**What is an ecological game? Examining ecological dynamics and metaphors through the survival-crafting genre**

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**Abstract**

This paper takes as its focus the genre of games known as ‘survival-crafting’. These games, popularized in the wake of *Minecraft*’s (2010-present) success, often feature high degrees of environmental interactivity and simulation of plant and animal behaviors, as well as a heightened sense of dependence upon the natural environment for shelter, sustenance, entertainment and other necessities. Beginning with an examination of the ecological and environmental metaphors embedded within terms commonly used to describe features of the genre, I will then focus on its two nominal pillars: survival and crafting. Analysis of both these mechanics reveals their role in creating game dynamics that are less ecological and more economic in character. Many games lead players to prioritize resource acquisition, and structure their play experience according to rates of resource accumulation that mirror capitalist economic activity. Often these processes resemble a simplified and stylized re-enactment of industrialization. This paper concludes that a truly ecological game only becomes conceivable in a partial and fragmentary way through what Timothy Morton (2010) calls ‘the ecological thought’ – by thinking across the connections and assemblages involved in digital gaming as an activity or experience.

**Keywords**

*Videogames, genre, ecology, survival, crafting, economic activity*

**Introduction**

Digital games discourse has long made a habit of borrowing ideas, terminology and metaphors from other fields and media, most frequently in its early period from film discourse, with terms like cutscenes, cameras etc. (Buecheler, 2006). More recently games have sought to distance themselves from other media by highlighting their distinct formal characteristics (Aarseth, 1997; Juul 2005; Bogost, 2007). As an extension of this drive, games discourse has begun to borrow ideas from ecology and systems theory, as well as associated natural and environmental concepts, to describe the systemic and procedural aspects of certain genres. This adaptation process has occurred in the course of marketing individual games and during the creation and maintenance of entire genres and the markets that support them. This is visible in the work of theorist Graeme Kirkpatrick (2012, 2016), who examines the discursive construction of the term ‘gamer’ through advertising and marketing materials in the 80s and 90s. The take up of spatial and environmental terms in more recent times follows a slightly different trajectory, with ideas often initially employed by developers and spreading into popular and scholarly discourse after adoption by journalists in the enthusiast press.

This includes some key terms like ‘environmental storytelling’ (Jenkins, 2004) – the technique of embedding fragmentary evidence of the past history of the game world via spatial arrangement of objects (think of a decomposing skeleton hidden beneath a freshly-dislodged boulder) – and also rather more fraught ones, like the term ‘realism’ deployed to describe visual verisimilitude in games. The saturation of ‘natural’ and even ecological metaphors throughout virtually all game discourse reaches its greatest extent around a popular genre of digital game which has emerged over the past decade, one that re-combines many pre-existing design tropes into the highly successful generic edifice defined loosely under the moniker of ‘survival-crafting games’. The ‘survival-crafting’ genre and the games that are developed, marketed and categorized as such is what this paper takes as its primary focus. I describe common features and dynamics of the genre in order to illuminate its structural or formal implications, and investigate whether they measure up to the ecological and environmental claims that have become implicit in the discourse around notions like ‘emergent gameplay’. This paper argues that these games do not reliably represent an ecological ethos, and I claim that the structural features common to most survival-crafting games (those that receive the lion’s share of attention from players, press and designers), bear far more resemblance to the structures and organizing logics of technological capitalism. Specifically, I claim that these games instead reflect the hegemonic orthodoxy of contemporary economics, which underpins and undergirds contemporary ecological crises from climate change to deforestation and biodiversity loss.

Relying primarily on close readings of a number of games from the genre, I also draw upon eco-theory from thinkers working across fields like human geography, philosophy and feminist ecocriticism. I argue that even if pro-ecological or counter-readings of these types of games are possible, their underlying logic resembles or re-imposes most if not all of the same problems we are trying to dismantle through ecocritical work. I begin with a brief survey of the ecological and environmental metaphors that suffuse the wider games discourse, both popular and scholarly, before moving on to detailed descriptions of the survival-crafting genre’s two principal distinguishing features – survival and crafting. I find the presence of (capitalist) economic logics in both: in the former, the ‘survival’ aspects of most of these games guide players into dynamics of industrial accumulation and life under capitalism, like eating as a nuisance or problem to be managed. In the latter I locate a specific reproduction of the trope of technological progress, coupled with representations of human-environmental relationships that reproduce narratives of mastery over the natural world. The paper concludes by rearticulating the question of what a truly ‘ecological’ or ecocritical game would look like, drawing on contemporary eco-theory.

**Ecological resonances in game discourse metaphors**

One hardly has to look hard for big-budget, so-called ‘AAA’ mainstream games that employ design elements and techniques that were, until recently, mostly relegated to specific genres like the ‘simulation’ or ‘sandbox’ game. Huge, industry shaping titles like *No Man’s Sky* (2016), *Skyrim* (2011), and the *Far Cry* series (2004-present) make much use of design tropes that have been described by developers, critics and scholars alike as ‘emergent’ – with the story or narrative emerging, at least in part, in a dynamic fashion, in response to the complex interaction of a host of systems and objects. In *Skyrim* (2011), wild animals, humanoids of different warring factions, and the unbidden appearance of dragons that drop out of the sky to attack all clash in the wild spaces of the game with spectacular results. The interaction of a host of different and mostly invisible systems behind each creature generates many possible player narratives, including heroic battles of humans against spiders, daring bandit raids interrupted by the appearance of trolls and other monsters, and any number of other strange systemic occurrences.

The concept of emergence has been a key one in games for both developers and players. Henry Jenkins (2004) describes emergent narratives via the popular game *The Sims* (2000), in a foundational piece sketching out the function of systemic story elements in games:

Emergent narratives are not prestructured or preprogrammed, taking shape through the game play, yet they are not as unstructured, chaotic, and frustrating as life itself. (Jenkins, 2004)

In Jenkins’ description here there is a sense in which emergence and emergent games are reflecting something about the generative nature of the world itself, of being capable of producing situations or scenarios *in excess* of comparable games that do not employ some degree of emergence. Players and critics often seem to prize these elements of emergent games for delighting and confounding expectations with dynamic surprises – such as *Skyrim*’s pitched battles of unpredictable foes. In the second edition of Ernest Adams’ (2010) game design fundamentals textbook, he pinpoints the term’s introduction into the industry, describing a lecture given by Marc LeBlanc at the Game Developers Conference in 2000 where it was first raised. But Adams devotes only five paragraphs of description to the topic in this edition of his textbook, belying the importance of the term to game development trends in the years that would follow. In 2013 Warren Spector, one of the primary developers responsible for the game *Deus Ex* (2000), widely credited with sparking mainstream interest in emergent systems and story in games, offered his ‘favorite definition of the term [as] ‘engines of perpetual novelty’.’ (Alexander, 2013) Describing how one goes about designing for ‘emergence’ in games, Spector’s advice is summarized as follows:

Create global rules versus specific, instanced behavior of objects and characters; build interlocking systems that are predictable and consistent (some objects are flammable, some guards are light-sensitive, the player has torches) but not pre-determined. Have a variety of object properties with plausible or simulated effects (‘let water be water’) that players can learn and engage with. (Alexander, 2013)

This sense of surprise, generativeness and indeterminacy coupled with an expected sense of behavior or natural properties – created via mimicking aspects of the world itself and its operation (‘let water be water’) – reflects an attempt to recreate the world and our complex relation to its dialectically opposed qualities of dynamism and predictability. Player expectations of how water or fire behaves, for instance, are drawn upon, bringing with them much the same cultural baggage the West is burdened with regarding nature and natural objects – a whole complex of ideas around repeatability and replicability of seemingly ‘natural’ events, phenomena and behaviors. The prevalence of discourses to do with ‘realism’ in gaming reflects a similar preoccupation, despite being greatly dependent on what Alex Galloway (2004) calls a ‘social realism in gaming’. As he notes,

‘realism’ is, however, a particularly unstable concept owing to its simultaneous, yet incompatible, aesthetic and epistemological claims, as the two terms of the slogan, ‘representation of reality,’ suggest.

A more extensive exploration of ‘realism’ in gaming is beyond the scope of this paper (see, however, Crisp (2015) for a thorough discussion). The importance for our purposes is a sense of correspondence (via both aesthetic and epistemological claims, as Galloway notes) to an object or behavior that we find, or perhaps more importantly, *expect* to exist in or belong to the world itself. For fire to be deemed ‘realistic’ it needs to behave in certain ways – by burning. In an emergent game, when fire burns grassland, which then causes a barrel to explode resulting in an unplanned scenario ‘emerging’ from the interaction of systemic rules and behaviors, we know that it was not explicitly scripted by the god-like figure of the designer themselves. Instead, it was the product of (and replication of) a dynamic within the natural world itself. There is a kind of correspondence in the emergent scenario that codifies the (often physical) laws of the universe into a game’s system – an attempt to replicate or reproduce ‘natural’ behaviors, as well as the predictability of those natural systems. This may seem relatively unproblematic for entities like ‘fire’ and ‘water’, but when the same schema is applied to other, more complex objects and phenomena, whether plants, animals or other living objects with agency, the implicitly deterministic or systematic nature frequently becomes a problem.

If the concept of emergence contains within it an understood metaphoric reference to the world itself, and thus freights in (whether surreptitiously or explicitly) a host of related senses including an affinity with the ‘natural’ or the ‘real’, then an even more explicit connection is found in the term ‘environmental storytelling’. Not coincidentally, in the same article in which he describes ‘emergence’, Jenkins (2004) offers the following account of the way that game environments can convey meaning or story to a player: ‘spatial stories can evoke pre-existing narrative associations; they can provide a staging ground where narrative events are enacted; they may embed narrative information within their mise-en-scene; or they provide resources for emergent narratives.’ The emblematic example of environmental storytelling in games that has become predominant recently, including becoming the butt of parody, is the meaningfully or humorously arranged skeleton, found in the game world in such a way that it evokes the stories, often the lives and deaths, of past inhabitants of the spaces where it is found. (Spokes, 2017) The *Fallout* series of games has become the premier example of this – with various skeletons found in toilets, or locked together in passionate embraces, evoking the final moments of their owners lives. Skeletons are by no means the extent of environmental storytelling, and Jenkins cites Carson’s (2000) broader description of this method:

Staged areas... [can] lead the game player to come to their own conclusions about a previous event or to suggest a potential danger just ahead. Some examples include... doors that have been broken open, traces of a recent explosion, a crashed vehicle, a piano dropped from a great height, charred remains of a fire.

Similar to the concept of emergence, environmental storytelling evokes the sense of a living, active world with a prior history or backstory that predates the current game world or the state that it is in. But if this sense of history is *evoked* rather than instantiated, that is appearing to be so via elaborate fictional cues rather than actually occurring and causing the consequences that are now represented, this raises a problem regarding the nature of game environments themselves. What actually is the environment of games? A number of scholars have begun to think through this question, including Alenda Chang, who has done perhaps the most work in this area in her PhD and subsequent publications like ‘Playing the Environment’, in which she asks: ‘how do games model ‘nature’ and relevant scientific theories?’ (Chang, 2009) Chang’s approach takes on a preoccupation with what Ian Bogost (2007) has described as the ‘procedural rhetoric’ of games, which emphasizes the formal differences between games and other media and the way their meaning is both constructed and conveyed. Bogost (2007) notes, ‘when we interrogate issues as procedural systems – as the emergent outcomes of interconnected, independent rules and cultural behavior – we can gain a unique perspective on [them].’ (98) It is implied, within the procedural rhetoric concept, that there exists an isomorphism between the political problems that Bogost suggests can be examined procedurally, whatever it may be, and the actual procedures that games employ to instantiate or represent them – once again reproducing a claim about a fidelity to the world itself. Chang (2009) finds this useful, arguing that,

In an age when ecological questions have been consistently framed in terms of crisis and moral duty, games offer a potentially less off-putting, less overtly didactic way to encourage people to consider environmental problems and their solutions.

Elsewhere, Abraham and Jayemanne (2017) have argued for four principle modes in which games depict, simulate or model environmental relationships between player and world – four metaphors for instantiating a sense of the natural world in games: environment as backdrop, environment as resource, environment as antagonist, and environment as text. Abraham and Jayemanne (2017) offer their categories as lenses for analysis of particular moments, events and features of games, finding that many games often shift between all or several over the duration of play. This suggests a slightly less cohesive ‘environment of games’ as experienced by players over time. American philosopher William James once famously claimed that ‘nature is but a name for excess’ (1909, 63) and game discourse notions that gesture towards the excessive capacities of gaming seem to be reaching for something similar.

The influence of biological metaphors on understanding computation, and vice versa, is well documented and has often been critiqued (see: Haraway, 1991; Lupton, 1994; Woodward, 1994; Uttal, 2005). The development of cybernetics, a perspective intimately entangled with the US Cold War military-industrial complex (Edwards, 1997), also involved a significant metaphoric influence of this type. Ultimately, however, the cybernetics view of ecology – and other perspectives like it, such as the ‘Deep Ecology’ movement – were attempts to view the world from ‘nowhere’ (Haraway, 1988), attempts to escapes from the terrestrial bounds of human understanding and a false sense of the independence of both human and so-called ‘natural’ systems – Mother Nature, it is still so often presumed, will always have the last word. Whether it is through ‘emergence’ or ‘environmental storytelling’ and the evocation of a history to the digital space, games discourse is often found repeating these same gestures, reaching for ecological, environmental or other ‘natural’ metaphors. In the following section I describe the twin features of ‘survival’ and ‘crafting’ within the survival-crafting genre, discussing standout examples and the ways mechanics and dynamics in these games replicate or sit uneasily with ecological philosophy.

**Features and dynamics of the survival-crafting genre**

One of the most prominent new genres of game to arise in the past few years has been given the moniker of ‘survival-crafting’, arising in tandem with the increasing emphasis on environments, ecosystems and systemic interrelationships indicated by the terms and metaphors just described. The two main dynamics common to these games are specialized obstacles to survival beyond the usual adversarial relationships between player and enemies, and some elements of crafting objects, tools and other creative acts of self-expression. The prototype for the genre is the cultural juggernaut that is *Minecraft* (2010–17), which has also done the most to raise the profile of the genre. Spawning countless variations on the design tropes *Minecraft* introduced, Amanda Phillips (2014) has called the game an ‘algorithmic ecology’ in which ‘automated computational processes govern nature…and in many ways, thanks to aesthetic design and game mechanics, subsume the eco-logical within the mathematical.’ (Phillips, 2014: 109)

One could easily list a dozen or more games in recent years that have followed in *Minecraft*’s footsteps in one way or another, emphasizing slightly different elements and dynamics in each: *Terraria* (2011), *Miasmata* (2012), *Rust* (2013), *7 Days to Die* (2013), *The Forest* (2014), *Subnautica* (2014), *Far Sky* (2014), *ARK Survival Evolved* (2015). Many of these games were first released through Steam’s early access system, which allows developers to sell early ‘alpha’ or ‘beta’ versions of their games in an incomplete state, with the unfinished experience substantial enough to attract an interested and engaged player base invested in the ongoing development of the game. Games in the genre often feature dynamic, even lush natural landscapes, as well as mechanics that emphasize the player’s precarious existence within and dependence upon the natural world. Food and water mechanics are common staples underpinning this precarity, and contribute to the seeming paradox of an avatar with fairly banal or ordinary capacities. This is quite different from the standard power fantasy avatar in many videogames. *ARK: Survival Evolved* even takes the uncommon step of modeling regular defecation in humans and animals, including the player themselves, who can use their own feces to fertilize their crops (Skrebels, 2016). The marketing material for these games frequently emphasizes the environment as a key element of gameplay, whether laid out by procedural design (*Terraria*, *Subnautica*) or by hand (*ARK: Survival Evolved*). Some proceduralization of ‘natural’ systems occurs in just about all of these games, if only at smaller scales such as where and when flora and fauna spawn; in *ARK: Survival Evolved*, dinosaurs spawn according to algorithms approximating geographic distribution of animal populations.

The 2D survival-crafting game *Terraria* is described on its page on the Steam online store with the following zealous exhortation: ‘Dig, fight, explore, build! Nothing is impossible in this action-packed adventure game’. Similarly, *The Long Dark* is described as ‘a thoughtful, exploration-survival experience that challenges solo players to think for themselves as they explore an expansive frozen wilderness’. When the game begins, however, the player is greeted with a disclaimer that notes the developers of *The Long Dark* have taken liberties with animal behavior, in particular its aggressive representation of wolves, noting that they ‘are not trying to create ‘realistic’ wildlife behavior in the game’. The disclaimer also contains the following passage, which positions the game uneasily in relation to its virtual environment:

The Long Dark is a survival experience, and we strive for realism in many areas, but it is NOT a replacement for actual survival training or experience in the wilderness. In the end, our goal is to provide an interesting set of choices for you to play with safely. It is not a wilderness training simulation.

An environmental orientation is frequently reflected in the way the players and press discuss the pleasures of these types of games. One of the early brace of features written about *Minecraft* that helped spark its initial mainstream buzz was written by John Walker (2010) of the influential PC gaming site RockPaperShotgun. Published in September 2010, Walker specifically highlights the ‘freedom’ and expressive dynamics of the game:

One of Minecraft’s most remarkable features is how different people approach it. Some see it as a giant Lego set, and set about constructing wondrous things. Others see it as a combat game, letting you create armor and weapons and fight your way through the nights. Me, I see it as an exploration and home-building game.

Even within Walker’s series of descriptions there is already a sense that players will value or prioritize the ‘survival’ aspects of the game. These aspects have gone on to become a mainstay of the genre. The player often begins in a very particular environment, with very few initial resources or capacities and little or no information about the immediate surrounding area. Over the following period, they must collect, harvest, grow, or in other ways acquire the raw materials and resources necessary to produce the tools and items that enable survival and other useful or enjoyable abilities. And while survival has always been a standing concern in many games – particularly first person perspective games that provide an intimate connection with an avatar whose survival the player is responsible for – the form this ‘survival’ has tended to take is a more immediate one. In fast paced combative games, the sense of avoiding instantaneous threats to one’s survival from bullets, monsters and other rapidly advancing dangers is primary. While these momentary threats to existence still occur in many survival-crafting games (via monsters, wildlife etc.), the main obstacles to survival in this genre play out over longer durations – through dangers like hypothermia, starvation, dehydration, illness and exposure. Hunger and thirst often increase in a linear fashion over time, as found in games like *DayZ, ARK: Survival Evolved*, *Subnautica*, and some modes of *Minecraft*. Enemies, whether human-controlled or AI driven, still represent threats to the player’s health, as encountered in *ARK: Survival Evolved*’s hostile dinosaurs and *Rust*’s antagonistic players. But obtaining shelter often becomes just as or even more important to securing one’s survival, whether to get through the cold in *The Long Dark* or to keep away from predators that only come out at night, as in *Minecraft*. The form that shelter takes in these games varies enormously, ranging from pre-existing structures players may huddle within to wait out passing threats; the ability to modify the environment in such a way that it provides shelter, as in *Minecraft*’s famous digging and building; to the crafting of entire pre-patterned structures at scales that range from individual houses to gigantic megastructures. This process of inscribing meaning onto the world has been described by Kyle Bohunicky (2014) as ‘ecocomposition’ – the writing of ‘shelter’ or ‘home’ onto the natural environment, constructed from the ‘media’ of the world itself: ‘rocks, trees, dirt, water and biological matter, and this discursive matter provides a set of symbols with which they can write shelter, tools and media.’ (Bohunicky, 2014: 222) As we shall see, however, these acts are invariably entangled within crafting systems that often reinscribe particular sets of relations between the player and the environment – relationships worth interrogating and critiquing, at the very least. The introduction of these longer term strategic ‘survival’ mechanics in the survival-crafting genre has shifted the dynamics and implied meanings of these games, as well as the relationships they create between players and the environments their characters inhabit.

In the survival-crafting game *Subnautica* – in which a player’s spaceship crash lands on a water covered planet – survival involves using the player’s escape pod fabrication tool to refine simple ‘scrap’ and other resources into usable blocks of raw material, which can then be made into objects like knives and other tools with which one can catch fish to cook and eat. The need to eat, and the time it takes to collect fish to cook and eat to fill the hunger meter, enmeshes the player in a series of dynamics of food gathering and management that interrupt and incentivize certain decisions. Time taken hunting and cooking is time ‘wasted’ or taken away from collecting more interesting or exciting resources. Eating (and often drinking as well) becomes a kind of mandatory drudgery – the simulation of the necessary upkeep of maintaining a living body in a somewhat ‘hostile’ environment, where one cannot simply exchange money for sustenance. The rate at which the ‘hunger’ or ‘thirst’ meter fills is calibrated to the rhythms of a typical play session, and the player will find the more complex and creatively rewarding activities such as exploring and building interrupted by the need to maintain sustenance. Beyond instrumentalizing the body’s relationship with food and water, this common survival-crafting dynamic frequently guides players toward stockpiling and accumulation, reintroducing an economic dimension. Often, as in the case of *Subnautica*, caught fish and other food does not keep forever, but can be processed into a more durable form (such as salted fish or jerky). While this might appear to be the sensible representation of ‘real world’ food dynamics like spoilage and entropy, we would be remiss in thinking that we engage with such dynamics free of our own predilections and prejudices. In other words, faced with ‘real world’ problems in the game, our solutions inevitably mirror the imperfect solutions capitalist economics have generated for these same ‘real world’ problems. It is also worth being critical of how this dynamic plays out in the second major feature of survival-crafting games: crafting and resource accumulation, which is often even more reflective of economic orthodoxies.

**Crafting as accelerating technological efficiency and accumulation**

A single consistent logic of crafting exists across the survival-crafting genre, involving the combination or refinement of ‘crude’ or simple items with one another to form more useful, more valuable ones. In some ways this represents an adaptation of the familiar ‘tech tree’ – a concept present in games for many decades now, and rightfully critiqued for the assumptions with which it is inflected. (See Ghys, 2012 and Carr, 2007 for a more nuanced discussion.) The crafting pattern established in *Minecraft* and followed by many others can be read to include similar assumptions about the nature of human advancement, wealth accumulation (in its most abstract sense – wealth as a stand-in for resources more simply) and technology. *Minecraft* introduced the template that many others follow in this respect, deploying a visual arrangement of items to craft its variety of objects and attributing variable levels of efficiency or efficacy to different ‘types’ of tool, weapon or armor depending on the material of its construction. *Minecraft* requires the player to place items in certain predetermined patterns on a 3x3 grid on the crafting screen in roughly the shape of the desired object. Arranging a ‘T’ shape of wood creates a wooden pickaxe; swap out the three blocks of wood across the top of the ‘T’ for iron to make an iron version. While crafting-via-arrangement is not often replicated by other survival-crafting games, presenting limited options for recombination, a variety of alternative methods exist throughout the genre. What is crucial in their respective implementations, however, is that they almost all retain a sense of *tiers* or levels of advancement, with increasing complexity, utility, etc. in the tools themselves. A brief survey of a number of these crafting systems in the more successful and well-known survival-crafting games follows.

In *Subnautica*, crafting is performed by selecting from a menu of blueprints rather than a visual ‘grid’. Simple technological tools unlock or enable the creation of more complicated ones. *Subnautica* begins with crafting a simple wetsuit apparatus including flippers, then proceeding to individual propulsion systems, and eventually fully enclosed submersibles. This process culminates in the production of highly advanced portable resource gathering and industrial production facility on-board a gigantic submarine which dwarfs the size of the player’s initial escape pod and the scales of player agency with which the game began. Each increase in technological complexity increases the speed of the player’s passage through the world that contains the resources and objects needed for survival and advancement, in turn speeding up resource gathering for the next level of complexity. This is important because each new ‘tier’ or level typically requires a kind of exponential increase in resources, mirroring capitalism’s intensification and acceleration of resource use since industrialization. Thus the game simulates the greatest contributor to the problems facing our planet at present.

In *Minecraft*, the tools a player can craft are gated by specific design decisions that replicate this dynamic of exponential accumulation. Starting with nothing but bare hands, only wood or dirt may be collected (or mined) within a reasonable timeframe. Stone mining is an excruciatingly slow process without any implements at all – and wooden ones are the most readily accessible, but the least durable. Once the player has wooden implements, stone gathering becomes achievable quite quickly; the quarried stone is then craftable into stone tools which are superior to wood in that they last longer and gather faster. Stone tools also allow for the collection of iron, and iron (once smelted and turned into iron tools) collects faster still and is the most durable of all save for diamond tools (which are relatively rare). The result of this design choice in *Minecraft* is the existence of a tool and resource *hierarchy* beginning with the hands and ending with diamond tools, which evoke the diamond tipped drills of actually existing mining techniques. The limited durability and slow speed of ‘mining’ that occurs with the lower orders of tools incentivizes and structures play sessions. This is obviously informed by real world characteristics and considerations: diamond is the hardest natural substance in the world, and is used in commercial mining applications. Thus it makes an immediate kind of sense for it to appear as the ‘ideal’ or ‘best’ form of tool. It conforms to player’s expectations drawn from knowledge or experience of the natural world. In *ARK: Survival Evolved*, a slightly different pattern is used, requiring experience gain and leveling up to unlock blueprints for more complicated tools – but the same hierarchy and dynamic of accelerating accumulation is in force. In *The Forest* the player peruses a menu of craftable items (visualized as a survival handbook with pages and illustrations) of varying complexity – palisade walls, standing fires, tree houses, tents and so on – including, for example, a sled that can be dragged while carrying several times the amount of wood that an individual player could carry initially. Once again, the scale of the player’s agency extends in parallel with the expansion of technological complexity.

In the majority of these games then, and by deliberate design, the crafting progression with its hierarchy of materials and tools comes to reflect something like a simplified version of the ladder of technological progress, with its main purpose being to provide something of a ‘goal’ to structure this free-form play in a seemingly open and un-directed world. This structure also *rewards* players for their time and effort with accelerated resource acquisition, and reliably increasing rates of return on time invested. A review on the Steam page for the game *ARK* makes this point clear. The negative review, by Steam user ‘Morticielle’, who at the time of posting the review in January 2016 had recorded over 3,400 hours of playtime in the game, claimed that their ‘love’ for the game had been ‘dying’ for several months due to changes to high-end, difficult to acquire dinosaurs introduced in a previous patch. Specifically, the user claims that:

Animals which were used to farm metal, stone, wood etc. now have a much much lower yield than before. This has as a consequence that getting resources for crafting now becomes a nuisance. [sic] (Morticielle, 2016)

In this quote, Morticielle is using economic language to describe the cause of feelings of frustration over a decreasing rate of reward on time invested, with an expectation of increased efficiency over time rather than the reverse. Many players understandably gravitate towards the most ‘efficient’ tools in order to spend more time on enjoyable and rewarding tasks that enable their self-expression, creativity, and ecocomposition. The less time spent on work necessary for enabling such self-expression (which we could perhaps call ‘maintenance’ work, like addressing survival questions of hunger and thirst) the more there is for fun and expressive activities. The last several years has seen the emergence of a body of work taking these concerns seriously, looking at what constitutes ‘work’ in games, which has sometimes been referred to as ‘playbor’ (Kuklich, 2005; Dyer-Witheford and de Peuter, 2009). In their review, Morticielle expresses a preference for spending more time planning and constructing and less time ‘working’ on resource gathering, suggesting that more work needs to be done looking into struggles over control of the means of production (so to speak) in digital games in the future.

In summary then, crafting dynamics hew closely to economic ideas, replicating capitalist notions of return on investment and increasing rates of wealth accumulation (if in rather simplified, cartoonish ways). Under capitalism it is often said that it ‘takes money to make money’, and in survival-crafting we might say that formula is slightly altered to reflect the range of resources beyond simply money: it takes stuff to make stuff. Accumulating this stuff takes time, but the amount of time it takes becomes reduced once access to greater technological complexity has been achieved. The way that higher order, faster and more efficient tools are ‘gated’ until sufficient resources are acquired, i.e. sufficient time is spent gathering them, structures rhythms of play, providing a goal for players to aspire to. This reflects a simplified image of the ladder of technological progress or capital accumulation, with a low barrier to entry.

These are clearly constructions worthy of analysis, particularly as the dynamics embedded in a hierarchy of tools and resources can be viewed as a reproduction of simple technological determinism – an idea that has been critiqued when present in other genres, particularly in the tech trees of historical strategy games like *Civilization* (Ghys, 2012). Certainly there is never any moment of revolutionary discovery in the survival-crafting game, with very little opportunity for the reconfigurations and reorderings of social worlds that are often instigated by technological development (in both positive and negative potential senses).

Further, we can compare the trajectory of increasing degrees of player ‘mastery’ over the landscape over time to a similar trajectory in Western history, with a deep (if simplified) connection to metanarratives about the triumph of humanity over ‘nature’. In this way the genre reproduces what feminist ecologist Val Plumwood calls the ‘mastery of nature’ narrative that is an undercurrent of Western society, and which simulates (again, in cartoonish form) what she calls the same ‘problematic features of the west’s treatment of nature which underlie the environmental crisis, especially the western construction of human identity as ‘outside’ nature.’ (Plumwood, 2003: 2) So despite what we might be tempted to laud as an encouraging, even pleasant inclusion of ecological concepts and bucolic themes within their simulations, the survival-crafting genre seems to reproduce many of the same ideas that environmentalists and ecologists have been struggling against since the modern environmentalist movement began in the 1960s. This point has been made previously by Chang (2011: 60) who suggested in another context, and before the current flourishing of the survival-crafting genre, that ‘game designers have yet to develop more sophisticated rules for interaction between players and game environments.’ As a result, ‘games naively reproduce a whole range of instrumental relations that we must reimagine’ (Chang, 2011: 60). Examination of survival-crafting games seems to suggest that hopes for a greater sophistication of game-environmental interactions have yet to be fulfilled in a meaningful way, at least by this genre.

One final observation may serve to further illustrate the argument I am making about survival-crafting games, and which applies to both of the two main elements. If we were to plot all the games in the survival-crafting genre onto an imaginary line, a particular spectrum emerges: at one end games in which the difficulty of survival is greatest or where the majority balance of design focus rests, and at the other end those in which it barely requires effort or attention. At the more ‘survival’ focused end of our line, we would find for instance *The Long Dark* or *DayZ*, games in which the player experience corresponds most closely to the struggles and experiences of those least economically fortunate, with the least access to money, resources and the means of production. Playing these games reflects something of the harrowing experience of being poor, homeless, destitute – with gameplay revolving mostly around the hard scrabble of simply staying alive, with a deck stacked against you, and with crafting often framed as ingenuity or necessity in the face of adversity. At the other end of the spectrum, however, where we find games more like *Minecraft* and *ARK: Survival Evolved*, the focus shifts more to about what one would *do* given access to great wealth or resources; how players would behave, essentially, if they had the same access to money and the means of self-expression and self-actualization as if they were members of the rich global elite. Relative freedom from scarcity (through technological dominance) enables greater amounts of freedom and self-expression, with crafting taking on either a more capitalist or industrial organization, as outlined in the discussion above, or becoming similar to consumerism, with consumption of resources as a method of self-expression through customization and control over the immediate environment. Bookshelves and cakes in *Minecraft*, for instance reflect a surplus of the necessary resources for survival much the same way an expensive bottle of Dom Pérignon does in the real world. Of course this illustration is rather crude, perhaps even a little reductive, but it illuminates a key aspect of what I have been arguing is the actual focus of these sometimes distractingly pastoral games: that they are much more about *economic* activity than *ecologic* activity.

**The ecological game**

What hope is there, then, for a truly ecological game? When even the most seemingly eco-systemic, or ‘emergent’ genre of game – the survival/crafting genre and its much touted relationships to natural worlds and spaces – is also thoroughly suffused with the same thought and structures underpinning the current global ecological crisis? What is, or would, a truly ‘ecological’ or ecocritical game resemble? The work of Timothy Morton (2007) has done a great deal to suggest an alternative ‘ecology without nature’, the goal of which is to avoid issues like ones above in which Nature (with a capital N) is constructed inextricably in and through capitalist thought and extraction. In answer, Morton offers what he calls ‘the ecological thought’ instead, which becomes possible in our current crisis-bound perspective:

The ecological crisis we face is so obvious that is becomes easy – for some strangely or frighteningly easy – to join the dots and see that everything is interconnected. This is *the ecological thought*. And the more we consider it the more our world opens up. (Morton, 2010: 1)

Once we begin to think ecologically – tracing the connections between all things – it becomes incredibly difficult to stop, opening up the possibility of an ‘ecological thought for games’. Formerly unrelated issues or elements are revealed as intimately linked in great chains of interactions and coexistences. In its analyses, the field of game studies and game criticism more broadly has tended to discount questions around impacts or connections beyond the game-space itself as unrelated to the immediate critique or criticism of individual games –this view sees games as part of a distinct and siloed realm of ‘culture’ instead (*pace* Plumwood’s (2003) human activity outside of ‘nature’). There are examples of material analysis being used to examine games as consumer objects, highlighting their status as products of industrial mineral extraction and labor exploitation with environmental consequences (see: Dyer-Witheford and de Peuter, 2009) – however this work has rarely been folded back into analysis of the games themselves. Partly this is because the burgeoning ‘material turn’, as Apperley and Jayemanne (2014) describe it, is difficult to reconcile with the seemingly ephemeral or transitory nature of the experience or moment of play itself. Few games call attention to their own materiality, after all. But as Morton notes, these realms cannot ever really be rendered separate: ‘like a dam, Nature contained thinking for a while, but in the current historical situation, thinking is about to spill over the edge.’ (Morton, 2010: 3) We can assert, therefore, that there is nothing ‘natural’ or indeed unnatural about rare earth minerals or a teenager sitting at a computer playing *The Sims*. Nature, the idea of an ‘out there’ pristine, untouched and unconcerned with the thoughts and activities of human beings, does not exist.

In his work ‘A Critique of Play’, Sean Cubitt (2009) quotes geneticist R.C. Lewontin for an explication of the relationship between organism and environment, suggesting its relevance for emergent game forms specifically: ‘Because organisms create their own environments we cannot characterize the environment except in the presence of the organism that it surrounds’ (Lewontin 1995, 133 cited in Cubitt, 2009). The conclusion Cubitt (2009) draws is that ‘an ecological game is then one in which the act of externalizing and objectifying the environment as other is broken down by insisting on the mutuality of production, the interaction of multiple users to produce an evolving rule-set.’ This perspective, however, challenges the prevailing approach to much game criticism and analysis which treats the *game itself* as the appropriate unit of analysis. Perhaps the ecological thought challenges our very notion of game coherence and the boundaries of the play experience, seeming to entreat us, paradoxically, to think both bigger and *smaller* at the same time. This is close to the conclusions reached by Abraham and Jayemanne (2017), who propose a suite of lenses for analysis of ecological or environmental messages in games, looking for modes of environmental representation in and across moments of gameplay. They conclude, however, by drawing attention to the partial and fragmentary nature of such analysis, noting its compatibility with games and the object of ecocritical thought itself: ‘none of these four modes really capture the potential of how the weird assemblages we call videogames can deal with the weird event we call climate change’ (Abraham & Jayemanne, 2017: 15).

On a moment-to-moment level, games may succeed or fail at representing or simulating an ‘ecological’ or ecocritical situation or event (according to the four ‘lenses’ proposed by Abraham and Jayemanne (2017)), but at the same time, the game object or experience exceeds this partial analysis. Though uncommon, games like those in the *Metal Gear Solid* series, for instance, gesture ecologically in the other direction entirely, with third-wall breaking moments that remind the player that they are playing a game on a console or device. A famous scene in *Metal Gear Solid* for the original PlayStation console required the player to unplug the controller from the first control slot and into the second in order to defeat a boss – prompting a potential moment of ecological thought in players who are intensely reminded of the activity they are actually engaging in as an organism, in an environment.

In fact, there is perhaps something about the nature of interaction itself which seems in accord with ecological thinking. Is it possible to consider even FPS games to be in some sense, at certain times, or in certain situations ‘ecological’, as the player reaches out and catalyzes interactions between bullet and world? Again we have to affirm that there is hardly anything more or less artificial about a virtual bullet versus, for instance, a virtual dandelion or seashell, and this is the ecological thought. The concept of interaction itself harbors a deep ambivalence or conceptual ambiguity about what it refers to exactly, reflecting a confusion in distinctions between the material and the cultural in games. Salen and Zimmerman’s (2004) discussion of interaction in *Rules of Play* is unable to reconcile the disparate ways in which the term is conceptually deployed to present a unified definition. The closest they come to a general definition of interaction is when they say that ‘interactivity simply describes an active relationship between two things’ (Salen & Zimmerman, 2004: 58). This incredibly broad definition has real and obvious resonances with Morton’s (2010) ecological thought as well. But if tracing ‘interaction’ is at least *like* thinking ecologically, then an analysis of mechanical interactions and the meanings they create, the ideologies and attitudes *about* nature that they embody, still remains valid as an avenue of critique. If we look at the ideas and ideologies embodied in consciously designed and developed interactions within games – in other words, the nature of relationships between player and world, player and objects, player and *other things* as foregrounded or backgrounded by design – then we approach the ecological thought and may find it in action in the games themselves.

**Conclusion**

A truly ecological game, then, remains extremely difficult to imagine. I have suggested that the concept of interaction holds a key resonance with what Timothy Morton (2010) has called ‘the ecological thought,’ offering potentials for extended connection, relations, and awareness of the lack of any true ‘ends’ to any open, relational ecological situation. But even if we focus our analysis on the dynamics of these games, even following the game community’s preference for reflection on ‘mechanical’ relationships, then certainly the survival-crafting genre can hardly be said to be truly ‘ecological’ except in its simplest thematic sense, or in the same sense that *any* interaction in a game is (partially, and potentially) ecological. Instead, as this paper has argued, much of the focus of the survival-crafting genre of games, and the dynamics they enmesh players within, boils down to economic activity, doing arguably little to prompt or extend player thought in an ecological vein (following Morton). For these reasons the genre deserves some scrutiny regarding the relationships it portrays between elements of the environment, from human players to land, animals, and resources under the ground. These portrayals occur both through the interactions in the game world itself, and – if we are to think truly ecologically – perhaps through production practices (such as the labor conditions under which the game was produced) and the responsible sourcing of materials for the devices it is played on as well.

Future research may wish to expand on this initial sketch of the survival-crafting genre’s particular resonance with differing class experiences of economic activity, as I have argued exists in the genre, and to examine player attitudes towards these activities and experiences. Why one might be attracted to simulations of the experiences of the economically destitute, for instance, is a highly pertinent question, as is whether or not players are consciously aware of these resonances. It may also be worth considering which, if any, other genres significantly reflect both ecological and class-economic relationships, and the differing attitudes and relationships those genres portray about the environments that sustain them – both in terms of the planet which we are currently warming with human activity, and the worlds which players inhabit within their screens. The truly ecological game remains as difficult to imagine under current conditions as it is to imagine an end to the ecological thought itself.

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