Mosasaurs

*Interactions between armies and ecosystems in the Meuse Region, 1250-1850*

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PART II: BIOTIC COMMUNITIES

4. Disturbances

INTRODUCTION

Consider a seventeenth-century German pamphlet depicting a ‘merciless, awful, horrible and atrocious animal that has destroyed, consumed and corrupted most of Germany in a few years time’ (figure 4.1). It denounced the suffering and misery armed forces caused during the Thirty Years War (1618-1648). This beast combines features from different creatures: a wolf’s head, a bear’s rump, a rat’s tail, a lion’s paw, a human arm, an armoured foot, and a horse’s leg. It carries weapons and a torch, while eating gold, trampling an armed man and leaving a trail of burning buildings behind. Snakes, toads, locusts and snails follow in its wake, and destroy the crops and vines depicted in the foreground. The woodcut represents armies as a destructive force, as a catastrophe, and serves as a leading thread throughout this chapter.

Studying disturbances means analysing disruptive influences of armies on ecological systems, in peace as well as war, thereby engaging prevailing arguments about the destructive role of armies directly. It also entails moving to a different level within the ecosystem concept: biotic communities, or interactions between living beings amongst themselves rather than with environmental factors (the landscape level). This should not be interpreted as a strict dividing line, but more as a shift in emphasis, as the ecosystem concept implies that living beings and their non-living environment are intrinsically connected to each other. This chapter examines to what extent armies contributed to ecological change by disturbing biotic communities, in both the short and the long term, for one has to take resilience into account, the ability of an individual, species, or system to absorb shocks without losing any of its essential characteristics. A distinction will thus be made between disturbances as temporary shocks and as contributing factors to long-term shifts in biological communities.\footnote{Campbell, ‘Nature as historical protagonist’, 307-310.}

A disturbance can be defined as ‘any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment’.\footnote{Pickett and White, The Ecology of Natural Disturbance, 6-9.} Disturbances are a crucial element in ecosystem functioning and encompass everything from floods, storms and volcanic eruptions to simple grazing. Ecosystems constantly change; there is no such thing as a delicate ‘balance’ that can be upset by external events. The calcareous grasslands for which the Meuse valley itself has become
Figure 4.1. Seventeenth-century pamphlet on the Thirty Years War (Dresden, Die Sächsische Landesbibliothek- Staats-und Universitätsbibliothek, inv nr. 334171156 Abbildung des unbarmherzigen, abschewlichen, grausam- und gewlichen Thiers, welches in wenigen Jahren, den grössten Theil Teutschlandes erbärm- und jämmerlichen verheeret, aussgezehret und verderbet).
famous, for instance, can only be preserved through regular disturbances, in practice mowing and grazing.\textsuperscript{378} The maintenance of fortifications is also a series of disturbances, for it involves the removal of vegetation from ditches and walls.

Drawing attention to disruptions' multiple functions is vital for challenging current assumptions about army-ecosystem interactions. The study of 'environmental destruction' during warfare has been a major stimulus in bringing about a rapprochement between military and environmental history, but also suffers from the vague terminology most scholars employ. Many analyses, whether they concern historic events, or contemporary effects of warfare, use the term 'destruction' indiscriminately, thereby obscuring different gradations of damage. The word destruction should be reserved for a specific kind of disturbance; those instances when a community or ecosystem has disappeared or is permanently degraded.\textsuperscript{379}

Establishing exact distinctions between different degrees of disruption is problematic, however, since comparatively few historical sources allow a detailed study of the actual extent of damage caused. Administrative sources (fiscal accounts, correspondence, court records, notarial acts) are generally more accurate than chronicles or literary works, but they still tend to focus on the economic value of destroyed property rather than giving explicit evidence about the surface of land affected or number of plants and animals stolen or killed. Many of these documents were indeed created to prove that a community, institution or individual should receive some sort of compensation or was unable to pay taxes or rents. Some of the most detailed records about ecological disturbances originate in French compensation payments to communities in the (neutral) principality of Liège in the aftermath of the Austrian War of Succession (1740-1748). This is the first time in the history of the region that a ruler systematically compensated foreign populations for damage done by his armies.\textsuperscript{380}

What these sources do provide is ample evidence about the disturbances' diversity: armed forces cut down or burned trees, shrubs and vines, mowed or trampled grasslands, harvested, trod or burned agricultural fields, damaged ponds and took the fish, stole or killed livestock and game, demolished buildings, and caused human communities to experience a sharp demographic decline. Contemporaries, particularly those involved in agriculture, portrayed warfare as a catastrophe, and more importantly as a shock that has similar effects to a natural disaster. A fourteenth-century miniature leaves little doubt about the nature of medieval warfare (see figure 4.2). It portrays a party of men-at-arms burning a castle, stealing

sheep, and cutting down a tree. A notarial act from Sautour, near Philippeville, in 1597 provides a textual equivalent for it included a clause that the tenant of a major forge was not obliged to pay rent when affected by war or another kind of disaster.  

Figure 4.2 Miniature from a fourteenth-century French Bible depicting warfare disturbances (BNF, Français, 160 Bible Historiale, f. 203v.)

While warfare in general did have a similar role to a natural disaster, there were still major differences, depending on the exact geographical and chronological context. As argued in the introduction, armies evolved from forces that primarily aimed to damage property, often relatively small groups of a few dozen or several hundred men, to massive entities of tens of thousands of people who generally refrained from attacking local populations, but still caused considerable damage because they required food and shelter and built or attacked fortifications. These changes reflected a growing divergence between armies and general society, but also mounting problems regarding the former's basic maintenance. Early modern rulers raised larger forces than their medieval predecessors, and also kept them in the field for longer periods of time. This put a heavy burden on their administrative apparatus, so much pressure in fact that warfare could only be conducted by outsourcing it almost entirely (especially recruiting and supply). By the early seventeenth century medieval extortions under threat of fire (brandschatting/ Brandschatzung) had developed into a complex system of

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381 Sautour 6931, 18/2/1597 (transcript Généamag).
contributions according to which local populations had to supply passing armies which everything they needed or face retaliation.\footnote{Gutmann, \textit{War and Rural Life}, 41-46, 61-66; Parrott, \textit{The Business of War}.}

In order to highlight differences between different kinds of disturbances, between short term 'shocks' and long-term 'shifts', this chapter adopts a thematic rather than chronological framework. The first section aims to determine the actual extent of warfare disturbances, and considers their effects in a short and long-term perspective. It therefore has to distinguish between different kinds of communities: woody plants, grasslands, animals, and human settlements. The next section takes the argument further and questions whether these same disturbances could have stimulated the spread of some species. The turmoil resulting from warfare might have diminished human control over ecosystems, resulting in the spread of wilderness or uncontrolled nature. A third and final section draws attention to preparation for war and its aftermath, rather than actual campaigning. It questions to what extent military disturbances can be considered as part of a larger set of influences that brought about shifts, or long-term changes, in biological communities. This chapter thus contributes to the re-examination of army-ecosystem interactions by stressing the ambiguity of military disturbances in the premodern period. The most obvious devastations might not have been the most significant in the long run, and it also unclear whether their ecological effects should be considered harmful by definition.

4.1 ARMIES: AN ECOLOGICAL DISASTER?

4.1.1 The Pressing Need for Wood

We will now examine the first aspect of the horrible animal depicted on the seventeenth-century woodcut: the burning, killing, and pillaging. Such activities are closely associated with warfare in general, regardless of its exact geographical and chronological context, but need to be broken down into their constituent parts. This section will accordingly examine warfare's ecological effects in terms of woodcutting, harvest loss, livestock raiding, poaching, and demographic decline.

It would be very difficult to overstate the significance of woody plants in premodern Europe, for basic survival, as fuel, raw material, or its fruits. Armed forces continued to slash or burn them, whether standing individually or in groups, as forests, hedges, orchards or vineyards, throughout the 1250-1850 period. Still, when chronicles or administrative sources declared that combatants cut wood or damaged forests they did not necessarily mean that entire trees were destroyed. In the year 1636 for example the steward of the lordship of Rijckholt near Maastricht looked into complaints about soldiers and their wives leaving the
forest with oak branches. One of them even fell off a tree while cutting these off.\textsuperscript{383} Forty years later, in 1677-1678, French troops felled woodlands near Charleroi claiming that Dutch troops had used them earlier as cover when attacking the fortress. In 1684 the woodlands still did not yield any returns because pigs could not be sufficiently fed with their acorns. In other words: the woodlands were not destroyed, but they did need time to recover.\textsuperscript{384}

These men and women contributed to more general processes of overexploitation, which is why these infringements on entitlements were so significant to contemporaries, but the ecological damage of their actions was in itself quite limited. From the Middle Ages onwards most trees and shrubs in the Meuse Region were managed as pollards or coppice wood (see figure 2.4). The former practice involved the removal of a tree's crown, the latter cutting down the plant at ground level. Both forms of management encourage the regrowth of a multitude of new branches that could be harvested every few, typically seven, years.\textsuperscript{385} Soldiers certainly took advantage of these practices since manufacturing \textit{fascines}, bundles of branches, or \textit{gabions}, cylindrical wicker baskets filled with earth, was a basic prerequisite for

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure43.png}
\caption{Cavalrymen gather \textit{fascines} and make \textit{gabions} (left foreground), late seventeenth century (Guérard, \textit{L’Art Militaire}).}
\end{figure}

\begin{thebibliography}{9}
\bibitem{RHCL} RHCL, 16.0502 Familie de Bounam de Ryckholt, inv. nr. 598.
\bibitem{Bechmann} Bechmann, \textit{Trees and Man}, Warde, \textit{Ecology, Economy and State Formation}, 76-77; Vera, \textit{Grazing ecology}.
\end{thebibliography}
building temporary fortifications from at least the fifteenth century onwards. It is depicted in Guérard’s seventeenth-century *Art militaire* (see figure 4.3), as well as in photographs made on the eve of the First World War, and appears regularly in military handbooks.  

This does not diminish from the very extensive harm done to woodlands in other circumstances, but draws attention to the fact that there is considerable variety behind vague expressions such as ‘damaging’ woodlands. The amount of wood required by garrisons and mobile armies alike certainly must have been enormous: the accounts of the counts of Hainaut reveal that the defence of Binche in 1334 necessitated at least 1786 *fascines*, or the felling of 72 large oak trees, for the construction of small forts or large barricades (*fortéreches*), another 600 *fascines* for the men of war who stayed in the city, and 476 *merrains*, wooden staves, for the making of *houlds* (wooden battlements built as an extension of walls or towers).

This consumption grew even worse in later centuries. The defence of Geldern in 1701 required the procurement of seventy thousand *pallisades* and thirty-four thousand *fascines*. Preparing a fortification for a potential attack further entailed the destruction of any vegetation within bowshot, and later cannon, range (see 3.3). Demand of firewood could also be very substantial: accounts from the general receiver of Limburg and Outre-Meuse specify that the nobleman Carselis de Eupen and his retinue of eleven men stayed in the fortress of Argenteau, between Liège and Vise, from the end of August 1410 to the first of February 1411 to defend it. They consumed thirty-six wagonloads of firewood, taken from the lordship's own woodlands.

These needs are fairly practical, in the sense that they are connected to a combatant’s health (firewood) or core activities (combat). Yet army members also burned or cut down woody plants and vines to punish their owners and affect their economic base, as in 1393 when Jan Uten Campe saw his house (castle), orchard and willows, located near Woudrichem, destroyed. This was an act of retaliation for Uten Campe's support of Willem...

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van Oostervant against his father, Albert of Bavaria (1358-1404). Early modern soldiers saw wood as a commodity that could be easily appropriated for their own ends, for instance to gain some extra income. The Spanish government singled out its own soldiers as perpetrators in legislation issued to protect woodlands in the Netherlands, and Louis XIV issued similar regulations for his own forces in the late seventeenth century.

Such disturbances are meaningful because they were part of long-term infractions resulting in the overexploitation of forests and the obstruction of regrowth. Villagers in effect took advantage of the turmoil armies created, and the resulting breakdown of authority, to evade the laws regulating the conservation of woodlands: regulations passed in 1559, regarding the use of woodlands in the County of Namur, explicitly mentioned that earlier legislation was being ignored because of the war with France. The year 1747 saw a similar renewal of legislation in the principality of Liège, during another French invasion.

The widespread practice of villagers taking refuge in the most inaccessible parts of their community when confronted with an invasion (often forests, but caves, hedges, ditches, marshes and islands are also mentioned) would have exacerbated the disruption of combat itself. It caused a sudden and very substantial rise in human presence in areas that would normally have been relatively left alone. The seventeenth-century County of Namur, for example, saw several lawsuits about damage done to privately owned woodlands and meadows by refugees and their livestock. In one instance the barriers protecting a forest were broken down in order to gain entrance. In 1686 Gilles Marteleur, fifty-eight years old, even testified during his interrogation by the councillors of Pesche, near Couvin, that he grew up in woodlands, in a house separated from the village by an hour's walk, because of the wars.

391 This conflict was instigated by the murder of Aleid van Poelgeest, the count's mistress, and is one of the most well known episodes of the so-called Hook and Cod Wars in the late medieval County of Holland. de Boer, Faber and Jansen (eds.), De rekeningen III 1393-1396, 4; Glaudemans, Om die wrake wille, 142-148, 179-181. See also La vie quotidienne dans les Ardennes, 26; de Slavelot, Chronique, 111; Douxchamps-Lefèvre, Inventaire, vol. 4, 342, 372; Girardot, ‘La guerre’, 6; Lefèvre, ‘Documents relatifs aux dégâts’, 44; Maguin, ‘Economie, politique et viticulture’, 196; Richer, Abrégé chronologique, 212; Servais, Annales Historiques du Barrois, vol. 2, 329.


394 Pesche 6361, 22/05/1686 (Transcript Généamag); Douxchamps-Lefèvre, Inventaire, vol. 3, 195-196, 217; vol. 4, 106, 117, 123, 132, 186, 275, 346; See also SAT, inv. nr. 1, f. 46r-v; Delcourté Debarre, ‘Espaces forestiers’, 101, 333; Faujas de Saint-Fond, Histoire naturelle, 40-41, 43, 50; Jacob, Bruyères, 105; Marchal, Inventaire, 166; van Houtte, Occupations, 98-102; Willems, ‘Opoeteren-Jan van Weert’, 128, 155, 157, 175.
Contemporaries particularly dreaded the harming of the few remaining trees with a full crown (in orchards, high forests, or as isolated individuals). This was clearly a less common occurrence than the harvesting of coppice woods or pollards, but then these trees were also relatively rare because of the constant pressure on wood as a limited resource. The citizens of Fosses near Namur, for instance, had to declare in a 1276 charter that they only cut down trees belonging to the collegiate church of Saint-Pholien because they had to strengthen its defences and no suitable trees could be found in their own woodlands. A voluntary hearing before the councillors from Sint-Michielsgestel, near ’s Hertogenbosch, in 1597 records likewise that the prospective buyers of forty-three oaks, managed as high forest, were only willing to pay a reduced price because soldiers and other people had cut off the crown of some of them and damaged the branches of others. The trees were in fact only useable as firewood since even a few years of regrowth could not restore them.

In a few instances there is quite precise data available and these sources make it clear exactly how much damage premodern armies could inflict, even with the relatively basic tools at their disposal. French armies of about twenty five thousand men settled down near Tongres in 1746 and 1747 to build field fortifications. This involved the digging of trenches and the construction of batteries, but also procuring firewood. During their two stays, which lasted about a month each, every tree standing in the direct neighbourhood of the encampment seems to have been cut down, including those on the walls of Tongres and local orchards. The priors of the local hospital (gasthuis) claimed in their institution's narrative of the events to have lost more than a thousand trees, mostly poplars and birches. In the nearby community of Overrepen, which encompassed one of the few remaining woodlands in the area, French soldiers took one thousand trees as well. Because the French king promised to compensate the population for their losses, an exact survey was made. This reveals that in the forest itself three hundred and eighty-four oaks and ash trees had been cut down. The other major loss concerned the community's fruit-bearing trees, with willows and coppice wood being considered less valuable. Still, even though the French army acted as a disaster, a shock, they did not destroy local ecosystems. If the term destruction is appropriate, it is only in the short term, for the Ferraris map (1777) indicates that the area recovered from this disaster.

One should indeed be careful to distinguish theory from actual practice: commanders may have given orders to procure a certain amount of palisades or cut down a particular

398 BRB, Cartes et plans, Ms. IV 5.567 Carte de Ferraris; Bader, Wald und Krieg, 230-244, 265-280; Buridant, ‘Le rôle des forêts’, 238; Verbois, Rekem, 315.
number of trees, but that did not necessarily mean that these orders were carried out, at least not to their full extent. This can be proven by letters kept in the prefect's archive in Maastricht regarding the preparation of the fortresses of Grave, Venlo and Maastricht for the Allied invasion in December 1813. French engineers calculated that this would require between eighty-five and ninety thousand palisades as well as tens of thousands of fascines and storm poles, or the cutting of about five thousand four hundred trees. Initially, they intended to use oak trees as well as conifers, but in order to preserve the remaining oak forests, and because transportation would be too expensive, these edifices were to be made from pinewood. Despite the use of more than two hundred wagons and a multitude of labourers, and to the growing frustration of the French director of fortifications, the desired production rate of three thousand palisades a day was never reached and large numbers of felled trees had to be left behind. Accounts from the forest administration in 1814-1815 comment on the selling of wood left by the French in Rekem and the Swedes, who blockaded the fortress of Maastricht, in Gronsveld. 399

Military officers were well aware of the problems affecting the supply of wood, especially in periods of crisis. This is one of the reasons why they started taking control over woodlands and planting trees themselves (see 2.2 and 3.3). If possible, timber was brought from other areas and stored. The Meuse River was after all a major transportation route for wood. During the siege of Utrecht in 1345 for example the count of Holland bought thousands of planks and poles of different sizes in Dordrecht, a significant part of which would have come from the Meuse Region itself. The construction of pavises alone consumed hundreds of planks which put together would have been more than three thousand metres long. 400

Wenceslaus, Duke of Brabant (1355-1383), similarly declared in a 1365 charter that the citizens of Aachen could keep a siege tower with battering ram (ein evenhoge ende ein catte in einem werke) because they paid for its construction, but since the wood came from his forests in the Duchy of Limbourg, he reserved the right to borrow the tower. Records kept by the chief engineer in the fortress of Maastricht in the second half of the eighteenth century reveal that several thousand to tens of thousands of palisades were kept in store and that about two thousand were planted each year in the fortifications to replace rotten ones. In case of necessity, major entrepreneurs were contracted to supply thousands of palisades, fascines, poles or gabions in a matter of weeks. 401 The demands armed forces placed on wood as a

399 AEL, Fonds Hollandais, inv. nr. 396; RHCL, 04.01, inv. nr. 81; 07.E01, inv. nr. 17; Frans Archief, inv. nr. 1177.
400 Pavises are large shields where crossbowmen could hide behind while reloading. Hamaker, De rekeningen, vol. 3, 457-465, 476.
401 RHCL, 01.E01, inv. nr. 1; Berens, Territoriale Entwicklung & Grenzbildung, 163; Suttor, La Meuse, 404-406.
scarce resource could certainly have devastating results, but they were in themselves rarely sufficient to cause long-term damage.

4.1.2 Grasslands as Food and Forage

While woodlands are relatively well studied and their disturbances significant, the same cannot be said about a very different kind of community: grasslands. Grasslands had a central role in contemporary agricultural systems as pasture or for producing hay (meadows). Chronicles, fiscal accounts, and notarial or court records sometimes remark that these were trampled or mowed by, or for, passing armies but provide no further specifications. Often, they simply comment that an army ‘foraged’. The use of this terminology proves that the need to sustain an army’s horses is the main consideration here. A horse can be fed with green forage (freshly cut grass, herbs, grains) or dry fodder (hay, oats, straw). Procurement of the latter is an essential requirement to keep up a horse’s strength or get it through the winter.402

A single horse needs about twenty-five kilograms of forage or twelve kilograms of fodder each day. The area that this forage is procured from would of course differ according to local circumstances, but seems to be quite considerable. The marquis de Puységur (1665-1743), a French marshall, calculated in the first half of the eighteenth century that a single horse required about one hundred and fifty square meters of grassland each day. One half was needed for forage and the other half was trampled and eaten in the process of collecting it, or simply left on the field.403 Even a small raiding party or cavalry company, of a few dozen horses, could therefore have significantly affected a village’s grass and agricultural lands. Still, grasslands recover faster than any other community under consideration here.404 Unless they were damaged repeatedly, because soldiers used them as training grounds or sources for the grass blocks incorporated in fortifications, these disturbances were only meaningful in a timespan of weeks or months. Besides, during the eighteenth century provisions of dry fodder, from supply depots or local villages increasingly replace ‘foraging’, at least until the army entered enemy territory.405

The disturbance of agricultural fields, which are also grasslands from an ecological perspective, was in many ways related to the aforementioned meadows and pastures, but

402 Geldern, Stadtarchiv, A, nr. G9, Stadtrechnung, f. 48r, 75v.,76r. (transcript Rien van den Brand); Gonrieux 4087, 13/7/1636 (Transcript Généamag); Douxchamps-Lefèvre, Inventaire, vol. 1, 250, 276; vol. 3, 171; vol. 4, 35, 239; vol. 5, 28, 120; Habets, Chronijk, 39-40; Richer, Abrégé chronologique, 192, 195; Vandewal, ‘De kroniek’, 233; Verschure, Overleven buiten de Hollandse Tuin, 138.


404 Dierschke and Briemle, Kulturgrasland, 32-52.

being more valuable, they are better documented. Harvests were stolen, burned or trampled, by armies simply passing through, using scorched earth policies, procuring food for men and horses, or protecting themselves from the elements (see 6). A particularly striking case is a letter written by a farmer living near Maastricht in 1794 to his son, a corporal in a Dutch cavalry regiment. He responded somewhat angrily to his son's earlier comment that he was looking forward to war by listing its effects on the villagers. He wrote that they had to seek refuge with their livestock in the quarries of the Sint-Pietersberg and that 'no green leaf' was left in the fields. French and Imperial troops had trampled the 'potatoes, clover, oats, vetches and other crops'.

Agricultural fields illustrate that the sources under consideration here are not just occupied with economic concerns, but that military disturbances primarily cause economic rather than environmental damage. The role of warfare as a major cause of harvest loss is well established within the history of agriculture, but burning agricultural fields or leaving them fallow for a few months or years also enriches the soil. Erik Thoen’s study about the fifteenth-century County of Flanders concludes that the productivity of lands left fallow as a result of warfare, was significantly higher when they were brought under cultivation again. Marginal lands with a low productivity were the first to be abandoned. Historical studies that reflect on agricultural systems in a long-term perspective agree that they normally recuperated fairly quickly from disturbances brought about by warfare, often within a few years or a decade at most. Farmers could go hungry or use their remaining financial reserves in order to plant again, but their ability to withstand shocks was permanently reduced if forced to sell equipment, which affected their ability to work the land. Major landowners also resorted to rent reductions or share cropping to ensure the continuous occupation of their farms.

Numerous lawsuits have been preserved from the County of Namur in the late sixteenth and seventeenth century regarding tenant farmers no longer able to pay their rent due to external circumstances, often a combination of warfare and undesirable weather. Most agricultural systems do seem to have experienced their worst crises when several factors, such


407 The Hague, Museum voor Communicatie, Collectie Doesburg, letter nr. 45-83. I am grateful to Renaat Gaspar for providing me with a transcript of this letter.

408 Thoen, ‘Oorlogen en platteland’.

409 Campbell, ‘Nature as historical protagonist’; Genicot, La crise agricole, 109-111; Gutmann, War and Rural Life, 75-102, 197-200; Hoffmann, ‘Warfare, Weather, and a Rural Economy’; Jansen, Landbouw en economische golfbeweging, 82-101, 154-161, 185-190, 195, 205; Verschure, Overleven buiten de Hollandse Tuin, 141.
as the aforementioned two, coincided. These lawsuits also show, however, that landowners did not necessarily accept armies’ depredations as an excuse for failing to pay rent.\footnote{Douxchamps-Lefèvre, \textit{Inventaire}, vol. 1, 178,181-186, 188, 190, 192-193, 196, 198-207, 210-226, 230-244, 261-280, 299-314, 325-341; vol. 2, 20-22, 29, 41-45, 49-50, 64-65, 73-77, 84, 103-104, 112, 154, 181; vol. 3, 56, 90, 252; vol. 4, 24, 65, 130, 133, 212, 228, 258, 269, 419-420; vol. 5, 21-22, 33, 37; Kraus, \textit{Regesten}, vol. 6, nr. 5.}

Armies’ depredations must have had a tragic impact on farmer’s lives, but their effects on agriculture as a whole were mostly transitory.

4.1.3 From Livestock raiding to poaching

The ecological consequences of livestock raiding were very similar to that of trampling or burning agricultural fields. Livestock theft remained a general feature of warfare up to the late seventeenth century, to supply armed forces with food, and because it represents a very considerable, and mobile, form of wealth.\footnote{AEA, 062, 1121 Correspondance entre le Conseil de Luxembourg, le duc de Lorraine et le capitaine de Sedan; Couvin 529, 26/5/1636 (Transcript Généamag); Adriaenssen, \textit{Staatsvormend geweld}, 146-147; Bormans, Lahaye and Brouwers, \textit{Cartulaire Dinant}, vol. 4, 186; Borgnet, \textit{Cartulaire}, 12-13; Deloffre, ‘Guerres et brigandages’, 358-359; de Stavelot, \textit{Chronique}, 363, 555, 569, 588; Douxchamps-Lefèvre, \textit{Inventaire}, vol. 1, 219; vol. 3, 334; Girardot, ‘La guerre’, 7, 9, 10, 26; Hagendorf, \textit{Tagebuch}, 60; Hoeckx et al. (eds.), \textit{Kroniek van Molius}, 178-179; Jenniges, \textit{Das Land zwischen Venn und Schneijfel}, 67; Lefèvre, ‘Documents relatifs aux dégâts’, 42-43, 48, 50, 53; Liégeois, ‘Compte de la recette de Chiny’, 159; Luce, \textit{Jeanne d’Arc à Domrémy}, 262-268; Mengels, \textit{Chronyk}, 26-27; Richer, \textit{Abrégé chronologique}, 194, 197; Rigault, ‘Ravages de la Guerre de Cent Ans’; Rorive, \textit{Les misères de la guerre}, 344; Salzmann, ‘La petite guerre’; 193-197; Satterfield, \textit{Partisan Warfare}, 181, 271; van Heiningen, \textit{Tussen Maas en Waal}, 74.} While small numbers of soldiers did prey on individual animals, taking livestock often assumed the form of well-planned raids, involving hundreds of combatants. The lordship of Geleen for example saw entire flocks, totalling 369 heads of cattle, taken by Hessian troops in 1640 and a list was made to establish how many animals each inhabitant lost.\footnote{RHCL, 01.075 Landen van Overmaas, inv. nr. 1487; Helmich, \textit{Journaal}, 248, 255; Kraus, \textit{Regesten}, vol. 6, nr. 481; Richer, \textit{Abrégé chronologique}, 250.}

Particularly instructive is an account kept by Willem IV van Egmont (1412-1483), brother of the duke of Guelders, on his income and expenses in 1435, when staying in the fortress of ’s Hertogenrath, near Aachen, during the war between Guelders and Jülich. It provides a good example of the maxim that ‘war feeds itself’, for Willem’s income included extortions under threat of fire, ransoms, and the taking of two hundred pigs. His expenses mostly concerned the purchase of food for man and horse. As revealing as this source is, the information it provides is probably incomplete. Pigs eaten by the soldiers themselves brought neither income nor expenses and would therefore not have been listed.\footnote{Arnhem, HA, inv. nr. 445 Rekening van de 'dingtalen', loskoop van gevangenen en van de ontvangsten in natura en uitgaven voor de voeding e.d. in hoofdzaak te ’s Hertogenrade, 1435, f. 1.}
Even if one takes this source criticism into account, it is clear that a considerable part of livestock herds would have been sold rather than killed, and in some cases the original owners even got the option of ransoming their animals back. An inquest made by the castellan of Stokkem has been preserved, which gives an exceptional insight into what happened to the livestock stolen by Imperial troops during the taking of the schans of Opoeteren in 1636. The investigation mainly concerned the attack itself, involving the taking of animals and goods, and the death of several villagers, but also included villagers’ testimonies that they managed to get some of their livestock back by purchasing it from a local nobleman, tenant farmers, Spanish soldiers and even one of the castellan’s own men, named Peter Colen. It is unclear whether anyone was actually pursued for purchasing stolen goods. Colen still served in the garrison of Stokkem in 1655.414

Nevertheless, in many areas livestock decline was a substantial problem. This can be proven because the Spanish Habsburg government taxed livestock ownership. We thus have access to relatively good overviews of the number of horses, cattle and sheep present in specific communities. In the Prince-Bishopric of Liège by contrast such information only becomes available after the French takeover in 1795. In Bastogne for example, in the Duchy of Luxembourg, the number of sheep decreased by eighty-two percent between 1624 and 1656, and the number of cattle and horses was reduced by about half. Villagers were forced to lend animals because their own flocks had been stolen or died of disease. 415

Assessing the ecological consequences of the killing of fish and game is fraught with its own problems. The right to kill or own these animals was carefully guarded by a small number of privileged persons, predominately nobles, which made poaching or illegal fishing a direct assault on their privileged status rather than just another form of pillaging. Army members therefore not only engaged in such practices to procure food, but also asserted their social status and undermined a lord’s authority by attacking the environmental symbols of his lordship.416 The accounts of the city of Grave mention for instance that swans were captured during a military expedition to Herpen, a more or less independent lordship close to the city, in 1463. Given that the right to keep swans was a carefully guarded privilege, this action should be seen as symbolic for a larger jurisdiction conflict. The specification that the count

414 AEL, Etats, inv. nr. 3006 Muster list of the garrison of Stokkem, 1655; Cuppens, 'Opoeteren', 85-96; Willems, ‘Opoeteren-Jan van Weert’. See also Cuppens, 'Opoeteren', 313-314; Deloffre, 'Guertes et brigandages', 405.


of Egmont, two high bailiffs and the city council of Grave all attended this operation, confirms this impression.\textsuperscript{417}

The close association of noble status with hunting is borne out as well by the fact that contemporaries repeatedly singled out military officers for their poaching activities. For officers, hunting was part of a noble lifestyle, but apparently they did not feel obliged to respect property rights.\textsuperscript{418} The accounts of the high bailiff of Souilly specify for example that he investigated the killing of a 'large deer' by a local squire and several captains of the garrison of Verdun in 1627.\textsuperscript{419} This example demonstrates that local populations also played a role in unlawful hunting. It was indeed quite common for villagers to offer game to commanders as a bribe or as part of a larger spectrum of services.\textsuperscript{420}

Illegal fishing is similarly well attested in the immediate surroundings of military garrisons. Nicolas d'Ischen, citizen of Arlon and leaseholder of seven ponds near the town, petitioned the Conseil de Luxemburg on 30 August 1624 because soldiers of the garrison took fish from his ponds on daily basis. He already asked their commander to intervene, but this request was apparently ineffective. He now sent a more or less veiled threat, arguing that if no effective measures were taken he would be obliged to end his lease, which would be particularly unfortunate in light of the government’s already precarious finances.\textsuperscript{421} Nicolas did not specify the number of fish taken, but it could have been very considerable: according to a voluntary hearing by the councillors of Hechtel, in the Campine, of the one thousand carp introduced into a pond, the owner was able to retrieve less than five hundred, the rest had been taken by army members (\textit{legervolck}). Sometimes the ponds themselves were damaged too by breaching the dam.\textsuperscript{422} Because freshwater fish and game animals were often kept in carefully controlled, but isolated populations (ponds, rabbit warrens, and hunting parks), they were very vulnerable to the ‘shocks’ warfare brought about.\textsuperscript{423}

At the same time, the effects of these poaching activities may not be overestimated. The argument of Jan Hendrik de Rijk for instance, that the Eighty Years War caused the extinction of the common crane (\textit{Grus grus}), great bustard (\textit{Otis tarda}) and black grouse (\textit{Tetrao tetrix}) in large parts of the Northern Netherlands as early as the 1570's is tenuous.

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\textsuperscript{417} SLC, Archief Gemeente Grave, inv. nr. 218, f. 136r. (transcript Rien van den Brand).
\textsuperscript{419} ADM, B 1280, f. LXXVII v.
\textsuperscript{420} Kaisin, \textit{Annales historiques}, 153, 164, 191, 235; Verschure, \textit{Overleven buiten de Hollandse Tuin}, 198.
\textsuperscript{421} AEA, 062, 1287 Plainte de Nicolas d'Ischen.
\textsuperscript{422} Vandermarliere, \textit{De troebele jaeren}, 57. See also RHCL, 04.01, inv. nr. 81; Amond, \textit{Les relations}, 58; Ceyssens 'Les premières hostilités', 90; Girardot, 'La guerre', 3; Lefèvre, 'Documents relatifs aux dégâts', 48; Neirinckx, 'A Letter', 10-11; Verbois, \textit{Rekem}, 312; von Grimmelshausen, \textit{Der Abenteuerliche Simplicissimus Teutsch}, Book 4, Chapter 9.
\textsuperscript{423} Delcourte Debarre, 'Espaces forestiers', 448, 451, 454; Marchal, \textit{Inventaire}, 166, 180.
\end{flushright}
because it is only based on indirect evidence provided by the withdrawal of their names from hunting regulations. If these birds became extinct only a few years after the start of the Eighty Years War, then they must already have been on the verge of extinction when the fighting started. The famous Dutch hunting treatise *Jacht-Bedryff* from 1600 blames habitat changes as a result of transformations in agriculture rather than warfare for the disappearance of many species. The disastrous impact of warfare is on its own insufficient to explain permanent changes in animal populations.

4.1.4 Abandoned Settlements and Refuge Flows

Moving from animal to human demographics, it is worth noting that even though more reliable sources are available for the latter, it is still very difficult to pinpoint exact causes. Battlefield losses could be massive, particularly if involving locally recruited armies, but were also relatively exceptional events. A surviving tax record suggests for instance that the city of Liège might have lost more than half its adult male population at the battle of Brustem (1467). Furthermore, the armies under consideration here rarely engaged in large-scale massacres outside the battlefield. The few references to mass killings come from very specific circumstances, such as fortifications taken by storm or rulers setting an example (e.g. Dinant in 1466), contexts where armed resistance was perceived as illegitimate or unnecessary.

While battles could certainly have a significant ecological impact, their effects would have been local, as the spilling of blood makes the soil more acidic. In 1958 Lucien Boullet wrote down a tale told in the area of Rocroi, the site of a major battle in 1643. He claimed that a local fountain was known as the ‘Red Fountain’ (*Rouge Fontaine*) because so many men lost their lives during this battle that their blood filled a local brook (la Sarte), and caused the moss on the fountain to adopt a reddish dew on rainy days for years afterwards. Stories about waterways turning red after a bloody battle are commonplace, but rarely include specific details such as these. Given that there is actually a genus of lichens native to this area (*Cladonia*) that thrives on acidic/acid soils and is generally identified by its blood red colour, this could be exceptional evidence about a localized ecological effect of a major battle.

How such events were remembered is a factor that cannot be neglected either, the turning of some of the battlefields of Verdun (1914-1918) into collective burial grounds and

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425 Balace and Gaier, 'Catalogue', 128-129.
later natural reserves, being exemplary in this regard. In the late Middle Ages victors sometimes erected chapels on battlefield sites. Built in 1461, to honour a pledge made before a battle in 1431, the chapel of Bulgnéville, near Neufchâteau, was destroyed in 1644, during the Thirty Years War. A similar pledge made before the battle of Stralen near Venlo (1468) by the duke of Guelders resulted in the relocation of an entire cloister from Oostrum to the battlefield.

Yet such spectacular examples also tend to obscure that major battles had a relatively limited role if compared to other factors. It is well established in historical studies that warfare-induced demographic decline was related to diseases, migration and a reduced fertility rather than fighting in the strict sense of the word. Warfare caused widespread insecurity, increased financial pressures and encouraged the spread of epidemics (see 6.1), but it was not the only factor influencing such patterns. The relative importance of warfare compared to economic conjunctures or the weather in particular is far from clear, especially before the introduction of parish records. Assessing demographic developments up to the middle of the seventeenth century is largely depends on hearth lists, numbers of households in a specific year.

Given the fiscal nature of these sources and the ambiguous meaning of the term household, calculating population growth can be difficult. A comparison between hearth lists from the Duchy of Brabant in 1480 and 1496, a period of political instability and warfare, indicates for instance that the city of ‘s Hertogenbosch grew by eighteen percent, while the number of households in nearby villages and smaller towns declined. Helmond and Eindhoven lost almost seventeen and fifteen percent of their population in the same period. This suggests the demographic decline in the countryside during armed conflicts is at least partially caused by massive emigration to (larger) cities, where mortality rates are on average higher.

Hearth lists from other areas confirm this pattern for the 1570-1715 period. They also demonstrate that communities in the worst affected areas, such as the Duchy of Bar-Lorraine, typically lost between thirty and sixty percent of their inhabitants, compared to their population levels before a particular war. These losses could be even higher for single settlements, with urban centres generally faring better than their rural counterparts.

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431 Cuvelier, Dénombrements de Foyers, CXVI-CXXIII, CCXXXVI-CCXXXVII.
Recovering from this decline was often a drawn out process, lasting at least several decades. Still, because demographic decline typically occurred in frontier contexts major discrepancies could be observed between different areas; cities north of the Meuse River, such as Rotterdam, experienced a massive population increase during the same period. There were even significant differences between the government of Rocroi and those of Mézières or Charleville in the mid-seventeenth century.\textsuperscript{432}

The well-known patterns of migration towards the Northern Netherlands during the Eighty Years War are significant because they show how war-related disturbances could have contrasting environmental effects in neighbouring areas. The situation becomes even more complex when one takes into account that conflicts far removed from the Meuse Region also influenced demographic structures because rulers took active measures to repopulate their lands. In the 1650’s and 1660’s the Elector of Mainz encouraged families from Hesbaye to settle on his lands, the Habsburgs stimulated emigration, especially from Luxemburg, towards the Banat on the Habsburg-Ottoman frontier from the 1720's onwards, and both Prussia and Russia tried to attract immigrants from Western Europe in the 1760's.\textsuperscript{433}

These demographic developments have to be interpreted in the context of building destruction. Setting fire to buildings is an important wartime influence because it contributed to an already extensive overexploitation of wood. The duke of Burgundy for instance allowed villagers from the County of Namur to cut no less than two thousand oaks and eleven hectares of high forest to rebuild their houses, destroyed by forces from the Prince-Bishopric of Liège in 1430.\textsuperscript{434} This example is significant because of it provides precise data. Many sources mention that buildings were set on fire, arson being a core element of warfare up to the seventeenth century, but they are rarely specific about the number of houses affected. There is little room for interpretation when accounts or chronicles comment that an army burned down an entire town or village, with only the church or stone buildings being spared, but this still does not say anything about how common this destruction really was. Extortion under threat of fire was an important source of income for armed forces (e.g. the account of 1435 cited above). Jean d'Haynin declared in his recollections that Burgundian troops set fire to houses here and there to provoke their opponents in the aftermath of the battle of Brustem (1467), but


\textsuperscript{434} Brouwers, ‘Indemnités pour dommages de guerre’, 89, 92.
refrained from devastating the entire countryside. Fiscal accounts do show that raiders often targeted mills; they represented wealth, had a crucial energy function, including the grinding of grain for passing armies, and were vulnerable because of their location on the edges or outside their communities.435

Fortunately, there is one source that provides very detailed information: a report from 1657 written by lieutenant colonel Jean Ernest de Terwel about the resources of each community in the governments of Reims, Rethel and Sainte-Menehouuld. This document would serve as the basis of a tax reform, intended to divide the tax burden more equally. It indicates that in frontier areas, such as near Rocroi, houses had been burned down in almost every community, but also that few communities had no houses left. Here villagers lived in huts or their fortified church. A handful of settlements, mostly hamlets, had been abandoned completely.436

Figure 4.4 Plan of the village of Biercé, 1699 (ARB, Cartes et plans, 116).

Still, it is revealing that de Terwel did not necessarily advise a significant tax reduction. In some instances he even believed taxation should be increased. This suggests that he considered this war damage to be a mere temporary phenomenon. The representativity of such a report for other areas and periods is unclear, but hearth lists from the Hohes Venn and Ardennes from the same period confirm this image of partial destruction (around fifty percent


436 Terwel, Les notices cadastrales.
of the houses). This also goes some way in explaining why complaints or petitions emphasize the economic cost of the destruction rather than its exact nature.\textsuperscript{437} We even have a depiction from 1699 of the village of Biercèe, between Maubeuge and Charleroi, ruined during the Nine Years War (1688-1697) (see figure 4.4). The houses had been demolished, but the hedges and even a few trees near the church remained standing.\textsuperscript{438}

While deliberate disturbances such as these became more and more rare from the eighteenth century onwards, damage done during sieges seems to have increased because of technological developments. Bombardments with incendiary missiles were common in the Middle Ages, but it is unlikely that they were as devastating as eighteenth-century artillery fire.\textsuperscript{439} In 1794, during the siege of Grave, French besiegers shot about two thousand and four hundred cannon balls and bombs into the city, killing only eight people and wounding another six, but damaging every single building.\textsuperscript{440} Several cities in the Prince-Bishopric of Liège experienced major fires in 1672-1714, either because soldiers set buildings on fire (Huy and Tongres) or bombarded them with incendiary devices (Liège). In all cases legislation was passed to ensure that houses were rebuilt in stone. Nearby Maastricht and Roermond, both of which had permanent garrisons, issued similar legislation several decades earlier since they ran a higher risk of being submitted to a regular siege.\textsuperscript{441} Warfare destroyed people's lives and homes, but was rarely able to overcome the resilience exhibited by communities as a whole.

4.2 WOLVES AND THE CREATION OF WILDERNESS

4.2.1 The Agency of Wolf Populations

After examining the variety of military disturbances and the paucity of evidence about their long-term effects, this section will now study these same disruptions from a different perspective. Given that disturbances make nutrients available, one should keep in mind that for every species being affected negatively, there could be another taking advantage. The image described at the beginning of this chapter depicts a beast that combines features of

\textsuperscript{437} Nimes 5934, 17/3/1659 (Transcript Généamag); Hagen, \textit{Van 'Crouwaetz gewelt' tot 'Fransche brandt'}, 66-68; Jenniges, \textit{Das Land zwischen Venn und Schneifel}, 104-121; Terwel, \textit{Les notices cadastrales}.

\textsuperscript{438} AGR, Cartes et plans, nr. 116, Plan du village de Biercèe, détruit par la dernière guerre, du 2 may 1699.

\textsuperscript{439} The Count of Holland, for example, bought one thousand three hunderd fire arrows for the siege of the house (castle) of Altena in 1393. De Boer, Faber and van Gent (eds.), \textit{De rekeningen I 1393-1396}, 56; Hoeckx et al. (eds.), \textit{Kroniek van Molius}, 154-155.

\textsuperscript{440} De Cauwer, \textit{Tranen van bloed}, 223-226; Naulet, \textit{L'artillerie}, 245-246; Roland (ed.), \textit{'Chronique Namuroise'}, 125, 131; Sabron, \textit{De oorlog}, vol. 2, 81-96.

\textsuperscript{441} De Rycke, \textit{‘L’architecture’}, 204-205; Douxchamps-Lefèvre, \textit{Inventaire}, vol. 5, 252; Martin, \textit{‘Maastricht’}, 63; Rorive, \textit{Les misères de la guerre}, 85-90; van Beurden, \textit{De handelingen}, 129; Vandewal, \textit{‘Tongeren’}, 179-183.
different animals (wolf, bear, lion/leopard, rat), and is associated with toads, locusts, snails and snakes. All these species shared an association with negative traits, or even symbolized evil. This pamphlet suggests that armies’ depredations were a direct assault on human control over their environment, whether this was a deliberate act or not, and consequently gave unwanted species a chance to migrate and reproduce. In other words: warfare encouraged the spread of wilderness or uncontrolled nature.\footnote{442 These effects are also recognised in modern wars, but tend to be neglected in favour of the detrimental environmental effects of warfare. Brauer, War and Nature, 166-168.}

The association between warfare and wilderness was particularly strong for one of the creatures depicted here, not coincidentally the animal that became the model for the beast’s head. Chronicles in particular comment on an increased presence of wolves as the result of armed conflicts. The famous Journal d’un bourgois de Paris (1421-1423), which recounts that wolves entered Paris and even attacked humans, is one of the best-known examples, but this association is much older than the fifteenth century.\footnote{443 The Dialogus Miraculorum by Caesarius of Heisterbach, dating to the early thirteenth century, tells the tale of a man who lived near Aachen and had three children, all killed by wolves. The connection between wolves and warfare is made twice. The narrator claimed that at the time Philip of Swabia was crowned, in 1198 and 1205, a time of major political unrest, there were many wolves in the area around Aachen. The third child also disappeared during a war, when his parents left him to guard the house and fled to Aachen, and it was assumed that wolves took him.}

The Dialogus Miraculorum might just be a collection of stories to educate novices of the Cistercian Order, but hunting treatises confirm this perception: according to Gaston Phoebus’ famous hunting treatise, Livre de la chasse (1387-1389), unburied corpses in war-affected lands gave wolves a taste for human flesh resulting in real attacks on humans. Edward Duke of York wrote an English translation of this work between 1406 and 1413, The Master of Game, to which he added his own observation that wolves also follow armies to scavenge for the horse cadavers they leave behind.\footnote{444 Heisterbach, Dialogus Miraculorum, vol. 2, 260-261; Ortalli, Lupi genti culture, 69-70.} Wolves do feed on human remains if given the chance, the most famous example of which is the body of Charles the Bold, discovered two days after the battle of Nancy in 1477.\footnote{445 Gummins, The Hound and the Hawk, 132-133; Phoebus, Le livre de la chasse, 66; See also De Lisle de Moncel, Méthodes et projets, 47-49; Moriceau, L’homme contre le loup, 50-59; Ott, Die besiegte Wildnis, 128-129.} The same can be said about dogs, however. The priest Petrus Treckpoel observes in one of his chronicles that the citizens of Bilzen were very afraid of local dogs in 1483, because they ate the corpses left there after the

\footnote{446 Vaughan, Charles the Bold, 432.}
massacring and burning of the town in February of the same year. The surviving citizens had in fact left the town, and only started to come back in June.447

Figure 4.5 Shepherd killing a wolf and its young, mid-seventeenth century (Meisner, *Sciographia Cosmica*, Namur).

It is often unclear whether the associations made in these sources provide evidence about the ecological influences of armies, or are simply part of a rhetoric of destruction. The above-mentioned woodcut portrays warfare as natural as well as social disorder. There is a clear religious undertone in these narratives, which is made very explicit in the image of ‘Namur aahn der Mase’ by Daniel Meisner (1642), depicting a shepherd killing a wolf and its young 'to the fourth generation' (see figure 4.5). It was also a clergyman, Egbert of Liège, who wrote down one of the earliest written versions of a folk tale now known as 'Little Red Riding Hood' in the early eleventh century. In this account the girl's baptism protected her from the wolves.448 Jean-Jacques Moriceau, who studied historical wolf attacks in France, argues that the fear that a single attack generates goes far beyond the actual damage done. It is quite possible that the climate of insecurity brought about by war fed this fear. His findings for the

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448 Berlioz, 'Un petit chaperon rouge médiéval '?; Ziolkowski, 'A Fairy Tale'.
departsments of the Meuse and Ardennes indeed indicate that rabies, rather than predation, was responsible for the majority of attacks.\textsuperscript{449}

Most of Europe's largest animals, symbols of wilderness, had already become extinct in the Meuse Region by 1250, or were on the verge of extinction: aurochs disappeared in the early Middle Ages, and bears, already very rare around 1250, were gone by 1500. Lynxes and eagles could still be found in some areas as late as the eighteenth century, but have such a low population density that this is hardly significant. Wild boar and red deer enjoyed protection because their killing was a noble prerogative, but were also restricted to major hunting parks.\textsuperscript{450} The wolf was the only large animal still present in most of the Meuse Region as late as the eighteenth century, despite intense prosecution. Hunters killed the last wolves in the Meuse Region only about a hundred years ago in the Ardennes and Argonne and now the animal is making a comeback.\textsuperscript{451}

Moreover, the connection between armies and wolves went further than the idea that warfare leads to an increase in wolf populations: not only were combatants themselves sometimes compared to raving wolves, but in seventeenth-century Lorraine gangs of armed men who used the woods as cover were referred to as \textit{loups du bois} ('wolves of the woods'). Wolves and outlaws were already associated with each other during the Middle Ages because they lived in the same spaces: woodlands and boundaries.\textsuperscript{452} There were also many similarities between the defence mechanisms directed against armies and wolves: the seventeenth-century accounts of Maastricht called pits dug out under the drawbridges \textit{wolfskuiten} or 'wolf pits', hedges protected villagers against wolves as well as raiding parties (see 3.1) and wolf hunting was the last surviving medieval form of armed service, being still

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\textsuperscript{449} Consider also the study of Jay M. Smith, which makes a direct connection between the mythic status of the 'Beast of the Gévaudan' and France's defeat in the Seven Years War. Kling, 'War-Time, Wolf-Time', 19-27; Moriceau, \textit{Histoire du méchant loup}, 492-498, 511-512; Siemer, 'Wölfe in der Stadt', 353-365; Smith, \textit{Monsters of the Gévaudan}.

\textsuperscript{450} Butzeck, Stubbe and Piechocki, 'Der Braunbär'; 31-36; Butzeck, Stubbe and Piechocki, 'Der Luchs', 146-151; Ervynck, 'In memoriam: De bruine beer der Benelux'; Garnier, 'La peau de l’ours', 264-269; van Bavel et al., \textit{De kroniek}, 414-415; van Vuure, \textit{Retracing}, 56-59.

\textsuperscript{451} In January 2018, when I was rewriting the thesis, a female wolf made the headlines of Belgian newspapers because she had established herself at the military domains near Leopoldsburg. By the time the final version of he thesis was submitted, in the fall of that same year, she had found a partner. Butzeck, Stubbe and Piechocki, 'Der Wolf', 280-291; Delcourtue Debarre, 'Espaces forestiers', 441; Geerlings and Schrijnemakers, 'Wolvenplaag', 144-145; Kolodziej, 'La louveterie', 71; Luys, \textit{Met vryaerts en resoeien}, 41-51, 240-257; Molinier and Molinier-Meyer, 'Environnement et Histoire', 236-237; Pluskowski, \textit{Wolves and Wilderness}, 11-17.

required of the general population as late as the nineteenth century. Peasants also used the presence of wolves as a pretext for walking around armed.\footnote{453 Adriaenssen, Staatsvormend geweld, 405; Delgustee-van der Kaa, Histoire des loups, 67, 78-88; Geerlings and Schrijnemakers, ‘Wolvenplaaq’, 118-121, 127-135; Kolodziej, ‘La louveterie’, 295-297; Luys, ‘De Wolfsgraaf’; Moreau, Bolwerk der Nederlanden, 17, 66; Verschure, Overleven buiten de Hollandse Tuin, 227.} Remarkably enough, soldiers did not have a significant role in wolf hunting. Nicolas de Moncel’s extensive account of officers from the garrison of Verdun chasing a wolf that approached the city walls in 1766, published in his hunting treatise from 1768, says more about his ambitions for the military in this regard, himself a former cavalry captain who became a lieutenant of the louveterie\footnote{454 From the Middle Ages onwards rulers in the southern half of the Meuse Region (southwards from Hainaut and Namur) designated a specific official with the task of organising wolf hunts: the louvetier. These officials also served briefly in the northern half of the Meuse Region during the French Republic and Empire (1795-1814).}, than it does about the contribution French soldiers made to wolf hunting. His proposal to create a special corps of trained hunters to exterminate wolves was likewise inspired by his military background. Members of the maréchaussée or gendarmerie did occasionally kill wolves or led hunting parties in the eighteenth and nineteenth century, but their role was generally of minor significance.\footnote{455 Delgustee-van der Kaa, Histoire des loups, 20, 72; De Lisle de Moncel, Méthodes et projets, 30-31, 115, 135; Kolodziej, ‘La louveterie’, 291-294; Smith, Monsters of the Gévaudan, 82-106.} The prefect of the Meuse Inferièure’s request for soldiers in 1810 to hunt down a predatory wolf, or wolves, near Roermond primarily reflects the general panic that these attacks generated as well as the traditional association of such assaults with warfare. Many people apparently believed that this wolf came from Germany where she had grown accustomed to human flesh during the recent wars. At some point a plan was made that would involve the mobilisation of no less than six thousand local men and more than two hundred soldiers. The local military authorities did not even consider using their soldiers for such a purpose.\footnote{456 Geerlings and Schrijnemakers, ‘Wolvenplaaq’, 134-137.}

Noblemen, who played a key role in the development of paid military service, did not necessarily share the negative attitudes of clergymen and farmers towards bears, wolves, wild boar, and other symbols of wilderness. Rulers as well as knights were often associated with these animals in literary works, and to a lesser extent heraldry, because they represented strength and endurance. Count Robert of Artois (1250-1302) even had a ‘pet’ wolf.\footnote{457 The most common animals in medieval heraldry were lions and eagles, however. The lion in particular was an important Christian symbol from the High Middle Ages onwards. Jordan, ‘Count Robert’s “Pet” Wolf’; Marillier, Le sanglier héraldique; Pastoureau, L’ours; Pastoureau, Une histoire symbolique, 49-77; Pluskowski, Wolves and Wilderness, 134-153; Willems (ed.), Rymkronyk, 201, 210.} The poem Van den ever, for instance, was written in 1334, when Jan III, Duke of Brabant (1312-1355), faced a coalition involving almost all neighbouring principalities. This rather short text (136 verses) compares the duke to a wild boar, and his enemies to hunting dogs.\footnote{458 Avonds, ‘Heer everzwijn’; Sleiderink, De stem van de meester, 114-115.}
The duke is also depicted as a wild boar bearing the arms of Brabant and Limburg in the Armorial Gelre, and on a miniature in the 1438 inventory of the charters of Brabant. The later image is especially remarkable as it provides a visual equivalent to the poem, with the duke being surrounded by a pack of hunting dogs bearing the arms of the rulers who challenged him in 1334. The duke of Bar, his only ally, is depicted as a wolf (see figure 4.6). More than one hundred years later, in 1466-1467 and 1477-1478, Bartholomaeus Macharii, a clergyman from Tongres, writes in his poems about the 'forest swine' (aper de silva) that threatens the garden of his patria. This refers to the nobleman Guillaume de La Marck (died 1485), also known as 'The Wild Boar of the Ardennes', who made several attempts to become ruler of the Prince-Bishopric of Liège. His followers wore a boar's head on their clothing. Both Macharii and de La Marck used the wild boar as a symbol, but gave very different meanings to it.

Figure 4.6 The dukes of Brabant (a wild boar) and Bar (a wolf) surrounded by their enemies, portrayed as hunting dogs (ARB, Manuscrits Divers, nr. 983, f. 496).

There are additional sources, however, that provide a stronger base for assessing whether the link between wolves and warfare is based on actual ecological influences. Regulations regarding wolf hunting are well known from the reign of Charlemagne onwards. Because humans perceived wolves as a threat to livestock and game authorities paid bounties for each confirmed kill. This means that one can reconstruct the historical presence of wolves and their

460 Boeren, Twee Maaslandse dichters, 26, 56; Gaier, Art et organisation, 135.
numbers in a way that is impossible for most animals before the nineteenth century. This approach has its difficulties: an increase in bounties does not necessarily prove that the population grew, just that more wolves died by hunting. Moreover, hunters often went around communities near the location the animal was killed to claim a reward. In this way, an examination of accounts from neighbouring villages is likely to inflate the real number of wolves in the area, at least until the French government completely reorganised the issuing of bounties in 1795.\footnote{Delguste-van der Kaa, \textit{Histoire des loups}, 68-72, 93-94; Devillers and Pinchart, \textit{Extraits des comptes}, 36, 58, 86-87; Dinstühler (ed), \textit{Die Jülicher Landrentmeister-Rechnung}, 125-126; Luys, \textit{Met vryaerts en resoelen}, 68-80; Moriceau, \textit{L’homme contre le loup}, 67-72, 253-278, 349-361; Ortalli, \textit{Lupi genti culture}, 73-83.}

Despite these problems, it is still possible to establish a direct link between warfare and increased wolf presence. According to the author of the famous \textit{Jacht-Bedryff}, wolves were considered exterminated in Holland around 1600. However, in 1598, during the Eighty Years War, dozens appeared in the Langstraat, the area between Geertruidenberg and ’s Hertogenbosch, on the Brabant-Holland frontier. Local fishermen had to make nets in order to catch them.\footnote{van Heenvliet, \textit{Jacht-Bedryff}, 1; Verschure, \textit{Overleven buiten de Hollandse Tuin}, 262-268.} Evidence from outside the Meuse Region, from the kingdom of France in the 1430’s, the area around Bruges in the 1490’s and late 1500’s, and Ireland in the 1650’s, confirms this connection. Despite assertions of contemporaries about unburied corpses, this expansion of wolf populations mainly related to the ceasing of wolf hunting during warfare. Hunting wolves was a very labour intensive activity and could include digging pits, making nets or woven hedges, using poison, maintaining packs of specially trained dogs and mobilizing local villagers (see figure 4.7). These activities either stopped during armed conflicts or became much reduced.\footnote{Marchal, \textit{Inventaire}, 282; Moriceau, \textit{L’homme contre le loup}; Ott, \textit{Die besiegte Wildnis}, 128-132; Rheinheimer, ‘The Belief in Werewolves’, 41-42; Westing, \textit{Warfare in a Fragile World}, 57-58, 92.} The \textit{Journal officiel du Grand-Duché de Luxembourg} (Oktober 19, 1815) explicitly attributed the more prominent presence of wolves to military movements, which is confirmed by a sharp decrease in the number of bounties claimed during the invasion years of 1813-1814.\footnote{Delguste-van der Kaa, \textit{Histoire des loups}, 34, 166; Molinier and Molinier-Meyer, ‘Environnement et Histoire’, 239-240.}

The ability of wolves themselves to adapt to different circumstances and grasp the opportunities brought about by warfare should not be underestimated either. The capability of wolves to cover hundreds of kilometres in the matter of days is well known. It is likely that the Meuse Region, and more particularly the Ardennes and Argonne, had an important role as a reserve from which wolves could spread to other regions. This is at least argued by Louis...
Gruau in his 1613 hunting treatise. Wolf populations reached their highest density in France in the Ardennes and Argonne in 1795-1815, as proven by the systematic overviews of killed individuals recently made on the basis of the French government's extensive records, and these areas also figured prominently among their last places of refuge in Western Europe. Wolves can thrive in very diverse environments, but likely started to favour more secluded spaces, such as woodlands, because of constant hunting pressures.

Figure 4.7 Wolf hunting, late sixteenth century, engraving by Joannes Stradanus (1523-1605) (RA, RP-P-1982-173).

Nevertheless, this link between the spread of wolves and warfare was not universal: an examination of accounts from the Campine in the eighteenth century reveals that wolves were killed on an almost yearly basis, but warfare did not have any significant effect on this pattern. This might have something to do with the changing character of warfare, but the available evidence from seventeenth-century Campine is too incomplete to support or deny this hypothesis. In nearby Hesbaye toponyms referring to 'wolf pits' confirm the existence of (relict) wolf populations in the Late Middle Ages, but there is no indication that its inhabitants perceived wolves as a major problem in subsequent centuries. The testimony of Petrus Treckpoel about fear for local dogs in Bilzen is noteworthy in this regard. Apparently, in this densely populated area, wolves were more or less exterminated during the High Middle Ages.

and never managed to re-establish themselves afterwards. While wolves profited from warfare to spread and multiply on many occasions, there were still limits to their agency.

4.2.2 An Ecology of Fear, or Wartime Recovery

The emphasis on wolves is of particular interest because wolves were one of the few animals in Western Europe, aside from bears, which considered humans as prey, albeit in exceptional circumstances. This actually reinforced their general perception as symbols of wilderness. The role of wolves in the Meuse Region was in this sense quite similar to that of tigers in Southeast Asia, a species that is known to have profited from warfare as well. Many historical sources, hunting treatises as well as chronicles, indicate a general belief that warfare not only stimulated the spread of wolf populations, but also caused an increase in wolf attacks (see figure 4.8). The data published by Jean-Jacques Moriceau do show a rise in wolf attacks during some war years, but more research is required to confirm this link.

468 I am grateful to Leon Engelen for providing me with an overview of bounties paid for killed wolves in the accounts of Stokkem (1748-1759), Achel (1684-1779), Bocholt (1680-1780) and Bree (1679-1779). The originals are kept in the state archives of Hasselt. Cremers, ‘De wolf’, 157-158; Helsen, De woorden, 5-10; Luyts, Met vryaerts en resoelen, 232-235; Mengels, Chronyk, 9-10; Ulrix and Paquay, Zuidlimburgsche plaatsnamen, 15, 16, 24, 47, 62, 69, 78.

469 Boomgaard, Frontiers of Fear.


Figure 4.8 Depiction of the wolf that terrorized the Ardennes in 1586 (Figure d’un loup ravissant trouvé en la Forest des Ardennes).

Still, it is significant that contemporaries sometimes attributed attacks to werewolves because this kind of behaviour was considered abnormal, even unnatural. Wolves generally avoid humans, a fact people who lived side by side with wolves would be well aware of. The few
trials concerning werewolves that occurred in the Meuse Region all date to the late sixteenth and early seventeenth century, a period of intensive warfare, and come from areas where wolves were common: Arlon, Namur, Limbourg, Liège and Maaseik. This was of course also the heyday of witch trials in the Meuse Region, werewolves being treated as a specific kind of witch or sorcerer.\textsuperscript{471}

The association between wolves, or wolf attacks, and warfare points to a specific influence of armies on ecological systems: the ecology of fear. This concept refers to the idea that predators, such as wolves, influence ecological systems in ways that go far beyond the actual number of prey taken. Their presence ensures that potential victims are on constant alert, which reduces damage done to local vegetation. In other words, the presence of wolves stimulates the regrowth of woodlands because it reduces the time deer or other herbivorous animals can spend grazing. The sources examined here effectively suggest the same thing: the anxiety caused by armies reduced the pressure of local populations on their environment. To what extent this reduced pressure was offset by the ravages of armies themselves, is open to debate, but it is an effect that cannot be ignored.\textsuperscript{472}

Wolves were only one species in a long list of ‘pests’, animals that were considered unwanted or harmful and could therefore be killed with impunity and by any means possible. In some instances one could even get a bounty. Changes in wolf populations may not always have been representative for other animals, but theoretically every species on this list, which shows considerable local variation but generally included all members of the \textit{Mustelidae} (badgers, weasels etc.) and \textit{Corvus} (crow) genera, most rodents, foxes, birds of prey, owls, sparrows, moles, caterpillars, and even woodpeckers, could have profited from warfare.\textsuperscript{473} It is no coincidence that the merciless animal described at the beginning of this chapter has a rat’s tail. In the government of Bastogne, part of the harvest had to be left on the fields in 1636, during an invasion, due to a lack of manpower. Mice invested the fields the following year. A plague such as this would also have given expanded wolf populations a more secure food base than corpses left on the battlefield. It is even possible that the bear population in the Vosges increased during the wars that affected Bar-Lorraine in the seventeenth century.\textsuperscript{474}

Warfare also allowed harbour seal populations in the North Sea to recover, simply because seal hunters did not dare to leave port. In Zeeland the number of bounties paid shows a sharp decline during war years (1621-1648 and 1672-1674) and crews of warships appear


\textsuperscript{472} Ripple and Beschta, ‘Wolves and the Ecology of Fear’.


\textsuperscript{474} Jacob, \textit{Bruyères}, 119-122; Laperche-Fournel, \textit{L’intendance de Lorraine et Barrois}, 123, 186.
among their few recipients. The County of Holland likewise started to issue bounties in 1609 because seals were perceived as a threat to the fisheries, but the available evidence for the Meuse Region is quite limited because there were very few seals in the area to begin with. Harbour seals need access to sandbanks in combination with deeper water, a habitat that was and still is quite rare in the Meuse estuary (see 2.2). The payment of bounties ceased altogether after 1618, and an official seal hunter was appointed instead, but it is uncertain how important seal hunting really was among the various tasks attributed to this man. He also had to defend fishermen against enemy attacks for instance. Soldiers did participate, however, in the kiling of a sea monster in the Meuse estuary in 1600, which turned out to be a pregnant hooded seal. This is a species that is significantly larger than a harbour seal and normally lives around the North Pole (see figure 4.9).475

Figure 4.9 Etching of the 'sea monster' killed in the Meuse/Merwede on 10 March 1600, by Julius Goltzius (Dordecht, Museum van Gijn).

Aside from a reduction in wolf or seal hunting, one of the most widespread effects of warfare would be agricultural land left uncultivated because farmers were too afraid or not numerous enough to work their fields. The afore-mentioned chronicler Petrus Treckpoel notes that in the County of Loon the land was left fallow for four years during the 1490's due to the depredations of Evrard de La Marck's horsemen, and this resulted in the fields being overgrown with 'thistles, hedges, hedgerows and thorns, foul herbs; it turned into a

475 The Second World War also stimulated a recovery of some seal species because it entailed a temporary hunting stop. de Vooys et al., 'Analyses of Four Centuries of Bounty Hunting'; Martens, De zalmvissers, 171-174; t Hart, 'De Zeehondenjacht', 77-78, 89-107, 151-168; Westing, Warfare in a Fragile World, 154.
A species such as hawthorn is indeed capable of rapidly colonizing abandoned land, and can even hinder the growth of coppice wood, particularly if already present as hedges on the edges of those properties. When Bartholomaeus Macharii requested Charles the Bold in a poem from 1466-1467 to refrain from destroying his patria's garden, and only remove the enemy thorns, he might therefore be referring to actual ecological consequences of the ongoing war. The explicit use of the term wilderness in Treckpoel's chronicle is also notable. The expression verwildert is again used in accounts from the same area dealing with farmland still left fallow in 1623, after having been deserted during the siege of Maastricht in 1579.

Fiscal accounts from the Duchy of Bar in the mid-seventeenth century similarly mention fields overgrown with shrubs, and ponds turning into land because of lack of maintenance. Foresters patrolled with armed guards or postponed the felling of trees because of the general insecurity. They also suspended the planned fishing of ponds or moats. In the area around ‘s Hertogenbosch by contrast the term vogelweide denoted agricultural fields left fallow, a reference to the fact that these would be used by wild birds, such as geese, for grazing. These changes could have long-lasting effects: in 1618 a man got permission to construct a bird trap on his lands, which had been left fallow for more than forty years. This was probably an eendenkooi, a rather complex trap to catch ducks, very common in the area, comprising a large pond, associated brooks and fences, all surrounded by woodland. These traps could easily occupy a surface of multiple hectares and would have thus have significantly altered the local landscape.

Contracts passed between land owners and their tenants are very informative in this regard as well: the commandery of Alden Biesen, near Maastricht, consented in a 1581 contract that the new occupant of one of its major farms would be allowed to cut wood and pasture pigs in its forest. In this way the coppice wood around his farm could be left standing, which made it less vulnerable to attacks from marauding soldiers. In 1650 Anne Pennas from Vireux (near Givet), who owned the right to fish in the Meuse, asked for a reduction of her

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476 'Ende binnen dien vier jaren en waert nie vele corns noch vruchten geseit, soe dat het lant verwassen was met distelen, heggen, haghen ende dornen, quaet croyt oft een wildernisse geweest hadde.' Evrard de La Marck was a brother of the aforementioned Guillaume, nicknamed 'Wild Boar of the Ardennes'. Paquay (ed.), ‘Kroniek der Luiksche Oorlogen’, 240-241; Villa-Sébline Nicole, La sénéchaussée, 36.


478 Boeren, Twee Maaslandse dichters, 31.

479 Tellingly, the connection between warfare and the creation of wilderness is still made during the American Civil War. Brady, War Upon The Land, 130-137; Nijssen, Vanderbeken and Wouters, Loonse ridders, 50-51.


481 Adriaenssen, Staatsvormend geweld, 294-298; Karelse, ‘Eendenkooi en kooibedrijf’.
rent because her employees had been unable to fish in 1635. A French cavalry regiment encamped next to the Meuse at that time and stationed guards at strategic points. The best time to fish, according to this testimony, was before sunrise and after sundown, but when fishermen approached the river under cover of darkness, the sentries unsurprisingly raised the alarm and shot at the intruders.\footnote{Majewski, ‘Pêches contrariées’; Thoelen, ‘Damereis’, 112-113. See also Hoppenbrouwers, ‘Een middeleeuwse samenleving’, 23-24, 261, 270, and Philippart, ‘La pêche’, 84.} Warfare thus encouraged the spread of wilderness through the utter fear it generated as well as through direct action.

4.2.3 Restoring Law and Order

The spread of wilderness serves as a remarkable counterweight to armies' depredations examined in the first section, but it still does not illustrate long-term ecological effects. Exactly because wolves figured as symbols of wilderness and disorder, their extermination became a top priority as soon as peace returned. The French government passed special legislation to this end after the Wars of Religion (1583, 1597, 1600 and 1601) and in Champagne in 1660. Regulations concerning the reestablishment of wolf pits in Bar-Lorraine and Luxembourg in the second half of the seventeenth century can also be read in this light.\footnote{La vie quotidienne dans les Ardennes, 40-41; Delguste-van der Kaa, Histoire des loups, 18; Kaisin, Annales historiques, 125, 134, 192, 199, 217, 226, 272; Kolodziej, ‘La louveterie’, 300; Moriceau, L’homme contre le loup, 82-93, 365-382; Platret, Les loups, 53-57. Verchure, Overleven buiten de Hollandse Tuin, 269.}

The above-mentioned revival of wolves in the Langstraat was likewise short-lived: seventy-seven of the ninety-five bounties were disbursed in 1609-1620, during the Twelve-Years Truce. Although war broke out again in 1621, no more than two bounties were paid; the last one in 1631. In the Duchy of Brabant so many wolves were killed in 1613 that the authorities lowered the height of the bounties. From a more practical viewpoint, the financial rewards paid for killed wolves would be a welcome addition to the income of local villagers, often impoverished by the war. One can argue, however, that without the constant warfare in the Meuse Region up to 1714 wolves would have disappeared centuries before they actually did.\footnote{McNeill, ‘Woods and Warfare’, 401.}

The consequences of these military disturbances can therefore be overstated. There is little evidence for instance to support the statement made by J.R. McNeill that warfare could lead to a spontaneous resurgence of forests.\footnote{Deloffre, ‘Guerres et brigandages’, 336, 411-412.} This is a literary topos typical of chronicles and petitions.\footnote{Alain Girardot’s study of the late medieval Princ-Bishopric of Verdun documents hedges evolving into woodlands during the fourteenth and fifteenth century, but these are cleared again in the early sixteenth century. Furthermore, many of these changes would have been very localized: in the 1480's the cathedral chapter of Verdun}
refused a squire’s request to turn lands of the uninhabited village of Forbeuvillers into a rabbit warren, because it feared that these rabbits would damage nearby fields. The squire released some rabbits anyway, which consequently multiplied and caused considerably damage. In 1501 the woodlands were cut down and the rabbits put in an enclosed warren next to the castellan's house (castle). Girardot claims in effect that in the Prince-Bishopric of Verdun the entire landscape structure changed as a result of wartime disturbances, with agricultural fields, ponds and forests being established in places most suitable for them.487

Not only does the pressure on forests appear to increase rather than decrease, trees also mature much slower than herbs or bushes. The inhabitants of Bastogne and Chaumont thus had to use heath as fuel due to a lack of wood, even though many fields lay deserted. The administrative sources examined here indicate that lands were brought under cultivation again as soon as possible, and that changing agricultural practices prohibited the growth of forests. The villages of Rommeréé, Hanzinelle and Cornelle, located near Givet, saw several disputes during the first half of the seventeenth century about farmers keeping sheep on common lands with a commercial goal. The village of Sevenum, near Venlo, likewise saw a massive increase in the number of sheep (from 1579 to 3037) in 1595-1680. This was probably an economic response to a declining population, abandoned fields and an increasing demand for meat from armies themselves.488

The combination of armies' mobility and their disruptive force could have had another ambiguous effect on ecosystems, an influence that is well known for contemporary wars. As early as the Franco-Prussian War of 1870-1871 botanists remarked that warfare caused the introduction of new species, species that could become invasive. Making similar observations about the pre-1850 period is very difficult, because of the character of the evidence: while it is possible to trace the appearance of a species to a general period or area, by historical or archaeological sources, the exact manner of this migration is open to interpretation. The crusades are traditionally credited with the introduction of herbs from the Eastern Mediterranean to Western Europe, but a recent archaeological study about the spread of spinach indicates that Muslim Spain, and peaceful trading, would have been at least as important factors. The fact that most armies operating in the Meuse Region came from similar ecosystems does not help either, because it means that any plants transported in their wake would have served to promote genetic diversity rather than become new introductions.

Tracing genetic diversity is an important part of ecological studies, but is next to impossible to do based on historical sources. In 1814 for instance Russian troops carried seeds of *Corispermum Marschallii* westwards, to Baden and Fontainebleau. To what extent they are responsible for the establishment of warty cabbage (*Bunias orientalis*) in the fortress of Namur is far less clear. The botanist André Devos noted the abundance of this plant in the grasslands of the citadel of Namur in 1870. He concluded that Russian soldiers brought seeds with them when they stayed in Namur during the 1813-1814 campaigns against France, but also claimed that the plant was deliberately introduced as forage in the Southern Netherlands in the 1820’s. Given that studies from later wars are quite consistent in arguing that most of these exotic species disappear as soon as the disturbances to which they are related cease, warfare does not seem to be the main factor in the spread of this species. Dutch or Belgian troops might instead have introduced the plant in a more peaceful manner.

Although it is very likely that the destruction of forges during armed conflicts encouraged the regrowth of forests, this would again be a mere temporary phenomenon. Troops from the Prince-Bishopric of Liège systematically destroyed forges in the County of Namur in 1430, and Charles the Bold thoroughly annihilated the arms industry of the Prince-Bishopric of Liège in the 1460’s. In both cases it took several decades before these industries started to recover. Still, armies need weapons and if specific manufacturing centres are destroyed, production is simply moved elsewhere; in the fifteenth century mainly to the Burgundian Netherlands, in the seventeenth-century to the Northern Netherlands and Sweden. Destructions of forges would therefore only have been significant in the long run because they encouraged their spread to or expansion in other regions.

The destruction of dikes by contrast makes a strong case for long-term effects. Breaching dikes is a well-known phenomenon of medieval warfare near the Meuse estuary. The accounts of the high bailiff of ’s Hertogenbosch specify for example that he ordered the breaching of the dike at Maasdriel to force troops from Guelders to break up the siege of the fortress of Ammerzoyen in 1387. It is a very good example of army-induced disturbances functioning as a disaster as well as the spread of wilderness. After all, damaging dikes results

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492 ARB, 1107 Rekeningen Hoogschout ’s Hertogenbosch, inv. nr. 2783, 7.1.1.7-7.1.1.11 (Transcript Henk Betjers); Herborn, ‘Die sogenannte Fischmeisterei-Rechnung’, 88.
in rivers adopting a more natural behaviour, which includes flooding. In December 1585 the Dutch army managed to isolate several thousand Spanish infantrymen, the elite of the Army of Flanders, on an island in the Meuse by breaching the dikes and conducting patrols with warships. The trapped soldiers would have either had to surrender or die from exposure and lack of food, but were eventually saved through the intervention of the count of Mansfeld and the garrison of ‘s Hertogenbosch, who used artillery to drive off the Dutch ships (see figure 4.10).

Figure 4.10 Print of a failed Dutch attempt to isolate Spanish troops on an island in the Meuse in December 1585, by Frans Hogenberg (1535-1590) (RA, RP-P-OB-78.784-250).

It should be emphasized, nevertheless, that larger conflicts about water management were often more important than strategic considerations, especially when it came to repairing war damage. The count of Holland for instance prohibited the cutting of peat soil near the sea dikes of the Meuse-Rhine estuary (the Grote Waard) in 1375 because it increased the risk of flooding. All noblemen, cities and communities received permission to destroy new dikes

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493 Schulten, ‘De strijd bij Empel’.
constructed to facilitate peatcutting (moerdijken), and chase away the diggers. In 1379 the militia of Dordrecht actually launched an attack on the lord of Zevenbergen and destroyed his new dikes. Short-term financial gain proved to be stronger than security concerns, however, and the peat cutting simply continued. This eventually contributed to the infamous Saint-Elizabeth’s flood of 1421.\footnote{Gottschalk, *Stormvloeden en rivieroverstromingen*, vol. 1, 436, 452-455, 468-469; vol. 2, 35, 280, 731, 756, 785, 791; vol.3, 238, 258; Herwaarden, ‘Water en vuur in en om Dordrecht’, 160.}

Perhaps most enlightening about the nature of the disturbances examined here is that there is very little evidence to suggest that settlements were deserted permanently because of army-induced disturbances. Some individual farms, mills and even hamlets were abandoned for decades, probably never to be rebuilt again, but armies very rarely caused entire villages or cities to disappear.\footnote{Desmet and Van Den Berge, *Voyages*, 25; Genicot, *La crise agricole*, 92-98; Girardot, *Le droit et la terre*, vol. 2, 520-534; Laperche-Fournel, *La population du duché de Lorraine*, 37-55, 133-136; Miart, ‘La population’, 162.} There is one exceptional example: the fortress of La Mothe, the second largest city in the Duchy of Bar, which was besieged by a French army in 1634 and 1644-1645. It was systematically destroyed after its second surrender to set an example for anyone daring to challenge French authority in the area again. Its population dispersed; most settled in nearby parishes. The French government eventually divided the land between two neighbouring villages, but ruins continued to overshadow the plateau on which it was located for at least another century. Girardot's study from late medieval Verdun also demonstrate that the lands of ‘abandoned’ settlements continued to be cultivated, either by landowners living somewhere else or by neighbouring communities. This actually prevented the rebuilding of the original settlement.\footnote{Barbier, ‘La Grande Pitié’, 255; Fulaine, *Le duc Charles IV*, 108-113, 147-148; Marchal, *Inventaire*, 334; Marchal, ‘Description de la ville et forteresse de La Mothe’; Martin, *Une guerre*, 284-287; Villa-Sébline, *La sénéchaussée*, 98-100.} There are therefore few indications that warfare-induced wilderness had permanent effects.

### 4.3 LONG-TERM CONSEQUENCES

#### 4.3.1 Financial Distress and Climate Change

The previous sections evaluated the diversity of armies’ disturbances, but also the paucity of evidence regarding long-term influences. Assessing such shifts in ecological systems will be the main subject of this part. Consider the woodcut described at the beginning of this chapter again and especially one particular detail still left unexamined: the beast eats gold. The idea that the economic consequences of these disturbances could have been more important than ecological ones has been noted in the first section. This does not imply that armies’
disturbances lacked long lasting ecological results, only that these influences were often of a more indirect nature. The first factor that needs to be taken into account is the impoverishment brought about by warfare, or rather transfers of wealth.\footnote{Enqueste ende informatie (1494), 198, 214, 216; Adriaenssen, Staatsvormend geweld, 225-252; Carolus-Barre, ‘Benoit XII et la mission charitable de Bertrand”; Dubois, ‘Die Reichsstadt Aachen”; Engelen, ‘Financiële en fiscal repercussies”; Rorive, Les misères de la guerre, 219-261.} Rising taxes, for instance, appear to have been a more important cause for permanent emigration from the Campine during the Eighty Years War than insecurity.\footnote{Mertens, ‘Bank van Pelt’.}

Land represented a major financial reserve, especially woodlands because the right to cut wood could be sold separately from the actual ownership of the land. It comes as no surprise therefore that rulers, ecclesiastical institutions, and communities traded access to woodlands to pay off debts brought about by armies, generally through warfare.\footnote{Dinant, Archives Ecclesiastiques, inv. nr. 312, f. 100, 1/01/1323; Gimnée 3939, 15/2/1624; Grand conseil de Malines, Luxembourg, nr. 400 c, 14/8/1636 (transcript Généamag); SAT, Sint-Jacobsgasthuis, charter June 9, 1491; Belhoste, ‘Une sidérurgie frontalière’, 18-19; Bodard (ed.), Recueil des ordonnances, 74, 208; Borgnet, Cartulaire, 107-108; Bouwer, Een notabel domein, 52-53; Burggraaff and Selter, ‘Waldgeschichte’, 310-311; Buridant, ‘Le rôle des forêts’, 234-235; Desbrière, ‘Le bois’, 248; Douxchamps-Lefèvre, Inventaire, vol. 2, 107-108; vol. 4, 43; vol. 5, 41; vol. 6, 49-50; Goblet d’Alviella, Histoire des bois et forêts, vol. 4, 57-59; Gutmann, War and Rural Life, 52; Illaire et al. (eds.), Les cahiers de doléances, 169; Jacob, Bruyères, 31-35; 48-49; Kaisin, Annales historiques, 74, 78, 98; Lemoine, L’enceinte, 37; Marchal, Inventaire, 345; van den Munchhof, ‘Jeneverbessen’, 192; Vera, ‘Gemene gronden’, 219-220, 229-233.}

The duke of Bar for example granted five of his fiefholders the product of two and a half hectares of forest in 1403 because they were wounded while serving him, and the city of Mouson gave up the profits of the annual cuttings in their woodlands for twenty-five years in 1730 in order to pay for the construction of barracks and stables.\footnote{Richer, Abrégé chronologique, 330; Servais, Les Annales historiques du Barrois, vol. 2, 339, 391.}

Actual selling of land was a more complex phenomenon. It affected common lands and peasants more than anyone else, but could produce very dissimilar results because there were significant differences in land ownership throughout this region. Historical studies regarding the effects of warfare on agriculture note that major tenants were generally less affected than peasants. Landowners took care to ensure that their lands continued to be cultivated, for instance by resorting to sharecropping. They were far less willing to show comparable leniency for small tenants, unless these were in short supply. These peasants also had to bear a disproportional part of the tax burden, including wartime contributions, as absentee landlords owned a considerable part of agricultural land, but refused to pay their share. The report of lieutenant colonel de Terwel was exactly meant to put taxation on a more secure and equal footing.\footnote{Mora-Dieu, ‘Les corporations’, 201; Roosen, ‘De rurale economie in het Maasland’, 53, 148, 153-161; Terwel, Les notices cadastrales, 23-24; Thoen, ‘Oorlogen en platteland”; van Bavel, Goederenverwerving en goederenbeheer, 331-332, 368, 376, 393-394, 401, 470.}
In this way warfare actually reinforced or accelerated existing economic transformations resulting in the proletarianization of a significant part of the rural population. In the counties of Holland and Hainaut, villages and individual peasants were increasingly forced to sell their (common) lands to wealthy farmers or inhabitants of nearby cities during the seventeenth century. This resulted in the establishment of large commercial farms. The area around Namur likewise experienced an evolution towards enclosing common lands, very much to the displeasure of the governors of the city (see 2.3). In the Campine, the area between Liège and Maastricht, and the Ardennes, by contrast, peasants mostly managed to hold on to their (common) lands until the nineteenth century, which was related to the dominance of small-scale land ownership in these areas. The fact that these peasants had various sources of income (e.g. protoindustrialization) also gave them a stronger financial reserve to overcome calamities. Wealthy citizens buying land in the Campine in the seventeenth and eighteenth century continued to exploit these as individual farms or turned heathlands into forests or parks, as part of a rhetoric of making such lands fertile again.\footnote{503}

Notarial acts and court records reveal how the selling of land in sparsely populated areas could have very divergent results: in the seventeenth-century Ardennes villages saw themselves forced to sell part of their common lands, often woodlands, to owners of forges or local noblemen. There can be no doubt that in the first instance trees would have been cut down and ended up in furnaces, but most noblemen had a vested interest in preserving these woodlands, for example as hunting parks. There are indeed noblemen who expanded the environmental symbols of their lordship, such as forests or ponds, after crisis periods (see the squire’s rabbit warren above).\footnote{504}

Aside from contributing to transformations in landownership military disturbances also acted as accelerator or contributor to other long-term processes, the most famous of which is the Meuse's declining importance as a transportation route (see figure 4.11). While transportation along the Meuse River certainly could become problematic during the Middle Ages, large scale political conflicts from the late sixteenth century onwards brought these difficulties to a whole new level. The Eighty Years War saw a multiplication of tolls and tariffs along the Meuse because of the need to finance states’ military endeavours. Remarkably enough, these charges initially did not impede transportation. Traffic actually


increased in the early seventeenth century, reaching far higher levels than before, because of the Republic’s blockade of the Scheldt.\textsuperscript{505}

Figure 4.11 The quarter of Outremeuse, and the docks of the city of Liège in the seventeenth century, as they are depicted in the atlas of Jan Blaeu (Blaeu, \textit{Novum Ac Magnum Theatrum Urbium Belgicae Regiae}, 1649).

It the long run, however, these tolls contributed to a significant decrease of traffic on the Meuse River, reducing it to a transport route of only regional importance by the early eighteenth century. Changes in the volume of transportation on the Meuse River had major ecological significance because efforts to ensure the continuous navigability of the river would have been either expanded or neglected. These included the construction and maintenance of dams and sluices, but also the clearance of vegetation next to the river. Boats could only move upstream along the Meuse, and sometimes downstream as well, when pulled by horses. These horses needed a towpath to walk on.\textsuperscript{506}

The disappearance of vineyards from the northern half of the Meuse Region in the sixteenth and seventeenth century by contrast was primarily caused by climate change, and more specifically a relative decrease in average temperatures commonly known as the 'Little Ice Age' (sixteenth-nineteenth century). In the fifteenth century numerous vineyards could still be found as far north of Jülich, as demonstrated by the income they provided to the steward of the house of Hambach. Accounts from to the household of lord Frank van Borssele confirm that in the 1430's vines could even be cultivated in Den Briel/Brielle, on the Meuse

\textsuperscript{505} Breuer, \textit{Die Maas}, 78-86; Knoors, ‘Maasvaart en Maashandel’, 20-29; Suttor, \textit{La Meuse}, 536-541; Thurlings, \textit{De Maashandel}.

estuary. It is very unlikely that these had much commercial value, and probably served as a status symbol.507

Due to the lowering of average temperatures vineyards slowly disappeared from the northern half of the Meuse Region, although they were still present near Huy and Liège as late as the eighteenth century. Armed conflicts accelerated this process. Cultivating vines is a very labour-intensive and time-consuming activity, as it takes years before a plant bears fruit. The population decline brought about by warfare in combination with general insecurity and the destruction of vines themselves would have aggravated these liabilities. Some vineyards were even established in close proximity to fortifications, exactly because they are labour-intensive and typically cultivated on a slope.508

The hills surrounding the city of Liège for instance were filled with gardens and vineyards in the late Middle Ages. We are fortunate to still have access to the published witness accounts of Burgundian soldiers, as the original records were lost during the 1940 bombardment of state archives at Mons. These men testified in the context of a judicial inquest opened to prove that a nobleman from Hainaut died during the siege of Liège in 1468, more specifically during the famous night assault on the Burgundian encampment. A recurring aspect in these statements is that the omnipresence of vineyards in the immediate surroundings of the city, which might have had an important role in hiding the attackers' advance from Burgundian sentries.509

The decline of the Dutch herring fisheries, a major activity in the Meuse estuary, on the other hand, can best be explained as a mixture of ecological, political-military and economic factors (tariffs). During the Eighty Years War the Habsburgs stimulated privateering from Dunkirk in order to damage the Republic's economy. These privateers took almost nine hundred ships belonging to fishermen from the Meuse estuary in 1585-1647, despite the Admiralty of the Meuse's attempts to protect them. It was not just the taking of ships and the ransoming of their crews that mattered, the general insecurity also forced fishermen to sail in convoys under the protection of warships, which meant increasing costs and declining catch rates. The final blow to the herring fisheries on the Meuse estuary came a few decades later, in the second half of the seventeenth century, as result of the three Anglo-Dutch Wars (1652-1654, 1665-1667, 1672-1674), and increasing competition with their

507 Arkenbout, Frank van Borselen, 113; Dinstühler (ed), Die Jülicher Landrentmeister-Rechnung, 91.
508 Vineyards have reappeared in the northern half of the Meuse Region in the last decades, an economic development made possible by global warming. Bormans, 'Table des registres', vol. 12, 13; Douxchamps-Lefèvre, Inventaire, vol. 1, 218; vol. 3, 42; vol. 5, 41; Genicot, L'économie rurale namuroise, vol. 4, 198-200; Girardot, Le droit et la terre, 551-558; Habets, 'Over den wijnbouw', 386-392; Halkin, Etude historique, 22, 24, 26, 27, 38, 42, 49, 81, 93, 101-102, 123-124; Marchal, Inventaire, 304; Pauls, 'Zur Geschichte des Weinbaus', 194, 198, 242-248; Richer, Abrégé chronologique, 346; Rogg, Landsknechte und Reisläufer, 131; Rorive, Les misères de la guerre, 353-354; Rorive, La guerre de siège, 114; Van Caulaert, 'Domaine de Golzinnes', 9.
509 Poncelet, 'Le combat'; Lemoine, L'enceinte, 67.
English and Scandinavian counterparts. In sum, warfare brought about long-lasting effects when its effects reinforced or enhanced larger ecological and socio-economic developments.

4.3.2 Arms and Gunpowder Production

As important as these combat-related effects were, there is another set of influences that is often overlooked, but might have been more significant in the long run than any of the influences analysed so far: the ways that an army actually obtained its teeth: arms manufacturing, gunpowder production and ship building. The wood consumption of these activities was immense, and in contrast to the depredations mentioned before, did not act as an exceptional event, but as a constant in peace as well as war. Although it can be difficult to connect specific ecological influences to armies’ demands, general iron production as opposed to arms manufacturing, for example, there is no doubt that most of the disturbances examined here were closely associated with military needs.

Arms production was a major economic activity in the High and Late Middle Ages. The area between Givet and Maastricht in particular, the County of Namur and Prince-Bishopric of Liège, had a key role in this regard. In theory every adult male had to own some basic weapon and armour (see 5.3), which means that the demand for arms would have been considerable. There are in fact some numerical data available: in the late Middle Ages every city and fortress of some strategic importance had at least one crossbow and bolt maker at its disposal, who was primarily occupied with supplying local arsenals with weapons and ammunition. City accounts show that these specialised craftsmen produced several hundred to several thousand bolts a year in times of necessity. The fortress of Valkenburg stored no less than ninety-six crossbows, six thousand bolts and twelve thousand arrowheads according to a 1406 inventory.

These numbers should be seen in light of the huge consumption of ammunition: the city of Geldern sent three crossbowmen to the siege(s) of Middelaar, near Cuijk, in 1387 according to its accounts. They left the city for fifty-six days in total and spent eight hundred bolts. Customs registers from fourteenth-century Dordrecht further note single ships carrying several hundred to two thousand lance or pike shafts downstream to the city. These would have ended up in the hands of combatants in Holland, Zeeland or Flanders, and

511 SLC, Archief Gemeente Grave, inv. nr. 217, f. 248r, inv. nr. 218, 31 r. (transcript Rien van den Brand); de Groot, De stadsrekeningen, 1384 f. 16, 1385 f. 7, 42, 1387 f. 7, 1388 f. 6, 1390 f. 29, 1391 f. 5, 1398 f. 12, 1399a f. 9, 1403 f. 10; Dinstühler (ed), Die Jülicher Landrentmeister-Rechnung, 76-77; Drooghaag, 'Visitation en Limbourg et Outre-Meuse', 196, 203-204, 208, 215; Gaier, L'industrie, 66-85, 98-104, 141-156; Marchal, Inventaire, 183; Pauls, ‘Inventar des Schlosses zu Montjoie’.
possibly even England. The fourteenth-century Tower of London stored several hundred pieces of armour made in Maastricht in 1337-1338.\textsuperscript{513}

The pressure on woodlands for raw materials as well as fuel was enormous, and explains why miners started digging up coal in the area around Liège as early as the twelfth century. Yet one woody plant was affected more than the others: the yew. Its wood is, thanks of durability, very suitable for the making of bow staves. It is unclear to what extent yew was used for the making of bows within the Meuse Region, since ash could be used as well, but English kings expressed a marked preference for yew as early as the late thirteenth century. Given the scarcity of yew, they started importing it from Spain, the Low Countries and the Baltic around the same time. A list of tariffs from Dordrecht (1287) already mentions bow staves.\textsuperscript{514} Custom registers dating to the late fourteenth century also mention the passage of ships carrying several hundred to over one thousand bow staves, but only a minority of these originated from the Meuse Region, which means that yew must already have become very rare by this time. Dordrecht continued to be a major supplier of bow staves almost until the final demise of this trade in the late sixteenth century, with staves being brought to the city from ever further away. By the 1550’s and 1560’s the felling of yew had reached such an extent in Austria and Bavaria that the species became almost extinct.\textsuperscript{515}

The environmental damage caused by arms production was thus already very substantial before the spread of gunpowder weapons. Technological changes further contributed to and transformed an existing overexploitation, particularly from the fifteenth century onwards.\textsuperscript{516} Given the need for woodlands or coalmines as a source of fuel, mineral deposits for raw materials, and streams as a source of biopower and for transportation, metallurgy, including arms manufacturing, became concentrated in the southern parts of the Meuse Region, from Liège to Lorraine (see figure 4.12). By the early seventeenth century major entrepreneurs, such as Jean Curtius and Louis de Geer, dominated this trade. Liège and Charleville stood out as major arms manufacturing centres. Liège profited from the neutrality of the Prince-Bishopric to supply arms to both sides, while Charleville became the heart of French arms production from the late seventeenth century onwards. The Charleville musket,

\textsuperscript{513} Gaier, L’industrie, 100; Herborn and Mattheyer (ed.), Die älteste Rechnung, 101; Niermeijer, Bronnen voor de economische geschiedenis, vol. 1, 411, 419, 582, 589; Richardson, The Tower Armoury, 24-25, 55; van den Brand and Manders, Vesting ’t Genneperhuys, 98-102.


\textsuperscript{516} Depreter, De Gavre à Nancy, 126; Douglas Smith and DeVries, The Artillery; Gaier, L’industrie, 179-180.
the standard infantry weapon of Napoleon’s infantrymen, was developed here in the 1770’s.\textsuperscript{517}

![Figure 4.12 Iron melting industry in the Meuse valley, mid-seventeenth century, detail of a painting by Lucas van Valckenborch (Vienna, Kunsthistorisches Museum).]

While the area around Liège, especially Herstal, retained its key role long after the 1850’s, most forges in the principalities of Namur and Liège reached their heyday around the mid-seventeenth century, after which they suffered from increasing international competition, including the newly founded Charleville. The Dutch Republic for instance replaced its arms imports from the Prince-Bishopric of Liège through prefabricated iron parts during the late sixteenth and early seventeenth century, before shifting to iron imported from the Baltic. While this competition is often seen in economic or political terms, including the destruction of forges by armies, the ecological contribution cannot be forgotten either.\textsuperscript{518} Deforestation had already reached such an extent by the early sixteenth century that authorities in Liège, Bouillon and Namur passed legislation to oblige forge owners to replace the trees they cut down or leave a certain percentage of woodlands standing. In the seventeenth century the


production of four to five kilograms of iron required no less than twenty kilograms of charcoal, or one hundred kilograms of oak wood.\textsuperscript{519}

In practice damage done to forests seems to have been limited more by environmental constraints than legal action. The Ferraris map (1777) clearly shows the deforestation along navigable rivers such as the Meuse, Sambre and Ourthe. Trees were spared simply because the transportation costs became too high. It is no coincidence that in the Duchy of Luxemburg, with a very different hydrography, woodlands still occupied relatively large areas of land. In this context the testimony of a weapon smith from Chiny who lived in the city of Namur in 1648 becomes especially relevant: he stated before a notary that in Luxemburg it was common practice to use charcoal rather than coal for arms production because the resulting iron was of better quality. It is because of the constant need for fuel that the remaining woodlands in Namur and Liège were increasingly reduced to coppice wood, which in turn made the soil more vulnerable to erosion. It is worth noting that the seasonal floodings of the Meuse became more frequent during the early modern period.\textsuperscript{520}

Gunpowder weapons not only also worsened existing processes of deforestation by stimulating iron production, but also because they required large amounts of saltpeter. The three main components of gunpowder are sulphur, charcoal, and potassium nitrate or saltpeter. In the late fourteenth century gunpowder was still made with approximately equal amounts of these three ingredients, but by the late sixteenth century gunpowder makers mixed six parts of saltpeter for one each of charcoal and sulphur.\textsuperscript{521} This growing importance of saltpeter presented a challenge, for in the Meuse Region it could only be found in small quantities. Rulers certainly attempted to obtain natural saltpeter: a charter from the County of Namur specifies that the lord of Han-sur-Lesse gave salpeter makers permission in 1487 to gather it in rocks (caves) situated within his lordship. This salpeter would serve the needs of the guns kept in the fortress of Namur. The high bailiff allowed them likewise to work in the cellars and stables of this fortress. Efforts to produce saltpeter from domestic sources were also made in Jülich, Bouillon, and Liège in the sixteenth century.\textsuperscript{522}

From an ecological perspective, the main issue is that these natural quantities were far too meagre to satisfy a rising demand for gunpowder. This was a logical result from an


\textsuperscript{520} BRB, Cartes et plans, Ms. IV 5.567 Carte de Ferraris; Bouvignes, Notaire Waulthier, Act 16/1/1648; Antoine and Lefebvre, ‘Les forêts de l’Avesnois’; Tomsin, ‘Freqüence des crues de la Meuse’, 297-302.

\textsuperscript{521} Gressy, \textit{Saltpeter}, 11-12; Hall, \textit{Weapons and Warfare}, 67-104.

exponential growth in the number of gunpowder weapons, on land and sea, as well individual weapons' increasing consumption, mostly due to the shortening of the reloading process. By the fifteenth century, saltpeter makers therefore attempted to extract saltpeter from earth rich in decaying organic matter, an environment that allows the bacteria responsible for the occurrence of nitrates to thrive. They subsequently boiled the excavated soil, mixed it with earth, ash and lime, and then boiled it again. Such refinement processes inevitably required large volumes of firewood, even more than for the refinement of natural saltpeter (see figure 4.13). The need for large quantities of firewood provided the duchies of Bar-Lorraine with an opportunity to focus on the production and export of saltpeter from the seventeenth century onwards.523

Figure 4.13 Refinement of saltpeter in late eighteenth-century France (Diderot and d'Alembert, Encyclopédie, vol. 6 (images), nr. VII).

This domestic production experienced increasing rivalry from the English and Dutch East India Companies, which started to import large quantities of saltpeter from India, where it could be obtained more easily. Yet the importance of this salt was such that many saltpeter makers continued their practices, especially in the kingdom of France, because their government loathed dependence on enemies' overseas imports. Strategic considerations thus encouraged the further depletion of woodlands. In 1737 Verdun even became the assembly point of all saltpeter produced in Lorraine. No less than 3372 kilograms of powder was stored here in 1770, from where it would be distributed to garrisons spread across northeastern

523 Cressy, Saltpeter, 15-25, 66-72; Hall, Weapons & Warfare, 74-79; Laperche-Fournel, L'intendance de Lorraine et Barrois, 184-185; Zunckel, Rüstungsgeschäfte, 80-100.
France.  

It is also in late eighteenth-century France that saltpeter makers began to experiment with using plants containing high nitrate contents. In 1794, when the Republic was in particularly desperate need of saltpeter, hundreds of citizens and soldiers were sent out to the woodlands near Verdun to pull out suitable plants. Overexploitation of woodlands to satisfy military needs for arms and gunpowder, in peace as well as war, was evidently one of armed forces' most long lasting ecological influences.

4.3.3 Supplying Timber for Shipbuilding

The final disturbance that needs to be examined here is shipbuilding. This means once again stressing the importance of wood and its overexploitation, but in a very different way. Iron or gunpowder production mainly consumes wood as fuel. Managing woodlands as coppice wood or pollards is in these instances a common way to limit ecological damage and ensure the continuous supply of firewood. The building of ships required large quantities of timber; mostly trees managed as high forest. Different pressures, economic or otherwise, could thus potentially have a major influence on forest management. The question is how these contrasting pressures related to each other.

The link between ships and armies might seem ambiguous, given that sharp distinctions between war and other types of ships only become discernible from the late seventeenth century onwards, but this confirms rather than questions their close association. Up to the mid-seventeenth century few ships were kept permanently in service as warships, as most were used for trading or fishing and became part of a war fleet when required. The main market for timber was Dordrecht, which procured a considerable part of its supply from the more forested areas of the Meuse Region, aside from the Rhine basin and the Baltic. Considerable quantities of wood were in fact transported from the Ardennes to Dordrecht from the early Middle Ages onwards. Customs registers from the fourteenth and fifteenth century demonstrate exactly how frequent the passage of ships loaded with planks or poles must have been. In some cases entire tree trunks were even bound together and floated down the Meuse.

Remarking enough, the importance of these wood transports decreased from the late sixteenth century onwards, exactly when Dutch naval industries experienced a major

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expansion. Timber for shipbuilding was now mainly imported from Norway and to a lesser extent the upper Rhine Region. The reason for this development lies in the aforementioned expansion of the iron and arms industries as well as regulations against deforestation. Shipbuilding requires a very different form of forest management, and had to make way for these expanding industries. In the mid-eighteenth century the construction of a man-of-war of seventy-four cannon, a common type of warship, required almost two thousand one hundred cubic metres of wood. The Meuse Region did retain a limited role in shipbuilding, especially in France from the 1730's onwards, when it became increasingly difficult to find suitable wood closer to the coast.\textsuperscript{528} Most timber originating from the Meuse Region was floated down the Marne towards Rouen. The wharfs of Toulon obtained only one percent of their timber from Champagne in 1755-1769.\textsuperscript{529}

The French takeover of the Southern Netherlands in 1795 could have served as a major turning point, because of the development of Antwerp as a major military port from 1810 onwards in combination with the massive expansion of state owned forests. In absolute numbers the Rhine basin again supplied far more timber than the Meuse Region, but the remaining forests were still significantly affected. In June 1813 for instance Napoleon ordered the extraction of no less than six to seven thousand cubic meters of wood from the woodlands near Namur and Dinant. In the long run this growing need for timber could have exerted a major influence on forest management throughout the Meuse Region, but given the abrupt ending of Antwerp’s naval wharfs later that same year, it just seems to have contributed to the deterioration of the remaining high forests. The pressure on woodlands would only end in the 1860's, with the final demise of wooden warships.\textsuperscript{530} The supply of timber for shipbuilding contributed significantly to the overexploitation of woodlands in the Meuse Region, but its long-term impact was relatively limited because it had to make way for arms and gunpowder production.

\textsuperscript{529} Buti, ‘Un arsenal méditerranéen’, 494-498.
Arguments about the destructive role of armies, about ‘environmental destruction’, figure prominently in current debates about the ecological influences of military forces. This chapter engaged these arguments directly by assessing warfare disturbances in a historical context. The choice for the term disturbances rather than destruction as a starting point is crucial because it does not assume that armies’ actions are inevitably damaging, upset some kind of delicate ‘balance’. Disturbances are an essential part of ecosystem functioning, of ecological change, but one has to distinguish between temporary shocks and long-term shifts.

Armies’ disturbances are well attested in all kinds of sources and this variety is mirrored by the diversity of the disturbances themselves. There was not a single type of biotic community (woodlands, grasslands, rivers) that escaped armed forces’ depredations unscathed. The ecological damage that premodern armies could inflict was very significant, even without the possibilities of industrial warfare, and with tools as simple as iron axes, spades, and torches. To what extent this damage is comparable to that inflicted by current military forces, in absolute or relative terms, certainly merits further analysis. For this study the understanding that armies acted as a shock, with influences that were surprisingly similar to actual natural disasters, is essential. This also means that the resilience of communities, human or otherwise, should be taken into account.

The contrasting effects of armies’ disturbances further complicate this ambiguity. While there is ample evidence of plant and animal communities being negatively affected, as well as demographic decline, other species profited from these changes, notably the sudden availability of nutrients. Contemporaries were well aware of the connection between warfare and the expansion of wolf populations, and feared an increase in wolf attacks. Hawthorns and weeds also colonized abandoned agricultural fields, and ponds turned into land. Armies acted as creators of wilderness, as reducers of human control over their environment that gave unwanted species a chance to spread. It demonstrates how perceptions of nature and actual ecological influences reinforce each other.

The example of wolves is of particular interest because it demonstrates the difficulty of assessing how important the role of armies was in relative terms. Wolves and other species took advantage of the turmoil armies created; they were agents in their own right. Yet such wilderness effects also rarely survived the disturbances they were associated with. Peace saw the return of order, from a social as well as ecological perspective. Armed forces certainly functioned as a disaster, but the 'shocks' they brought about were in themselves rarely sufficient to bring about 'shifts' in ecological systems. Outcomes might have been very different if not for the intervention of other actors, human or non-human. If warfare changes became permanent various political or economic factors likely played a part as well.
The strongest evidence for long-term effects comes in fact not from warfare as such, but its preparation and aftermath: arms production and destitution. The most harmful disturbances in a long-term perspective were not the most obvious ones. Especially in these cases, making distinctions between armies and other, external or internal, influences is very problematic. The decline of vineyards in the northern half of the Meuse Region was an ecological process which warfare enhanced rather than initiated. The same applies to geographical fluctuations in the distribution of herring fisheries in the North Sea. Armed forces put considerable financial pressure on communities, but the decline of small-scale land ownership in many areas of the Meuse Region cannot be reduced to this one stimulus. The long-term ecological developments examined here were the result of complex interactions between many factors, among which armies were an essential element.

The essential characteristic of military disturbances in the Meuse Region from 1250 to 1850, then, is that they put pressure on the substantial yet fragile control humans exerted over ecosystems. Survival strategies of the general population in wartime, especially rural dwellers, are very meaningful from an ecological perspective because agriculture and livestock raising dominated landscape use throughout the Meuse Region. Access to scarce natural resources, such as wood, fish or game, was limited and carefully regulated. When armed forces challenged this control wolves and other unwanted species could still take advantage of the resulting turmoil to reassert themselves. They no longer had such chances during the World Wars, for wolves had been almost exterminated by 1914. The destruction these later conflicts brought about was in fact so extensive that it stimulated new forms of ecological conservation (e.g. the afforesting of the former battlefields of Verdun).