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WE HAVE THE APPARENT DOUBLE ANOMALY, that Australia is better suited to some English plants than England is, and that some English plants are better suited to Australia than those Australian plants were which have given way before English intruders.

—Joseph Dalton Hooker, 1853

IT IS REALLY NOT SURPRISING that Europeans failed to Europeanize Asia and tropical Africa. They did better in the New World tropics, but fell far short of founding congeries of Neo-European societies under the blazing American sun. In fact, in many areas they did not even try, but concentrated on creating plantation colonies staffed with non-European peons, slaves, or contract laborers. What is amazing is that Europeans were able to establish themselves in large numbers in the Neo-Europes, and indeed to thrive and multiply there "as the stars in the sky, and as the grains of sand on the seashore." This the white imperialists achieved despite the remoteness of the Neo-Europes and their many bizarre aspects – bizarre by Old World standards. Quebec may be like Cherbourg today, but in 1700 it certainly was not. San Francisco and Montevideo and Sydney may be European today, but a few – really a very few – generations ago they were without masonry or streets, and they were inhabited by Amerindians and Aborigines jealous of their lands and rights. What enabled the white intruders to make Neo-European cities of these harbors and shorelines?

Any respectable theory that attempts to explain the Europeans' demographic advance has to provide explanations for at least two phenomena. The first is the demoralization and often the annihilation of the indigenous populations of the Neo-Europes. The obliterating defeat of these populations was not simply a matter of European technological superiority. The Europeans who settled in temperate South Africa seemingly had the same advantages as those who settled in Virginia and New South Wales, and yet how different their histories have been. The Bantu-speaking peoples, who now overwhelmingly outnumber the whites in South Africa, were superior to the American, Australian, and New Zealand indigenes in that they possessed iron weapons, but how much more inferior to a musket or a rifle is a stone-pointed spear than an iron-

pointed spear? The Bantu have prospered demographically not because of their numbers at the time of first contact with whites; they were probably fewer per square kilometer than, for instance, the Amerindians east of the Mississippi River. Rather, the Bantu have prospered because they survived military conquest, avoided the conquerors, or became their indispensable servants – and in the long run because they reproduced in greater numbers than the whites. In contrast, why did so few of the natives of the Neo-Europes survive?

Second, we must explain the stunning, even awesome, success of European agriculture in the Neo-Europes. The difficult progress of the European agricultural frontier in the Siberian *taiiga* or the Brazilian *sertão* or the South African *veldt* contrasts sharply with its easy, almost fluid advance in North America, for instance. Of course, the white pioneers of the United States and Canada would never have characterized their progress as easy; their lives were filled with danger, deprivation, and unrelenting labor. But as a group they always succeeded in taming whatever portion of temperate North America they wanted within a few decades, and usually a good deal sooner. Many individuals among them failed – they were driven mad by blizzards and dust storms, lost their crops to locusts and their flocks to cougars and wolves, or lost their scalps to understandably inhospitable Amerindians – but as a group they always succeeded, and in terms of human generations, very quickly.

These phenomena were so vast that they strike one as suprahuman, as manifestations of forces impinging on human affairs that are more powerful, undeviating, and pervasive than human will – forces that are to will as the persistent and inexorable progress of a glacier is to the rush of an avalanche. Let us look at human migration between Europe and the Neo-Europes. Tens of millions of Europeans left home and went to the Neo-Europes, where they

reproduced voluminously. In stark contrast, very few indigenes of the Americas, Australia, or New Zealand ever went to Europe and had children there. Now, it is not startling that the flow of human migration was almost entirely from Europe to the colonies, nor is it very enlightening. Europeans controlled overseas migration, and Europe needed to export, not import, labor. But this pattern of one-way migration is significant in that it reappears in the history of the migration of other species between Europe and the Neo-Europes. We cannot take all the migrant species into consideration, and the spread overseas of such Old World crops as wheat and turnips, for instance, is the obvious and uninformative concomitant of the spread of European farmers. Let us consider three general kinds of life forms that often passed over the seams of Pangaea and usually prospered in the colonies, not with but often without help and even despite European actions: weeds, feral animals, and pathogens associated with humanity. Is there a pattern in the histories of these groups that suggests an overall explanation for the phenomenon of the demographic triumph of Europeans in the Neo-Europes, or that at least suggests new paths of inquiry?

First, it is necessary to define "Neo-Europe" more narrowly than we have thus far. Not all parts of the United States, Argentina, Australia, and so forth, attracted great numbers of Europeans. There are, for instance, few whites in Australia's Great Sandy Desert, and if all of Australia were arid, then that continent would be no nearer to being a Neo-Europe than is Greenland. Where the hottest, coldest, driest, wettest, and, in general, the most inhospitable parts of the Neo-Europes have white populations today, it is because great numbers of white immigrants were attracted to the more hospitable regions, and then spread out from there. These regions are the arenas in which native and alien species had their most significant competitions in the post-Columbian and post-Cookian era, and in which the

results made possible the Europeanization of the whole lands. It is on these arenas that we shall be focusing our attention. The eastern third of the United States and Canada, where half the population still lives, though it has been over three and a half centuries since the founding of Jamestown and Quebec, is the Neo-European seedbed of North America. The counterpart in Australia is its southeastern corner, bounded by the seas and a line drawn from Brisbane to Adelaide, plus Tasmania. All of New Zealand, minus its high cold country and the west coast of the South Island, falls into this alluring category. The Neo-European core of southern South America is the humid grassland at whose center lies the city of Buenos Aires. It is an enormous territory, most of it flat as a board, that lies within a half circle scrawled from Bahía Blanca in the south to Córdoba in the west to Porto Alegre on the Brazilian coast. This vast tract of upwards of a million square kilometers includes a fifth of Argentina and all of Uruguay and Brazil's Rio Grande do Sul. There live two-thirds of Argentina's people and all those of Uruguay and Rio Grande do Sul, the largest concentration of population in the world south of the Tropic of Capricorn.¹

Having set the scenes, let us introduce into them "the tramps of our flora," as Sir Joseph Dalton Hooker called them: weeds.² "Weed" is not a scientific term in the sense of species, genus, or family, and its popular definitions are protean; so we must pause to define it. In modern botanical usage, the word refers to any plant that spreads rapidly and outcompetes others on disturbed soil. Before the advent of agriculture, there were relatively few of these plants representing any given species; they were the "pioneers of secondary successions or colonizers," specializing in the occupation of ground stripped of plants by landslides, floods, fires, and so forth.³

Weeds are not always unlikeable. Rye and oats were once weeds; now they are crop plants.⁴ Can a crop plant shift the

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other way and become a weed? Yes. Amaranth and crabgrass were prehistoric crops in America and Europe, respectively, both treasured for their nourishing seeds, and now both have been demoted to weeds. (Amaranth may be on its way back to respectability in the crop category again.)⁵ Are weeds, while in that category, always a bane and torment to everyone? No, indeed. Bermuda grass, one of the most irrepressible tropical weeds, was extolled a century and a half ago as a stabilizer of levees along the lower Mississippi at the same time that farmers not far from that river were calling it devilgrass.⁶ Weeds are not good or bad; they are simply the plants that tempt the botanist to use such anthropomorphic terms as aggressive and opportunistic.

Europe had plenty of weeds long before the *marinheiros* set out into the Mediterranean Atlantic. As the Pleistocene glaciers retreated, species of weeds evolved to take over the bare earth left behind. As Neolithic farmers moved into Europe, they carried with them their crops, their livestock, and Middle Eastern weeds. Some of these opportunistic plants probably crossed the Atlantic to Vinland, but lasted no more than a season or two longer than the Viking settlements there. Mediterranean weeds were no doubt the first successful crossers among colonizing plants, making the short jump to the deforested slopes of the Azores, Madeira, and Canaries, and then the long voyage to the West Indies and tropical America.

We know very little about weeds in America in the fifteenth and sixteenth centuries. The *conquistadores* paid little attention to farming, less to weeds as such, and the historians who traveled with or followed after Cortés and the rest rarely took notice of the *malas hierbas*, but we know they were there. European crops and other desirable plants flourished in the Indies even when disgracefully neglected by farmers gone crazy for gold and conquest; so we can be sure that the imported weeds, which thrive on neglect, did

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very well indeed.⁷ Even trees sank to the level of weedy behavior. When, at the end of the sixteenth century, José de Acosta asked who had planted the forests of orange trees through which he walked and rode, the answer was "that oranges being fallen to the ground, and rotten, their seeds did spring, and of those which the water carried away into divers parts, these woods grew so thicke." Two centuries and a half later, Charles Darwin found islands near the mouth of the Paraná thick with orange and peach trees, sprung up from seeds carried by the river.⁸

The imported weeds must have taken over large areas in the West Indies, Mexico, and other places, because the Iberian conquest created enormous areas of disturbed ground. Forests were razed for timber and fuel and to make way for new enterprises; burgeoning herds of Old World animals grazed and overgrazed the grasslands and invaded the woodlands; and the cultivated fields of the declining Amerindian populations reverted to nature, a nature whose most aggressive plants were now exotic immigrants. Friar Bartolomé de las Casas told of large herds of cattle and other European animals in the West Indies eating native plants down to the roots in the first half of the sixteenth century, followed by the spread of ferns, thistles, plantain, nettles, nightshade, sedge, and so forth, which he identified as Castilian and yet stated were present when the Spanish arrived.⁹ It is impossible that the same species would have developed in both Castile and Española, and unlikely that they made the trans-Atlantic passage in pre-Columbian times. It is much likelier that they were Old World colonizing species moving in with the explorers and advancing as fast as or faster than the friars.

The weeds must have advanced at least as fast in central Mexico, as colossal herds of Spanish cattle and other animals, tame and feral, grazed and overgrazed and, by the end of the sixteenth century, began in some areas to starve in the midst of the vacancies they had made.¹⁰ Old World

colonizing plants had not had such an opportunity since the invention of agriculture. At least as early as 1555, European clover was so widespread that the Aztecs had a word of their own for it. They called it Castilian or *Castilian ocoxochil*, naming it after a low native plant that also prefers shade and moisture.¹¹ It is probable that central Mexico's weed flora by 1600 was largely what it is today: mostly Eurasian with a predominance of Mediterranean plants.¹²

Perhaps we can reconstruct to an extent what happened in Mexico in the sixteenth century by examining the record of weed spread in California (upper California) in the late eighteenth and nineteenth centuries. We do not have a firsthand description of the aboriginal condition of California's grasslands, but botanists with a taste for history have gathered together such evidence as does exist in the way of tiny relict meadows in neglected corners and a few oblique references in written sources. They have hypothesized a flora dominated by bunch grasses subjected to only the light grazing of pronghorns and such. The buffalo did not flow through the Sacramento and San Joaquin valleys in all their millions, any more than through central Mexico.

This Californian flora was as fatally vulnerable to Eurasian invaders as were California's aboriginal peoples, but isolation protected the flora, as it did the people, for two and a half centuries after the first coming of the Spanish to America. California, separated from Europe by a continent and an ocean, and from the population centers of Spanish Mexico by deserts and the northerly winds and currents that flow along the coasts of both upper and lower California, remained one of the most remote regions in any of the European empires until the last decades of the eighteenth century. As late as 1769, according to the evidence of plant materials embedded in the adobe bricks of California's oldest colonial buildings, only three European plants were growing there: curly dock, sow thistle, and red-stemmed

filaree.¹³ The latter was in particular the pioneer of an assemblage of Mediterranean weeds tolerant of hot weather with seasonal droughts.

When, in the middle eighteenth century, Russian fur traders and imperialists became active on the northwest coast of America, the Spanish reacted by dispatching soldiers and missionaries to the wild California frontier. They took with them, whether they intended to or not, the forage plants and weeds of the Mediterranean – the three named earlier, plus wild oats, common foxtail, chess, bromes, Italian ryegrass, and others – and these accompanied them and in some cases may even have preceded them along the coastal hills and into the San Joaquin and Sacramento valleys and beyond.¹⁴ Some of these plants had tagged along with the agricultural frontier all the way from the hearthlands of Old World civilization. Black mustard, the tiny seed of which, according to Jesus Christ, is like the kingdom of God, because it "groweth up, and becometh greater than all herbs, and shooteth out great branches; so that the fowls of the air may lodge under the shadow of it," arrived in California with the Franciscan friars.¹⁵

A few of these plants trickled in, and then more and more, as their pioneers pressed on ahead. As John Charles Frémont, an explorer from the United States, was coming down along the *Río de los Americanos* into the Sacramento Valley in March of 1844, he found red-stemmed filaree, an Old World immigrant like himself and his mounts. It was "just now beginning to bloom, and covering the ground like a sward of grass." The horses consumed it "with avidity," and even the squaws he met ate it "with apparent relish," indicating by sign language that what was good for the animals was good for them, too.¹⁶

A number of weeds came into California during the late Spanish era, probably more during the Mexican years after 1824, and more yet after annexation by the United States,

as Anglo-Americans brought plants with them across the plains from the eastern seaboard. The gold rush of 1849 produced an immense demand for beef and therefore severe overgrazing, which was followed by extensive floods in 1862 and then an intensive two-year drought. When the rains came again, the introduced plants sprouted first and fastest, and California's grasslands became what they had been becoming for a century, that is, Eurasian. Without the opportunistic invaders, the loss of topsoil would have impoverished thousands of hectares of the most valuable agricultural land in the world today. By 1860 there were at least ninety-one alien weed species naturalized in the state. A twentieth-century reconnaissance of the San Joaquin Valley revealed that introduced plants "constituted 63 per cent of the herbaceous vegetation in the grassland types, sixty-six per cent in the woodland, and fifty-four per cent in chaparral."¹⁷

We have to guess about the early history of Old World colonizing plants in Mexico, extrapolating backward from more recent examples of their spread, but not in Peru, thanks to the Jesuit Bernabé Cobo and the half Amerindian, half Spanish nobleman Garcilaso de la Vega. They did not write specifically about plants that were unequivocally weedy in behavior – such plants did not deserve the attention of distinguished men – but they did write about respectable plants that went wild and defied attempts to keep them out of cultivated fields, citing turnips, mustard, mint, and camomile as among the worst offenders. Several of these "have overgrown the original names of the valleys and imposed their own as in the case of Mint Valley on the seacoast, which was formerly called Rucma, and others." In Lima, endive and spinach grew taller than a man, and "a horse could not force his way through them."

The most expansionistic European weed in sixteenth-century Peru was *trébol*, a clover or clovers that took over more of the cool, damp country than any other colonizing

species, providing good forage but smothering crops as well. The former subjects of the Inca, who had abruptly found themselves with a new elite and a new God to support, now discovered themselves in competition with *trébol* for crop land.¹⁸ What was *trébol*? Most of it, in all likelihood, was white clover, which performed the same role of pioneer and *conquistador* in North America.

England, which spawned most of the colonies in northern America, had, according to John Fitzherbert's *Book of Husbandry*, "divers maner of weeds, as thystels, kedlockes, docks, cockledrake," and others,¹⁹ and they are as thick in Shakespeare's language as they no doubt were in his gardens at Stratford-upon-Avon. His duke of Burgundy informs Henry V not that times are hard in France, but that, "darnel, hemlock and rank fumitory" are growing there. His Hotspur wins literary immortality by promising that "out of this nettle, danger, we pluck this flower, safety." Poor mad Lear roams the fields

Crowned with rank fumiter and furrow-weeds,
With hardocks, hemlock, nettles, cuckoo-flowers,
Darnel, and all the idle weeds that grow
In our sustaining corn.²⁰

It is a sure bet that English weeds were rooted in North American soil while Shakespeare was alive. John Josselyn, who visited New England in 1638 and 1663, scores of years after the first European fishermen began summering in Newfoundland and environs, and in all likelihood planting small gardens, made a list "Of Such Plants as have sprung up since the English Planted and kept Cattle in New-England."²¹ He was not a professional botanist and may have been mistaken in a few of his identifications, but surely was accurate in most.

Couch grass	Shepherd's purse
Dandelion	Groundsel
Sow-thistle	Wild arrach

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Night Shade, with the White Flower	Nettles stinging
Mallowes	Plantain
Black henbane	Wormwood
Sharp-pointed dock	Patience
Bloodwort	Adder's tongue
Knot-grass	Cheek-weed
Compherie, with the white flower	May-weed
The great clot-bur	Mullin, with the white flower

Nettles were the first of these plants to be noticed in New England, either because they were the first to spread or because they do indeed sting. Plantain, which figures in *Romeo and Juliet*, Act I, Scene II, as a medicinal herb ("Your plantain leaf is excellent for that. What? For your broken shin.") was called "Englishman's foot" by the Amerindians of both New England and Virginia, who believed in the seventeenth century that it would grow only where the English "have troden, & was never known before the English came into this country."²²

What was the first European weed in the southern colonies of North America? A candidate that does not come first to mind is the Old World peach, but it was as quick to take up residence in North America as José de Acosta's orange trees in tropical America. When the English first penetrated into the interior of Carolina and Georgia, they found peach trees flourishing in Amerindian orchards, and many growing wild. The indigenes, some of whom believed peaches to be as American as maize, dried the fruit in the sun and baked it into loaves for winter consumption. The trees were so quick to sprout from the stone that John Lawson wrote from Carolina in the early eighteenth century that "eating peaches in our orchards makes them come up so thick from the kernel, that we are forced to take a great deal of care to weed them out, otherwise they make our land a wilderness of peach trees."²³ The probable explana-

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tion for the Old World peach preceding the English pioneers, and also for the odd fact that the Amerindians initially had more varieties of the fruit than the English, is that the Spanish or French had introduced it into Florida in the sixteenth century. From there, the Amerindians spread it northward, where, as their populations declined and their orchards went wild, the peach became naturalized.

Plants more commonly rated by Europeans as weeds than the peach probably arrived as early, but, as befitted their stature, less ostentatiously. In 1629, Captain John Smith reported that most of the woods around Jamestown, Virginia, had been cut down and "all converted into pasture and gardens; wherein doth grow all manner of herbs and roots we have in England in abundance and as good grass as can be," but he did not trouble us with specific names.²⁴ The champion pioneers among the European weeds in North America were forage forbs and grasses gone wild. Native American grasses east of the Mississippi, never having had to survive the enormous herds of quadrupeds that grazed the Great Plains, had few of the attributes that enable plants to live in the same fields with cattle, sheep, and goats. The indigenous grasses disappeared from all but the niches and crannies of British and French North America after the arrival and spread of those animals.²⁵

Among the imported forage crops, the champions were white clover (the probable champion of colonizing plants in Peru) and the Eurasian plant Americans have arrogantly named Kentucky bluegrass. The two mixed together were called English grass. They were quite English in their preference for cool, damp climates; if peaches preferred the southern tier of European colonies in North America, English grass preferred the northern.²⁶ Either or both the clover and grass were being sown intentionally in North America at least as early as 1685, when William Penn tried some in his courtyard. Their desirability as forage and their own aggressive natures soon spread them widely in the

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thirteen colonies and in Canada along the St. Lawrence. When English pathfinders topped the Appalachian and proceeded into Kentucky in the last decades of the eighteenth century, they found white clover and bluegrass waiting for them. The plants either had crept over the mountains clinging to the coats of traders' horses and mules from Carolina or, more likely, had entered with the French in the late seventeenth or eighteenth century.²⁷

White clover and Kentucky bluegrass continued west until the rain petered out on the other side of the Mississippi, hustling along to keep up with the frontier of the new United States and even striking off on their own.

Illinois, 1818: Where the little caravans have encamped as they crossed the praries, and have given their cattle hay made of these perennial grasses, there remains ever after a spot of green turf for the instruction and encouragement of future improvers.²⁸

From those green spots, ripples of nourishing forage and nearly ineradicable weeds spread out over the Midwest, in time to be carried across the semiarid plains to renew their wild spree of expansion in the cool, moist lands of the Far West.²⁹

Right behind white clover and Kentucky bluegrass on the list of the most aggressive floral imports were barberry, Saint-John's-wort, common hemp, corn cockle, and chess, plus all those on Josselyn's list, plus many more. In January of 1832, Lewis D. de Schweinitz, after much research, announced to the Lyceum of Natural History of New York that the most aggressive plants in the northern states of the United States were the foreign weeds, and he provided a list of 137 of them. The situation in the South was in all probability similar.³⁰

The weeds whose presence he and Josselyn and the others east of the Mississippi recorded seemed to lose their aggressiveness as they neared the center of North America. Buffalo grass and grama grasses and the other native flora of

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the plains were able to resist the invaders effectively, except when humans made an earnest effort to assist the exotics, as in obliterating the Manitoba and Dakota grasses and planting wheat. Later we shall return to the question why the Great Plains flora was so resistant to invasion.

Meanwhile, let us turn to another success story, this one some eighty degrees of latitude to the south-southeast. There sprawls the pampa, a plain that in its well-watered portions succumbed to Old World invaders about as thoroughly as equivalent parts of the San Joaquin Valley in California. The pampa is an enormous level area, well watered in the east, and less and less so as one moves away from the Atlantic and the Río de la Plata toward the Andes. The moist and fertile pampa was four centuries ago a vast grassland, "barren and flat and without trees, except along the rivers," said the first Spaniards to see it. Dominating the flora were the swaying needlegrasses, and grazing on them and moving through them were outlandish humplless camels and giant flightless birds.³¹

The usurpation of the native biota of the pampa must have been under way by the end of the sixteenth century, as domesticated animals from Europe arrived, thrived, and propagated into enormous herds. Their eating habits, trampling hooves, and droppings, and the seeds of the weedish plants they carried with them, as alien to America as they were themselves, altered forever the soil and flora of the pampa. That alteration must have been swift, but there is little in contemporary documents on the subject until the eighteenth century. A visitor, Félix de Azara, recorded in the 1780s that the vast numbers of livestock and the practice of burning off the dead grasses annually were eliminating delicate plants and the taller grasses, and the resulting vacancies were not going begging. Wherever the European or half-breed pioneer threw up his little hut, mallows and thistles and such sprang up, even if there were no other such plants for thirty leagues. And it was enough

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that the frontiersman frequent a road, even though alone with his horse, for these plants to rise up along its edges. The pioneer of the pampa was a sort of botanical Midas, changing the flora with his touch.³²

The story of the flora of the pampa, in at least its most spectacular features, becomes clearer in the nineteenth century. The wild artichoke, *cardo de Castilla*, common in Buenos Aires in 1749, continued to spread, and when Charles Darwin visited this part of the world eighty years later, he found it in Argentina and Chile and so luxuriant in Uruguay that it rendered hundreds of square miles impenetrable by horse or man. "I doubt," he wrote, "whether any case is on record of an invasion on so grand a scale of one plant over the aborigines."³³

W. H. Hudson, as a child in mid-nineteenth-century Argentina, saw thickets of wild artichoke that stretched bluish and gray green as far as the eye could see, but he was more impressed with the imported giant thistle, a Mediterranean biennial that grew as high as a mounted man. In "thistle years" it sprang up everywhere, and when it dried there was great danger of fire:

At such times the sight of smoke in the distance would cause every man who saw it to mount his horse and fly to the danger-spot where an attempt would be made to stop the fire by making a broad path in the thistles some fifty to a hundred yards ahead of it. One way to make the path was to lasso and kill a few sheep from the nearest flock and drag them up and down at a gallop through the dense thistles until a broad space was cleared where the flames could be stamped and beaten out with horse-rugs.³⁴

The evidence we have on the floral changes in the grasslands of the Río de la Plata region is anecdotal, spotty, far from scientific, but we can take the enormous spread of these two alien weeds in the nineteenth century as certain proof that the ecosystem of the pampa had been trauma-

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tized by the whites and their animals. The herds caused changes nearly everywhere between the snow line on the Andes and some similar line in Patagonia, but nowhere was the transformation as profound as in the core of the grasslands: the well-watered, fertile, and, all in all, rather European region 300 and more kilometers across that has as its kernel the city of Buenos Aires. As Darwin in 1833 crossed into that core from the outside, he noticed a change from "coarse herbage" to "a carpet of fine green verdure." He attributed this transformation to some change in the soil, but "the inhabitants assured me that . . . the whole was to be attributed to the manuring and grazing of the cattle."³⁵

In 1877, Carlos Berg published a list of some 153 European plants he had found in the province of Buenos Aires and in Patagonia, including among the most plentiful such European familiars as white clover, shepherd's purse, chickweed, goosefoot, red-stemmed filaree, and curly dock. Also included is *llanten*, as it is known to the Spanish, or plantain to the English, or Englishman's foot to the Algonkins in North America.³⁶ According to field botanists, only one quarter of the plants growing wild on the pampa in the 1920s were natives.³⁷ W. H. Hudson bemoaned the plight of the European of the pampa, surrounded by his weeds "that spring up in his fields under all skies, ringing him round with old-world monotonous forms, as tenacious of their undesired union with him as the rats and cockroaches that inhabit his house."³⁸ Yet without these plants, what would have – what could have – replaced the native species disappearing under the hooves of the exotic herds?

If it were true that the degree of difference between European life forms and the native life forms of a colony correlates with the vulnerability of the latter to invasion by the former, then Australia – with its distinctive grasses and forbs, forests of unique eucalypti, black swans, giant

flightless birds, and pouched mammals – should today be another Europe. It has not become so, of course, because it was saved by its hot, arid, and entirely un-European interior, and by the tight grip on existence that characterizes organisms living in the environments that shaped them. But there have been changes, considerable changes. The Europeans and their portmanteau biota have altered the Australian environment irreversibly.

The British who came to New South Wales in 1788 to found a colony intentionally brought many kinds of plants with them – over two hundred by March of 1803 – and, of course, others unintentionally. Some of those brought on purpose immediately took up the ways of the weed – purslane, for one – and their success indicates the vulnerability of the Australian flora to Old World invasion.³⁹ White clover barely held its own in the rather dry site of the original settlement at Sydney, but advanced rapidly in the moist climate of Melbourne, “often destroying other vegetation.”⁴⁰ Sow thistle seemed to thrive everywhere in and around the latter city, even growing on roofs. Other weeds also spread rapidly in Victoria, including knotgrass and red sorrel, pushing less aggressive grasses right out of some pastures. Tasmania, whose climate is very like that of northwestern Europe, was also hospitable to the new weeds, and knotgrass and snakeweed kept pace with the colonizing humans.⁴¹

The weeds could move into the interior with amazing speed, sometimes bounding ahead of the settled frontier. In the same general period in which Frémont found flarce along the *Río de los Americanos* in the foothills of California’s Sierras, Henry W. Hays found wild oats, a weed common in Europe since the early Iron Age, along the Snowy River where it flows down from the Australian Alps:

Horses are excessively fond of this plant, so much so, that in the early part of the spring, when it shoots up sooner than other

vegetation, they will not hesitate to swim over the river in quest of it. The waters at that time are frequently so much swollen as to prevent any one from crossing, so that the stockkeeper, after losing the track of his saddle-horses upon the river’s edge, has the mortification of seeing them quietly grazing upon the other side.⁴²

In the middle decades of the last century, according to a careful census of naturalized plants around Melbourne and a few scattered reports from elsewhere, 139 aliens were growing wild in Australia, and almost all of them of European origin.⁴³ In the state of South Australia, settled later than Victoria or New South Wales, the climate is drier than around Melbourne, and, as in California, Mediterranean weeds have a special advantage. As of 1937, the state had 381 species of naturalized plants. Of these, the great majority were Old World species, and 151 were Mediterranean species.⁴⁴ One of the more widespread was the red-stemmed flarce that Frémont found in the valley of the *Río de los Americanos*.⁴⁵

Today, most of the weeds of the southern third of Australia, where most of the continent’s population lives, are of European origin. There the climate is most nearly European, and there the impact of imported animals, particularly the sheep, has been greatest. The native grasses – kangaroo grass or oat grass, for instance – often are toothsome and nourishing for livestock, but are intolerant of heavy grazing and of the direct sunlight that burns down on them after the forests are cleared. Kangaroo grass, initially described in some places as up to the “very flaps of the saddle,” was on the retreat as early as 1810, and in many localities it now survives only in railroad embankments, cemeteries, and other protected refuges. As the native plants faded and the settlers, arrogant and ignorant about Australia’s periodic droughts, burdened her grasslands with excessive numbers of animals, ecosystems

frayed, and erosion followed, opening even more land to the opportunistic plants. In 1930, the botanist A. J. Ewart stated that in the previous two years, alien species had been establishing themselves in Victoria at a rate of two per month.⁴⁶

Not all weeds, by our definition, are obnoxious, but those that plague the farmer tend to get the most scientific attention, and our statistics for them are plentiful and dependable. Let us revert for a moment to the common definition of weeds for the sake of these statistics, on the basis of which we can generalize about the success in the Neo-Europes of weeds in the broader definition. Sixty percent of the more important farmland weeds in Canada are European.⁴⁷ Of the 500 equivalents in the United States, 258 are from the Old World, 177 specifically from Europe.⁴⁸ The total number of naturalized plant species in Australia is about 800, and despite contributions from the Americas, Asia, and Africa, the majority came from Europe.⁴⁹ The situation vis-à-vis naturalized plants in the Río de la Plata region is approximately the same.⁵⁰ For each one of these triumphant tramps, there is at least one other exotic flourishing in the Neo-Europes that is loved, not hated, and therefore is not included in these statistics.

The naturalized floras of the Neo-Europes overlap to a considerable extent. Of the 139 European plants listed as being naturalized in mid-nineteenth-century Australia, at least 83 had already attained that status in North America.⁵¹ Of the 154 European plants listed as naturalized in the province of Buenos Aires and Patagonia in 1877, no fewer than 71, and probably more, were also growing wild in North America.⁵²

The onslaught from Europe troubled American naturalists, though most of them were of the same origin as the plants in question. Charles Darwin did not let pass the opportunity to tease his American country cousins a little on the subject. "Does it not hurt your Yankee pride," he

asked in a letter to the botanist Asa Gray, "that we thrash you so confoundedly? I am sure Mrs. Gray will stick up for your own weeds. Ask her whether they are not more honest, downright good sort of weeds." She countered nicely, answering that American weeds were "modest, woodland, retiring things; and no match for the intrusive, pretentious, self-asserting foreigners."⁵³ Thus, she proved herself both a patriot and an observant botanist.

It was more than a matter for joking. Research on the distribution of life forms – we call it biogeography today – was leading biologists further and further away from orthodoxy and into the environs of evolutionary theory. This affair of the migratory weeds was obviously a spectacular biogeographical phenomenon going on right under their noses, and they did not understand it.⁵⁴ The premier British botanist of the Victorian age, Joseph Dalton Hooker, who witnessed the advance of European weeds in Australia and New Zealand circa 1840, opined "that many of the small local genera of Australia, New Zealand and South Africa, will ultimately disappear, owing to the usurping tendencies of the emigrant plants of the northern hemisphere, energetically supported as they are by the artificial aids that the northern races of man afford them." But European weeds were doing very well in North America, too; so it seems that his interpretation of the mystery was in part faulty.⁵⁵

Something approaching an equal exchange of weeds between mother Europe and her colonies – or at least something in proportion to the sizes of their floras – is what nineteenth-century scientists expected. Indeed, it is what we would expect: Old World crabgrass for American ragweed, for instance. But the exchange has been as one-sided as that of human beings. Hundreds of Old World weeds packed up, weighed anchor, set sail for the colonies, and prospered there, but the American and other Neo-European plants that crossed the Pangaeen seams in the

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other direction usually pined away and died unless given special quarters and pampering at such homes for exotica as Kew Gardens.

A few American plants did manage in Europe by themselves. The Canadian waterweed, which first attracted notice in Britain's waterways in the 1840s, had them nearly clogged solid in a decade, and Canadian fleabane and annual fleabane gained a foothold in Europe by the last third of the nineteenth century. But most of the native weeds rated as fiercest in North America (ragweed, goldenrod, milkweed, etc.) could not even get started in Europe. And as of the middle of the nineteenth century, not one Australian or New Zealand plant had attained naturalization in Britain, nor, as far as we know, anywhere else in Europe.⁵⁶

Some naturalists muttered obscurely about the greater "plasticity" of Old World plants. Meaning what? Variability? Others talked about European flora having the advantage over American flora because of being older, and still others because of its being younger.⁵⁷ The whole matter was clouded in mystery. "It appears," wrote Professor E. W. Claypole of Antioch College in Ohio, "as if some invisible barrier existed preventing passage Eastward, though allowing it Westward."⁵⁸

The obvious explanations do not hold water. It is true that crop seeds and therefore (and unintentionally) weed seeds were exported from Europe to the colonies in quantity, but the ships that carried them returned to Europe with bales and barrels of tobacco, indigo, rice, cotton, wool, timber, hides, and, increasingly, enormous quantities of wheat and other grains, and all this cargo, inside and out, was a vehicle for seeds from the Neo-Europes. The bales of raw hides that Buenos Aires shipped to Cádiz by the millions must have carried innumerable American seeds with them, but no American equivalent of the wild artichoke ever swept over the backcountry of Granada. One

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tuft of fluff caught on a splinter of a log shipped from Portsmouth in New England to Portsmouth, Great Britain, could have set off an epidemic of milkweed in the south of England, but it never did. And sailors with Sydney mud and chaff still in the cracks of their best boots clumped down the gangway onto Liverpoolian quays, but only European, never Australian, weeds sprouted between the pilings. It seemed contrary to nature that Australian plants could not even get a toehold in Britain, whereas British plants were spreading wildly in Australia. Scientists who were moving toward a theory that species adapt to their environments, taking hundreds of generations to do so, found the contrast inexplicable. Joseph Dalton Hooker sputtered at "this total want of reciprocity in migration."⁵⁹

Let us consider why weeds in general do so well, and where and when. They reproduce rapidly and in great quantity. Mayweed, one of those John Josselyn saw in seventeenth-century New England, produces 15,000 to 19,000 seeds each generation. Others he saw — shepherd's purse, for instance — produce fewer per generation, but compensate by producing several generations per season. Many weeds reproduce not by seed or not by seed alone, but from bulbs, pieces of root, and so forth. Mow them before they come to seed, and they are discouraged not at all. Wild garlic, a bane of wheat farmers in colonial North America, propagates in six different ways, most of which would require more explanation than we can provide here. It is no wonder that weeds are so difficult to eradicate and can reproduce in solid masses. To cite two extreme examples, broadleaf filaree in the San Joaquin Valley has been found in concentrations of 13,000 young plants to the square meter, and fescue up to 220,000 per square meter.⁶⁰ Weeds are, as well, very efficient at getting themselves, particularly their seeds, distributed. This is essential, because 220,000 plants in one place are their own worst enemies. Some weeds produce seeds so light — down to

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0.0001 gram – that they float away with any movement of air. Some, like Josselyn's sow thistle and dandelion, provide their seeds with sail-like filaments to further their travels down wind.⁶¹ Other weeds produce seeds that are sticky or have hooks to grab fur and clothing to hitchhike to new places. Others produce their seeds in pods that dry and explode, flinging their seeds out and away. Many have tasty leaves and fruit, plus seeds that easily survive digestion, and so are deposited, with fertilizer, at distant points. White clover seed ambled from campground to campground right across North America in this fashion. In Australia, the settlers realized very early that their most important distributor of this plant was the sheep they drove before them into the interior.⁶²

Weeds are very combative. They push up through, shade out, and shoulder past rivals. Many spread not by seed as much as by sending out rhizomes or runners along or just below the surface of the ground, from which "new" plants sprout.⁶³ Plants of this kind – Josselyn's couch grass, for example – can advance in solid mats, smothering every other plant in their way. The leaves of weeds often grow out horizontally, pushing back and suppressing all other vegetation. The dandelion, a bright spring flower in all the Neo-Europes, is such an efficient usurper that a large one can produce a bald spot a third of a meter across on a lawn, bare except for its own expansive self.⁶⁴

Weeds are very good at doing what many of them evolved to do when the Pleistocene glaciers retreated: grow profusely in miserable micro-environments. Henry Clay, the perennial Whig candidate for the American presidency and gentleman farmer from Kentucky, said of Kentucky bluegrass that "you will find no better time to sow it, than to scatter it upon the snow in the month of March."⁶⁵ Weeds sprout early and seize bare ground. Direct sun, wind, and rain do not discourage them. They thrive in gravel beside railroad tracks, and in niches between slabs of concrete.

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They grow fast, seed early, and retaliate to injury with awesome power. They will even take root in the cracks in an old shoe; not much hope there, but perhaps the shoe will be thrown into the midden out back, and then they can burgeon and swallow the whole yard.

To sum up the weedy qualities of weeds, let us turn again to plantain, the Englishman's foot. The average plant produces 13,000 to 15,000 seeds, 60 to 90 percent of which germinate. Some have been known to sprout after forty years. It thrives in meadows and in hard-packed pathways, where it suffers little from being stepped on. Its leaves spread wide, shading out and pushing aside other plants. Its underground structure enables it to survive even weather that freezes its leaves. Cut it off at ground level and it produces lateral shoots, and new plants appear. It has been with us for a very long time: Its seeds have been found in the stomachs of ancient Danes disinterred from peat bogs. It was one of the nine sacred herbs of the Anglo-Saxons, and Chaucer and Shakespeare cited its medicinal qualities. It grows wild today in all the continents but Antarctica, as well as in New Zealand and a number of islands. It rates as one of the very hardest of weeds in the world, and it will be with us forever, apparently.⁶⁶

It is probably necessary at this point to explain why the entire land surface of the globe is not covered with plantain and the like. Colonizing plants – weeds – can survive nearly anything but success. As they take over disturbed ground, they stabilize the soil, block the baking rays of the sun, and, for all their competitiveness, make it a better place for other plants than it was before. Weeds are the Red Cross of the plant world; they deal with ecological emergencies. When the emergencies are over, they give way to plants that may grow more slowly but grow taller and sturdier. In fact, weeds find it difficult to elbow into undisturbed environments, and they will usually die out if disturbance ceases. A botanist interested in weeds calculated the proportion of

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introduced plants – weeds – in three fields, one that had been undisturbed for two years, another for thirty years, and another for two hundred years. The percentages of weeds, respectively, were 51 percent, 13 percent, and 6 percent. Weeds thrive on radical change, not stability.⁶⁷ That, in the abstract, is the reason for the triumph of European weeds in the Neo-Europes, concerning which we shall have more to say in Chapter 11 in a general discussion of the success of Old World species overseas.

What has all this about weeds to do with European humans in the Neo-Europes, beyond providing latter-day investigators with a model for the success of other exotic organisms – humans, for instance? The simple answer is that the weeds were crucially important to the prosperity of the advancing Europeans and Neo-Europeans. The weeds, like skin transplants placed over broad areas of abraded and burned flesh, aided in healing the raw wounds that the invaders tore in the earth. The exotic plants saved newly bared topsoil from water and wind erosion and from baking in the sun. And the weeds often became essential feed for exotic livestock, as these in turn were for their masters. The colonizing Europeans who cursed their colonizing plants were wretched ingrates.

8



Animals

WE HAVE A BELLYPULL of victuals everyday, our cows run about, and come home full of milk, our hogs get fat of themselves in the woods: oh, this is a good country.

—J. Hector St. John de Crèvecoeur, *Letters from an American Farmer* (1782)