

Soil Times

The Pace of Ecological Care



Echinocereus triglochidiatus,
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María Puig de la Bellacasa

The book *Matters of Care: Speculative Ethics in More than Human Worlds* by María Puig de la Bellacasa contests the view that care is something only humans do. It emphasizes the nonhuman agencies and communities that comprise the living web of care by considering how care circulates in the natural world. The following excerpt highlights human-soil relations and soils as living organisms consisting of a multispecies community of biota. Bellacasa enhances the idea that humans are part of soil communities. It is in these conceptions that Anthropos-centered concepts are called into question and transformative trends in human-soil relations are fostered.

Human-soil relations are a captivating terrain to engage with the intricate entanglements of material necessities, affective intensities, and ethico-political troubles of caring obligations in the more than human worlds marked by technoscience. Increasingly since the first agricultural revolutions, the predominant drive underlying human-soil relations has been to pace their fertility with demands for food production and other needs, such as fiber or construction grounds. But at the turn of the twenty-first century, Earth soils regained consideration in public perception and culture due to global antiecolological disturbances. Soils are now up on the list of environmental matters calling for global care. The Food and Agriculture Organization of the United Nations declared 2015 the »International Year of Soils,« expressing concerns for this »finite non-renewable resource on a human time scale under pressure of processes such as degradation, poor management and loss to urbanization.«¹ Soils have become a regular media topic, drawing attention to the »hidden world beneath our feet,«² a new frontier for knowledge and fascination about the life teaming in this dark alterity. Human persistent mistreatment and neglect of soils is emphasized in calls that connect the economic, political, and ethical value of

soils to matters of human survival. Recent headlines by environmental analysts in the UK press reiterate this: »We're Treating Soil Like Dirt. It's a Fatal Mistake, as Our Lives Depend on It«³ or »Peak Soil: Industrial Civilisation Is on the Verge of Eating Itself.«⁴ Warnings proliferate against a relatively immediate gloomy future that could see the global exhaustion of fertile land with correlated food crises. So while soils remain a resource of value extraction for human consumption and a recalcitrant frontier of inquiry for science, they are also increasingly considered endangered living worlds in need of urgent ecological care.

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From Productionism to Service – and Care?

Soil biologist Stephen Nortcliff speaks of a change in focus from research in the 1970s and 1980s, when sustainability concerns focused on »maintaining yield« rather than the »soil system«: »How things have changed as we have moved into the 21st Century! Whilst maintaining agricultural production is still important the emphasis now is on the sustainable use

of soils and limiting or removing the negative effects on other environmental components»⁵. Nortcliff is not alone. A disciplinary reassessment seems to be taking place. This could be a significant shift in the historical orientation of soil science, as summarized by soil scientist Peter McDonald:

Soil science does not stand alone. Historically, the discipline has been integrated with all aspects of small farm management. The responsibility of maintaining good crop yield over a period of years was laid upon the soil. Research into soil fertility reflected this production-oriented emphasis during most of the nineteenth century ... the focus of their efforts remained, and to a large extent still remains, to benefit overall harvests.⁶

Guaranteeing yield through production is obviously an essential drive of the agricultural effort. But critical research on agriculture refers to *productionism* more specifically in terms of the intensification that drove agricultural reform in Europe from the seventeenth century onward. This culminated in the mid-twentieth century with the industrialization and commercialization of agriculture and the international expansion of this model through the Green Revolution's assemblage of machines, chemical inputs, and genetic improvements. In *The Spirit of the Soil*, philosopher of agricultural technology Paul B. Thompson argues for an ethics of production and summarizes productionism as the consecration of the aphorism »Make two blades of grass grow where one grew before.«⁷ Critiques of productionism address the absorption of agricultural relations within the commercial logic of intensification and accumulation characteristic of capitalist economies. In other words, productionism is the process by which a logic of production over-determines other activities of value.⁸ Agricultural intensification is not only a quantitative orientation – yield increase – but also a way of life, and a qualitative mode of conceiving relations to the soil. While it seems obvious that growers' and farmers' practices, whether grand or small scale, pre-or postindustrial, would be yield-oriented, productionism colonizes all other relations: everyday life, relations with other species, and politics (e.g., farmers' subjection to the industry-agribusiness complex). The increasing influence of logics of productionist acceleration and intensification through the twentieth century can be read within scientific approaches to soil. One notable example can be

found in chemistry's contribution to turning cultivation into a productionist effort. Soil physicist Benno Warkentin explains how early studies on plant nutrition were first based on a »bank balance« approach by which nutrients assimilated by plants were measured with the idea that these had to »be added back to the soil in equal amounts to *maintain* crop production.« But the »balance« emphasis changed after 1940 with an increase in off-farm additions to the soil, bringing artificial fertilizing materials, external to a site's material cycles and seasonal temporalities, in order to bolster yield. The aim of this increase was to ensure »availability of nutrients for *maximum growth, and timing for availability* rather than on the total amounts removed by crops«⁹ – that is, not so much to maintain but to intensify the nutrient input in soils beyond the rhythms by which crops absorb them. These developments confirm a consistent trend in modern management of soils to move from maintenance – for instance, by leaving parts of the land at times in a fallow state – to the maximization, and one could say preemptive buildup, of soil nutrient capacity beyond the renewal pace of soil ecosystems.¹⁰ This makes visible how the tension between production and sustainability at the heart of soil science involves misadjusted temporalities: between soil as a slowly renewable entity and the accelerated technological solutions required by intensified production.

This is not to say that soil scientists – or even practitioners who live by the productionist credo – have not taken care of soils. Remediating worn-out soils has been at the heart of the development of soil science since its beginnings and was related to the socioeconomic concerns that influenced early soil studies.¹¹ Numerous soil scientists have been committed to conserving soils and working with farmers to foster ways of caring for them while maintaining productivity: »soil care« is a notion widely employed.¹² Moves to interrogate productionism seem nonetheless to question conceptions of soil care in the light of a broader societal realization of the untenable pressures on soil. In science and beyond, the persistent productionist ethos overlaps today with an »environmental era« starting in the 1970s and influenced by a conception of environmental limits to growth that place »the living earth ... in a central position«¹³. This has marked soil science – many researchers, for instance, pointing at the unsustainable destruction and deterioration of natural habitats associated with an excessive use of agrochemicals. Most sociohistorical accounts of the

soil sciences since the early 1990s recognize this »ecological« turn: »in the present era of soil science ... the questions are on a landscape basis, have an ecological nature, and ask about the sustainability of natural resources.«¹⁴

What can a critical analysis of the articulation of the temporality of productionism and relations of care contribute to these transformations? In a sense, there is an inherent ambivalence contained in these relations whereby the future is simultaneously hailed as central and »discounted,« as Adam emphasizes with regard to short-term thinking that pushes to exploit natural resources today at the expense of future generations.¹⁵ And yet, the temporality of productionist-oriented practices in late capitalist societies remains strongly future-oriented: it focuses on »output,« promissory investments (led by so-called agricultural futures), and on efficient management of the present in order to produce it. This is consistent with how, as described above, restless futurity renders precarious the experienced present: subordinated to, suspended by, or crushed under the investment in uncertain future outcomes. Worster's account of the living conditions of farmers who outlived the destruction of successive dust bowls to see the return of intensified agriculture and successful grand-scale farming are also stories of discontent, debt, and anxiety, echoing farmer experiences worldwide living under the pressures of production.¹⁶ So though the timescale of soil productionist exploitation discounts the future by focusing on the benefit of present generations, the present is also discounted, as everyday practices, relations, and embodied temporalities of practitioners embedded in this industrious speeded-up time are also compressed and precarious. Productionism not only reduces what counts as care – for instance, to a managerial »conduct« of tasks to follow¹⁷ – but also inhibits the possibility of developing other relations of care that fall out of its constricted targets. It reduces care from a coconstructed interdependent relation into mere control of the *object* of care.

And it is not only human temporalities, but also more than human, that are subjected to the realization of this particularly linear timescale focused on intensified productivity. It could be argued that within the productionist model the drive of soil care has mostly been for the crops – that is, importantly, plants as commodifiable produce (which also begs the question of what kind of care is given to plants reduced to crop status). In the utilitarian-care vision, worn-out soils

must be »put back to work« through soil engineering technologies: fed liters of artificial fertilizers with little consideration for wider ecological effects or made host for enhanced crops that will work around soil's impoverishment and exhaustion. In sum, soil care in a productionist frame is aimed at increasing soil's efficiency to produce at the expense of all other relations. From the perspective of a feminist politics of care in human–soil relations, this is a form of exploitative and instrumentally regimented care, oriented by a one-way anthropocentric temporality. This direction could be troubled by moves perceptible in the way the soil sciences are reconceiving how they see soil as a natural

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body, with important consequences about how to care for it. We can see changes supported by a notion that soils are of more »use« than agricultural production. An emphasis on the multiplication of »soil functions«¹⁸ means that they are valued for other purposes than agriculture, or building. This points at a diversification of the applications of soil sciences as soils become providers of a range of »ecosystem services« – for example, including social, aesthetic, and spiritual value – beyond commercial agricultural needs.¹⁹ The ecosystem-services approach looks at the elements involved in an ecological setting or landscape from the perspective of what they offer to humans beyond purely economic value and tries to calculate other sources of value – not

necessarily to »price« them, a distinction important to many advocates of this approach. This is a significant move for human–soil relations with a transformative potential that shouldn't be underestimated. Yet this notion has its limitations to transform the dominant affective ecologies of human–soil relations and not merely because it is restricted to a calculative vision of relationalities. Even if we accepted staying within a logic of valuation and service provision, at the very least a notion of ecosystem services should also calculate those provided by humans to sustain a particular ecology and the nonhuman community. The notion of ecosystem services, while representing an important attempt from inside Capitalo-centered societies to shift the parameters of a purely economic valuation of nature for production, is not enough to bring us closer to a relation of care that disrupts the notion of other than humans as »resources« and the sterile binary of utilitarian versus altruistic relations with other than humans. A notion of care, Sue Jackson and Lisa Palmer argue, could disrupt this logic and improve the way ecosystem services are conceptualized:

If we extend the concept of relatedness from humanity to all existence and foster an ethic of care which recognizes the agency of all »others,« be it other people or other nature, and the specific cultivation of these relations by humans, we avert the broadening of a schism between nature and culture – the schism that in the ecosystem service framework construes nature as provider/producer and human as consumer.²⁰

Thinking with a feminist politics of care that remembers the contested exploitations involved in the type of service work that care is often made to be, we can also interrogate the connotations involved in the notion of »service« itself. While service could seem to lead us beyond a logic of exchange – doesn't service also refer to what we do for altruistic purposes or sense of duty? – in strongly stratified societies it is marked by a history of serfdom. Struggles around the relegation of domestic care to women's work showed how the point is not only to make this »service« more valuable or recognized but also to question the very division of labor that underpins it. A feminist approach to more than human care would at the very least open a speculative interrogation: *Cui bono?*²¹ *service for whom?* as a question that reveals the limitations of a service approach to transform human–soil relations while it

remains based on conceiving nature/cultural entities as resources for human consumption, thus interrogating an understanding of soils that posits them as either functions or services to »human well-being«²².

An interrogation of both the productionist and service logic can learn from ecofeminist critiques about the instrumentalization, degradation, and evacuation of more than human agency²³ and the connection of these ecologically oppressive logics to gender and racialized binaries with their classic segregation of life domains.²⁴ Thinking with care invites us to question unilateral relationalities and exclusionary bifurcations of living, doings, and agencies. It brings us to thinking from the perspective of the maintenance of a many-sided web

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of relations involved in the very possibility of ecosystem services rather than only of benefits to humans. Coming back to rearticulating relations of care and temporality, I engage below a conception of soil »as living« that can further question its persistent status as serving for input for crop production or other human needs. A more soil-attentive mode of care might also reveal other ways of experiencing time at the heart of productionist relations, while, as Haraway would put it, »staying with the trouble« of humans' relation to soil as an essential resource for survival.

The Living Soil: Becoming in the Foodweb

As part of the ecological turn, soil ecology research has become more important at the heart of the soil sciences, concentrating on relations between biophysical, organic, and animal entities and processes.²⁵ Moreover, a number of accounts of the discipline's development in the past ten years connect the growing significance of the ecological perspective with the moving of biology to the center of a field traditionally dominated by physics and chemistry. In this context, it is remarkable how a notion of »living soil« – once mostly associated with organic and radical visions of agriculture²⁶ – is now mainstream. This does not mean that soil science traditionally conceived of soils as inert matter. Even conceptions of soil as reservoirs of crop nutrition focus on lively physicochemical processes and interactions. Also, soil microbiology has been a crucial part of soil science since its early beginnings as well as is important precursor work on soil biology (such as Charles Darwin's work on earthworms). This does not mean either that biology and ecology support environmentalism per se or that other disciplinary orientations in soil science must now be connected to biology. The noticeable changing trend is the increased significance of »biota,« from microbial to invertebrate fauna and, of course, plants, roots, and fungi, in the very definition of soil. That this has not been an obvious move is attested by ecologists who claim for a change in soil's definitions:

Are living organisms part of soil? We would include the phrase »with its living organisms« in the general definition of soil. Thus, from our viewpoint soil is alive and is composed of living and nonliving components having many interactions. ... When we view the soil system as an environment for organisms, we must remember *that the biota have been involved in its creation, as well as adapting to life within it.*²⁷

In this conception, soil is not just a habitat or medium for plants and organisms; nor is it just decomposed material, the organic and mineral end product of organism activity. Organisms are soil. A lively soil can only exist with and through a multispecies community of biota that makes it, that contributes to its creation.

One of the most significant aspects of these changes in conceptions of soil is a growing interest

in investigating biodiversity as a factor of soil fertility and system stability.²⁸ This goes beyond biological interest; for instance, the recognition of the importance of large pores in soil structures gives a central place to increased research on soil fauna such as earthworms, which some have named the »soil engineers.«²⁹ In the words of a soil physicist: »As the appreciation of ecological relationships in soil science developed after the 1970s, studies on the role of soil animals in the decomposition process and in soil fertility have been more common.«³⁰ More research focuses on the loss of soil biodiversity after alterations³¹ and on the ecological significance of soil health for nonsoil species.³² A number of soil scientists are now engaged in drawing attention to biodiversity in soils as part of educational campaigns and soil fertility projects worldwide.³³ Soils have become a matter of concern and care not just for what they provide for humans but for ensuring the subsistence of soil communities more broadly.

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These developments are not disconnected from worries about the capacities of soil to continue to provide services (a range of calculations are deployed to value the services of biota) or from a notion that accounts for soil fertility according to its ability to provide yield. Production continues to be a concern as the »loss of organic matter, diminishment or disappearance of groups of the soil biota and the accompanying decline in soil physical and chemical properties« are identified as important causes of »yield declines under long-term cultivation.«³⁴ However, these approaches bring significant hesitations at the heart of a conception of soils as physicochemical input compounds. Soils as living, for instance, create other questions about effects of human interventions to technologically enhance impoverished soils, however well intentioned. For example, agrochemical inputs can benefit crop yield, but soil communities can face long-term destabilization or

destruction, making soils and growers dependent on fertilizers. Also, the protection of soil structures connects to a generalized reevaluation of tillage in agriculture and other technologies that alter and destroy fragile and complex soil structures.³⁵ In sum, exploiting soil species for production threatens to destroy the living agents of this very productivity.³⁶ Once again, reconceptualizations of soil as living emphasize how productionist practices ignore the complex diversity of soil-renewal processes in favor of linear temporalities aimed at speeding up abundant output.

It is the nature of soil itself and ways to care for it that are at stake in these moves. Attention to soils as a living multispecies world involve changes in the ways humans maintain, care, and foster this liveliness.³⁷ So how does this affect temporal involvements in caring for the soil as a multispecies world? I approach these through the example of the »foodweb,« an ecological model of soil life that, having become popular in alternative growers' movements, thrives at the boundaries of soil science.

Foodweb models are not new, but they became increasingly prominent in soil ecology after the 1990s.³⁸ Foodweb models are valuable for scientists to describe the incredibly complex interactions between species that allow the circulation of nutrients and energy. They follow predation and eating patterns as well as energy use and processing. Soil foodweb species can include algae, bacteria, fungi, protozoa, nematodes, arthropods, earthworms, larger animals such as rabbits, and, of course, plants. They describe not only how species feed on each other but how one species' waste becomes another one's food.³⁹ Foodweb conceptions of soil question the use of artificial fertilizers, pesticides, and intensified agricultural models more generally. This is because their weblike, interdependent configuration means that altering or removing any one element can destroy them. Often conceptualized as soil »communities« even as they are based on »trophic« relations – who eats whom – foodweb models emphasize a living world below, teeming with life and yet always fragile. Soil ecology is, of course, not a unified domain and, while rich in holistic models of life cycles, it is also rich in reductionisms. If I am lured by moves that see soil as a multispecies world, it is for how they could affect not only the nature of soil itself but also the ways humans maintain, repair, and foster soil's liveliness – that is, the agencies involved in more than human webs of care.

Interdependent models such as the foodweb disturb the unidirectionality of care conceived within the

linear timescapes of productionist time traditionally centered in human-crop care relations. Relational approaches to the cycles of soil life in themselves can be read as disruptions to productionist linear time, simply because ecological relations require taking a diversity of timescales into account.⁴⁰ Yet foodweb models also affect relations to soil for how they turn humans into full participant »members« of the soil community rather than merely consumers of its produce or beneficiaries of its services. It is the emphasis on the interdependency of soil communities that is appealing for exploring more than human care as an immanent obligation that passes through doings and agencies involved in the necessary maintaining, continuing, and repairing of flourishing living webs. Remembering discussions in previous chapters around the nonreciprocal qualities of care, we see that while care often is represented as one-to-one practice between »a carer« and »a cared for,« it is rare that a carer gets back the

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care that she gives from the same person who she cares for. Carers are themselves often cared for by someone else. Reciprocity of care is asymmetric and multilateral, collectively shared. A caring conception of soil emphasizes this embeddedness in relations of interdependency. Caring for soil communities involves making a speculative effort toward the acknowledgment that the (human) carer also depends on soil's capacity to »take care« of a number of processes that are vital to more than her existence. Thinking multispecies models such as foodwebs through care involves looking at the dependency of the (human) carer not so much from soil's produce or »service« but from an inherent relationality. This is emphasized by how the capacities of soil in foodwebs refer to a multilateral relational arrangement in which food, energy, and waste circulate in nonreciprocal exchanges. Foodwebs are therefore a good example to think about the vibrant ethicality in

webs of interdependency, the a-subjective but necessary ethos of care circulating through these agencies that are taking care of one another's needs in more than human relations.

A care approach needs to look not only at how soils and other resources produce output or provide services to humans but also at how humans are specifically obliged, how they are providing. The capacity of exhausted global soils to sustain these webs of relations has become more dependent on the care humans put in them. In resonance with Anthropocenic narratives that acknowledge the impact of situated human actions on the making of earth, what the above conception might require is not only for organisms but also for humans to be included more decisively in the concept of soil. Here, in turn, changing ways in soil care would affect soil ontology. Coming back to the redefinition of soil as living⁴¹, we could include a rephrasing such as: »When we view the soil system as an environment for humans, we must *remember that humans have been involved in its creation, as well as adapting to life within it.*«

Though scientists have long spoken of »soil communities« to refer to the organisms involved in soil's ecology, the idea that humans are part of soil communities is not a prevailing one in the scientific literature. Scientific illustrations of the soil foodweb rarely represent humans as part of this relational web – for example, as producers of »organic waste« and beneficiaries of the output of plants. This could be connected to the traditional role given to the anthropogenic element in soil scientific literature, where it is generally considered as one »element« of soil ecosystems and formation processes that »lies apart« because of the higher impact of its activities in a shorter amount of time than other organisms. The »human« mostly features as an unbalanced irruption in soil's ecological cycles – or a victim in the case of soil pollution – rather than as a »member« of a soil community.⁴² Notions of humans as members, or even of humans being soil, thrive outside science, however – including in how scientists speak of soil (and land) beyond their »official« institutional work.⁴³ It could be argued that alternative affective ecologies with soil become obscured within science. But in the spirit of staging matters of fact, scientific things, as matters of care, it seems to be a more fertile option to attempt an articulation of different horizons of practice and modes of relating to soil through their potential to transform human–soil relations. Connections with »nonscientific« ways of knowing soil, whose relevance is sometimes also mentioned by scientists⁴⁴,

could become even more important in the light of an argument for a shift in soil models from considering soil as a »natural body« to soil as a »human-natural« body⁴⁵ and for the introduction of new approaches such as »anthropedology« that broaden soil science's approach to human–soil relations.⁴⁶

Now, like all Anthropocenic narratives, these ideas would require nuancing which Anthropos is being spoken for, asking questions such as: If the marks on Earth that are to be accounted for are those that dramatically altered the geological makeup of the planet since the industrial age or atomic essays, shouldn't we, as Jason Moore argues, rather declare a Capitalocene? Or, should we, as Chris Cuomo has called for, reject this recentering of the notion of Anthropos altogether for its masking of capitalist and colonial dominations.⁴⁷

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Or, couldn't we propose questioning the tendency of Anthropocenic thinking to further evacuate agency from the other than human world and to reinstate Man as the center of creation – populate our speculative imagination with visions of more than human co-existent epochs that amplify the proliferation of symbiotic processes with multifarious nonhuman agencies such as Haraway invites us to do with a *Chthulucene*.⁴⁸ All these doubts contribute to complicate the narratives of the agential ethicalities at stake in reinstating humans in the concept of soil. Desituated storylines of Anthropos-centered relations need to be challenged if are we to offer situated humans a place within, rather than above, other earth creatures, in acknowledgment of specific modes of agency: a vital task for

environmental thought and practice, across the social sciences and humanities, but also for exceeding collective imaginations.

The exploration of decentered ethicalities of care via foodweb visions of human–soil relations can be nourished by such collective imaginations to contribute a displacing of human agencies without diluting situated obligations. Eliciting articulations of the sciences with other domains of practices, even subtle, is important here. Obviously, my reading of foodweb models goes beyond its explanatory potential to alter scientific conceptions of soil. Speculative thinking is professedly excluded from scientific concerns maybe even more than political stances. But when understood as part of a naturecultural transformation in human–soil relations of care, the foodweb is not just a scientific model. One could say that successful scientific models owe part of their power to their figurative potential. Beyond science, the foodweb is a charged figuration of soil relations, which I read here as going in the sense of restoring what Thompson calls the »spirit of the soil,« by which he points at an understanding of human

activity as part of the life of the earth and »the spirit of raising food and eating it as an act of communion with some larger whole.«⁴⁹ The search for glimpses of a transformative ethos in human–soil relations moves us beyond science and its applications to the articulations of alternative affective ecologies and technoscientific imaginaries to which science participates but not necessarily drives. The soil foodweb model is interesting in this regard because it has become, beyond science, a symbol of alternative ecological involvement – particularly in ecological movements where alternative visions of soil practice are being developed, such as agroecology, permaculture, and other radical approaches to agricultural practice. It is in these conceptions that transformative trends in soil relationalities can be read most visibly for how they foster a different relation of care, one susceptible to alter the linear nature of future-oriented technoscientific, productionist extraction in anthropocentric timescapes.

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