



Habitat management of the
Hermann's Tortoise in the Albera

Manual of best practices

September 2012

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Manual of best management
practice for the Hermann's tortoise
habitat in the Albera

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Presentation

Despite the protection of specific sites for promoting the conservation of native species of flora and fauna, the management of these protected areas often falls to the landowners. The success of any conservation measures will depend on them. All species of fauna are linked to areas characterised by the terrain, climate, vegetation, type of soil etc. which make up their habitat. This habitat becomes an inseparable part of the species, and its conservation is fundamental for their survival. Any management carried out should meet the species' requirements.

The case of the Hermann's tortoise in the Albera Range is one good example. The history of the Albera, where constant long term transformations have been brought about by humans, has determined the present and the future of the species. Intensification in agriculture, deforestation, forest fires, urbanisation and humanisation of the territory has decisively impacted conservation of the Hermann's tortoise in this its last natural population of in the Iberian Peninsula.

Given that human interaction with this territory will continue into the future, it is necessary to review some aspects of how this secular relationship between humans and nature is carried out, so that our activities do not affect this singular species. Vineyards and olive groves, in use or abandoned, meadows, pine woods, cork oak woods, low undergrowth etc. form their habitat and the way we manage them determines their future.

With the edition of this best practice manual, our aim is to provide management guidelines for landowners and managers of the multiple and varied agricultural and forest land that makes up the tortoise's habitat.

These recommendations are the fruit of many years of observation and study, but even so, they are only a starting point from which we can improve our relationship with the tortoise and the natural environment that surrounds us.

It is possible that some readers may begin to carry out some of these recommendations diligently. Others may make only small changes to their present land management, but every little helps. Before we commence, we would like to thank you for your collaboration. If the Albera tortoise is to continue living in our area, its future is in your hands.

The Albera Custody Network

The Xarxa de Custòdia de l'Albera (XCA), (Albera Custody Network) was created in 2008 by Grup d'Estudi i Protecció de les Tortugues (GEPTO, Tortoise Study and Protection Group). It is a non profit making body and an active member of the Xarxa de Custòdia del Territori (XCT, Territorial Custody Network, see <http://www.xct.cat>)

XCA was first created to protect, conserve and/or improve the Hermann's tortoise habitat through custody agreements between the group and landowners. The recommendations additionally take into consideration other species of threatened fauna and flora.

The custody agreement is a voluntary pact in which the landowner obtains technical support (Technical Management Plans of Custody) and, in some cases, economic or human resources for land management, as well as social recognition and personal satisfaction from contributing to farming conservation, a natural and cultural patrimony of our country.

We hope to see an increase in the amount of land registered in the XCA

and with these words, we encourage you to participate.

The Custody Management Technical Plans

Through analysis of the state of the habitat and tortoise population in the custody properties, these management technical plans form a basic tool which establish and plan agro forestry management measures for restoring, improving and conserving tortoise and other native species habitat.

All landowners who are interested in obtaining a custody management technical plan should register their land in the XCA (Albera Custody Network).

The signing of the custody agreement signifies that the land is included in the Territorial Custody Network initiatives list. The Network, in coordination with the landowners, can apply for various grants for funding management.



The Hermann's tortoise in the Albera

The Hermann's tortoise is a reptile which is found, as the name implies, throughout the northern Mediterranean basin. It is one of our most threatened species and therefore protected by national and international legislation.

Legislation

Europe

Annex II of the Habitats Directive considered of European interest.

Spain

Royal Decrees 439/1990, 1997/1995 (Annex IV), 1193/1998 (Annex II).

Catalonia

Law 3/1988

IUCN Category

World

Near Threatened NT

Spain

Endangered (EN). Recently catalogued as a species in danger of extinction in the List of Wild Animals under Special Protection and in the Spanish Catalogue of Threatened Species. According to the Royal Decree Act 139/2011 4th of February.

Albera Range. The Public Administrations, together with civic entities dedicated to nature conservation, have carried out a series of actions aimed at the recuperation of the species: laws have been passed prohibiting commerce, possession, capture or killing; special protection areas have been designated; programmes have been set up for captive breeding and raising local people's awareness, and reintroduction plans in natural areas where the species has disappeared have been developed.

Tortoises are diurnal animals that can have a territory of more than 3 hectares. Like all reptiles, they are cold blooded, meaning that their body temperature depends on ambient temperature. For this reason, when faced with disfavorable conditions of cold or heat they survive by entering into a deep sleep (hibernation or estivation), slowing down activity and lowering body temperature to save energy. To hibernate or estivate, the tortoises hide away in holes between stones, under piles of branches, leaf litter or beneath dense bushes. They particularly like to use rabbit burrows and they most frequently hide away amongst blackberry bushes.

The last natural population of Hermann's tortoise in the Iberian Peninsula can be found in Catalunya, and specifically in the





The Hermann's tortoise is vegetarian and prefers plants in the compositae and papilionaceae families, followed by gramineae, whilst avoiding aromatic plants. A total of 46 plant species have been described in the diet of the Albera population.

The Albera tortoises are found on siliceous ground and in habitats made up of mainly cork oak woodland mixed with holm oak and oak, pine forests mixed with holm oak, cork oak and shrub land. They also occupy vineyards or other abandoned cultivated fields, but avoid them when they are in use.

Mating takes place at the start of spring, although copulation can be repeated until the end of summer. Females dig out nests with their back legs between May and

June, and once the eggs are buried (between 3 and 6) they no longer concern themselves with their young. Each year they lay twice and do so in fairly open, sloping areas with a low stone density, facing south and out of dense woodland. After 3 months (between September and October) the young tortoises hatch. These will take 10-12 years to reach adulthood. As a result, this is a very slow growing creature with a low reproduction rate, making it extremely sensitive to adult mortality and habitat alteration.

There are a number of factors which have placed the Hermann's tortoise in danger of extinction: the high number of individuals removed from the habitat for commerce; the effects of large scale forest fires which rose in frequency in the 70's and 80's, together with human activity (creation of forest trails, legal and illegal constructions etc.).

Protected areas in the Albera

In 1986, the Catalan Parliament declared part of the southern slopes of the Albera Range as a natural area of national interest. Around the Albera Range, two nature reserves were defined with the aim of protecting the habitat of the Western Hermann's tortoise. In 1992, the Albera protected area was increased with the Plan of Natural Interest's approval.

With the creation of the Natura 2000 net-

work, the 17,182 hectare protected area is currently a Site of Community Importance

(SCI), covering much of the tortoise's distribution area and habitat.

The biological clock





Woodland Areas

Woodland Areas

Current woodland systems are characterised by their multifunctional role, providing both goods (wood, firewood, cork, fruit or pasture) and social services (hunting, cultural activity, biodiversity conservation, outdoor activity etc.). The majority of the woodland areas are in an abandoned state, with cork being occasionally extracted. However, the low management which is carried out is unprofitable and is often detrimental to the tortoise or other species.

The woodland management recommendations we propose (some requiring authorisation) are focused on ensuring the conservation of the cork oak woodland as habitat for the Hermann's tortoise.

The aim is also to make this compatible with cork extraction and production, and to reduce as far as possible the vulnerability of woodland against forest fire.



Amongst common woodland management actions, some of which require authorisation, we can find:

The reduction of bushy areas

The total or partial elimination of non-arboreal vegetation in the forest, mainly bushes, is called undergrowth clearing or cutting. The main aims of clearing and cutting are to reduce the competition for resources, help the process of regeneration, eliminate combustible material in order to prevent fires, and improve transition and silvopastoral conditions.

Clearing can be done in a variety of ways:

Using mechanical tools

This is a silvicultural measure which is impractical if applied to large extensions of woodland due to high costs and the need to carry out maintenance work every 4 or 5 years. It can be done with 1. a tractor or tractor mounted flail or 2. a brush cutter. The first is perhaps more commonly used in the area and also the one we would not recommend, since it can kill tortoises and is also linked to erosion and a compacting of the soil. The brushwood cutter on the other hand, is a more efficient tool for redu-

Hammer mowers cause tortoise mortality and temporal habitat destruction. For this reason, it is a highly inadvisable tool to use in any part of the Hermann's tortoise's habitat.



cing the shrub land. We recommend cutting twice: the first cut at 30cm off the ground, and the second at the planned height. The first cut allows any tortoises to be spotted and removed before any damage is done.

It is preferable to concentrate clearing work during October and November in order to avoid the hibernating season (so tortoises are not left unprotected) or spring (their most active period). It should not be carried out in summer, when this activity is prohibited, or in spring when birds' nests situated in the undergrowth, the eggs or young birds can be damaged.

Biological clearing

The high costs of managing woodland areas associated with mechanical tools provide new opportunities to use livestock as biological control agents of unwanted vegetation (under storey). Goats, sheep, horses or cows, and in particular, the native breeds, in combination with mechanical management are a very effective tool in the control of bushy vegetation.

Clearing is not strictly necessary for the improvement of the tortoise habitat except in landscapes with a high density of vegetation.

Treatment of wood and brush remains

Any woodland management should

also include the management of wood, bark and leaf debris left after land clearance. This is necessary in order to reduce the risk of forest fire, avoid interference with regeneration and to promote the incorporation of organic material back into the ground. The following techniques can be useful:



Pile up remains resulting from clearing or pruning. Large branches should be cut (see refuges). These piles are good for the tortoise and other species of animals and plants.



Despite being a more expensive option and signifying limited access and mobility for mechanical tools, use wood or brush chippers in situ.

Any woodland intervention requires management, since many plants often regrow after cutting. An excellent strategy would be to maintain clearings using grazing cattle herds, which are unfortunately very scarce.





The Cork Oak Woodland

The majority of the remaining cork oak woodlands in the Albera are the result of the intense relationship with humans. It is difficult to find mature forest and at best, only fragments of cork oak woodland which have remained unaltered since the 1950's can be found. They are not the result of woodland management, rather the abandonment of woodland activity due to the crisis in the sector.

Here are recommendations to ensure compatibility between tortoise conservation and cork production:



Encourage structures with diverse bushy layers directed towards benefits.



Leave dead tree stumps to attract birds and insects, which, contrary to belief, do not cause forest plagues.



Carry out selective cutting (see reduction of bushy areas) to maintain or create clearings as areas for feeding, nesting or thermoregulation on south facing slopes. These clearings, combined with other measures such as pruning, can re-

duce combustible matter, aiding in forest fire prevention. On the other hand, cutting or clearing is not necessary on north facing slopes.



Cut down young pine trees, since this species has a great capacity for colonisation and, once established, their canopy is damaging to the bushy stratum below.



Create structures which provide refuge (See refuges)

The presence of leguminaceae species such as Genista (broom) is an indicator of more productive soils and therefore better quality cork. On the other hand, undergrowth with Erica (heather) and Cistus (Rock Rose) indicates poorer soil.



A mixed cork oak forest with holm oak and downy oak together with an understorey represents a place of refuge for the tortoise during the winter and summer. If the woodland is south facing, selective clearing of bushy undergrowth can be carried out, with an aim to creating clearings which offer the tortoise places to feed, nest and bask.

Pine Forest

The pine, brought in the 1950's through forestry governance to repopulate abandoned vineyards, is a recent arrival to the Albera. Anthropogenic action encourages its propagation and colonisation in new sites where cork oak woodlands are slowly being taken over by pine forests. The pine forests we find are mainly monospecific, regular and dense. This habitat is not useful for the tortoise since pine canopy impairs bushy and herbaceous layers and even destroys them, elimina-

ting the tortoise's possibility to feed and/or find shelter.

For this reason, we recommend:



Actively encourage a conversion of pine forest, first towards mixed woodland, especially including cork oak or holm oak and finally to areas of purely cork oak, holm oak, and downy oak with an assorted undergrowth.



Cut down any isolated pine tree of any diameter.

Dense formations of pine forest impede the development of the understorey, which limits the tortoise's means of finding food and refuge structures.







Bushy Undergrowth

Bushy undergrowth appears as a consequence of the transformation of other more mature forest formations, or the abandonment of cultivated fields (see abandoned cultivated fields). It makes a very interesting habitat for many species of flora and fauna. With high plant diversity, the undergrowth is used a lot by the tortoise for refuge, and the annual plants which make up the herbaceous layer provide them with food.

In the case of open undergrowth, where it is easy to walk, the recommendations are the following:



Cut down any young pine trees.



Select trees, preferably holm oak, downy oak or cork oak with an aim to developing woodland structures. Cut non-selected trunks and young trees.

If the undergrowth is very dense, (difficult to walk through and occupying large areas), we propose the creation of clearings (maximum area 100m²), together with the previously mentioned

recommendations. These clearings could become new nesting areas, so it is important that they are south facing, and with a low stone density which makes excavation, thermoregulation and feeding easy. These clearings could be created with mechanical tools or through grazing (see reduction of bushy areas).

In recent years, one activity which has been hugely damaging to this vegetation formation and to the tortoise is the clearing of undergrowth to form firebreaks using mechanical mowers and flails.

Selective cutting with a brush cutter can create clearings which, if south facing and not too stony, can be used by females as areas for nesting, feeding and basking.



This bushy undergrowth tends to naturally reforest with pine, holm oak or cork oak, where the seeds find ideal conditions for germination.

Abandoned Fields

Over the past years, the number of abandoned fields has increased. These are potentially good habitat for the Hermann's tortoise and should be conserved.



In recent decades, due to the low profitability in the primary sector, people have been abandoning cultivated fields and meadows. As a consequence, the woodland has taken over agricultural land.

Abandoned fields, which are categorised as forest by current legislation, form an ideal habitat during the first 15 years, especially for tortoise reproduction. They also contain a highly interesting diversity of plants and animals such as butterflies, grasshoppers, beetles, ants and vertebrates, some of which also need conservation protection. As the vegetation cover increases, it ceases to be an optimum nesting site but the tortoise continues to use it for feeding, shelter and

thermoregulation.

Traditionally, abandoned fields were seen as unkempt wasteland and many landowners decided to periodically till them or

plant pine trees, neither of which is advisable.

Given the importance of these fields in the conservation of the species, it is important to conserve them, or at least one part of them, in their primary state of ecological succession. The following steps could be taken to achieve this:



Cut young trees which start to appear.



Carry out selective clearing to control the undergrowth every 5 years, with the aim of maintaining some clearings with herbaceous cover.



Do not use chemical products to control vegetation.



Create refuges.





Streams and Brooks

The margins of streams and brooks offer the tortoises refuge, above all during the summer, where they find shallow water to drink and often green grass to eat. These margins are also used as connectors between different parts of their territory. In some of these streams and brooks, rare plants that are critically endangered can be found such as *Hydrocotyle vulgaris*, *Isoetes durioui* and *Spiranthes aestivalis*. So the conservation of these margins which should have a width of 2 -10 metres, is important and we recommend using

no management at all (no herbicides, clearing etc.).



Brooks and streams provide habitat for diverse species of flora and fauna, some of which are threatened.



Agricultural Areas

Agricultural Areas

Current productive agricultural systems, even though some may have an integrated production certification, are not completely respectful towards human or environmental health, and only accelerate the fragmentation and loss of tortoise habitat. What is more, the use of chemical products (phytosanitary products, fertilisers, herbicides and hormones) can be harmful to tortoises when applied. We should not forget that they feed basically on annual plants which can grow between vineyards and olive groves, making these fields play a vital part in the species' survival. In addition, the characteristics of these fields make them an ideal place for females to make their nests.



Some of the recommendations for best agrarian practice, common in the two most widespread cultivations - vineyards and olive groves (and additionally in cereal cultivation), which focus on guaranteeing environmental, economic and social sustainability from agricultural products are:



Use non-chemical plant protection. When chemical products must be used, apply them on days without wind. Follow the health warnings of the Plant Health Service.



Do not apply herbicides but use mechanical or biological methods to control herbaceous vegetation.



Adjust agricultural practices to the tortoise "biological clock".



Convert to ecological production.

Some common actions that can be taken in the vineyard and the olive grove, which deserve special attention, are:

The use of vegetation cover as a weed control measure is being used more and more, benefiting both the tortoise and the crop.

Ecological farming offers economic opportunities to grow produce which is more profitable, and also respectful to the environment.



One of the most established agricultural practices is tilling. Superficial tilling with a chisel type plough is recommended over deep tilling with a subsoiler. Tilling should only be carried out during periods of inactivity and outside the incubation period (June to October).

The treatment of pruning remains

The burning of pruned branches in vineyards and olive groves is common practice – they are piled up and burned.

Tortoises really like to hide underneath these piles, so one action would be to

leave these piles untouched in between the rows of grape vines or olive trees, or in the margins of the fields. If they need to be burned, it is advisable to do so on the same day as pruning,

as long as this is outside the hibernation season. Chipping the debris and then incorporating it into the soil is a good alternative.

When green pruning in the vineyard (and only when no chemical products have been applied) we recommend the branches be left on the ground, since the tortoise enjoys these leaves. Once they are dry, they can be collected up, burned or shredded.

Vegetation cover

Two of the most important vegetation control techniques consist of introducing seeded vegetation cover (preferably leguminosae) and leaving the natural vegetation to grow after the grape harvest. This vegetation cover, besides helping to reduce water evaporation from the soil, has a controlling effect on populations of spontaneous species and weeds which grow between the vines. With its reserves of beneficial organisms, it also helps to keep pests under control. At the end of winter, this vegetation can be trimmed.




Below are recommendations for the maintenance of vineyards, olive groves and also field margins, which are not only beneficial to the tortoise but improve crop production.





The vineyard

Grape cultivation is one of the most representative crops in the Albera. Vineyards can form part of the tortoise's habitat if they are managed using the measures aforementioned, together with the following complementary actions:

-  Use vegetation cover.
-  Avoid tilling but if necessary, only do so in winter as a protective measure.
-  Minimise the use of heavy machinery.

survive, but these are of no interest to the tortoise.





If the vineyard is to be recovered later on in the future, we would recommend not abandoning it but carrying out occasional management focused towards

ecological production, naturalising the vineyard or converting to pasture. If this is the case, some actions would be:



Abandoning the vineyard

As mentioned beforehand, fields that were once cultivated but then abandoned represent a very good habitat for the tortoise. Here it can find structures for refuge, and all its other biological necessities. Abandoned vineyards are similar to abandoned pasture since the vines tend to disappear. In some cases, the rootstocks of American origin used to combat the Filoxera disease at the end of the 19th century



-  Cut young trees.
-  Selectively clear bushy stratum (see reduction of bushy areas).
-  Do not plant pine trees.
-  Do not till the land.

Ecological grape cultivation is an interesting alternative to conventional agriculture, even though the current legislation permits the application of a series of chemical products. The effects of these on the tortoise are not yet known.

The olive grove

Olive cultivation is widespread in the Al-bera. If some of the recommendations aimed at modifying agricultural activities are followed, olive groves can be transformed into optimum tortoise habitat, without affecting economic benefits.

Here is a summary of the recommendations:

-  Reduce as much as possible applications of chemical synthesis products.
-  Don't apply herbicide, and preferably use vegetation cover.
-  Adjust agricultural practices to the tortoise "biological clock".
-  Avoid tilling and minimise the use of heavy machinery.
-  Convert to ecological production.

Some of the chemical products used in agriculture, according to scientific studies, are mortally dangerous for tortoises. Alternative weed control techniques exist, for example, using vegetation cover, brush cutting, or tilling the soil.

therefore protecting natural resources and protecting human health, can be highly beneficial for tortoise conservation. The relative differences in cost between a conventional olive grove and an ecological one are small, and in fact, with a heavy use of chemical products,



Ecological olive groves

Ecological olive production, which aims to produce extra virgin oil without the use of chemical synthesis products,



The vegetation structure of an abandoned olive grove recreates an ideal habitat for the Hermann's tortoise which, when well managed, can benefit the Albera population. The vegetation structures which appear next to olive trees offer good refuge cover.



the costs of the conventional olive grove are higher.

Abandoning the olive grove

Currently, there are many abandoned olive groves throughout the Albera. All make highly interesting habitat for the tortoise where it can find refuge in the bushes growing around the base of the olive trees, nesting sites and food. In

contrast to vines in abandoned vineyards, olive trees do not die.

We recommend that you avoid abandoning the

olive grove but carry out some of the following recommendations with the aim of maintaining it in a primary state:



Cut young trees.



Selectively cut bushy stratum (see reduction of bushy areas).



Maintain the herbaceous layer.





Field margins

The intensification of agriculture has impoverished or brought about the loss of habitats of many species of flora and fauna which are, above all, situated in field margins. These margins are a common element in agricultural areas and represent a source of food or refuge for many species, without which they don't survive.

The minimum width of these margins should be 2m. Species such as blackberry (*Rubus* sp.), thorny broom (*Calycotome spinosa*) and heather (*Erica arborea*) are the plants most commonly used by tortoises as refuges. Tortoises and species of insects that are useful in biological control can be harmed by measures such as field margin burning or herbicide use. Recommendations:



Don't apply chemicals products, especially herbicides on margin vegetation.



Don't burn field margins.

The conservation, restoration or creation of this vegetation which delimits many

fields can create structures which promote auxiliary fauna, save in applications of pest control products and at the same time become biological connectors favouring tortoise dispersion.

If the land is bigger than 2 hectares, we recommend creating corridors of vegetation through the middle, mimicking the natural botanical structure of the margins.

Field margins are the only available space for flora and fauna in many of the existing agrosystems in the Albera. Thanks to this habitat, associated fauna contribute to the improvement of the soil in a natural way, and many animal species carry out the important role of plague controllers.





Others



Refuges

One of the main problems for the tortoise in the face of forest fire is a lack of refuges. Generally, they will use dens or holes of other animals such as rabbits, but due to the drop in the rabbit population from mixomycosis and viral hemorrhagic disease, these holes are becoming scarcer. Therefore, we would encourage you to create the following refuges:

Stone refuges

A hole under a large stone can be enough to ensure the tortoise's survival during a forest fire. Dry stone walls are also useful and simply need spaces to be made between the stones.

Refuges from plant matter

Generally, any piled up plant matter can be a useful refuge for tortoises but also for rabbits and for artificial rabbit burrow construction which is used for breeding. Many different models exist and perhaps the one most used is with wooden pallets.

If any clearing needs to be carried out, branches that have been cut can be used. To make an artificial burrow, first the branches with the widest diameter are placed on the ground, up to 30cm

apart. Then some more branches are piled on and then more, thinner branches are added, making up a second layer. The minimum diameter of each burrow should be approximately 5m and preferably situated close to a clearing, abandoned field or pasture.

One threat facing the species is the decrease in the rabbit population, probably forcing many predators to look for alternative prey such as eggs and young tortoises. The construction of artificial burrows is one way to increase rabbit numbers and will hopefully reduce tortoise depredation.



Wells

The majority of wells dispersed throughout the Albera are testimony to the state of the agricultural landscape years before. Wells are traps for tortoises and other animals and can also be a danger to humans, being located at ground level. So it is fundamental to cover up a well if there is one in your land, preferably with a registered lid or by making a low parapet wall around it.



The wild boar

At the beginning of the 20th century, the wild boar seemed to have almost disappeared but in the 1960's their populations were revived due to the increase in woodland areas and the abandoning of many woodland activities. Today, it is still present and in the Albera Range, densities are currently the highest in Catalunya, estimated at more than 18 per 100 hectares. The wild boar is not only a potential predator of young tortoises, but also tortoise eggs.

There are often actions which favour the wild boar or threaten the tortoise such as:



Installation of feeding or watering points for wild boar.



Creation of dog training areas in sites where tortoise populations are present.

Selective clearing is needed in extensions of bushy growth to reduce refuge areas for wild boar.



Camera trapping identifies the wild boar as one of the potential predator species of tortoise nests together with the badger, beech marten and fox.

Honey Production

Mediterranean undergrowth is made up of a variety of aromatic plants which humans have traditionally made use of in honey production. The lines of beehives which can be seen in some clearings or meadows within the undergrowth form an inseparable part of this landscape. Beekeeping has always

been a family, artisanal business which respects the environment, making it a compatible activity with the conservation of the Hermann's tortoise.





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Addresses of interest

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(Territorial Laboratory of Plant Health Girona)

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(Project for the recuperation of the native Albera goat)

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Habitat management of the Hermann's Tortoise in the Albera

Manual of best practices

This manual has been conceived as a useful tool for all land owners and managers of natural agricultural and woodland sites in the Albera who can contribute to conserving the Hermann's tortoise habitat. The management recommendations found here, some of which are small variations on the type of activities already carried out, can aid the recovery of this singular species in a decisive way.

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