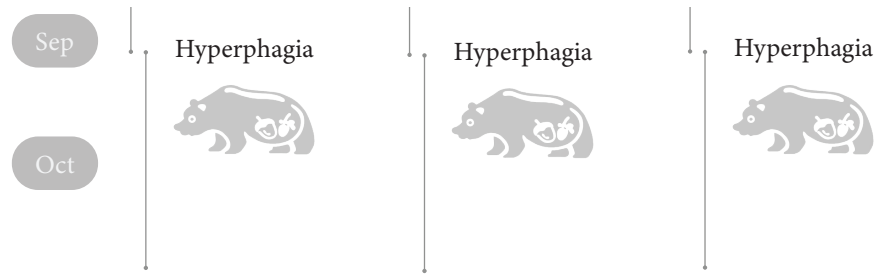


Fig5-19| Imaged by author.

- Elevation: 800-1300
- Vegetation: Shrubland
- Openness: Open

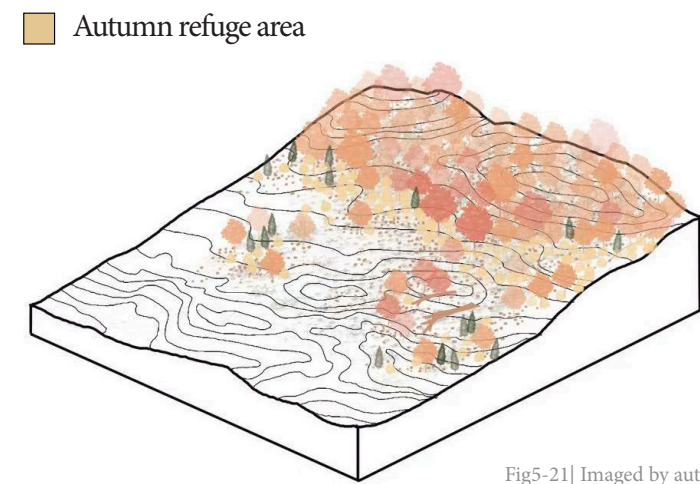
During summer, refuge areas of bears are typically located in cooler, north-facing forests with dense canopy and understory, providing daytime shelter and thermal comfort. Foraging and interaction zones expand into berry-rich shrublands and summer pastures, where bears feed opportunistically and may overlap with pastoral activities, particularly along forest edges. In late summer, bears begin to concentrate near forest-pasture interfaces as they gradually enter hyperphagia, anticipating the more intensive feeding patterns of early autumn

Autumn



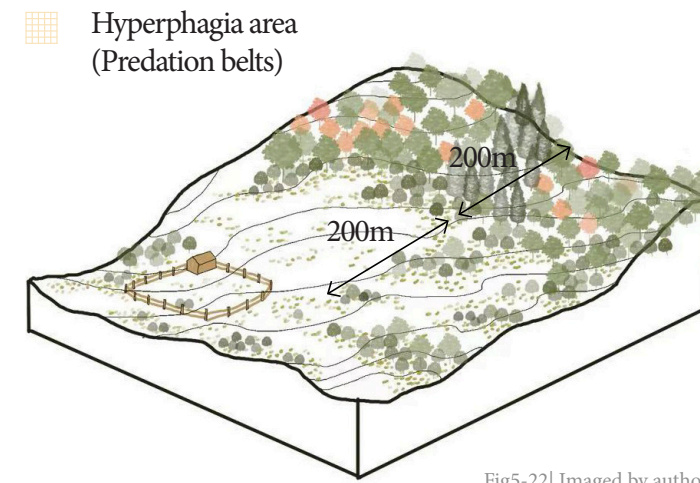
- Refuge area
- Hyperphagia area(summer pasture interfaces)
- Hyperphagia area(Nut forests)

Fig5-20| Imaged by author.
Data Source:
CORINE Land Cover; brown bear distribution data (OFB, 2021);
habitat interpretation based on Quenette (2000) and national conservation reports; author's elaboration.



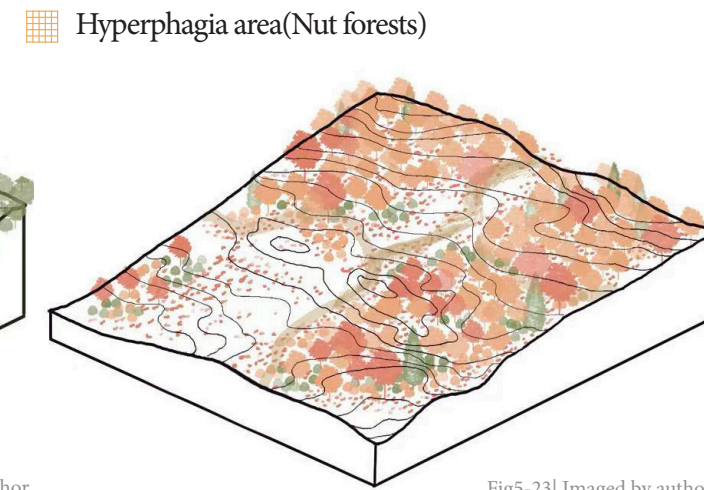
- Slope: 15-35°
- Elevation: 800-1300
- Vegetation: Broad-leaved
- Openness: Dense

Fig5-21| Imaged by author.



- Elevation: 800-1300
- Vegetation: Shrubland
- Openness: Open

Fig5-22| Imaged by author.

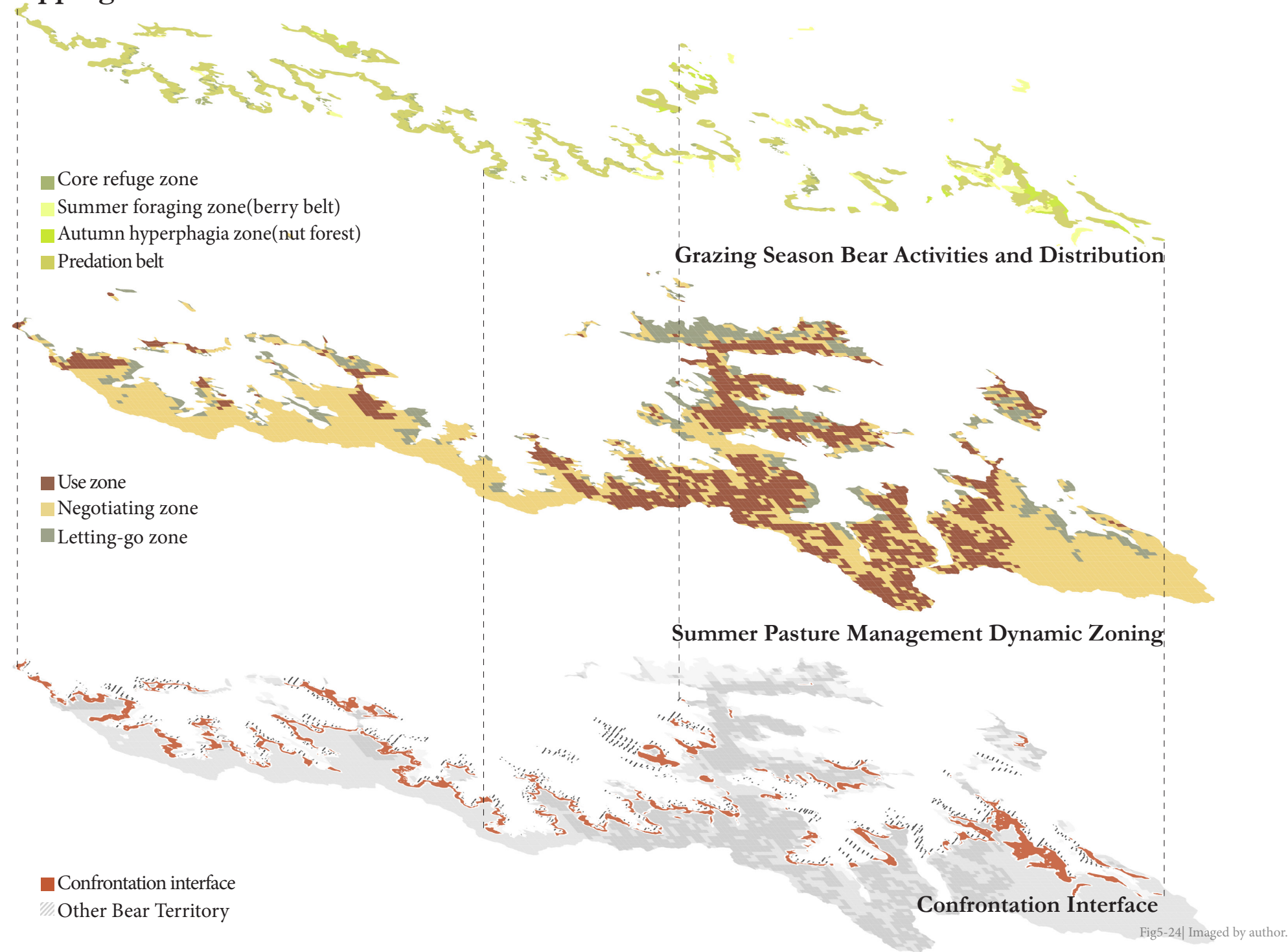


- Elevation: 800-1300
- Vegetation: Shrubland
- Openness: Semi-open

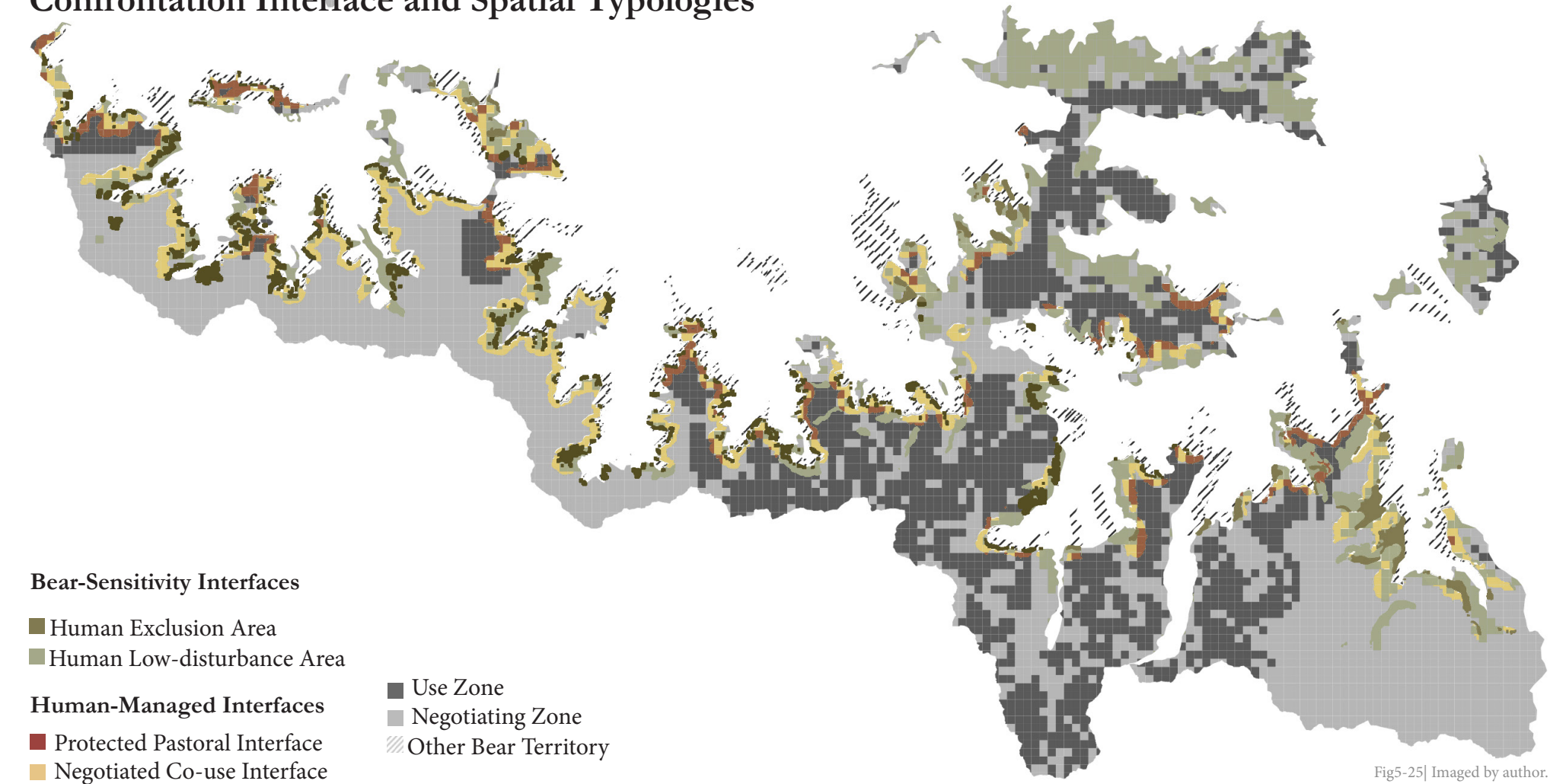
Fig5-23| Imaged by author.

Autumn refuge areas provide sheltered resting habitats within dense broad-leaved forest interiors, often located on steep slopes at medium altitudes, with low disturbance. These areas are important for short-term resting between feeding periods, offering cover, thermal stability, and protection. Predation belts of hyperphagia area occur along forest-pasture edges where bears opportunistically forage during hyperphagia. These transitional areas support diverse food sources, including livestock, carrion, and insects, making them key interfaces of human-bear interaction and potential conflict. Nut forests of hyperphagia area represent the core feeding habitats during hyperphagia, where bears intensively consume high-energy resources such as acorns, beechnuts, and chestnuts. Typically located in mid-elevation broad-leaved forests, these areas are highly sensitive to disturbance as they directly determine fat accumulation for winter survival.

Mapping the Confrontation Interface



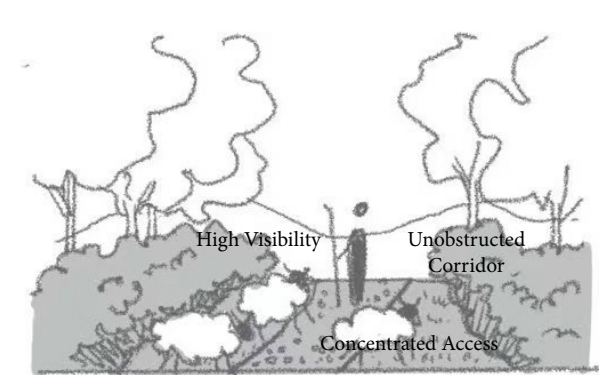
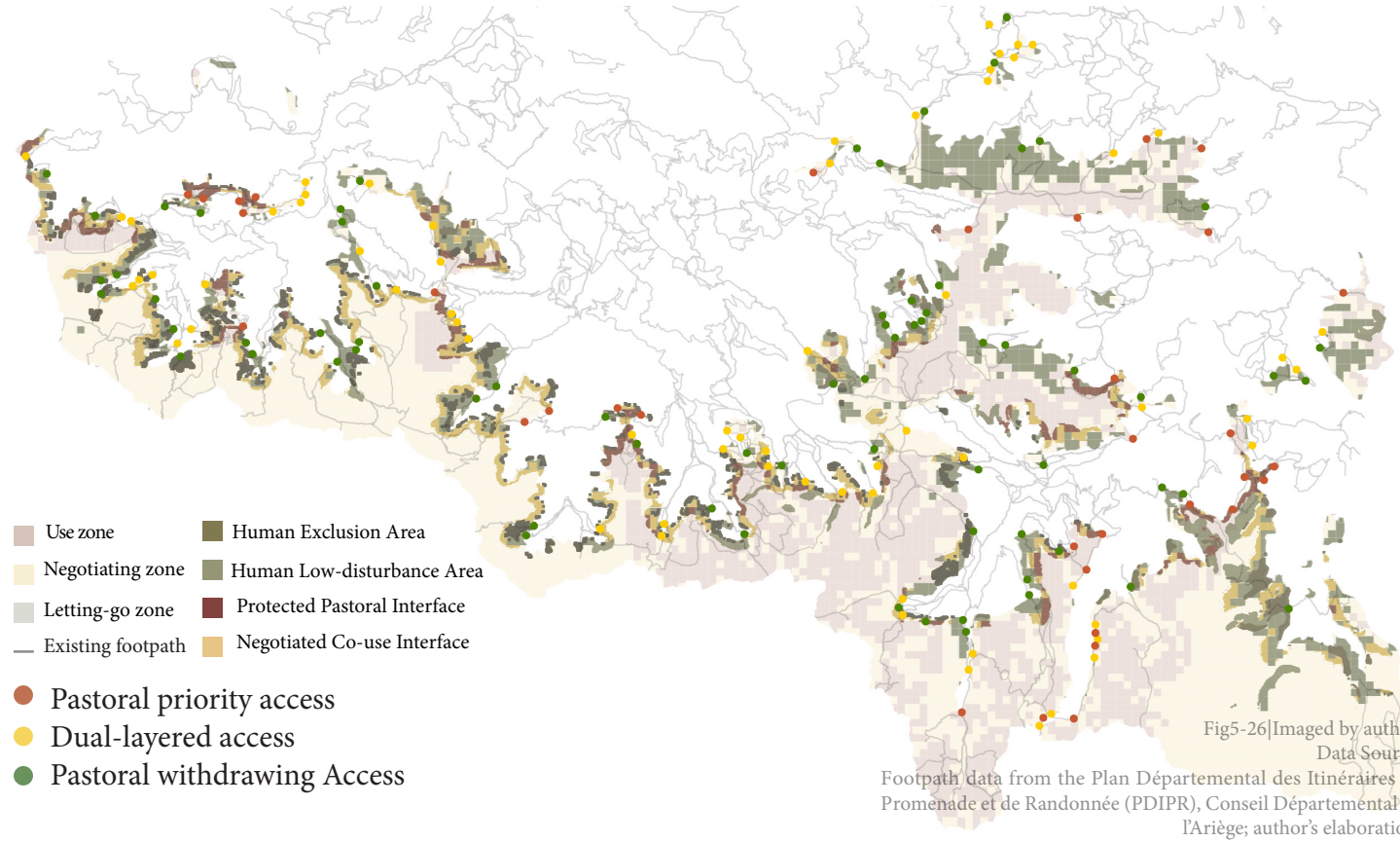
Confrontation Interface and Spatial Typologies



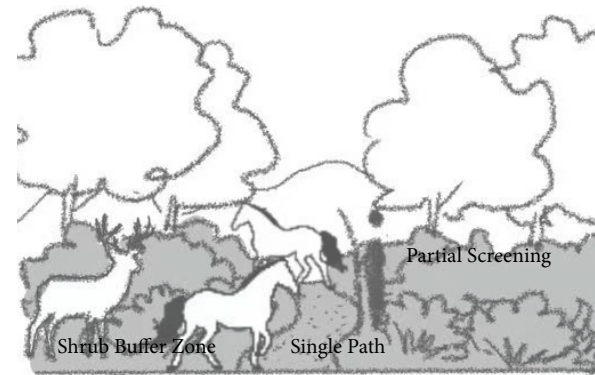
The overlap between seasonal bear habitats, summer pasture management boundaries, and remaining human or livestock use defines confrontation interfaces where coexistence needs to be spatially managed. These interfaces are not uniform conflict zones. They are classified according to habitat sensitivity and intensity of human use. Four interface types are identified. Human Exclusion Areas secure refuge and highly sensitive seasonal habitats through grazing-season entry restriction. Human Low-disturbance Areas allow limited passage or monitoring with reduced staying time and minimal maintenance. Protected Pastoral Interfaces maintain pastoral use where livestock exposure remains high, but require visibility, protection facilities, and concentrated access. Negotiated Co-use Interfaces organise shared edges where human movement and wildlife movement are spatially separated or buffered.

Summer Pasture Access

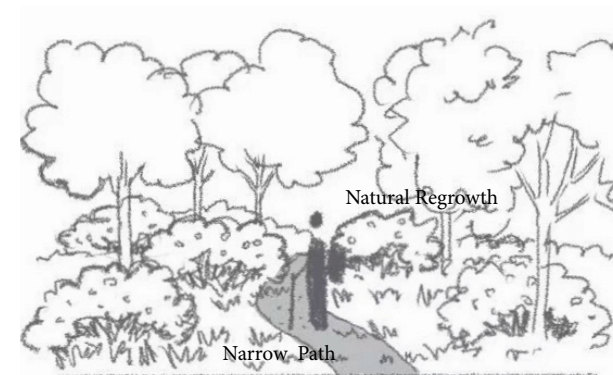
Access reconfiguration translates the confrontation interface mapping into a first movement layer by reorganising the routes that enter the summer pasture system. Pastoral-priority access concentrates herds, shepherds, and maintenance along clear and visible routes. Dual-layer access allows human passage while retaining shrub or forest buffers for wildlife movement. Pastoral withdrawing access weakens or reduces livestock-oriented maintenance, allowing paths to become narrower, less dominant, and more compatible with natural regrowth. This access layer establishes where human and livestock entry should be maintained, negotiated, or reduced before more specific habitat-sensitive path regulation is applied.



Pastoral priority access



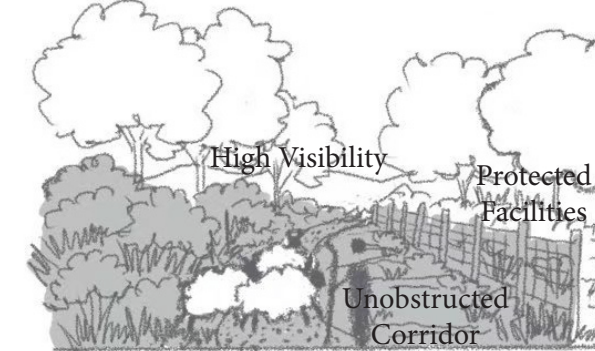
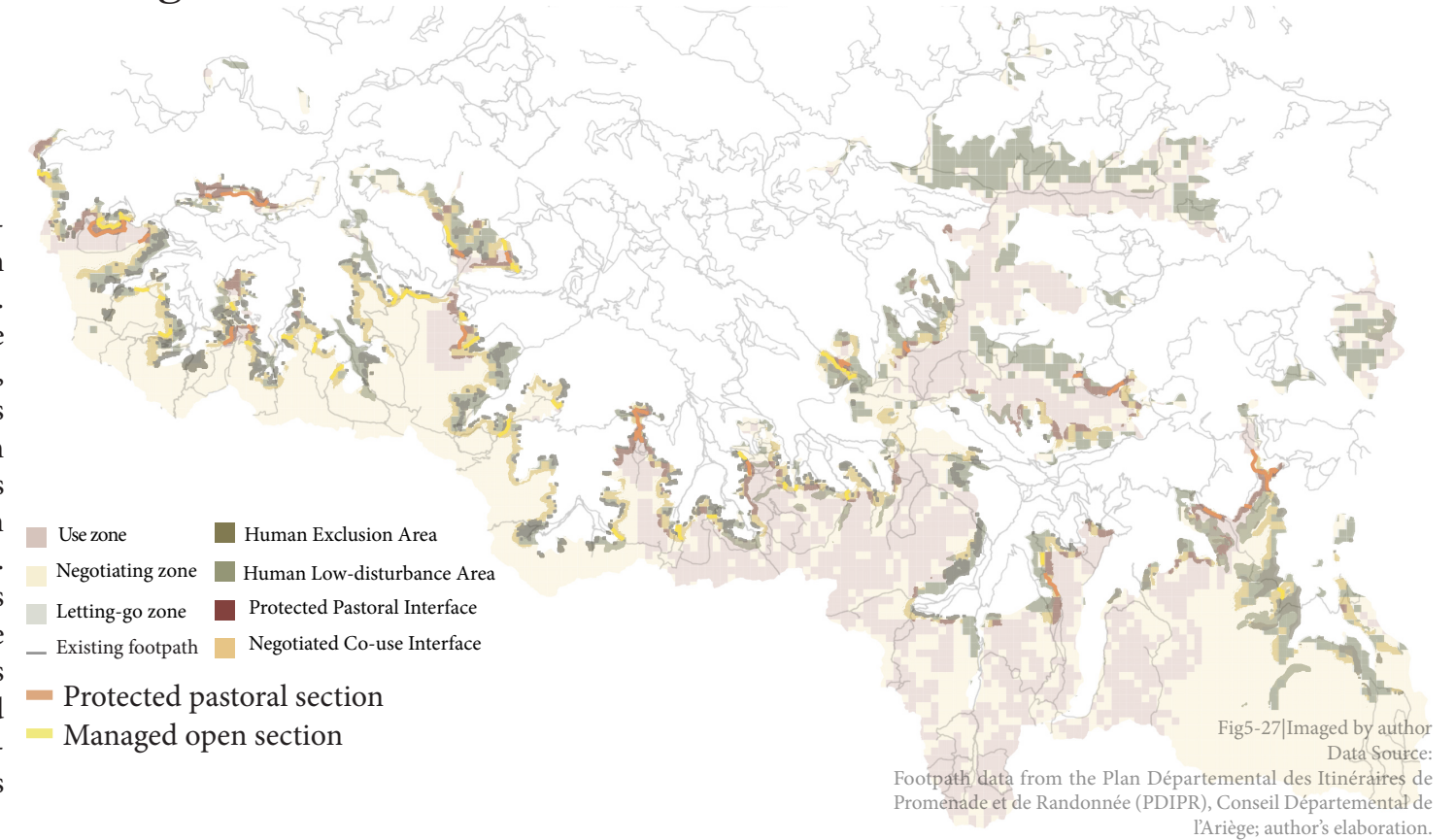
Dual-layered access



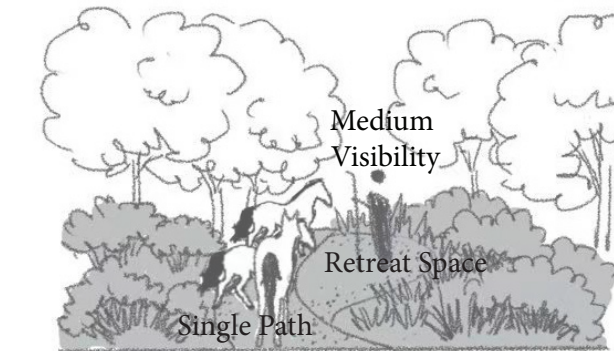
Pastoral withdrawing access

Path Regulation in Human-Managed Interfaces

In human-managed coexistence interfaces, paths are adjusted to reduce predation risk while keeping pastoral functions. Protected pastoral sections occur where active grazing remains dominant. Here, paths are kept open and visible, access is concentrated, and protective facilities such as night pens, fencing, or guarding points support livestock safety. Managed open sections apply to negotiated co-use areas. Human movement remains possible, but is narrowed and guided along a single legible path, while adjacent shrub or forest buffers provide retreat space for bears and wild grazers. These sections do not exclude either side, but spatially separate movements to reduce direct encounters.



Protected pastoral section



Managed open section

Path Regulation in Bear-sensitivity Interfaces

Habitat-sensitive path regulation applies where footpaths cross bear-sensitive areas during the grazing season. In summer foraging shrublands and L zone, low-disturbance sections remain accessible, but with reduced maintenance, narrow paths, limited stopping, and minimal facilities. They allow human passage while keeping disturbance low in foraging or transition areas. No-entry sections are applied to refuge areas and autumn hyperphagia forest zones during sensitive periods. These paths are seasonally closed or bypassed, allowing vegetation cover and quiet conditions to support undisturbed bear movement, resting, and feeding. In these areas, path management shifts from facilitating access to limiting disturbance.

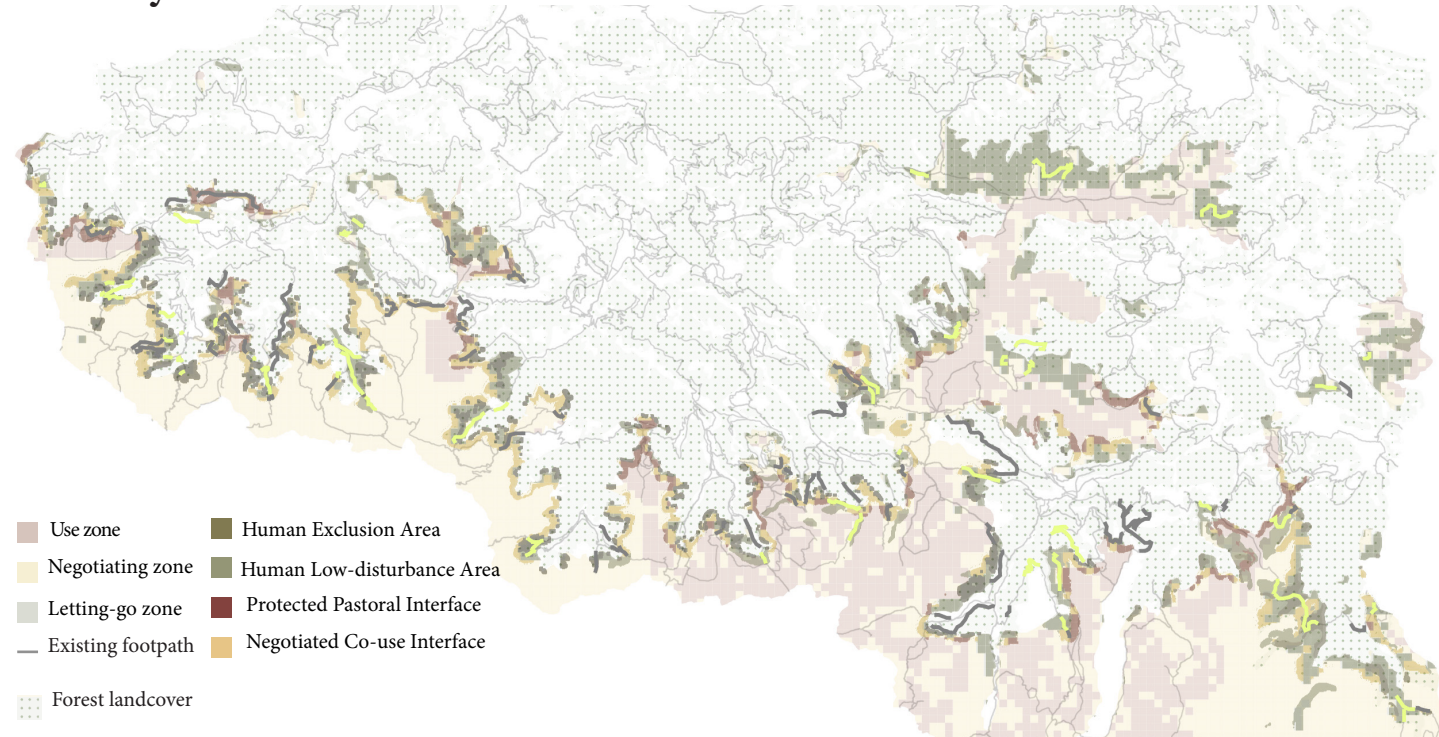
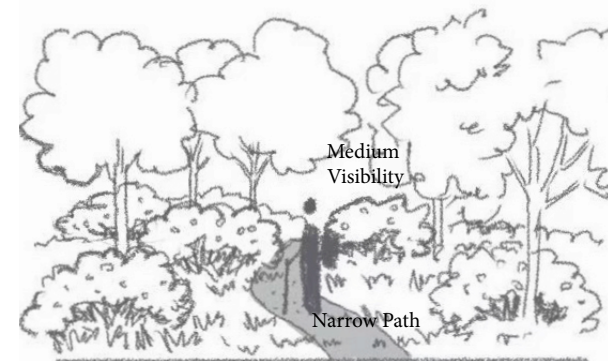
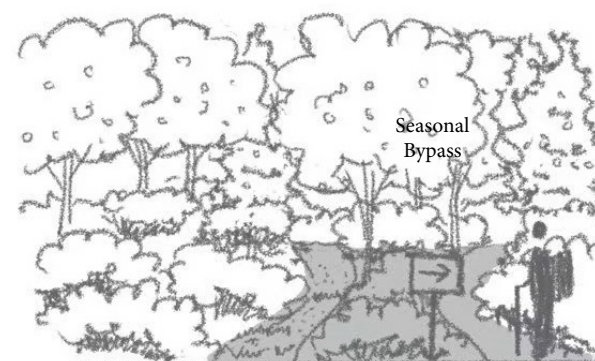


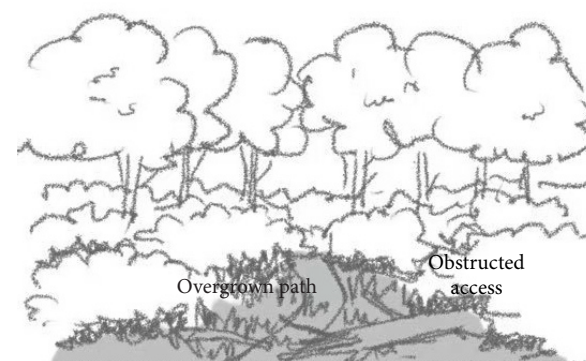
Fig5-28|Imaged by author.
Data Source: Footpath data from the Plan Départemental des Itinéraires de Promenade et de Randonnée (PDIPR), Conseil Départemental de l'Ariège; author's elaboration.



Low disturbance section



No entry section



Reconfigured Grazing Season Movement

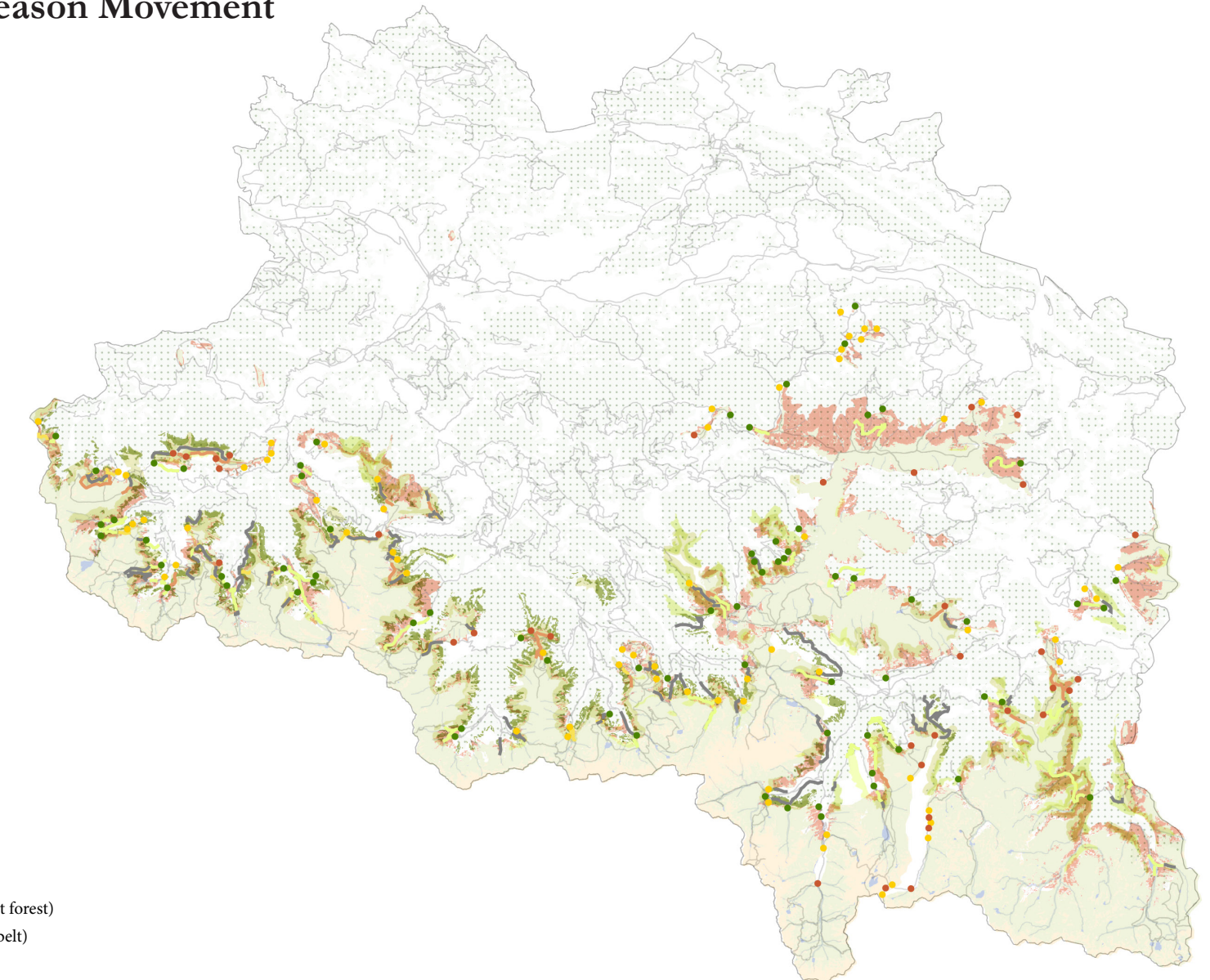


Fig5-29|Imaged by author.
Data Source: Copernicus Land Monitoring Service (Tree Cover Density), OCS GE, RPG; Footpath data from the Plan Départemental des Itinéraires de Promenade et de Randonnée (PDIPR), Conseil Départemental de l'Ariège; author's elaboration.

Movement regulation combines access reconfiguration, human-managed path sections, and habitat-sensitive seasonal restrictions. Pastoral entry is concentrated where grazing remains necessary, dual-layer access separates human and wildlife movement, and sensitive bear habitats receive low-disturbance or no-entry rules. Together, these actions redistribute movement across the pasture-forest mosaic and create the basis for enhanced ecological connectivity.

Multi-species functional movement corridors

Before Movement Reconfiguration



After

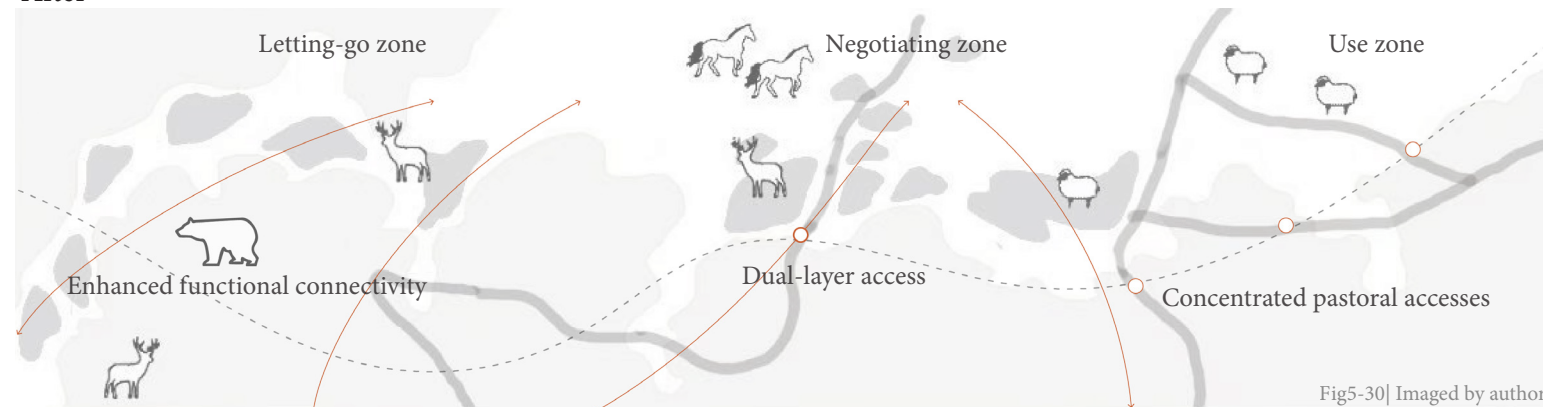
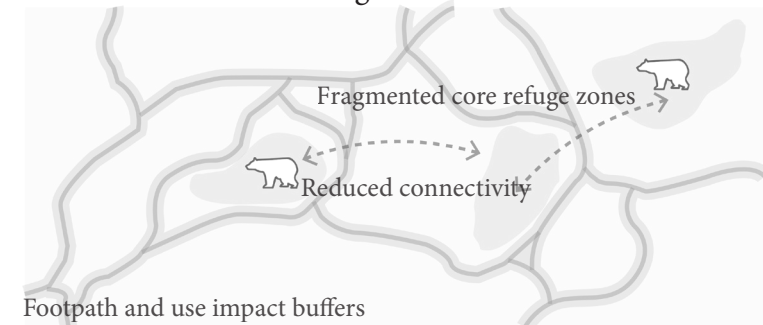


Fig5-30| Imaged by author.

Enhanced ecological connectivity

Before Movement Reconfiguration



After

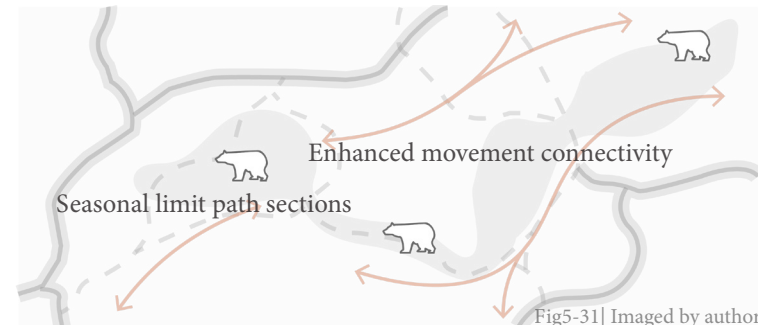


Fig5-31| Imaged by author.

Enhanced Multi-species Movement Connectivity through Movement Reconfiguration

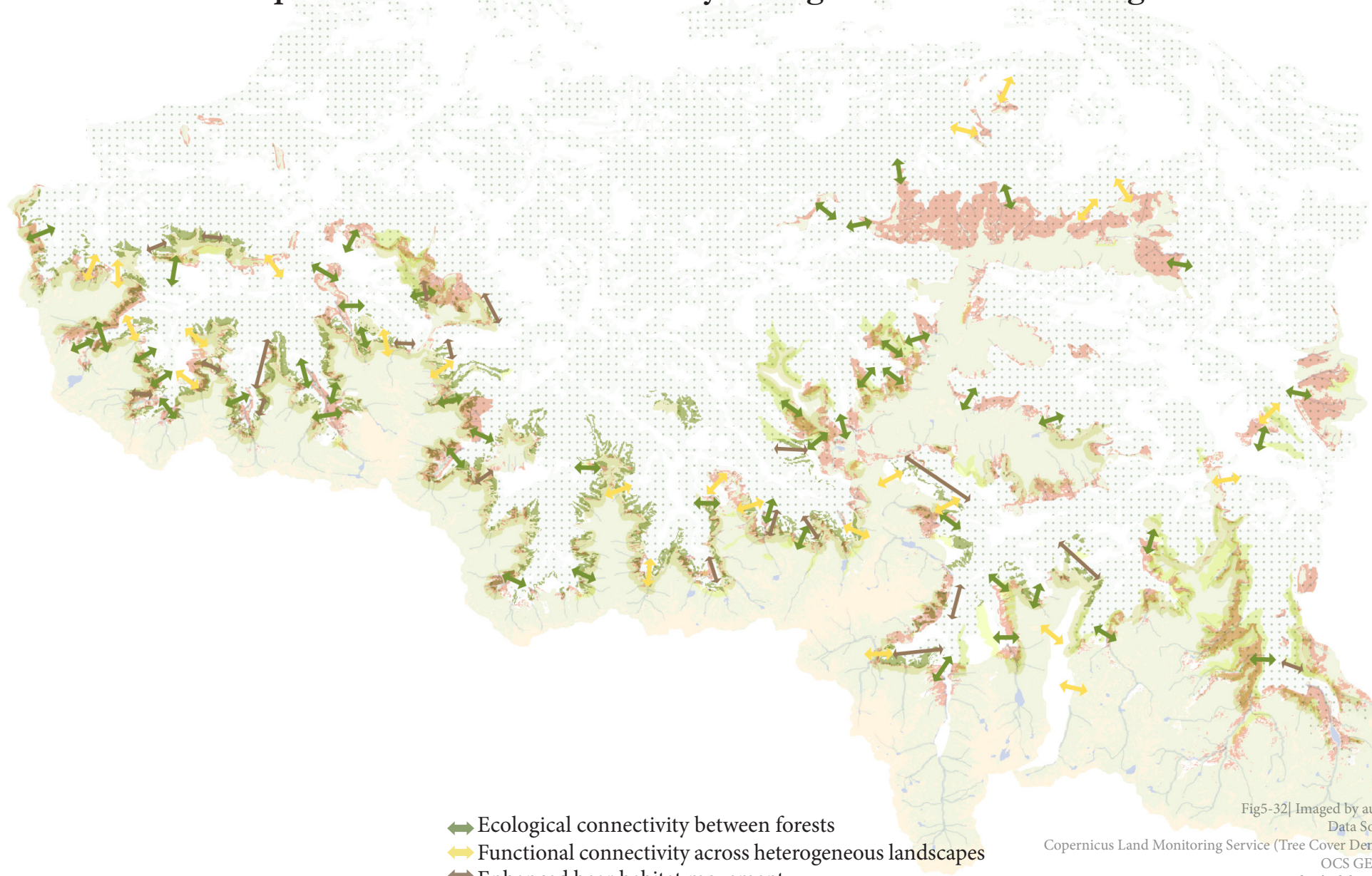


Fig5-32| Imaged by author.

Data Source:
Copernicus Land Monitoring Service (Tree Cover Density),
OCS GE, RPG
author's elaboration.

Reconfigured access enhances ecological connectivity at three levels. First, functional connectivity across heterogeneous landscapes is improved as pastoral-priority, dual-layer, and withdrawing access redistribute movement between open pasture, shrubland, and forest edges. Second, forest-to-forest connectivity is strengthened as reduced maintenance and quieter interface sections reconnect forest patches inside and outside the summer pasture system. Third, bear habitat movement connectivity is improved through seasonal no-entry sections and low-disturbance paths, reducing interruption within refuge, foraging, and passage areas. Together, these strategies do not simply restrict human access; they reorganise movement so that pastoral herds, wild grazers, and bears can use the mosaic with fewer direct conflicts.

Enhancing ecological connectivity does not directly restore open mountain pastures, but reactivates the underlying ecological processes that sustain them. By enabling continuous movement of herbivores and predators, it supports grazing, disturbance, and nutrient cycling, which together limit woody encroachment and maintain the dynamic grassland–forest mosaic characteristic of the OMP system.

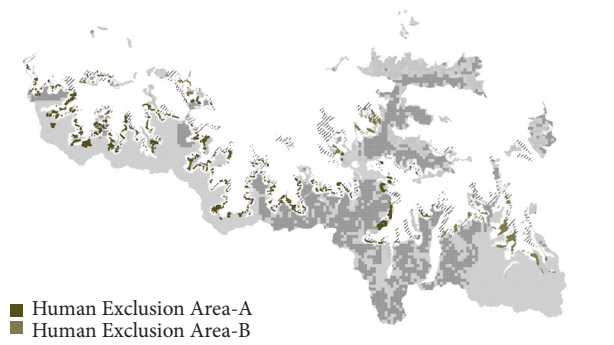
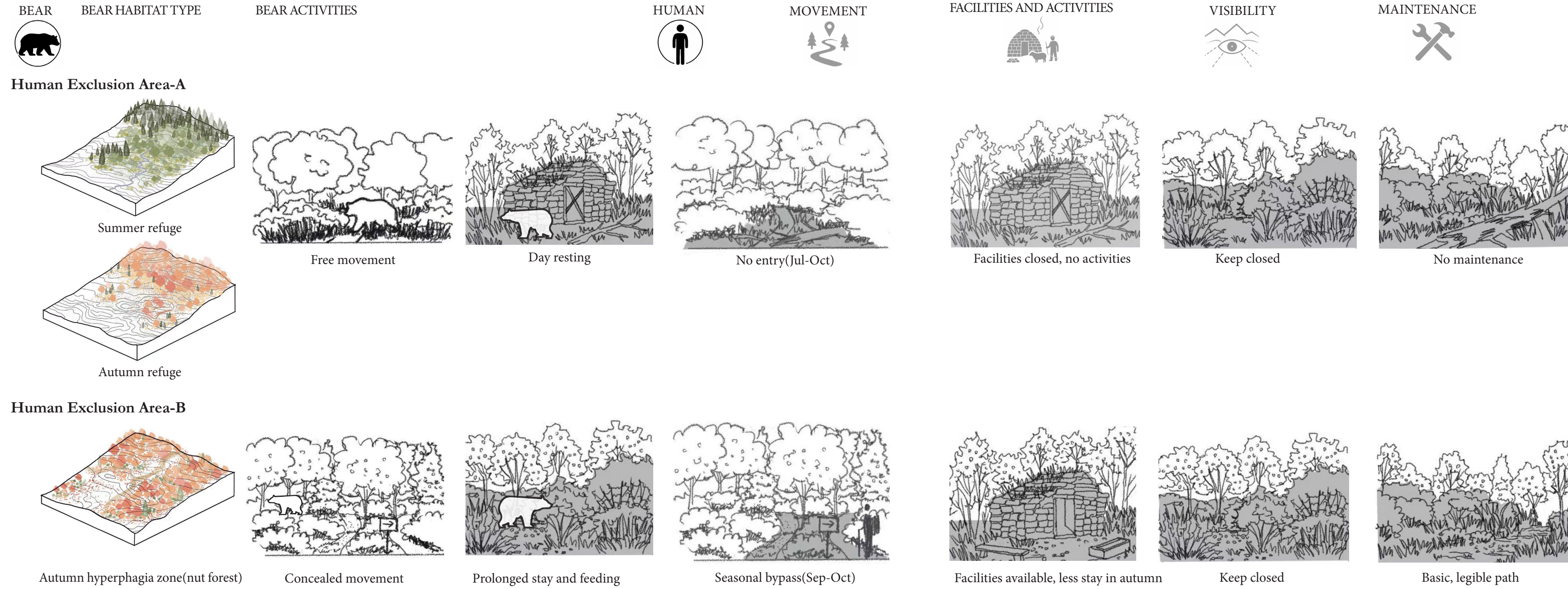


Fig5-33| Human Exclusion Area Distribution. Imaged by author.

Human Exclusion areas are bear-sensitive interfaces where human presence is temporarily or seasonally reduced to secure undisturbed habitat conditions. In core refuge areas, access is removed during sensitive periods so that bears can rest, hide, and move with minimal interference; existing facilities are closed, maintenance is withdrawn, and natural succession is encouraged to strengthen continuous cover. In autumn hyperphagia areas, especially nut forests, access is seasonally restricted during intensive feeding periods, while paths and facilities remain only minimally maintained for legibility and future use. Rather than implying permanent exclusion everywhere, this typology uses temporal withdrawal to protect crucial resting, movement, and feeding conditions while allowing shared use outside sensitive periods.

Fig5-34| Human Exclusion Area. Imaged by author.

V.Coexistence with Bears| From Confrontation to Coexistence
Bear-Sensitivity Interfaces: Human Low-disturbance Area

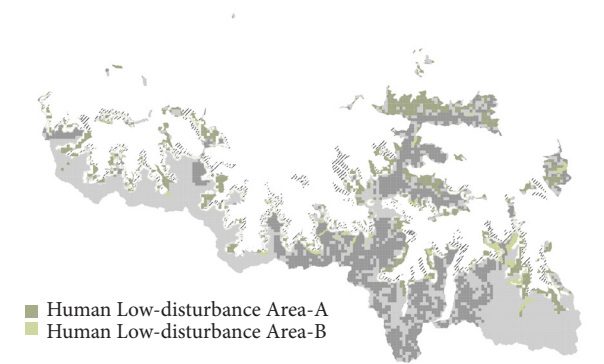


Fig5-35| Human Low-disturbance Area Distribution. Imaged by author.

Human Low-disturbance Areas are bear-sensitive interfaces where human presence is allowed only at a reduced intensity, while pastoral use and heavy maintenance are withdrawn. This typology applies to non-critical summer foraging areas such as berry belts, and to Letting-go zones where natural succession is encouraged. Bears may use these spaces for concealed movement, dispersed foraging, exploration, and short stays, while humans are guided to pass through or rest briefly without creating strong disturbance. Paths remain narrow and legible but are not upgraded; facilities are lightweight, temporary, or reused from existing structures; visibility is partial or closed rather than fully cleared. In this way, the area can support low-impact visiting, monitoring, and ecological interpretation, while maintaining vegetation cover, retreat space, and potential bear activity.

Fig5-36| Human Low-disturbance Area. Imaged by author.

V.Coexistence with Bears | From Confrontation to Coexistence
Human-Managed Interfaces: Protected Pastoral Interface

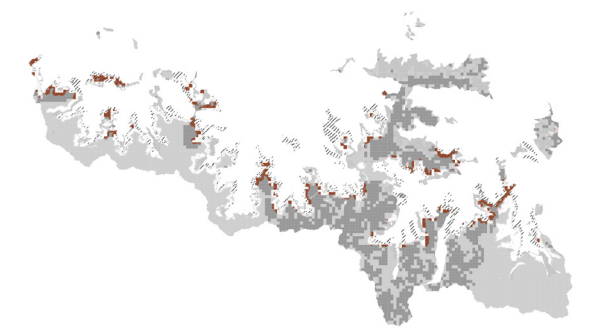
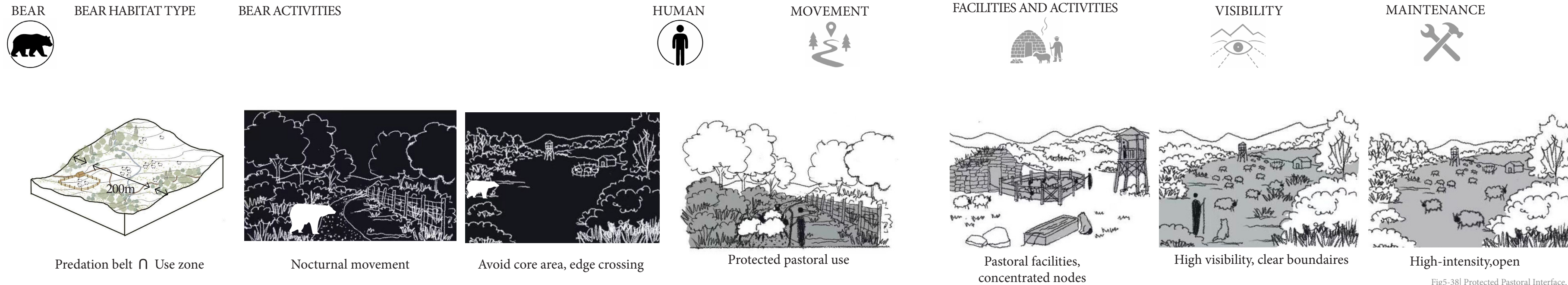


Fig5-37| Protected Pastoral Interface Distribution. Imaged by author.

Protected Pastoral Interfaces prioritise pastoral use while managing bear-related risk in predation belts where grazing and livestock facilities remain necessary. Movement is concentrated along clear paths and protected nodes such as night enclosures, water points, and guarding areas. Vegetation is managed for visibility, reducing unexpected encounters. Bears may still pass through at night or along forest edges.

Human-Managed Interfaces: Negotiated Co-use Interface

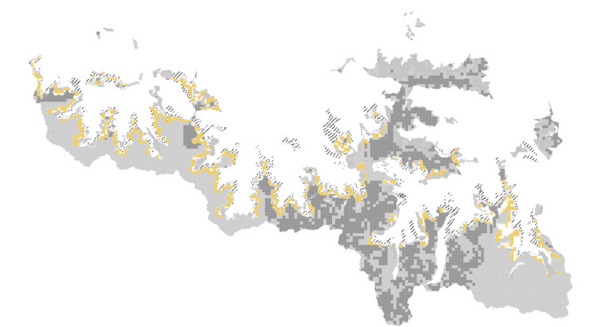
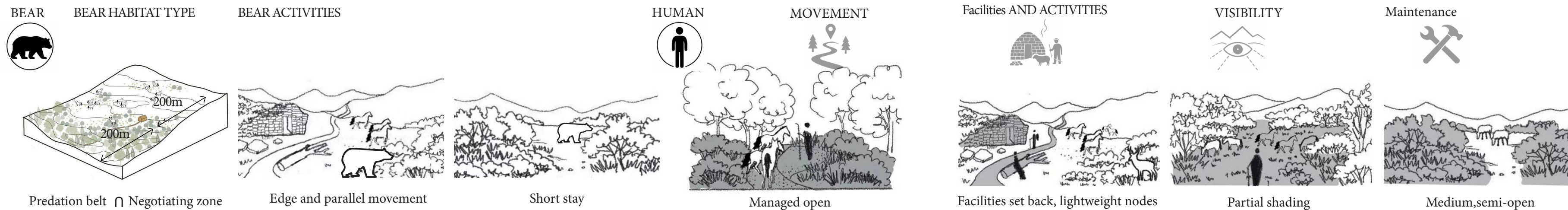


Fig5-39| Negotiated Co-use Interface Distribution. Imaged by author.

Negotiated Co-use Interfaces coordinate pastoral use, human movement, and bear activity without full exclusion. They occur in predation belts within Negotiating zones, where neither pastoral dominance nor withdrawal is appropriate. Human movement follows low-intensity paths, while shrub belts and forest edges provide concealed wildlife routes. Lightweight facilities and spatial buffering allow parallel movement with reduced disturbance.

Fig5-40| Negotiated Co-use Interface. Imaged by author.

VI.Human as Cohabitants|Intervention Area
Chapter VI: Human as Cohabitants



This chapter translates the territorial strategies of dynamic zoning and coexistence interfaces into actor-based spatial interventions. It distinguishes shepherds, wildlife protectors, and visitors as different cohabitants of the rewilded pasture mosaic. Each group relates to the transforming landscape through different routines, attachments, and expectations. The chapter therefore takes the site The Pastoral Mosaic of Pic des Trois Seigneurs to test how cohabitation can become legible, usable, and maintainable at the scale of routes, edges, and nodes. Through three paths, the design explores how pastoral practice, wildlife monitoring, and public experience can be repositioned within the rewilded landscape.



Fig6-1| Land Art:Turning Inward
Imaged by author.

The Pastoral Mosaic of Pic des Trois Seigneurs

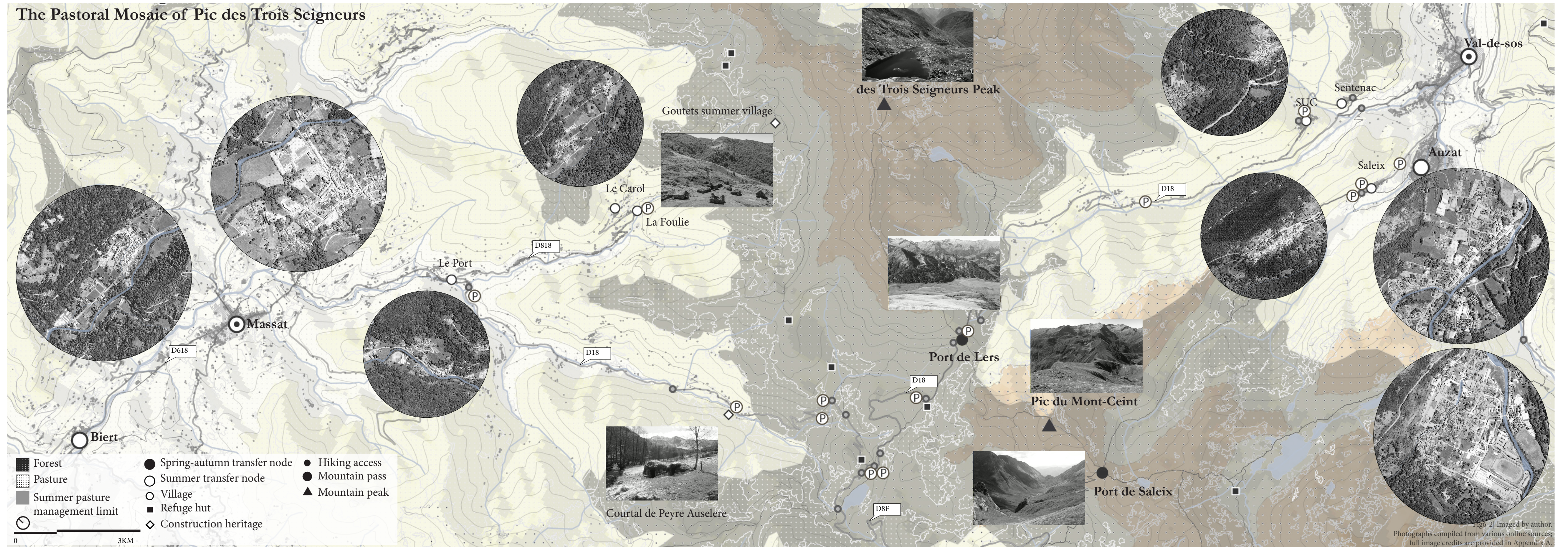


Fig. 2 | Imaged by author. Photographs compiled from various online sources; full image credits are provided in Appendix A.

The Location of Pastoral Mosaic of Pic des Trois Seigneurs

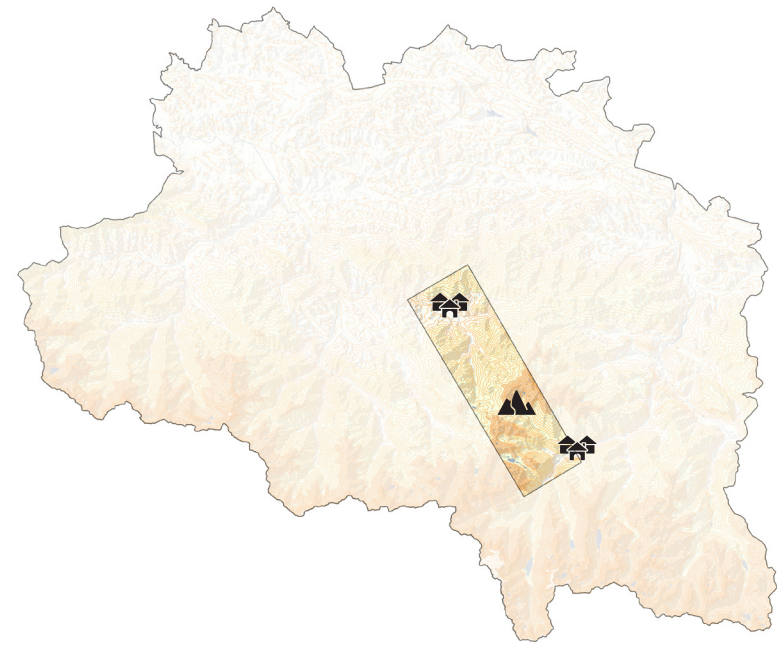


Fig6-3| Imaged by author.

From Open Mountain Pasture to Valleys on both sides

The Pastoral Mosaic of Pic des Trois Seigneurs is selected because it brings the main tensions of the project together within one readable landscape. It is located at a lower and more transitional part of the summer pasture system, where forest habitats, shrub succession, and open pasture edges meet. This makes it a front line of natural re-growth, rather than a remote high alpine pasture only.

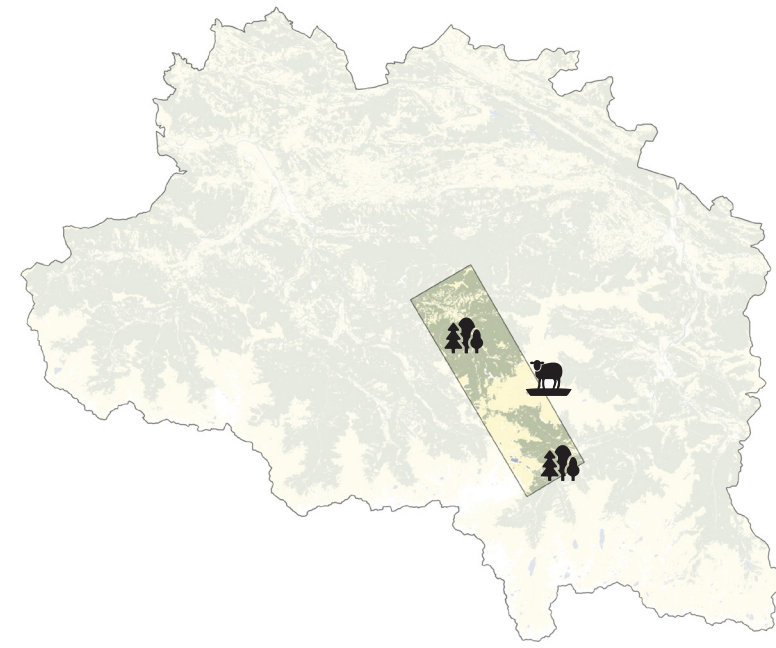


Fig6-4| Imaged by author.

Forest–pasture succession transition

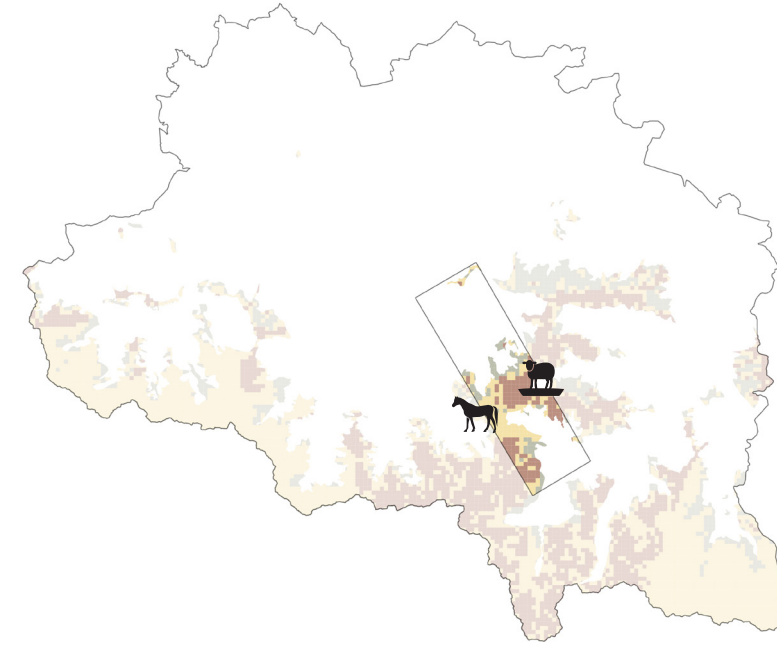


Fig6-5| Imaged by author.

Bear activity overlap with new summer pasture dynamic zoning

The area also lies within the wider brown bear activity landscape around Auzat and Val-de-Sos. When the dynamic zoning is compared with the confrontation interface mapping, the site shows a strong overlap between summer pasture management, bear habitat, human access, and forest–pasture edges. It is therefore suitable for testing how confrontation can be translated into coexistence interfaces.

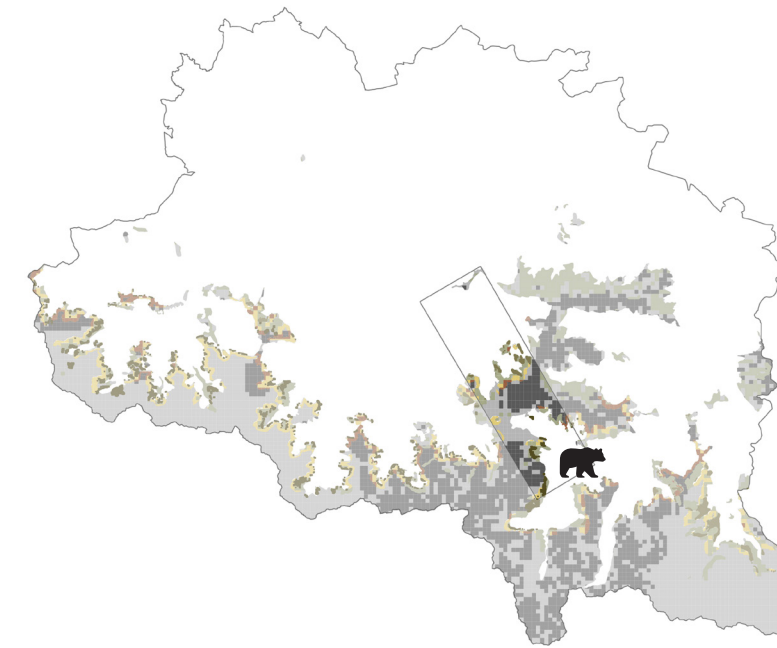


Fig6-6| Imaged by author.

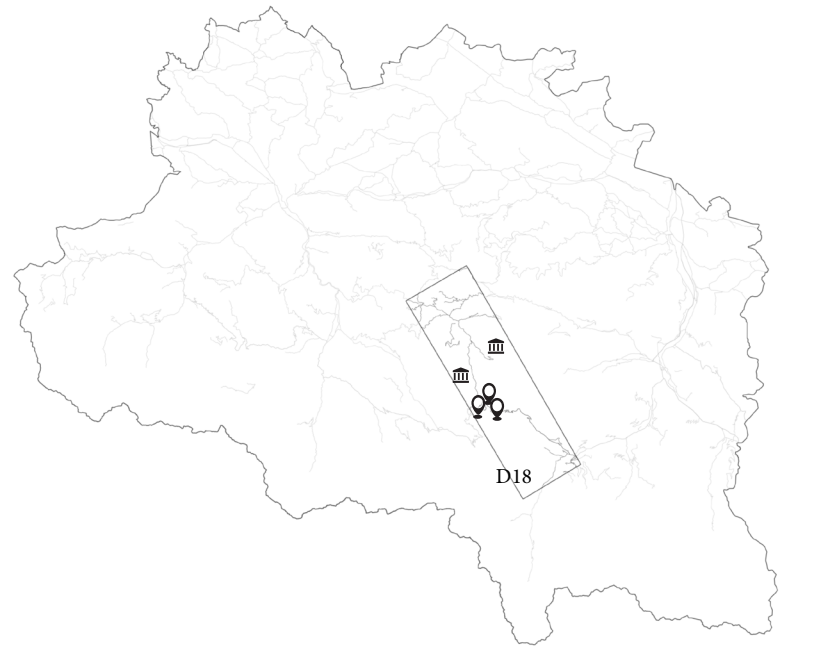


Fig6-7| Imaged by author.

Pastoral construction legacies and visitor access via D18

At the same time, the area contains visible pastoral relics, such as Peyre Auselère and Goutets. These abandoned or partly reused summer pasture structures make the decline of former pastoral occupation tangible. Along the D18, Étang de Lers and Port de Lers also bring visitors, access points, and public experience into the same landscape. For this reason, the site allows the project to test three actor-based paths together: shepherds, wildlife protectors, and visitors.

Two Valleys, the Rite and the Routine

Existing Pastoral Units, Routes and Actors' Activities

The Pic des Trois Seigneurs massif is encircled by four distinct shepherd ascent routes, each leading to a different summer pasture and operating under a different institutional structure. Two routes climb from the Arac valley on the northwest (A.Biert-Goutets, B.Massat-Peyre Auselère) and feed into the cross-commune AFP Massat-Le Port; two ascend from the Vicdessos valley on the southeast (C.Suc-Pic de Girantes North Slope, D.Saleix-Port de Saleix) and still feed into many local pastoral groups. Together they reveal a single massif staging two contrasting pastoral cultures, one of which is mediatised, ritualised, and tourism-oriented; the other quiet, quotidian, and economically rooted in the autumn fair.

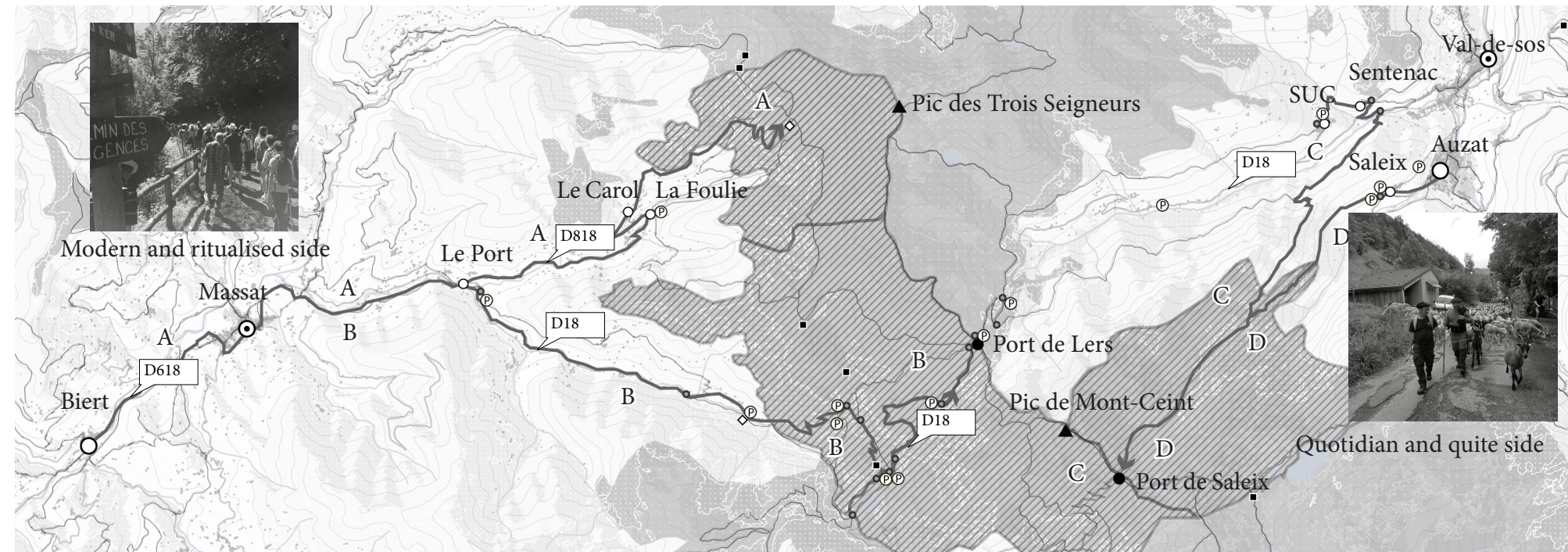


Fig 6-8| Existing pastoral units and routes.
Imaged by author.

Fig 6-9| Transhumance festival in Biert,
Ariège, France.
Imaged by Bénédicte Taurine (2019).

Fig 6-10| Transhumance in Saleix,
Ariège, France.
Imaged by DDM – A.B., via La Dépêche du Midi (2025)

Imaged by DDM – A.B., via La Dépêche du Midi (2025)

A.Heritage-Tourism Festival Route

Biert-Goutets Pasture

A three-day seasonal grazing festival is held annually in the Massat region along this migration route. During the festival, the entire procession walks on foot from Biert to Goutets pasture. The herds gather at Biert's town square, where a blessing ceremony and departure ceremony are held around the church. They then ascend 11-12 kilometers along La Foulie and Le Carol to reach the partially restored summer village of Goutets pasture (elevation 1463 meters). The participating shepherds are all from the Couserans foothills and Ariège lowlands; there are no local residents. Finally, a hired shepherd remains at Goutets pasture to care for the herd throughout the season.

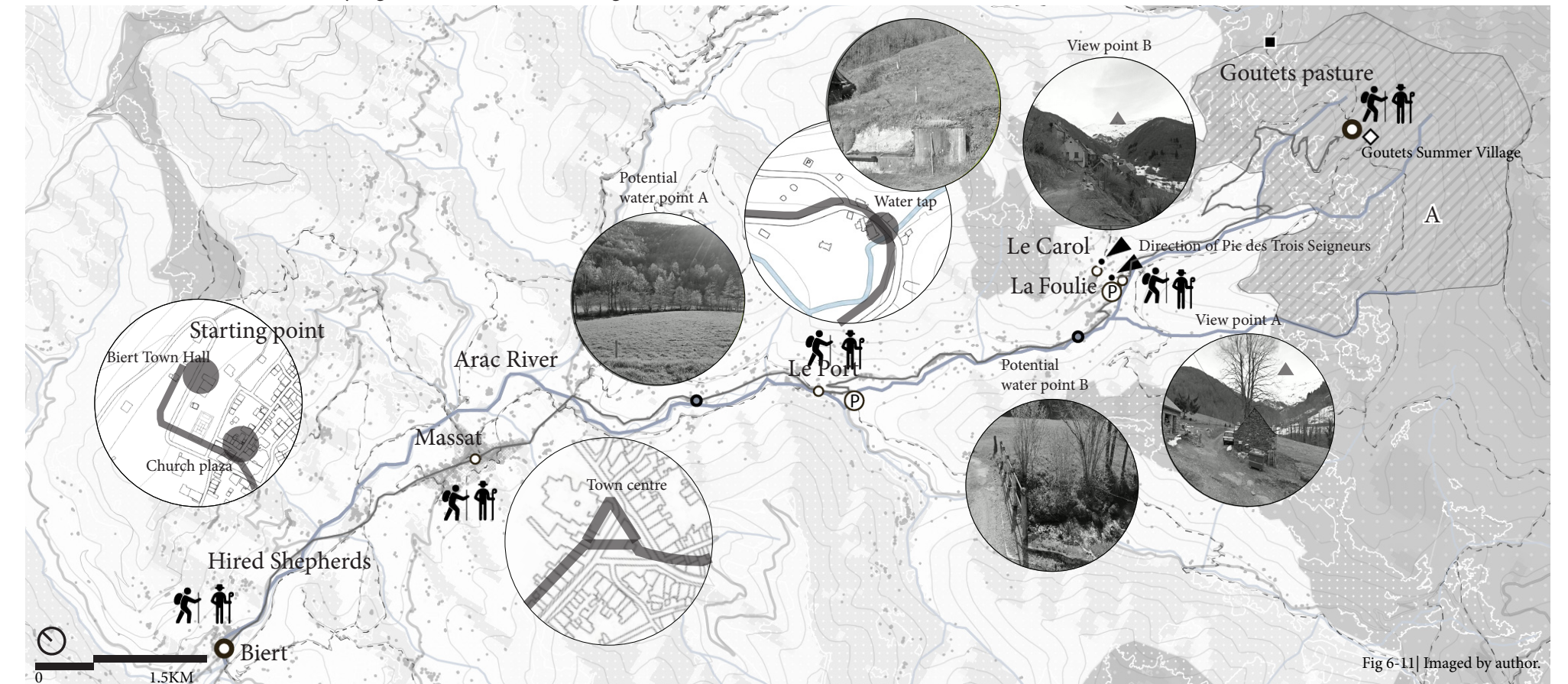
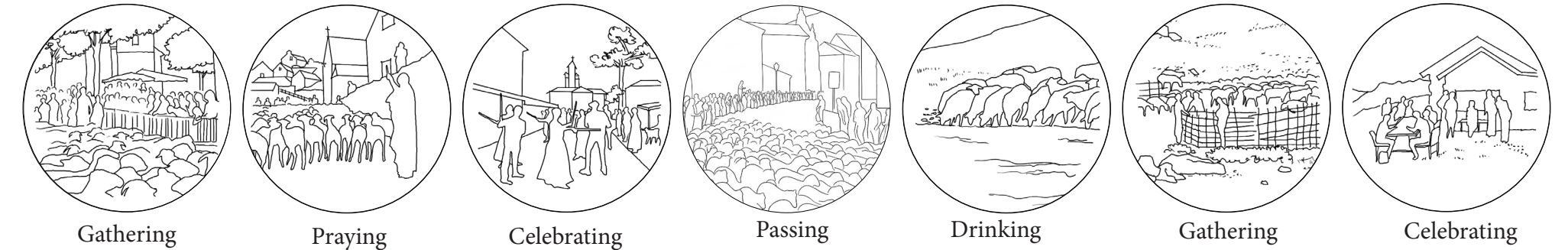
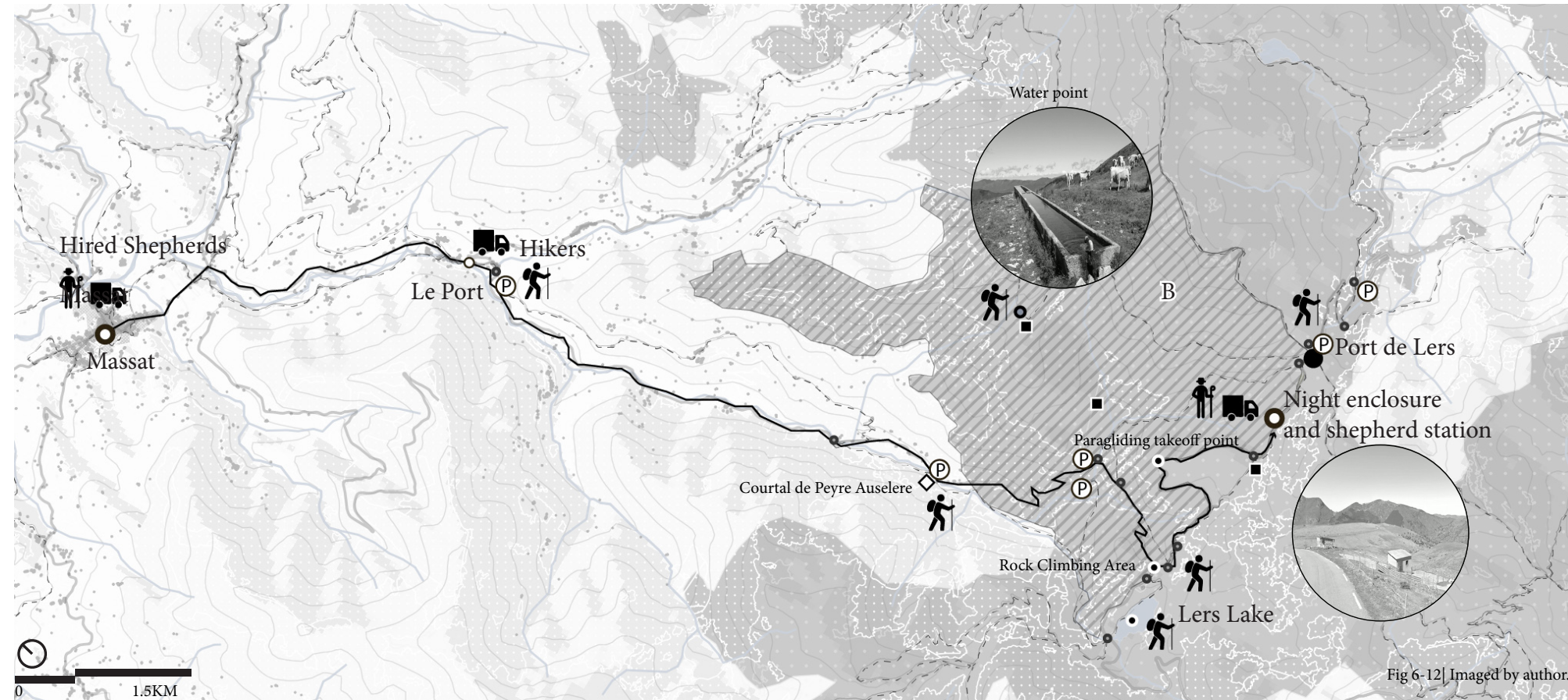


Fig 6-11| Imaged by author.

B.Truck-Borne Daily Practice Route

Massat -Peyre Auselère

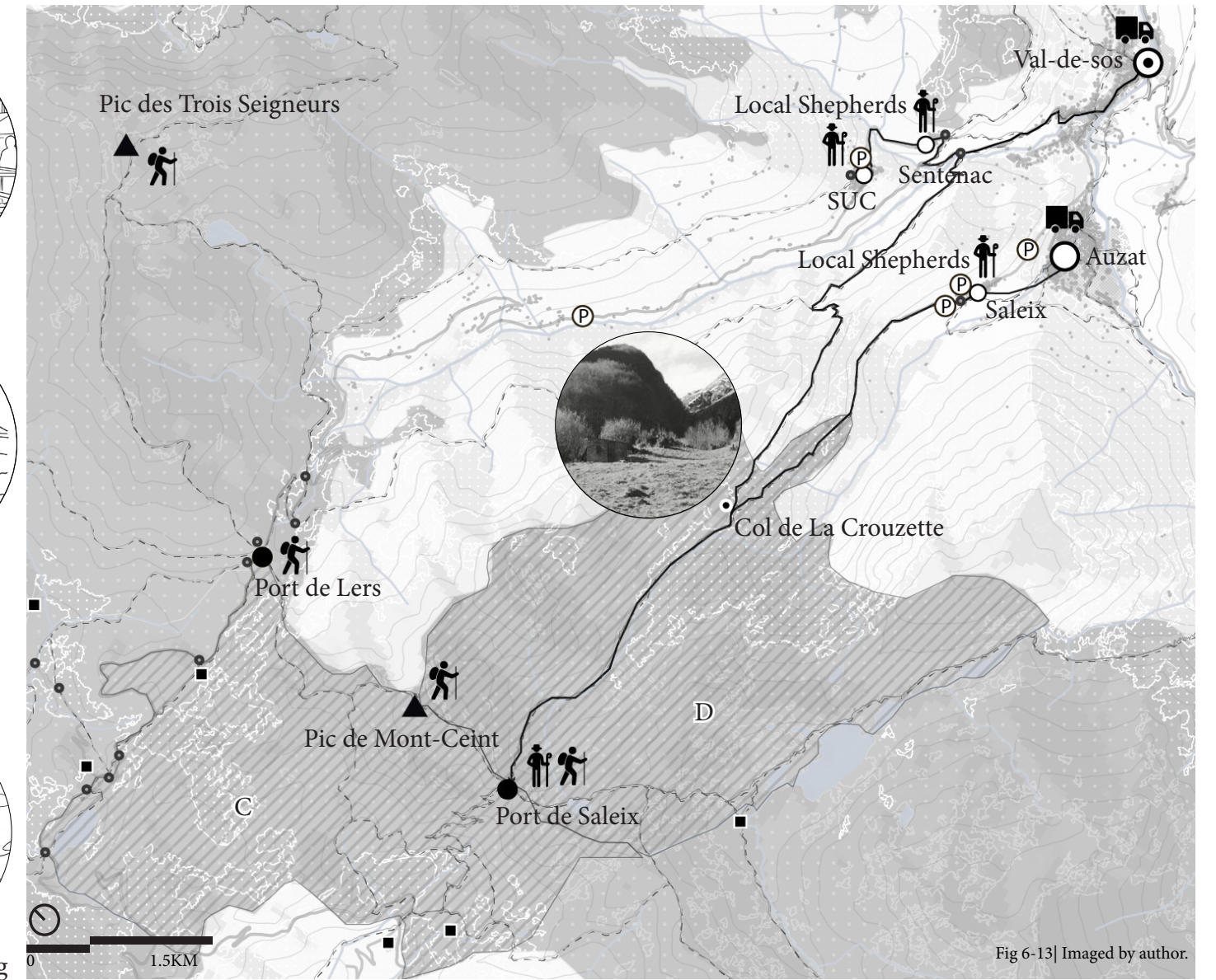
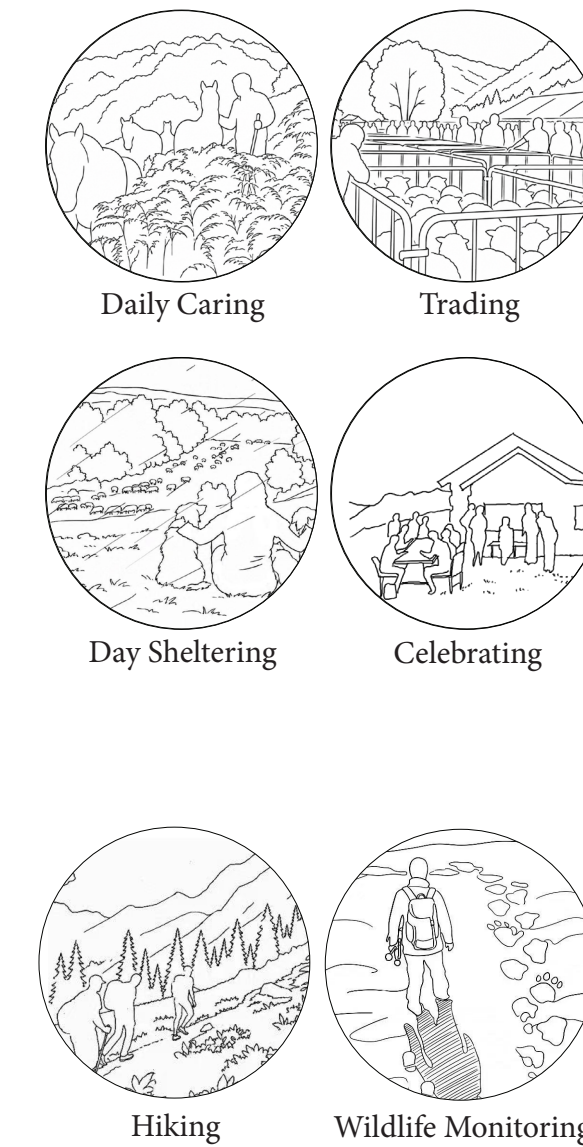
This is the daily operating route corresponding to the festival route. The other 29 shepherds registered with AFP Massat-Le Port also drive their livestock up along the D18 road. The pastures at the end of the transhumance route include the famous Port de lers and the entrances to numerous hiking trails, as well as the remains of summer pasture buildings, Peyre Auselere, creating a landscape where tourism and pastoral life overlap.



C&D.Quiet Daily Practice Routes

Auzat-Port de Saleix and Suc&Sentenac- Mont Ceint

On the Vicdessos side, shepherds manage the herds through daily commutes from their villages, while existing cabanes only serve as day-shelters. Livestock from the Vicdessos valley are trucked up to Saleix, Suc and Sentenac villages, where the on-foot ascent begins. In this quieter grazing rhythm, the famous GR10 long-distance trail crosses the Port de Saleix, where shepherds and hikers encounter incidentally. In September, the descended flocks of two routes converge at Auzat for a livestock fair held continuously since 1324. Besides, Auzat is one of the communes with the most frequent brown bear activity in the Ariège Pyrenees, where wildlife protectors carry out behavioural observation, sign tracking, and sample collection.



Rewilded Pic des Trois Seigneurs massif
 Pasture Mosaic, Coexistence Regulations and Design Site

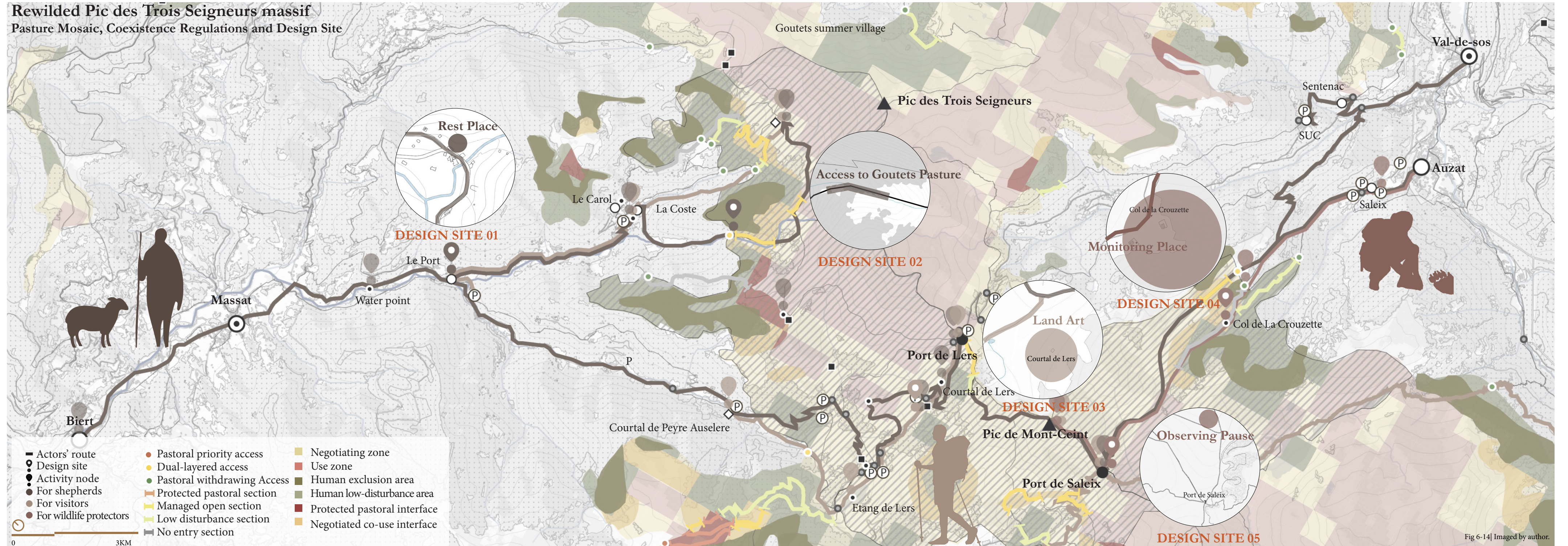
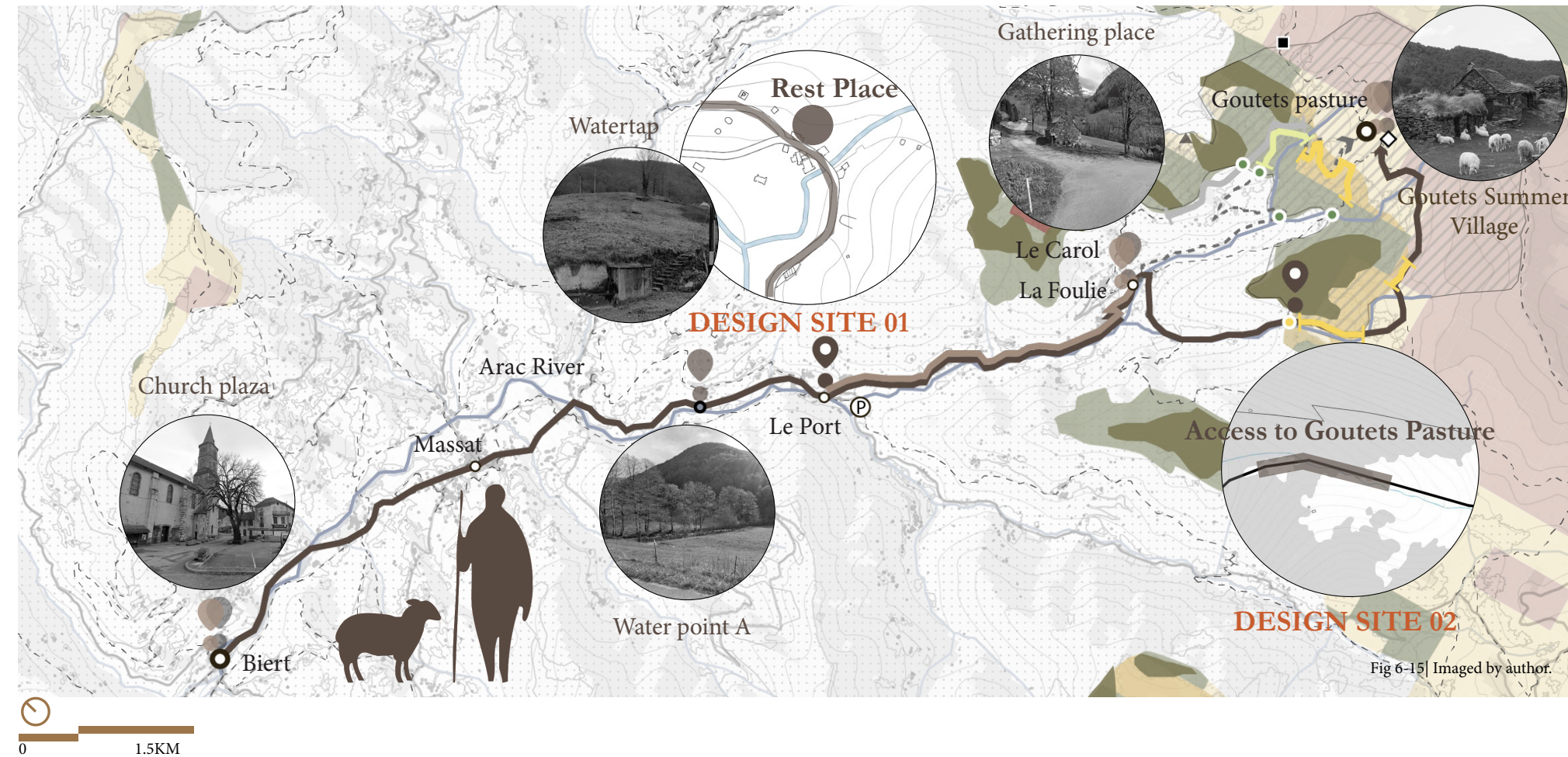


Fig 6-14| Imaged by author.

VI. Human as Cohabitants | For Shepherds— From River to Ridge: A Procession of the Rite
From River to Ridge: A Procession of the Rite
 Design Route and Nodes



Biert Church Plaza



Water point



Watertap place in Le Port Village



Final Passage into Forests



Goutets Summer Village Relics

The designed transhumant rite route balances shepherds' work and visitors' presence through a deliberate rhythm of gathering and separation of meeting, parting, meeting, walking together, parting again, and finally reuniting.

The procession begins at Biert church plaza, where shepherds and visitors gather for the ceremony marking the start of the transhumance. Shortly after, the two groups part: shepherds water the herds at the water point while visitors follow at their own pace. They meet again at Le Port, at the rest place beside the watertap plaza, to pause and converse before walking together to La Foulie parking area. Here, at the final passage, the shepherd stands on a raised stone to count the herds. The herds then enter the forest with the shepherds alone, crossing the dual-layered access toward Goutets pasture, where the procession reunites with the visitors in a closing celebration.

Fig 6-16| Biert church plaza.
 Adapted from Google Street View, accessed via Google Maps (May 2026)
 Fig 6-17| Watertap place in Le Port Village.
 Adapted from Google Street View, accessed via Google Maps (May 2026)
 Fig 6-18| Water point.
 Adapted from Google Street View, accessed via Google Maps (May 2026)
 Fig 6-19| Parking place at La Foulie
 Adapted from Google Street View, accessed via Google Maps (May 2026)
 Fig 6-20| View Goutets summer village relics.
 Adapted from AFP Massat–Le Port (n.d.).

The body's perception

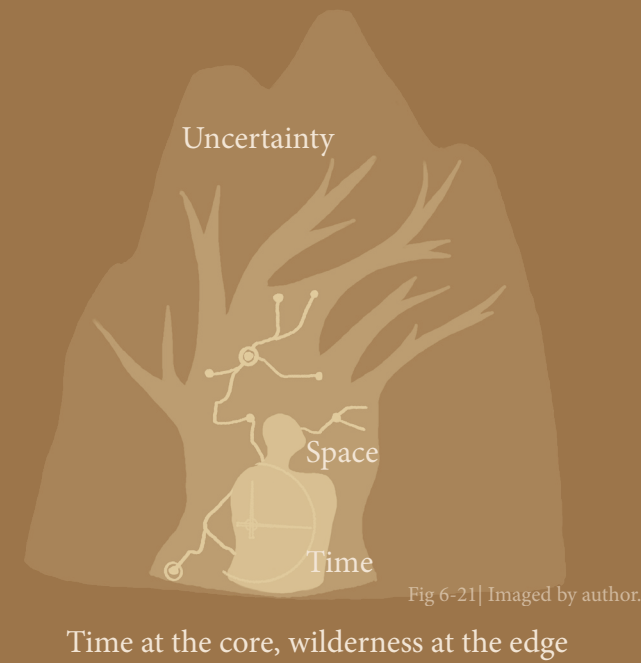


Fig 6-21| Imaged by author.

Routes and nodes as sheathing

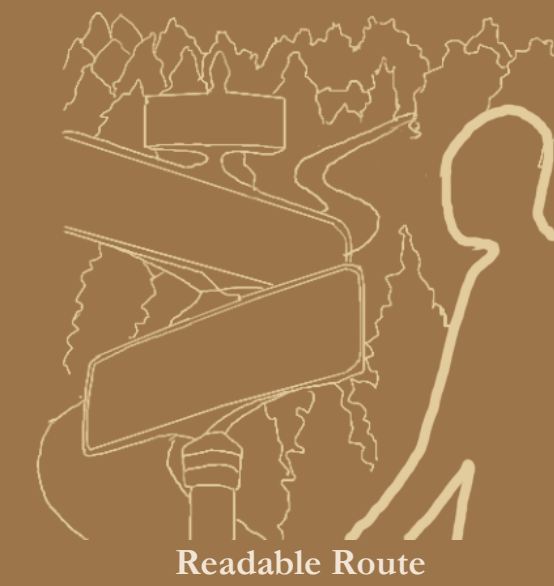


Fig 6-22| Imaged by author.

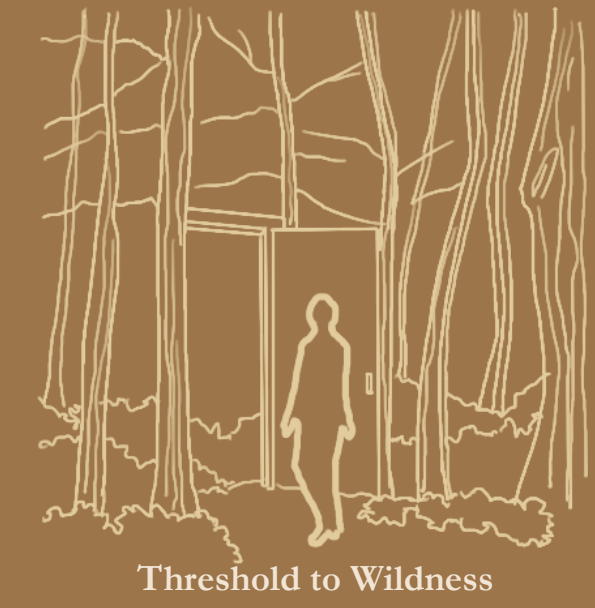
Strategies



Existing nodes are reused as familiar grounds where people gather, rest, care for herds, and reconnect the route with local memory.



Wayfinding signs and repeated route markers turn the transhumant path into a readable procession, linking village, water point, forest edge, and summer pasture.



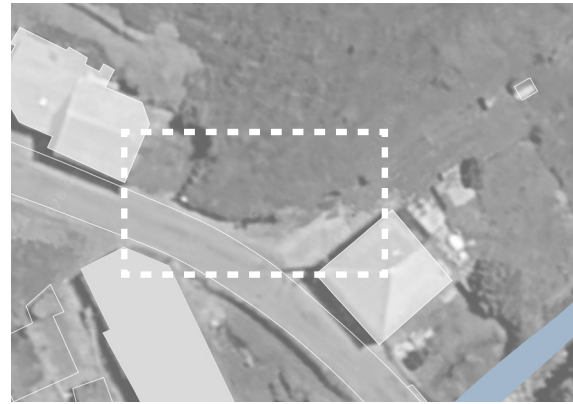
The markers, vegetation, path width and pavement together form the threshold, prepare shepherds for entering a less controlled landscape, where pastoral movement meets wildness.

Fig 6-23| Imaged by author.

Design Site 01
Rest Place



Site Location



Existing Condition



Fig 6-24 | Designed rest place plan.
Imaged by author.



Fig 6-25 | Rest place after design.
Imaged by author.

- 100–150 mm Topsoil
- Existing Slope
- Through stone
- 200–300 mm Backfill
- Timber Seat Plank
- Geotextile filter fabric
- 30–100 mm Hearting stones
- Pinning stones

- 50–75 mm weep gap at base
- Large Foundation Stones
- Stable Bearing Ground

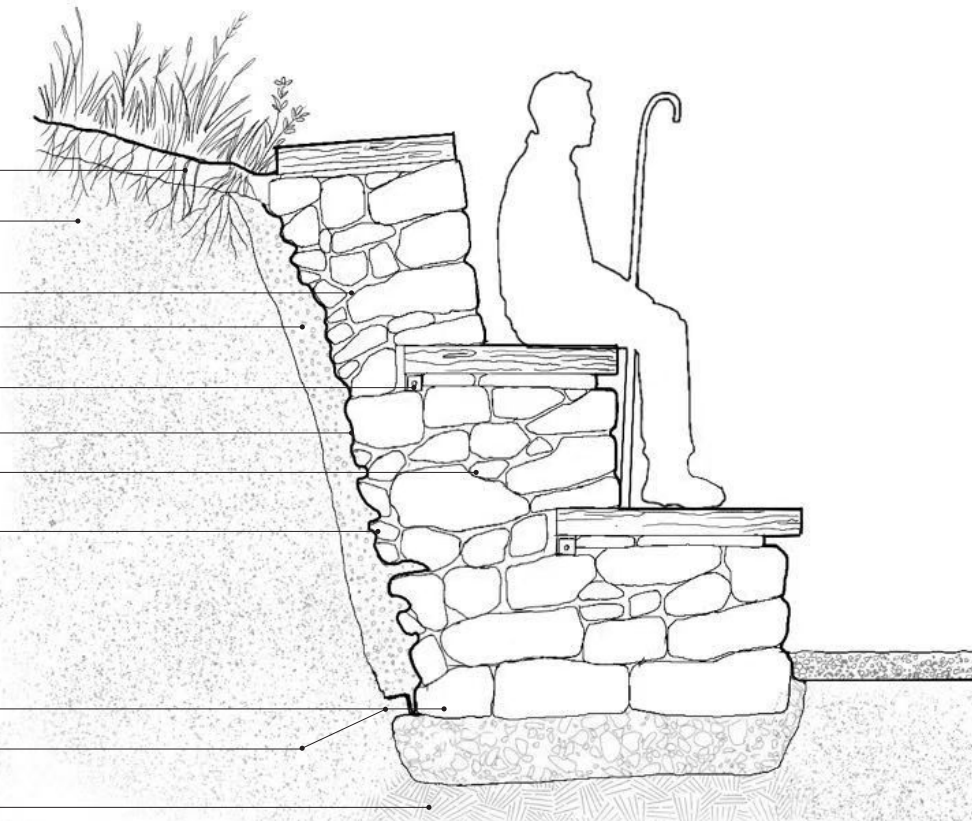
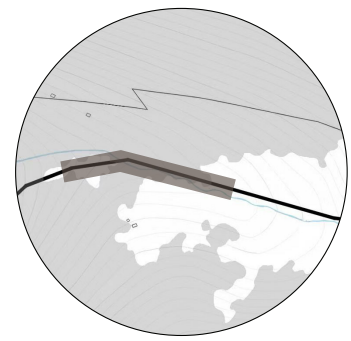
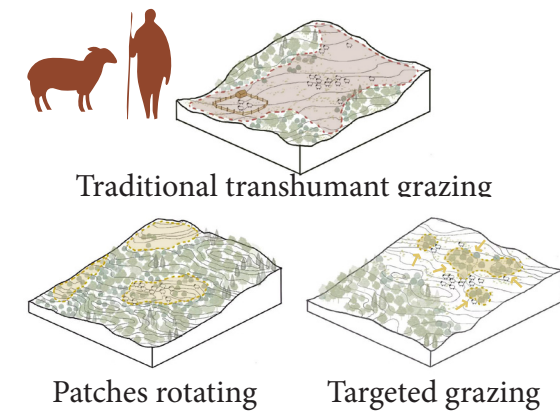


Fig 6-26 | Details of rest staircase.
Imaged by author.

Design Site 02
Access to Goutets Pasture



Zoning Interventions



Confrontation Interface

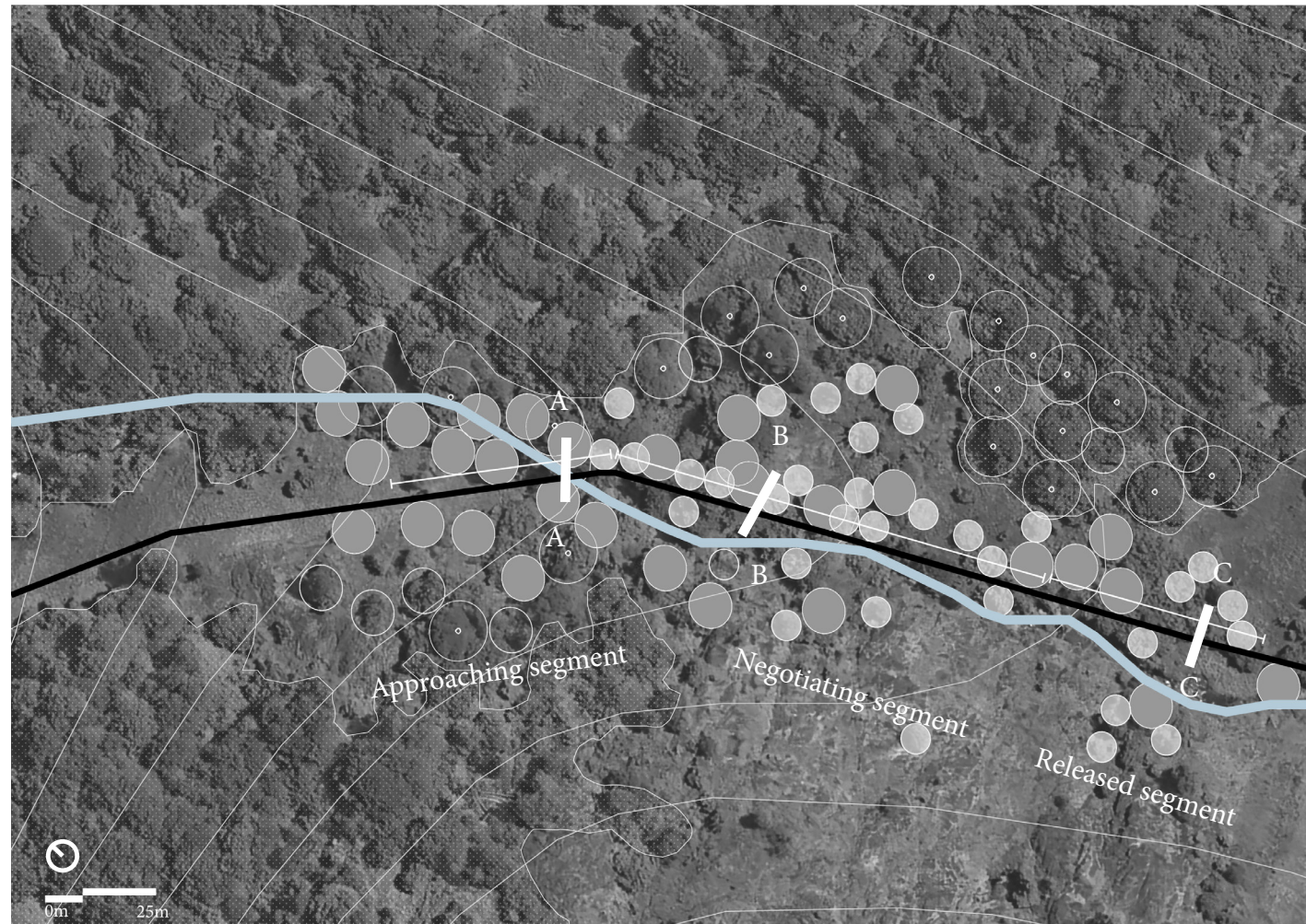
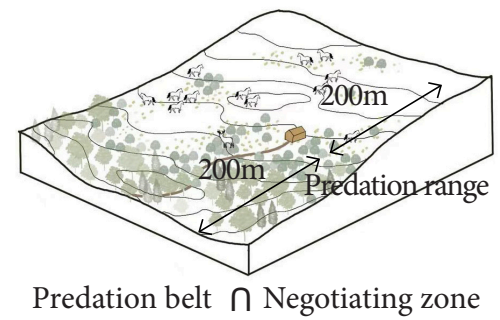
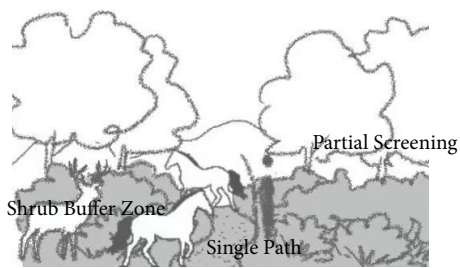
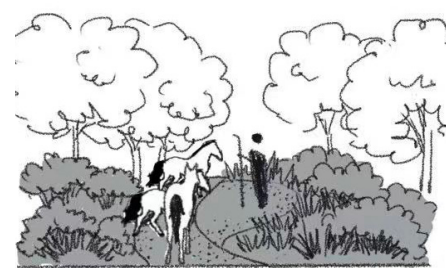


Fig 6-27 | Plan of the design segment of dual-layered access. Imaged by author.



Dual-layered access



Managed open

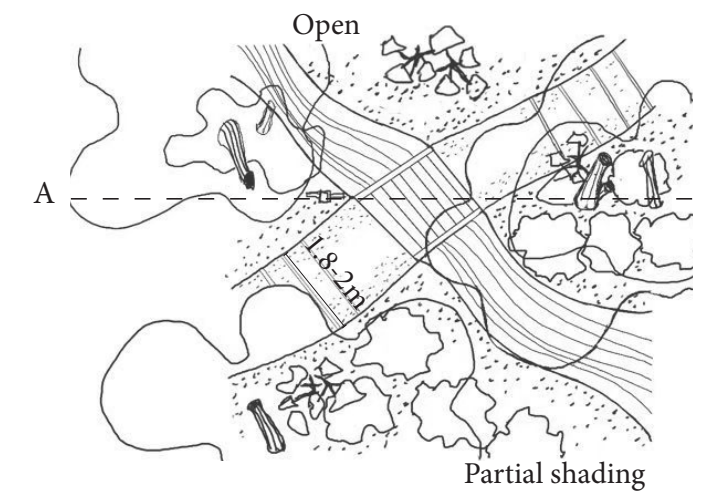
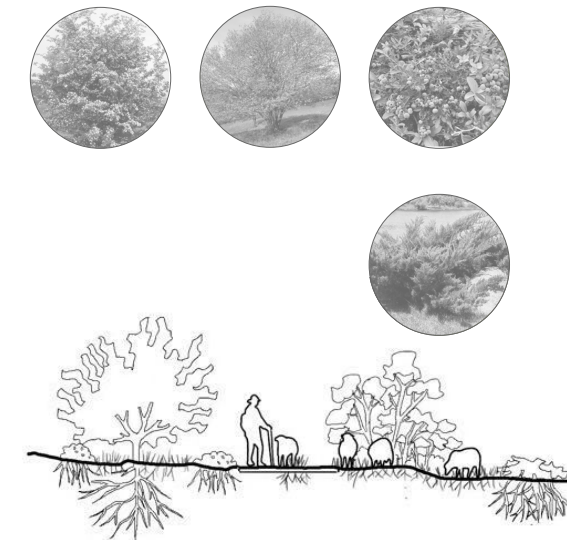


Partial shading

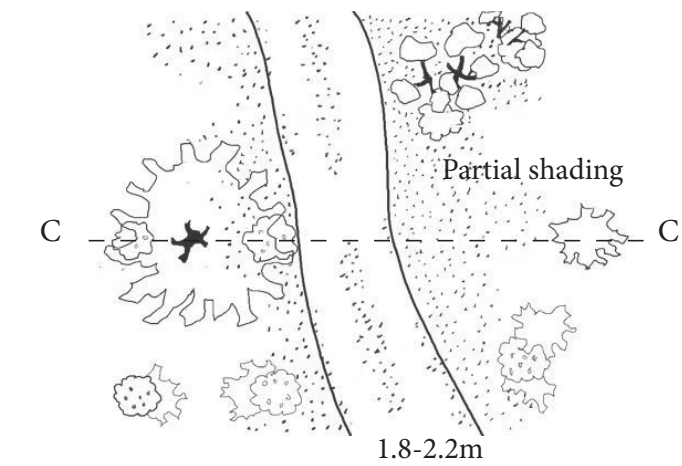
Approaching Segment



Released Segment



Partial shading



Partial shading

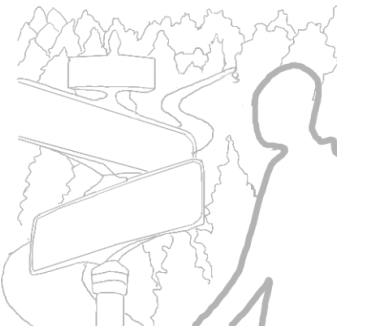


Fig 6-28 | Imaged by author. 125

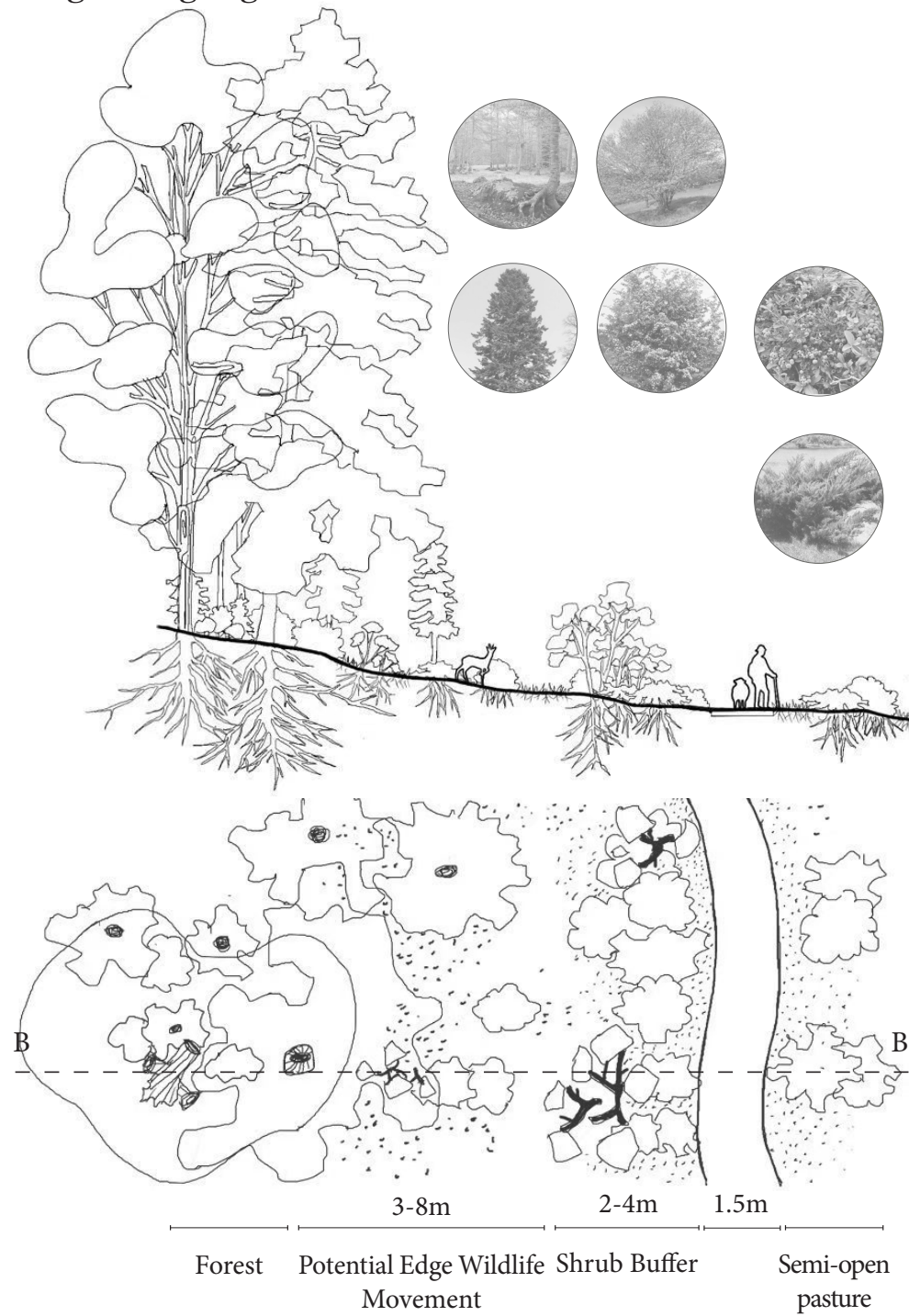


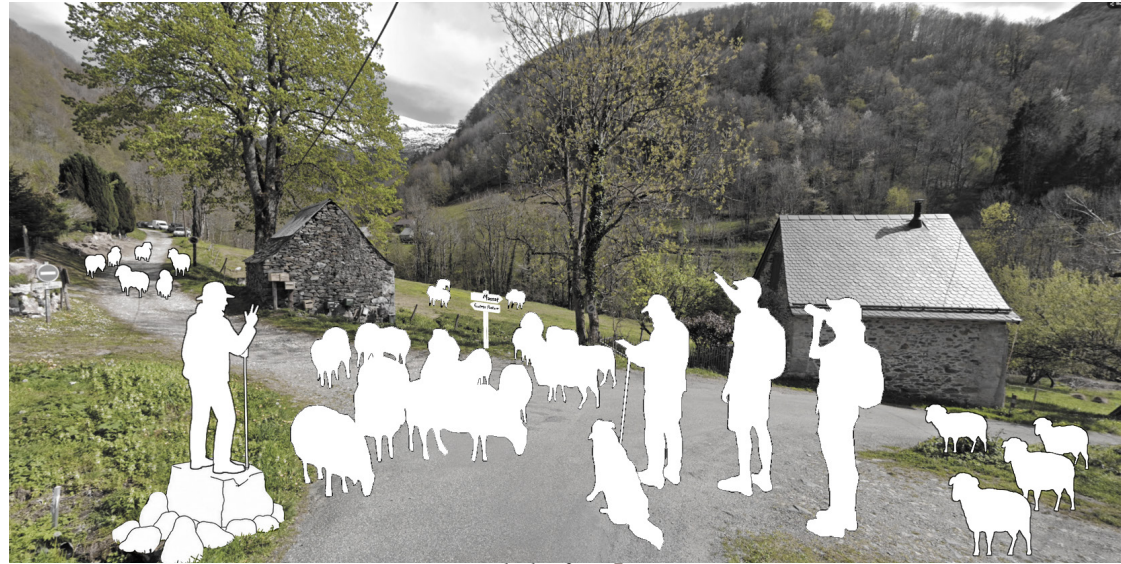
Fig 6-29 |Imaged by author.



Fig 6-30 |Imaged by author.



Departure from Biert Church Plaza



Counting Herds before Entering Forests



Walking Threshold to Summer Pasture



Caring Herds at Water Point



Half-way Rest at Le Port Village



Arriving at Goutets Summer Village Relics

VI.Human as Cohabitants| For Wildlife Protectors — From Threshold to Pass: A Path of Watch
From Threshold to Pass: A Path of Watch
 Design Route and Nodes



Wildlife protectors begin their route at the parking lot at the entrance of Saleix. From here, they walk along the monitoring routes ascending into the forest, sharing the path with the shepherds' transhumant route until the intersection where the paths diverge toward different parts of the summer pasture. At this point, the pastoral withdrawal access restricts entry to human-exclusion areas, accessible only to rangers and wildlife protectors during the grazing season. A restricted-access sign hangs on the abandoned barn nearby, marking the threshold for visitors. Continuing alone, the wildlife protectors walk to the Col de la Crouzette, the monitoring place where the cabane gathering, working trails, secondary branches, wayfinding cairns, and a forest clearing platform together form a network for solitary fieldwork. The route then leads to Port de Saleix: a wildlife corridor with broad views, where a designed observation pause is built into the surviving walls of a former refuge. This shelter is also open to visitors and shepherds in variable mountain weather. The route ends at Pic du Mont-Ceint, the highest point of the pasture south of the D18, where the wildlife protector scans for traces of bears, ungulates, and other wildlife crossing the high slopes.

Fig 6-37 | Imaged by author.



Parking lot in Saleix



Abandoned barn Granges ruinées de Salingres



Shepherd Cabane Col de La Crouzette



Remains of Cabane at Port de Saleix



Pic du Mont-Ceint

Fig6-38| Parking lot in Saleix.
 Adapted from Google Street View, accessed via Google Maps (May 2026)
 Fig6-39| Granges ruinées de Salingres.
 Adapted from Photos Ariège (n.d.).
 Fig 6-40| Cabane Col de La Crouzette.
 Adapted from a photograph published by Pyrenees Refuges (n.d.).
 Fig 6-41 Remains of Cabane de berger at the Col de Saleix
 Adapted from Pyrenees Refuges (2002)
 Fig 6-42| View from the Pic du Mont-Ceint
 Adapted from Pierre Martin, via AllTrails (n.d.).



Routes and nodes as sheathing



Fig 6-43| Imaged by author.

sheathing for human and non-human

Strategies



Anchored Refuge

A fixed shelter where the body rests before and after entering the bear's terrain.



Readable Boundary

Cairn and wooden markers show the existence of the walking trail web in the forest.



Hierarchical Wayfinding

Cairns along trails, a wayfinding stone at the terminus, the platform as arrival.

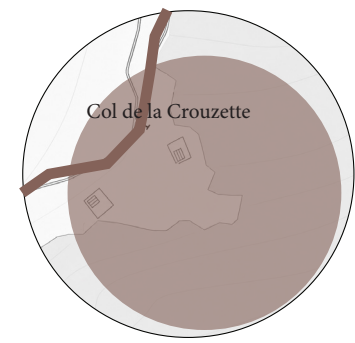


Prospect-Refuge Balance

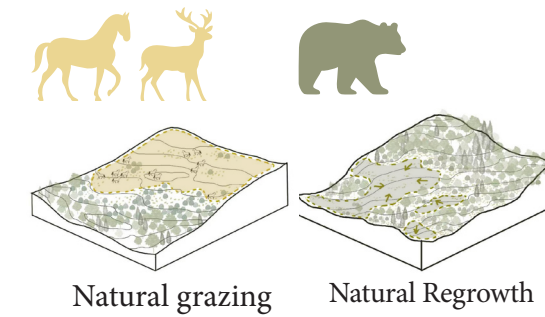
Relative open views in the forest clearing held together with the body's need to remain concealed.

Fig 6-44| Imaged by author.

Design Site 04
Monitoring Place



Zoning Interventions



Confrontation Interface

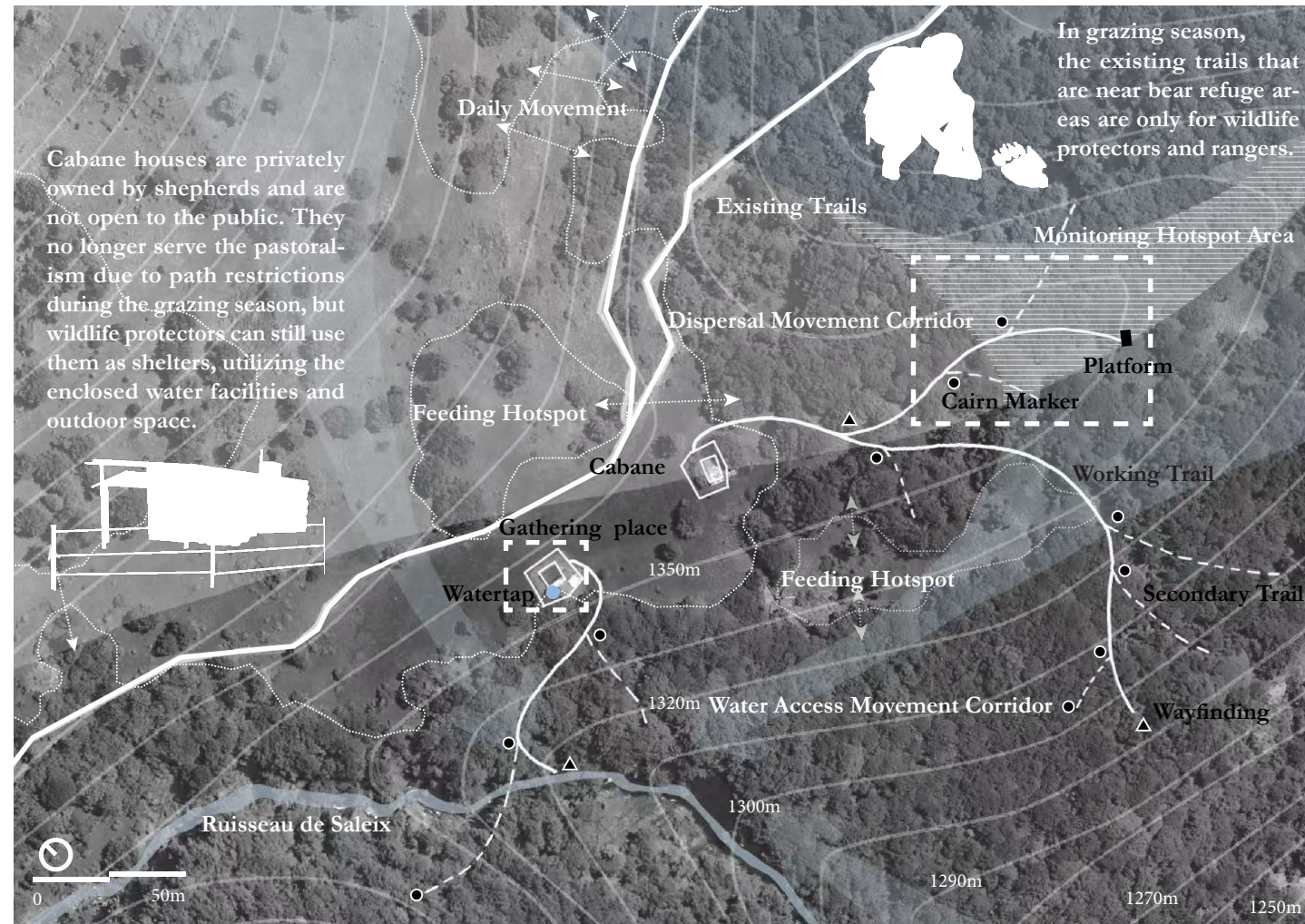
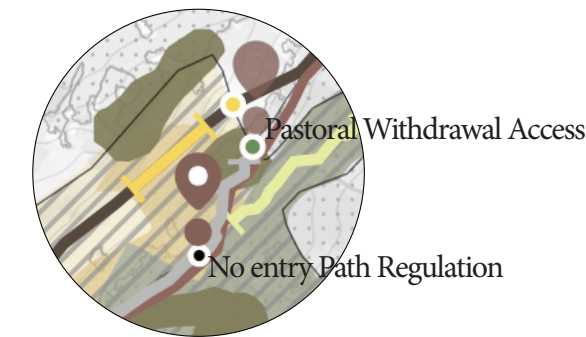
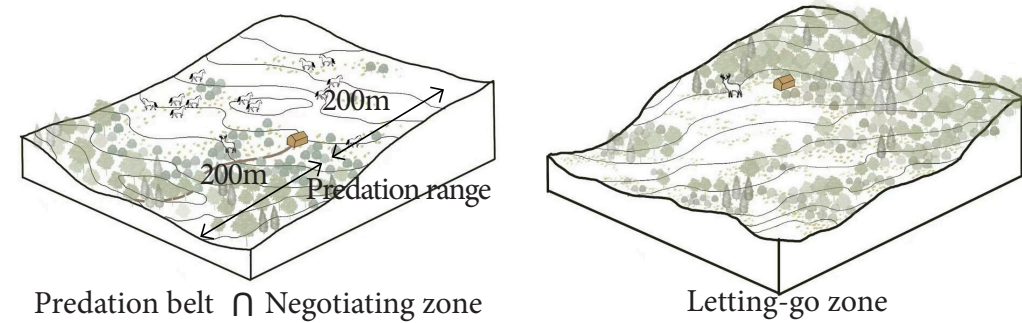


Fig 6-45 |Monitoring place plan. Imaged by author.



Sited near the Col de la Crouzette at 1350m, the design extends two existing cabane into a working network for wildlife protection during the grazing season. The cabane itself remains untouched; a salvaged tree trunk placed in its enclosure forms a gathering place for the protectors at the threshold of each day's work. From there, a working trail leads through the forest to a small monitoring platform at the system's deepest reach, near the Dispersal Movement Corridor. Secondary trails extend opportunistically into the surrounding monitoring hotspot, where ground traces are sampled along the bear's likely passage routes. Wayfinding is organized in a hierarchy: cairn markers along working trails to indicate the secondary trails, a single cairn-and-pole at the end points, and the platform as the landmark of arrival.

Monitoring Hotspot Area

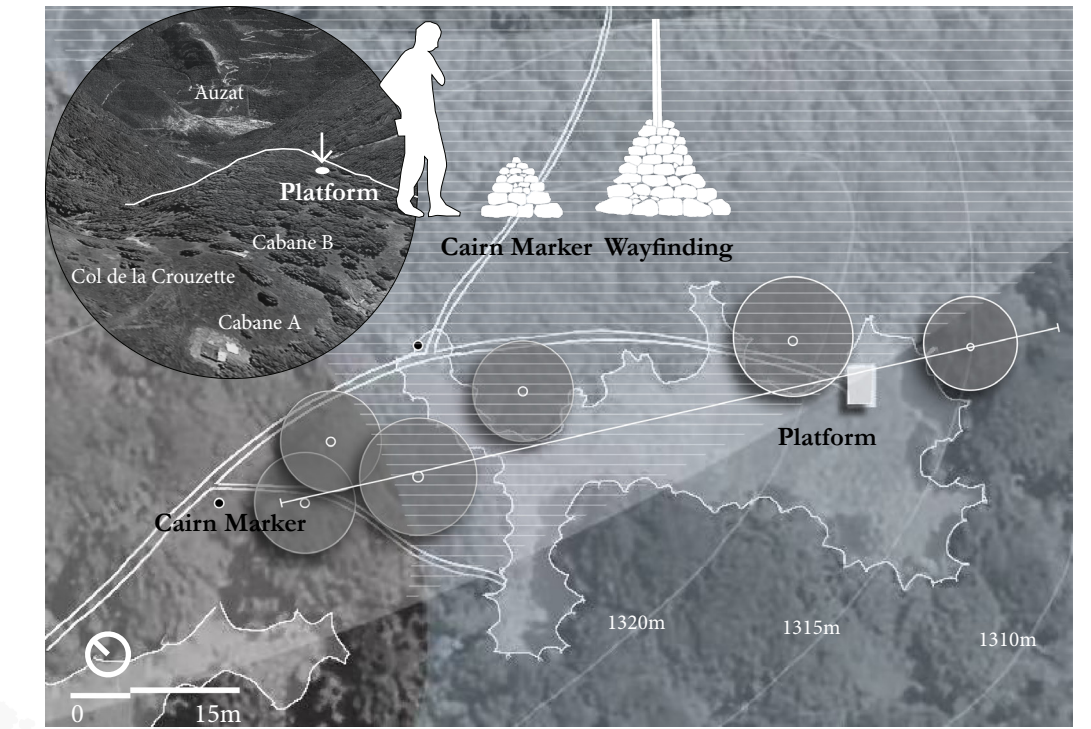
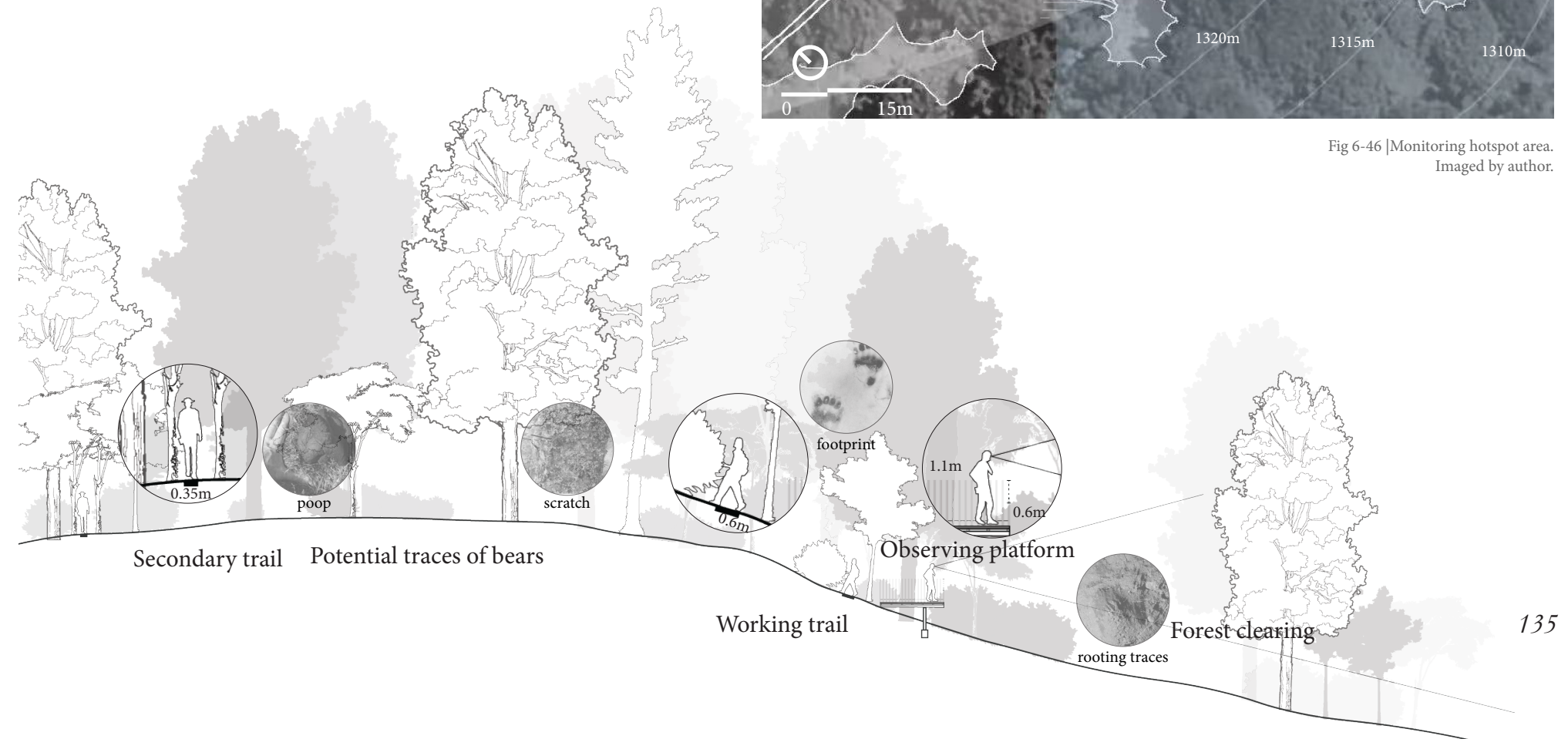


Fig 6-46 |Monitoring hotspot area. Imaged by author.



Working platform in prospect-refuge balance



Fig 6-47 | Imaged by author.

Gathering place in front of Anchored Refuge



Fig 6-48 | Imaged by author.

Design Site 05
Observing Pause



Site Location

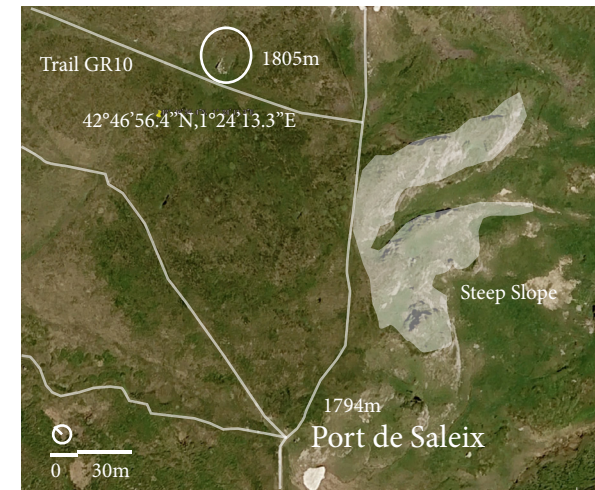


Fig 6-49| Site location.
Imaged by author.

Fig 6-50| Port de Saleix,
Ariège, France
Imaged by Camille Luxen(2021).

Fig 6-51| Cabane de berger at the Col de Saleix,
Ariège, France
Imaged by Wikimedia Commons (1882).

Fig6-52| Existing remains of the Cabane,
Ariège, France
Imaged by Pyrenees Refuges (2002).

Site wind and exposure condition

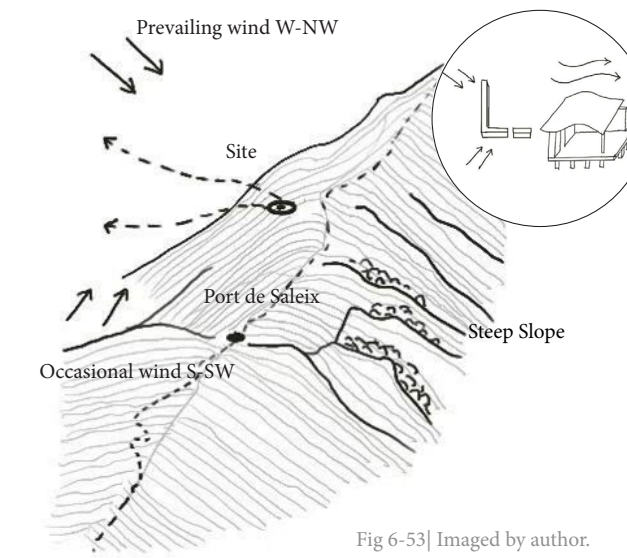


Fig 6-53| Imaged by author.

South view towards Massif de Bassiès

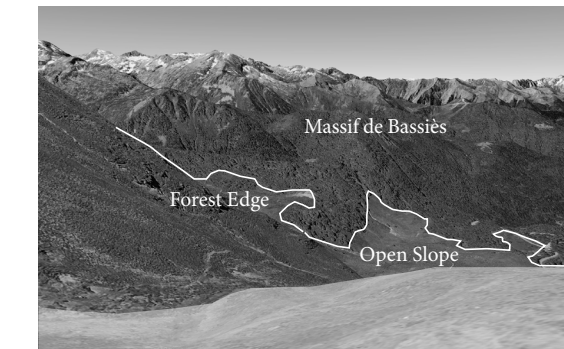


Fig 6-54| Imaged by author.

South Primary scanning view toward the Bassiès slopes



Fig 6-55| Imaged by author.

Trail to Pic de Mont-Ceint

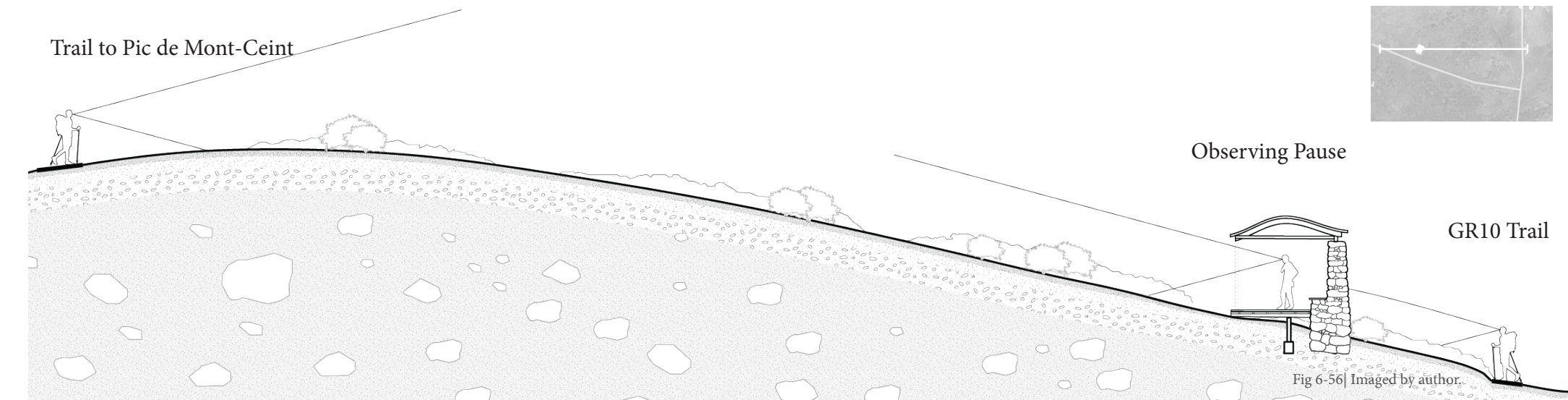


Fig 6-56| Imaged by author.

VI. Human as Cohabitants| For Wildlife Protectors — From Threshold to Pass: A Path of Watch



Arriving at Parking Lot in Saleix



Rest and Talking Surround the Anchored Refuge



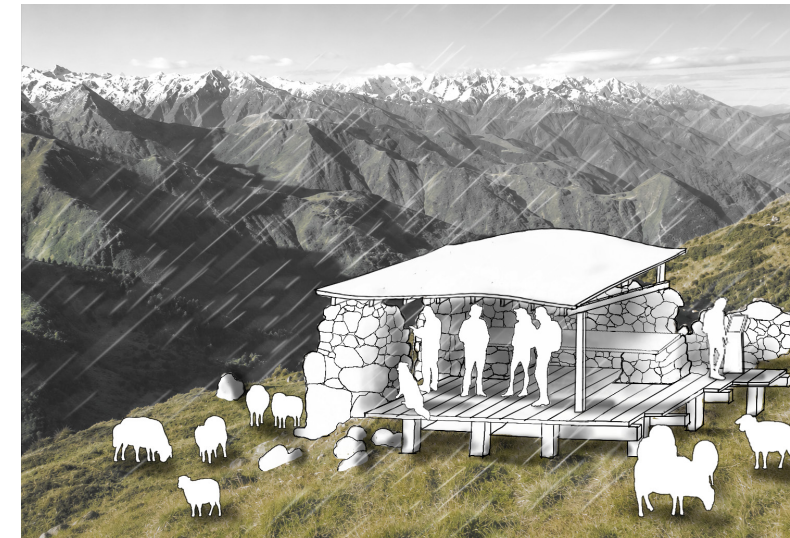
Observing and Monitoring at Port de Saleix



Rest at Barn Relics and Seasonal Restricted Entrance



Working in the Forest of Col de La Crouzette



Shepherds and Visitors Taking Shelter and Rest



Scanning and Trace Monitoring at the Highest Point of Pic du Mont-Ceint

VI.Human as Cohabitants| For Visitors — Reading the Rewilding: A Path of Awe
Reading the Rewilding: A Path of Awe
 Design Route and Nodes

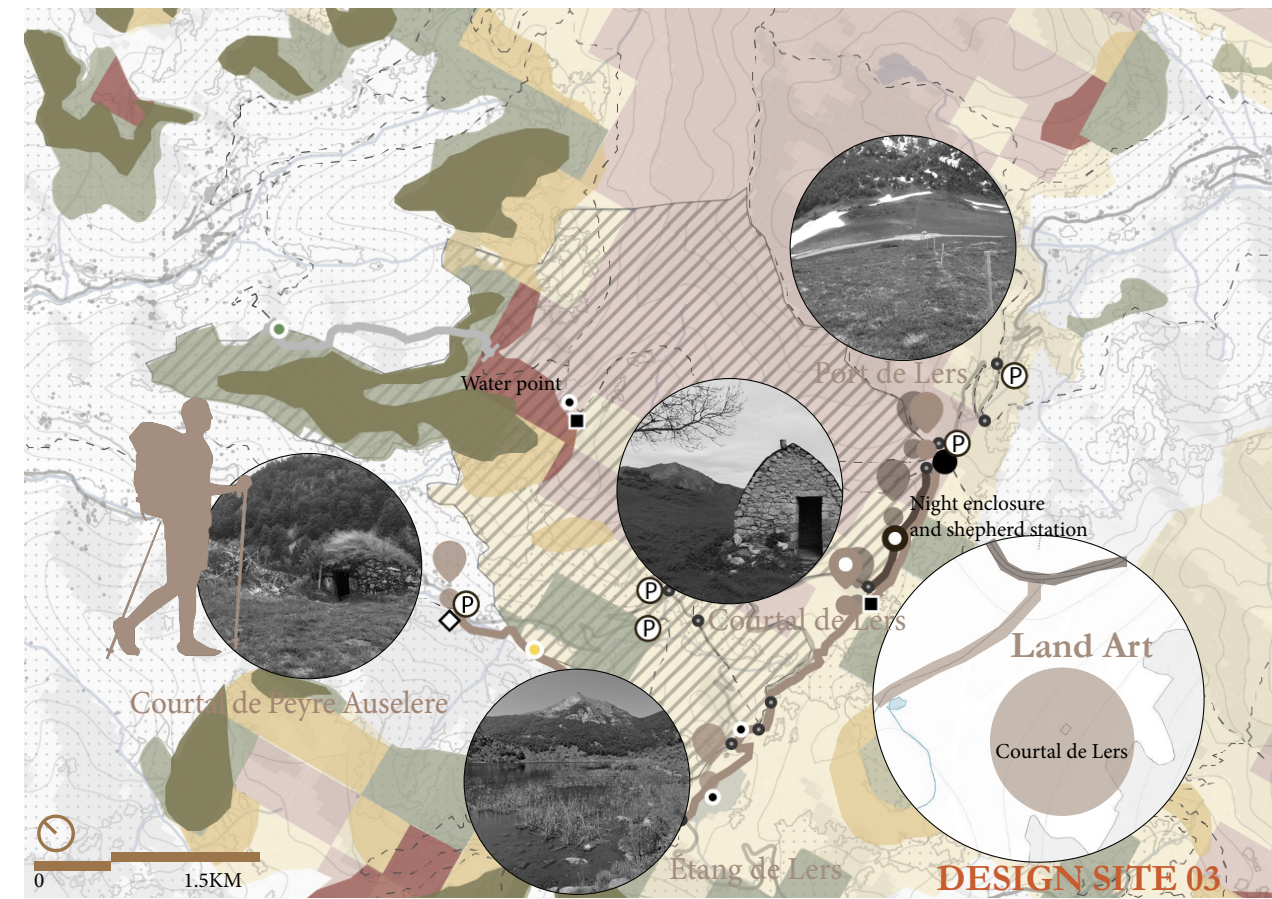


Fig 6-64| Imaged by author.

Visitors begin their route at the parking area at the entrance of Peyre Auselère, where the road from the D18 ends and the path on foot begins. A wooden sign reading “Natural Grazing Areas” marks the threshold of the slower landscape ahead and asks the drivers approaching on the road to slow down.

Walking into Peyre Auselère, visitors encounter the ruins of a former summer pasture, drystone walls, sunken cabanes, and an information stone that names the place and its past. Here the visitor reads the landscape as a record of pastoral abandonment and quiet return.

The path then descends to Étang de Lers, where the lake reflects what stands at its edge, the mountains above, the trees around, and the visitor themselves. The design does not intervene at the lake; this is the moment for the visitor to slow down before the encounter ahead.

Continuing on, the route arrives at Courtal de Lers and the land art Turning Inward. Through a sunken and tilted path, stone marker guidance and standing stones bearing inscriptions in the voice of a bear, the visitor moves inward toward the rewilding core, learning to read the landscape as both an inhabited cultural ground and a territory shared with non-human others.

The route concludes at Port de Lers, where the pass opens onto two grazing modes at once: the natural grazing area where horses move freely on one side, and the traditional transhumance pasture where cattle graze under the shepherd’s watch on the other. The journey ends in awareness of the landscape that came before, of the visitor who arrives second, and of the many ways a mountain may be inhabited.



Courtal de Peyre Auselere



Etang de Lers



Courtal de Lers



Port de Lers

Fig 6-65| Courtal de Peyre Auselère, Ariège, France. Adapted from Google Maps user-contributed photograph (accessed May 2026).
 Fig 6-66| Etang de Lers, Ariège, France. Adapted from Google Maps user-contributed photograph (accessed May 2026).
 Fig 6-67| Courtal de Lers, Ariège, France. Adapted from Source: Refuges.info (n.d.).
 Fig6-68| Port de Lers,Ariège, France. Adapted from Google Maps user-contributed photograph (accessed May 2026).



Arriving at the Parking Lot at Courtal de Peyre Auselere Relics



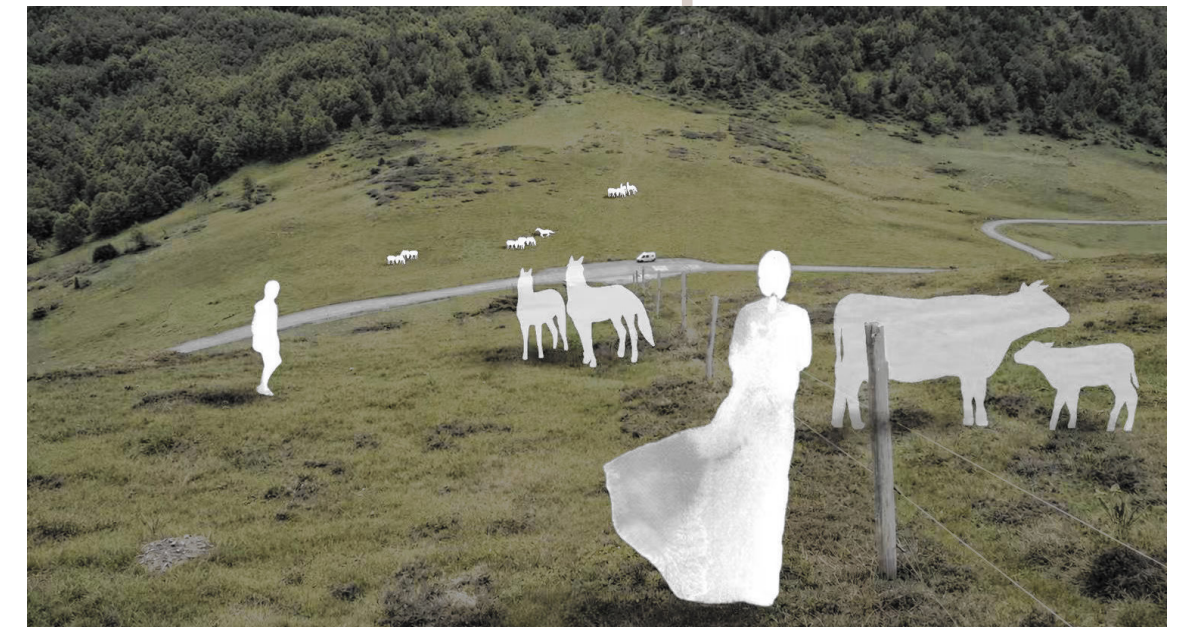
Reading the Rewilding at the land art located near Courtal de Lers



Knowing Pastoral History at Courtal de Peyre Auselere Relics



Slowing Down at Etang de Lers

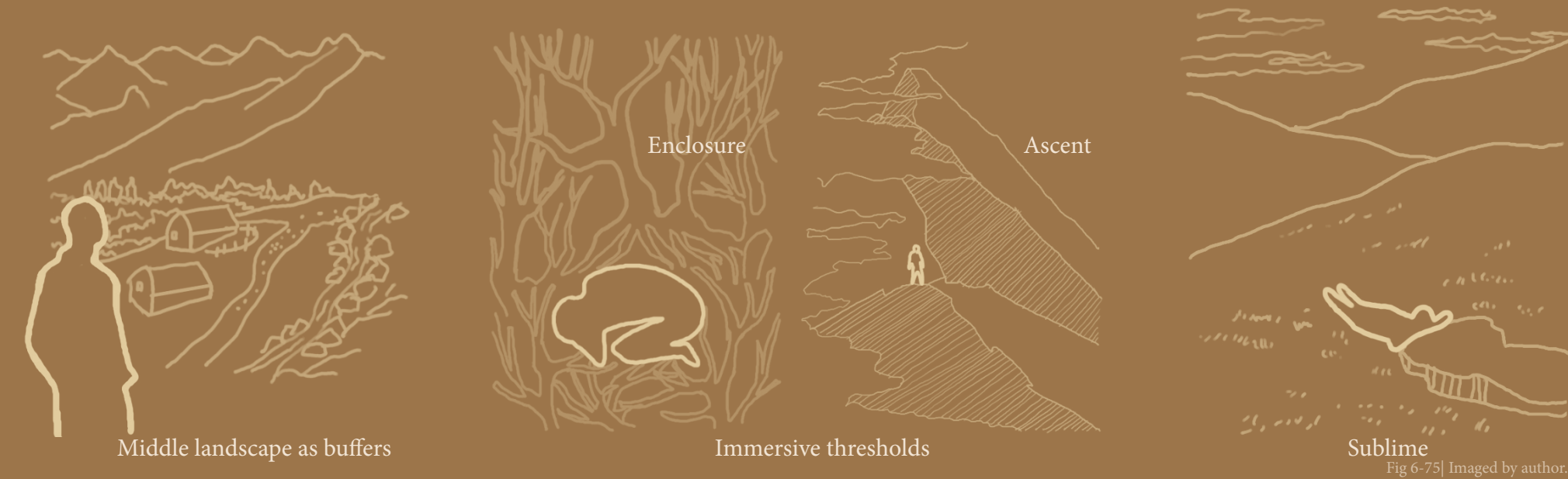


Climbing Slopes and Overlooking at Port de Lers

For Visitors: Escapist desire

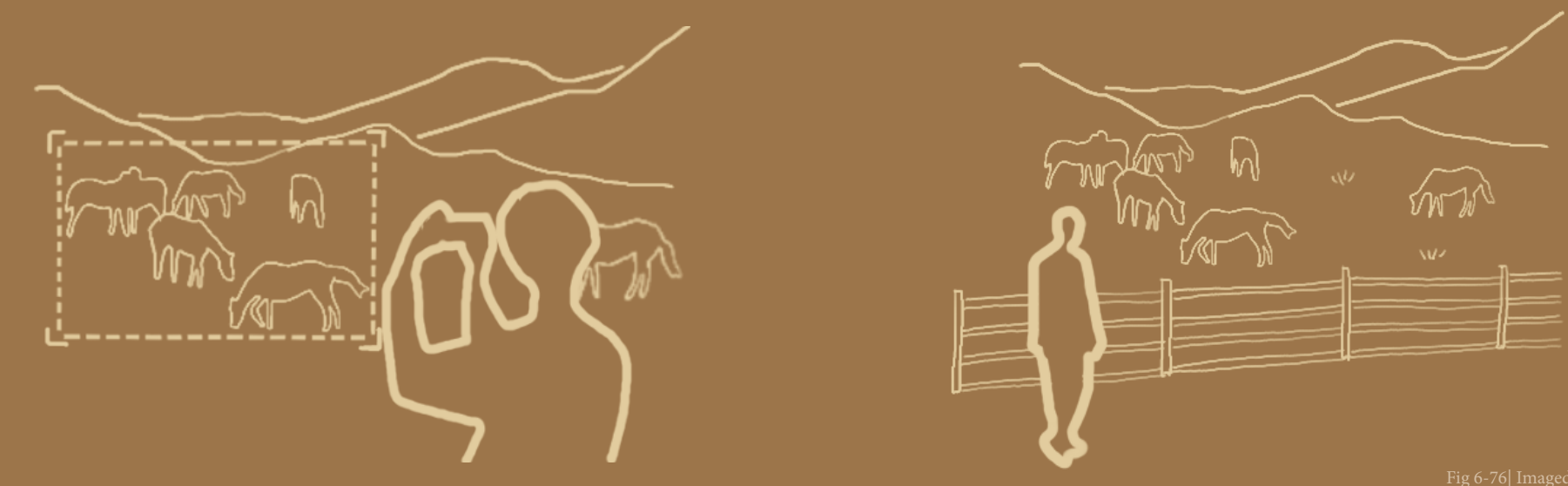
Unlike shepherds and wildlife protectors, whose psychological needs emerge from rewilding's disturbance of existing attachments and fears, visitors arrive with an already-formed desire. The Pyrenees do not create escapism; they receive it.

Spatial conditions that host escapist desire



Four spatial conditions in the rewilded Pyrenees can receive an escapist trajectory. They operate as siting principles, indicating where in the territory the design should act.

Re-enchantment forks: consumption or care



The same spatial conditions can lead in two different directions. Reenchantment of wildness may degenerate into consumption, reducing landscape to scenery, viewpoints, and photographs; or it may deepen into care, transforming the same encounter into a slower pace of perception, physical contact, and restraint. Landscape architecture cannot suppress this desire, but it can determine where it ultimately leads. The following four strategies, operating at the site scale, guide reenchantment towards care.



Reality and gravity

Bear behaviour is presented as an ecological process, reminding visitors that the inhabited landscape is also a territory of non-human life.



Immersion and sublime

The sunken path, open view, exposed slope, broad pasture and large mountain background place visitors inside a wider landscape, turning escape into awe rather than consumption.



Body intervention

A sequence of stones requires stepping, slowing down, adjusting balance, and climbing, so that reading the landscape begins through the body.



Restriction and respect

Dry-stone retaining walls work as barriers and edges, showing where visitors should stop and making wildlife presence and sensitive processes respected through limited access

Fig 6-77| Imaged by author.

Temporal Strategies

The D18 road that brings visitors to the site is closed each winter, typically from December until May due to snow and avalanche risk. Yet bears emerge from hibernation in late March and April and begin their spring foraging immediately, well before the road reopens. The land art does not manufacture this separation. It honours it, and is designed to be encountered only after the bear has already left.



Fig 6-78| Imaged by author.

Spring

Summer and Autumn

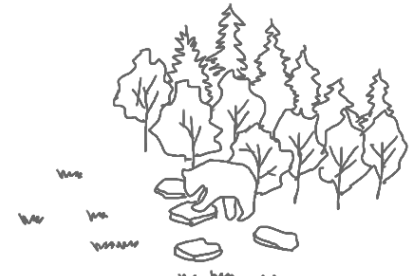
Land Art :Turning Inward

Design site 03

Spring bear foraging behavior



Flipping stones for food



Forest-pasture transitional area



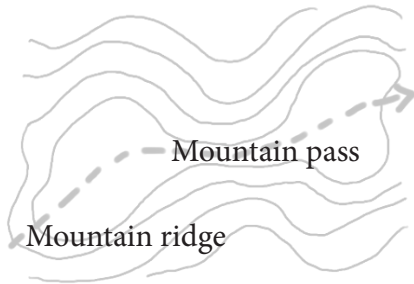
Large but energy-efficient stones



Sequential and clustered search

Fig 6-79| Imaged by author.

Spring bear dispersal behavior



Mountain pass

Mountain ridge



Mating movement



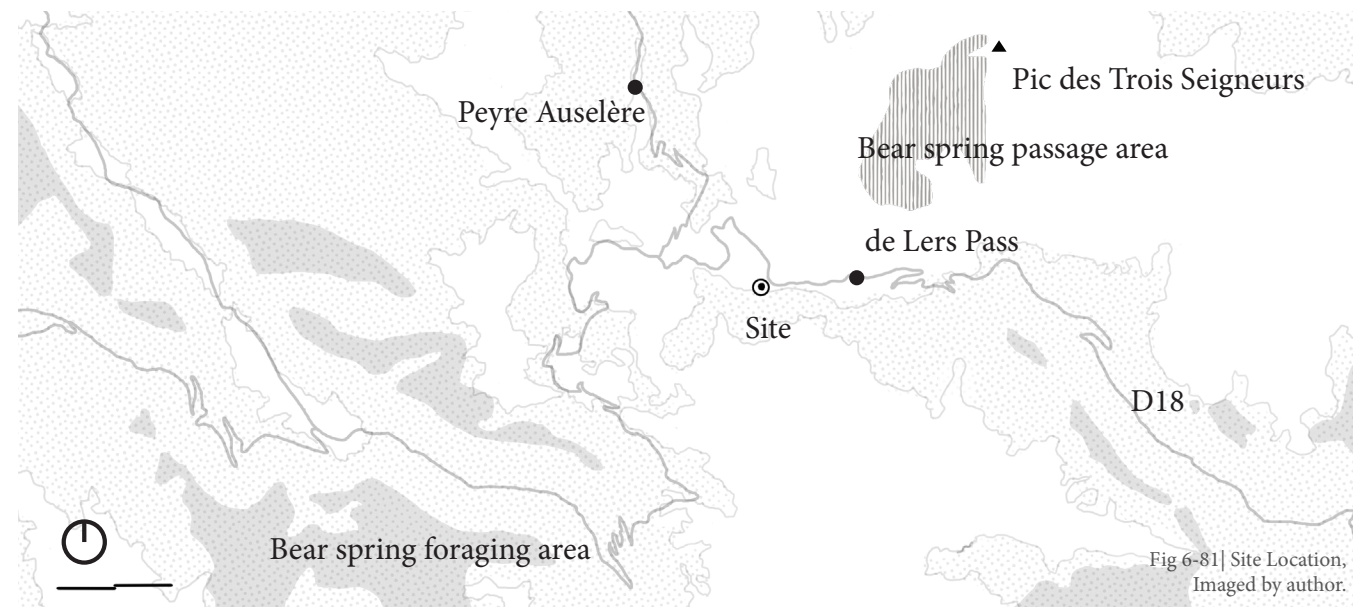
Natal dispersal



Bear across mountain pass

Fig 6-80| Imaged by author.

The site sits at the intersection of two bear behaviours that define the Pyrenean spring. To the south, the open forest-pasture mosaic functions as a foraging ground where post-hibernation bears flip stones for insects along the gentler slopes. To the north, the higher cols around the Pic des Trois Seigneurs serve as passage corridors for dispersal and mating movements. Situated next to Port de Lers along the D18, the land art positions the visitor between two spring activities of the bear: foraging in the mosaic below and dispersal across the mountain passes above, inviting them to read the landscape as a territory already at work.



Bear spring foraging area

Pic des Trois Seigneurs

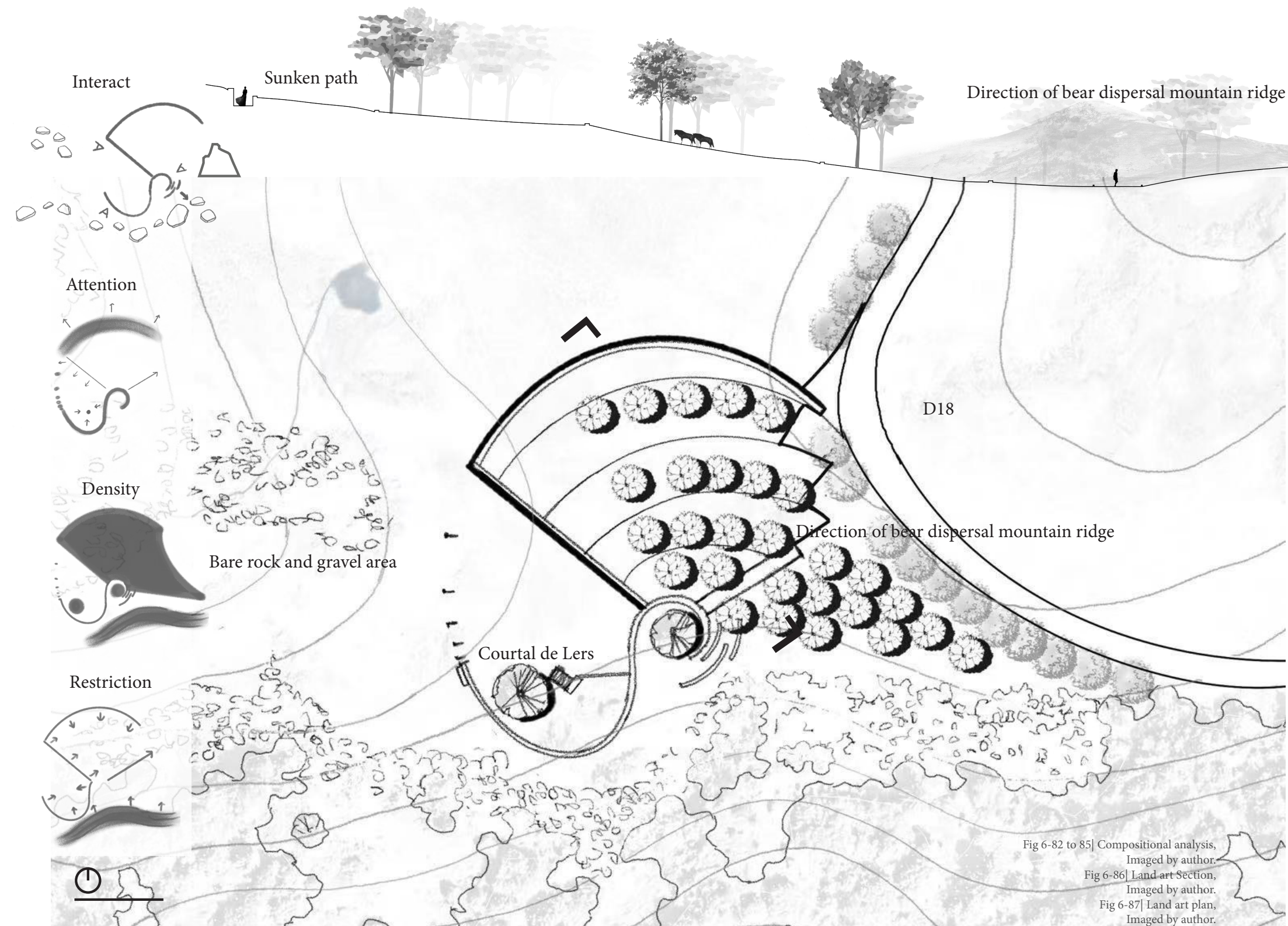
Bear spring passage area

de Lers Pass

Site

D18

Fig 6-81| Site Location, Imaged by author.



Interact

Sunken path

Direction of bear dispersal mountain ridge

Attention

Density

Bare rock and gravel area

Restriction

Courtal de Lers

D18

Direction of bear dispersal mountain ridge

Fig 6-82 to 85| Compositional analysis, Imaged by author.

Fig 6-86| Land art Section, Imaged by author.

Fig 6-87| Land art plan, Imaged by author.



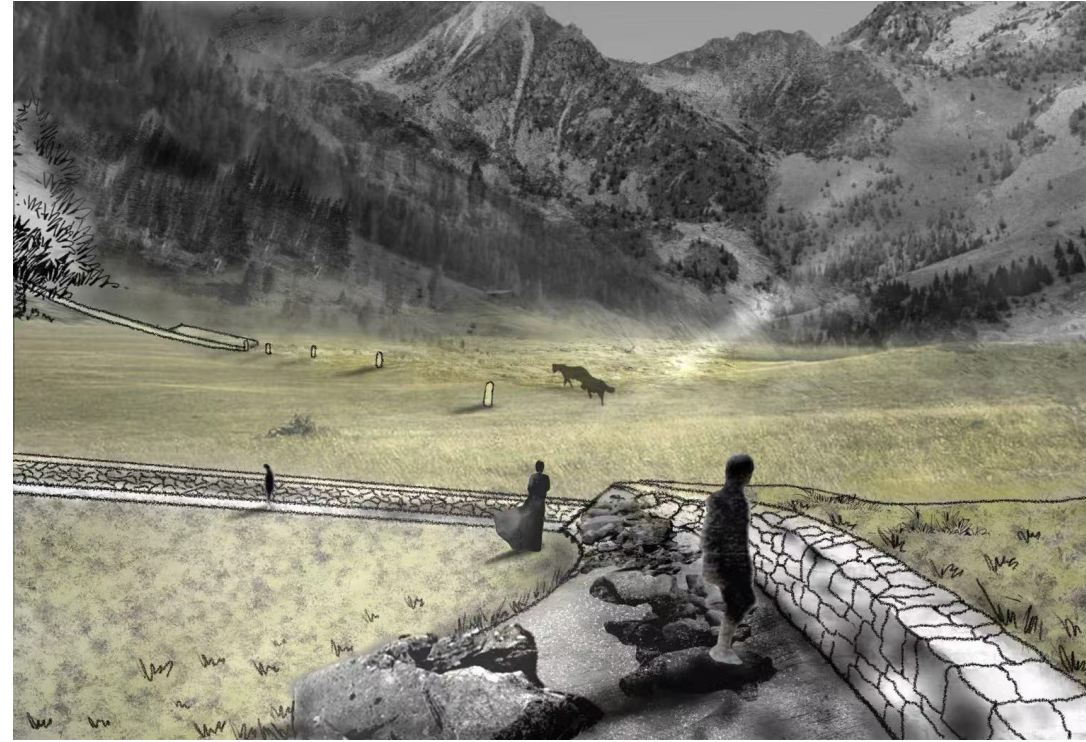
Fig 6-88| Land art site in early spring.
Imaged by author.



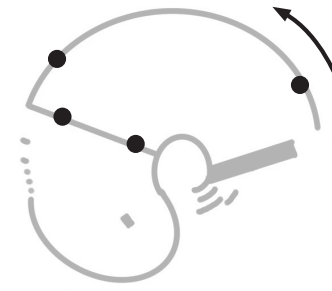
Fig 6-89| Land art site in summer.
Imaged by author.



Walking from the Entrance



Physically Guided Turning Inward



Walking through the sunken path, visitors must climb over and around the rocks; the elevation difference forces them to look out across the rewilded pasture from below, in a humbled posture. Distant standing stones hint at something further on, while near the intersection, the retaining wall lowers and the path tilts inward, physically guiding the visitor to turn toward the core areas without crossing the wall. Along the descending path, the tree array on the left, an extension of the mountain mass, contrasts with the broad pasture on the right. Approaching the Courtal de Lers at the mountain's foot, the landscape reveals itself as an inhabited place within the wilderness.

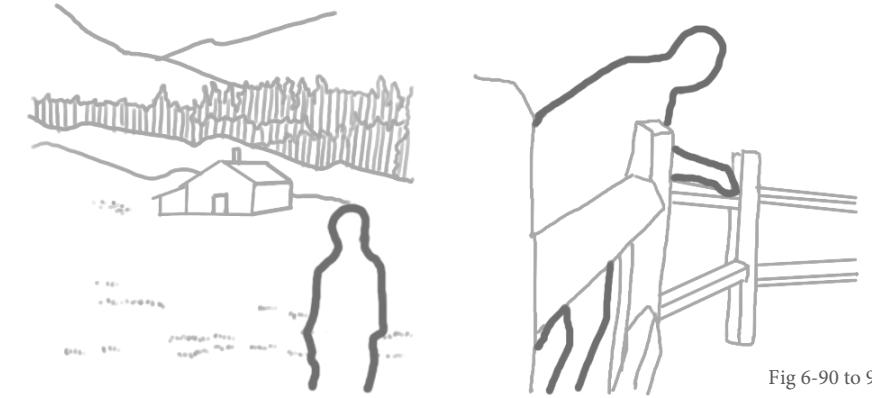
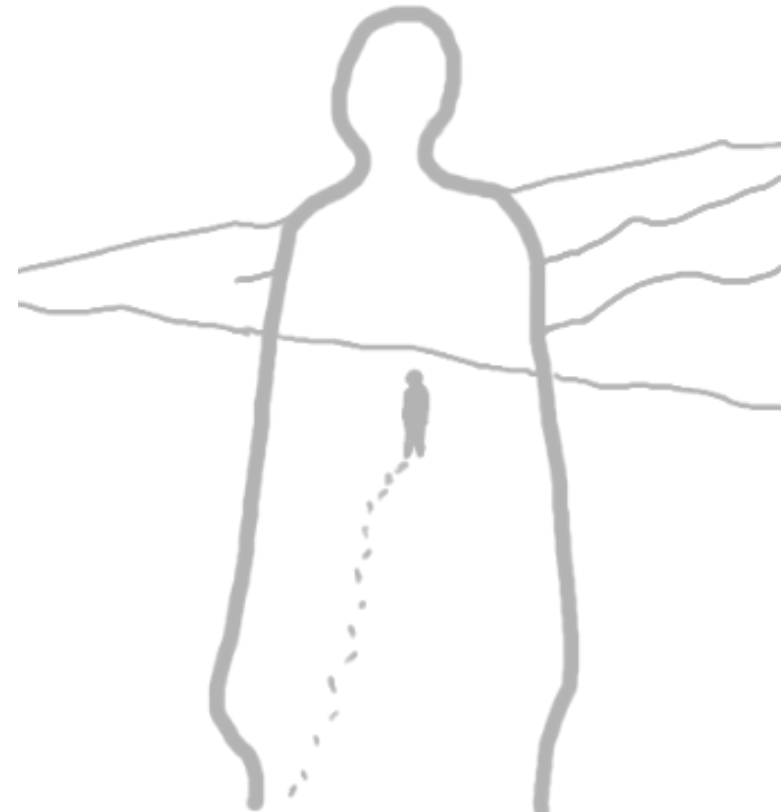
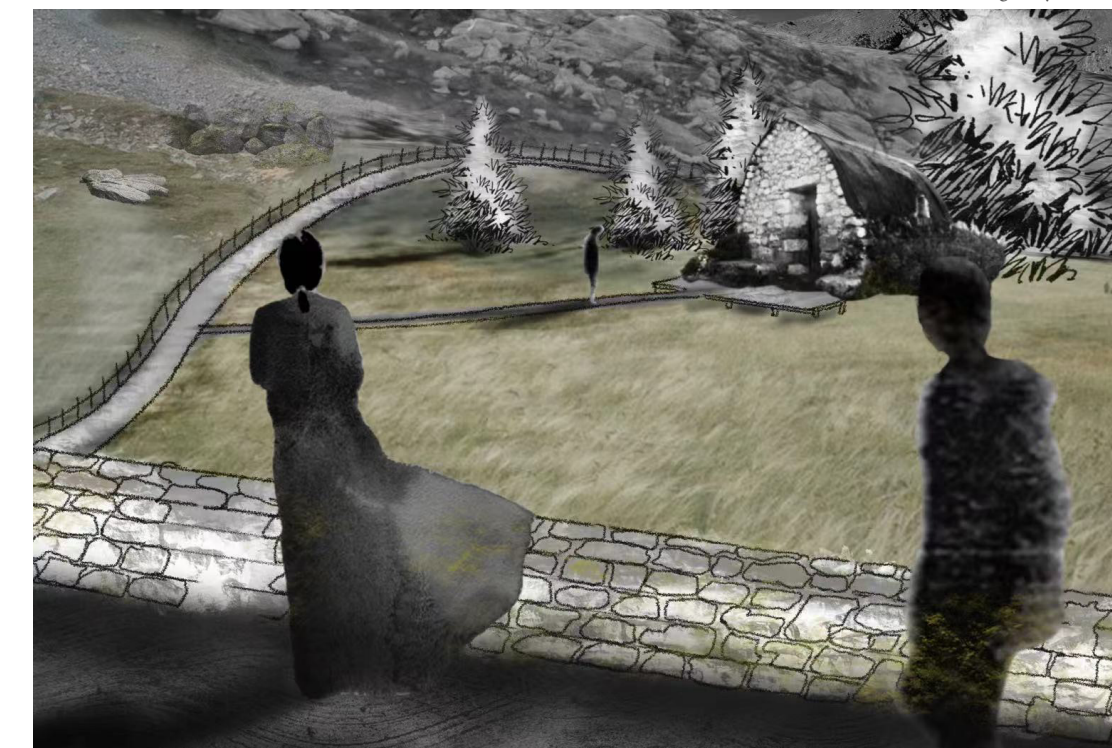


Fig 6-90 to 93| Land art Serial vision. Imaged by author.



Walking Down towards the Mountain



Facing the Courtal de Lers



Fig 6-94| Land art Serial vision,
Imaged by author.

Facing the Pic des Trois Seigneurs

Standing in front of the tree array, the visitor's gaze is guided toward the Pic des Trois Seigneurs by axes embedded in the earth. At the end of the path, a stone marks the reading pause, where the visitor encounters a message authored as if by a bear who passed through the spring before. This inscription names the place not as scenery but as territory shared by another, shifting the visitor's perspective from egocentric to ecocentric.

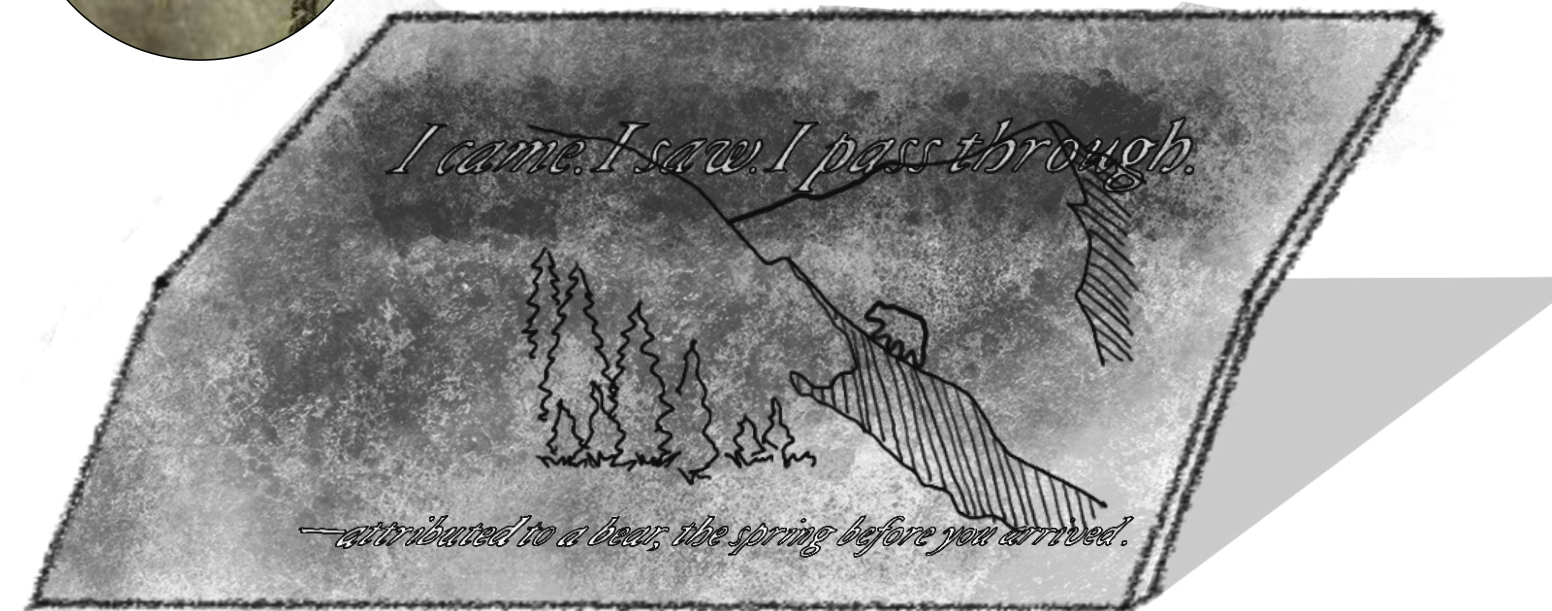
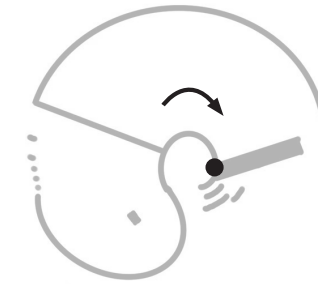


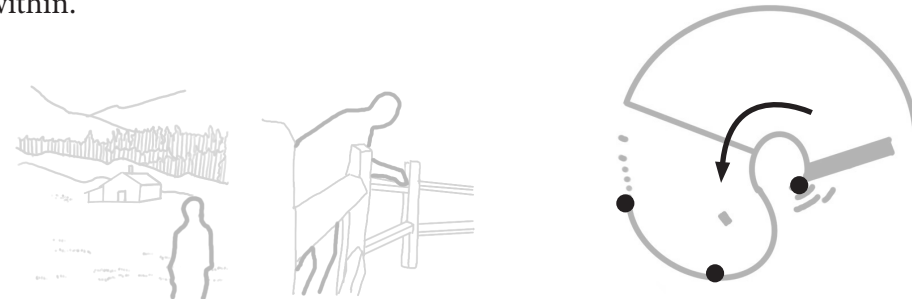
Fig 6-95| Plaque,
Imaged by author.

VI.Human as Cohabitants| For Visitors — Reading the Rewilding: A Path of Awe

Arriving at the rest place at the mountain's foot, the visitor finds shade and coolness beneath the silver firs. Here visitors sit on the slope, sensing the topography and the texture of gravels and rocks underfoot, the same surfaces the bear may turn and overturn each spring. Walking on, the visitor arrive at the highest overlook on the route, and then descends toward the final moment of the path: where five standing stones frame a platform.

The visitor reads the inscription carved into the rocks: Something came before you, and turned stones.

Learning what the bare rocks and gravels mean for the bear, the visitor looks outward, at the rewilded landscape beyond, at the horses moving in the natural grazing area below, through the slow turning of attention within.



Sitting and Walking at Bare Rock and Gravel areas



Walking down to the Platform and Overlooking



Fig 6-96 to98| Land art Serial vision, Imaged by author.

SubQ3: How can landscape strategies reorganize bear-related confrontation interfaces to support coexistence between humans, livestock, and bears?

Chapter V shows that coexistence can be designed by treating bear-related confrontation as a spatial and seasonal condition. Bears do not follow pasture boundaries or management zones; they move according to forest cover, seasonal food sources, refuge conditions, and disturbance. By overlaying bear habitats and seasonal activity with summer pasture management zoning and human access, the project identifies where pastoral use, human movement, and bear activity meet. These overlaps define four confrontation interfaces: Human Exclusion Areas, Human Low-disturbance Areas, Protected Pastoral Interfaces, and Negotiated Co-use Interfaces. Each interface becomes operable through a shared set of spatial variables: seasonal access, movement, facilities and activities, visibility, and graded maintenance. Core refuge and autumn hyperphagia zones are seasonally closed or bypassed; summer berry-foraging belts and Letting-go zones allow low-disturbance passage; Protected Pastoral Interfaces maintain pastoral use through high visibility, concentrated access, and protected nodes; Negotiated Co-use Interfaces separate or buffer human and wildlife movement through shrub belts, forest edges, and parallel routes. The reorganized footpath network further links these interfaces into enhanced multi-species connectivity.

Confrontation is therefore translated into a negotiated spatial order, in which humans, livestock, wild grazers, and bears can use the same mosaic with fewer direct encounters.

SubQ4: How can actor-based spatial interventions make cohabitation legible, usable, and meaningful along the routes, edges, and nodes shaped by pastoral use, public access, and bear habitats?

Chapter VI translates dynamic zoning and coexistence interfaces into actor-based spatial interventions, reading shepherds, wildlife protectors, and visitors as different cohabitants of the rewilded landscape. Each group is understood through three types of needs. Operational needs define what they must be able to do along the route, making cohabitation usable. Psychological needs, including attachment, fear, responsibility, desire, and awe, explain how they experience the transforming landscape, making cohabitation meaningful. Spatial needs translate these activities and experiences into routes, edges, and nodes, making cohabitation legible through bodily experience. For shepherds, the transhumant route is reworked through anchored spaces, readable routes, and thresholds to wildness, turning a production line into a living pastoral landscape carried by ritual and body memory. For wildlife protectors, the path of watch uses monitoring places, prospect–refuge positions, hierarchical wayfinding, and readable boundaries, turning uncertain wildness into observable and accountable work. For visitors, the path of awe and land-art interventions redirect escapist desire from scenery consumption toward restraint, attention, and care. In this way, cohabitation becomes more than territorial strategies.

The same rewilded landscape is translated into three modes of inhabitation, showing how shepherds, wildlife protectors, and visitors can remain present in a bear-inhabited pastoral landscape without returning to full control or disappearing through withdrawal.

Final Answer to the Main Research Question

How can a rewilding approach that repositions humans as cohabitants inform a new configuration between evolving ecological processes and continued cultural legacies in the Pyrenees’ transforming landscape?

Returning to the main research question, this project shows that rewilding can operate within a cultural landscape as a way of repositioning humans as cohabitants. It does so through three levels. First, a process-based baseline: the project uses rewilding to re-establish the disturbance–succession balance that once sustained the open mountain pasture system. Second, a spatial framework: U/N/L dynamic zoning and coexistence interfaces redistribute disturbance, succession, bear habitat, and movement across the open mountain pasture mosaic, so that ecological processes, pastoral use, wild grazers, and bear activity can be negotiated within the same landscape. Third, actor-based landscape interventions: shepherds, wildlife protectors, and visitors are repositioned through routes, edges, and nodes where they can continue to live, work, experience, and care for this transforming landscape.

In this sense, cohabitation is not an abstract ethical ideal, but a designed condition of readable boundaries, negotiated access, shared use, and situated care.

It allows humans, livestock, wild grazers, and bears to share the same mosaic with fewer direct conflicts, while enabling different human actors to remain attached to, responsible for, and willing to understand the rewilded pastoral landscape. Through this condition, ecological processes and cultural legacies can continue to support one another.

This project contributes a design framework for applying rewilding in an inhabited cultural landscape. In this framework, humans are not removed from the landscape, but are repositioned as cohabitants together with livestock, wild grazers, bears, and ecological processes. The project does not claim that rewilding in cultural landscapes or human-wildlife coexistence are new topics. These discussions already exist. The contribution of this project is to translate these ideas into a spatial framework for a bear-inhabited pastoral landscape in the Pyrenees. Through the process of research and design, four rewilding principles are drawn out.

Designed disturbance over withdrawal

In a pastoral cultural landscape, abandonment is a spatial process: as maintenance withdraws, shrubs and forest close in, and the spatial separation between human use and wildlife erodes. Rewilding here therefore does not mean removing people and letting the land go. What needs to be restored is the disturbance-succession balance that once kept the mosaic open, which means redesigning disturbance rather than withdrawing it.



Fig7-1| Imaged by author.

Graded interfaces over fixed separation

Coexistence does not only mean separating humans and wildlife. In many places, complete separation is not possible or not desirable. This project proposes graded interfaces, where humans, livestock, wild grazers, and bears can use the same mosaic under different conditions of access, visibility, activity, and maintenance.



Fig7-2| Imaged by author.

Time as a coexistence tool

Coexistence can also be organized through time. Annual patches rotating, seasonal closures, animal feeding cycles, grazing calendars, and transhumant rhythms can reduce direct encounters without excluding either humans, wildlife or natural processes from the landscape completely. Time is therefore treated as a design tool, not only as a background condition.



Fig7-3| Imaged by author.

Perceptibility as acceptance

Rewilding processes are often difficult to understand when they are not visible or readable. Shrub encroachment, reduced maintenance, seasonal closures, or wildlife presence may be seen as neglect or danger. This project uses spatial cues, bodily movement, framed views, and land-art interventions to make these processes more perceptible. When people can read why a landscape is changing, it may become easier to accept and care for it.

Among these four principles, the last two are especially important for this project. Temporality and perceptibility are used as active design variables. They help turn cohabitation from an abstract idea into something that can be experienced, negotiated, and maintained in everyday practice.



Fig7-4| Imaged by author.

Reflection

This project has been developed through a combination of ecological mapping, cultural landscape reading, and spatial design. It helped me understand rewilding not only as an ecological process, but also as a change in management, perception, and responsibility. At the same time, the project has several limitations, especially in relation to ecological uncertainty, implementation, and the position of design in a lived cultural landscape.

Methodological and technical limits

The first limitation concerns the mapping of brown bear habitats and movement. The available bear data mainly reflects observed distribution at a broad grid scale. Since brown bears have large home ranges and flexible seasonal behaviour, this data can only provide a general reference for management. I combined it with vegetation, elevation, slope, aspect, food resources, and disturbance conditions to infer the more likely seasonal habitat areas. This made the mapping more useful for spatial design, but it still cannot fully predict where bears will move or stay. This uncertainty is not only a weakness of the method; it is also part of rewilding itself, where natural processes cannot be completely controlled or fixed in advance. The second limitation is the lack of a detailed phasing strategy. The project proposes Use, Negotiating, and Letting-go zones, and suggests that some Letting-go areas may be removed from future summer pasture management boundaries. However, it does not fully explain how this withdrawal would happen step by step, who would decide it, or how the Negotiating zones might change over time. Related to this, if grazing becomes more concentrated in Use zones, the resulting grazing intensity may need to be checked against actual pastoral capacity to avoid local overgrazing. A stronger project would describe this transition more clearly, including monitoring, adaptive management, and possible changes in grazing pressure, vegetation structure, and wildlife movement.

The third limitation is the limited attention to socio-economic conditions. The project focuses mainly on spatial and ecological logic, but the future of Negotiating and Letting-go zones would also depend on income, labour, tourism, hunting, compensation, local governance, and the willingness of pastoral actors to participate. These questions show that spatial zoning is only a starting point; it would need to be supported by management agreements and economic instruments that lie beyond what landscape design alone can resolve.

Ethical and positional limits

There are also ethical questions in the project. The land-art intervention is intended to make rewilding processes perceptible, but land art is not ecological restoration in itself. It can even become a strong transformation of landform and a visual spectacle, which creates a risk that the visitor experience becomes more important than the ecological process it tries to reveal. For this reason, the design should remain restrained, light, and reversible where possible, and should avoid turning bear presence into a consumable image. This tension is built into the principle of perceptibility itself: making a process visible and turning it into spectacle are only a step apart. Another limitation is the way human actors are represented. I read interview-based materials such as Mountain People, and used theories of topophilia,

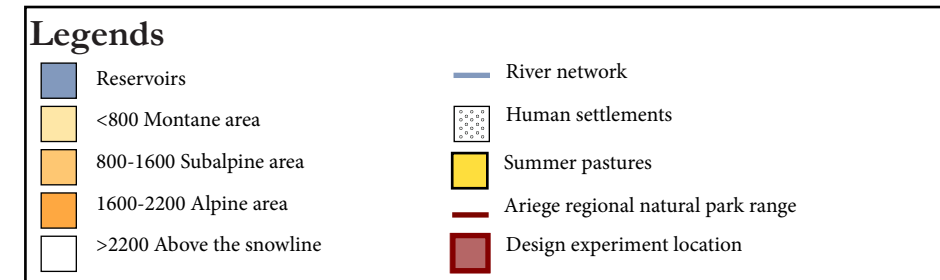
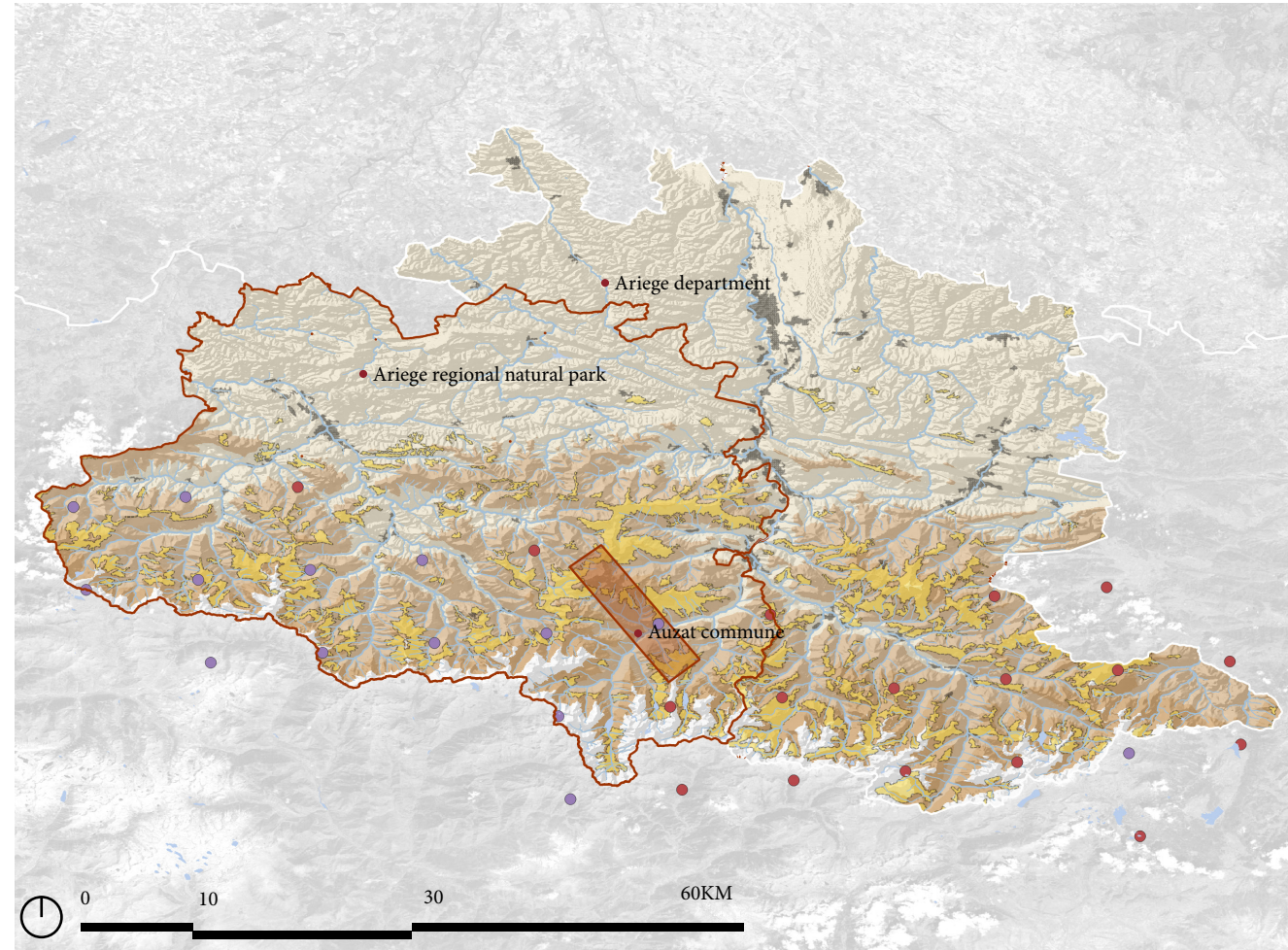
topophobia, escapism, prospect–refuge, awe, and care to interpret the needs of shepherds, wildlife protectors, and visitors. This helped me build a spatial framework, but it cannot replace direct fieldwork, interviews, or questionnaires. The actor needs in this project are therefore interpretive and design-oriented, not fully verified by the people themselves. If the project were continued, direct conversations with pastoralists, hunters, wildlife managers, and local residents would be necessary.

The project also raises a question about acceptance. Removing some areas from traditional pastoral use and allowing more succession may increase habitat continuity and bring back more wildness, but it may also make local actors feel that familiar landscape relations are disappearing. Landscape perception can help make change more understandable, but it cannot solve all conflicts by itself. Readable boundaries, seasonal rules, and land-art experiences may support understanding, but acceptance also depends on trust, governance, and long-term participation.

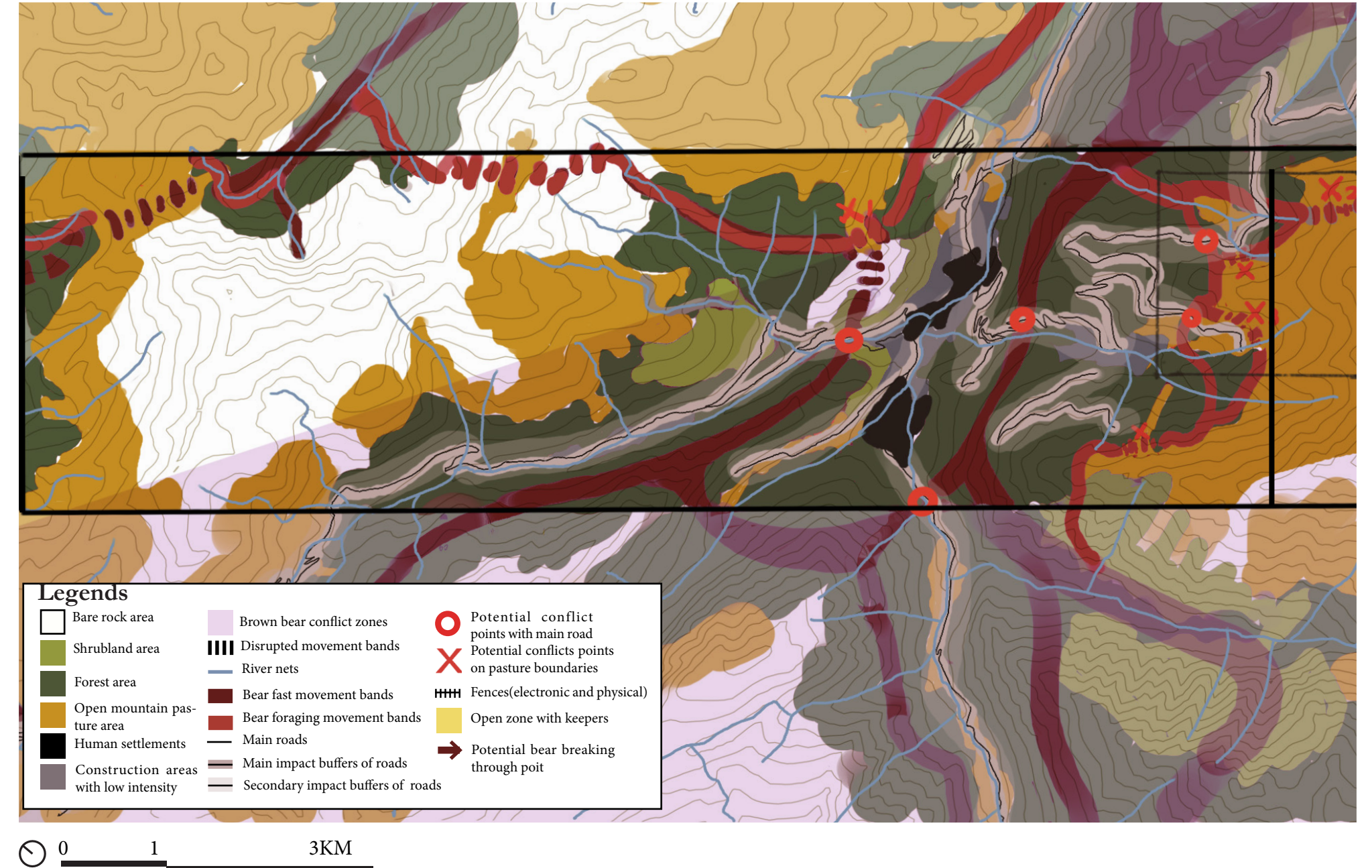
Taken together, these limits point in the same direction. This project offers a spatial framework and the conditions for negotiation, not a guarantee of outcomes or acceptance. Rewilding as design can make change readable and coexistence workable, but whether the landscape is finally accepted and cared for depends on monitoring, governance, and the people who live with it over time.

Personal reflection

Conducting this project also changed how I work and how I see my own position. I began with an emotional attachment to mountain pastoral culture and an interest in the bear as a cultural symbol, which is why I chose the bear as the focal species of rewilding. As I studied its habitat and seasonal movement, the bear became less of a totem and more of a living animal with its own needs. I felt sympathy for it, but I could also understand the shepherds' hostility toward it. This double feeling is what pushed me, when designing the confrontation interfaces, to keep asking when to give space to the bear, when to the people, and what gradient between them is fair and workable. The hardest part was finding a position: whose side to speak from. Following Meyer's ecocentric view, I turned to ideas of multi-species justice, where spatial design can give a voice to other species and make their situation visible and understandable. At the same time, reading Mountain People made me sympathetic to the fatalism of pastoral life, and the actor-based interventions are, in part, an attempt to keep that local way of living possible within the landscape. I have come to see the landscape architect's role in rewilding not as controlling nature, but as mediating space and reading its layers, between human and non-human, past and present, creating spatial conditions and experiences both for the different people willing to live and work here, and for the species that have always lived here.

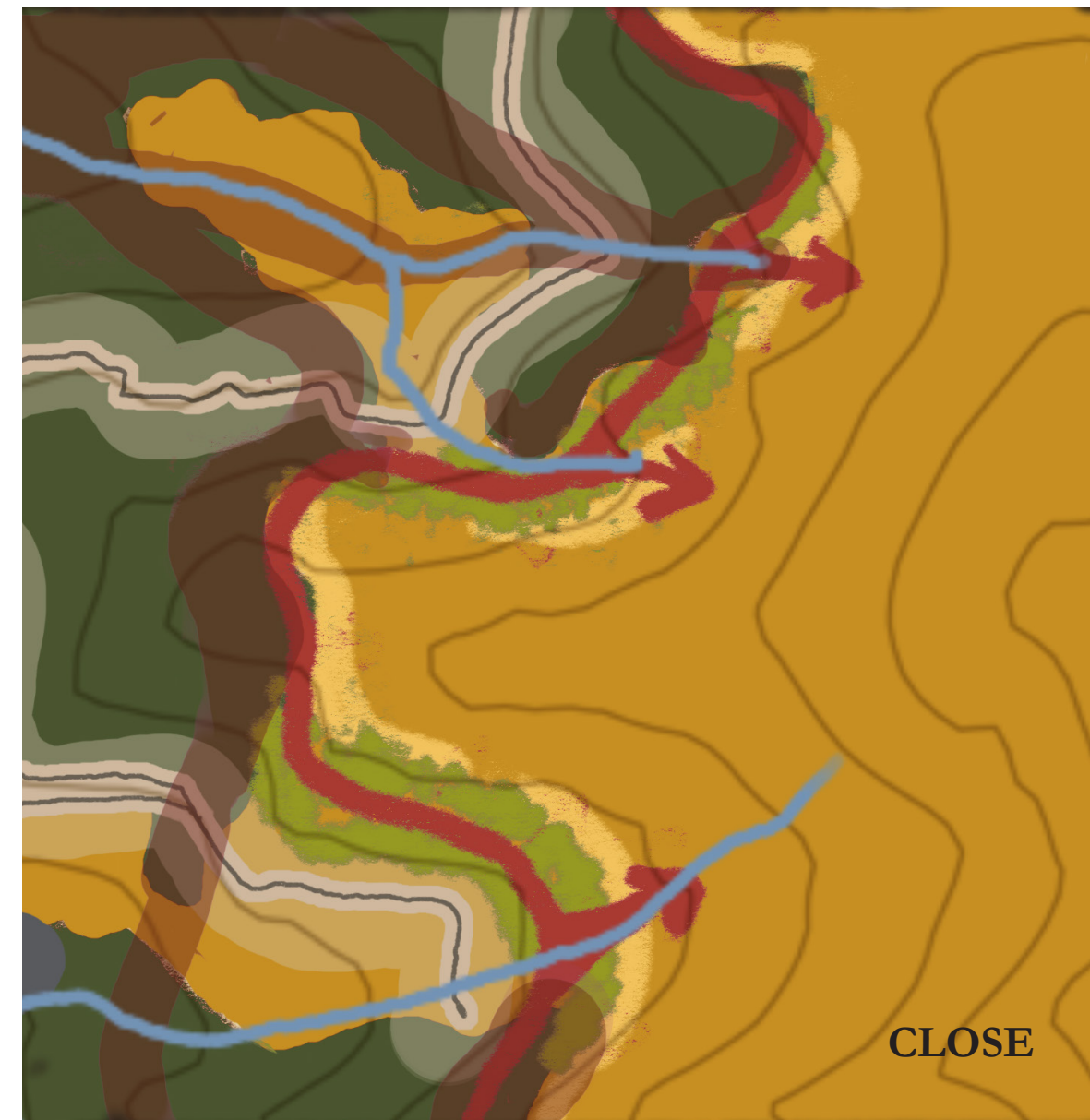


The experiment was conducted near the commune of Val-de-Sos within the Regional Natural Park of the Ariège Pyrenees (the PNR), an area considered high-risk based on French government statistics on human-bear conflict over the past five years. The experiment first selected the commune's valley and the subalpine summer pastures and forests on either side as the site for analyzing bear movement patterns and potential conflict points. Then, three boundary modification experiments were conducted within a 2x2 km area along the boundary of a summer pasture with high conflict potential identified in the analysis. The analysis categorized bear behavior into two types: rapid movement (in the forest) and foraging movement (along the forest edge). Possible energy-efficient crossing paths (such as along gullies and streams) were inferred based on the terrain. According to Koreň et al. (2011)'s study, 500m was selected as the maximum threshold for bears' willingness to move away from the forest edge, used to infer bears' willingness to leave the forest edge to cross pastures for foraging or for rapid movement. The experiment provides preliminary directions for further research on human-bear coexistence design at the boundaries of summer ranches where human-bear conflict is high, including the temporal and spatial patterns of bear activity and feasible spatial measures.



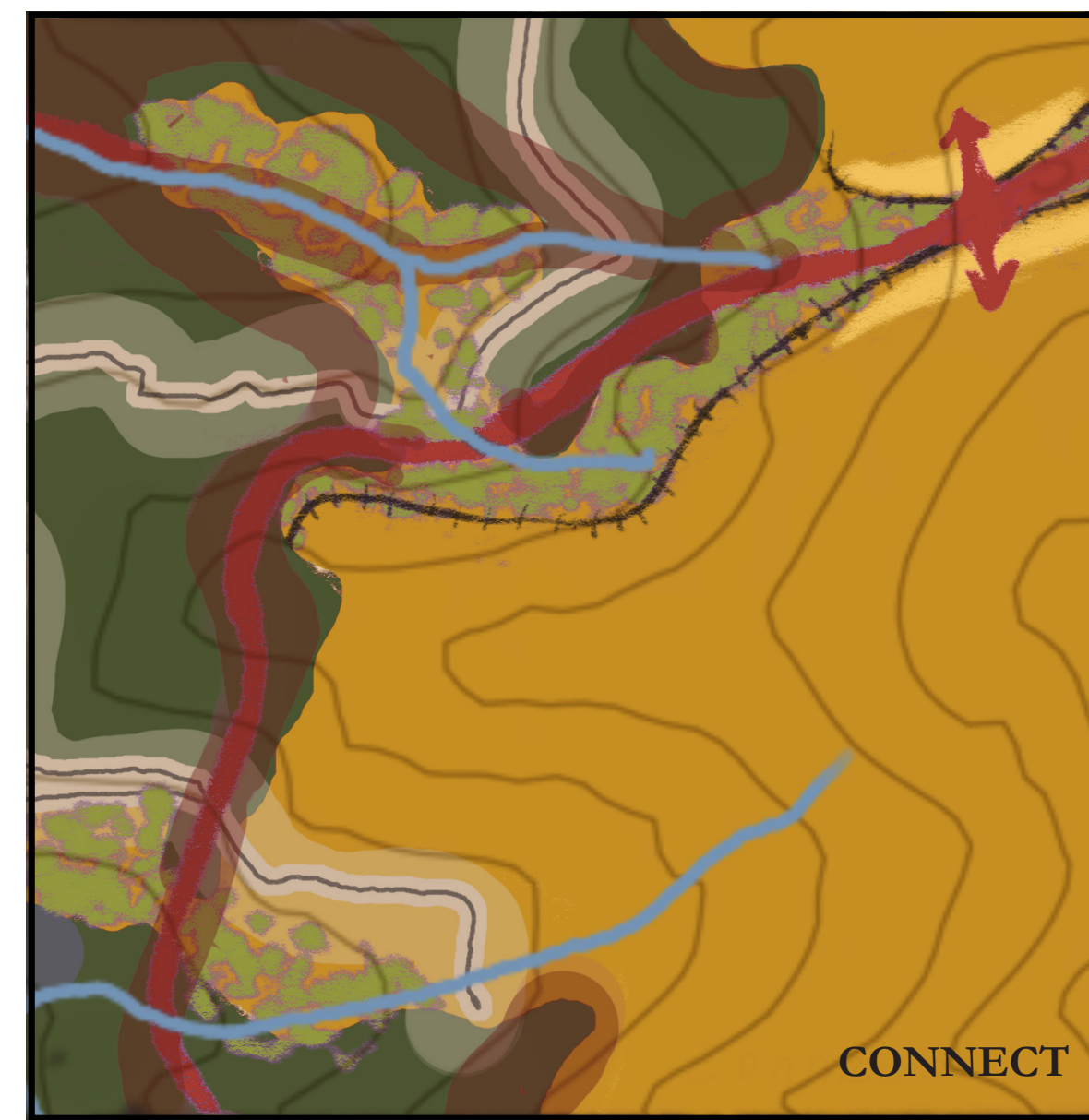
Appendix|Design Experiments

Close scheme thickens and connects shrub cover along the forest–pasture edge while keeping a clear patrol strip on the pasture side. The aim is to reduce crossings by offering bears a continuous, sheltered bypass that stays on the forest side, lowering incentives to enter open grazing areas. The trade-off is stronger edge use and potentially longer patrol near livestock.

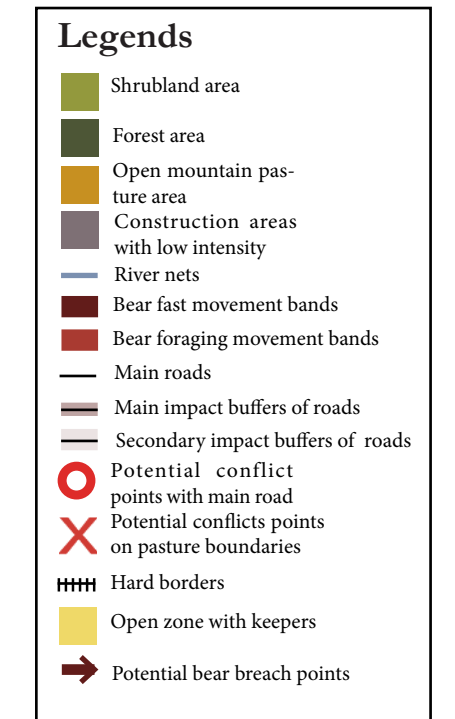
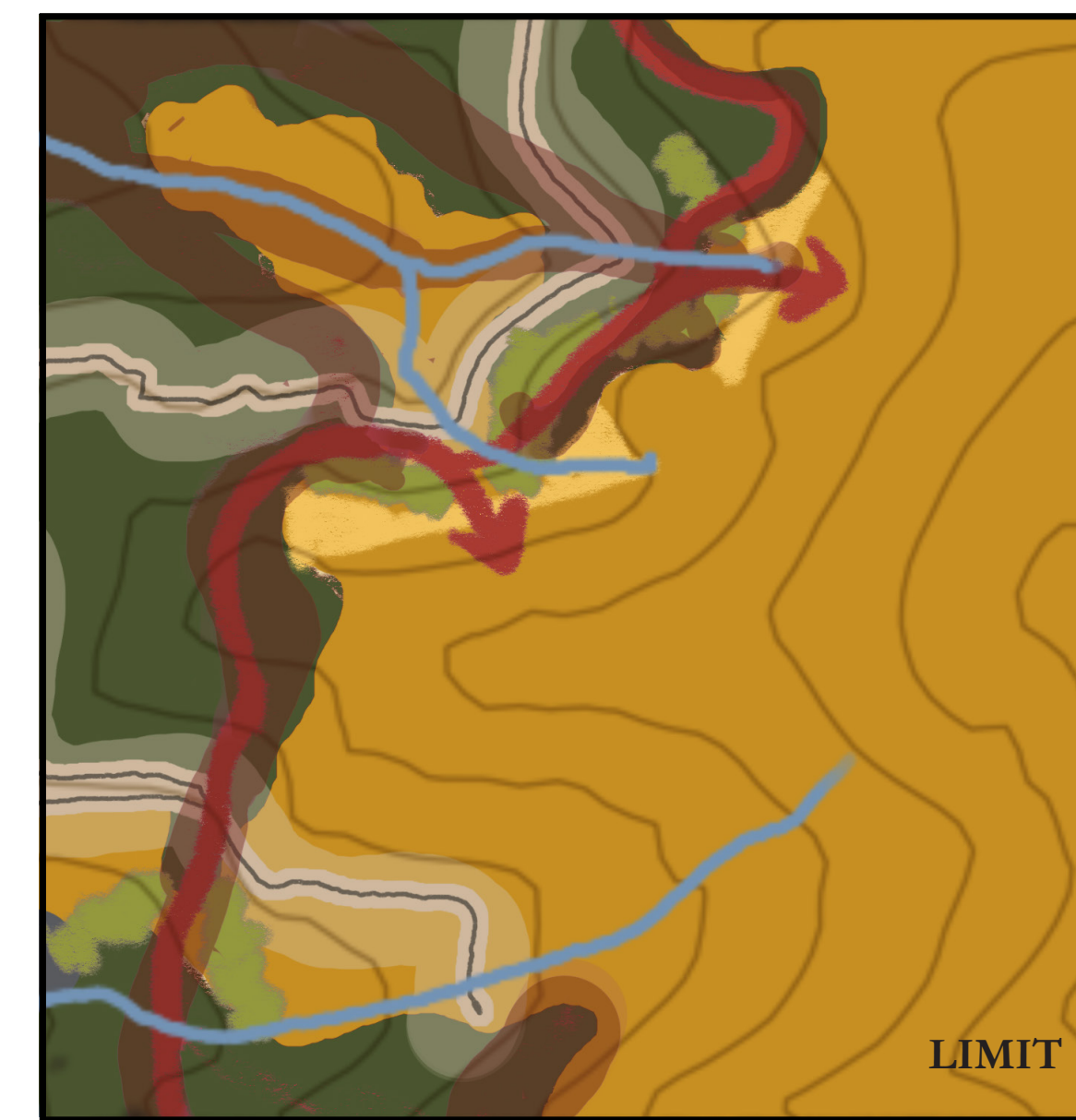


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Connect scheme concentrates movement into a single guided passage by reinforcing shrubs along a gully and stream line and adding hard boundaries (fence/stone wall) to prevent scattered exits. Bears are encouraged to transit quickly through a narrow, predictable corridor rather than roaming the pasture edge. Clean visibility zones at the exits supports patrol and monitoring. The trade-off is introducing a managed crossing within pasture.



Limit scheme reduces edge permeability across most of the interface: shrubs are thinned or set back to the side of forest, and an open visibility strip makes the boundary bright and costly to approach. Movement is deliberately concentrated at two preferred gate shaped by a funnel and a clear open zones for patrolling. The trade-off is stronger reliance on management at selected nodes.



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Spatial datasets

CORINE Land Cover 2018 — Copernicus Land Monitoring Service / EEA — 2018 — Land cover and vegetation/succession classification
 EU-DEM v1.1 — Copernicus Land Monitoring Service / EEA — 2018 — Elevation, slope, aspect (terrain and habitat analysis)
 Tree Cover Density 2018 — Copernicus Land Monitoring Service / EEA — 2018 — Canopy density (forest expansion, bear cover)
 Hydrographic Network of the Pyrenees — EEA; OPCC (INTERREG POCTEFA) — 2020 — Hydrological network and water points
 CTP Administrative Boundaries — Comunidad de Trabajo de los Pirineos / OPCC — 2017 — Administrative boundaries and study extent
 Registre Parcellaire Graphique (RPG) — Ministère de l'Agriculture (France) — 2021 — Agricultural parcels and pastoral land use
 Occupation du sol à grande échelle (OCS GE) — IGN / Ministère de la Transition écologique — 2020 — Large-scale land use
 Historical Aerial Imagery (Remonter le temps) — IGN — n.d. — Historical imagery for landscape change and abandonment
 Sources for bear habitat and movement mapping
 Brown bear presence grid (regular / occasional presence areas) — OFB (formerly ONCFS) — [2021] — Seasonal habitat distribution baseline (10 km grid)
 Pyrenean brown bear activity patterns — Parres et al., Mammal Research — 2020 — Diurnal and seasonal activity rhythms
 Bear depredation hotspots, Pyrenees — Gastineau et al., Biological Conservation — 2019 — Predation hotspots and predation belts
 Réintroduction de l'ours brun, synthèse 1996–2000 — Quenette / DIREN — 2000 — Bear distribution and reintroduction data
 Plan de restauration de l'ours brun 2006–2009 — Ministère de l'Écologie (France) — 2006 — Official bear range and protection zones
 Footpath network — Plan départemental des itinéraires de promenade et de randonnée (PDIPR), Conseil départemental de l'Ariège; author's elaboration — n.d. — Existing trail network, reorganized into the multi-species footpath system

Fig4-4| F Transhumant nodes and activities across the PNR des Pyrénées Ariégeoises.

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